



**Preservation of Digital Art:
Theory and Practice**
The project *digital art conservation*

Edited by Bernhard Serexhe

//////ZKIII Center for Art
and Media Karlsruhe **/**

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Foreword

Foreword and Acknowledgments

Bernhard Serexhe

The question “Are you born digital?” may well soon become all-important with respect to conserving and thus preserving the art of our times for future generations. In the certainty that such conservation and accessibility is both necessary and reasonable, and in the uncertainty about whether, and how, this is best implemented, the research project *digital art conservation* was launched in 2010 at the ZKM | Center for Art and Media Karlsruhe. Three volumes in three different languages now seek to disseminate the results of the project to all those with an interest in the subject.¹ The primary task of this research project was to understand the conditions under which conservation of digital artworks in collections takes place or, alternatively, not. Further, the project’s aim was to test and propose strategies for future conservation measures.

Because the apparently unlimited possibilities of the digital are frequently presented as aids and remedies to analog culture, it must be made clear from the outset that the project *digital art conservation* has nothing to do with the digital conservation of art in general, namely, with conservation by means of digitization, but with the conservation of digital artworks. In other words, the conservation of art which was subject to digital codification during its production process, or which is already tied to digital processes with its original presentation equipment. The general problem touched upon here, namely, the preservation and handing down of the genuine digital culture of our time to future generations, is destined to become a decisive question for all culture institutions in the twenty-first century, irrespective of whether they uphold the standards of traditional values, operationing structures, and objectives, or themselves seek to be part of the avant-garde of technological progress.

The project *digital art conservation* was initiated at the ZKM | Karlsruhe in response to the urgency of this issue, so fundamental to digital art, and it was carried out in collaboration with five other regional partners. In keeping with its objective to develop conservation strategies and, within the context of international exchange to test these for meaningfulness and feasibility with curators and conservators, public museums and private collections, the value categories of the traditional ethics of conservation should be measured against the actual possibilities of digital art conservation. In the evaluation

¹ *Digital art conservation* was chosen as the short, internationally understandable title. The project’s official title is *Digital Media Art in the Upper Rhine Valley. Conservation – Restoration – Sustainability*, and in French it is *L’Art numérique du Rhin supérieur. Conservation – Restauration – Pérennisation*.

of various strategies, the much-vaunted “authenticity” of the digital work should not be hastily sacrificed to the existing or apparent pressure of technical innovation, nor should the legitimate desire for the preservation of this “authenticity” lead to the work’s disintegration as a result of technical failure. The generally acknowledged insight that digital media art frequently has a performative and thus ephemeral character, and that the conservation of its technical functionality, in other words, its behavior, can best be guaranteed by the constant adaptation of its technology to respective “performance situations,” should in no way lead to abandoning the recognizable historical origins and classification of the work. And neither should the works be “improved” technically or aesthetically. They should retain their original work character, behavior, and aesthetics for as long and as faithfully as possible, and in doing so be testimony to the epoch and the conditions in which they were created.

Recognizing that up to now theory and practice are inadequately developed, from the outset the project *digital art conservation* consciously rejected any development and euphemistic announcement of guidelines and ideal solutions – in view of the fact that time is now running out for conserving many works of digital art. All the contributing partner institutions were, and are aware that the theoretical and practical groundwork must be established on which future teaching and practice in conservation is structured.

With these considerations in mind, the following objectives and sections of the project were identified; the details are elaborated in the reports in individual chapters of the publication: identification of digital works in the collections in the Upper Rhine region; completion of ten case studies on the works selected; interviews with the artists; organization of two international symposia of experts; integration of the project’s objectives into courses at two art academies (Strasbourg and Bern); development, production, and organization of the touring exhibition *Digital Art Works. The Challenges of Conservation*² at four locations within the area covered by the project.

The compilation of digital artworks held in collections within the Upper Rhine region was carried out by the partners in the respective areas, and the two symposia provided the opportunity for critical expert and interdisciplinary investigation and exchange between the partner institutions. At the symposium *The Digital Oblivion. Substance and Ethics in the Conservation of Computer-based Art* (Karlsruhe, November 4–5, 2010) theorists and curators discussed

2 ZKM | Center for Art and Media Karlsruhe (Germany), October 29, 2011–February 12, 2012; Espace multimédia gantner Bourgogne (France), February 25, 2012–April 28, 2012; CEAAC (Centre Européen d’Actions Artistiques Contemporaines), Strasbourg (France), and École supérieure des arts décoratifs (ESADS), Strasbourg (France), June 16, 2012–September, 23, 2012; House of Electronic Arts Basel (Switzerland), January 18, 2013–March 31, 2013.

the impact of the current systemic change in cultural memory on temporal and historical consciousness, and on the image of self and world in the digital age. Questions relating to the transformed temporality and materiality, the reevaluation of documentation and archiving, as well as the development of methodology were discussed in connection with the conservation of digital art. At the symposium entitled *Digital Art Conservation. Practical Approaches: Artists, Programmers, Theorists* (Strasbourg, November 24–26, 2011) artists, programmers, and theorists engaged with issues relating to conservation practice encountered both in their own experience as professionals as well as in the project's case studies. The discussions and formation of opinions at both symposia were not confined to a treatment from strictly scholarly perspectives, but also incorporated interdisciplinary approaches ranging from ethical, artistic, and curatorial to practice-related issues. In their approach and diction, the essays included in the publication mirror the variety of expert backgrounds of the speakers.

To guarantee compliance with existing laws when applying conservation measures, at the beginning it was important to deal with the legal questions pertaining to conserving genuine works of digital art. For this we owe a special debt of thanks to the project partners at the Center for Applied Legal Studies (ZAR) and Institute for Information and Business Law (IIWR) at the Karlsruhe Institute of Technology (KIT) under the direction of Professor Thomas Dreier.

For the organization of the exhibition *Digital Art Works. The Challenges of Conservation* (see pp. 520–563), the project partners would like to thank Espace multimédia gantner Bourogne (France) under the direction of Valérie Perrin, and Vidéo Les Beaux Jours under the direction of Marie-Michèle Cattelain and project management of Catherine Mueller, as well as the CEAAC (Centre Européen d'Actions Artistiques Contemporaines), Strasbourg (France), under the direction of Evelyne Loux and, finally, the House of Electronic Arts Basel (Switzerland) under the direction of Sabine Himmelsbach.

All project partners would also like to express their thanks to the employees of the INTERREG administration in Strasbourg, as well as to all members of staff at the respective partner institutions. The project partners thank the lecturers at both symposia, and the authors of the present publication for their contributions, as well as the ZKM | Karlsruhe publications department for the editing, coordination, and successful completion of this publication.

We are particularly grateful to Arnaud Obermann, who, as an outstanding conservation manager himself was responsible for directing the project's conservation enterprises, including the implementation and coordination of the case studies. Great thanks are owed to Chiara Marchini Camia, who assumed

responsibility for the weighty task of coordinating this research project, and who mastered it with utmost dedication. Arnaud Obermann and Chiara Marchini Camia also collaborated as cocurators in developing the exhibition *Digital Art Works. The Challenges of Conservation*.

The research project *digital art conservation* is a joint venture of the following institutions:

Project Direction

ZKM | Center for Art and Media Karlsruhe (Germany)

Project partners

École supérieure des arts décoratifs (ESADS), Strasbourg (France)

Espace multimédia gantner, Bourogne (France)

Vidéo Les Beaux Jours, Strasbourg (France)

Bern University of the Arts (BUA) (Switzerland)

House of Electronic Arts Basel (Switzerland)

Associated Partners

La Laiterie, Le Festival des Artefacts, Les nuits électroniques de l'Ososphère; all located in Strasbourg (France)

The project was cofinanced as part of the funding program INTERREG IV Upper Rhine by the European Union – European Regional Development Fund (ERDF). The project running time was 36 months, from January 1, 2010 to December 31, 2012.

Translated from the German by Justin Morris



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Collecting and Preserving Digital Art

Born Digital – But Still in Infancy

Bernhard Serexhe

The question “Are you born-digital?” which was also posed in the foreword, indicates a turning point set in motion decades ago by the far-reaching system change from analog to digital culture. This turning point not only marks the commencement of a new era, of a new time in history, but also the concept of time itself has changed and is changing still. With the ubiquitous availability and, at the same time, transience of all information, the perception of the present is distinct from that of the past. The only thing that counts is what can be communicated immediately. History seems to have become a random reconstruction based on available data.¹ Against the backdrop of a fast-moving digital culture, the research project *digital art conservation*, the subject of this volume, may appear thoroughly conservative, for it engages with conserving works and values which, although they were produced very recently and thus belong to our times, will soon be relegated to the past because of their ephemeral nature and highly transitory technology.

The project’s premise – that it is necessary to preserve digital art – which derives from traditions of cultural memory, does not represent a consensus among artists, curators, and art scholars. This is because the decisive characteristics of the “genre” of digital art are its extremely fast-moving nature, its performative character, and its perpetual ongoing development, which even compel its creators to adapt their works continually to new technological developments, and thereby “improve” them. The twentieth-century motto “faster, higher, further, better” together with globalization of the manufacturing and marketing of information and communication may have led to unprecedented economic growth, but it has also resulted in the massive exploitation and unsustainable consumption of resources and the accompanying negative effects this has on our environment. In the introduction to a publication such as this, which aims to preserve cultural values, we must also touch upon this issue. For if art is not only seen as an exclusively creative act that ostensibly liberates itself and its users/performers, and then satisfies the demands of eager buyers, then essentially art is also a valuable resource, which, although renewable, cannot by any means be used arbitrarily. This is not least because artworks bear witness in various ways to the era and society in which they were created: this piece of art could only be created at

1 See also the essays by Edmond Couchot, pp. 85–90, and Siegfried Zielinski, pp. 91–108, both this volume.

such and such a time and in such and such a society, not earlier and not later. In this sense, the preservation of our cultural artifacts guarantees continuity within time. And this leads us to ask whether the digitization of cultural memory, which has been proceeding so rapidly over the past few decades, will ultimately lead to the destruction of cultural memory,² and thereby to an “intelligence without memory and a past, to a sinking into the utopian, into a future without human beings,”³ as Paul Virilio already prophesied in 1995.

Seen in this light the intention of the *digital art conservation* project – to preserve the digital testimonies of our time – is by no means conservative. At the beginning of the twenty-first century, it should be seen as highly progressive, for the preservation of digital art – be it as a research theme or as a fundamental task of the art collections affected – represents an attempt to curb the pointless competition for ever faster, market-driven innovation to which our world has been subject in recent decades, including art.

The utilization of new materials, which began in the early twentieth century, brought with it the development of artistic techniques and the use of new media. However, it was especially the advent of electronic and digital art that since the 1960s has resulted in new concepts of artistic authorship and expanded forms of communication between artworks and viewers.⁴ Via the media channels of radio and television the public sphere now extends to the global electronic data universe, in which today, according to the sages and promoters of the Internet, all information – at least potentially – is available at all times and everywhere. And the expectations connected with these developments in tandem with a society increasingly oriented on the cult of the event plus evolving artistic modes of production, today confront museums, collections, curators, and conservators with hitherto undreamed creative possibilities, but also with unanticipated and yet unsolved curatorial and conservation issues.

A great deal has been written about the boundless possibilities of art with new media, about the new instruments for enhancing perception and artistic creativity, about limitless distribution and presence, as well as new forms of grass-roots democratic participation of a Web-oriented public in the global data universe. The twenty-first century artist is frequently presented as a virtuosic arranger of a never-ending work in progress, and the work as a 24/7

2 Manfred Osten, *Das geraubte Gedächtnis. Digitale Systeme und die Zerstörung der Erinnerungskultur*, Insel Verlag, Frankfurt am Main, Leipzig, 2004.

3 Paul Virilio in an interview with Friedrich Kittler, *ARTE*, November 1995 (in German).

4 “The artist is not alone in accomplishing his act of creation since the spectator is the one who puts the work in contact with the exterior world by deciphering and interpreting its profound qualities, and thus he contributes to the creative process.” Umberto Eco, *The Open Work* [*Opera aperta* 1962, rev. 1976], trans. Anna Cancogni, Harvard University Press, Cambridge (MA), 1989, pp. 261–262.

open platform in the online universe. The user is an inspired coauthor of the work, and the curator an omnipresent project manager straddling real polycentric and virtual worlds: to date these euphemistic visions have not been proved true, nor have they been refuted.

Rapid technological and social transformations have made it necessary to undertake a thoroughgoing revision of previous theories and practices of art, and thus in essence to a reevaluation that interrogates all traditional standards and criteria. This has become necessary because the conditions of art's production and distribution changed radically after the emergence of digital tools and transmission media. The familiar and common concepts used before to describe art, as well as those used to describe and critique emergent social and economic upheavals, have run up against problems of detailed definition, classification, and meaningfulness. For the art of our times, the generic concepts of traditional art history are no longer valid because they are incapable of reliably capturing new developments, whether these be in the production and distribution or in the reception of art.⁵ This questioning and reevaluation also derives from the fact that the question "Are you born-digital?" is now answered in the affirmative for an entire generation of digital natives. In the future, art will be confronted with a new generation of users who will approach it with new expectations directed explicitly towards interaction and participation.

About a century ago, artists began intentionally to appropriate perishable materials,⁶ new techniques,⁷ and new methods of presentation, and they began to stage their works' impermanence – all this was contrary to the interests of the art market and collectors. To this was added in recent years technical obsolescence, brought about by the accelerated pace of technological developments, which must be comprehended as a threat to art that is inherent in the system – a threat insofar as one seeks to hold fast to traditional categories like intrinsic value and longevity. The "decline" of artworks has

5 As early as 1983 Hans Belting proposed "that contemporary art indeed manifests an awareness of a history of art but no longer carries it forward; and that the academic discipline of art history no longer disposes of a compelling model of historical treatment." Cited from: Hans Belting, *The End of Art History?*, trans. Christopher S. Wood, University of Chicago Press, Chicago, London, 1987, p. 3. Originally published in German in 1983: Hans Belting, *Das Ende der Kunstgeschichte*, Deutsche Kunstverlag, Munich, 1983.

6 Chocolate, honey, fat, blood: the list of ephemeral materials is long. In 2002 Teresa Margolles showed her work *Vaporization*, at the MoMA PS1 in New York, in which the exhibition was obscured in a mist of water vapour. The water came from a mortuary in Mexico City where it had been used to wash corpses.

7 "The twentieth century demonstrated that artists no longer work with bronze, marble and with paint, but utilise all kinds of media in their works and all kinds of materials..." Letizia Ragaglia, director of Museion Bozen for the exhibition *Frontera*, May 29–August 28, 2011, Bozen, Museion. Cf. MUSEIONbz, 01.06.2011, available online at: www.youtube.com/user/MUSEIONbz#p/a/D6DD8DD4367B28DB/1/L322ktoJViu, accessed 06/11/2013; translated from the German by Justin Morris.

accelerated still further due to the blanket, nonreversible system changeover to digital technologies. This affects works that were digitized to save their original analog data (documents, graphics, photography, film, music, musical art, video), as well as works created using digital devices (audiovisual recording equipment) and commercial software as well as works based mainly on custom programming of their source code (see glossary, p. 602). In order to draw a clear distinction between analog works that were digitized subsequently, the latter category of works is classed as “born-digital” (see glossary, p. 599). It is this category of works of genuine digital art that the *digital art conservation* project is specifically dedicated to examining.

Only very recently have we come to understand what this system change of cultural memory signifies for media art realized in digital code: the more rapid the technological development, the shorter the “half-life” of works of art. Going by our experience of the past twenty years, we must assume that in view of their rapid cycles of innovation, digital hardware and software have a maximum usability period of less than ten years. The resulting functional obsolescence or failure of digital works of art reduces the hitherto valid collecting criteria of longevity, authenticity, and intrinsic value to absurdity, and calls for a general rethink about their preservation, conservation, and presentation. Although the basic substance of the work of art lies incontestably in the idea, such an idea can only be expressed, communicated, and comprehended through being experienced by the senses. To this end material media are required, whether these be the walls of Stone Age caves, stone sculptures, paintings on canvas, photographs on paper, or even hardware and software whose functioning are intrinsic to the preservation and any new presentation of a digital artwork; namely, computers, hard drives, interfaces, sensors, monitors, projectors, and all other devices, which although they function and operate together in the digital process, they are in themselves anything but immaterial. Over the course of thousands of years it has been shown that information saved in analog media is retrievable for as long as they exist in their material form.⁸ In the space of a mere thirty years, with each new cycle of development and “advance” relating to digital art, the extremely short history of digital media has demonstrated the opposite.⁹

8 An often cited example of this is the Rosetta stone (Egypt, 196 BCE), which is in the British Museum in London

9 Twenty years ago, for example, so-called floppy disks were still used to save and transmit digital data. In the storage facilities of many collections early digital works are “sleeping” on floppy disks and other digital data storage media for which the devices to read them are no longer available. In the case of CDs and DVDs partial or even complete data loss is to be expected after five years. Hard disks can develop defects for different reasons at any time. The situation becomes more difficult in so far as the new operating systems of present-day computers no longer support the older software necessary for playback of these works, and that it cannot even be installed.

The technological and cultural paradigm triggered by the systemic shift from analog to digital culture may be shaped to a large extent by art as a catalyst of new technologies, but this has yet to be accepted by the majority of museums and collections.¹⁰ Thus, the question is how can and will museums and collections meet their responsibilities to preserve and pass on cultural heritage. This is quite independent of whether we understand the substance of digital art as consisting in its ideas and its codification in immaterial binary code, or whether we wish to hold fast to the historical materiality of its equipment for production, storage, and presentation.¹¹ With respect to their existing forms of organization, and due to increasingly diminishing funds, museums and collections have thus far not been in a position to meet the requirements imposed by this acceleration in technological development. Consequently, it is clear that this paradigm shift in the production and distribution of art must usher in changes in curatorial and conservation practices, which will result in a reevaluation of the four core tasks of collections and museums: collecting, conservation, research, and art education.

In recent years various research projects have focused on the problem of conserving, and thus preserving, modern and contemporary art. In her introduction to the highly recommended publication *Modern Art. Who Cares?*¹² which presents the results of a project enquiring into present conditions for conserving modern and contemporary art by the Foundation for the Conservation of Modern Art (SBMK) and the Netherlands Institute for Cultural Heritage (ICN), project director Dionne Sillé points out that clear guidelines exist for the conservation and restoration of traditional art.¹³ In addition to the fragile nature of the materials used in contemporary art and their diversity of meanings of the artworks, Sillé draws attention to the fact that generally accepted criteria and methods do not exist for the conservation of modern and contemporary art. Sillé emphasizes that it is a matter of urgency to develop such methods and vital that there should be international dialog and exchange of expertise. Clearly, one cannot but agree with these demands. What is surprising about this project from a present-day perspective is that although a diversity of materials and techniques were examined during the 1990s,

10 This is not least because of the permanently poor financing as well as the traditional inertia of human resource development at most public sector cultural institutions, which are often opposed to an interdisciplinary approach.

11 The ethical dimension of this question was treated as part of the project *digital art conservation* at the symposium *The Digital Oblivion. Substance and Ethics in the Conservation of Computer-based Art*, November 5–6, 2010, ZKM | Center for Art and Media Karlsruhe (see this volume, pp. 72–193).

12 Ijsbrand Hummelen, and Dionne Sillé (eds.), *Modern Art: Who Cares? An Interdisciplinary Research Project and an International Symposium on the Conservation of Modern and Contemporary Art*, Foundation for the Conservation of Modern Art, Netherlands Institute for Cultural Heritage, Amsterdam, 1999. The international symposium of the same name took place 8–10 September, 1997, in Amsterdam.

13 Dionne Sillé, "Introduction to the Project," in: Hummelen and Sillé 1999, pp. 14–19.

none of the published case studies or other contributions to the final publication of this project deals with the conservation of genuine digital art. Is it possible that those involved in restoration, who were dealing explicitly with modern and contemporary art failed to recognize the high-level threat to digital art right up to the end of the 1990s? Although “Computer art” had been a talking point back in the 1960s,¹⁴ it was the euphoric embracing and explosive spread of digital technologies in art in general, especially during the 1990s, which led to an uncritical attitude towards and underestimation of the risks to the long-term preservation of this type of art. The removal of constraints on the artwork, which was desired, achieved through tying it to immaterial binary code combined with the ongoing development of technically fascinating, highly efficient hardware and software provided artists with virtually unlimited creative possibilities. It was only after the turn of the millennium that the grave consequences for works created on this short-lived technical equipment were recognized.

In the 1990s assigning timeframes to and distinguishing Modernity, Postmodernity, or even “Second modernity” from each other, especially for contemporary art, was a problem, and the emergence of Media art only compounded the conceptual chaos. There is no clear conceptual boundary between the terms Media art, Computer art, Electronic art, Interactive art, New Media art, Multimedia art, Digital art, Web art, Net art and so on, as used in the English language, nor is there any direct semantic correspondence to the French terms *art multimédia*, *art numérique*, *art électronique*, *art interactif*, *art génératif*, etc. And in German, the terms used such as *Computerkunst*, *Softwarekunst*, *Medienkunst*, *elektronische Kunst*, *interaktive Kunst*, *generative Kunst*, do not permit a clear definition of digitally encoded art and its specific forms of production and distribution.¹⁵ It is hardly surprising that with this lack of conceptual clarification little attention has so far been paid to the conservation of digital art.

Other highly commendable research projects on the conservation of media art are discussed in detail elsewhere in this volume.¹⁶ However, all these

14 Digital art, incidentally, has been around at least since the 1960s and has been collected since that time. Georg Nees organized the first exhibition of digital art at the Technische Hochschule Stuttgart, in 1965, entitled *Generative Computergrafik* (February 5–9, 1965).

15 All art uses a medium. One can refer to *Media art* in the narrower, technical sense of the term “media” since the invention of photography at the latest; *Interactive art* has been around since Dada; *Computer art* also covers works created with analog computers; *Generative art* does not necessarily require a computer, but it is based on algorithms; *Electronic art* was introduced long before the invention of the computer; *Multimedia art* does not necessarily rely on the computer, but multiple media – whereas, it is especially *digitally coded art* that requires the use of program language, and which is fundamentally distinct from *digitized art*. For a long overdue critique of the concept “media” see also: Hans Ulrich Reck, *Mythos Medienkunst*, Verlag der Buchhandlung Walther König, Cologne, 2002.

16 See also the essay by Perla Innocenti, this volume, pp. 217–230.

projects focused primarily on the conservation of installations, electronic art, and time-based media, especially analog Video art, which is now fifty years old and the genre faces serious questions concerning its longer-term preservation. Probably the earliest initiative in Video art conservation is the not-for-profit Electronic Arts Intermix, founded in 1971 and still active today.¹⁷ True to its collection profile it has one of the most important historical collections of experimental Video art, and the initiative's conservation program is dedicated to the preservation and digitization of these works. New research projects have engaged with many issues relating to digital archives and, in a few cases, the preservation of digital works of art. In 1999 the Guggenheim Museum in New York, launched its Variable Media Initiative, a nontraditional, new preservation strategy that resulted from its attempts to preserve media-based and performative works in its collection, which later became the Variable Media Network.¹⁸ The Variable Media approach of adapting to the specific situation of performance or exhibition is, compared to the traditional ethic of restoration, groundbreaking, and is a fundamentally new method for describing a work; not solely according to its materials, but according to its "behavior." In addition to time-based works, this also covers digital works; the recommended strategies for conservation range from the traditional pool of technical equipment and spare parts to migration (see glossary, p. 601) in which its format is upgraded from an old medium to a more current one; to emulation (see glossary, p. 600), as a simulation of an older operating system on a newer software or hardware platform, and reinterpretation (see glossary, p. 601) a recreation of the work while retaining its idea and its specific behavior.

Another important research initiative is Documentation and Conservation of the Media Arts Heritage (DOCAM). Initiated by the Canadian Daniel Langlois Foundation for Art, Science, and Technology in 2005 this large-scale international research alliance, focused – up to 2010 – on the preservation of digital, electronic, and "technological" works of art. Through case studies, and within the framework of interdisciplinary workshops, DOCAM developed guidelines for the preservation of technological art, a thesaurus which critically examines the concepts, a timeline of technological development, and model documentation strategies and structures. Since its gradual introduction from 2007 onwards this documentation model has been widely acclaimed by experts.¹⁹ In 2005 *Matters in Media Art*²⁰ was launched, a joint

17 Electronic Arts Intermix (EAI), New York, available online at: www.eai.org, accessed 06/11/2013.

18 The Variable Media Network, available online at: www.variablemedia.net, accessed 06/11/2013.

19 See also the essay by Alain Depocas, this volume, pp. 145–153.

20 Available online at: www.tate.org.uk/about/projects/matters-media-art, accessed 06/11/2013. Belonging to the consortium is the Museum of Modern Art New York (MoMA), the San Francisco Museum of Modern Art (SFMOMA) and the Tate London.

undertaking of the Museum of Modern Art (MOMA) in New York, the San Francisco Museum of Modern Art (SFMOMA), and the Tate Modern in London. The multi-phase project is designed to provide guidelines for presentation, care, and preservation of time-based works of media art; namely, video, film, and software-based installations. The objective of the European research project *Inside Installations: Preservation and Presentation of Installation Art* (2004–2007)²¹ was to develop good practices and care of this art form by means of reinstalling, investigating, and documenting 33 complex installations and sharing the results in the form of recommendations. The ZKM | Center for Art and Media Karlsruhe was also involved in this collaborative endeavor, and the results can still be accessed via the project's website.

Since the aim of these research projects was the preservation of predominantly time-based works, the main emphasis was on conserving the vulnerable material of analog elements of the works, including digitizing and storing their mainly analog data. The updating, utilization, and archiving of genuine digital art data (born-digital art, see glossary, p. 599) was only explored in a very few cases. In recent years, the most noteworthy initiatives for collaboration in the field of conservation, especially of digitally encoded art, have come from the Netherlands Media Art Institute (NIMk) (since January 2013 the institute has been incorporated into the new foundation Living Media Art – LIMA, located in Amsterdam). The Computer-Based Art Preservation Resource, which is based there, focuses on the particular difficulties connected with the conservation of digital art. “Conserving a work of a computer-based nature is more complicated than simply preserving digital files. What must be saved for the future is not merely data, but all the nuances of an artist’s vision.”²² The published study *Born-Digital Kunstwerken in Nederland* of the Virtueel Platform²³ deserves credit, together with DOCAM, for analyzing the special features of conserving digital art, and for its timely reports on current methods and strategies. *Obsolete Equipment*, one of the projects of the Belgian center of expertise for digital cultural heritage PACKED vzw in collaboration with the Netherlands Media Art Institute (NIMk), Amsterdam, also dealt with the preservation of digital art.²⁴

21 *Inside Installations: Preservation and Presentation of Installation Art (2004–2007)*; under the direction of the Netherlands Institute for Cultural Heritage (ICN), Amsterdam; available online at: www.inside-installations.org, accessed 06/11/2013.

22 Available online at: <http://nimk.nl/eng/computer-based-art-preservation-resource>, accessed 0/11/2013.

23 *Virtueel Platform Research: Born-Digital Art in Nederland*, Virtueel Platform, Digital Erfgoed Nederland, Stichting Behoud Moderne Kunst and Nederlands Media Art Institute, Amsterdam, 2012; available online at: <http://virtueelplatform.nl/g/content/download/virtueel-platform---born-digital-kunstwerken-in-nederland-2012.pdf>, accessed 06/11/2013.

24 *Obsolete Equipment (2009–2011)* was a project by PACKED vzw – Centre for Expertise in Digital Heritage, Brussels, in collaboration with the Netherlands Media Art Institute (NIMk), Amsterdam; online: www.obsolete-equipment.org,

Although there are many collections that do not yet have any digital artworks, by the turn of the millennium latest digital art began to gain visibly in importance at exhibitions, festivals and biennials, and in the future this is bound to influence collecting policies. Museums throughout the world have recognized both the urgency of taking steps to preserve their own holdings and, with a view to the future and the increasing significance of digital art in their collections, have formed collaborative, interdisciplinary initiatives in order to study their conservation. With the project *digital art conservation*, which is dedicated explicitly to studying means and methods of preserving genuine digital art, the ZKM | Karlsruhe and its partners are making a further contribution to the work of these initiatives.

Implementation of the Project

An initial phase of *digital art conservation* was identifying inventoried digital art works in public and private collections in the Upper Rhine region.²⁵ Thirty-seven museums and private collections were approached for information. In the Regio Basiliensis and the neighboring Swiss cantons²⁶ 65 digital works were identified in 21 collections, 55 of which are held in the Digital Art Collection/Store in Basel. In the Alsace region of France, there are a total of four genuine digital works housed in two collections, whereas the project partner Espace multimédia gantner in Bourogne (Territoire de Belfort, France) holds fifty works. On the German side of the Upper Rhine region, no digital works were identified in the ten public and private collections there²⁷, whereas the ZKM | Center of Art and Media Karlsruhe holds over five hundred digital works, the largest collection by far. The ZKM | Karlsruhe has over one hundred complex interactive, computer-controlled digital installations alone, a type of installation that is not found in many collections.

As only three collections out of the 37 approached hold more than ten works, and 25 collections have no digital art at all, in most public collections in the Upper Rhine region digital art does not yet play any role in collecting policy. The concentration of digital works in three collections in the region is due to the institutions' specific focus: the ZKM | Karlsruhe, the Digital Art Collection/Store in Basel (55 works, the majority on CD-ROM and DVD-ROM), and the Espace multimédia gantner in Bourogne (fifty works, also predominantly on CD-ROM and DVD-ROM) – the only public collection in France dedicated exclusively and explicitly to digital art. Since its foundation in 1989, the

accessed 06/11/2013. See also the essay by Emanuel Lorrain, this volume, pp. 232–242.

25 In line with the guidelines of the support program INTERREG IV Upper Rhine, the "project region" was defined as follows: in Switzerland, the Regio Basiliensis; the Alsace region in France on the left bank of the Rhine; on the right bank of the Rhine the area lying in the Rhine valley between Basel and Mannheim.

26 The City of Basel, Basel-Land, Aargau, Solothurn, and Jura.

27 Only one private collection in Baden-Württemberg declined to provide information.

ZKM | Karlsruhe has fulfilled its statutory mission to engage with digital art and new technologies.²⁸ In artists' residency programs, since 1989 over seven hundred artists from all over the world have created digital artworks of all kinds. The ZKM_Collection is one of the most important collections of digital art worldwide.

Regrettably, the inventory of digital artworks in collections of the Upper Rhine region also showed that, despite all efforts to procure proper documentation, a large proportion of these works are treated no differently than other "archive materials" in storage. Exact and comprehensive documentation of an analog or digital work, as well as the regular updated archiving of its data, are essential prerequisites for its conservation. In the context of the project *digital art conservation*, however, documentation and storage only serve a functional purpose within conservation strategies; they can in no way replace the work itself. In the case of analog art it is obvious to anyone that a painting cannot be replaced by a photograph of the original, for example, and this also holds true for digital art. A work cannot be replaced by documentation or digital storage however perfect; it can at most be remembered. From this necessary distinction between work and documentation follows the project's special task; namely, to enquire into the conditions under which digitally encoded works can be preserved in the long term in their historic form and their aesthetics, as well as the "behavior" of an artwork, even under changing technological conditions.

In view of this goal, and against the background of art's euphoric espousal of digital technologies throughout the 1990s, it was an unsettling discovery for the ZKM | Karlsruhe that many of the digital works created in its institutes and held in its storage facilities could not be reactivated simply by switching them on again, but that they required a thorough technical overhaul even after just a few years. Digital works in the ZKM | Media Museum's permanent exhibitions are kept in functioning order by constant maintenance, by ongoing replacement and renewal of their components, and by updating their software and electronic control units to new operating systems. Thus these works have evolved technologically; however, for works that had been out of operation for longer periods of time, the rapid technological advances made in the meantime proved fatal in a number of respects. When it was envisaged to "revive" a work that had not been shown for some time, frequently the artist as well as the museum technicians would press for technical "improvements." As increasingly this became necessary for works to function at all, from the conservator's standpoint such interventions needed to be restricted

28 "In the experiment and research facilities and laboratories, artists and scholars explore and develop project-related and – as far as possible – interdisciplinary artistic possibilities of applying the new media in both theory and practice." Excerpt from the statutes of the ZKM | Center of Art and Media Technology Karlsruhe, version dated 02/02/2005; translated from the German by Justin Morris.

to preserve the authenticity and historicity of a work, as well as its specific “behaviors” in consequence of its historical components. In many cases, however, providing new equipment for a work was unavoidable – particularly projectors, monitors, computers, and interfaces – which often also necessitated revising the work’s software. Predictably, this resulted in slightly or even conspicuously different behavior and often the aesthetics were different. It soon became evident that, in the long term, the conservator’s dilemma of trying to preserve a work’s original aesthetics with obsolete equipment is not a solution.²⁹

In view of the vast number of digital works that have been presented at the ZKM | Karlsruhe since 1997 in well over one hundred exhibitions engaging with media technology, a major discrepancy could not be overlooked: what applies to analog works does not necessarily apply to genuine digital works or works that use digital technology. When an analog work of art needs to be restored, in the literal sense of being resuscitated, it has obviously not been well cared for or conserved. Thus basically, conservation is in opposition to restoration. Conservation seeks to avoid the necessity for restoration by conserving the original materiality, form, aesthetics, and mode of functioning of the work.

By contrast, entirely different conditions prevail for digital art. Even if the conservation of a work is optimal, after a few years its technical components will be defective, obsolete, and unobtainable on the market, and all later developments in hardware (more effective technology) or software (upgrades/updates) will alter a work’s behavior, will affect its presentation adversely, or may even result in not being able to show the work at all. Under these conditions of rapid technological change, how can the ZKM, as an institution with probably the most important collection of genuine digital art in the world, provide for the conservation of this valuable collection and the presentation of its works in the future? How can other institutions with important collections of digital works prepare for the necessity of permanently keeping abreast of subtle changes within the works themselves and the rapid development of their technologies? What, under these circumstances, does “conservation” mean with regard to digital art compared to analog art? These are the core themes that the *digital art conservation* project engaged with.

It was evident when work commenced on the *digital art conservation* project in early 2010 that issues of problem awareness, of expertise and assessment, of institutional structures and funding, as well as the normal practice of

29 One example of this is that it was necessary to replace tube projectors, (CRT projectors), which have not been manufactured since the 1990s, by LCD projectors, whose projections clearly have a different aesthetics. Although this does not correspond with the aesthetics of the original work, the substantially greater brightness of LCD or even LED projectors are considered a desirable improvement.

collecting and exhibiting play just as important a role for conservation as the purely technical tasks involved in conservation measures. When in established collections conservation efforts are directed towards the preservation of visible, object-like, highly valued analog works of art (paintings, sculpture, drawings, photography, video, etc.), digital art, the substance of which is “invisible,” quickly finds itself relegated to the back seat because the necessary financial and human resources are lacking. Further, many institutions assume it suffices to save the digital data – which is frequently done by their colleagues in the IT department. In collections and museums the majority of restorers employed still have a predominantly classical training, specializing in painting, photography, or paper, for example, but actually work in collection areas where conservation work demands high-level, diversified expertise and qualifications in digital technologies. As there is a lack of education and training in this area qualified restorers for the conservation of digital art are still extremely hard to come by. Thus, in the context of the *digital art conservation* project the inclusion of two regional universities as direct partners, namely, the École supérieure d’art décoratif (ESADS) in Strasbourg and Bern University of the Arts (BUA)³⁰ was desired and deemed essential.

In addition to such theoretical, structural, and professional training issues, that do not directly affect the works themselves, the conservation practices undertaken in the course of the project proved highly informative (see the case studies in this volume, pp. 312–519). Although meaningful solution strategies for the conservation of digital art can only be proposed for a limited timespan, the case studies resulted in two possible approaches that complement each other. In order to preserve the work’s original behavior, as well as its aesthetics, the original components (computer, electronic interfaces, digital control units, monitors, etc.) – or exactly identical equipment – should be conserved for as long as possible with the original software in a functioning condition (strategy of storage or “hardware preservation”, see glossary, pp. 602). As a parallel measure, the operating systems, programs, applications, and so on, which form the basis of the work, should be saved and updated with regard to developments in technology. This should be done, however, in such a way that these necessary interventions do not alter the content, the behavior, and the aesthetics of the work. Whereas elaborate and work-intensive adaptation and updating of the software (emulation, porting [see glossary, p. 600] or other strategies) preserves the content and behavior of the work to a large extent, as far as the aesthetics of digital works are concerned these can only be preserved for as long as the original presentation equipment (with CRT monitors, for example, see glossary, p. 599) continues to function. This means that the length of time of successfully applying the

30 See the essay by Johannes Gfeller, pp. 567–583, as well as the contribution by Francisco Ruiz de Infante and Jérôme Thomas, pp. 584–595, both this volume.

above-mentioned hardware preservation strategy is decisive for the relative conservational integrity of the works. Each time technologically new presentation equipment is used – irrespective of impairing the sculptural appearance of a work – the aesthetics of a work changes. Thus, the different solution strategies elaborated in the case studies demonstrate that there are only solutions of limited duration, but no ideal solutions. Which strategies are meaningful and useful is something that can only be decided on a case-by-case basis. Generally, one has to pursue several strategies at the same time in order to be prepared for future technological changes, which entails extra costs.

Although the significance of the artist interview cannot be overestimated for the conservation of individual works, when these interviews were conducted as part of the case studies, time and again a conflict with traditional conservation ethics became apparent. In view of the inexorable advance of technology, artists often sought to “improve” the technical, sometimes even the aesthetic aspects of their work. The underlying assumption here is that by applying current, or possible future technology with improved computers and presentation techniques, not only can the works be preserved better, but certain qualities and effects of the works can be enhanced. As a rule, the aspect of performativity in digital art was emphasized in the artist interviews: as long as future presentations retain the substance of the artwork’s fundamental idea, its integrity will also be preserved. Under these circumstances the work then becomes a permanent *work in progress*, always open to reenactment and reinterpretation. Notwithstanding the artistic freedom to create new versions of a work, in the *digital art conservation* project the artist interview is seen as an important aid in preserving the historicity of a work, but it is by no means an essential or the sole requirement for selecting a particular method of meaningful conservation.

Besides the theoretical discussions on ethical questions in the conservation of digital art, which figured prominently in the symposium *The Digital Oblivion. Substance and Ethics in the Conservation of Computer-based Art* (see pp. 72–193), equally valuable was the project’s inclusion of case studies and detailed reports from conservation practice. These were discussed at the second symposium titled *Digital Art Conservation. Practical Approaches: Artists, Programmers, Theorists* by an interdisciplinary forum (see pp. 194–311). At the two symposia theory and practice were measured against each other, and in the touring exhibition *Digital Art Works. The Challenges of Conservation* (see pp. 520–563) the project’s case studies of selected works were evaluated in connection with the presentation of these works. The artworks themselves were presented as well as the different conservation strategies selected to preserve them, which were set up alongside in a separate “documentation room.” In this way specialists and nonspecialists alike were able to compare

the different approaches and the original. The valuable comments and suggestions that were received about the conservation strategies have been included in the texts on the case studies that were written later for this publication.

In view of the technical and cultural conditions mentioned above, to which digital art is more subject than the analog arts, this publication gives an account of work that is ongoing, of research that we must persistently pursue in the interests of preserving and passing on our culture to future generations.

Translated from the German by Justin Morris

Im/possible Tasks – Remarks on the Concept of Collecting and Conservation Issues at the House for Electronic Arts Basel

Sabine Himmelsbach

“The distinctive features of new media art do challenge many of the conventional notions about art, but many respected – and collected – non-new media artists have used these same strategies in their work. I have no doubt that eventually new media art will be as much a part of institutions’ collections as photography, video, and installation art have become. In the meantime, however, there is a crisis at hand. We are in danger of losing 30 years of new media art history. It is important to learn now how to collect new media art, if there is to be any hope of preserving its recent past,” (Steve Dietz, *Collecting New Media Art*).¹

The critical exploration and promotion of media art in Basel is characterized by continuity and is continually developing. With [plug.in]² a space for contemporary media art was established in 2000. Exhibitions, presentations, artists talks, and workshops presented a great diversity of artistic approaches and strategies together with the various formats of art that engages with media – from net-based works to spatially expansive installations, from performances to concert events. Building on this experience a festival of electronic arts, Shift – Electronic Arts Festival,³ was inaugurated in 2006 by [plug.in], the platform for electronic music sinus-series, the Videofilmdays Basel

- 1 Steve Dietz, “Collecting New Media Art: Just Like Anything Else, Only Different,” available online at: www.neme.org/524/collecting-new-media-art, accessed 06/11/2013. First published in: Bruce Altshuler (ed.), *Collecting the New: Museums and Contemporary Art*, Princeton University Press, Princeton (NJ), Oxford, 2005, pp. 85–101.
- 2 [plug.in] was directed by Annette Schindler since its foundation in 2000, and financed predominantly by the Christoph Merian Foundation and the Canton Basel City until its dissolution in 2010. At the end of 2010 [plug.in] officially ceased its activities and was then integrated into the House of Electronic Arts Basel (HeK). The Christoph Merian Foundation was the primary initiator during the founding process, and has since engaged continually in promoting the electronic arts in Basel.
- 3 During the four-day Shift – Electronic Arts Festival, alongside the media art exhibitions it was above all current trends in electronic music that were presented. Performances and conferences took place, as well as the screening of a comprehensive video program. The first Shift festival in 2007 was also the first time that the Dreispitz site in Basel featured as a venue; based on development plans by the renowned Basel architects Herzog & de Meuron, this is being developed into a “Campus of the Image.” See online at: www.dreispitz.ch/, accessed 06/11/2013. The Shift festival was one of the first actors in the field of culture to draw attention to this new and ambitious development project.

festival, and the DVD magazine *Compiler*.⁴ Shift, conceived as a cross-genre festival with a focus on electronic music, attracted a high level of interest from Basel audiences and elicited a positive response. Over the years, the festival has established an impressive international reputation.

In 2009, the idea came up of founding a center for the electronic arts, which would bring together the activities of [plug.in] and the Shift festival under one roof, as well as undertaking the classic activities and tasks of a museum – collecting, conservation, and research, in this case of media art. Thus, in 2011 the House of Electronic Arts Basel (HeK)⁵ was founded with the aim of creating sustainable structures for the presentation and preservation of media art. In addition to on-going exhibitions and events, it was envisaged that the HeK would reinforce study and research efforts, as well as the long-term development of a media art collection. This mission confers a unique position and pioneering role within Switzerland on the HeK. It reflects the topicality of media art as a key mode of expression in contemporary art production, which lies in the reflection of cultural transformations brought about by increasingly accelerated technological change. Because these changes have become a ubiquitous feature of our lives, media art today can also be described as “art under post-media conditions.”⁶ The central aspect of artistic interventions is no longer the use of cutting-edge technologies per se, but instead engaging critically with such technologies. “The meaning of the notion of *media art* has also shifted alongside the transformation of digital culture into a normal aspect of everyday culture. Even ten years ago, the term marked a clear distinction from other forms of contemporary art by pointing to the fact that this art was conceptually and materially connected to the new media technologies. Since then, the term has become less explicit.”⁷ This is why the HeK’s collection and exhibition program centers on artworks that describe or foreground social transformations that accompany the increasing

4 The founding team included Philippe Alioth, Daniel Baumann, Raffael Dörig, Marc Février, Jean-Marc Galler, Hanspeter Giuliani, Stefan Holenstein, Annette Schindler, Dominique Spirgi, Katrin Steffen and Sacha Roche. See online at: www.shiftfestival.ch/en/shift-2007/about-us/credits/, accessed 06/11/2013.

5 The House of Electronic Arts Basel (HeK) receives funding primarily from the Christoph Merian Foundation, the Canton Basel City and the Canton Basel Country. From 2014, the new institution will also be supported by the Federal Office for Culture to ensure the fulfillment of its mission. See online at: www.haus-ek.org, accessed 06/11/2013. At present, the HeK is still housed in temporary accommodation on the Dreispitz site; however, relocation to new permanent premises for exhibitions and the collection, also space on the Dreispitz site, is planned for 2014.

6 Inke Arns, “Über Zeitgenossenschaft. Die medialen Künste im Zeitalter ihrer postmedialen Kondition,” in: Giaco Schiesser/Department Kunst & Medien (ed.), *Mediale Kunst Zürich. 13 Positionen aus dem Studienbereich Neue Medien / Media Arts Zurich. 13 Positions from the New Media Programm*, Zurich, Scheidegger & Spiess 2007, p. 36.

7 Andreas Broeckmann, “Concept, Experiment and Production. The Sites of Making Media Art,” in: Sabine Himmelsbach (ed.), *produced @ Edith-Russ-Haus für Medienkunst*, Revolver Verlag, Berlin, 2011, p. 48.



House of Electronic Arts Basel, view of the building's facade and the artwork *A Band of Floating Mushrooms* by Monica Studer and Christoph van den Berg
 Photo © House of Electronic Arts Basel
 Photo: Stefan Holenstein

digitization of our lifeworlds, that address the possibilities due to the transformation of perception through the new media, or explore the expansion of the aesthetic sphere.

Excursus: The Digital Art Collection/Store

In addition to the synergy effects outlined above, the thinking behind the foundation of the HEK also embraced efforts to develop new strategies for collecting and sales concepts for digital art. Annette Schindler, the then director of [plug.in], and Reinhard Storz, editor of the art platform *Xcult.org*⁸ and lecturer on media and art theory at the Academy of Art and Design in Basel, tackled this in 2009 with the Digital Art Collection/Store (DAC/S) project⁹ – a “model for demonstrating ways of owning, archiving, and

8 *Xcult.org* is a type of culture server initiated by Reinhard Storz and others, which has been in continuous operation since 1995. Storz points out that the emergence of *Xcult.org* is also linked to the failed initiative to found a state-funded culture server. In view of the precarious state of funding, he referred to the possibilities of *Xcult.org* as follows: “Growth, contraction, pushing temporary excesses and then reducing activities down to a low-budget level; this is how one may paraphrase our survival strategy over the previous nine years.” Quoted in: Reinhard Storz, “Die Schweizer Kunstplattform *Xcult.org*,” in: Monika Fleischmann, and Ulrike Reinhard (eds.): *Digitale Transformationen*, Whois-Verlag, Heidelberg, 2004, p. 212.

9 Online: www.digital-art-collection.net/collection/collection.html; as well as: www.digital-art-store.com/artists.html, accessed 06/11/2013.



*Collect the WWWWorld.
The Artist as Archivist in the
Internet Age, 2012,
Exhibition view House of
Electronic Arts Basel
Photo © House of Electronic
Arts Basel
Photo: Stefan Holenstein*

preserving digital art.”¹⁰ In the meantime the collection contains works by 23 artists, which are either long-term loans by private owners or works from the archives of [plug.in] and *Xcult.org*, which both either played a decisive role in the realization of some of the media artworks, or commissioned them. The collection and the store are very closely linked. Together with the artists, issues relating to ownership, reproducibility, and conservation and maintenance measures are regulated and defined for the purchasable “work packages.”¹¹

The activities of the DAC/S are still in their infancy. The two founders describe DAC/S as “a new venture which is just beginning to take its first steps away from project status into everyday practice.”¹² One of the central concerns of the DAC/S is making media art affordable and accessible to a wide audience. With this end in mind, strategies are developed that offer possible

10 Annette Schindler in cooperation with Reinhard Storz: “Collecting Media Art: After Creating the Work, Creating the Value?”, in: Sabine Himmelsbach (ed.), *produced @ Edith-Russ-Haus für Medienkunst*, Revolver Verlag, Berlin, 2011, p. 76.

11 The proceeds of sales from the Store will be redirected to the collection, thus permitting investments in new acquisitions. In addition to the sales, the Digital Art Collection/Store offers a technical and curatorial consulting service as another option for supporting collectors. The range of works offered comprises objects and installations, as well as net-based productions and computer-generated animations.

12 Available online at: www.digital-art-store.com, accessed 06/11/2013.

solutions both to issues of conservation as well as of presentation – for example, through producing editions and multiples, or by developing special hardware for presenting digital works. Although constructing the collection continues to be oriented on the model of a market-based increase in value,¹³ however, the connection between market strategies and the idea of availability and distribution is foregrounded. As the cofounder of DAC/S, Annette Schindler, points out: “In the age of digital media, multiplication and wide distribution – not uniqueness – ensure the survival of ideas, models, and also works themselves.”¹⁴ DAC/S is hence an ideal supplement to the collecting strategy of the House of Electronic Arts Basel (HeK), which focuses more on the preservation and conservation of media-based art, scholarly research on its historical development – especially of Swiss media art – and assisting and accompanying current productions in media art.

The HeK Collecting Strategies

The House of Electronic Arts Basel (HeK) is assigned with the fascinating but complex task of building up an international media art collection. As financial resources are very limited, the storage facility situation remains unresolved, and the personnel resources are still not adequate for the tasks, the question arises as to what the present and future emphases should be. Ideally, the HeK’s collection should offer an historical overview of the development of media art in Switzerland, and preserve key works in the long term by acquiring them for the collection on a permanent basis, although this cannot be entirely realized. The case studies in the present publication (see pp. 312–519) show that without institutional support many digital artworks be consigned to oblivion because artists cannot handle permanent migration (see glossary, p. 601), emulation (see glossary, p. 600) or other strategies of conservation without help. Besides the historical aspects, which can be resolved through selective acquisitions, the HeK’s declared goal is to assist and accompany current productions.

Initially, the HeK can build on the archives and documentations of [plug.in] and the Shift festival. During the ten years of its existence, [plug.in] has presented numerous media projects, mainly by Swiss artists, and provided support for artists throughout the production stages of their works. The aim is now to make this material accessible to the public via a web-based database. The HeK seeks to build up a valuable archive of texts, video and sound files, construction sketches, and so on, as a study collection, and in this way make

13 Annette Schindler describes the lack of collections for media art as a deficit and sees here a need for improvement for better positioning of media art in the art market system: “Collecting and preserving are, so to speak, the ‘missing links’ in the value chain of media art.” See Schindler 2011, p. 71.

14 Schindler 2011, p. 77.

a contribution to the visibility of the history of media art in Switzerland. The HeK's exhibition projects and events are documented for the archive. Furthermore, at some later point in time, it is possible that artworks will be included in the collection independently of any exhibition context.¹⁵ Of central importance here is the documentation of production processes.

Artistic Productions at the HeK

Another of the HeK's key interests is artistic production as part of exhibition and events programs. New artistic works will be produced on-site – some as site-specific works for the Dreispitzareal or the City of Basel, and some as artworks that engage with the content of an exhibition or the Shift festival. These works, which are coproduced by the HeK, will be included in the collection. In particular the production of complex media works has need of institutional support both for secure funding, and for developing works independently of exhibition contexts and their dwindling budgets. It is very important to support such experimental concepts and projects because media art does not orient itself on the market and hence continually presents new challenges to exhibition spaces, to collections, and also to museums. In addition to realizing technically elaborate productions, it is vital that an institutional art forum foster free and controversial discourses. As media scholar and curator Andreas Broeckmann has said: "Art requires concentrated and thematically focused platforms for discourse and presentation where edgy and advanced explorations can take place."¹⁶ The immateriality of the digital¹⁷ confronts museums with further problems. Thus, the curator is often also a producer, a filter, and an editor.¹⁸ Curators are mediators between the artistic work and the conditions of its presentation and reception. In addition to the various tasks – from content producer to museum administrator and independent contractor – the curator assumes the function of mediator between artist, technicians, and the museum team. The HeK has competence

15 The fact that archival and study collections precede or supplement the construction of a permanent collection is illustrated by the example of Gallery 9, the online exhibition space of the Walker Art Center in Minneapolis, which curator Steve Dietz therefore describes as a "hybrid collection." Many works are initially documented on the project website before going on to become part of the physical collection. See Steve Dietz, "Collecting New Media Art. Just Like Anything Else, Only Different," available online at: www.neme.org/524/collecting-new-media-art, accessed 06/11/2013.

16 Broeckmann, 2011, p. 48.

17 The work *Elsewhere: Anderswo (Oldenburg)* by Teri Rueb, for example, was created in 2009 for the exhibition *Landschaft 2.0* at the Edith-Russ-Haus für Medienkunst in Oldenburg. It offers a GPS-based sound walk through the botanical gardens in Oldenburg and can only be experienced when visitors actually walk around the gardens themselves to experience the acoustic interventions in this specific location. In the exhibition itself, there was only a flyer describing the work and where and how to experience it.

18 See Beryl Graham, and Sarah Cook, *Rethinking Curating. Art after New Media*, The MIT Press, Cambridge (MA), 2010.

in this respect because it understands one of its tasks as being a partner of the artists and supporting them in producing their art. To open up and maintain free spaces beyond the market structures and exhibition contexts is another elementary task and central aspect of the HEK's work.

Several new works were produced for the exhibition *Sensing Place. Meditating the Urban Landscape* (August 31–November 11, 2012), held at the House of Electronic Arts Basel, some of which will find their way into the collection. The theme of the exhibition is the use of mobile media and the changing perceptions of urban space through these technologies. Accordingly, the works themselves are also location-based, namely, site-specific and geo-localized; they are made for a specific place and experienceable only at this location. *Electrical Walks Basel* (August 31–November 11, 2012) by Christina Kubisch, is one example. With headphones, specially developed by Kubisch, which have built-in induction coils and react to electromagnetic fields, and a city map on which a route and especially interesting audio points are marked, the exhibition visitor sets off on a path to discover acoustically the electromagnetic fields of the city of Basel. The spectrum of sounds, their timbre and volume vary from place to place. Light systems, cash machines, antennas, computers, and many other things provide a soundscape of extraordinary presence. Many of the sounds exhibit an astonishingly musical quality, and enable entirely new access to an apparently familiar world for the (multimedia) walker.¹⁹ In Basel, two walks were created – one on the Dreispitzareal in the immediate vicinity of the House of Electronic Arts, and the other in the inner city with an city map on which points that are especially interesting acoustically are marked. For the acquisition of the work, the HEK first purchased a large number of headphones so that *Electrical Walks Basel* would be available after the exhibition had finished. In addition to maintenance of the headphones, other measures for conserving the work were discussed with the artist in advance. After a few years it will be necessary to test the audio “hot spots” since the city's electromagnetic fields will undoubtedly change and thus also its acoustic pattern. This also means that after a few years the city maps will also have to be updated and reprinted to reflect the new city electromagnetic soundscape.

Walking the Edit Dreispitz (2012) by Ulrich Fischer is another new work that was produced within the context of the exhibition *Sensing Place*. With an iPhone and a special app this work allows visitors to generate and experience their own films based on existing video material of the Dreispitz site. Fischer collected the existing video and audio fragments – from historical material to mobile phone films – in a database and geolocalized them. The GPS on the

19 With her *Electrical Walks*, Christina Kubisch made us aware of a sound world that exists but is inaudible to us without technical aids; a sound world which, with our increasingly technologized environment, is continually changing.

iPhone localizes the position and movement of the participant as they walk and relates it to the database material available in virtual space. From a technical standpoint, *Walking the Edit* operates much like an audiovisual database, which can be applied directly via cloud computing to the city space. Each video and audio fragment is allocated a geographic address and given corresponding metadata. Via the GPS on the iPhone, the walker's movement linked to the material in the virtual space which, in turn, triggers the editing of the film. Depending on how the participant walks (fast, target-oriented, or slowly strolling), the film adapts itself to the particular form of walk. The film's soundtrack is streamed to the walker's iPhone in real time. While walking through the real space, the walker already hears over earphones the soundtrack of the future film, which can subsequently be viewed on the project's website.²⁰ *Walking the Edit Basel* is the fourth stage of the project, which has already been realized in Geneva, Paris, and Brussels, and began in Basel in the context of *Sensing Place*, but will be used as part of a long-term study of the development of the Dreispitz site. The HeK wants to accompany the further evolution of the project and assists Fischer to find sites and to shoot site-specific video material. After the exhibition *Sensing Place* has ended, it will still be possible to contribute further video clips and to recombine the available material into new clips with the iPhone app, so that an ever more detailed virtual map of the area emerges. From the point of view of conservation of the work, this signifies a continuous changing of the status quo, which must be documented because the work only begins to unfold its potential through the iPhone app user.

The HeK's Collection Focus with Respect to Content

The HeK's collecting activity centers on the significance and effects of the media transformation of our society, on the environment and on the individual, and is dedicated to the artistic investigation of the technologies and developments in question. As illustrated in the above examples, one of the collection's concerns is the ubiquitous access to the sphere of information. This includes the use of locative media and the accompanying transformation of our perception of space, urban structures, as well as concepts of landscapes. A further point of reference is the concepts of information, Internet, and networked systems. Many artworks use real-time data from the World Wide Web, which they transfer to new contexts – the case study *TV-BOT 2.0* (see pp. 384–402) by Marc Lee gives one such example. Existing global network structures are used by artists as interfaces for their own programs. For example, for her net-based video installation *Real-time Family* (2008), which was on show at the exhibition *gateways. Kunst und vernetzte Kultur* (June 1–August 19, 2012) at the HeK, Finnish artist Hanna Haaslahti used the photographic database Flickr

20 Available online at: <http://walking-the-edit.net/en/>, accessed 06/11/2013.



Hanna Haaslahti
Real-time Family
 2008
 Installation view
 Exhibition gateways. *Kunst und vernetzte Kultur*, 2011,
 House of Electronic Arts
 Basel
 Photo © House of
 Electronic Arts Basel
 Photo: Stefan Holenstein

as a resource for her real-time stream, and hence drew attention to the paradigm shift in the treatment of private photographs: recollection has receded into the background and the sharing of moments has increasingly shifted into the foreground. Another example is the interactive installation *Media Bubble* (2008) by Timo Toots,²¹ by means of which the viewer triggers a stream of news information in real time which is projected onto the floor in an ever-widening circle. The more the viewer moves, the larger the circles or “media bubble” he or she generates become. The generated stream of news is a mix of global news events and human interest stories from Basel and the surrounding region. This networked element of the work, which is based on content from commercial providers, is adapted to each specific exhibition contexts; namely, the selection of news channels is geographic and context-specific.

These examples make it clear that the focus of the collection is not formats but questions of content – wholly net-based artworks are just as relevant to the collection as net-based installations or works which can only be experienced through interaction in physical space. In the final analysis, the HEK’s

21 The House of Electronic Arts Basel presented Timo Toots’ work *Media Bubble* (2008) in June 2012 at the LISTE The Young Art Fair in Basel.



Timo Toots
Media Bubble
 2008
 Installation view
 LISTE The Young Art Fair,
 Basel, 2012
 Photo © House of
 Electronic Arts Basel
 Photo: Sabine
 Himmelsbach

future exhibition and events activities will reflect the diversity of artistic engagement with media, from sculptural artworks to concerts and performances, and will thus be representative of the future collection. The HeK's first purchases for the collection were commissioned by the Federal Office for Culture and the Kunstkredit Collection of the Basel City Canton.²² As a result, the HeK can draw on infrastructural as well as personnel resources of existing collections with respect to the storage and maintenance of the works. However, in the long-term, the plan is to carry this out independently, as well as to train expert staff, and to undertake study and scholarly research projects through collaborations.²³

22 The decisions to buy the respective purchases, in terms of content, rest with the House of Electronic Art (HeK). Nominally, the works are housed in the Swiss Federal Art collections and the collections of the City of Basel, and are made available to the HeK as permanent loans for the future collection. This arrangement ensures that the competence of the HeK remains decisive for purchases.

23 In this area possible collaboration with universities and academies is under



Night of Museums 2012
at the House of Electronic
Arts Basel

Photo © House of
Electronic Arts Basel
Photo: Stefan Holenstein

Spatial Structures

In spite of the immateriality of some of the works, a collection still requires spatial structures for its preservation. As Peter Schneemann aptly put it: “Computer art so often described as ‘immaterial’ is tied again to a media carrier through the question of its capability of being archived. There is more and more recognition of how the discourse of immateriality contradicts the strong dependency of net art on technical equipment and a sophisticated infrastructure.”²⁴ In order to guarantee the functionality of the works, first of all there have to be rooms for storing material components and data carriers. Server structures and capacities for hosting of net-based works are also required. At present the HeK is still in a transitional situation and is housed

consideration, which offer relatively new courses in conservation, restoration, and archiving of digital cultural artifacts, such as the Bern University of the Arts (BUA). Further, with the relocation of the Academy of Art and Design (HGK) of the University of Applied Sciences and Arts Northwestern Switzerland (FHNW) to the Dreispitz site, which will be completed in 2013 and 2014, new possibilities for exchange and collaboration between the HeK and universities in the area of scholarship and research will be created.

²⁴ Peter Schneemann, “Problems of Compatibility: On the Relation Between Net-based Art And Market in a Media History Perspective,” in: Markus Schwander, and Reinhard Storz (eds.): *Owning Online Art. Selling and Collecting Netbased Artworks*, p. 23, available online at: www.ooart.ch/publikation/inhalt/PDF/02-Peter-Schneemann-e.pdf, accessed 06/11/2013.

in temporary facilities. In two years' time the collection and the festival will move to permanent premises located on the Dreispitz site. During the next few years it is planned to create the above-mentioned structures for the long-term preservation of media-based art.

Personnel Resources

A further significant factor for the development of an archive and an independent collection is conservation work on the collection's holdings and their detailed documentation. Process-based art often has to be adapted to the particular requirements of an exhibition context; that is, spatial dimensions as well as the projection and playback technologies used may vary. It is thus important to develop specialist know-how and expertise within the HEK team. This requires, firstly, creating a position for an expert technician to supervise and maintain the works, and, secondly, creating a custodial position to produce descriptions and documentations of the works in collaboration with the artists. The changed profile requirements of the classical museum structures are described by Beryl Graham and Sarah Cook in their book *Rethinking Curating. Art after New Media*: "All of this imposes systemic changes on institutions: conservators need to talk to curators, artists, technicians, interpreters, documentors, and registrars; the very metadata of collection-management systems shift."²⁵

The history of the HEK's foundation described at the beginning of this text shows that in Basel there were several initiatives and venues for presenting media art, often supported by volunteers. With the HEK, a place to engage with new media art has now emerged, which promises both institutionalization and continuity; and with its explicitly academic orientation it will be developed into a competence center for media art in Switzerland. In order to meet these complex challenges the HEK will continue to collaborate with regional, national, and international partners in the future. As curator and art historian Pip Laurenson, director of the department of time-based media conservation at the Tate in London, aptly wrote in the periodical of the Museum Association ICOM in 2006: "The challenge of preserving time-based media is one best met collaboratively [...]"²⁶

Consequently the HEK, or respectively [plug.in], participated in the research project *digital art conservation*. Together with partners from Germany and France, we identified and elaborated the challenges and problems connected with the conservation of digital art, and with the project's case studies obtained first research findings and determined promising approaches to

²⁵ Graham, Cook 2010, p. 207.

²⁶ Pip Laurenson, "The Future of Collections – Media Matters," in: ICOM News, no. 4, 2006, p. 3.

solutions. Based on the knowledge acquired through the project, it should be possible to create the structures described in this text for developing an independent media art collection in the coming years. While one of the focal points of the HEK still lies in the presentation and support of artistic productions, it is the two aspects of research and collection which makes the house unique.

Translated from the German by Justin Morris

Collecting Digital Art: Reflections and Paradoxes – Ten Years' Experience at the Espace multimédia gantner

Jean-Damien Collin and Valérie Perrin

There is no denying that in terms of public art collections, the decision taken in the early 2000s by the regional council of the Territoire de Belfort – to build a collection based exclusively on digital artworks – was extraordinary. The collection is still unique in France because of its approach and wide range. The project *digital art conservation*, funded by the European Union INTERREG IV Upper Rhine program, has helped the Espace multimédia gantner, where the collection is held, to establish appropriate conservation procedures and improve its policies for acquiring works in the future. The project also offered an opportunity to demonstrate the relevance of the collection and to reflect on the concept of a collection when it involves a medium that is considered “unstable.” The history of this atypical collection and the work carried out over the past two years suggested that in taking stock we should focus on three aspects: the type of work in question, the artistic approach taken, and the issues to be addressed in taking such an initiative after the collection had been in existence for ten years.

Our Acquisitions Policy: Types of Works and Artistic Approaches

How the works in the Espace multimédia gantner collection were selected is explained in detail in the catalog *Some Artistic Practices of the Digital Age*,¹ which covers the first 35 works to enter the collection. The idea was to acquire works that reflected their times, or were of particular significance for the history of digital media, at a moment when Hollis Frampton's vision of a more flexible multimedia technology was becoming reality.² This guiding principle is still applied in selecting works.

The acquisitions policy was based on exploring a category of works with specific technical characteristics, but without making those characteristics the aesthetic criterion: the choice was guided by themes appropriate to

1 Jean-Damien Collin (ed.), *Quelques pratiques artistiques à l'ère de la numérisation, collection 35 œuvres / Some artistic practices of the digital age, collection 35 works*, Vol. 1, Les presses du réel, Dijon, 2007.

2 See the interview with Hollis Frampton, “Une interview avec un ermite autiste,” by Adele Friedman (March 1979), in: Yann Beauvais, and Jean-Damien Collin (eds.), *Scratch Book*, Paris, Light Cone, 1999, pp. 226–227; as quoted from: Jean-Damien Collin (ed.), “De la collecte à la collection, le fondement d'une action / From Collecting to a Collection: Setting a Project in Action,” in: Collin 2007, pp. 11–16.

Espace multimédia gantner,
view of front entrance with
rainbow
Photo © Espace multimédia
gantner
Photo: Fabien Velasquez



contemporary art and artistic experimentation. From the very beginning, the project to build a collection faced problems intrinsic to all digital media, and more specifically the fragility of digital artworks, which raised questions relating to transfer or technical adaptability. Furthermore, they were works that in a strict sense were representative of their time: their subject and form of expression were closely bound up with the social, technical, and political practices of the day. This point was made by Annette Schindler and Raffael Dörig³ when they selected a number of works from the collection for the exhibition *Histoires à l'ère digital – Works from the Collection of Espace multimédia gantner* ([plug.in], Basel, April 3–May 31, 2009).

The Acquisition in Question

It is worth noting that the original criteria – the diversity of artistic practice, the relevance of the artworks for contemporary art production and society, for aesthetic and theoretical relationships with traditional and experimental ways of making art or with specific forms of experimentation in media – are met by the current holdings of this collection.

In 2002, the problems to be addressed involved the different stages in managing a collection, such as acquisition, conservation, art education and outreach, restoration, and the constant evolution of the “equipment.” Further, there was the intention to exhibit these works on a regular basis to expose them in a concrete and practical way to problems resulting from new developments in hardware and software. These different stages show themselves

3 Since 2012, Raffael Dörig has been director of the Kunsthau Langenthal. See his contribution, this volume, p. 206–216.

to be in constant interaction, each with the other, and are related via exhibition of the works in the collection. The acquisition phase is thus the key moment when we determine, at a specific moment, the possible ways in which a work could evolve and could be presented.

The Modalities of Acquisition in the Evolution of the Espace multimédia gantner's Collection

After the works to be acquired had been selected, the following procedures were instituted with a view to anticipating the issues raised by exhibiting them and by changes in hardware and software in order to ensure the work's permanent place in the collection:

- Information sheet to be completed by the artist or copyright holder (contact details, technical data, documentation) and stating the envisaged sale price;
- negotiation of purchase: some works, at the time of acquisition or since, in accordance with the artist's wishes, involved the transfer of hardware or software because of technological development (for example, in the case of JODI with the reprogramming of *OSS/...* [2005]; Lynn Hershman Leeson with the migration [see glossary, p. 601] of her works from laser disc [see glossary, p. 600] to DVD; and Loïc Connanski, where a CD-ROM version of one of his works was migrated to a high-definition video version);
- contract;
- delivery of the work; plus digital copy.

Most of the works acquired during the first phase (2004–2006) were available on CD- or DVD-ROM and were installed on a computer. Thus they could all be copied – with the agreement of the artist(s) – and viewed on computers.

The second phase began in 2007, with the acquisition of installations produced by the Espace multimédia gantner as part of its exhibition program. Next, artists from the first phase were requested to suggest works or artists that they considered relevant and suitable for the collection. A committee of experts reviewed the artists' proposals, made a selection, and contributed further suggestions. Currently, acquisitions are handled by an expert, or works are commissioned especially for exhibitions at the Espace multimédia gantner.

Problems Intrinsic to Digital Media

The equipment used to store and display works in the collection is varied: for instance, USB flash drives, Adobe Director software, a screen or video projector for Antoine Schmitt's *still living* (2006), and the Internet for Heath Bunting's *BorderXing Guide* (2003). Such technical equipment becomes obsolete for commercial reasons. A work of art, however, cannot be reduced to these

Heath Bunting
BorderXing Guide
 2001–2011
 Documented on its own
 website, the work explores
 the concepts of borders
 and of border crossing. The
 illustration shows a plan the
 artist made for an impending
 border crossing.
 Photo © Espace multimédia
 gantner



storage and display media, even if it needs them in order to exist physically and to evolve. The questions posed by the acquisition of works of certain kinds tend, in the case of the digital artwork, towards the extreme; the considerations are technical, and sometimes even quasi-philosophical. Take, for example, the acquisition of Heath Bunting's *BorderXing Guide*, an exploration of the notion of borders and of the Internet, which was the subject of long discussions with the artist. A characteristic of this work is its accessibility for the user, which is not automatic. When users open the *BorderXing Guide* website,⁴ they can enter it only if they live in one of the countries on a list approved by Heath Bunting. If they live elsewhere, they have to ask the artist's permission to enter the website. They also have to have a fixed IP address, which many people do not have. The users always have the option of physically going to one of the authorized places, which are listed on the website. Discussions with Heath Bunting also touched on the notion of borders or frontiers. Given the geographical location of the Espace multimédia gantner and its proximity to the Swiss border, Heath Bunting then suggested that it should become one of the locations from which it is possible to enter the *BorderXing Guide* website, and at the same time the Espace multimédia gantner was entitled to grant access to the website, and to respond directly to users' requests, in the same way as the artist. The acquisition of the artwork included an artist's certificate in the form of an IGN (National Institute of Geographic and Forest Information) map, *Carte des sentiers et des refuges*

4 Available online at: <http://irational.org/cgi-bin/border/clients/deny.pl>, accessed 11/10/2012.

JODI
OSS/....
Reprogrammed CD-ROM
version, 2005
Photo © Espace
multimédia gantner



1:25000, *Alpes Maritimes et Ligurie* [map of footpaths and shelters in Alpes-Maritimes and Liguria], officially stamped by Heath Bunting, and a sort of notebook entitled *Day Planner, August 2004–August 2005*, an illustrated tool for organizing the day, according to the artist.

Similarly, works such as JODI's OSS/...., which are unable to exist without their individual context of screen/keyboard/individual experience, or George Legrady's *An Anecdoted Archive from the Cold War* (1994), whose presentation and narrative trajectory are more important than its hardware. Thus, these works intersect with and magnify the questions posed by the acquisition and preservation of performances and installations. The variety of hardware raises the question of the materiality of the work, and in different ways extends the question posed during the first phase of acquisition: What precisely are we acquiring when we buy a digital artwork, which some people erroneously describe as having no “material” form?

The Source Code

When the acquisition is a painting, its physical elements are the paint, the wooden stretchers, and the canvas, but as with any work of art, its price does not reflect the value of these elements. The essence of the work, its aura, and its history are crucial. The same applies to digital art, though it is true that in this case the “materiality” of the technology needed to give a work substance is more complex, since it requires interpretation and an interface. Its “raw material,” the source code (see glossary, p. 602), is a virtual component that has to be interpreted in order to make the work visible. The source code must therefore be acquired and must remain accessible, since that is what will “future-proof” the work, beyond future developments in technology. Source code is protected by copyright, and a number of questions and problems with economic, technical, and ethical implications accumulate around it. In the

light of such problems concerning source code, questions of copyright (including rights of correction, adaptation, etc.) are central. They are an issue in negotiating and drawing up the acquisition contract, over and above questions about the media components or the physical form of the work.

The accessibility of the source code raises questions about the role of programming as a tool in creating the work. Some works are coded directly by the artist, others use third-party or proprietary software such as Director, developed by Macromedia, then by Adobe. In the late 1990s Director was the most popular software for creating multimedia applications, but very few artists now use it. The majority of works in the collection, especially those from the first phase, were created with Director. In these circumstances, the work is dependent on the development of the software, and its future commercial prospects, even its very existence. Access to the source code is the basis of any conservation policy for preserving digital works. At the same time, this accessibility of the source code challenges the notion of a work, ethically and in its very essence. What is at stake is the future of a work over which the artist has asserted a moral right, which is entirely different from the right of the user or the consumer in the case of operating systems and software that have been to a large extent democratized by the political, economic, technical, and social issues raised by Open-source software (see glossary, p. 601). Hence the importance of the artist's interview at which factors that might threaten the integrity of the work can be identified in a dialog with the artist. The initial interview is, of course, the basis for the acquisition, but it is a dialog that must be renewed at regular intervals or when a problem with the conservation and evolution of the artwork arises. Every possible option has to be considered, but only subject to the artist's agreement.

The testimony of artists such as JODI and Igor Štromajer at the *Digital Art Conservation. Practical Approaches: Artists, Programmers, Theorists* symposium, held in Strasbourg in November 2011, demonstrated the relevance of the artist's opinion and vision of their work with regard to technical developments and their implementation. How far should the development or adaptability of a work go when it is dependent on technical and graphical interfaces, whether in connection with the social application of a tool (JODI) or in terms of its relevance for a period that is as much technical as artistic (Štromajer)? These cases remind us that institutions involved in the conservation of art do not enjoy complete technical and imaginative freedom; this would carry the risk of distorting a work's essence (see the case study, pp. 366–382, and the essay by Igor Štromajer, pp. 299–310). These constraints, which arise from the development and the fragility of media – whether technical or connected with a market economy that quickly renders them obsolete – are recurrent. The *digital art conservation* project enabled us to delimit these problems and find solutions by developing new modalities of acquisition, and to open up our discussions with artists to include philosophical, technical, and practical questions.

ACQUISITION CONTRACT

Between:

The General Council of the Territory of Belfort
The Gantner Multimedia Facility
1 Rue de la Varonne
90140 Bourogne

in the first part,

And

Heath Bunting
40 roadbury avenue
Bristol
BS2 9TN

(United Kingdom)

Hereinafter referred to as the Assignor:

in the second part,

Now, therefore, the parties hereto agree as follows:

ARTICLE 1: Purpose

The purpose of this contract is to stipulate the terms and conditions of acquisition by the General Council of the Territory of Belfort of a digital work of art conceived and produced by the artist *Heath Bunting*, and its integration into the permanent collection. Acquisition ratified by the General Council of the Territory of Belfort.

ARTICLE 2: Description of the work

The following work

"*borderxing guide*",

date 2000-2007, is a web site published on the Internet

The work is a site web and a digital work stored on Compact Disk medium for archive

The work includes a certificate from the artist which is a signed map (IGN).

ARTICLE 3: Acquisition

The work entitled "*Bordering Guide*", *data*, is assigned to the General Council of the Territory of Belfort for the sum of _____ sum paid upon receipt of the work by administrative mandat.

The artist commits himself to selling an other copy of this work to institution for a sum equal or higher than _____

Conservation of the work and ownership of the master

The work produced shall be registered in the inventory of the permanent collection of the General Council of the Territory of Belfort. The master (internet website) of the work belongs to the artist, who undertakes to ensure its conservation.

Subsequent exhibition

Upon subsequent exhibitions of the work in structures other than The General Council of the Territory of Belfort, the artist undertakes to inform The General Council of the Territory of Belfort thereof at such time as he is aware of the scheduling to have affixed in catalogue or wall label the words *Collection du Conseil Général du Territoire de Belfort*.

Reproduction of the work

Upon reproductions of the work in any medium, the artist undertakes to inform the General Council of the Territory of Belfort thereof at such time as he is aware of the reproduction, to have affixed to the words *Collection du Conseil Général du Territoire de Belfort*.

ARTICLE 4: Broadcast and exploitation of the work

To present "*bordering guide*", it is necessary to have:

- A computer with a Graphique User Interface (GUI) browser and a webserver

ARTICLE 5: Intangible rights granted

The author grants the General Council of the Territory of Belfort, for the entire duration of artistic property, and for all countries, authorise Espace multimedia's gallerist clients is acquired by the General Council of the Territory of Belfort as following:

A) The right of public or private representation of the work as a whole:

- In all premises belonging to the General Council of the Territory of Belfort, or outside such Territory, on the occasion of events or presentations that the General Council of the Territory of Belfort organizes within the framework of its collections or in which it participates.
- The website is not available to everyone who has an internet connection, so the artist grants Espace multimedia gallerist the right to control the access to the work.

B) The right to reproduce, represent and exploit any excerpts, documents and pieces of the work:

- To announce or publicize the activities of the General Council of the Territory of Belfort and events or presentations which it organizes or in which it participates and this in all media and by all processes known at this time, including online networks.
- For the needs of publications in any medium, known or unknown (paper and electronic editions), pertaining to the collections of the General Council of the Territory of Belfort and its exhibitions.

C) The right to lend the work with no fee to public and private exhibition.

In the event that the General Council of the Territory of Belfort considers reproducing or representing such work for lucrative purposes, an addendum to this contract shall first determine the terms and conditions of use and the sum of the remuneration to be paid to the authors or to their parties in interest.

The artist guarantees the General Council of the Territory of Belfort full and free use of the rights granted against problems, claims or dispositions of any kind.

ARTICLE 6: Wear and tear of the copy / Reprint

In the event of wear and tear to the information contained in the digital medium, and when acquisition of the intangible rights accruing to the work is done pursuant to articles III, IV and V for the legal duration of protection of literary and artistic property, it is agreed that, to enable enjoyment of the rights granted to the General Council of the Territory of Belfort, the latter shall be authorized to print a replacement copy at its own expense.

ARTICLE 7: Storage / Conservation / Broadcast

Furthermore, in the face of the current instability of digital reading and storage tools, the General Council of the Territory of Belfort shall make a copy of the work on its closed and secure server.

ARTICLE 8:

This contract is drawn up in the French language, which shall prevail at all times.

This contract cancels all other prior letters and agreements and shall constitute the sole valid agreement between the parties.

Subject to French law, in the event of litigation, the French courts shall be solely competent.

ARTICLE 9: Attribution of competence

In the event of a difference of opinion and before submitting to the competent legal bodies, the signatory parties shall study any possibilities of conciliation open to them.

Done at Bourgogne in two original copies, on

For the Espace multimedia gantner

Valérie Perrin

Director  **Conseil Général du Territoire de Belfort**

ESPACE GANTNER

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The Paradox of Collecting Contemporary Art

Thus, like most contemporary art collections, the Espace multimédia gantner collection has seen its acquisition policies change according to the particular works acquired, each one posing specific problems for which individual solutions are needed. When we started, the ease of reproducing digital works and the increasing use of emulation (see glossary, p. 600) led us to believe that this would guarantee their conservation; however, constant technological change and greater understanding of the nature of some works suggested we must think differently.

Contemporary art's relationship with time – technology-based art being the most striking example – is highly complex. As we have seen, it poses new problems, given the pace of technological development and the changing relationship between technology and the economy: factors which art did not have to confront in these terms until the nineteenth century. Time has thus become a component of the artwork, whether intentionally – in its form or subject – or through external necessity, imposed by changes in hardware or software. This unstable component imposes its own dialectic on the notion of collecting contemporary art, resulting in a paradox: the works are not inherently stable, yet there is a need to give them stability in order that they may be preserved. The paradoxical aspect of collections, in an era when works of art are themselves so complex, unstable, and ephemeral, is that we seek to guarantee their permanence, integrity, and uniqueness – necessary conditions for any art collection, and *a fortiori* for a public collection where acquisition is inseparable from exhibiting them independently of time. This paradox is not insoluble or against nature for these so-called “unstable” works are not contingent, but are more correctly “impermanent”; in other words, they are not physically permanent like traditional works, but that does not mean they are trivial, the product of technological whim, or passing fashion.

The three years during which we have worked on the *digital art conservation* project, and the discussions with our Swiss and German partners, have helped us to formulate questions about the ontological basis of our collection. What a collection of digital art means for an institution like the Espace multimédia gantner and for the Territoire de Belfort's regional council goes far beyond considerations of heritage and history. It obliges us to think about what a work of art is today and what it needs in order to exist tomorrow; thus the collection also represents a constant process of interrogation that plays a full, concrete part in the institution's mission and in its critical engagement with these artistic practices and their connections to technology, economic conditions, globalization, everyday life, the individual, and the history of experimentation in art.

Conservation of Born-digital Art? The Legal Framework of Copyright

Thomas Dreier and Veronika Fischer

1. Conservation: Technology, Ethics, and Legislation

To preserve the documentary character and testimonial evidence of artifacts in collections for future generations, it is essential that the “legibility” of these objects be retained. It is thus incumbent on museums to protect their collections, to conserve and – where necessary – to restore them. In the field of restoring traditional media (paintings, drawings, sculpture, etc.), for the most part this takes the form of cleaning the works, repairing and replacing damaged and missing parts, and the structural treatment of deteriorated picture supports. In the field of digital art conservation there is less emphasis on preserving the original physical components, and more on updating the hardware and software, sometimes including the adaptation or replacement of visual or audible content (for example, texts, images, music).

Precisely which measures are necessary, possible, tenable, and can also be financed in each case is firstly a question of the technology and ethics of conservation. However, it is not only technology and ethics that define the framework within which conservation measures are identified; legal issues must also be taken into account. This is because when there are interventions in the physical integrity, the original form, or the intellectual conception of artworks, not only the conservation interests of the museum are involved. Although the museum assumes the role of custodian of the interests of the general good, which in Western cultural circles derives from the memory strategy of “reification and objecthood,”¹ this is not the only consideration. As a rule, collectors who have entrusted their works to museums as loans are also interested in their conservation, although economic considerations frequently play an important role here. Moreover, artists may have their own ideas as to the manner in which the continued existence of their artworks is preserved in the White Cube of the museum, and these may deviate from conservation endeavors that are in the interests of the general public. This is also of significance for the choice of conservation measures. For example, artists may insist that their works in the museum should be subject to natural transformations and processes of deterioration intrinsic to them. Conversely, the curator of a museum might consider it necessary to alter the work’s

1 Hans Belting, “Contemporary Art and the Museum in the Global Age,” in: Peter Weibel and Andrea Buddensieg (eds.), *Contemporary Art and the Museum. A Global Perspective*, Hatje Cantz, Ostfildern-Ruit, 2007, pp. 16–41, here, p. 19.

substance for conservation reasons in a manner that is not in conformity with the artist's original intentions. Even when artist and conservator agree about the fact that interventions are necessary, there may be disagreement as to which conservation measures should be carried out; for example, an artist might demand particular measures to preserve a work, which the conservator does not wish to carry out or which cannot be carried out due to budgetary constraints.

When interests clash, the law seeks to bring about a satisfactory and, wherever possible, just compromise. Hence, the work of conservators is also subject to legal provisions, first and foremost of copyright law. As far as can be established no case law exists that governs the conservation of digital artworks. Thus, this essay focuses on issues of copyright that arise in connection with the rights and interests of artists with regard to the conservation of born-digital art (see glossary, p. 599); namely, artworks that are genuinely digital. The question as to whether the conservator can claim copyright for the end result after conservation will not be considered here. The reason for this is obvious: by definition, the work of the conservator is oriented as closely as possible on the original object, and this work consists primarily in the skillful application of available techniques, therefore the conservator does not act creatively in the sense defined by copyright law. However, this does not preclude that in certain cases – the reprogramming of software or the recreation of photographs – may be construed as constituting a claim to copyright protection on behalf of the conservator.

The purpose of this essay is twofold: to explain theoretically the legal issues connected with conservation, and to provide a practical guide and on-the-spot support for conservators. Because copyright adheres to the territoriality principle – a state has no competence to prescribe legal rules to govern activities outside its national borders – and insofar as the international or European legal frameworks have not been standardized, only general guidelines on copyright can be provided here.² At the same time, the legal methodology will be illustrated for the lay person. First, in this connection the law does not always deal with artistic problems in the same way as image science or art history. Second, prevailing laws – the terminology of which draws on the line, form, and material identity of analog works of art – do not, in all respects, provide easily implementable and appropriate solutions for digital

2 For this reason, this essay primarily refers to the regulations of the revised Berne Convention of the Protection of Literary and Artistic Works (available online at: www.wipo.int/treaties/en/ip/berne/trtdocs_wo001.html, accessed 06/07/2013), as well as the Directive 2001/29/EC of the European Parliament and of the Council on the harmonization of certain aspects of copyright and related rights in the information society (available online at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:167:0010:0019:EN:PDF>, accessed 06/07/2013) which aims to standardize aspects of the EU member states legislation on copyright. Outside Europe, especially important is the USA's Visual Artists Rights Act (VARA) of 1990 (17 U.S.C., United States Code, § 106A).

artworks which are often largely conceptual. Thus, at a more abstract level upstream of law it is worth considering whether digital artworks in general require a different culture of dealing with heritage, as well as needing different strategies than those which have so far obtained in the world of analog heritage. The answer to this question would also have repercussions on the constitution of law.

2. The Legal Framework of Copyright

2.1 Reproduction, Adaptations or Other Transformations of the Work, and the Right to Prohibit Distortion of the Work

Copyright protects the artist's intellectual and personal relationships to the work and to its use. Copyright also serves "to ensure equitable remuneration for the exploitation of the work."³

Should a conservator reproduce parts of an artwork protected by copyright during the implementation of conservation measures, this affects the artist's rights concerning reproduction. Insofar as no legal exceptions exist, it is the responsibility of the artist "to authorise or prohibit direct or indirect, temporary or permanent reproduction by any means and in any form, in whole or in part."⁴ In the past this formulation probably referenced the production of copies of physical objects, such as books, where in normal cases their reception – reading – did not imply any act of copying. Of course this is different in the nonphysical, digital sphere, in which all acts of reproduction, including the purely technical, are registered in order to counteract the pending loss of control.⁵ Should the conservator's work go beyond restoring the work to its original state, then the copyright holder's rights concerning adaptations or other transformations of the work may be affected.⁶

In essence, the work of the conservator concerns the rights of the artist to preserve the integrity of his work: "Independently of the author's economic rights, and even after the transfer of the said rights, the author shall have the right to claim authorship of the work and to object to any distortion,

3 As an example, see §11 of the German UrhG (Copyright Act and Affiliated Laws). As a rule, references to personal rights in the states of continental Europe are more pronounced than in Anglo-American legal circles.

4 Art. 2 of the Directive 2001/29/EC of the European Parliament and of the Council on the harmonization of certain aspects of copyright and related rights in the information society (see footnote 2); see also: §16 I UrhG. Parallel to this, the reproduction of computer programs as well as the content of the author's databases or database creator is reserved (art. 4a of the Directive 2009/24/EC on the legal protection of computer programs; art. 7 I of the Directive 96/9/EC on the legal protection of databases).

5 See only ECJ (European Court of Justice) Case C-5/08 and C-302/10 – *Infopaq I* and *II*, [2009] I-6569.

6 See on this law of the processing, arrangement and other adaptations: art. 12, revised Berne Convention of the Protection of Literary and Artistic Works. In the EU, this law has yet to be standardized; see only §23 UrhG.

mutilation or other modification of, or other derogatory action in relation to, the said work, which would be prejudicial to his honor or reputation.”⁷ In the area of fine art, this includes changes to the design or the context in which the work is intended to be viewed (for example, in works of site-specific art).⁸ In architecture this would concern an owner’s wish to make alterations to an architectonic work, which the architect does not like, or which he only wants to do himself.

In the case of conservation of copyright-protected works of art, there ought to be no noteworthy problems concerning the artist’s right to prohibit distortion of the work exercised by his heirs after his death. First, the artist’s right to prohibit distortion of the work and copyright protection in general endures for seventy years after the artist’s death in the EU and in the USA; in other countries the term of copyright protection is at least fifty years. Thus works by Old Masters through to works by creators who were deceased by the beginning of the 1940s or 1960s, respectively, are in the public domain. Only France recognizes, in theory, a *droit moral de l’artiste* in perpetuity, which in practice, however, does not appear to lead to any severe problems. Second, each instance of conservation seeks to maintain or restore a work’s original condition as created by the artist; that is, such measures are entirely in accordance with the author’s intentions. With regard to the conservation of analog works, in most cases copyright problems arise if the works were created to change physically or deteriorate over time.⁹ By contrast, the conservation of digital works of art is much more problematic. Preservation of digital works for the longer term often entails replacing or even changing the hardware and/or software as well as the media content, if necessary; that is, it entails interventions in elements that may well have an influence on the visual appearance and acoustic experience of the digital artwork.

2.2 Artwork and Work Protected by Copyright

One special point needs to be mentioned: although the subject of copyright law is the work produced by an author (“Article 1: The authors of works in the literary, scientific and artistic domain enjoy protection for their works”), this

7 Art. 6bis I, revised Berne Convention of the Protection of Literary and Artistic Works.

8 See from German case-law, e.g., BGH (Federal Court of Justice) GRUR (Journal of the German Association for Industrial Property and Copyright) 2002, p. 532 – *Unikatrahmen*; RGZ (law reports of the German Reichsgericht in civil matters) 79, p. 397 – *Felsenland mit Sirenen*; Winfried Bullinger in: Artur-Axel Wandtke and Winfried Bullinger (eds.), *Praxiskommentar zum Urheberrecht*, 3rd ed., C.H. Beck, Munich, 2009, §14, 37ff, with further references.

9 See Thomas Dreier, “Urheberpersönlichkeitsrecht und die Restaurierung von Werken der Architektur und der bildenden Kunst,” in: Joseph Straus (ed.), *Aktuelle Herausforderungen des geistigen Eigentums, Festgabe von Freunden und Mitarbeitern für Friedrich-Karl Beier zum 70. Geburtstag*, Carl Heymann, Cologne, Berlin, 1996, pp. 365–378, here, p. 365ff.

definition is by no means identical in all respects to the artistic and art historical concept of a work. Thus, one must first distinguish between the work in its nonphysical, immaterial form and the “carrier medium” of an artwork. The carrier medium represents only one copy of the work and is not an object of copyright protection: copyright protection is accorded to the intellectual substance, which it embodies. However, protection does not relate to the artistic idea as such, and not exclusively to the style or manner in which a work is executed. The artistic idea must be executed in one form or another and assume concrete expression; this prevents the artist from blocking, through copyright protection, many other works of art which are based on a similar idea or which amount to variations of the same idea.

In the case of classical art genres (paintings, drawings, sculpture) artistic and copyrighted works are congruent. However, copyright law understands a work to be an own intellectual creation, whereas in an artistic sense a work may consist of several works in the legal definition of the term. This has particular significance for works of digital art. In these works computer programs, databases, and audiovisual elements (such as texts, images, music) come together. All these elements may have an independent and legally different status, although from an artistic point of view they are viewed as integral components of a digital artwork. Furthermore, the digital work of art may claim copyright protection not only for its elements that fall under copyright, but also as a whole, since from an artistic standpoint it amounts to more than the sum of its parts.¹⁰ When the dividing line between concept, material execution, and visual appearance shifts, as is the case in works of digital art, then the legal definition of a work leads to a range of problems.

3. The Conservation of Digital Art

The legal questions thrown up in connection with conserving works of digital art with a view to their long-term preservation are discussed here in accordance with the ICOM principles¹¹ on the basis of the various strategies for conservation and preservation, and are arranged according to the extent of the intervention: from measures to conserve the original components to their (partial) replacement with functionally identical elements, to recreation and reinterpretation (see glossary, p. 601).

10 See for German law BGH GRUR 1985, p. 529 – *Happening*. On the question of the relationship between individual protective rights and a work conception realized through software, databases and their content, see: Winfried Bullinger and Christian Czychowski, “Digitale Inhalte: Werk und/oder Software? Ein Gedankenspiel am Beispiel von Computerspielen,” in: GRUR 2011, p. 19 and in the jurisdiction ECJ Case C-393/09 – *BSA*, according to which the screen view is not part of the computer program.

11 Deutsche Museumsbund, ICOM-Deutschland (ed.), *Standards für Museen*, Kassel, 2006, clause 6, pp. 16–17, available online at: www.icom-deutschland.de/client/media/8/standards_fuer_museen_2006.pdf, accessed 06/07/2013.

3.1 Conservation of the Original Materials

3.1.1 Measures

The conservation of digital artworks can be facilitated by implementing a series of preventive measures. These include technical and scientific analysis as the foundation of conservation measures in the future. Therefore, wherever possible it is recommended to document the technical requirements (of the software, which should exhibit certain playback characteristics, and of the operating system; the hardware specifications), and to put on record the intention of the work in order to ensure the greatest possible authenticity in future presentations. Due to the limited shelf-life of storage media, redundant data storage (see glossary, p. 601) makes a great deal of sense, where the work's data is backed up at regular intervals and in different file formats, and upgraded to new software and hardware environments as these become available (migration; see glossary, p. 601).

3.1.2 Legal Relevance

From the standpoint of copyright, however, even such simple preventive measures are not entirely devoid of problems. Although straightforward documentation of a work of art does not raise any legal issues, from a legal standpoint even a simple illustration of a work is a copy if the external form of a work is protected by copyright. The same likely applies if a film is made of how an interactive artwork behaves.¹²

Further, the data backup as well as the backup copy encroaches on the author's right of reproduction. As a rule, only the creation of a single backup copy of the software is expressly permitted.¹³ With regard to individual works (the entire work including each copyright-protected work it contains) the EU Directive concerning copyright offers sufficient flexibility (permissible are "specific acts of reproduction made by publicly accessible libraries, educational establishments or museums, or by archives, which are not for direct or indirect economic or commercial advantage").¹⁴ However, not all EU member states exploit this flexibility to the full. According to German law, a museum archive can only hold copies of works belonging to that museum; to include copies of other works requires the consent of the authors of the works. What is more without a written agreement with the respective artist, only "smaller" parts of the works can be copied, and then only on paper or for the purpose of purely analog use.¹⁵ This is no help at all with the data backup

12 See ECJ Case C-393/09 – BSA Subs. 57 (rejected, however, for a graphic user interface, since the user was unable to intervene interactively in the film).

13 Art. 5 II Directive 2009/24/EG (see footnote 2), insofar as carried out by an authorized user and "necessary for use".

14 Art. 5 II c Directive 2001/29/EG (see footnote 2).

15 § 53 II, p. 1, no. 2 in conjunction with § 53 II, p. 3, no. 3 (regulation of the archive limit) and § 53 II, p. 1, no. 4a in conjunction with § 53 II, p. 3 and p. 2, no. 1 or 2 UrhG (permitted copies of small parts).

for protecting a digital artwork. If the totality of the elements comprising a digital artwork represents a copyright-protected (because it is expensive) database, the law does not provide for any exemptions in the case of conservation measures.¹⁶

In other words the existing ruling has proved too limited and, furthermore, it is contradictory, even with reference to simple backup data. The only explanation for this is that, first, copyright is not tailored to the work of art as a totality, but instead to each copyrighted object, and second, it is geared to the legal protection of commercial databases, and not to those that contain the content of digital artworks.

3.2 Replacement with Functionally Equivalent Elements

From a legal point of view, if elements of works are exchanged during the course of conservation measures and replaced by identical elements, this is not a problem. The situation may possibly be different in cases where the replacement is only a functionally equivalent component. Whether this involves a hardware or software component is immaterial.

3.2.1 Hardware Replacement

In the first instance, complete replacement of the material elements of the work constitutes reproducing the external form of the work, and is therefore legally relevant in cases where the creative content of a work does not consist entirely in its concept or its interactive behavior, but is also expressed in its external design. The same holds in cases where only certain parts are replaced, insofar as these parts, taken alone, may be subject to copyright protection. Ultimately, the issue is: when does a conserved original cease to be an original, and when does conservation result in a recreation of the object in question.¹⁷

Beyond this, replacing hardware may lead to infringement of the author's right to prohibit the distortion of the work, if the replacement affects the sculptural attributes of the digital artwork (e.g., flat screens instead of tube monitors), even when the picture quality and behavior of the work remain the same. Whether the artist can oppose such changes to the external appearance of a digital artwork is something that must be evaluated on a case-by-case basis.¹⁸ In practice, however, this evaluation often turns out in favor of the conservator, since all professional interventions are either minimally invasive or involve making replacements, and pursue the objective of making the artist's work publicly accessible entirely in accordance with the latter's intention.

¹⁶ §§ 87b I, p. 1, 87c UrhG (in the case of essential copying, no limit is effective).

¹⁷ See for the definition, for example, BGH NJW (Neue Juristische Wochenschrift) 1984, 2282 (for the restoration or recreation of a damaged model boat).

¹⁸ See in addition the subsequent paragraph 3.3.

3.2.2 Software Replacement

Unlike the hardware, the software that constitutes the foundation of a digital artwork is not visible. Nevertheless it is still protected by copyright. Consequently, when changes to the software that controls the digital work become necessary because of migration, porting (see glossary, p. 601), or emulation (see glossary, p. 600), software copyright must be respected.

In accordance with European law, legally relevant acts of reproduction with reference to software do not require the consent of the copyright holder, “if they are necessary for an intended use of the computer program including error correction through the lawful acquirer.”¹⁹ Even where the concern may not be, in the strict sense, error deletion during porting and migration, in order to maintain the operating capability of the program in question within the contractually agreed usage, all necessary processes such as porting and migration are nevertheless included under the elimination of errors in the jurisdiction and in the specialist literature. Third-party companies can be contracted also for the implementation.²⁰ However, the permitted modifications are exceeded should the implemented measures lead to the program being used in other ways than stipulated in the contract – even if this only follows maintenance work. The complete exchange of software only poses no legal problems when the rights to use the software have been acquired. For the emulation of obsolete operating systems “complete” solutions by third-party suppliers, or Open-source components (see glossary, p. 601) are generally used. Even the reprogramming of the functionalities of an older program is legally permitted as long as permission to use parts of the original source code (see glossary, p. 602), and/or its internal architecture has been sought and granted.

3.2.3 Replacement of Content

First, in the event of the original content being changed or replaced during conservation of a work of digital art (for example, by other language versions or more up-to-date content), the author’s right of reproduction is affected. Second, such changes frequently amount to a reinterpretation of the original work. In any case, a reinterpretation may not be publicly exhibited without the artist’s consent.²¹

19 Art. 5 I Directive 2009/24/EG (see footnote 2).

20 BGH GRUR 2000, p. 866 – *Programmfehlerbeseitigung*; see: Thomas Dreier and Gernot Schulze (eds.), *Kommentar zum Urhebergesetz, Urheberrechtswahrmungsgesetz, Kunsturhebergesetz*, 3rd ed., C.H. Beck, Munich, 2008, § 69d Rn 8; Malte Grützmaker in: Artur-Axel Wandtke and Winfried Bullinger (eds.), *Praxiskommentar zum Urheberrecht*, 3rd ed., Verlag C.H. Beck, Munich, 2009, § 69d 21; Lehmann in: *Urhebervertragsrecht. Festschrift für Gerhard Schricker zum 60. Geburtstag*, C.H. Beck, Munich, 1995, pp. 534–569, here p. 560.

21 See in addition subsequent paragraph 3.4.

3.3 Changes due to Functionally Similar Components

In this context “changes due to functionally similar components” is understood as the replacement of “original” components by elements that are neither identical nor functionally the same; they are only functionally similar, and they change the visible appearance of the digital work to a greater or lesser degree. Thus, the replacement of hardware or software can change the playback behavior of the images contained in the work, or the display of image elements will be in another format. After a software update, it can also happen that particular graphic elements will not be displayed at all anymore.

3.3.1 Balancing of Interests

From a legal point of view, it depends on whether the owner of the artwork has the right to undertake such measures without the artist’s consent, and whether the artist can oppose such interventions by asserting the author’s moral right to prohibit the distortion of a work. According to the legislation of most countries, this moral right of the author is not absolute; namely, there has to be a balancing of interests. On an international level, the changes concerned are those that would “prejudice” the “honor” or the “reputation” of the artist. In this respect German law cites “distortion or any other derogatory treatment of his work which is capable of prejudicing his legitimate intellectual or personal interests in the work”(Article 14).²²

In practice, the following conflicts of interest are conceivable: in the interests of preserving an artwork a certain conservation measure is carried out in spite of the fact that the artist wants different measures that he or she deems more appropriate; the artist rejects conservation per se; the artist wants to carry out the conservation measures personally, but opts for a procedure which does not agree with the ideas of the owner or the conservator; the museum that owns the artwork does not wish to carry out any conservation, although the artist insists upon it.

Under German law there would be a three-stage assessment of the facts of the case:

- Initially it must be established, purely objectively and in accordance with the artistic intention, whether the work is distorted or not. This is the case when an intervention affects the outstanding features of the work, or when the overall intellectual and aesthetic impression of the work as created by the artist has been verifiably altered, even when the work, considered objectively, has not undergone devaluation.²³

22 Art. 6^{bis} I revised Berne Convention of the Protection of Literary and Artistic Works; §14 UrhG.

23 BGH GRUR 1989, p. 106, 107 – *Oberammergauer Passionsspiele II*.

- At the same time, not all distortions prejudice the author's legitimate intellectual or personal interests in the work, for example, in cases where the latter has agreed to the intervention.²⁴ Furthermore, the objective basis for assessment is not the most highly developed artistic sensitivity, but the perspective of the average viewer of art.²⁵ Thus, conservators are also protected against possible retrospective changes of mind on the part of the artist, since the artist is at most entitled to revoke any formerly granted rights of use.²⁶ Against retrospective changes to the works carried out by the artist personally – even in cases where these run counter to a conservation measure which the artist applied – the owner may rightly object on property grounds.
- Finally, of decisive importance is the evaluation of conflicting interests. Here, the interest of the artist's moral right to integrity is, generally speaking, not to be evaluated as higher than the interest of the owner. Only if the interest of the artist – depending exclusively on this, not, for example, on the interests of the heirs subsequent to the artist's death²⁷ – outweigh those of the owner of the work, does this amount to an infringement of the artist's moral right. A great number of criteria influence this evaluation; first and foremost, the reason for and the extent of the intervention.²⁸ Thus, with regard to the artist's right to prohibit distortion, replacing original components with identical components and with functionally equivalent ones is far less significant – if at all – than changes caused by the substitution of functionally similar components. This is particularly valid because the work amounts to more than its physical components. The continuing accessibility of the work to the public is also of importance; whether it is an original or a multiple, the practical purpose of the work as well as its condition, artistic significance, and relation to its environment.²⁹ The public interest in the preservation of the work is not enshrined either in copyright or civil law but, at best, in the legislation pertaining to the protection of monuments.³⁰

24 OLG Munich GRUR Int. (Industrial Property and Copyright, International part) 1993, p. 332, 333 – *Christopher Columbus*.

25 BGH GRUR 1974, pp. 675, 677 – *Schülerweiterung* – see also Adolf Dietz and Alexander Peukert in: Gerhard Schricker and Ulrich Loewenheim, *Kommentar zum Urheberrecht*, 4th ed., C.H. Beck, Munich, 2010, §14, 29, with further references.

26 See e.g., §42 UrhG (recall due to change of conviction); however, even this is linked to a series of restrictive conditions.

27 BGH GRUR 1989, pp. 106, 107 – *Oberammergauer Passionsspiele II*.

28 BGH GRUR 2008, pp. 984, 986 – *St. Gottfried*.

29 See Annemarie Beunen, "Moral Rights in Modern Art: An International Survey," in: Ijssbrand Hummelen and Dionne Sillé (eds.), *Modern Art: Who Cares? An Interdisciplinary Research Project and an International Symposium on the Conservation of Modern and Contemporary Art*, Archetype, London, 2005, pp. 222–232, here pp. 222, 225.

30 Exceptions can be found in several forerunner laws of the Visual Artists Rights Act of 1990 (VARA) of the USA (see footnote 2), e.g., the California Art Preservation Act (1980), Cal. Civ. Code §989 (c), (e) (1), and the Massachusetts

It may thus only be invoked in the balancing of interests, when the museum – for example, in fulfilling its public function – has a legal duty to consider the public interest.³¹

3.3.2 Balancing in the Case of Digital Art

Like analog works of art, with every change to their components digital artworks lose artistic authenticity and historicity. However, at the same time, with regard to the admissibility of necessary conservation measures the following must be taken into account:

- the intervention is in the interest of conserving or maintaining the ability to exhibit the work;
- the lifespan of digital art is determined by technological facts (hence, the artist must expect that the technical components of a work will be rendered obsolete due to advances in technology);
- a high degree of wear and tear in interactive works must be anticipated due to their being on (continual) display in the museum.

Under these circumstances, the interest of the museum as owner of the work in its conservation will, as a rule, prevail over the interest of the artist where a particular conservation measure has not been executed, insofar as the work in question was not designed by the artist to be perishable. In the U.S. Copyright Act, this is expressly specified (and, at the same time, the duty is prescribed that modifications to artworks caused by public presentation or conservation do not rank as distortions unless they are caused by gross negligence).³²

3.3.3 The Artist's Claim to Restoration?

In a case where an artist's moral right to prohibit distortion has been infringed, – again subject to the specific provisions of national legislation, of which French law has the most extensive³³ – the artist has a claim to omission, to

Art Preservation Act (1985), Mass. Gen. Laws Ch. 231 § 85 S (e) and (g), that the Chief Prosecutor determined or entrusted to organizations dealing with art with the protection of the public interest.

31 However, the public interest within the framework of balancing is also not taken into account if the public institution has only entered into a contractual responsibility for compliance, see: OLG Stuttgart GRUR-RR (Industrial Property and Copyright, Jurisdiction report) 2011, pp. 56, 60 – *Stuttgart 21*.

32 Chap. 1, § 106A (c) (2): The modification of a work of visual art which is the result of conservation, or of the public presentation, including lighting and placement, of the work is not a destruction, distortion, mutilation, or other modification described in subsection (a)(3) unless the modification is caused by gross negligence.

33 See the evidence in the very comprehensive jurisdiction – though only in reference to analog works of art – in André Lucas, Henri-Jacques Lucas, and Agnès Lucas-Schloetter, *Traité de la propriété littéraire et artistique*, LexisNexis, Paris, 4th ed., 2012, § 548.

elimination and, where applicable, entitlement to damages.³⁴ Thus, the artist can demand that a conservation measure is not implemented at all or, where applicable, be reversed if it is unduly prejudicial to his or her legitimate interests.

Yet can an artist also demand that a specific conservation measure be undertaken? In other words: does the artist's right to prohibit distortion of the work incorporate a right to preserve the work? The answer to this question is no. As described above in connection with the balancing of interests, the artist has to expect that specifically works of interactive, digital art will be subject to wear and tear and rapid technical obsolescence. The artist is also aware that conservation is invariably very expensive. If its owner does not undertake conservation work, all the artist can demand is that the work be removed from public view and no longer be exhibited, if it no longer functions due to, in his or her view, inappropriate or no conservation, and it no longer conforms to the artist's intention. In the final analysis – with the exception of works designed to deteriorate – it remains the conservator's decision as to which measures will be carried out, or whether conservation work is done at all.

3.4 Recreation and Reinterpretation

In the case of a recreation or even reinterpretation, a work is “conserved” using a different, new technology, for example, a web-based application or application for a mobile device. This may be done at the same time as including new content. Thus, a recreation or reinterpretation of a digital work goes beyond the scope of other conservation strategies. Consequently, in view of the accompanying changes to content, recreation or reinterpretation are no longer in the sphere of conservation proper.

In terms of copyright, it is generally considered that authorization is necessary to make these modifications.³⁵ And in practice, the modifications of content connected with the recreation or reinterpretation of an artwork are hardly accomplishable without the agreement and cooperation of the artist.

4. Conflict Prevention by Means of Contract

Avoidance of conflicts is preferable to engaging in disputes. Disputes between artists and conservators can be avoided by means of a timely inventory and documentation of the work, as well as by agreements on the manner of conservation, and the timely granting of rights that later conservation measures

34 On German law, see Adolf Dietz and Alexander Peukert in: Gerhard Schricker and Ulrich Loewenheim (eds.), *Kommentar zum Urheberrecht*, 4th ed., C.H. Beck, Munich, 2010, §14, 41f.; Gernot Schulze in: Thomas Dreier and Gernot Schulze (eds.), *Kommentar zum Urhebergesetz, Urheberrechtswahrnehmungsgesetz, Kunsturhebergesetz*, 3rd edition, C.H. Beck, Munich, 2008, §14, 43f.

35 §23 UrhG.

will require. To conclude, only the latter is briefly described here. In this context distinction must be made between copyright rights of exploitation and personal rights protection.

4.1 Assigning Exploitation Rights

Due to the separation of material property and intellectual property in connection with works protected by copyright,³⁶ the owner of a work of art basically does not have any rights of use. German law stipulates that the owner of the work can only exhibit the work without the consent of the artist.³⁷ Insofar as conservation measures require a copy or version of the work which is relevant under copyright law in the sense discussed above, it is recommended to obtain the appropriate rights of use and modification. Because of its evidentiary value (proof is required in cases of dispute) it is strongly advised to have the grant of rights in writing, even if there is tacit granting of rights in individual cases resulting from the common goal of artists and museums of preserving the functionality of the digital artwork.

Attention should be paid to two things in particular. First, the artist can only grant such rights to the museum and that he or she holds. Software, for example, which was not programmed by the artist, and for which the artist does not hold or has been granted unlimited rights of use by the copyright holder, is one such case. It must also be verified whether the artist has acquired sufficient rights to the content used in the work of art. Where necessary, here one must operate with exemption clauses. Second, not only the conservator or museum may have rights granted to them, they can also reserve actions for the artist to which are legally the prerogative of the conservator. Thus German jurisdiction, for example, holds that contractual prohibition of using the software on a higher performance computer is permissible.³⁸

4.2 Waiving of Personal Rights

The final question relates to the extent to which an artist may waive his or her moral right to prohibit distortion of their work. This is problematic, at least according to German legal conceptions, because the personality of the author as reflected in a work is something a human being cannot give up. There are, however, substantial differences in legislation from country to country.

Insofar as museum and conservator have acquired rights of use, according to German law, changes are nevertheless permissible to which the author cannot, in good faith, refuse his or her consent. Furthermore, in the cases of fine art and photographic works within the framework of limiting provisions, it is permissible to change the dimensions of a work, as well as effecting

³⁶ See above paragraph 2.2

³⁷ § 44 I and II UrhG.

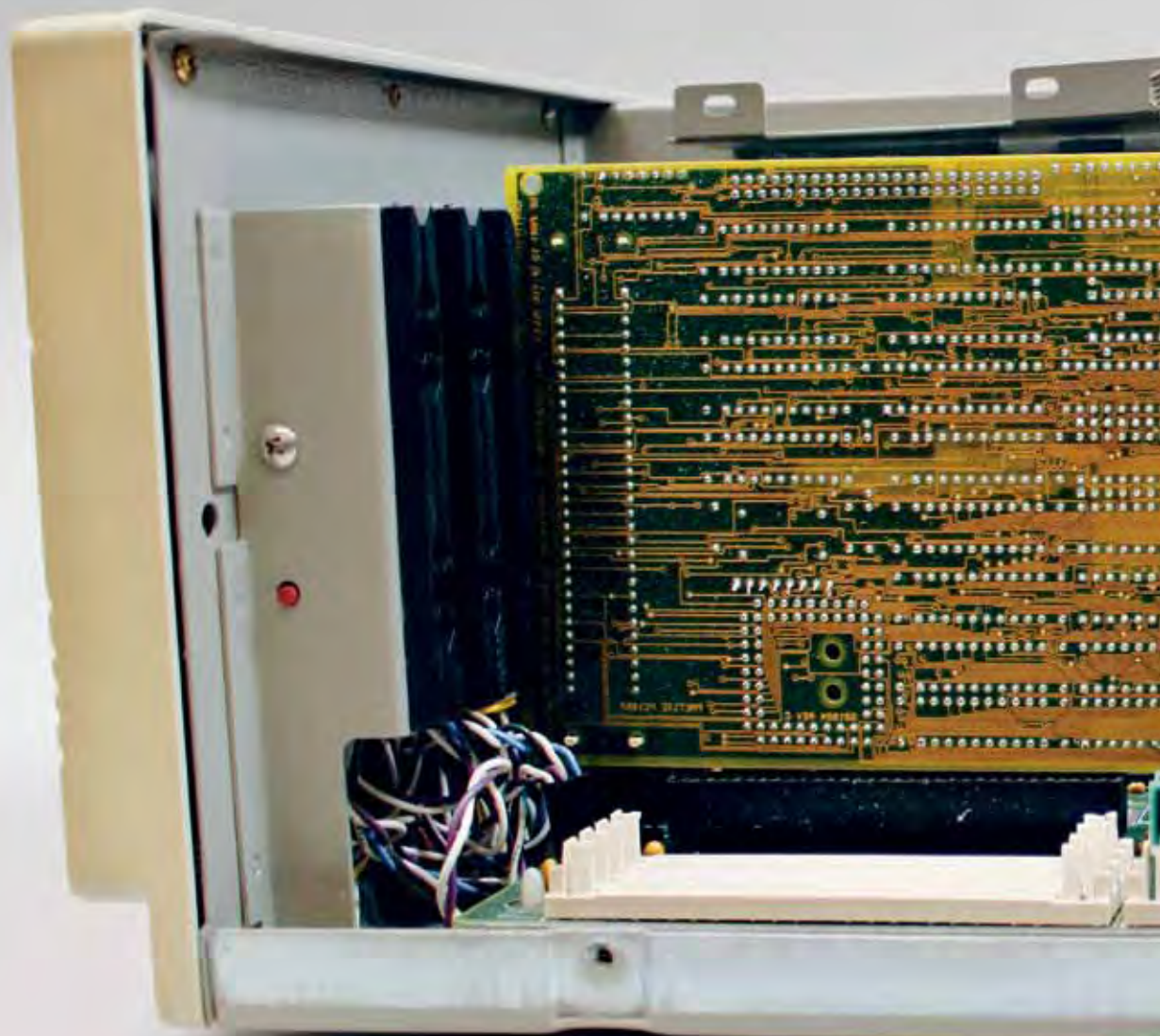
³⁸ BGH GRUR 2003, 416, 419 – CPU Clause.

changes due to procedures applied for reproduction.³⁹ Furthermore, although German jurisprudence permits an artist to waive his or her moral right to prohibit distortion of their work, a general waiver on behalf of the artist regarding the integrity of the work is not possible. In other words: the artist is able to take action against gross distortion of his or her artwork, even if the artist has previously contractually excluded this (the unalienable essence of the author's personal rights).⁴⁰ With this, ultimately, a satisfactory balancing of interests is procured, although the general rule also applies here: Where in each individual case the borderlines lie, is something that often has to be decided by a court ruling.

Translated from the German by Justin Morris

39 §§ 39 II, 63 I and III UrhG.

40 Hence, e.g., BGH GRUR 1971, 269, 271 – *Das zweite Mal*.



Symposium I

*The Digital Oblivion.
Substance and Ethics in the Conservation
of Computer-based Art*

ZKM | Center for Art and Media Karlsruhe

On System Change in Cultural Memory and the Conservation of Digital Art

Bernhard Serexhe

Introduction

In November 2010 a symposium was held on *The Digital Oblivion. Substance and Ethics in the Conservation of Computer-based Art* at the ZKM | Center of Art and Media Karlsruhe. It was part of a three-year research project, *digital art conservation*, funded by the European Union (EU) within the framework of the INTERREG IV Upper Rhine program, which seeks to contribute to the international debate on the conservation of digital art. This issue is not new; a number of projects in Europe and America over the past decade have shown, by way of well-documented case studies, how digital artworks can be conserved in particular cases. A brief glance at private and public collections reveals that practices of preserving digital art have lagged far behind expectations that are oriented on measures applied to traditional art media. As a consequence the ZKM | Center for Art and Media Karlsruhe is frequently consulted and asked for specific assistance as there is an almost complete lack of experience in the conservation of digital art together with the concomitant deficit in qualified personnel and dedicated facilities and structures. It is thus no secret that especially digital art, more than any other art form, is threatened by deterioration for a variety of interconnected reasons.

The primary task of the *digital art conservation* research project is, therefore, not to continue the impressive series of earlier case studies, but instead to understand the conditions under which it is or is not possible to preserve the digital art in collections. This project, involving the participation of three French and two Swiss institutions,¹ was initiated by the ZKM | Karlsruhe, one of the leading institutions worldwide to have adopted a positive stance towards digital media, and, with respect to its wide experience in the critical analysis of art and media technologies, the ZKM | Karlsruhe is in a position to provide the best expertise and solutions. Further, the ZKM | Karlsruhe is the home of the most important collection of born-digital art in the world and, through self-critical reflection and open presentation of its own practices of conservation, the ZKM | Karlsruhe demonstrates by example its unconditional commitment to its own collecting policy.

1 Partners of the ZKM | Center for Art and Media Karlsruhe in the research project *digital art conservation* are: the Espace multimédia gantner, Bourogne (Territoire de Belfort, France), the École supérieure des arts décoratifs (ESADS), and Vidéo Les Beaux Jours, both located in Strasbourg (France), as well as the House of Electronic Arts Basel (Switzerland), and the Bern University of the Arts (Switzerland).

Collecting, preserving, research, and communication as the primary tasks of museums, are strategies for transmitting cultural heritage. However, if one looks beyond particular artworks and their respective concepts of conservation, it is evident that to understand structures the fundamental question as to the general conditionality and future of digital cultural heritage in general has to be raised. The goal of the *digital art conservation* research project is to analyze the paradigm shift brought about by the digitization of cultural heritage and thereby to advance understanding of the structural and institutional transformations that are to come.

To illustrate the pressing nature of this issue, I would like to begin with an example drawn from practice: the CD-ROM *Media, Architecture, Installations*² by Antoni Muntadas was released in 1999 as the first in the promising *Anarchive* series published by the Centre Pompidou in Paris, a collaborative project which included the Centre de recherches en histoire et esthétique du cinéma (CERHEC) at the university Paris 1 (Panthéon-Sorbonne), the ZKM | Karlsruhe, and a number of other leading media-technological institutions. Muntadas' CD-ROM centers on twelve key works that engage with architecture and media, and develops into a very well-structured interactive digital archive of Antoni Muntadas' complete oeuvre over a period of nearly thirty years. At the time CD-ROMs were an advanced medium for storage and communication, and this one, which was produced by Muntadas and the French media research scholar, Anne-Marie Duguët, comprises 150 themes with around the same number of Muntadas' texts, interviews, writings, and precise descriptions of his works, the majority of which are in French, Spanish, and English: in short, the CD-ROM delivered the best possible documentation that an art scholar could wish for. Twenty people participated directly in the production of this CD-ROM; it lists scholarly articles by 104 authors and works by 61 photographers, and the credits include some of the most well-known media artists and scholars.

Around twelve years after its appearance, anyone wishing to make use of what, for cultural memory and for the prevailing standards of 1999 was a forward-looking and wonderful archive, now gets the following message on their Apple computer: "You cannot open the program 'Start', because the Classic Environment is no longer supported." All subsequent attempts to start the CD-ROM are futile.

The explanation for no longer being able to start the CD-ROM is as banal as it is shocking: with the introduction of the Mac OS X 10.4 version, at the

2 Anne-Marie Duguët and Antoni Muntadas, *Muntadas: Media, architecture, installations*, Centre George Pompidou, Paris, 1999. Also participating in the production were: Centre de recherches en histoire et esthétique du cinéma (CERHEC), university Paris 1 (Panthéon-Sorbonne); Fundació Arte y Tecnología, Madrid; Fundació "la Caixa," Barcelona; Le Métafort d'Aubervilliers; Fonds franco-américain Etant Donnés; Centre d'art contemporain la synagogue de Delme; ZKM | Center for Art and Media Karlsruhe.

latest, an operating system with the nickname Tiger that ran as of mid-2007 on Apple computers with Intel processors, Apple no longer guaranteed downward compatibility with programs requiring the so-called Classic Environment. For all users of more recent Apple computers, this means that the vast majority of the programs, files, archives, and digital artworks that were created prior to 2007 can no longer be used or accessed. And older computers are no longer supported by the manufacturers.

Anyone seeking to use the Antoni Muntadas' CD-ROM archive with a more recent version of Windows, for example, can open it, but continually receives error messages with the various applications, such as "Script error. Property not found." On a Website where one can purchase the CD-ROM, potential customers are quite rightly made aware of the problem: "This CD-ROM was created for Mac OS 7.1 and Windows 95 or 98, and is not compatible with several contemporary computers. Please contact the office before ordering." But who still owns a PC with Windows 95 operating system, or an Apple with Mac OS 7.1? And for how long will it be possible to contact the sales office for customer enquiries?

Naturally, one can consult the various hotlines and chat rooms and get good advice; and obviously solution strategies do exist; however, these remedies are not an option for the majority of average computer users, to which group most of us belong. At this point I should mention that even the IT specialists and "computer nerds" of our institution were unable to make the ZKM | Karlsruhe's copy of the CD-ROM, which it in fact co-produced, play back its data perfectly. Unfortunately, this problem affects entire series of digital archives on CD-ROMs or DVDs that were produced by the ZKM | Karlsruhe or other institutions.

System Change of Cultural Memory

In every age and in all societies, cultural developments are intimately bound up with economic, political, and social conditions. They condition the latter as much as they are their products. Thus, in this connection our view must extend beyond the usual horizons of collecting policy and of conservational, stylistic or heritage preservation evaluations. It is only against this wider backdrop – which interrogates the economic conditions of culture in general – that phenomena can be comprehended, which, on closer inspection are too often attributed to the imperfection of certain technologies, or the failure of individual institutions. The assumption of ongoing progress that pervades our society is directed toward the maintenance and continuation of existing systems through improvements to applied technologies. However, the economic, social, and cultural structures are not interrogated, because if they were, then the limits of the assumption would similarly have to be questioned. Consequently, for thousands of years the self-image of our society has been characterized by the emphasis placed on the durability of stable systems of

cultural transmission. In his research on ancient Egyptian culture, the Egyptologist, scholar of religion and culture, Jan Assmann, has persuasively shown that “our internalized tradition, [...] the repetition of texts, images, and rituals crystallized over generations, for centuries, indeed over thousands of years, [...] have defined our consciousness of time and history, our image of self and world.”³ The decisive feature of this observation is its conclusion; namely, that in all cultures to date “cultural memory” – a term coined by Jan Assmann – have pivoted on durability and reliability, obviously and especially in view of the permanent threat from without, that is, external influences: wars, intentional destruction, natural catastrophes, and natural processes of decay.

For just a few decades now, digitization permits easier generation, processing, and transmission of cultural resources. Via Internet – according to the grand promise of our times – these resources will be accessible for all users at all times and in all locations. Digitization and worldwide networking have extended the acquisition of information to universal access to vast quantities of unfiltered information that hitherto had been restricted due to technical and political reasons. This has provided the real possibility of a previously unknown expansion of intercultural, global exchange, and thereby offers the well-versed and interested user with the means to participate actively in worldwide societal processes.

In view of the fact that the Internet is dominated principally by market interests, and in view of the burgeoning state control and censorship in many countries, one can only wait and see whether the expectations raised of an emerging grass-roots democratic global society of the future will be met or not. Texts, images, films, music, works of art, documents of all kinds – indeed, virtually all variants of human expression – are today generated and stored in binary code; a code that can no longer be read directly by the human senses, but only by machines which then render it in a form that is comprehensible to people.

Thus, in the context of conserving and preserving cultural memory we have to acknowledge the fact that for the last thirty years, use of digital processing, communication, and storage media has resulted in our society becoming irrevocably dependent on hard and software, as well as on digital systems of communication, the development, control and supply of which has been entirely subject to private sector commercial goals. It is equally clear that the value creation strategies of listed businesses are diametrically opposed to the goals of earlier, traditional cultural transmission, which was geared towards long-term durability.

3 Jan Assmann, “Das kulturelle Gedächtnis,” in: J. Assmann, *Thomas Mann und Ägypten. Mythos und Monotheismus in den Josephsromanen*, C.H. Beck, Munich, 2006, p. 70; translated from the German by Justin Morris.

The market as driver of the economy, upon the interests of which cultural developments are substantially dependent, does not mediate between the interests of the different social actors, rather – in accordance with the principle of consumerism which constitutes the basis of our society – it propels producers and consumers into an increasingly virulent vortex of consuming and replacing.⁴

That the laws of consumerism especially influence the sphere of digital industries and markets requires no further elaboration here. It goes without saying that a soft and hardware company, which develops a long-term secure storage system, would soon be bankrupt. Instead, each and every newly developed piece of technology must be replaced as fast as possible by an even newer and more sophisticated technology. Commercial survival means that a long-term secure storage system cannot be tolerated.

Today, we can justifiably speak of an explosion of storage capacity and an implosion of storage time.⁵ This process has led to increasingly greater risks being taken. The main promise of long-term digital data security has yet to be fulfilled. In effect, the conservation of digitized content, as we have seen, has been subject to ever more short-term adaptations to new technical systems. The resultant functional obsolescence of the digital constitutes a system-immanent threat to cultural memory, which leads the hitherto valid criteria of durability and authenticity at all times ad absurdum, and this challenges us to a general rethink.

In his studies on consumerism as a central principle of our society, the Polish-British sociologist, Zygmunt Bauman, concludes that “the seminal departure that sets the *consumerist* cultural syndrome most sharply apart from its *productivist* predecessor, [...] seems to be the *reversal of the values attached respectively to duration and transience*.”⁶

In his contribution to this symposium (see pp. 85–90), Edmond Couchot states that digital technologies not only alter our relationship to the world and to others, but also, he argues, they destabilize our relationship to time and shake the very foundations of our culture. We find ourselves torn between

4 A lucid example of the speeding up of the market driven by consumerism is the so-called “Abwrackprämie” [scrappage bonus] in Germany of 2009. Under the guise of environmentally friendly measures, the aim of which was to phase out perfectly well-functioning, but older cars by simply scrapping them and paying their owners a bonus, this artificially generated a need to buy new cars. Consider the fact that in 2009 approximately two million (!) functional cars were scrapped. According to the political and economic rationale, this measure of destruction in the midst of a global economic crisis was apparently necessary so as to stimulate the economic welfare of society; this was to be achieved by boosting the economic power of the automobile industry.

5 As aptly expressed by Peter Weibel in his essay, see this volume, pp. 183–192.

6 Zygmunt Bauman, *Consuming Life*, Polity Press, Cambridge, Malden, 2007, p. 85. Bauman continues: “But the most pressing need, that makes haste truly imperative is nevertheless the necessity to discard and replace. [...] In ‘nowist’ culture, wishing time to stop is a symptom of silliness, sloth or ineptitude. It is also a punishable crime.” Bauman 2007, p. 36.

two temporalities. In a similar vein, Hans Belting concludes that “this temporal fracture we are now experiencing calls for a new order of memory.”⁷

Thus the digital revolution has brought about conditions which fundamentally question the future existence of cultural memory as we know it. The far-reaching consequences of this systemic transformation in cultural memory have so far scarcely been a subject for reflection at all.

In its *Charter on the Preservation of Digital Heritage*, the UNESCO established as early as 2003 that “the world’s digital heritage is at risk of being lost to posterity. [...] Digital evolution has been too rapid and too costly for governments and institutions to develop timely and well-conceived preservation strategies. The threat to the economic, social, intellectual and cultural potential of heritage – the building blocks of the future – has not been fully grasped.”⁸

On the Hope of Rescuing Cultural Memory by Means of Comprehensive Digitization

To compensate for the progressive loss of the original sources of cultural memory, while at the same time securing the increasing volume of recorded data exclusively in digital form and making it accessible to a wide audience throughout the world, research projects on digital conservation and long-term archiving have increased over the past ten years. Here, the hope is that digitized data will be safer on highly developed technical media secured in several continuously mirrored decentralized databases in worldwide networks than they are as analog data, which are threatened by external destruction and degradation from all kinds of causes. The underlying assumption is that the entire system will function at all times worldwide, and cannot be corrupted by disturbances, program mistakes, or intentional attacks.

However, this hope of permanently preserving the digital images of our world for future generations is in contradiction to the fact that digitized data, like photographs and videotapes, are highly susceptible to an entire range of different, scarcely controllable influences. We have long known about the short-term shelf life and unreliability of the new media, both in a material as well in a technical sense. If photographs are exposed to light when stored, the stored image data begins to fade within the shortest possible time. Videotapes produced only twenty to forty years ago are long since threatened by material degradation and illegibility due to technical obsolescence. The bulk of cultural memory produced during the 1970s and 1980s that was saved on magnetic disks is today impossible to save. Partial data loss or complete

7 Hans Belting, “Butterfly nets,” abstract of a lecture at the Symposium *The Digital Oblivion. Substance and Ethics in the Conservation of Computer-based Art*, ZKM | Karlsruhe, November 4–5, 2010.

8 “UNESCO Charter on the Preservation of Digital Heritage,” article 3, October 10, 2003, available online at: http://portal.unesco.org/en/ev.php-URL_ID=17721&URL_DO=DO_TOPIC&URL_SECTION=201.html, accessed 10/17/2012.

illegibility in the case of CDs and DVDs is already a factor after five years. Hard disks may prove defective for various reasons at any time. Blessed are they who continually make backups and copies.

Furthermore, the sheer efforts involved in the long-term digital conservation, or even restoration, of the amount of data saved until now by far exceeds the budgetary means at the disposal of museums and archives. A further decisive risk factor for the long-term conservation of digital data is rapid system change, which is connected to the need for increased storage capacity: within a very few years the playback devices and/or the requisite operating systems are no longer available.

A further factor is that the sheer masses and diversity of digital data demands constant care and administration over many generations and changing regimes, as well as the highest degree of trust with respect to quality and the absolute independence of the administrators – a requirement, that in view of our most recent historical experience, we can by no means look forward to with much optimism. By contrast, and in accordance with contemporary trends and the advocacy of powerful lobbyists, increasing digitization of cultural heritage is being demanded. At the level of the European Union (EU), for years now significantly more funds are available for research projects in this area than for research and measures to conserve the originals. And while UNESCO has surrendered what it deems as the cultural heritage of humankind to unfettered commercial exploitation by the respective owner countries, it demands the comprehensive digitization of cultural memory worldwide, including in countries in which the originals have neither been properly registered nor are they protected. Here, too, the question must be raised on a global scale as to which bodies in the respective countries and under the respective regimes should decide on the selection, worthiness of digital preservation, treatment, research, and accessibility of the *memoria* that are to be comprehensively digitized.

Collection and Conservation

Evidently, a paradigm shift has also occurred in the practice and theory of art collection and conservation which continues to present unsolved problems to curators, collectors, art historians, and conservators. Whereas the traditional tools were still the responsibility and in the hands of the artists, and subsequently the conservator, the digital tools for production and presentation are subject to an ever more rapid succession of technical changes in the hardware and licensing of new software versions that are frequently incompatible with the original version.

New conditions of production have always led to new approaches and, necessarily, also to a review of traditional conceptions of a work. This is why, for the last hundred years we have moved away from a work conception that eulogizes the genius of the individual artist and the unique originality of the

work. At the same time, numerous works have won recognition and found their way into collections which, in terms of their materiality, have had a short shelf life factored in from the outset. In the case of digital artworks, one continues to assume that the immateriality inherent in the programming which is anchored in the source code (see glossary, p. 602) guarantees their eternal survival. What is more, one has evidently completely accepted the notion of works with a performative character and multiple identities, which result from the respective staging.

Yet all these postulates have not liberated the collector or the curator from their desire and their dilemma to preserve these works in an identifiable form and to present them time and again. Thus, what is the significance and what are the consequences when, in the case of digital artworks, we must reckon with a shelf life of less than ten years?

It is not the digital artworks themselves that age more rapidly, as is often maintained, because their real “substance” lies in the digital code, which cannot age. The problems consist in the hardware and software required for maintenance and presentation, the operating systems, the specific applications, the requisite knowledge of the programs and, frequently enough, the financial means for their reactivation, which are no longer available after a few years. What this means for digital media art is that the faster the technical developments, the shorter the work’s half-life.

The Practice of Conservation

It is essential to evaluate theoretical precepts in the light of actual practice, and to examine the reasons underlying the respective practices. Here, it must be admitted that institutions like the Tate Modern in London, the San Francisco Museum of Modern Art (SFMOMA), the Nam June Paik Art Center in South Korea, Le Centre Pompidou in Paris, as well as the ZKM | Karlsruhe are not miracle-workers and, in spite of best efforts, have not succeeded in applying the ambitious aims of traditional conservation practices to digital art. This has many and diverse interrelated causes:

1. Evidently, the criteria for the specific work character, as well as the durability and the assured intrinsic value of traditional works of art that obtained up until now cannot be applied to digital art. The result of this is a palpable ambivalence in evaluating digital art which has negative implications for its conservation.
2. In line with the economy of attention and the usual evaluation of exhibitions and museums in terms of the number of visitors, over the last ten years priority has often been given to a large number of exhibitions that follow in rapid succession, which mean there is considerably less time and funds for conservation measures. What remains in store is not visible, and therefore due to limited financial resources and further anticipated cutbacks no financial resources need to be used for these works. As a result, works in poor

condition are often put in store, and later, when they come to be exhibited again, important information and knowledge relating to their restoration has already been lost.

3. Frequently, precise documentation was lacking when the artwork was acquired. The rapid transaction of purchasing a technical work often contrasts strongly with the lengthy testing of the content and technical quality that are necessary. Additionally, the artists are often not willing, or not in a position to supply precise and comprehensive documentation including the source code; often they are not even requested to do so.

4. The general overestimation in the 1990s of how durable digital technologies are together with the simultaneous rapid progress of technical obsolescence has resulted in a massive backlog of badly conserved digital artworks and works that have not been conserved at all. Often it is only when the works are to be presented again that data loss and incompatibility with current hardware and software are discovered. Many works have already been lost, and many others can only be reconstructed with considerable expenditure and the efforts of specialist personnel.

The following questions and findings result from this structural evaluation of conservation practice: in view of the extreme technical difficulties in a situation of increasing financial shortfall, are museums and collections at all capable of maintaining the prevailing high standards, also in the conservation of digital art? Can they be expected to do so in this situation? Hence, is it possible to secure the intrinsic value of a collection? If these urgent issues can only be resolved by saving a number of prioritized works, which criteria and preferences should decide on preserving these works and the consignment to oblivion of the others? The degradation of digital artworks is so rapid that we do not even have enough time to carry out such an evaluation.

Developing solutions for the preservation of digital media art lies in the question of the material in relation to the ideal substance of the work of art: in the first case, namely, cleaving to the material substance of the work of art, desperate pragmatic repairs and the limited stocks of meanwhile obsolete technical equipment very soon reaches its limits. And yet this approach, for as long as we dare implement it, is no less promising than replacing the sculptures of Strasbourg Cathedral with real sandstone instead of with artifacts made of fiber concrete or synthetic material.

The second approach lies in recognizing the irrevocable and short-term material transience of a digital work of art which is considered immaterial and thus adaptable to technical systems that are the equivalents of its original staging. However, by giving up the materiality, namely, the presentation of a work with specific, historically determined technology, we sacrifice the historical anchor to which it is indebted for its social and cultural context. The ambiguity of the provocative thesis that is the title of our first symposium would then tip over into unequivocal oblivion due to the obsolescence of the digital.

Digital art is by no means without substance. Irrespective of whether we seek the essence of digital art in a concept and its implementation in immaterial digital code, or whether we hold fast to the historical materiality of the devices that produced and presented it, the ethical question nevertheless remains of how we can meet our responsibility – even in a situation of dwindling resources – to pass on our cultural heritage; a responsibility that every generation must confront.

Focusing once again on the horizon of cultural heritage, the question may arise at this point as to why, for centuries, we have bothered to preserve the materiality and historical form of, for example, the facade of Strasbourg Cathedral. With considerably less effort, we could just exhibit the architectural plans of the cathedral, though presumably this would attract far fewer entrance fee-paying tourists. When today, due to financial and personnel restrictions, we are obliged to make decisions about which works ought to survive, we have to ask: why conserve Strasbourg Cathedral, the Pantheon in Rome, the Pyramids of Giza, and why Heidelberg Castle – and why not the digital cultural heritage of our times?

Is the cultural legacy of our times to be any less respected than that of earlier generations? Or are we to wait until masses of works have disappeared and there remain just a few – most likely due to chance than selection – that we can then hand down to future generations as testimony of our times?

Translated from the German by Justin Morris

Historical Time and Uchronic Time: A Different Way of Conceiving of Memory and Forgetting

Edmond Couchot

The conservation of digital art and digital culture in general poses one of the most complex problems human societies have ever had to solve. In fact, it involves not only maintaining in good condition the things that artists make, making them widely accessible, bringing them onto the art market, or setting new selection criteria, but also helping to define a new culture of which the field of art is only a part. From the various factors that have determined the way in which that culture has emerged, I have selected our relationship with time, whose role proves decisive in so far as it concerns the organization of memory and forgetting, a process that any society has to deal with.

Historical time

Until recently our relationship with time was based on a consensus that history came into existence with writing. Its function was to record the events experienced by a society that were deemed worthy of being remembered. However, we should also note that when writing was invented, over five thousand years ago, it was not used to record the memorable events lived through by a community, but to improve the methods used by the great religious centers to administer their landed property. Writing was not yet the handmaid of History, but a tool in the service of commerce and religion. It was only very slowly that it became the means of “fixing” certain events by means of graphic systems. Thanks to the durability of writing, history rendered the past relatively stable, and at the same time created temporal continuity between what was, what is, and what will be. It was, therefore, not only the wealth of states that was managed by History, but also the very meaning of such events, and the direction and development of the strand that connected past and future.

History is a decisive social component of the kind of time that Émile Benveniste called “chronic time,”¹ time that is firmly anchored in the world’s physical time, that of the stars, seasons and days, by a multiplicity of reference points, including calendars, rituals, and the major events that mark the life of societies and give them shape and form. With the advent of History, these reference points ceased to be passed down orally and were instead permanently fixed in writing. Writing determines what is to be forgotten and

1 Émile Benveniste, *Problèmes de linguistique générale*, vol. 2, Gallimard, Paris, 1974, p. 72.

what is to endure in human memory. Since control of chronic time is as decisive as control of space, it has always been an issue for religious and political authorities. It was only very much later that the writing of History attempted to detach itself (not without difficulty) from all forms of power, and became a scholarly discipline. But History does not consist solely of the discipline of History.

Although they have added considerably to the sum of events produced by society and have made increasingly difficult the selective management of History, techniques for recording and transmitting images and sound have not fundamentally altered our relationship with time. Digital technologies, on the other hand, are in the process of profoundly transforming it.

Uchronic Time

To understand how digital technologies are changing our relationship with time, it is important to ask how they differ from traditional technologies. The most fundamental of these differences is the fact that in most cases, they offer the user the possibility of experiencing virtual events that can be repeated any number of times, possibly in a different way each time that a chosen device is operated. In this way, the user – or more precisely, the “interactor” – can influence the scenario (a series of still or moving images, perhaps in association with text, sounds or music) and can restart it at will, within the limits prescribed by the program, and play it again as often as desired. These events have the specific character of being located outside any passage of time. They take place in a sort of parallel time, or time-outside-time, a virtual time like the virtual space with which they are associated. I call this time “uchronic.” They are no longer “events” or accomplished “facts” belonging to the past and irreversible, but possible events amongst other possibilities, sometimes even improbabilities. They are “eventualities;” that is, simulations of events that may or may not happen.

It is under these conditions that we acquire the habit of “resetting,”² of returning to zero the chain of possible events and data and to live in the insulated bubble of uchronic time. These temporal experiences have different, even opposite, effects on our perception of time. They create a feeling of power, of control over time. Everything takes place as though an inexhaustible supply of time were now at our disposal.

However, the same experiences may also induce a kind of intoxication, caused by the possibility of restarting the virtual scenario ad infinitum while not being exposed to any sort of risk – in other words, with none of the consequences of reality – because we are protected from physical time and its inevitable constraints. This intoxication with the extremes of time, the source of a new type of pleasure that is specific to the digital age, goes hand in hand

2 In “computer” English: to restart a program, reinitialize, reboot.

with a kind of giddiness that is hard to control. And the multiplicity of possibilities offered by the scenario, far from helping us to make decisions, tends on the contrary to make decisions impossible because every bad choice can be cancelled – “reset” – and the interactor lacks any engagement with the virtual world.

One of the specificities of uchronic time is that it breaks the continuity between past, present, and future. It thus creates for itself a “habitus”, or manner of perceiving time that privileges the present moment over the past and the future. The Internet contributes very powerfully to developing this habitus and propagating it. Studies of the Internet³ have shown that users seem to be locked in a temporality that is the prisoner of the present. A simple “click” is all one needs to carry out instantly an action that in the real world would have taken several operations and much more time. In many cases, the Internet user’s time is reduced in an almost obsessional way to the “present moment,” the “now,” and the “here” – the screen.

This persistent present seems to have the characteristic of releasing itself from space, movement, and the causal succession of mental states involved in an action, and of abolishing “before” and “after” by compressing them to zero. This appears to damage the usual subjective construction of duration, causing the user to lose the ability to represent change, and to be constantly obsessed with saving time, so that before and after form a single time, condensed into a permanent present, while at the same time making the user unaware of time-limits and preventing either anticipating or projecting the self into the future. Some people experience psychological conflict between the perception and representation of time induced by the Internet, and objective time, which is connected with space and the characteristic motion of the modern world.

One may object that the Internet has not made us all ill, and that it offers new and extraordinary possibilities for communication. Nevertheless, some people’s pathological behavior reveals tendencies that are inherent in the changes the Internet has brought about in our relationship with time. Another significant effect of uchronic time is to alter the pace of our lives by imposing on them an increasingly fast tempo. All social activity, whether political or economic, or ordinary, everyday phenomena like work, information, leisure, or culture, tends to take place in a state of feverish, constantly increasing impatience that tolerates no form of mediation or delay, an effect that also has consequences for the way we appreciate works of art.

3 See especially Luc Bonneville’s article from 2001: “Temporalité et Internet: réflexion sur la psychologie du temps à la lumière des pratiques domiciliaires,” in: *COMMPosite*, vol. 5, no. 1, 2001, pp. 78–94; online: <http://commposite.org/index.php/revue/article/view/83>. Although this study investigates domestic use of the Internet, in “everyday” time, its conclusions nevertheless throw light more generally on tendencies in how it is used.

From the Actual to the Potential

The slippage of the actual towards the potential is also changing the interactor's relationship with the forms of narration offered by digital devices. Linear narration of events which took place in the past and have been imported into the present by the process of writing is being replaced by (or combined with) the branching narration of hypertext and hypermedia. They have the specific power to create events and sequences of events from the moment they are expressed. While some information, recorded in digital memories, may preexist, hypertext and hypermedia do not refer to the past. They *recall* nothing, they *recount* nothing, they *relate* nothing, and more generally, they *represent* nothing. They *present* for the first time, among innumerable possibilities, the things they offer us to read, see, or listen to. And perhaps even do so for the last time, since it may happen, in the course of further navigation, that a reader does not find the same text again, a viewer the same images, or a listener the same sounds: everything depends on the architecture of the programs and on what the interactors do.

With the substitution of the potential for the actual, our relationship to history as the "story of memorable events" changes. Writing, which until now had guaranteed the permanence of history, conforms with the model of hypertext and divides into innumerable branches. The thread connecting past, present, and future, held out by history like a guide rope, is broken by uchronic time. The "settling" processes which filter out what will be remembered by society and what forgotten cease to function in the usual way. The past ceases to provide history with events to which history will give meaning. It becomes a network of possibilities whose meaning will emerge at some future time. Everyone can reconstruct history according to their own ideas and offer their personal version of it: several websites already invite users to do this, with reference to this or that past or present event.

In the picture I have just drawn of the effects of digital technologies on our relationship with time, I have merely tried to emphasize some tendencies whose future development, however, is not set in stone. It is nevertheless worrying that, when we pair up with digital machines, we fluctuate between two conflicting temporalities in which the articulation of present, past, and future no longer follows traditional rules. We are torn between Historical time and uchronic time: between a logic of the actual and a logic of the potential. The problem is then not to play off one against the other, but rather to master the coexistence of these opposing temporalities and to negotiate them; in short, to reinvent our relationship with time.

How might this look in concrete terms when applied to the conservation of digital works of art? One way of negotiating historical time and uchronic time could be, for example, to take the way organic memory works as a model. Our remembering brain does not work by looking for the event we want to recall at a specific address (memory is not localized), but recreates it by

activating the neuronal areas that took part in and experienced the event. Organic memory is an act of living re-creation – fundamentally different to that of a hard disk – which means that a memory hardly ever presents itself to the mind in exactly the same way twice.

The way in which we have preserved works of art up to now is closer to the hard disk memory than organic memory, for that method is suited to their physical form and fixed identity. It would therefore make sense to leave the hard disk, or dead memory behind, and turn instead to living memory, to borrow an image from digital technologies. This method already exists in other cultures, and we could take these as our inspiration. In the West, architects still rely on the hardness of stone to guarantee that their buildings will last. When parts of them age, they are replaced by new ones, but only in exceptional cases is the whole structure rebuilt. In Japan, on the other hand, the entire structure of monuments and buildings is gradually replaced; memory does not reside in the material (being of wood, they are by nature perishable) but in the design. Thousand-year-old temples have thus retained their original form, but contain no original material.

This method could probably be applied to many interactive devices, both in the field of art and outside it, since interactivity is one of the most characteristic and widespread features of digital technologies. Yet it is important to remember that these devices have aesthetic reality and meaning only in so far as they are activated by users. They have to “function”. That being so, we would not be able to replace the creative experience of interactive dialog with a filmed recording – to do so would return the work to the category of the hard disk or dead memory. But I agree that this procedure would not be without its difficulties. The device or artwork would first have to be described in an appropriate algorithmic language independent of the equipment and its obsolescence – a crucial problem faced by all IT applications and one that has been the subject of advanced research. Furthermore, some works, including those produced collaboratively online that are more like performances, could not be preserved. Here we should remember that the same was true of all the performing arts before the development of mechanical, optical, and electronic technologies: nothing survives of Mozart but his written scores, or of the works painted by Apelles of Kos apart from what Pliny the Elder and Quintilian wrote about them. What does change, however, is the way this transience is accommodated. How are we now to capture the transient and transfer it in living form?

In this necessarily limited essay I have tried to do no more than grasp the most far-reaching and characteristic changes that digital technologies are bringing about in our relationship with time. I have described a possible means of preserving certain works. Yet the cultural consequences of these

changes go far beyond the issue of preservation. Their effects are felt in every domain of art: in the creation, circulation, and reception of works; in criticism, aesthetics, history and philosophy of art, museology, and education; in the economy, in the role of political and administrative institutions, and even beyond that, in the culture as a whole, and the relationship between human and machine. The question of conservation, therefore, cannot be resolved unless it is broadened and seen in relation to all these questions.

Translated from the French by Imogen Forster

An (An-)Archive. The Abolition of the Present and the Archive of the Future

Siegfried Zielinski

In the winter of 1975/1976 the author and editor Michael Krüger penned a remarkable text. It was also published in its original form, in longhand. In the text, Krüger expressed his surprise about the curious rise of archaeology in Germany. The attraction exerted by things archaeological at that time, according to Krüger, was obviously linked to gross ignorance about the present, especially the political present in Germany. Therefore, archaeological thinking and thinking about the present contradicted each other.

This is quite strange because at the time when Krüger produced his pamphlet, Rainer Werner Fassbinder's feature film *Welt am Draht* [World on a Wire], originally made for television, was screened in cinemas for a brief period. This brilliant techno-aesthetic critique of the present in the form of a science fiction film was first aired in 1973. The problem was that hardly anyone wanted to see this powerful film, which is based on Daniel F. Galouye's novel *Simulacron-3* (1964), and the few who did watch it failed to understand it at the time. Fassbinder's critique of a present that is ruled by technology-based constraints, his indictment of the implementation of cybernetics as a constitutive social form is superbly expressed in his melodrama. This was followed by the cold "German Autumn," a set of events in late 1977 associated with operations of the militant Red Army Faction group, after which things began to change, including in art.

Michael Krüger operates primarily within literary discourse. The mid-1970s was a period in the fine arts when many art critics, curators, and professional custodians of art urged museums to take the present more seriously and the past less. In this connection, a re-reading of the forty-three contributions to the discussion on the future of the museum published in the DuMont aktuell series in 1970 proves highly instructive.¹ As Wieland Schmied puts it in his contribution: "The museum's mandate is not only retrospection, it is also the present, and thus implicitly the future."² In due course I shall return to the intimate connection between these three temporal modi, which also play a role in Edmond Couchot's contribution (see this volume, pp. 85–90), because I consider this one of the central issues of our theme. A mere ten years after the publication of the Michael Krüger's text, in the mid-1980s,

1 See Gerhard Bott (ed.), *Das Museum der Zukunft. 43 Beiträge zur Diskussion über die Zukunft des Museums*, DuMont aktuell series, DuMont Schauberg, Cologne, 1970.

2 Wieland Schmied, "Der Auftrag lautet Gegenwart. Gedanken zu einem erweiterten Museum," in: Bott 1970, pp. 248–255.

critical theorist and filmmaker Alexander Kluge deplored the grievous loss of historical awareness. While his film *Der Angriff der Gegenwart auf die übrige Zeit* [The Assault of the Present on the Rest of Time] (1985) was one of Kluge's last major cinematic treatises on cinema; it was essentially as much a critique of ideology as a critique of technology. Kluge criticized that the present was getting ever "fatter" as a result of time continually being speeded up and shaped right down to the microscopic level. In view of two possibly paradoxical, but doubtless interlocking processes, society was increasingly running out of time: with digitization, on the one hand time had become more abstract, and its value less tangible. On the other hand, time had not only become a commodity, but a general equivalent in the global economy. It had evolved into a quality no longer susceptible to experience which one was obliged to take into account.

Today, more than twenty-five years after the release of Kluge's film, there is again lamentation about the spread of a flat awareness of time, or even about the amnesia that goes hand in hand with the development of rapid tele-matic technologies. At the same time, the archaeological approach is once again a hugely popular cultural phenomenon – not only in Germany. It spawns popular journals, serves television programs, and the designers increase exponentially who co-opt the worlds of images and the signs of former centuries as effects of truth, as effects of experience and sensuality for the striking design of the present moment. Never before have there been so many junk and antique markets. Old Masters once again fetch astronomical prices at international auctions. The machines that process cast-offs and trash into something precious rotate rapidly. In short, "history is sexy." The same applies to scholars and scientists, but from a particular perspective to which I shall return later.

Archaeology has long been used as a metaphor and meta-method in many fields of cultural studies and the natural sciences, including media theory and research. The utopian potential latent in the present is all the more attractive the less the present is in a position to generate it in the here and now. And artists are joining in, too: *Spuren. Eine Archäologie der realen Existenz* [Traces. An Archaeology of Real Existence], for example, is the title of a book by Berlin filmmaker and writer Thomas Heise published in 2010.³ The immediate working environments from which artists and scientists draw their resources become archival resources. Further, archaeologies have been developed of the computer and of algorithmic artifacts,⁴ and some people even believe that it would be meaningful to start writing archaeologies of media archaeologies.

3 Thomas Heise, *Spuren. Eine Archäologie der realen Existenz*, texts on the documentary film, vol. 13, Vorwerk 8, Berlin, 2010.

4 See the outstanding contributions by David Link in Volumes 1, 2, 4, and 5 of the series *Variantology – On Deep Time Relations of Arts, Sciences and Technologies*, Verlag der Buchhandlung Walther König, Cologne, 2005–2011.

Both propagate side by side and intertwined with one another: the fear of forgetting the past and the outright celebration of it. Both are strongly represented – a vertical movement into deep time strata as well as the experience of culture as a “flat time culture” with a horizontal movement with all its slipperiness, to which philosophers of *posthistoire* have at least contributed. Dancing on plateaus has to be learned; when there are thousands, one needs an anchor in the vertical otherwise it is easy to slip and spin out of control.

The Berlin philosopher Dietmar Kamper, who died in 2001, expressed it somewhat differently: what we would need to learn is to make our departure from the cross that is constructed from a vertical and a horizontal. The dynamic leave-taking and liberation from this structure, which has so deeply influenced Western Christian culture, is something that needs to be tried out repeatedly. We practice this departure by looking very closely at and attempting to understand present events. Here, I do this in the form of theses, constructing just a small framework to which I can hold onto for the purposes of establishing more fundamental postulates or, put more diplomatically, to express my hopes with regard to the project currently under debate.

1.

For anyone who has to do with the past professionally, anxiety about oblivion is a nonsensical attitude. For the most part, this anxiety in any case reveals itself to be anxiety about being forgotten oneself. From Hinderk M. Emrich, Detlef B. Linke, and other neurobiologists and psychiatrists I have gathered that it is the dialectics of remembering and forgetting which generates that active arsenal we require for forward thinking, but also for thinking about history. We ought rather to be concerned about not remembering the wrong things, or remembering falsely, where attention is shifted to the object and the methods of memory. What has anyway been elevated, canonized, and described does not require our special attention yet again. I focus my energies on that which falls through the gaps in the grid of established historiography and obvious canonization. It is this practice I designate as an-archaeology. In Greek, *archein* (ἀρχεῖν) means to be the first, to lead; *archos* not only means beginning, but also one who leads, the leader. Thus, archaeology, not only involves the search for origins, but also the claim of desiring to be the first to govern a process. The archive is an instrument of *gouvernementalité*. By being inaugurated into language it administers rules. It was Michel Foucault who introduced this historico-political connection.

The difference from an artistic point of view is familiar to us by way of two exhibitions on the history of video art in Germany developed at the ZKM | Center for Art and Media Karlsruhe.⁵ It required two opposing – and in the

⁵ See *40jahrevideokunst.de – Teil 1*, ZKM | Karlsruhe, March 25–May 21, 2006; *RECORD > AGAIN! 40yearsvideoart.de – Part 2*, ZKM | Karlsruhe, July 18–September 6, 2009.

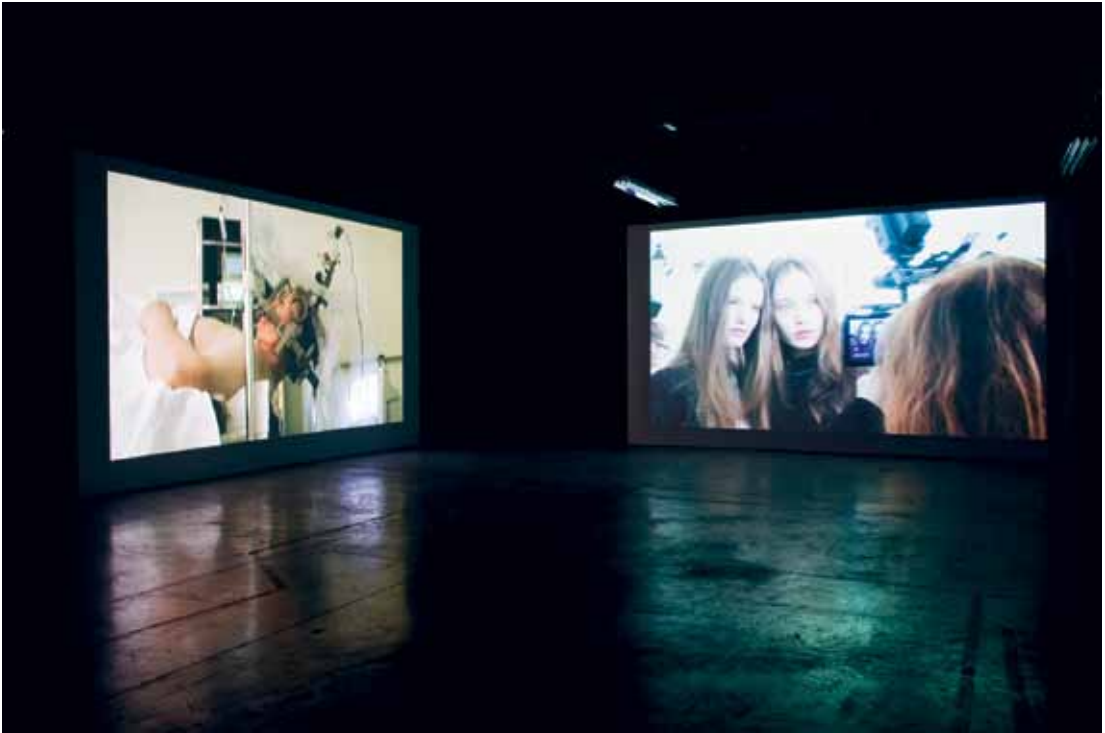
future will probably need more – alternative approaches to be able to write and exhibit the idea of a history of video art in Germany. The first part of the exhibition presented a collection of works that are self-evident, which are to be expected provided one is familiar with the most important actors in video art of the past decades. In the second part of the exhibition, that which had hitherto been pushed out to the periphery, had been consigned to oblivion, was shifted to the center of attention; further, it also factored in that a substantial part of the material was in especially poor condition and quite literally had to be rescued. On this basis we conclude that we cannot in every instance develop alternative models for each single theme, and thus it is all the more important to think precisely about what it is we wish to remember, and with what means we achieve this.

2.

In my opinion, there have been more biographies and memories in the age of the technologies of forgetting than at any time before. At present, the future is planned immediately as that which one will remember or should remember: in other words, as binding. Young artists in their twenties, seduced by business-minded gallerists into preparing large-scale solo shows, write down in a few lines what they call their life; in essence, this appears to consist of their studies and a number of other exhibitions. However, there is one particularly strange phenomenon which, by modifying the name of an Ampex machine of 1967 called *Instant Replay* and continuing Vilém Flusser's reflections on video philosophy, one could call "instant archaeology," *archéologie instantanée*.⁶

What I am referring to with the term "instant archaeology" has not only become a part of our everyday experience, it has also already been explored artistically in superb ways – amongst others by Turkish video artist Ali Kazma. It has to do with having something that has just occurred at one's immediate disposal and being able to present it as objectified memory. Artifacts that were developed towards the end of the 1980s for professional elites, for example, in sport or for specific work processes, are now cultural technology that is installed en masse. This phenomenon is most conspicuous in the case of digital photography. Due to the extremely short time span between recording and playback, everyone can see what they looked like only a few seconds ago, and they can then put on a facial expression to be forearmed for the next shot. Young people practice this cultural technique of real-time archaeology, instant archaeology, to the point of excess, which approximates to prospective archaeology. YouTube and other social network platforms are their crowded playgrounds, their "apposite media."

6 Annika Kuhlmann is currently working on this thematic complex in her graduation thesis with the title *Instant Nostalgia* at the Berlin University of the Arts.



Ali Kazma
Obstructions
 2005–2010
 Video installation
 © Ali Kazma
 and Marc Damage

In his film *Content* (2010), British director Chris Petit gives a magnificent *mise-en-scène* of the sensitivities of people who, twenty years after the establishment of the Internet, are in search of a dialog with a fictive interlocutor every day. At first glance, the film is apparently still driven by the idea that camera and car are two devices deriving from the same *dispositif* context. On the other hand, the film remains entirely inside a private, intimate living space; indeed, even inside a telematic communications device. In this sense, *Content* is at once a road and home movie. I cite a short sequence in which young people say the following:

“Just once, for one day in my life, I would like to feel that I and everyone speaking to me were talking complete sense.”

“I would like to fall in love before it’s too late, don’t care who with.”

“I would like a feeling of assignation to life, not sitting here calculating how many fucks I have got left. The middle ground is hardly there anymore.”

The “middle ground,” in a temporal perspective this is the present. Petit’s young characters, who utter such words, move around in front of the camera, which in the passage quoted above from *Content*, is a simulated webcam, as

though they are in a strange hall of mirrors where they constantly meet someone who wants to snap their picture. They present themselves for total visibility while at the same time trying to hide within it: under the brims of hats, behind hair falling over their eyes, behind huge glasses, under hoods, or by turning their heads to present their in semi-profile to the camera. We are familiar with such half-hearted games of hide-and-seek – under historically very different circumstances – in the existentialist shadowy figures inhabiting John Cassavetes' early films, such as *Shadows* (1959) and *Faces* (1968). "Technologies of the self" is what Michel Foucault called such regimented identity exercises. Andy Warhol's Factory in New York, for example, was the ideal laboratory for developing attitudes and poses of this kind.

However, the question is whether what I have described as instant archaeology is actually a kind and form of remembrance at all, or whether it is rather a slight extension of the moment into the past. Yet to be already the subject of a past topic in the instant that something takes place amounts to abolishing the Now as a possible extension, as an event. The present becomes a minimal, no longer quantifiable amount of time. The extreme shortening of storage times has not led to the past being consigned to oblivion, but rather the present. In contrast, future and past are now joined together directly. And it is this which I consider to be the greatest challenge with respect to the major theme of the archive.

The immediacy of recording together with its availability not only challenges the conventional ideas of biography and history, but cuts to the core of the idea of a future archive, as well of the media- and time-based arts. Is not the main interest of many who wish to optimize and speed up the processes of archiving to make future productions more effective? Today, for example, editorial departments for audiovisual news have access as a rule to large databases and collections of digital moving images of past events, from which material can be retrieved by theme, name, date, or event. Every second counts and is precious. What has been common practice in music production for a long time is now to be delivered by optimizing the audiovisual archive: sampling as a cultural technology, which also includes the production of contemporary arts.

3.

Archives of the future no longer primarily serve the viewing and interpretation of the past, but are machines for generating the future – the radicalization of the idea from the 1970s that I cited above in connection with museums. The more that production itself is digital, the shorter is the distance between the time modi. Under the conditions obtaining in cinematography it often took several decades before a film found its way into one or the other private or public archive, and it took many more years until it was classified and indexed and thus finally archived. Today, a form of archiving has to be found

immediately after production so as to free up the hard disk for the next production as quickly as possible. The volume of material produced by digital cinematography is incomparably larger than with earlier forms of production. This is something I have witnessed time and again in my professional capacity at art academies. For Hans Weingartner's *Das weiße Rauschen* [The White Noise] (2001), for example, over forty hours of digital material was shot which was then edited into a format suitable for cinema. As in most cases there are several different versions of a film, the vexed question arises for an archive as to the so-called master copy (or, in the case of classic cinematography, that of the master negative). I will not elaborate on this aspect here except to note the fact that variants of master copies already existed in the age of classic cinematography, and in the digital age the numbers have vastly increased. Copies do not derive from a single source material, but as various generations of different draft versions.

However, the massive increase in storage capacity and falling prices for visual and audiovisual notations produces something else: there is no longer any lack of objectified past, but a spectacular glut. This is a core problem for the thematic field in which we are engaged today. We currently face an excess of processed and recorded material and are by no means suffering from a dearth of it. How is this superabundance to be organized? How is it to be structured? This is quite possibly the greatest challenge for future archives. As we know – at the latest since Bertolt Brecht – order is a sign of paucity, not superfluity. “Disorder is a source of hope,” wrote Harald Szeemann on a note which he hung up in his “Fabbrica,” the Factory, which served as his archive. Anyone who ventures into Peter Weibel’s office will be convinced of the profound truth of this sentence.

Montage in the cinema film arose because the filmmakers of early Russian cinema suffered from a spectacular lack of physical film stock. It was for this reason that Lev W. Kuleshov – portrayed here in a massively blown up and pixelated old photograph – had the idea of repeating the same shot and intercutting it with other images thereby churning out new semantic contexts. An important prerequisite for this was that each shot had to be significantly distinct from the others, so that semantic variations could be produced easily.

The digital world is not a world of montage. The classic (structuralist) tactic of modern times, the constant dismantling of assemblages and of recombining the elements is no longer effective in the world of superabundant images and sounds. It also makes increasingly less sense in view of an already thoroughly edited world. One important implicit aspect is that a shortage of material demands extreme precision in the preparation of filmic and artistic processes, and that films could be visually conceived, as it were, in the absence of celluloid, as in the wonderful example of Kuleshov’s film *Films without Films* from 1921.



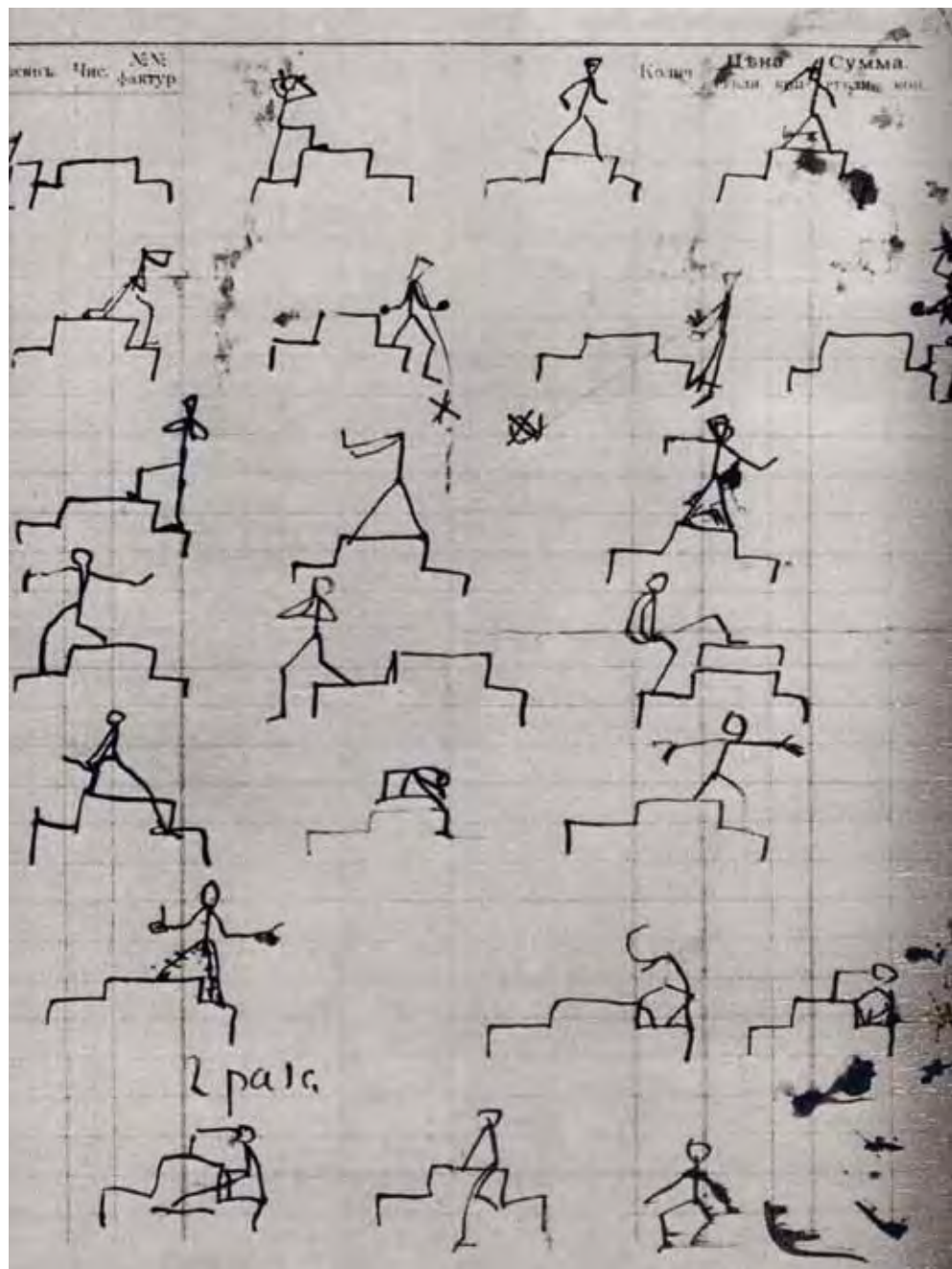
Lev W. Kuleschov
in: Jonas Mekas (ed.),
Film Culture (Vol. 44),
1967
© An-Archiv,
Siegfried Zielinski

In view of the hegemony of overflowing material, I am relying on the idea of successful discovery as an alternative to searching in vain. This is difficult to organize and only feasible when accompanied by the creation of a substantial degree of freedom. And this is precisely what our archives of the future must succeed in doing: to facilitate access to the overflowing wealth of the past so generously and in such a way that, when moving through the heterogeneous diversity, unexpected encounters can occur. Here one runs the risk of not necessarily always finding what one set out to find, but then chancing upon something entirely different which one would never have dared to ask for.

4.

We contrast the coquettish short-term memory from the culture-technological arsenal of the attention span economy with our research which is a *deep time* construct.⁷ Although it avails itself of technologies, dynamic databases,

⁷ See Siegfried Zielinski, *Deep Time of the Media. Toward an Archaeology of Hearing and Seeing by Technical Means*, The MIT Press, Cambridge (MA), 2006.



Lev W. Kuleschov
 action score for his movie *Films without Films*
 1921
 Drawing
 © An-Archiv, Siegfried Zielinski

for example,⁸ above all it has to be conceptually developed. It presents challenges to the concept which, as historians, we internalize, irrespective of affiliation to any particular provenance. At present, three dimensions are of especial importance to me in teaching and research. They run through the specific genealogies we construct like marker lines:

- The concept of history and therefore of the archives we are capable of constructing, should *not* have a *monolinear* focus. Their formulation should be rather *multilinear* or even dynamic, and follow models such as those of Manuel De Landa from Mexico and his *A Thousand Years of Nonlinear History* (first published in 1997)⁹ or the ideas familiar from chaos theory, like the Lorenz attractor and other abstractions dealing with temporal phenomenon.
- At the beginning of the third millennium of our calendar, concepts of history and the archive can *no longer be oriented along Eurocentric lines*, they must be *mondial*. I have learned a great deal from Édouard Glissant and his Caribbean creolism, as well as from other South American and Indian writers, about how to avoid falling into this trap.
- The most exciting and, for those of us interested in an-archives, the greatest challenge is what is currently being developed in American research under the rather presumptuous title “Big History.” It is an attempt to write a non-anthropocentric history, which reaches far beyond our perception of time and our powers of temporal imagination. It looks at all timescales and deals with billions of years. The concept integrates heterogeneous disciplines and discourses, such as astrophysics, geology, and the history of culture. Human civilization no longer constitutes the focus of this concept, but occupies a marginal role, like in paleontology. There is also an important differentiation within Big History as a field. David Christian, for example, works with a closed universe.¹⁰ Freeman J. Dyson’s open universe and his timescales are, by contrast, significantly more plausible for the intentions of a variantology of deep time relations.¹¹ Dyson’s timescales also facilitate the interpretation of cosmic planetary movements as communicative events. Thus, the concept of the archive necessarily entails cosmic dimensions.

8 Daniel Irrgang is currently working on such a platform for the telematic net, in the context of the research project *Variantology/Archaeology of the Media* at Berlin University of the Arts.

9 See Manuel De Landa, *A Thousand Years of Nonlinear History*, Zone Books, Brooklyn (NY), 2000.

10 See David Christian, *Maps of Time. An Introduction to Big History*, University of California Press, Berkeley (CA), 2004.

11 See Freeman J. Dyson, “Time Without End. Physics and Biology in an Open Universe”, in: *Reviews of Modern Physics*, vol. 51, no. 3, July 1979, pp. 447–460.

5.

Internationally, there are already a plethora of decentralized databases, decentralized collections of electro-based and digital works of art, as well as other works which have electronic components, or which exist in their original form only as an ephemeral temporal structure that was immediately processed digitally. There will and should continue to be decentralized collections. They serve entirely different purposes. These include Montevideo/Time Based Arts at the Netherlands Media Art Institute (NIMk) in Amsterdam, Videobrasil in São Paulo (Brazil), the Theremin Center in Moscow (Russia), the C³ Center for Culture & Communication Foundation in Budapest (Hungary), the imai – inter media art institute (Düsseldorf, Germany), the Institut für Medienarchäologie in Hainburg (Austria), and the _Vilém_Flusser_Archiv at the Berlin University of the Arts (Germany).

I propose that such institutions be called “an-archives.” By including the prefix familiar to us from other contexts, terminologically speaking we remove any claim to leadership. An-archives do not follow *gouvernementale* objectives. Beyond their own artistic or scientific practice, they pursue no aims of canonization. However, like the individual collections of scholars and artists designed for very specific applications, they are by no means arbitrary, but are instead, in the sense of the *quodlibet*, associated with all activities driven by passion. The intended uses undergo perpetual change. An-archives require a special flexibility and spectrum of variance. They are founded on certain performative intentions and, naturally, they should go down in history in a particular way. As a rule, they are connected with individual actors and are thus strongly personalized. Only Harald Szeemann himself was able to walk through his Fabbrica blindfold and generate something new from something discarded by the magical laying on of his hands. An-archives are also radical, individual collections aiming directly at artistic exploitation as, for example, The Noise Machine Tapes Archive of the musician and composer, Jan Stephan Werner, also well-known as member of the duo Mouse on Mars. His acoustic an-archive, which can meanwhile be accessed free of charge via the Internet, not only includes elements of his own compositions, but more especially a large heterogeneous collection of electronically generated music from the last few decades.

6.

In contrast – and this is a political project – we also need places where intellectual and technological endeavors are pooled and concentrated; places where one is conscious of the transient claim to leadership. I propose calling such an institution an archive, very much in the deeper sense of *arquivo(n)* as an official seat of the government, as “administrative building.” A living archive must constantly strive against this *dispositif* structure. The ZKM | Karlsruhe is on the way to becoming just such an archive.

In one of Christian Boltanski's installations in his *Les Suisses morts* [The Dead Swiss] series (1990) there is nobody. The archive of the past is conceivable as devoid of people. The archive of the future, however, will be far more thought- and personnel-intensive than those of the past and the present. It will be a research facility which is connected to the existing an-archives. Highly qualified scientists and technicians are required for the purposes of organizing this abundance. Economically and politically, such high-level archives in Europe are currently conceivable only in a centralized form.

We require a privileged "time space" in which the work of sorting, hierarchization, selection, contextualization, discarding, conservation, and restoration is developed intellectually and executed in an exemplary fashion; where work is ongoing on the theory and methods of collection no less than on continuing development of technical solutions. Such an archive would be a site of the variant-rich production of history as a profession that encompasses

- the ongoing debate on different concepts of history,
- the disclosure of their respective principles of construction,
- writing, which is still the best method of archiving and transmission,
- artistic production and its adaptation for the construction of history (as an-archaeological work).

Archivists-in-Residence-Programs or "Ars Memoriae Awards" would be good institutions for developing and cultivating such a culture.

7.

Finally, what should also be borne in mind is that precisely such an-archives of the future, especially when involving art, should be generated as artistic projects. An imaginary commission might be to construct superbly conceptualized collections and their presentation, which possess sufficient potential to resist monopolization and transformation by the archive's *dispositifs*.¹² There are a wealth of examples in contemporary art of the past fifty years for the creation of an-archives by artistic production itself.

Interestingly, in the art history of recent years an especially intimate connection can be observed between event art and the trend toward composed collections. With utmost meticulousness and discipline, George Maciunas' "Lernmaschinen" [Learning Machines]¹³ appear to aim at capturing the

12 Author's postscript in August 2011: Harald Szeemann's an-archive will become something fundamentally different when it is integrated into the archive and library machine of the Getty Centers, since the essential practical attributes of the Fabbrica cannot be converted into research terminology.

13 See the catalog on the exhibition *Maciunas' Learning Machines* in the art library of the Berlin State Museums, 2003: Astrit Schmidt-Burkhardt, *Maciunas' Learning Machines. From Art History to a Chronology of Fluxus*, exhib. cat., art library Berlin State Museums Berlin, Vice Versa, Berlin, 2003.

overflowing and chaotic wealth of past artistic events in diagrams, card indexes, maps, or large-scale overviews. Anything that refuses to be archived is given a grammatical structure retrospectively. The “Fluxkits” of 1960s Fluxus artists have in the meantime become coveted and wickedly expensive collectors’ objects. Objects by various artists were collected in small imitation leather cases with compartments. The containers have transmuted into mobile an-archives of art history.

A special challenge are the estates of artists who worked with generic, process-oriented methods, and whose efforts during their lifetimes were thus directed at making memory the central feature of their own activities. Dieter Roth was such a melancholic. His oeuvre is permeated with compulsive collecting and a mania for order. The carpets, in part produced in collaboration with Ingrid Wiener and Valie Export, should be understood quite literally as storage spaces for interwoven thoughts, ideas, and dreams. Many of his emergent objects made of foodstuffs or other biological material were grouped into an-archives of molds. The video diaries are played on numerous recorders and monitors positioned on storage racks, as if offering themselves as an arsenal for future productions. Roth collected documents, copies, notes, photographs and other discarded material in hundreds of Leitz files.

Was geschah wirklich zwischen den Bildern? [What really happened between the images? – original English title: *Film before Film*] – was the title Werner Nekes gave to his first film in the series “Media Magica,” in 1985. A question and an obsessive answer to it: for almost half a century Nekes has been tracking down and collecting artifacts, books, manuscripts, and all manner of objects which might offer an approach to various genealogies of the technical image, however marginal any such access might be. The films of the “Media Magica” series are only the most obvious expressions of this an-archive, the most complex one I know. In the basement of an old garage in Mühlheim – with the water of the Ruhr very close by – Nekes edits his endless film on researching the origins and development of motion and time-based images in ever new configurations and varied combinations – for a good ten years now, to a considerable extent also in museums all over the world, thus the accumulated treasures are no longer as opaque as they were in the past. I fear that one day this overflowing an-archive will also be dismantled into its component parts, and those that are suitable for canonization will be integrated into various archives, from Tokyo to Los Angeles. An institution that is in a position to care for the cohesion of this unique whole does not yet exist.

One of the most outstanding archival projects is Jean-Luc Godard’s *Histoire(s) du cinéma*. He developed this project in a number of sketches from the 1970s, before realizing it between 1988 and 1998. His designs prepared both him and us for what he set out to do with this very idiosyncratic an-archive, namely, to write a history of cinema and film composed from the material of its objects.



Jean-Luc Godard
Histoire(s) du Cinéma
 1970s
 Storyboard
 © An-Archiv, Siegfried Zielinski

The *Histoire(s) du cinéma* offer at least two contrasting phenomenologies with entirely different perceptual and interpretive propositions. As a unique event within the continual “flows of broadcasting,” they are quite literally an attack. They carry the everyday, frenetically organized output of sounds and images to extremes: the confrontation with the tremendously accelerated and multi-layered film history leaves us in a daze. At a rough estimate, the first two parts of about one hundred minutes supply our retina with a total of 130,000 to 150,000 images. Presented and perceived in a uniquely ephemeral mode, the *Histoire(s)* appear like an illustration of a sentence in Godard’s film *Le gai savoir* [english title: *Joy of Learning* ; a reference to Nietzsche’s *The Gay Science* / *voir* = seeing / *savoir* = knowledge] of 1968, his first major film-essayistic discourse on the history of images, which functions like a leitmotif: “If you want to see the world, close your eyes!”

Naturally, someone whose profession and calling is to produce and maintain moving illusions resists this. Image construction through image destruction appears paradoxical. But it is at this point that deconstruction commences. The filmmaker’s revolt, the attempt to create a form of effective an-archive in contradistinction to conventional canonizations, expresses itself above all when a literary process emerges from the frenetic event or uniquely organized cinema screening; when from the act of hectic perception an act of reading emerges that is no longer bound to the temporal course of flight, but which rather searches for its own tempi and progressions, perhaps even allowing the film to stop. This is only possible when this particular cinema and film history is available as recorded micro-archive.

Throughout his analysis with filmic means Jean-Luc Godard never tires of emphasizing that objective history is just as improbable as objective historiography. At the beginning, he dissects the word *histoire(s)* into three components – “HIS-TOI-RE(S)”. It is a rhythmic game, a challenge to us to think about how our history would look if we were to write it down or reconstruct it videographically.

8.

For the last twenty years, Californian artist Paul DeMarinis has been hinting at a process involving the artistic diffusion of the idea of an archive. At this point, research into the past immediately switches to generating new objects and processes. In his series of works entitled *The Edison Effect*, which Paul DeMarinis worked on principally from 1991 to 1996, exploring old recording technologies and their contexts suddenly turned into inventing various devices for the technical conservation of sounds and their reproduction. Each artifact with the Edison effect is at once the conservation and presentation of methods, concepts, and ideas for recording.

The researcher and artist David Link goes a good deal further. He practices something I call the special philology of precise things. His analytical



Die Zerlegung des Wortes "histoire" in die Bestandteile "his", "toi" und "re" mit ihren jeweils eigenen Bedeutungen ist nur die eine, oberflächliche Ebene des Spiels. Spannender: die Schrift wird zum Bild. Der semiotische Status der Buchstaben als symbolische Zeichen wird aufgehoben, die Grenzen zwischen den Zeichencharakteren werden fließend. Gleich erscheint ein zweites "toi", dann ein drittes; die Fragmente beginnen zu blinken, die Symbole erhalten Rhythmus, werden so auch zu musikalischem Material ...



Jean-Luc Godard
Histoire(s) du Cinéma
1989

Film still

© An-Archiv, Siegfried Zielinski

case studies could certainly be prolegomena for installations, which one would characterize as special experimental facilities of an-archival praxis.¹⁴ While searching for early examples of texts that were generated by a computer, David Link came upon the remarkable fact that with the “first industrially produced computer” from the Computer Department at the University of Manchester, the Ferranti Mark I, “texts of a genre” were generated “that are intended to express and arouse emotions.”¹⁵ During the course of his research, Link found the software developer Christopher Strachey’s original *Love Letters* program only to discover that the instructions for operating the Ferranti Mark 1 had only been rudimentarily documented. As it seemed impossible to study the *Love Letters* program during operation, Link constructed an emulator (see glossary, p. 600) of the Ferranti Mark I, built a replica of the user interface, and made it possible for the program to be successfully performed again today.

These are the lengths to which media technology can go when it is in the position to intervene in technological practice. The component of a complex machine from 1952 for communicating emotions has been wrested from *oblivion* in a maximum form. The program is running once again on the new setup devised by the research scientist and artist David Link. From this perspective, the history of science and technology is not only a collection of what has been. It becomes an aggregate for possible states in the past, it becomes the installation of what could have been and what, in the present, definitely and exactly is so.

Translated from the German by Justin Morris

14 See for more comprehensive information: Siegfried Zielinski, [*After the Media*] *News from the slowfading Twentieth Century*, Univocal Publishing, Minneapolis (MN), 2013.

15 The process is described in detail in: David Link, “There Must Be an Angel. On the Beginnings of the Arithmetics of Rays,” in: Siegfried Zielinski, David Link (eds.), *Variantology 2. On Deep Time Relations of Arts, Sciences and Technologies*, Verlag der Buchhandlung Walther König, Cologne, 2006, pp. 15–42.

Monument – Values – History. On the Theory and Relevance of Monument Conservation

Ingrid Scheurmann

Preliminary Remarks

The conference *The Digital Oblivion. Substance and Ethics in the Conservation of Computer-based Art* held at the ZKM | Center for Art and Media Karlsruhe was far from being an event on monument conservation. And yet with its reference to substance and ethics of conservation, to cultural memory and cultural heritage, as well as the attestation of longevity, authenticity, and originality as ostensibly established artistic values, the meeting engaged with quintessential themes of monument conservation; themes which over the course of postmodernity have been challenged – at least theoretically – as being the constitutive foundations of the subject. What it is precisely that constitutes the substance of a monument is being interrogated as well as the basis of its value; here, too, longevity and originality – not even the original building any longer – are considered as necessary or sufficient conditions for granting monument protection.¹ Stable systems of transmission, as apostrophized in the conference program, have been lost, and, since the conference in Nara in 1994, the concept of authenticity has also been adapted to cultural diversification.² The overarching issues of digital conservation are not unique to this genre, even though the time factor adds drama to the issues of preservation and evaluation, and their sheer numbers expands the potential quantity of heritage objects almost into infinity. Therefore, with reference to the concept of the conference, the question arises as to whether the traditional notion of heritage is applicable at all, and whether the values associated with it are capable of doing justice to the ephemeral, yet persistent substance of this art. What do the concepts original, uniqueness, identity, and substance mean with reference to virtuality and digital art, and what about memory and forgetting which are immanent to the concept of heritage?

1 Wilfried Lipp (ed.), *Denkmal – Werte – Gesellschaft. Zur Pluralität des Denkmalsbegriffs*, Campus, Frankfurt am Main, New York, 1993; W. Lipp and Michael Petzet (eds.), *Vom modernen zum postmodernen Denkmalkultus. Denkmalpflege am Ende des 20. Jahrhunderts*, 7. Jahrestagung der Bayerischen Denkmalpflege, Passau, October 14–16, 1993, Bayerisches Landesamt für Denkmalpflege, Munich, 1994.

2 UNESCO, ICCROM, ICOMOS, “Das Nara-Dokument zur Echtheit/Authentizität,” Nara, 1994, in: *Denkmalschutz. Texte zum Denkmalschutz und zur Denkmalpflege*, Schriftenreihe des Deutschen Nationalkomitees für Denkmalschutz, vol. 52, 4th edition, Bonn, 2007, pp. 233–235, available online at: www.skr.ch/de/grundlagen/konventionenchartas, accessed 06/25/2011.

Problematic Fields

With regard to the problematic fields of preservation and conservation outlined above, I shall first provide a brief overview of current theoretical discourse relating to historic monument preservation. Next, I shall take a closer look at one of the central values in the debate on monuments and heritage; namely, the value of the historical cultural evidence. Possibly this will lead to insights that are useful for protecting digital art.

A key point of contention relating to monument conservation that came to public attention in the late 1980s concerned whether reconstructions are admissible or not; recently apostrophized by Aleida Assmann as a novel cultural practice, this has to some extent rehabilitated it from the point of view of public history.³ This was preceded by a paradigm shift in society's relationship to its past: the future no longer served as a projection screen for change, but instead the past. History viewed in this sense was rendered correctable; the medium of architectural reconstructions offered the fortuitous opportunity of a second chance.⁴ Hence, the past offered an "inexhaustible resource for renewal and transformation"⁵ – for changes, one might add, that turn out to be historical constructions, and which, in principle, no longer have any need of genuine cultural remains from the past.

Incidentally, architecture not only contributes to this trend of correcting history by using reconstructions, but also by historicizing new buildings, one example being the Neumarkt in Dresden. Currently, it can be observed that great efforts are being undertaken to achieve architectural homogeneity and integrity wherein monuments and new buildings forfeit their differences and the original becomes less important to society. Theoretical reflections on this controversy pivot on historical materiality as opposed to pictorial urban repairs; at stake is authenticity, intellectual and ideal values, but also the issue of the perception of monuments; for example, the relationship of image and substance, of historical material and exhibition value, and of knowledge and sentimental value.⁶

What has been less rigorously discussed, but which is no less present as a further theoretical as well as practical problem, is the still unresolved relationship of monument conservation to the culture of particular, and thus popular, public history and the concomitant watering-down of established cultural values while at the same time the potential objects of monument protection

3 Aleida Assmann, "Rekonstruktion – Die zweite Chance, oder: Architektur aus dem Archiv," in: Winfried Nerdinger, Uta Hassler (eds.), *Geschichte der Rekonstruktion. Konstruktion der Geschichte*, Prestel Verlag, Munich, Berlin, London, New York, 2010, pp. 16–23, here p. 17.

4 Ibid., p. 23.

5 Ibid., p. 16.

6 See Hans-Rudolf Meier, Ingrid Scheurmann (eds.), *DENKmalWERTE. Beiträge zu Theorie und Aktualität der Denkmalpflege. Georg Mörsch zum 70. Geburtstag*, Deutscher Kunstverlag, Berlin, Munich, 2010.

To harmonize with the reconstructed Dresden Frauenkirche (completed in 2005), the Neumarkt was rebuilt based on the Baroque-style cityscape popularized by Canaletto's vedutes.
Photo © Ingrid Scheurmann, 2011



increase exponentially.⁷ This includes dealing with the often unwanted heritage of the twentieth century; from the traces and remains of dictatorships to serial and informal buildings.⁸ The question is whether the traditional historic monument values, which are based on a cultural achievement or a work, are at all applicable to traces, remains, and various other sites of remembrance. Or has the subject of monument protection – not only as a consequence of its institutions having dried up – literally reached its limits? Be that as it may, in the wake of current commercialization the mandate of monument protection has once again shifted to protecting the good and the beautiful, whereas, for the most part, engaging with the remains of more recent history has been left to the various remembrance and memorial sites. Thus, in the age of globalization the beautiful and the old is the responsibility of historic monument conservation, reinforcing the identity of inhabitants and for the pleasure of tourists. Cultural heritage that is uncomfortable is divorced from it and serves as a warning and as political education, programmatically directed at young people along the lines of the long-since redundant idea of a *historia magistra vitae*.

7 See Hans-Rudolf Meier, Marion Wohleben (eds.), *Bauten und Orte als Träger von Erinnerung. Die Erinnerungsdebatte und die Denkmalpflege*, vdf, Hochsch.-Verl. an der ETH Zurich, Zurich, 2000. See also Ingrid Scheurmann (ed.), *Erinnerung kartieren? Bauforschung in ehemaligen Konzentrationslagern*, Schriftenreihe des Masterstudiengangs Denkmalpflege und Stadtentwicklung, Dresden, 2012.

8 Norbert Huse, *Unbequeme Baudenkmale. Entsorgen? Schützen? Pflegen?*, Beck, München, 1997. See also Ingrid Scheurmann, "Mehr Substanz! – Bemerkungen zum Geschichtsbild der modernen Denkmalpflege, oder: Warum sind Baudenkmale unbequem?," in: Meier, Scheurmann, 2010, pp. 59–74.

After the bombing of Dresden on February 13, 1945, the ruins of the Frauenkirche were preserved as a war memorial during the period of the German Democratic Republic (GDR).

Photo © SLUB Dresden / Abt. Deutsche Fotothek
Photo: Walter Möbius, 1958



Contextualization

Type and selection of the objects to be preserved as historic monuments has only become the subject of critical theoretical enquiry since the introduction of a scholarly approach to historic monument protection around 1900. Prior to this date, the focus on large and national monuments was not controversial. However, not only has the question of the “how” with respect to preservation become a theme of expert conferences, but above all the question of the “what” and the “why.” After the wholesale destruction wrought in the twentieth century, in 1975 Willibald Sauerländer denounced the “expansion of the concept of a monument” and thus any extension of the objects to be protected.⁹ In 1988, Otto Borst cautioned of a museumization of the landscape,¹⁰ while Marianne Schuller criticized “monumentalization” in 1993.¹¹ “Remembrance madness” and the “bliss of the past” are among the keywords which Pierre Nora¹² and Hermann Lübbe¹³ subsequently used to summarize the societal turn to history and remembrance and which, according to David Lowenthal, triggered a process resulting in the growing gap between

9 Willibald Sauerländer, “Erweiterung des Denkmalbegriffs?,” in: *Deutsche Kunst- und Denkmalpflege*, vol. 1, no. 2, 1975, pp. 117–130, reprinted in: Lipp 1993, pp. 120–149.

10 Otto Borst, “Vom Nutzen und Nachteil der Denkmalpflege für das Leben,” in: *Die alte Stadt*, no. 15, 1988, pp. 1–22, reprinted in: Lipp 1993, pp. 85–119.

11 Marianne Schuller, “Bilder – Schriften zum Gedächtnis. Freud, Warburg, Benjamin. Eine Konstellation,” in: *Internationale Zeitschrift für Philosophie*, no. 1, 1993, pp. 73–95, here p. 73.

12 Pierre Nora, “Das Zeitalter des Gedenkens,” in: P. Nora (ed.), *Erinnerungsorte Frankreichs*, Beck, Munich, 2005, pp. 543–575.

13 Hermann Lübbe, as quoted in: Aleida Assmann, *Geschichte im Gedächtnis. Von der individuellen Erfahrung zur öffentlichen Inszenierung*, Beck, Munich, 2007, pp. 18f. See also A. Assmann, “Paradoxien des Denkmalschutzes,” in: *archithese: Unbequeme Denkmäler*, No. 1, 1994, pp. 8–11; and, *Im Zug der Zeit. Verkürzter Aufenthalt in der Gegenwart*, Berlin, Heidelberg, 1992.

“history” and “heritage”; the distinction between “history as scholarship” and “history as memory.”¹⁴

In a society where the pace is constantly accelerating, this process of the tendential disappearance of the present correlates with the conflation of past and present into a “synchronic space,” for which Hans Ulrich Gumbrecht recently coined the expression “backwards into the future”.¹⁵ The objects of this fixation on the past are also continuing to expand. In addition to classic monuments, there are now memorials and remembrance sites, historic theme parks, real and virtual historical reenactments plus – as mentioned above – historicizing architecture and reconstructions — all this as background music to the simultaneous destruction and neglect of that which is authentically ancient. As a construction, history is omnipresent, not only in China and the postsocialist states of Central and Eastern Europe. As early as 1987, Dietmar Kamper referred to this “theater of memories”;¹⁶ Aleida Assmann noted in the publication accompanying the reconstruction exhibition in Munich that, in the context of political transformations, the “historical horizon is being reinvented like a “stage backdrop.”¹⁷ In this way history is mutating into an evidence room of the present, into a storeroom of various designs for the present.

The booming contemporary affective turn to history is characterized by strong conformity to the mainstream of commercialized society. Historic monuments, sites of commemoration, material and immaterial cultural heritage and, beyond this, whatever else can claim significance within the memorial landscape are increasingly assigned labels and, at least in Germany, given over to a categorization that was hitherto unknown. In addition to the World Heritage List initiated in 1972, very recently the World Document Heritage has appeared as well as lists of European and nationally important cultural heritage, all of them geared towards the media with an accompanying hitparade of “our best of the best,” which at regular intervals selects Neuschwanstein Castle, Cologne Cathedral, and the Dresden Frauenkirche as the Germans’ favorite historic monuments. The desire to hold fast to the native and to the local that accompanies this process is supposed to compensate for the consequences of globalization and social transformations. In this way, critique of modernity and aestheticization of history appear as parallel phenomena to Pierre Nora’s “age of commemoration,”¹⁸ tendentially

14 David Lowenthal, “‘History’ und ‘Heritage’. Widerstreitende und konvergente Formen der Vergangenheitsbetrachtung,” in: Rosmarie Beier (ed.), *Geschichtskultur in der Zweiten Moderne*, Campus-Verlag, Frankfurt, New York, 2000, pp. 71–94.

15 Hans Ulrich Gumbrecht, “Die Gegenwart wird immer breiter,” in: *Literaturen*, vol. 10, no. 5, 2009, pp. 14–19.

16 Dietmar Kamper, “Inszenierte Ereignisse: Kultur als Theater der Erinnerung,” in: *Ästhetik und Kommunikation*, vol. 67, no. 68, 1987, pp. 75–81, available online at: <http://nbn-resolving.de/urn:nbn:de:0168-ss0ar-146342>, accessed 06/26/2011.

17 Assmann 2010, p. 16.

18 Nora 2005, pp. 543–575.

extending the concept of heritage to all areas of life, protecting French cuisine the same way as timber-framed houses or the film *Metropolis*.

The consequences of these developments for monument protection are investigated by the research project Heritage – Values – Dialogue. Rethinking Conservation Theory and Practice, in the context of which I direct a collaborative project on theoretical discourses on heritage conservation.¹⁹ In the following, I shall give a brief overview of one aspect of this research; namely, historical material evidence and its underlying images of history.

Historical Material Evidence

The laws governing monument protection in the German federal states, as well as international policy documents of postwar monument conservation organizations, codify the historicity of buildings and ensembles as the precondition for their formal recognition as monuments.²⁰ However, if one enquires as to what historicity is in more concrete terms, beyond being something that is old and demonstrably so, then at least being famous – for example, an architect or a family – or a rarity, like the last surviving exemplar of a type of building or first model of a new technology – are offered as selection criteria. Furthermore, the images of history underlying monument classification are hardly ever defined, and consequently not transparent.

Whereas during the nineteenth century European states considered those monuments to be essentially worthy of conservation that qua social agreement were acknowledged as “monuments” testifying to and epitomizing national tradition, such a conception of history in the twentieth century – leaving aside the specific postsocialist developments – has to a large extent been lost. In public awareness today, monuments can be evidence of very different views of, very different interests in, and very different experiences with and in history. History as a monolithic construct, suggesting a unified and binding character, increasingly proves to be a myth. However, the monument concept without any theoretical delimitations stands in opposition to a practice which presents itself as monument conservation and draws on a traditional image of national history. And it is not only on this point that theory and practice diverge. It is against this background that my randomly selected analyses of the images of history in certain works on monument theory should be seen.

19 See information about the project Denkmal – Werte – Dialog. Historisch-kritische Analyse und systematisch-praktische Konzeption denkmalpflegerischer Leitwerte, available online at: http://tu-dresden.de/die_tu_dresden/fakultaeten/fakultaet_architektur/ibad/master/forschungsprojekt/forschungsprojekt, accessed 02/02/2011.

20 The following remarks make reference to a lecture I held at the conference “Europäisches Kulturerbe. Bilder – Traditionen – Konfigurationen,” on October 8, 2010 at the University of Kassel. See also Ingrid Scheurmann, “Denkmalwerte heute. Vom historischen Zeugniswert und seiner Substanz in den Denkmaldiskursen des 20. Jahrhunderts,” in: Winfried Speitkamp (ed.), *Europäisches Kulturerbe. Bilder, Traditionen, Konfigurationen*, Arbeitshefte des Landesamts für Denkmalpflege Hessen, vol. 23, Konrad Theiss, Stuttgart, 2013.

The Value of History in the Discussion around 1900: Georg Dehio and Alois Riegl

In view of a general crisis in the humanities in Germany, more particularly “the crisis of historicism” as it was later characterized by Ernst Troeltsch,²¹ debates about monument conservation around 1900 – albeit without referencing contemporary discussions in sociology and philosophy – centered on the scholarly substantiation of fundamental values. Georg Dehio and Alois Riegl, university teachers in Strasbourg and Vienna, were the most important

protagonists of the monument value debate, which erupted in the so-called Heidelberg Castle dispute. Their findings, published between 1901 and 1905,²² are still considered to be the theoretical foundations of monument conservation, although they represent different intellectual positions and different scholarly orientations. Their debate confronted the monument with the transient, the nation with the individual, historical facticity with perception, and the historical sciences with the natural sciences’ claim to ultimate justification.

Georg Dehio, who belonged to the conservative Historical School, situated his central point of reference in the nation.²³ He thus stood in the tradition of a conception of the monument that harked back to the beginnings of the nineteenth century, and which sought to record and preserve the monument as a state treasure. Here, the connection to the nation constitutes the logical correlate. For emerging monument conservation, the state’s efforts to affirm its cultural values included an

emphasis on grand monuments as emblems of history that, to some extent, was frozen in time. Dehio saw such monuments as being constituted of “aesthetic and historic characteristics,”²⁴ and marked by an “intellectual-physical [...] dual nature.”²⁵ Hence, for Dehio the “true” essence of the monument is intellectual and resides at the level of meaning that materializes in physical substance and thereby substantiates the central place of historical material evidence. For Dehio, monuments as historical “sources” are inviolable; this also excludes any subsequent aestheticization or purification which are viewed as deceptions, masquerades, and falsifications of sources.²⁶ The issues at stake are the originality and authenticity of what is old. According to



Georg Dehio
1906
Photo © Estate Georg
Dehio
Photo: Anna Hartwig

21 Ernst Troeltsch, “Die Krisis des Historismus”, in: *Die neue Rundschau*, no. 33, vol. 1, Berlin, 1922, pp. 572–590. See also Dieter Dolgner, *Historismus. Deutsche Baukunst 1815–1900*, Seemann, Leipzig, 1993.

22 Marion Wohlleben (ed.), *Georg Dehio – Alois Riegl. Konservieren, nicht restaurieren. Streitschriften zur Denkmalpflege um 1900*, Vieweg, Braunschweig, Wiesbaden, 1988.

23 Georg Dehio, “Denkmalschutz und Denkmalpflege im neunzehnten Jahrhundert,” Strasbourg, 1905, reprinted in: Wohlleben 1988, pp. 88–103, here p. 92.

24 *Ibid.*, p. 89.

25 *Ibid.*, p. 92.

26 *Ibid.*, p. 97.



Alois Riegl
ca. 1904
Photo ©
Bundesdenkmalamt,
Austria

Dehio, what is old should “also appear old” “with all the traces of what it has experienced.”²⁷ Beyond references to the “wealth of historical experiences,”²⁸ and “historical [...] existence as such,”²⁹ the question as to what, in particular, the monument testifies to, is not further discussed.

Around the same time, Alois Riegl, Austrian General Conservator for the Central Commission for the Research and Preservation of Art and Historical Monuments, postulated a “modern cult” of monuments, which not only did away with tying their values to the nation, but also negated the prioritizing of historical values by obligating monuments to the scientifically based “being as such” (Hegel), the very foundations of existence, which at the same time also advocated proposed a new individualism. In place of what was central for Dehio, the historical value, Riegl shifted the “age-value” to the foreground and the place of the unique historical event was taken by the processuality of history.³⁰ Riegl rejected the inviolable historical testimony in favor of the “becoming and passing away” of buildings, and thus, for the first time, also the value of traces and remains. History, which one could say had become frozen in the monument, was now confronted with the idea of development, which also integrates what is missing and has “disappeared in conservation” (Marianne Schuller).³¹ Entirely in the spirit of Sigmund Freud, the “trace” ennobled by Riegl’s age-value as “elapsed time in the image,” attention turns to that which once was and appears as a “flash” of something that once was but no longer exists.³²

It is precisely this imperfection, which, for Riegl, enables an emotional relation to the monument, and constitutes its atmospheric value. By contrast, the academic, and hence elitist, interpretation of a monument is of secondary importance for the modern cult of the monument in the twentieth century aimed at the general public.³³ Although anything can, in principle, be a historical monument, Riegl’s age-value focuses on the artistic character of the historical monument and thus, conversely, on “what is past becoming aesthetic” (Beat Wyss).³⁴ For Riegl, only the conservation of historical substance

27 Georg Dehio, “Was wird aus dem Heidelberger Schloss werden?,” 1901, in: Wohlleben 1988, pp. 34–42, here p. 41.

28 Dehio 1905, p. 99.

29 Ibid., p. 92.

30 See Ernst Bacher (ed.), *Kunstwerk oder Denkmal? Alois Riegls Schriften zur Denkmalpflege*, Studien zu Denkmalschutz und Denkmalpflege, vol. 15, Böhlau, Vienna, Cologne, Weimar, 1995.

31 Schuller 1993, p. 93.

32 Ibid., pp. 77f.

33 See also, among others Alois Riegl, “Das Denkmalschutzgesetz,” in: Bacher 1995, pp. 101–120, here pp. 103, 105.

34 Beat Wyss, “Jenseits des Kunstwollens, Anmerkungen zum Historismus,” in: *Österreichische Zeitschrift für Kunst und Denkmalpflege*, vol. 40, 1986, pp. 1–8,

as a vehicle for individual emotive values made it possible for historical buildings to become objects of public interest and public support in mass society.



Paul Clemen
1936
Photo © LVR-Amt für
Denkmalpflege im
Rheinland

The Historical Implications of the Symbolic Value: Paul Clemen

In view of the anticipated rise of nationalism, in his work *Die Deutsche Kunst und Denkmalpflege* from 1933 art historian and former Provincial Conservator of the Rhine Province from Bonn, Paul Clemen, sought to summarize the debate on the monument in the period around 1900, and bring its findings together in a new hierarchy of values. In place of Dehio's historical value and Riegl's age-value, Clemen introduced symbolic value as the key value of a monument; an intellectual value, that – materialized in the form of a historic landmark – is comprehensible and accessible to everyone.³⁵ Unlike Riegl, Clemen was less interested in the individual atmospheric value, and more in the social, community-building function of the past. With their mythical and arcane qualities, monuments trigger religious feelings and moods.³⁶ For this, the material substance of the monument is less important than its

landmark function. Here, atmosphere primarily indicates myth, memory, and community.³⁷ By contrast, the materiality of that which has come down to us, its substance, recedes in importance as historical material evidence, and heritage conservation once again has recourse to an interpretative and creative treatment of history.

With respect to monuments as national symbols, Clemen, like Dehio and Riegl before him, calls for reverence and veneration;³⁸ monument conservation is “responsibility” and “an obligation of honor”;³⁹ the monument itself is a “document” but also a “model” and “source [...] of national health”⁴⁰ and thus – entirely in the spirit of the early nineteenth century – a treasure and riches. As such, the monument is a product of human achievement; it testifies to grandeur, beauty, tradition, and community.⁴¹

Clemen's symbolically superelevated monuments as sacred national sites and epitomes of old German beauty and harmony were soon to be integral elements of National Socialist policy with respect to the German

reprinted in: Lipp 1993, pp. 31–50, here p. 33.

35 Paul Clemen, *Die Deutsche Kunst und Denkmalpflege. Ein Bekenntnis*, Deutscher Kunstverlag, Berlin, 1933, p. 4.

36 Ibid., p. 3.

37 Paul Clemen, “Der Denkmalsbegriff und seine Symbolik. Eine Rede zum 1. Januar 1933,” Bonn, 1933, p. 5.

38 Clemen 1933 (see footnote 35), pp. 20, 26, 31, 35.

39 Ibid., p. 16.

40 Clemen 1933 (see footnote 37), p. 20.

41 Clemen 1933 (see footnote 35), among others pp. 3, 4f., 6, 12.



In European Architectural Heritage Year 1975 Brutalist architecture, like the Stadthaus Bonn by Heinle, Wischer & Partner (1973–1977), was characteristic of the inhospitable appearance of contemporary cities. Photo © City of Bonn Photo: Friedhelm Schulz

“Volk” and its history. For these purposes, the substance of the monuments played less of a role than the historical site and the figurative superelevation of the identical.

The positions of Dehio, Riegl, and Clemen are the most distinctive in the monument debate around 1900. For Dehio and Riegl, the relationship of the monument to its substance is still constitutive; they assume history and the past to be something defined and definable; for the one a repository of national sentiment and for the other of atmospheric evidence of general existence. An uncoupling of monument values from historical substance is hinted at in the case of Clemen, and this signifies, first and foremost, emphasizing the reference of the monument to the nation and underpinning it with pseudo-religious sentimental values. In view of the almost contemporaneous research carried out in German and French cultural sociology and cultural history,⁴² this late falling back on heritage conservation of the nineteenth century appears as obsolete as it is ideological. In spite of all their differences, the three protagonists hold fast to the idea of *one* history, which finds aesthetic expression in the monument. By contrast, research by Maurice Halbwachs on collective and particular memory, for example, is ignored the same as the critique of history as formulated by Walter Benjamin a few years later, whose “angel of history” looks back at the ruins and catastrophes of history and declares it the task of the historian-archaeologist to reconstruct the “memory of the nameless.”⁴³ In place of monuments for Benjamin it is already the sites of the victims and destruction that come to the fore: the traces, the remains, and the fragments. Particularity and subjectivity accompany the critique of history and the reconstructions of memory. For this, monuments are not constitutive per se, commemorative sites and places of remembrance are.

The European Year of Monument Protection 1975: Michael Petzet, August Gebeßler, and Others

Paul Clemen’s publication of 1933 marks the close of the monument debate of the early twentieth century. During National Socialism, heritage policy that toed the party line replaced critical reflection on one’s own actions; the period

42 One thinks, for example, of the work of Emile Durkheim, Georg Simmel, or Max Weber. See also Rüdiger vom Bruch, Friedrich Wilhelm Graf, and Gangolf Hübinger (eds.), *Kultur und Kulturwissenschaften um 1900. Krise der Moderne und Glaube an die Wissenschaft*, vol. 1, Steiner, Stuttgart, 1989; Gangolf Hübinger (ed.), *Kultur und Kulturwissenschaften um 1900. Idealismus und Positivismus 1997*, vol. 2, Steiner, Stuttgart, 1997. See therein Klaus Lichtblau, “‘Alles Vergängliche ist nur ein Gleichnis.’ Zur Eigenart des Ästhetischen im kultursoziologischen Diskurs der Jahrhundertwende,” pp. 86–121.

43 Scheurmann 2010, p. 71.

of post-war reconstruction was characterized by a return to principles of creative heritage conservation. It was not until the run-up to and during the European Architectural Heritage Year in 1975 that there was any theoretical interrogation of the premises of the field.⁴⁴ In a critical review of modernity in general and the achievements of reconstruction in particular, in the catalog *Eine Zukunft für unsere Vergangenheit* ["A future for our history"] Michael Petzet and other commentators sought to reestablish a theoretical discussion. In the context of a critical analysis of modernity and reconstruction efforts



Even before it was completed, the Essen Town Hall by architect Theodor Seifert (1975–1977), was the prime negative example of a cityscape for many involved in urban planning and architectural heritage preservation. Photo © Stadtbildstelle Essen

after 1945, monument conservation was primarily located as an aesthetic discipline, and not as a historical discipline in which the ensemble was foregrounded more strongly than the single monument. Apostrophized as “environment therapy,”⁴⁵ it is a counter-image to that of a society perceived as divided, inhuman, and sick.⁴⁶ Concepts such as historicity, tradition, continuity, identity, diversity, intimacy, security, uniqueness, harmony, and humanity are attributes of monuments that are juxtaposed in opposition to large-scale redevelopment of historic monuments, international architecture, and modern transport infrastructure. Pairs of images of before and after were intended to validate the good and the old. The “unadulterated conservation of the past” was the program, and celebrated monuments once more as “documents,”⁴⁷ as “necessary testimony to human history,”⁴⁸ and “as typical achievement of the age.”⁴⁹ However, for the authors, the “sellout of the past,” the battle against the growing “lack of history in cities

and villages,” “throw-away architecture,” and “hostility to life,”⁵⁰ the historical material evidence of historic monuments exhausts itself tautologically in “historicity,” and appears a priori as the value of heritage. Monument conservation is thus primarily understood as compensation, as visualization of the ostensibly good old times. The fact that at the same time society was grappling with painful memories, commemoration of victims, and responsibility was overlooked in 1975. As built images of history, monuments became the positive antitheses of a present that was critiqued and apparently uprooted.

44 See Burkhard Körner, “Zwischen Bewahren und Gestalten.” *Denkmalpflege nach 1945*, Imhof, Petersberg, 2000.

45 Michael Petzet, “Eine Zukunft für unsere Vergangenheit? – Denkmalpflege und Denkmalschutzjahr 1975,” in: *Eine Zukunft für unsere Vergangenheit. Denkmalschutz und Denkmalpflege in der Bundesrepublik Deutschland. Europäisches Denkmalschutzjahr 1975*, Prestel, Munich, 1975, pp. 7–37, here p. 14.

46 August Gebeßler, “Altstadt und Denkmalpflege. Die Beispielstädte der Bundesrepublik Deutschland,” in: *Zukunft*, 1975, pp. 57–72, here p. 57.

47 Petzet 1975, p. 21.

48 Ibid., p. 37.

49 August Gebeßler, “Zur Geschichte der Denkmalpflege. Denkmalbegriff – Organisation – Aufgaben – Probleme,” in: *Zukunft*, 1975, pp. 157–164, here p. 160.

50 Petzet 1975, pp. 7, 13.

After 1989 and 1990, the German Parliament deemed it impossible to justify preserving the Palace of the Republic, built between 1973 and 1976 by Heinz Graffunder and others, which had been the seat of the GDR Parliament and People's Chamber.
Photo © Ingrid Scheurmann



The Postmodern Monument Cult 1993: Wilfried Lipp and Others

In the wake of the 1975 European Year of Architectural Heritage this identification of the old with the beautiful and the good had far-reaching repercussions. From the 1980s onward the nostalgic images of exhibition catalogs tended to assume a separate existence to the materiality of monuments and, as mentioned above, the social need for compensation is increasingly satisfied in the form of reconstructions. This is one of the grounds for a “post-modern monument cult,” as was called for in 1993,⁵¹ which only a few years after the rediscovery of the works by Dehio and Riegl ushered in their historicization, and which broke up Dehio’s so-called aesthetic-historical dual nature of the monument into a dichotomy of image and substance.

Wilfried Lipp, one of the authors and initiators of the new monument cult proclaimed at a conference in Passau in 1993, pronounced that there was a “fading” of “conventionally established values, such as the historical and artistic value”⁵² as well as the reevaluation of visual and atmospheric appeal. In the age of “patchwork identities” monuments are “repositories, not only of aesthetics, history, education, remembrance, but also of other very different trivial, everyday, or fictional [...] values.”⁵³ Social, ethnic, spatial, and natural new values now demand attention, identity, and a home, but also otherness and alienness influence expectations of society vis à vis the built heritage of

⁵¹ Lipp, Petzet 1994.

⁵² Wilfried Lipp, “Einleitung,” in: Lipp 1993, pp. 11–30, here p. 17.

⁵³ Wilfried Lipp, “Vom modernen zum postmodernen Denkmalkultus? Aspekte zur Reparaturgesellschaft,” in: Lipp, Petzet 1994, pp. 6–12, here p. 11.

In 1993 the Förderverein Berliner Schloss, an association founded to promote reconstruction of the Berlin City Palace, presented a painted simulation (at the scale 1:1) of the facade. Photo © Förderverein Berliner Schloss e.V. / eldaco, Berlin



the past.⁵⁴ The experience of acceleration and the increasingly provisional state of the present led Lipp to classify the “compensatory memory construction”⁵⁵ that history – not least in form of reconstructions – can provide as significant. Thus falsifying stagings of history are not excluded any more nor orientation on established values attaching to substance.

If Dehio’s theory responds to national sentiment and Riegl’s to an existential feeling, then the new monument cult responds “in view of general catastrophes” to a “yearning for survival,” which expresses itself in the endeavor “to preserve memories and thus continuity.”⁵⁶ Historicity becomes significant as proof of authenticity, and furthermore as nonqualified memory, as proof of continuity. What remains unclear is whether history can still be read from its material traces, or whether the new images of the old only point to historicity. Which images of history are handed down and which histories are consigned to oblivion, remains, in principle, an open question. In view of the cited compensatory function of monuments and retrospective emendations of history by way of reconstructions, the postmodern monument cult, with its focus on the idea of the beautiful old far remote from history – similar to 1975 – remains immanent.

The Return to History

The so-called postmodern monument cult advances compensatory monument values, beautiful images, sentimental values, a sense of home, and

⁵⁴ Lipp 1993, p. 17.

⁵⁵ Ibid.

⁵⁶ Michael Petzet, “Der neue Denkmalkultus am Ende des 20. Jahrhunderts,” in: Lipp, Petzet 1994, pp. 22–32, here p. 30.

a diffuse enduring identity. In the meantime neighboring disciplines were discussing topical historical questions, for the most part without the participation of heritage conservation. Cultural memory and sites of remembrance, cultural transfer research, postcolonial studies and transnationality, architectural modernity and commemorative problematic – although all connected with places and sites, buildings, remains and traces of history – were largely ignored. For this reason, in 1997 art historian Norbert Huse, sought to group together critical voices under the title “Uncomfortable Architectural Monuments” and to relocate heritage conservation as a discipline of history.⁵⁷

For the first time since but differently to Riegl, Huse problematized the concept of achievement that is immanent to monument value, and which was still ubiquitous in the contributions to the European Year of Architectural Heritage and assumed by the postmodern monument cult. In view of the fact that “history is not only a sequence of successes,” Huse found the concept of value predicated on achievements to be obsolete.⁵⁸ For Huse, historicity also comprises destruction and the traces thereof,⁵⁹ also the locations, not only the objects of the event,⁶⁰ as well as the material evidence of vacancy⁶¹ and triviality.⁶² Even “historically contaminated sites” can be essential for memory and the cultural memory of a society.⁶³ In contrast, for example, to Michael Petzet’s 1975 and 1993 continuity of history apostrophized as a central historical value, Huse emphasizes the significance of “rejections, break[s], interruptions” as well as the “alienness” of history.⁶⁴ Huse also understands history, and with it monuments, as a “resource” and the “wealth” of a country,⁶⁵ although less in the sense of art historical values and more as potential experience and social memory. Especially since the historical is perceived in its principle difference and otherness, as well as in its potential to enlighten, which, in its otherness, always shows an alternative to what already exists.

Summary

Discussion of values always commences when agreements disappear and social changes demand a new definition of community. I hope this brief outline of theoretical discourse on monument conservation has shown that

57 Norbert Huse, *Unbequeme Baudenkmale. Entsorgen? Schützen? Pflegen?*, Beck, München, 1997. See also N. Huse, “Unbequeme Baudenkmale,” in: Georg Mörsch, Richard Strobel (eds.), *Die Denkmalpflege als Plage und Frage. Festgabe für August Gebeßler*, Munich, 1989, pp. 96–101.

58 Huse 1997, p. 43.

59 Ibid.

60 Ibid., p. 44.

61 Ibid., p. 49.

62 Ibid., p. 46.

63 Ibid., p. 47.

64 Ibid., p. 88.

65 Ibid., p. 9.



Site of the Topography of Terror foundation, in the former Prinz-Albrecht-Straße 8, December 1989, Berlin.

Photo © Bundesarchiv
Photo: Manfred Beier

cultural values require social negotiation and that they are accompanied by images that characterize the relationship of the generation in question to the past, present, and future. Whereas, around 1900, Georg Dehio still argued mainly in affirmation and Alois Riegl in anticipation of emerging mass society, after 1945 the discussion of values is primarily a critique of the present and a backward-looking evocation of the good old past. In the course of this, the past mutated into an arsenal of viable drafts of the future. Identity and home advanced to become central, at times almost unquestioned values. At the same time, the local, native, and manageable also shifted into the center of attention – currently, for example, in the case of the Darmstadt project on the *intrinsic logic* of cities.⁶⁶ Here, renewed strategies of compensation are recognizable. In the process, the confirmation of history is attributed greater value

66 See Helmuth Berking, and Martina Löw (eds.), *Die Eigenlogik der Städte. Neue Wege für die Stadtforschung*, Interdisziplinäre Stadtforschung, Campus, Frankfurt am Main, 2008. See also www.stadtforschung.tu-darmstadt.de/eigenlogik_der_staedte/index.de.jsp, accessed 05/29/2012.

– although it has long been unclear as to what Reinhart Koselleck’s concept of “collective singular” currently implies; and whether it will disintegrate and again make way for a multiplicity of histories. What is clear, however, is that *the* history as reference point for monument conservation has become problematic, and discourses about history have taken its place. The concept of cultural heritage cannot bridge this uncertainty and only superficially ameliorates insecurity in the face of globalization. Rather, in the course of the aestheticization and romanticization immanent to the term, it tends to rob the past of its differences, and thus of its critical and enlightening potential. Multiperspectivity and openness, by contrast, are essential attributes of monuments, which just like their differences and uniqueness, must be retained in the face of the appropriation of heritage.

Thus, aside from the complex issues of restoration, whether digital art requires an “extension of the concept of heritage” – to cite Willibald Sauerländer once again – or another UNESCO Charter, another European designation of heritage, in my view is questionable. A crucial potential of contemporary art resides in its intellectual explosive force – and not only since Joseph Beuys, Fluxus, and the Arte Povera movement – to transgress boundaries, sound out what is yet to be thought, what is unfamiliar, and by being a provocation. All this needs society’s protection, but not as intended by the concept of the *immaterial heritage*.

Translated from the German by Justin Morris

Museum and Amnesia. An Attempt at a Review

Klaus Weschenfelder

A seldom-told story of Judaic origin tells of a holy man who went into the forest and lit a fire at a certain place before saying a prayer for world redemption. Years later, one of his disciples returned to exactly the same spot in the forest, but did not know how to kindle a fire, so he simply said the prayer. Many years after that, the next disciple was unable to recollect the prayer and did not know how to kindle fire, but did know the secret place in the forest. Finally, after many years had passed, there came a disciple who said: "I have no idea how to kindle a fire, I have forgotten the words of the prayer, and I do not even know how to find the place in the forest. All I can do is to tell the story, and this will have to suffice."¹

This Chassidic narrative is about forgetting and how authentic memories are and have to be replaced by symbolism. In the museum, as central locus of memory, such experiences are grouped together with the transformation of objects and insights about the loss of what is authentic as if in a burning glass.

The Material Transmission of the Original

On closer scrutiny, the concept of the original turns out to be less viable than supposed. In other words, if one were to introduce rigorous standards, then one would find hardly anything original in the museum. With respect to the material, almost everything has been restored or, from an ideal standpoint, has lost its original function and significance. The originals of our art and cultural history are, like the architectural monuments, complex constructs of superimposed layers of material and meaning. Here it seems that skepticism is justified as to whether the material conservation of museum collections is reliable enough to guarantee material memory.

In addition to being aware of the shifts in meaning and losses of meaning to which the collected objects are subject, there is also the painful recognition that lacunae exist in the material cultural heritage. With respect to the sacred art of the late Middle Ages, which appears to be present in no small degree in European museums, reliable sources estimate that a mere two percent of the original body of work has survived.² As soon as one turns one's attention

1 "Der Clown als schlechter Prediger," Doris von Drateln im Gespräch mit Christian Boltanski, in: *KUNSTFORUM international* 113, 1991, pp. 314–331, here p. 315.

2 Gert von der Osten, quoted in: Harald Siebenmorgen (ed.), *Überlieferungskultur. Wie viel Vergangenheit braucht die Gegenwart? Wie viel Gegenwart braucht die Zukunft?*, Info Verlag, Karlsruhe, 2010, p. 13.

towards objects that do not belong to ecclesiastic or court life, one rapidly enters fractional percentages. We are not always aware of these lacunae because museum presentations tend to foster the impression that their displays, reconstructed from fragmentary relics, are in fact comprehensive and illuminating.

At regular intervals, a new enhanced perspective, or one seen from another angle provides us with new insights that prompt us to review our picture of past realities. The most impressive example of this in recent years was the discovery that originally, Greek sculptures were highly colored, and the reconstructions of garish multicolored statuary demolished the notion of “noble simplicity and quiet grandeur” once and for all.

Thus, caution is advised with respect to the evaluation of material sources. Can we really be entirely certain that we have an adequate idea of Greek sculpture when a substantial part of it has only come down to us in the form of copies? After all, this includes the *Laocoön Group*, a later Imperial copy of a Hellenistic work, the *Discobolus* of Myron (the discus thrower), and the works attributed to the Greek sculptor Polyclitus, *Diadumenos* and *Doryphoros*. These are all marble copies of bronze sculptures which, centuries after the originals were created in the studios of the most important Greek sculptors, were reproduced in Roman workshops.

Ephemera

One must not forget that there are forms of cultural production that have entirely eluded transmission. Here I am thinking of ephemera such as the stages and scenery for *tableaux vivants* or fireworks. Another example is the *castrum doloris* [Lat. “castle of grief”], which had its heyday in Catholic countries during the seventeenth and eighteenth centuries. It was a temporary decorative structure erected over a catafalque and included sculptural elements, paintings, and inscriptions amongst other things. These “ephemeral decorations,” as Jacob Burckhardt referred to them, were an opportunity for the most outstanding architects of the day to invent and try out hitherto unknown architectural forms.³ These “castles of grief,” with their gilded elements or sometimes with parts constructed of durable materials, were extremely elaborate productions, as was generally the case with *memoria* for persons of high estate, they were of supreme cultural importance, and immensely expensive. Nothing of this has survived, and contemporary prints convey only very limited impressions. The same applies to the immensely elaborate Baroque firework displays, staged at great expense.

The historically and structurally close relationship of the museum to the phenomena of forgetting and disappearance has been treated in the literature

3 See Harald Olbrich, Gerhard Strauss, *Lexikon der Kunst*, vol. VII, Seemann, Leipzig, 1994, p. 395.



August Christian
Fleischmann
*IOSEPHO I ARA MONUMEN-
TUM HOC POSUIT REVEREN.
ET ILLUSTRIS CAPITULUM
RATISBONENSE*
1711
Etching
46 x 28 cm
© Bavarian State
Library Munich

on the subject by various commentators. From a cultural anthropological standpoint, Krzysztof Pomian has developed a theory of collection objects as semiophores, which acquire a new significance only after their original function has been lost. Pomian also attributes the origins of the museum to ancient practices featuring collections, such as grave goods or offerings, which did not need to be seen by living people for they could be viewed by dwellers of the afterworld.⁴ Michael Fehr goes further and points out that the modern museum is above all indebted to the fact of not remembering and to a disappearing cultivation and awareness of traditions.⁵

Thus, the following two aspects should be borne in mind when tracing the relationship between museum and amnesia: the discovery of gaps in

4 See Krzysztof Pomian, *Der Ursprung des Museums. Vom Sammeln*, Wagenbach, Berlin, 1988, p. 94.

5 See Michael Fehr, "Das Museum – Ort des Vergessens," in: Wolfgang Zacharias (ed.), *Zeitphänomen Musealisierung. Das Verschwinden der Gegenwart und die Konstruktion der Erinnerung*, Klartext, Essen, 1990, p. 220.

cultural heritage because of failure to collect and the continuing increase in the quantity of stored items in an endeavor to fill such gaps, as well as memory loss due to loss of information.

The Growth of Storage Capacity

It would appear that museology, which first emerged in the sixteenth century, has concentrated its efforts on doing everything to sidestep this dilemma, eschewing systemization or perfecting the concepts of collecting.

Whereas as the art and curiosity cabinets of the Renaissance were defined above all by intellectual curiosity and remained places in which rare, valuable, new, or peculiar objects were collected and made accessible to a limited audience for the purposes of satisfying their thirst for knowledge, the paradigms of museum collection have changed over the course of the centuries. Gradually, as the idea of the museum as archive began to supplant the idea of the museum as curiosity cabinet, the function of conservation came to the fore. The wave of new museums founded as a result of civil as well as feudal initiatives during the nineteenth century went hand in hand with the spread of positivism, especially in the historical and cultural disciplines; positivism also found expression in the taking of large-scale regional, social, and cultural inventories, from the graphical depiction of antiquities and the most famous places of interest to the collection of traditional costumes, the recording of customs and traditions, and of dialects in dictionaries.

The nets cast to record past realities in their material and immaterial traditions became more fine-meshed, and the fishing grounds extended increasingly into the present. Endeavors to ensure the most thorough and systematic record of the recent past caused the volume of goods considered worthy of conservation to swell to such an extent that the abundance of material soon became a problem.

Contemporary critique of this material-hungry positivism was not lacking. In his work of cultural criticism *Untimely Meditations*, the second essay of which was entitled *On the Uses and Abuses of History for Life* of 1874, Friedrich Nietzsche ridiculed:

“Man is encased in the stench of must and mould; through the antiquarian approach he succeeds in reducing even a more creative disposition, a nobler desire, to an insatiable thirst for novelty, or rather for antiquity and for all and everything; often he sinks so low that in the end he is content to gobble down any food whatever, even the dust of bibliographic minutiae.”⁶

The idea of preserving historic monuments is also indebted to the spirit of the nineteenth century. Similar to the museum, over the course of the twentieth

6 Friedrich Nietzsche, *Vom Nutzen und Nachteil der Historie für das Leben*, Reclam, Stuttgart, 1985, p. 31. English translation quoted: Friedrich Nietzsche, “The Uses and Abuses of History for Life,” in: *Untimely Meditations*, trans. R.J. Hollingdale, Cambridge University Press, Cambridge, 1983, p. 75.

century monument conservation expanded into an ever growing number of dimensions. The expanded concept of a monument was reflected in the heritage protection laws of the 1970s, which focused increased attention on evidence of social and economic history and everyday culture, and led to the development of new standards of evaluation.⁷ An exemplary instance of this in Germany was the protection of the Völklingen Ironworks as an industrial monument after decommission in 1986, and then its logical inclusion in the World Heritage List of UNESCO.⁸

The growth in the number of heritage monuments is comparable to the rapidly expanding inventory of potential museum collections that are based on new concepts of collection. When exhibitions were planned in Sweden at the beginning of the 1970s on the 1950s and 1960s, it was discovered that virtually no museums had collected contemporary objects of everyday culture. Desiring to remedy to this problem, the SAMDOK project for contemporary museum documentation was initiated in Sweden: museums of varying sizes and types formed a voluntary association in which the institutions take on specific themes and tasks along decentralized and networked lines, and, in addition to acquiring objects, also carry out field studies, conduct interviews, or put together photographic documentation. This has also meant the acquisition of entire collections and ensembles, which has led to an accumulation of duplicate copies.⁹

Newly established museums are particularly prone to such collecting euphoria. A brief look at one of the depots of the Technoseum (until 2009 Landesmuseum für Arbeit und Technik) in Mannheim in Baden-Württemberg (Germany) illustrates the situation. After its foundation, the Technoseum not only rapidly acquired large and heavy exhibits, such as railway engines and industrial turbines, during the first phase of building its collection from 1980 to 1984; it was decided for strategic reasons to aim for a comprehensive collection of very average cars in the automobile section instead of expensive luxury cars, which are frequently found in private collections. But when the depot had finally to be reduced from the initial 15,000 square meters to 6,000

7 Holger Brülls, "Denkmalschutz für gerade vergangene Gegenwart?," in: Ingrid Scheurmann (ed.), *ZeitSCHICHTEN. Erkennen und Erhalten – Denkmalpflege in Deutschland. 100 Jahre Handbuch der Deutschen Kunstdenkmäler von Georg Dehio*, Deutscher Kunstverlag, Berlin, Munich, 2005, pp. 290–309, here p. 291.

8 See Ulrike Wendland, Axel Böker, "Weltkulturerbe Völklinger Hütte. Aspekte der Industriedenkmalpflege," in: Scheurmann 2005, pp. 173–179, here p. 174.

9 See Britt Bogren Ekfeldt, "Samtidsdokumentation SAMDOK – Gegenwartsdokumentation in Schweden," in: *Museumsmagazin 5. Museumsarbeit zwischen Bewahrungspflicht und Publikumsanspruch*, published by Landesstelle für Museumsbetreuung Baden-Württemberg in collaboration with Museumsverband Baden-Württemberg e.V., Konrad Theiss, Stuttgart, 1992, pp. 68–74, here p. 68. SAMDOK is a good example of how, from the moment an object loses its original function via the trash stage through to its appearance as a signifier of meaning in the museum (the semiophore, in the words of Krzysztof Pomian) the time frame has now shortened to such an extent that the break between the past and present is barely recognizable.

square meters owing to financial pressures, the collection was carefully scrutinized and then reduced.¹⁰

The disposal of collected materials, which until a few decades ago constituted a major sin for Europe's museums, has in the meantime become an issue of serious museum debate. This does not concern the occasional sale of high-quality collector's items prompted by museum administrators out of financial considerations, but rather the sorting out of objects considered superfluous from today's perspective. The Deutscher Museumsbund [Association of German Museums] recently composed a position paper bearing the title *Nachhaltiges Sammeln* [Sustainable Collecting], which in essence amounts to a detailed description of "de-collecting."¹¹ In the most recent revision of its *Code of Ethics for Museums*, the International Council of Museums (ICOM) similarly engages with the theme of dispensing with collection objects, and urgently recommends developing concepts of collection to deal effectively with the uncontrolled inflow of objects from private donations. This due to the fact, that in the meantime supply is greater than demand. Artist's estates are a good example of this. Only in the rarest of cases can the latter be maintained as independent foundations with their own exhibition spaces. An escape valve has been created for managing contemporary art material due to the fact that, in most instances, museums reject donations or estates offered them because of the conservational efforts and storage involved. Over the last few years, several collection points have been established for artist's estates, financed in part by public, in part by private funding.

In spring 2010, the Archiv für Künstlernachlässe der Stiftung Kunstfonds [Archive for Artist's Estates of the Art Funds Foundation] in Pulheim, near Cologne opened its doors. The foundation's aim is to ensure the expert collection and conservation of entire work complexes in recent art. Of foremost interest here are not single works of art, but an artist's entire oeuvre. One of the most remarkable acquisitions of this still young institution is the estate of the painter, sculptor, and multimedia artist, Ludger Gerdes, who died in 2008. The non-profit association Forum für Nachlässe von Künstlerinnen und Künstlern e.V. [Forum for Artist's Estates], which pursues similar objectives at a regional level, was already established in Hamburg in 2003. For the time being, these institutions will give the museums a breathing space, but they will soon be filled to overflowing.

The endeavors to create collections of material with as few gaps as possible in museums resulted in temporary overfilling and subsequent

10 See Thomas Kosche, "Schrott oder Kulturschatz? – Sammeln und bewahren im Landesmuseum für Technik und Arbeit in Mannheim," in: Siebenmorgen 2010, pp. 42–55, here pp. 47–48.

11 *Nachhaltiges Sammeln. Ein Positionspapier zum Sammeln und Abgeben von Museumsgut*, online: www.museumsbund.de/fileadmin/geschaefte/dokumente/Leitfaeden_und_anderes/Nachhaltiges_Sammeln.pdf, accessed 12/27/2010.

emptying; drastically expressed, the fight against amnesia set off something akin to bulimia. Meanwhile the suspicion is emerging that in the quest for systematic, contingent, and representative collections, one may lose sight of what is special and unique; I shall return to this aspect in the final section.

Amnesia through Loss of Information

For centuries, durability was considered the sign of quality in art. When Albrecht Dürer had an altar piece delivered to the Frankfurt patrician, Jakob Heller, in 1509, he remarked in an accompanying note: "I know that you will take good care that it will remain well-kept and fresh for 500 years. Because it is not made in the usual way. It can be well-kept by not being touched or having holy water spilled on it."¹² Today, there is hardly an artist living that would pay so much attention to the question of durability; instead, in the visual arts entropy is largely taken for granted, if not factored in from the outset. A few examples should suffice.

The sculptural machines by Jean Tinguely, created during the 1960s, are machines that no longer produce any material goods; their purpose is productive uselessness turned toward the artistic sphere that continues in perpetual movement. Movement is part of the constitutive essence of these works. If they stop, they are no longer capable of making their artistic statement. Their creaking and rattling signalize what effects are connected with mechanical movements: deterioration and general wear and tear must ultimately lead to the destruction of the works. The question that arises for the collector is how to deal with the contradiction that destruction of the work is inevitable if it is adequately presented. In order to postpone mechanical exitus for as long as possible, presentation must be limited.¹³ Tinguely's *Heureka* (1963–1964), is only set in motion for thirty minutes per day. To be prepared for a complete breakdown, curators and restorers have developed strategies of "accompanying documentation," which, with the aid of various media, are capable of representing the functioning of such mechanical sculptures along with the sensory impressions that it generates.

Essentially, media art encounters similar problems. The practice of presentation that constitutes the work relies technology and hardware, the durability of which, under constant operation, is limited. Although the hardware can be replaced if the software can be successfully transferred to a new medium, or else adapted; yet two integral questions necessarily arise for the process of artistic production:

12 Hans Rupprich (ed.), *Dürers schriftlicher Nachlass*, vol. 1, Deutscher Verlag für Kunstwissenschaft, Berlin, 1956, no. 19, p. 72.

13 See Reinhard Bek, "Die kunsttechnologische Erfassung der Maschinenskulpturen Jean Tinguelys," in: *Zeitschrift für Schweizerische Archäologie und Kunstgeschichte*, vol. 62, n° 3/4 (Presentation held at the conference of the Vereinigung der Kunsthistorikerinnen und Kunsthistoriker in der Schweiz [VKKKS], Luzern, June 25–26, 2004), 2005, pp. 245–252.

1. Would a change, for example, from an analog to a digital projection medium compromise the artistic statement, or would it be appropriate? And would these changes include the agreement of the artist with respect to copy-right law?

2. Would a collector, whether a private person or a public museum, accept an alteration to the work in the above-mentioned form? And how would the art market evaluate a work thus altered?

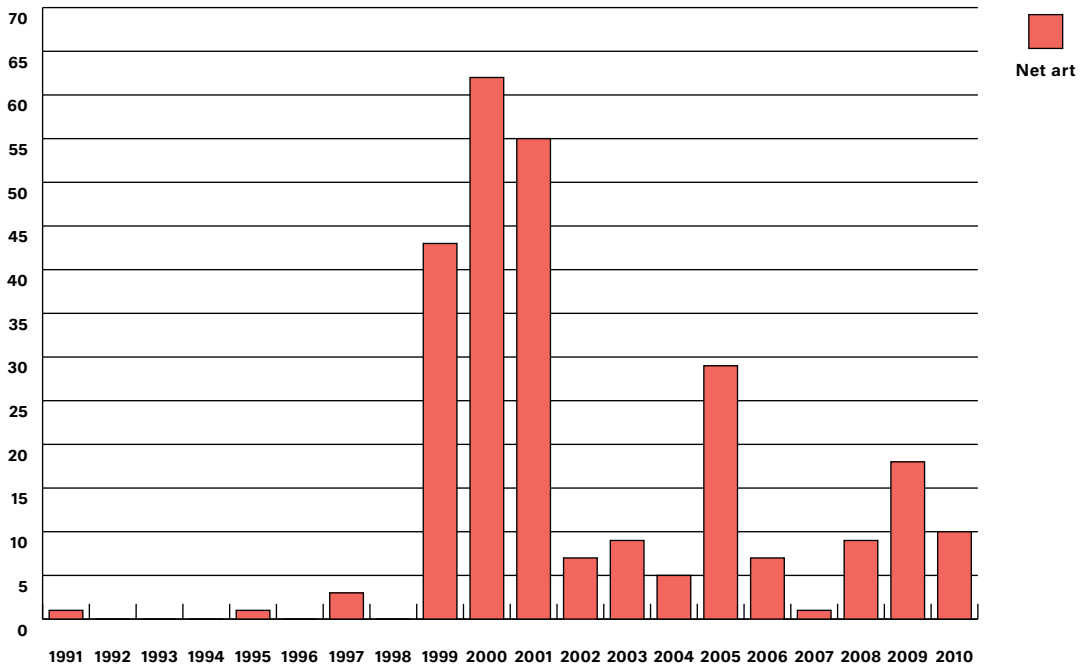
Works composed of perishable materials are unlikely to survive, whether these be chemical substances or natural materials, such as the felt with which Joseph Beuys' suits were made: their protein fiber, keratin, loses its binding function, and the material deteriorates.

Dieter Roth, who consciously explored this conflict and carried it to extremes, already factored in the degeneration and dissolution of his works. In 1965 he began producing "Decomposition Objects and Pictures," whose durability was intended to be limited. Roth's work *Georg Wilhelm Friedrich Hegel: Werke in 20 Bänden* from 1974 consists of a shredded Suhrkamp pocket book edition, which was prepared with herbs and pork dripping before being pressed into sausage skins. This work, however, was one of his more harmless material combinations. His rotting *Schimmelmuseum* [Mold Museum] (1992–2004) leaves little room for doubt as to his artistic intentions, but it still did not escape museumization. The dentist Hans Sohm bequeathed his extensive Dieter Roth collection to the Staatsgalerie Stuttgart in 1981.¹⁴ The restorers should not, nor want to stop the process of decay, but nevertheless they attempted to delay it by creating appropriate environmental conditions. Roth's works were to age with dignity and peacefully pass away, much like the human being in a good retirement home.¹⁵

Although one can still identify the classic notion of the work of art in a broad spectrum ranging from Albrecht Dürer to Dieter Roth, albeit with very different half-lives, there are still sufficient examples in contemporary art that evade this traditional notion of a work of art in the sense of an enduring object. Many artists work performatively, context-related, and in various media. Some of them, such as Yves Klein or Joseph Beuys, arrange their actions such that works are able to result from them, whereas others do not. This leads to the fact that the Fluxus movement can be documented but not exhibited. When presented, works that have emerged from actions require authorial interpretation. Difficulties arise when the author is dead, and the interpreters of his work are of differing views.

14 See Ina Conzen, *Dieter Roth. Die Haut der Welt*, Sohm Dossier 2, exhib. cat., Staatsgalerie Stuttgart, Verlag der Buchhandlung Walther König, Cologne, 2000, p. 11.

15 This is how the restorer Hermann Degel, responsible for the archive Sohm at the Staatsgalerie Stuttgart, formulated it during a telephone discussion with the author in October 2010.

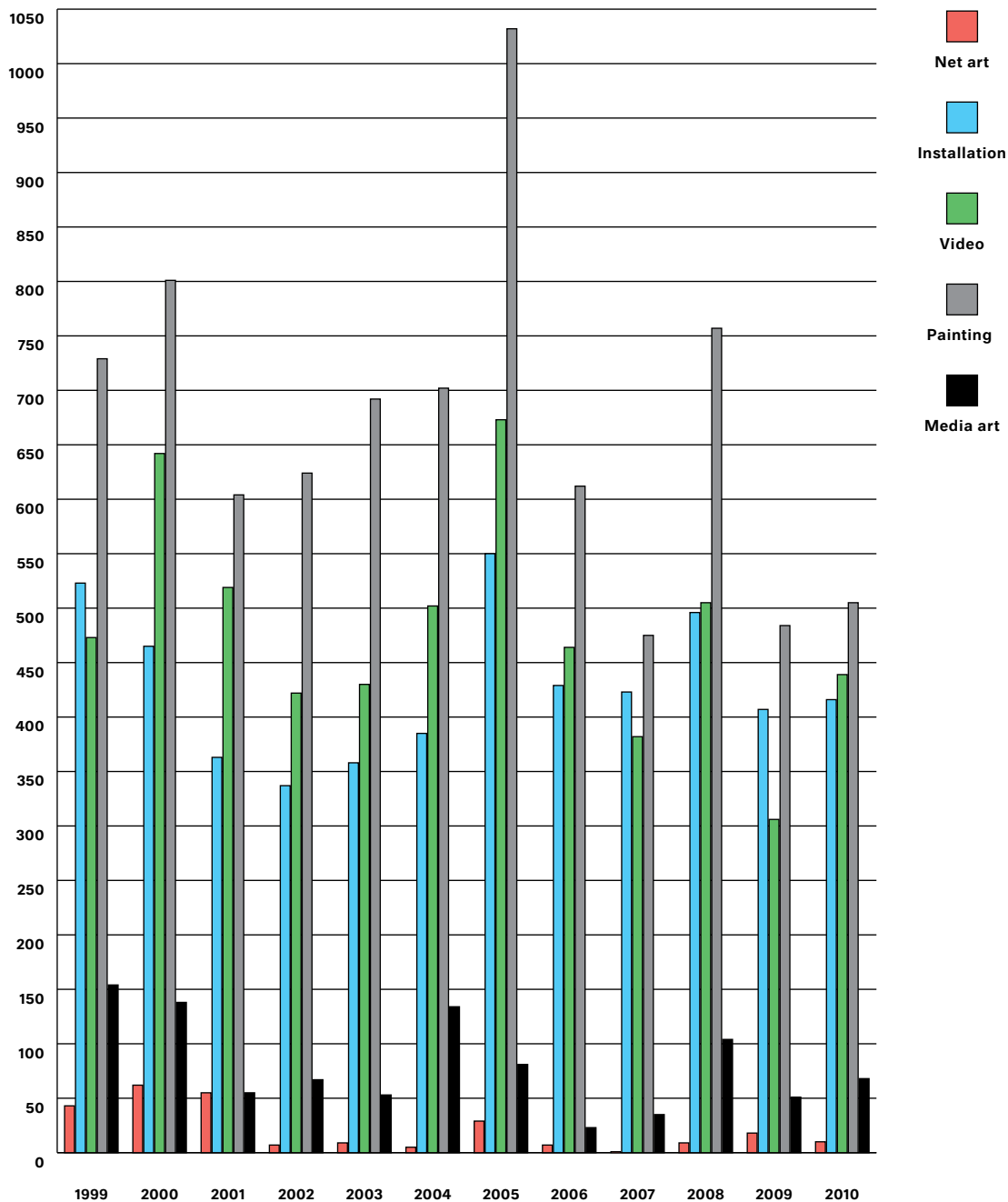


Frequency of references
to the term net art in the
periodical *KUNSTFORUM*
international
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The works of artists who create discursive platforms or conceive of exhibitions as stagings also resist collection and conservation in the usual sense. The works are time-based and their artists understand themselves as exemplary communicators and utilize the possibilities of initiating changes from the sphere of art. Their works are manifested in exhibitions that are based on their sketches of the project. At the end of the presentation, the props for the stagings are removed and are not necessarily materially conserved in a collection or in a studio. At present it is difficult to estimate the extent to which museum collection strategies will do justice to these changes in art production. If they are neglected because they elude the classic apparatus of collecting and conservation, a gap will emerge in the transmission of cultural heritage the causes of which are comparable to that of “digital oblivion.” At the same time, these reflections throw up questions about the extent to which the traditional museum is suitable as a site for all modes of transmission, and what changes may possibly be necessary. In view of the complexity of contemporary art forms, further specialization in the museum landscape is to be expected.

Storage Gaps and Amnesia

With respect to the above examples of contemporary art and in view of collecting, a conflict is emerging that will most likely not be without consequences. Since those responsible for public collections, not only for legal reasons but also for technical and museum ethical reasons, are obliged to maintain the substance of the collection and also the integrity and value of an object, it



Frequency of references to
the terms *net art*, *installation*,
video, *painting*, and *media art*
in the periodical *KUNSTFORUM*
international

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cannot be ruled out that the readiness to invest in works of problematic stability may be less than in objects whose condition does not present any fundamental problems. Perhaps, this is a reason why, from the point of view of conservation, precarious collections are often to be found in private hands.

Unfortunately, I am not in possession of any statistics with regard to the presence of media art or computer-based art in museum collections. However, if it is true that frequently preference is given to the typical and representative over and against the exceptional and the advanced, then media and network art in museums – leaving aside highly specialized institutions – will have far less a share than they ought to have in view of their importance: for media art – in the broadest sense of the term – anticipates and thematizes in an exemplary artistic form the far-reaching transformations that society is subject to in the age of mediatization and digitization. Thus, it could be that digital amnesia is not solely based on the lack of appropriate conservation strategies, but on poorly considered strategies of collection oriented on the broader public discourse. Because there digital art, in spite of its innovative power, remains underrepresented.

In order to substantiate this assumption, this discourse will have to be quantified. It would seem appropriate to undertake a statistical evaluation of reporting in one of the leading journals for contemporary art in Germany, *KUNSTFORUM international*. The basis is an annual output of six volumes with a total of approximately 2,500 pages containing essays, reports, discussions, interviews, and an extensive magazine section: this sample appears to be of sufficient size and covers a broad enough spectrum. One could object that the discourse is not amenable to quantification, since quality alone is the defining factor. However, it is incontestable that the keywords which feature in the discourse and their frequency in reporting do mirror the events in the exhibition system and in the art market.

Besides, what also speaks in favor of the procedure is the superb digital availability of the source material, which facilitates searching for keywords and counting.¹⁶ Whatever reservations we may have about the method, if we take a glance at the results of this investigation, then the frequency of the concept of net art over the last twenty years shows relatively strong fluctuations and does not exhibit an unambiguously continuous trend. The diagram (see p. 133) shows the events that have influenced discourse, for example, the increase in references to net art after the presentation of the exhibition *net_condition* (September 23, 1999–February 27, 2000) at the ZKM | Karlsruhe.

If one uses a differentiated spectrum of concepts for new art forms, such as net art, media art, video, or installation, and sets this in relation to a classic medium, such as painting, then one sees clearly what dominates the wider

16 Available online at: www.kunstforum.de/volltextsuche.asp?session=, accessed 12/27/2010.

discourse. If one assumes that the attention accorded by art criticism to new art forms corresponds to that of the collectors, then the chances for appropriate transmission of these art forms would appear to be rather limited. This disproportion makes it all the more important to presume that the transmission of media art and computer-based art is in a double sense precarious.

Summary

Museum and amnesia stand in a symbiotic relationship to one another. This attempt to review the theme of “museum and amnesia” should underline the following:

1. The transmission of material by the museum reproduces only an incomplete or distorted picture of past cultural reality. Amnesia is a characteristic feature of the museum, as is the construction of memory. “Digital amnesia” is also to be situated in this context.
2. The approach to ephemeral phenomena in contemporary art and the treatment of new art forms, which are time-dependent and at the same time placeless, demands revising the notion of the work in art, and examining the role of the museum as the location for a collection of works.
3. The desire for systematic, comprehensive, and representative collecting carries within it the danger of a certain standardization. It is doubtful whether digital art has already achieved an adequate presence in museum collections, and this, in turn, strongly impacts the problem of transmission.

How can the museum respond to this challenge? In its *Code of Ethics for Museums*, ICOM gives no indication as to what should be collected, but instead concentrates on the question of how. Besides stating the imperative necessity of clarifying provenances and the strict ban on unlawful trading, the *Code* also cites museums’ obligations to maintain and preserve their collections.

It is here that the obligation to give special attention to the problem of the digital heritage should be anchored. Particularly Internet-based concepts deserve attention, for with regard to the storage of text or image files, there are already promising solutions for the migration (see glossary, p. 601) of data and for the emulation (see glossary, p. 600) of programs. Since in 2004 ICOM adopted the “agreement on safeguarding the intangible cultural heritage” of UNESCO (October 17, 2003) and made it part of its mission and objectives, now would be the time to examine whether the Charter for the Conservation of Digital Cultural Heritage of UNESCO (passed at the 32nd General Conference of UNESCO, on October 17, 2003) can be thematized by ICOM. The research project *digital art conservation* at the ZKM | Karlsruhe likewise offers an opportunity for this.

From New Media to Old Media: Ambiguous Concepts, Complex Problems, and Open Questions

Hans Dieter Huber

1. Accelerating Change to Polar Inertia?

The technological transition from analog to digital modes of production, presentational forms, and archival strategies represents a profound cultural and social upheaval the dimensions of which have not yet been fully understood. Paradoxically, new media age faster than “old” media and this fact necessitates a fundamental reevaluation of all long-established conservation strategies. Whereas society’s cultural memory is oriented towards longevity and reliability, the operability of digital objects depends on upgrades at ever shorter intervals. The interests of the software industry run counter to the conservation and sustainability of cultural heritage. Therefore, the dependency of technological systems on corporate strategies and market interests is an acute threat to cultural memory.

2. Unclear Concepts Impede Adequate Understanding

In the current discussion about the conservation of contemporary art, various concepts are introduced without being clearly defined. Frequently employed without due consideration, especially concepts like materiality, original, document, or authenticity represent obstacles to a satisfactory understanding of the problem of long-term preservation of digital media art. Such terms must therefore be subjected to critical scrutiny.

2.1 Materiality and Presence

In 1988, the two literary scholars Hans Ulrich Gumbrecht and Karl Ludwig Pfeiffer launched an interdisciplinary discussion on the subject of materiality with the anthology entitled *Materialities of Communication*.¹ The publication contains papers of a colloquium held at the Inter University Centre Dubrovnik in 1987. Gumbrecht’s later publication *Production of Presence. What Meaning Cannot Convey*,² revisits the question of the relationship of materiality and presence using a new approach. The findings of these discussions are significant for advancing the question of conserving the substance and materiality of digital media art, and consequently deserve to be studied in detail.

1 See Hans Ulrich Gumbrecht and Karl Ludwig Pfeiffer (eds.), *Materialities of Communication (Writing Science)*, translated from the German by William Whobrey, Stanford University Press, Stanford, 1994.

2 Hans Ulrich Gumbrecht, *Production of Presence. What Meaning Cannot Convey*, Stanford University Press, Stanford, 2004.

The materiality of a work of art is the condition of the possibility of its aesthetic experience. The materiality generates the specific presence of the work, as a precondition for its experience. Hence, materiality plays a seminal role in the presentation of a work of media art. This is why any transformation of its materiality necessarily entails a shift in its aesthetic experience.

2.2 The Memory of Our Society

Similarly, the discussion about a society's memory is frequently conducted with recourse to poorly defined concepts. Sometimes reference is made to collective memory and sometimes to cultural memory, and on other occasions even to social, short, and long-term memory. What is vague here is the relationship that the respective concepts bear to terms such as recollection, storing, or archiving. In my opinion more precise definitions are more than urgently needed.

A complete human memory process comprises three different levels: *encoding*, *storage*, and *retrieval*. Moreover, it is evident that, taken by themselves, storing and archiving cannot be termed memory, although they represent a necessary precondition for memory. It is precisely here that the notorious ambiguity of the concept of memory arises. An entire memory process extends from encoding via storing and archiving to the reactivation of stored information. Or does the term "collective memory" refer to only one of these aspects? Does it mean the collective encoding of historic events, the specific form of storage and archiving, or the active recollection and processing of the historical information already stored and archived? In the final analysis, the process of active recollection, in other words the phase of *retrieval*, is decisive for dealing with historical objects.

This three-phase model of human memory demonstrates extraordinary similarities with the OAIS model, the *Open Archival Information System*, which is in the meantime the standard reference model for the long-term archiving of digital data, and was published as the ISO standard 14721:2003.³ The OAIS model also has three processes of memory formation: *ingest*, *archival storage*, and *access*. In a museum context, the process of ingesting is the acquisition of a work of art and its physical storage in the storerooms. For the actual long-term archiving an *Archival Information Package* (AIP) is created, which contains a complete set of descriptive informations about the stored contents. In the human memory process, this aspect is equivalent to the storing process, and in the museum context to the area of preservation and conservation. In addition, the OAIS model has three additional important elements, namely, data management, planning for long-term preservation, and archival administration.

3 See Nils Brübach, "Das Referenzmodell OAIS," in: Heike Neuroth, Armin Oßwald et al (eds.): *Nestor Handbuch. Eine kleine Enzyklopädie der digitalen Langzeitarchivierung. Version 2.3*, 2010, chap. 4:3; available online at: <http://nestor.sub.uni-goettingen.de/handbuch/index.php>, accessed 10/16/2012.

2.3 What Is an Original?

Frequent use of the terms “the original,” “the document,” and “authenticity” make it necessary to provide a more precise clarification of how they function before they are applied to questions relating to the long-term preservation of digital media art. Derived from the Latin word *origo*, which means source, well, or stem, the adjective “original” became part of the English and German languages by the fourteenth century. Since the fifteenth century, it is the antonym of the word “copy” in German *offizialese*.⁴ Jacob and Wilhelm Grimm use the substantive “original” to mean “the original in contrast to the copy or imitation.”⁵ What is denoted is the autograph or original text in contrast to a transcription or translation, as well as the prototype or archetype in contrast to a copy or replica. Semantically, the term only makes sense if used against the background of another object that is *not* an original but a copy, a transcript, an imitation, a translation, a representation, or a replica. Only the judgment of a scientific observer can make an object into an original. The statement that a certain object is an original, also implies a truth claim.⁶

2.4 What Is a Document?

The term “document” functions very similarly to that of the original, except that it refers to something else. The claim that a given object is a document is identical with the claim that this object is part of a history, and that this history is true. The word “document” originally derives from Medieval Latin and means “evidential record.” The word is a relatively late linguistic coinage; it makes its first appearance in the English language around 1425. It is probably a borrowing from the Middle French *document* meaning “lesson” or “written evidence”.

Let us probe a little further: In what ways can works of digital media art be documents and thus achieve the status of historical evidence? Any given object, person, or event can be a document. A fictive story or a tall tale can also transform any object into a document, a proof, or a piece of evidence for that story. However, the fictionality or falsity of the story will render the object of reference a fictive, invented, false, or even counterfeit document. If a story narrated about an object, a person, or an event is true, then we designate this object, this person, or this event as a true document of this story, and thus consider object, person, or event authentic.

4 Friedrich Kluge, *Etymologisches Wörterbuch der deutschen Sprache*, 23rd updated and expanded edition, De Gruyter, Berlin, New York, 1995, p. 524.

5 Jacob and Wilhelm Grimm, *Deutsches Wörterbuch*, vol. 13, Hirzel, Leipzig, 1854, Section 1347–1349; quoted after the online edition: <http://urts55.uni-trier.de:8080/Projekte/DWB>, accessed 10/16/2012.

6 Hence, the far more important question is which epistemological, ontological or, shall we say, which ideological function this concept assumes within a particular discourse.

2.5 Truth as Precondition for a Historical Document

We now return to our opening question of what makes a work of digital art a historical document. It becomes a document when it becomes part of a true story which makes reference to the work. Thus the historical evidence of a museum object depends on the truth of that story. This means that the status of a work of media art as a historical document of its period results from an extremely complex individual, collective, and social process of attributions and judgments, at the end of which the formal decision is taken that this work is a true document of a historical story, of a situation or fact. However, the judgment of truth as a result of a social consensus about the status of a document is always subject to revision at any time should new information come to light.

2.6 What Is Authenticity?

The English adjective *authentic* is derived, via the Medieval Latin *authenticus*, from the Greek *authentikos* to *authentēs* (author) before its sphere of application was extended such that the adjective in Medieval Latin may mean “original, real, reliable” as well as “acknowledged, lawfully binding.”⁷ According to Otto Prinz, who thoroughly researched the semantic connections of *authenticus* in his *Mittellateinisches Wörterbuch*, the word can mean anything from “original, genuine, unaltered, (well) attested; containing original documents; credible, reliable; authorized, legitimated, recognized, valid, certified, lawful, fully authorized, binding, expressly; as well as reputable, important, providing for, an authoritative teacher, a respectable and trustworthy man, an authentic transcript, an original, a credible report, or possessing an important dictum.”⁸

There are two things that appear interesting about the concept of authenticity. First, it is the reference to an author, who ensures the authentic provenance of an original in contrast to a copy. Second, the concept of authenticity touches on the aspect of a special credibility or reliability, which is established by a warranted and certified reference to an author.⁹ In museology, it is particularly the authenticity of the original that counts in the evaluation of an object.¹⁰ Surrogates, by contrast, are substitutes, such as copies, facsimiles, reproductions, or reconstructions.

7 The *Brockhaus*, vol. 3, F.A. Brockhaus, Leipzig, 2006, p. 9.

8 Otto Prinz, *Mittellateinisches Wörterbuch bis zum ausgehenden 13. Jahrhundert*, vol. 1, Beck Verlag, Munich, 1959–1967, section 1280–1283.

9 On the concept of authenticity, see also Susanne Knaller, *Ein Wort aus der Fremde. Geschichte und Theorie des Begriffs Authentizität*, Universitätsverlag Winter, Heidelberg, 2007; Susanne Knaller and Harro Müller (eds.), *Authentizität. Diskussion eines ästhetischen Begriffs*, Wilhelm Fink Verlag, Paderborn, Munich, 2006; Eva Ulrike Pirker, Mark Rüdiger, Christa Klein, Thorsten Leiendecker, Carolyn Oesterle, Miriam Sénécheau, and Michiko Uike-Bormann (eds.), *Echte Geschichte. Authentizitätsfiktionen in populären Geschichtskulturen*, Transcript Verlag, Bielefeld, 2010.

10 Friedrich Waidacher, *Handbuch der Allgemeinen Museologie*, 3rd unrevised edition, Böhlau Verlag, Vienna, Cologne, Weimar, 1999, pp. 170–171.

3. The Long-term Conservation of Media Art

With questions relating to the long-term conservation of works of media art, we are confronted by a special initial situation. First, a media artwork is generally only available as a one-off version. It is unique. Especially this property of an artwork plays an important role in installations and makes their long-term conservation so precarious. Second, there is the heterogeneity of the materials used, their different properties, their status, their function, and their state of preservation. Thus, in a media installation, there may be objects and materials produced, changed, or reworked by the artist personally. Third, there has to be a differentiation between the treatment of analog media, which are digitized at a later point in time, and born-digital media; that is, media or data, which were produced digitally. Digitization of analog originals marks the transition from the analog to the digital age. Analog original and digital copy are similar only on the surface.

In the museum context there is another group of objects, which are neither authentic nor original, but which fulfill an important function: the surrogates. Typical surrogates are the copy, the facsimile, the reproduction, the cast, the imitation, the reconstruction, the model, or the maquette. They should not be negatively evaluated as a matter of principle. As Winfried Nerdinger has remarked: "A copy is not a swindle, a facsimile is not a forgery, a cast is not a crime, and reconstruction is not a lie."¹¹

The relationship between exchangeable and nonexchangeable components is part of the historical authenticity of a piece of work. Compared to the richness of an original, a surrogate offers only a very limited repertoire of social and cultural meanings. Thus, according to the museum curator Friedrich Waidacher, surrogates obstruct the museums' present from referring to the original, historical context.¹²

To date, there are various acknowledged strategies for the conservation of contemporary artworks¹³ and of digital data. The most conservative is the purchase and storage of spare parts.

3.1 Storage or the Depositing of Spare Parts

The standard strategy adopted by most museums consists in storing a work physically; that is, either storing specific equipment on shelves or archiving digital data on disks, CDs, or hard drives. What does this storage strategy imply in the case of digital objects? What could a museum or an archive physically store of digital works of media art? The data, the hard drives, the

11 Winfried Nerdinger, "Zur Einführung – Konstruktion und Rekonstruktion historischer Kontinuität," in: Winfried Nerdinger (ed.): *Geschichte der Rekonstruktion. Konstruktion der Geschichte*, Prestel Verlag, Munich, Berlin, London, New York, 2010, p. 10.

12 Waidacher 1999, p. 176.

13 Jon Ippolito, *Variable Media Paradigm*, available online at: www.variablemedia.net/e/index.html, 11/05/2012, see menu item *terms*, then subitem *strategies*.

software, the operating system, the computer, the monitors, the peripheral devices, the cables and interfaces – in fact, a heterogeneous mix of various materials and media, each element of which, in the worst case, requires different storage conditions.

To conserve data or a program in its original hard- and software environment, and to preserve it in its specific functionality, it is necessary to preserve the computer with its original operating system, the original software, as well as the corresponding interfaces and peripheral devices in a complete and fully functional form. But even masses of stored spare parts, like all materials, are susceptible to processes of aging and physical decay, even though they may have never been used or were stored in mint condition. When the storage of replacement parts is no longer of any help as a conservation strategy, migration (see glossary, p. 601) is the next option.

3.2 Migration

The object of migration is that image, text, or audio files, together with their contexts and their indexing data can remain readable for longer periods of time within the context of their respective time-referenced hard- and software architectures. What does the strategy of migration mean for the conservation of digital objects? Migration is not a major problem so long as the archived object in its functionality can be preserved on a more recent operating system with updated software. However, as we know from net.art, some digital works of art, depend on a whole array of control elements, scripts, or protocols that are no longer in use anymore. We can see such cases every day, if we look at works of net.art that were made in 1995 with the aid of browsers from 2011 and notice unintentional changes or the formation of digital artifacts (see glossary, p. 599). Then, the limits of migration as a conservation strategy have definitely been reached. The next step for conservation is the concept of emulation (see glossary, p. 600).

3.3 Emulation

The concept of emulation was proposed in 1995 by Jeff Rothenberg from the RAND Corporation, who thought that in the long term the strategy of migration would not be reliable enough. In principle, emulation reconstructs the functionality of an operating system from the period when the archived digital object was created. In other words, hardware and operating system that are no longer accessible are simulated so that the digital information can be preserved and remain retrievable at a later period in its original software environment, and thus also with its original functionality and aesthetics.

There are advantages and disadvantages to the strategy of emulation. One advantage consists in the fact that an emulator, which emulates a certain obsolete operating system on a newer contemporary system, is theoretically capable of emulating all software programs and digital objects which once

ran on this operating system. Thus, only one emulator needs to be programmed for an obsolete operating system. According to some specialist authors, in the long run the concept of emulation has financial advantages over and against migration.

However, a basic problem of emulation is that the emulator itself is dependent on a certain operating system, and can only run on this. Thus, when more recent versions of an operating system on which an emulator is based are developed, there is a danger that the emulator itself will no longer function. Thus an emulator is subject to the same laws of aging and decay as the digital objects it is meant to emulate, and sooner or later will have to be migrated too. To this end, there are meanwhile several new possible solutions, such as the Universal Virtual Computer¹⁴ or nested emulation.¹⁵ However, if emulation does not represent a viable solution for long-term conservation, at present the last possibility for conserving an artwork is its reconstruction.

3.4 Reconstruction

The most radical conservation strategy consists in reconstructing an artistic work each time it is set up. This strategy can be used for spatial installations, performances, and expanded media. The reconstruction or reenactment of a work should to be based on a most precise documentation, notation, or operational calculus. The best is a detailed notation, a calculus, or good documentation – ideally produced by the artist – that give the decisive parameters or significant properties of the work or object to be reconstructed. A tried and tested tool in conservation science, for example, is to conduct in-depth interviews with artists about an authorized form of reenactment or reinstallation of the work, and to document the variable and invariable parameters in the best possible form.

4. Ethical Rules in the Treatment of Digital Media Art

In recent years there has been intensified debate in the conservation sciences about values and responsible ethical behavior of conservators and restorers toward the cultural heritage of the past. Clearly, a need has developed to discuss issues relating to ethically responsible actions in conserving artworks, and to find a workable consensus. An important trigger of this debate was a doctoral thesis written by Katrin Janis on the ethics of restoration,¹⁶ in which she developed five categories of ethical and moral behavior in the treatment of cultural heritage.

14 For more detail on this, see Stefan E. Funk, "Emulation," in: Neuroth et al., 2010, chap. 8:21.

15 Dirk von Suchodoletz, *Funktionale Langzeitarchivierung digitaler Objekte. Erfolgsbedingungen des Einsatzes von Emulationstrategien*, PhD diss., Albert-Ludwigs-Universität, Freiburg (Breisgau), 2008, Nestor Edition, vol. 1, pp. 105–106.

16 Katrin Janis, *Restaurierungsethik im Kontext von Wissenschaft und Praxis*, PhD diss., Otto-Friedrich Universität, Bamberg, 2002, M-Press, Munich, 2005, p. 119.

The category of *responsibility* is given central importance, which Janis, following Otfried Höffe, defines as a three-part relation: the responsibility of persons *for* tasks that have been taken on *to* an authority which demands accountability. Her second category is the competence to make *critical and practical judgments*. The third category of *interdisciplinarity* is particularly interesting. Janis calls for an ongoing dialog and a culture of openness and cooperation between the different sciences. Ideally she would like to see experts from various disciplines working together on a given conservation problem on equal terms, and agreeing on the relevant concepts and definitions in order to find a common language. Working in an ethically responsible manner on the long-term conservation of digital media would thus essentially be a team endeavor, which should be carried on in a spirit of equal cooperation. Janis's fourth category is the demand for a *culture of timeliness*. In contrast to this, I would prefer the term "anticipatory action." Anticipatory action means thinking about the limits and possibilities of long-term conservation as early as possible. As a fifth category of ethical and moral action in conservation science, Janis introduces the *conservation of the original and its authenticity*. The original is defined by its historical dimension. The state of the original is part of its authenticity. To the extent that the original state changes due to aging, information disappears that constitute the authenticity of the object. Even when an original is gradually lost over time due to aging, usage, or damage, its authenticity remains, paradoxically, for as long as a small, minute part of the "original" still exists.

To conclude, I would again like to emphasize that with respect to good rules, strategies, and practices of preservation and conservation of digital objects we are still very much in the early stages. To compile, arrange, and critically appraise the various approaches and methods of media conservation alone would already be an important step forward to a better understanding of the range of problems with which we will continue to engage in the future.

Translated from the German by Justin Morris

Documenting and Conserving Technological Art: The Evolution of Approaches and Methods

Alain Depocas

In the field of art practices that use technology, documentation and conservation are indissociable. Every intervention designed to conserve a work of art requires supporting documentation that will make it possible to take decisions and to act with due regard for the work's authenticity. Sometimes this documentation is the only evidence left of a work's existence, for when the deterioration of its constituents has gone too far conservation strategies such as migration (see glossary, p. 601) or emulation (see glossary, p. 600) are no longer an option. More frequently a hybrid process of conservation and documentation will provide access to the art work and enable it to be understood in the future.

Over the past ten years or so, a number of research groups have been engaged in developing strategies, methods, and tools for documenting and appropriately conserving technological artworks. Their efforts have also helped us to understand better the specific nature of these art practices. The methods are often complementary, and fluctuate between two poles: preserving the work's physical components for as long as possible, and the riskier option (though often unavoidable in the long term) of migrating a work's contents, instructions, and codes to new media or new technological devices that will make it possible to reproduce the work's unique behavior and effects.

To achieve a better understanding of how complex and interesting the theoretical and methodological progress of the last ten years is, we first need to delineate the field of our subject of inquiry. In other words, how should we describe and label these art practices that use technology? The question of terminology is never simple and becomes more complex when it is posed in a multilingual international context. It becomes even more complex due to the fact that technical terminology evolves every rapidly, just like the terminology of the branch of art in question, which often relies on the latest buzzwords and "memes." To be as inclusive as possible, I have decided to refer here to "technological art." Although this term is often associated with a specific art movement that flourished in the 1960s,¹ it nevertheless has the advantage of

1 One thinks in particular of Experiments in Art and Technology (E.A.T.), founded 1967 by engineers Billy Klüver and Fred Waldhauer and artists Robert Rauschenberg and Robert Whitman, or of the Art and Technology (A&T) program founded in 1966 by Maurice Tuchman at the Los Angeles County Museum of Art. On E.A.T., and especially of the series of events 9 Evenings: *Theatre and Engineering*, see the work of Clarisse Bardiot: www.fondation-langlois.org/html/f/page.php?NumPage=572, accessed 04/30/2011. On A&T, see the

covering a great number of art practices which have in common the use of technology. They include, among others, digital art, network art, electronic art, Web art, and new media.

Above and beyond the fact that they exist in – and by means of – a technological environment, these works also have several characteristics in common that we cannot avoid taking into account when developing tools and methods for documentation and conservation.

The Things to Be Documented and Conserved

First of all, technological artworks behave in certain ways and produce certain effects. These take many forms, sometimes in combination with each other, and are frequently complex. Interactive works, in particular, present a range of behaviors that pose major challenges. These works are reactive and, in most cases, “open.” This openness may, for example, manifest itself by offering the viewer the possibility of altering the work by adding to, changing, or manipulating its content. This characteristic alone makes the documentation and conservation of such works extremely complex, since what the documentation has to “capture” is ephemeral and constantly changing. Rather than trying to capture every possible iteration of such a system, it is more appropriate to identify what is happening in the artwork under these conditions of variability. If, for example, an algorithm injects randomness into the feedback of a system, it must be preserved intact.

However, even less complex technological works, using standard components and familiar software, and producing relatively linear effects without feedback can rapidly become difficult to preserve. Of course, the first reason why these works deteriorate is technological obsolescence, which, as we know, tends constantly to accelerate. The work’s permanence is soon threatened by mechanical wear and tear, deterioration of computer components, and the flood of new versions of software, protocols, and languages. Added to these problems is the gradual disappearance of the knowledge and experience needed to repair, migrate, and evolve the work throughout its life.

The forms of technical knowledge brought into play in designing and making a work, are among the elements that are “fragile” and often difficult to conserve. Artists increasingly call upon collaborators and external suppliers, and veritable knowledge networks, with variable geometries, are created. In such a context, the information needed to document and conserve works becomes dispersed. This information proves very difficult to reassemble and therefore to conserve. In addition to the “reality” of the work contained in its tangible, physical, or digital constituents, there are the effects it produces on

viewers and the artist's intention. These two aspects are often overlooked, even though they must be addressed, especially in the case of interactive works where they are more complex.

In traditional art practice, the question of the artist's intention is certainly important, but it is always limited to (or rather collides with) the work itself, which is stable and self-contained. In the case of interactive, open, variable works, the question of intention is at once more complex and more fundamental, because it presents the work as an instrument that can be "played" by the viewer and by means of which a vast number of possibilities manifest themselves. In such a context, the notion of "intention" opens up, becomes more conceptual, and is obliged to take into account an *n*-factor, the viewer-actor who brings in his or her uniqueness, multiplying the artistic apparatus' possible effects. This situation makes the documentation of the work more complex, because in one way or another it has to be capable of registering the artistic intention. In addition to intention there is the question of reception, or more precisely, the experience of the user, the viewer. In the case of an interactive work, the user is part of the whole artistic apparatus: the user is included, movements are captured, gestures, comings and goings alter the work, set off actions, and are translated into various kinds of feedback. This experience forms the core of the artist's intention, but it to some extent evades it, because it is determined by the uniqueness of each viewer or user.

Documentation of this audience experience is complex and has been the subject of some very interesting research, notably by Lizzie Muller, who proposes a methodology for documentation based on oral history. Within the framework of a number of case studies,² she interviewed many users of interactive art to collect their personal accounts and impressions. These interviews demonstrate that there is sometimes a considerable gap between the artist's intention and the actual experience of the viewer-user. That information helps us understand the work better and to go beyond traditional documentation, and it will also prove most valuable when we have to take decisions about the conservation of a work, because it will provide us with information about which aspects of the work produce effects and provoke

2 See Lizzie Muller, *Vers une histoire orale des arts médiatiques* (2008), available online at: www.fondation-langlois.org/html/f/page.php?NumPage=2096, accessed 30/04/2011; as well as the case studies on the capture and documentation of user experience in connection with David Rokeby's *The Giver of Names* (available online at: www.fondation-langlois.org/html/f/page.php?NumPage=2121, accessed 04/30/2011) and Rafael Lozano-Hemmer's *Subtitled Public* (available online at: www.fondation-langlois.org/html/f/page.php?NumPage=2111, accessed 04/30/2011). See also Rolf Wolfensberger's work on Paul Sermon's *Telematic Vision* (available online at: www.fondation-langlois.org/html/f/page.php?NumPage=2169, accessed 04/30/2011) and Katja Kwastek's on *Tmema, The Manual Input Workstation* by Golan Levin and Zachary Lieberman (available online at: www.fondation-langlois.org/html/f/page.php?NumPage=2220, accessed 04/30/2011).

feelings in the viewer, sometimes even over and above the artist's intentions. These are all additional elements that it is essential to preserve.

While the ways in which works behave do indeed present major challenges for documentation and conservation, we should not overlook the question of their technological components, both physical and digital. They remain the core of the work and it is through them that it functions. The notion of variability – now established and recognized in so-called “variable media artworks” – does not permit us to go beyond what constitutes a work's authenticity and integrity when the time comes to present it by using new or different technological means. Research carried out by the Variable Media Network³ has made it possible to produce tools and a methodology that can identify which elements of a work are potentially variable and which are not. The Variable Media Questionnaire (VMQ) enables us to produce unique, innovative documentation for a work by inviting an artist, or someone with significant experience of the work, to answer a series of questions about the different ways in which it behaves. The questionnaire enables us to understand what can and what cannot change in the work. Thanks to the VMQ, the creator of a video work, for example, will have the option of deciding that it can be shown on a very large screen, while another artist will decide that it is imperative that their work be shown on a screen of a very precise type and with a specific resolution, otherwise its integrity will suffer. The VMQ thus enables us to record what an artist wishes to happen to a work in the future.

Nevertheless, even when an artist states that a work may be presented in a different medium or using a different technology from the original one, or that such and such effects are secondary, and it is not imperative to preserve them in future iterations of the work, it is none the less true that the components and technologies of the “original” version possess their own historicity, over and above the effects they are meant to produce in a work. In a documentation model that is appropriate for technological art, this historicity must be taken into account. The majority of technologies used by artists impose their own limitations and specificities, and present challenges specific to a given period in time. Making a work with a touchscreen in the early 1980s did not present the same challenges as doing the same thing today. The limitations involved in accessing and using certain technologies have direct effects on the decisions artists make, at a given point in time. The same goes for the effects these technologies produce on viewers. People who in the early 1980s interacted with the work *The Erl King*,⁴ by Grahame Weinbren and Roberta Friedman, had probably never used a touchscreen before. How are

3 Available online at: <http://variablemedia.net/e/welcome.html>, accessed 04/30/2011.

4 On this subject, see the report by the engineer Isaac Dimitrovski on the work he did in the context of producing a digital version of *The Erl King*, available online at: www.variablemedia.net/e/seeingdouble/report.html, accessed 04/30/2011.

we to regain the effect produced by showing a work using a totally novel technology when a work is reactivated years later? This is impossible, of course, and that is why it is so important to document the viewer's experience if we are to understand how a work has been perceived at different moments in its history.

The Variable Media Network and Its Successors

For the past ten years or so, various researchers, research groups, and organizations have been trying to develop documentation models capable of encompassing all the features of technological art. Some of this work offers tools that are specific to technological art, while others put forward more holistic approaches and are associated with the activities of conservation, collecting, and cataloging.

The Variable Media Network is the product of work carried out by Jon Ippolito and his colleagues at the Solomon R. Guggenheim Museum, New York. In partnership with the Daniel Langlois Foundation for Art, Science, and Technology, the Network has produced a publication, *L'approche des médias variables: la permanence par le changement*,⁵ as well as the VMQ and an exhibition entitled *Seeing Double*,⁶ presented at the Guggenheim Museum in 2004, whose theme was the validation of emulation as a conservation strategy for technological art. In addition to *The Erl King*, by Grahame Weinbren and Roberta Friedman, *Seeing Double* presented works by Cory Arcangel, Mary Flanagan, JODI, Robert Morris, Nam June Paik, and John F. Simon Jr. All these works were presented in at least two "versions": the "original" and a second one using emulation in one form or another in order for it to function. Only Nam June Paik's work *TV Crown* was not presented in an emulated version. It is, in fact, impossible to present an emulated version of *TV Crown*, which is based on an intrinsic physical characteristic of the cathode ray tube. *TV Crown* thus served as a counterexample in the exhibition to demonstrate the limits of emulation as a conservation strategy.

Subsequent to the work of the Variable Media Network, research groups consisting of various bodies, most of whom had worked in collaboration with it, have successively taken over its activities. Archiving the Avant-Garde: Documenting and Preserving Variable Media Art⁷ and Forging the Future,⁸ in particular, have continued to develop the VMQ, of which the latest version

5 Alain Depocas, Jon Ippolito, and Caitlin Jones (eds.), *Variable Media Approach. Permanence through change/L'approche des médias variables: la permanence par le changement*, Solomon R. Guggenheim Museum, New York, The Daniel Langlois Foundation for Art, Science, and Technology, Montreal, 2003; available online at: www.variablemedia.net/e/preserving/html/var_pub_index.html, accessed 05/11/2012.

6 Available online at: <http://variablemedia.net/f/seeingdouble/index.html>, accessed 04/30/2011.

7 Available online at: www.bampfa.berkeley.edu/about/avantgarde, accessed 04/30/2011.

8 Available online at: <http://forging-the-future.net/>, accessed 04/30/2011.

is now available online.⁹ The Media Art Notation System (MANS),¹⁰ developed by Richard Rinehart, provides a notation system for technological art. It consists of a conceptual model for standardizing the organization of information about a work. MANS is based on a structure in XML format, which is expandable and takes account of the changes a work undergoes during its life. MANS took its inspiration from the VMQ and the Capturing Unstable Media Conceptual Model (CMCM) proposed by V2_Institute for the Unstable Media, in Rotterdam.¹¹ The CMCM¹² was developed as part of a research project in 2003. The model offers a structure for documentation in ontological form, with strategies for data capture and a structure for metadata. The CMCM makes it possible to integrate the relevant documents and to create links between them. It also makes it possible to describe the interactions of user-viewers and takes into account interdisciplinary factors, and creative work that is distributed among several authors and collaborators. The CMCM is closely associated with the work of V2_, which offers residencies for artists and gives them access to technical resources.

Inside Installations: Preservation and Presentation of Installation Art¹³ is another major research project that has produced useful tools for documenting and conserving works in the field of technological art. This project, which ran for three years, from 2004 to 2007, brought together some thirty European museums, each of which focused on a specific installation in its collection. All the installations contained and/or depended on technological components. This large number of case studies enabled the project to produce a documentation model and a method for documenting light effects, sounds, and movements.

Matters in Media Art – Collaborating towards the care of time-based media¹⁴ is an ongoing project that brings together a group of museums and a private collection. Participants include professionals at Tate Modern in London, the Museum of Modern Art (MoMA) in New York, the Museum of Modern Art of San Francisco (SFMOMA), and the New Art Trust, which supports the project. Matters in Media Art supplies the appropriate conservation tools for technological art and offers resources such as an acquisitions guide and a loans guide designed for museum staff. The expertise of specialists such as

9 Available online at: <http://variablemediaquestionnaire.net/>, accessed 04/30/2011.

10 See Richard Rinehart, *A System of Formal Notation for Scoring Works of Digital and Variable Media Art*, available online at: www.bampfa.berkeley.edu/about/formalnotation.pdf, accessed 04/30/2011.

11 The structure of MANS is a hybrid of several systems: the Dublin Core, the CDWA (Categories for Descriptions of Works of Art) of the J. Paul Getty Trust, in association with AITF (Art Information Task Force) and the DIDL (Digital Item Declaration Language) of the MPEG-21 format.

12 Available online at: <http://capturing.projects.v2.nl/index.html>, accessed 04/30/2011.

13 Available online at: www.inside-installations.org/home/index.php, accessed 04/30/2011.

14 Available online at: www.tate.org.uk/research/tateresearch/majorprojects/mediamatters, accessed 04/30/2011.

Pip Laurenson at Tate Modern, Glenn Wharton at MOMA and Jill Sterrett at SFMOMA has made it possible to produce some extremely valuable tools.

The DOCAM Documentation Model

The Research Alliance Documentation and Conservation of the Media Arts Heritage (DOCAM)¹⁵ adopted a different structure and methodology. This multidisciplinary research group, made up of various bodies including museums, university departments, and research organizations, worked almost exclusively on the basis of case studies, that is, on works held by participating museums. The initiative for DOCAM came from the Daniel Langlois Foundation for Art, Science, and Technology and its work took place between 2005 and 2010. The project gathered together widely varying forms of expertise, in fields such as library science, conservation, cataloguing, art history, public relations, technology, and IT. In addition to organizing annual conferences and postgraduate-level seminars, DOCAM produced and published five major research tools: a cataloging guide and a conservation guide, both designed for museum staff, a bilingual French–English “glossaurus” (GLOssary-theSAURUS), a timeline of technological developments, and a documentation model adapted to the specific characteristics of technological art. These tools and resources, and video recordings of conference and seminar presentations, are available on the DOCAM website. The site also includes dossiers on the many works that were the subjects of case studies, notably works by Philip Beesley, Jim Campbell, Alexandre Castonguay, Janet Cardiff, Max Dean, Stan Douglas, Gary Hill, Jenny Holzer, Greg Lynn, Nam June Paik, David Rokeby, and Bill Viola.

The DOCAM documentation model¹⁶ offers a structural framework within which all the information pertaining to a work can be assembled, organized, and made accessible. The documentation is created by different contributors at each stage of a work’s life cycle. The model is in the form of a visualization interface for illustrating the links between the documents, their creators and the different stages of the work’s life cycle, its successive iterations, and its components. It was designed to accommodate an unlimited number of agents (producers and users), sources, and types of documents. It also encompasses the work’s life cycle and makes it possible to describe it hierarchically, taking as its model the Functional Requirements for Bibliographic Records (FRBR),¹⁷ developed by IFLA, the International Federation of Library Associations, and adapted for application to technological artworks. This hierarchical description makes it possible to take into account the fact that these works may have

15 Available online at: www.docam.ca, accessed 04/30/2011.

16 Available online at: www.docam.ca/en/modele-documentaire.html, accessed 04/30/2011.

17 Available online at: www.ifla.org/en/publications/functional-requirements-for-bibliographic-records, accessed 04/30/2011.

many parallel “existences,” which may take the form of multiple versions, editions, or copies, to name only the most frequent. The model offers a hierarchical structure by which to describe the work, which goes from the generic level to levels that are increasingly granular, so that it can account for all the possible iterations and changes that the work and its components may undergo throughout its life cycle. The hierarchical levels are as follows: the *work*, “a distinct intellectual or artistic creation,” the *expression*, “the specific intellectual or artistic form that a work takes each time it is ‘realized,’” the *manifestation*, “the physical embodiment of an expression of a work,” and the item, “a single exemplar of a manifestation.”¹⁸

Furthermore, the DOCAM model approaches documentation as a source of information with several roles, depending on how and when it is used. When the work is first conceived documentation serves the needs of the artist and his or her collaborators, who are engaged on its production. As the work develops, documentation serves the needs of an increasingly large number of users, from the curator to the commissioner and the art critic, playing an important role in the communication, dissemination, and history of art. Documentation is also used and developed in the context of various other activities, including the installation, conservation, and restoration of the work, and later, its reinstallation or even its possible reinterpretation (see glossary, p. 601). One may in some cases imagine using certain documentary elements for purposes of compensation to make up for the various “losses” or damage that the work has suffered, caused mainly by the technological obsolescence of its components. Finally, documentation is what survives the work. It becomes its historic witness, sometimes in addition to a number of fragments and relics.

The DOCAM website contains three examples of the use of its documentation model, in the form of interactive tables or visualization interfaces. The three tables contain all the information collected for David Rokeby’s *Machine for Taking Time* (Boul. Saint-Laurent), Nam June Paik’s *Royal Canadian Mounted Police*, and Philip Beesley’s *Hylzoic Soil*. The tables present the documents relating to a work, organized as follows: the work’s life cycle, divided into key moments such as the work’s creation, dissemination, and hierarchical description, according to the levels described above, and the agents, or authors of the documents, such as the artist, curator, restorer, critic, or technician.

None of the documentation models presented here is perfect, and none is complete. None of them is able to take account of all the information that needs to be collected, produced, recorded, organized, preserved, and presented. In addition to that, technological art, the use that artists make of technological tools, and the effects of these works on users and viewers are

18 Available online at: www.docam.ca/glossaurus/, accessed 04/30/2011.

constantly evolving and quickly render obsolete any documentation model that is categorical or rigid. Lastly, the amount of work, the expertise needed, and the speed and growing complexity of technological development mean that any attempt to produce exhaustive documentation becomes an exercise that is practically impossible to carry out other than in a specific research context, like the Variable Media Network, Capturing Unstable Media, Inside Installations, Matters in Media Art, or DOCAM. In this context, it becomes urgent and important to develop tools and resources to enable each person who actively intervenes in the life cycle of a work to record and preserve the relevant documentary items.

Translated from the French by Imogen Forster

Formats, Strategies, Interpretations, and Translations

Antoni Muntadas

In the 1970s words like “dematerialization,” “impermanence,” and “ephemeral” were on the agenda. And other words like “preservation,” “conservation,” and “durability” were not. I think it’s a paradox because I constantly come across works from that period which have been preserved. I discovered a couple of months ago that one work I produced in Brazil was being shown in Stuttgart. It was a work that I thought was lost but then it reappeared. And lately, a work I produced for Antwerp reappeared in Seville.

At that time ideas about what was to be preserved became very problematic. There was one word that appeared during that period which was “documentation.” The majority of the documentation for works that were produced at that time existed through photography and later through film and video documentation. Documentation was, at that time, a new word because I don’t think that it had the same meaning in relation to painting or sculpture, in which case one spoke of reproduction. Documentation has another meaning, a much more profound one. It was not a substitution of the work – it was a kind of image to remind one of a specific work. I do not want to enter into a discussion about the original and the copy, as this is beyond the scope of this contribution.

For museums of the 1950s and 1960s, it was not problematic to preserve painting, sculpture, or photography. However, with the introduction of kinetic works, performance, and works with new technologies, things became more difficult. If we agree that one of the functions of museums is to conserve works, then this function is no longer adequate if museums are to keep up with the work artists are producing. I think there’s been a gap there. Museums have preservation procedures for oil painting, for sculpture and photography, but I don’t think that they’re up to date with regard to other art forms. In recent years there have been efforts to conserve certain works through the use of technology. In one way I would say that this is a matter of the museum’s responsibility as much as the artist’s responsibility.

Museums and artists need to accept that there is a need to destroy more. Artists should destroy more works, and keep works that are most relevant. Why keep all the work? In scientific research, for example, only data which is relevant is kept. With artworks, we could keep what we think is the synthesis of the work. Everything that surrounds the works, those things that become the objects of fetishistic admiration or market interests, should not be preserved. We need to destroy more. We need to make decisions.

Related to this is the responsibility of artists to create their own vocabulary that explains what it is they are doing with the work. Somebody like Sol LeWitt left behind clear notes, certificates, and documentation that make very clear what his work is about. At the other extreme, somebody like Hélio Oiticica left more open instructions for the interpretation of his works. On the one hand there are artists giving very clear instructions, and on the other, artists who don't give any instructions at all. We thus have a spectrum of interpretation that is very complex. It is the responsibility of the artists, if they care, to give instructions – to give notes and diagrams – and to keep what they think is necessary. For example, the artists can keep something that is exemplary of the work in an anthropological sense. I like to use the word “artifact” for works of art, in the sense that they represent something of the time, the geography, and the context of their production.

I will enumerate the terms that I want to address. I think “artifact” is an important element for understanding that the work needs to be activated. I think in a way the work of art is activated by the viewer, but in certain cases, it could be activated by the interpreter – this could be the curator. The term “*partition*,” [score] as used with reference to music, is interesting when applied to visual art. I like this idea that sometimes the artist's work is considered the interpretation of a score. The author, and to some extent the curator, are the composers. “Interpretation” and “translation” are part of

Antoni Muntadas
The Last Ten Minutes
 Documenta 6
 1976
 © Antoni Muntadas



what I believe to be strategies through which the work can be activated. From this perspective I want to discuss certain works that illustrate what it is I am talking about.

I would like to present some of my own works as case studies. One work, *The Last Ten Minutes* (Kassel, Washington, and Moscow, 1976), made for Documenta 6, is a three-screen installation that still exists, is conserved, and belongs to a collection. When it is presented today, it is a reinterpretation of the work twenty-five years after it was made. The work *Sensorial Experience*, also from the 1970s, exists only in photographs and videotapes. At that time, the viewer came to relate to the work through direct experience. Such works, I feel, exist only at the moment they happen. Supporting material does not need to be kept in storage because the notes and diagrams that come with the work are enough to present it again. The direct experience is lost.

Between the Frames is a work that addresses the 1980s and the system existing between art, the artist, and the audience. There are eight chapters: “the dealers,” “the collectors,” “the gallery,” “the museum,” “the professors,” “the critics,” “the media,” and “the epilog.” In this space – the forum which is a reversed panopticon – the audience takes the position of control to see the system. This work has been shown in different places. For each of the work’s presentations, my intention is to provide different kinds of notations and instructions that address the life of the work. The eight chapters of the work contain several interviews; they are fifteen to forty-five minutes long and were conducted with 150 people from the art world between 1983 and 1991. It’s an overview of the art system and its players, and the intermediary people between the art, the artist, and the audience. The first presentation was at the Wexner Center for the Arts in Columbus, Ohio – an example of deconstructivist architecture by the architect Peter Eisenman. I then had the opportunity to show the work in Bordeaux, at a museum that is in its architecture very well structured, the CAPC musée d’art contemporain de Bordeaux [Museum of Contemporary Art of Bordeaux]. The typology of the building in Ohio made me construct the work in the form of a forum, but in Bordeaux I responded by deconstructing the work. I located every chapter in a different

Antoni Muntads
Sensorial Experience,
Experience 1
Vilanova de la Roca,
Barcelona
1971

© Antoni Muntadas



part of the museum: the “museum” chapter was in the permanent collection, “the critics” in the library, “the collectors” where the staff was working – this is an intimate space, to which collectors normally have access. This was a way of showing the work differently.

Since then, every time I have shown *Between The Frames*, I have proposed and delegated the work. In Rotterdam, an art historian interpreted the work. I gave him the software and he took the decisions on how to show the work. I only asked for a text that would explain the reasons for his interpretation of the composition. In Montreal, at the Musée d’art contemporain [Museum of Contemporary Art], I delegated it to a sociologist. And I think this was because the work also has elements of art history, sociology, philosophy, and economics. The interpretation of *Between The Frames* in Montreal was very different from the others, but I delegated it and I feel like it was a score of music. If someone wants to sing *a cappella*, it’s very different from an interpretation by a symphony orchestra or a chamber ensemble.

A philosopher was then the interpreter in Berkeley. He disseminated the eight chapters around the campus of the University of California, Berkeley, in the departments of art history, anthropology, and so on. Again, what I asked of the interpreter was his writing, his interpretation, and that in his activation of the work he would take full freedom to do what he felt was interesting in terms of the context and the discipline he came from.

Antoni Muntadas
Between the Frame
 1983–1991
 © Antoni Muntadas





Antoni Muntadas
The Board Room
 1987
 © Antoni Muntadas

A work that has a much more circumscribed status within a museum collection is *The Board Room* (1987). The work belongs to the National Gallery in Ottawa, Canada. The process of its conservation has been interesting because, at its origin, its production was very cheap. It was shown on video monitors bought on Canal Street in New York for 30 US Dollars. The museum asked me for my permission to digitize the videos. “If you want to do that,” I said, “go for it.” I think in a way it guarantees the life of the work. This is part of what I mean: it is the responsibility of the artist (like the responsibility to destroy) to provide the elements for the conservation of those works he or she wants to conserve. I was working with the National Gallery to agree to certain kinds of changes, and the work comes with certain possibilities for a certain kind of permanence.

Another conservation strategy has been applied to *The Stadium* (1989), a work of which there have already been fifteen versions. Each time it’s a different kind of recontextualization: the software is activated and the hardware is constructed. The last version was shown in São Paulo in February 2011. Again, I think in the work of an artist there could be many ways of interpreting the work, but who is going to give that information? This is the author’s responsibility. Because of its dimensions and the implications for transportation, it would be impossible to conserve the supporting material of *The Stadium*.



Antoni Muntadas
The Stadium
 1989
 © Antoni Muntadas

The File Room (1979–1998) demands yet another conservation strategy. That work was first presented in a former public library – the Chicago Cultural Center – and is now presented based on diagrams and notes on the construction of the work. When I developed the work in Chicago I had the opportunity to work with the University of Illinois at Urbana-Champaign, and they used the project as a case study. In the beginning it was not supposed to be on the Internet, but to exist as hypertext. However, given that the work is about censorship, I thought why not make an interactive work. While the work is presented as an installation, the synthesis of the work is the website. I don't keep all of these files. For the work's subsequent presentations, the file cabinets needed to be leased or bought again. A website is not a static collection item; it is constantly active, characterized by the Internet and its interactivity. Thus, how could this work be kept in a static form? An institution proposed to buy this work, but I was against it. Besides the technical reasons, I don't want to sell a work that is about censorship, I don't think it's ethical. This is a work made by many people that can be used as a public domain – it's on the web and maintained by the National Coalition Against Censorship (NCAC). If somebody wants to reinstall the work then we create the installation with diverse elements for the period of the show, with a physical temporality.



Antoni Muntadas

The File Room

1994

© Antoni Muntadas /

Espacio Fundación Telefónica

Foto: Oscar Balducci

I have discussed a spectrum of works that illustrates my different approaches to work, impermanence, and durability. I want to reinforce the idea that artists should destroy more of their artworks; we don't need to keep it all in place. The analogy with the work of the scientist can be useful. Let's keep the formulas, the synthesis of the work, the essential elements of a piece of research. I am from a generation for whom research is very important. But I think that once the research is done, you should forget it; it is only part of the work process. What should be kept are the essential elements. Anything else is mystification, a kind of surplus value, and can be misinterpreted as the "aura" of the artwork, for commercial or other reasons.

Conserving and Archiving Media Art – The Policy of Discourse

Rosina Gómez-Baeza in collaboration with Brendan Maloney

Introduction

“How can we document our own experiences for future generations and not only the facts? How can we visualize the invisible mystery and timeless charm of art objects while reflecting their different levels of reality? How can we empower users to their own critical perception?”¹

This complex question does not have a simple answer. Conservation, documentation, contextualization, and interpretation of media art: the form that these fields of knowledge, expertise, and perception take at any given time, the significance they have for us today and the generations of tomorrow, is determined by the “policy” of the given media archive.

Serious reflection upon conservation is ultimately of a philosophical character. Michel Foucault, for example, wrote:

“[...] the archive determines that all these things said do not accumulate endlessly in an amorphous mass, nor are they inscribed in an unbroken linearity, nor do they disappear at the mercy of chance external accidents; but they are grouped together in distinct figures, composed together in accordance with multiple relations [...].”²

To establish an archive is to articulate the structure of order from within the very flux of discursive chaos. This means that the discourse of any archive, if it is to be successful, must frame the conceptual field that will determine the domain of its conservation activity, and this, in turn, involves delineating an interconnected nexus of temporal and contextual factors that are of a heterogeneous – and interdisciplinary – nature.

“The analysis of the archive, then, involves a privileged region: at once close to us, and different from our present existence, it is the border of

- 1 Harald Krämer, *Survival of the Fittest – Notes on the Documentation of Contemporary Art*, video lecture, presented on December 1, 2005, as part of the European project Preservation and Presentation of Installation Art, available online at: www.inside-installations.org/project/detail.php?ct=lecture&r_id=74, accessed 08/01/2012.
- 2 Michel Foucault, *Archaeology of Knowledge*, trans. Alan Sheridan, Routledge, London, 2002, pp. 145–146.

time that surrounds our presence, which overhangs it, and which indicates it in its otherness; it is that which, outside ourselves, delimits us.”³

And yet this theory is juxtaposed by a crisis of epic proportions. We are facing the real possibility that we may fail in our efforts to conserve contemporary media art. To emphasize this, I will quote the urgent words of Oliver Grau, who is also a pioneer in the field:

“We witness the erasure of a significant portion of the cultural memory of our recent history. It is no exaggeration that we have to face a total loss of digital contemporary art, and that works that originated approximately ten years ago can normally not be shown anymore – preservation exists only as case studies, not as a concerted strategy.”⁴

With our own productions of digital culture facing possible oblivion, this is a time when our discourse must crystallize into communicative action, where speech not only conveys truth but also realizes its inherent rationality. Our words must have real effects if we are to make any headway towards saving our own cultural heritage.

This is why LABORal Centro de Arte y Creación Industrial in Gijón (Spain) has chosen to link its own emerging conservation strategy closely with the possibilities offered by the medium of Internet television with the launch of its own Internet television channel: LABtv. It is through this mode of visual and digitized discourse and the interrelationship of all of LABORal’s activities that meaning can emerge, documented in a medium that not only allows for communication and dissemination of but also education and experimentation in contemporary artistic practices. The delimitation, order, and therefore meaning of any media archive can only arise from a policy that is true to the dynamic of the organization that implements it. Two questions are essential in this context: *What* is to be conserved, and *how* does it derive from the type of artistic event taking place? The answer to these questions, in turn, depend upon the operational definition of art that informs the activity and structures it. That which is considered to be art is not only a societal notion (cultural context), it is also liable to shift and change, influenced by the very artistic events that it hopes to define.

LABORal’s identity is closely linked to the dissemination of artistic practices that employ information and communication technologies (ICTs) as expressive media. As such, it is only natural that LABORal’s discourse should employ the same innovative technological media, and that it should take place in the reflexive and interactive exchange network that is the Web 2.0. In

3 Ibid., p. 147.

4 Oliver Grau, private correspondence.

this way, LABoral can have an active hand in shaping society's views on media art. Over the long term, LABoral can help to raise awareness of the cultural and artistic possibilities of ICTs. Educating our society as to the value of its cultural production, empowering visitors to their own critical awareness, awakening artists to new creative potential, educating youth and children in new technologies – all this should contribute to make our society more sensitive to its conservation responsibilities.

LABoral Centro de Arte y Creación Industrial was created in 2007 as an interdisciplinary space seeking to foster artistic exchange and promote relations between society, art, science, technology, and industrial creation.⁵ It is the only center in Spain dedicated – since its very inception – to technological culture, artistic research, production, education, exhibition, and dissemination of today's art and creative industries.

Inaugurated on March 2, 2009, LABoral's Mediateca_Archivo brings together three distinct but complementary facilities: the Mediateca Expandida (an exhibition space dedicated to audiovisual projects that go beyond the conventional exhibition), the chill-out zone (a room for activities included in the art center's public program), and the archive itself: a permanent space dedicated to consultation and research as well as promotion of today's art and the disciplines that are part of the creative industries.

The archive holds resources from four areas of interest: bibliographical documents, the Newspaper Library, the LABoral Archive, and the Asturian Artists' Archive.

First International Symposium on Media Libraries and Archives for the Twenty-first Century

Being a relatively young institution, LABoral wanted to consult other leading organizations in the field of archiving and conservation of digital media art. With this in mind, on May 28 and 29, 2010, LABoral's Mediateca_Archivo held the first International Symposium on Media Libraries and Archives for the twenty-first century,⁶ which brought together 27 representatives from 24 institutions (educational organizations, art centers, museums, archives, libraries, and publication departments) from nine countries.⁷ Divided into sessions, the

5 La Fundación LABoral Centro de Arte y Creación Industrial, Gijón, is an initiative of the Government of the Principality of Asturias, created as a private, cultural, and non-profit foundation to give impetus to the domain of technological culture as part of its strategy to design alternative models of the future for Asturias and to continue making advances in the development of the knowledge society.

6 The symposium was organized by LABoral with the collaboration of HC Energía, Gijón City Council, The State Corporation for Spanish Cultural Action Abroad (SEACEX), the Spanish Agency for International Development Cooperation (AECID), the Embassy of France in Spain, and the National Hispanic Cultural Center, Mexico, as well as other institutions.

7 Including Tate (London), Ars Electronica GmbH (Linz), V2_ Institute for the Unstable Media (Rotterdam), The Daniel Langlois Foundation (Montreal), Museu d'Art Contemporani de Barcelona (MACBA), Museo Nacional Centro de Arte Reina

symposium dealt with the objectives and challenges facing media libraries and archives in the age of technological revolution, covering subjects as important and varied as conservation, preservation, content production, and selection, as well as the tools and technical processes needed in these changing times.

Objectives and Challenges of Digital Art Conservation

The participants were in unanimous agreement that the purpose of a digital art archive is to “select and preserve the elements [of twenty-first century digital art] that should become part of the cultural heritage, and at the same time facilitate public access to them, so that they can be studied and valued.”⁸ Ideally, access should be both via a documentation center and online, as is exemplified by LABORal’s own Mediateca_Archivo. An archive needs a “correct balance between bricks and electrons.”⁹ A digital archive provides universal access, but a physical archive allows one to see works in their original state and provides a place to meet face to face. This helps to establish and disseminate digital art practices in the present.¹⁰

A digital archive also allows for “access among the elements” of different archives of different institutions, their interoperability being an important objective for the future.¹¹

“Similar to how research is facilitated in reputable natural science labs in astronomy, biology, or climatology through access to common/shared data, the digital cross-linking of the humanities through the creation of common data pools would allow the undertaking of new globally relevant questions for our society, which till now has not been possible and difficult to realize, like the documentation and preservation of Media Art and much more.”¹²

We are living in the middle of an era of information explosion: the content of the World Wide Web, for example, doubles every ninety days.¹³ Surrounded

Sofía (Madrid), London School of Economics and Political Science (LSE), museo universitario arte contemporáneo (MUAC, Mexico-City), Universidad de Oviedo (Asturias), Universitat Oberta de Catalunya (UOC, Barcelona), Filmoteca Española (Madrid).

- 8 Pau Waelder, *Account of the 1st International Symposium: Media Libraries and Archives for the 21st Century*, LABORal Centro de Arte y Creación Industrial Gijón, May 28–29, trans. Nuria Rodríguez Riestra, 2010, p. 2, available online at: www.google.de/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=0CFkQFjAC&url=http%3A%2F%2Fwww.laboralcentrodearte.org%2Fen%2Ffiles%2F2010%2Factividades%2Fsimposio-internacional-de-mediatecas-doc%2FMedialibraries_account.pdf&ei=aqASUMHWF9DzsgbOiYDwAQ&usg=AFQjCNEW3zglo5DmIDAu4-rWfFaQa4oPcA, accessed 08/01/2012.
- 9 Jonah Brucker-Cohen, [as] quoted from: *Ibid.*, p. 21.
- 10 Patricia Sloane, [as] quoted from: *Ibid.*, p. 23.
- 11 Alessandro Ludovico, in: Waelder 2010, pp. 6–7.
- 12 Oliver Grau, private correspondence.
- 13 Waelder 2010, pp. 10–11.

by this plethora of data, the challenge is to introduce, order, and to explain the context.¹⁴ Therefore, protocols and ethical codes must be set out to define what will be archived, keeping in mind that “every decision in the archiving process involves taking a position, which is often a reflection of the principles of the institution.”¹⁵

This involves a “conscious historicization”¹⁶ of archived content, which betokens Foucault’s “border of time that surrounds our presence” and “indicates it in its otherness.”¹⁷ It is the historically distant view that we must take when interpreting contemporary activities as future heritage: that which once will have been.

It is at this point where artistic identity intersects with conservation policy. What is conserved and by which means will depend on how art is being practiced, discussed, and understood.

The platform Gateway to Archives of Media Art (GAMA) provides online access to a variety of European media art archives that represent a large spectrum of media art, and whose declared objectives include becoming “Europe’s key online portal to its media art archives.”¹⁸ GAMA is the first to point out that, in a media art archive, what is conserved should never be divorced from the living and material context in which the artwork has been experienced. However, depending on where that experience took place, greater or lesser emphasis may be placed on the material medium itself when interpreting it.

“If the gateway loses [its] connection with the media carrier altogether, it would become an entirely new immaterial information bank, consequently losing its meaning [...]. [...] the older institutions which have sufficient funding at their disposal devote a large portion of their activities to conservation and preservation of the original carriers [...]. However it could be argued that the actual media work is not the original carrier in itself but the artwork or any cultural product that it carries.”¹⁹

The Netherlands Media Art Institute (NIMk) supports presentation, research, and collection of media art in the Netherlands and has numerous activities and extensive documentation on conservation. Their website goes into further detail when exploring this second option for interpretation that de-emphasizes and decentralizes the concept of the artistic medium:

14 Benjamin Weil, [as] quoted from: *Ibid.*, p. 2.

15 Jesús Carrillo, [as] quoted from: *Ibid.*, p. 3.

16 Patricia Sloane, [as] quoted from: *Ibid.*, p. 3.

17 Foucault 2002, p. 147.

18 See GAMA, “Mission Statement,” available online at: www.gama-gateway.eu/index.php?id=42, accessed 08/01/2012.

19 Ida Hirsensfelder, *Characteristics of the 8 GAMA-Archives*, available online at: www.gama-gateway.eu/index.php?id=40, accessed 08/01/2012.

“[Media art works] can be understood as ‘*artistic events*,’ characterized by generative processes and changing time. In order to be able to present these works in the future it is important to understand what is important to preserve and how to capture, define and transmit the ‘core’ of the art work. [...] we understand this ‘core’ or ‘essence’ of a media art work more and more in terms of its behaviours and in the effects these behaviours produce, rather than the material nature of its components. Where visual arts preservation mainly deals with objects, material and the notion of authenticity and originality, media art preservation is not based mainly on physical manifestation, but increasingly deals with ephemeral technological components.”²⁰

The objective of long-term preservation of digital and media art can only be achieved through a combination of conservation and documentation strategies. However, emphasis may be placed on one or the other. Even for the more traditional and better-funded institutions, the priorities for conservation increasingly include the digitization of archives and the creation of databases that offer a detailed description of the context and relationships between documents.²¹ When emphasizing documentation, therefore, the priority becomes keeping a record of the different experiences that can arise from a single artwork, especially if it is interactive and involves audience participation, using photos, videos, blogs, and social networks.²² A digital and media art archive must present works in the “full multiplicity of their relationships.”²³

“A central task necessary to be able – both today and tomorrow – to adequately present and to experience media art is the careful documentation of the specific requirements for presentation of media art works. Documentation is at the centre of any new media preservation strategy. Improving efforts to preserve new media artworks are insufficient without the support of structured documentation about both the artworks and their context. As in theatre, this documentation may often be the only remaining trace of the work.”²⁴

There are two major problems facing digital and media art archives. The first can be summed up as “global obsolescence”²⁵ or differently expressed: the

20 Available online at: <http://nimk.nl/eng/preservation>, accessed 08/01/2012.

21 Theresa Schubert-Minski, quoted in: Waelder 2010, p. 19.

22 Beryl Graham, quoted in: Ibid., p. 4.

23 Mela Dávila, quoted in: Ibid., p. 5.

24 Available online at: <http://nimk.nl/eng/preservation/preservation-resource>, accessed 08/01/2012.

25 Yves Bernard, quoted in: Waelder 2010, p. 22.

ever-accelerating cycle of adoption and discarding of new media²⁶ to which media art is particularly prone.²⁷

Conservation does not end with digitization, but presupposes a continuous struggle with the medium itself: “the context of a work also encompasses the history of technology.”²⁸ There are four typical strategies to counter obsolescence: storage (see glossary, p. 602), migration (see glossary, p. 601), emulation (see glossary, p. 600), and reinterpretation (see glossary, p. 601).²⁹ Each of these strategies has problems and limitations.

The second major problem facing media art archives is that of funding. On the one hand, the sheer quantity of data forces economization: “de-growth” and “production levels based on common sense, and a common commitment to the production of meaning.”³⁰ On the other hand, digitization alone is not a guarantee against data loss. Local servers in an institutional archive, for example, are equally susceptible to obsolescence; they must be regularly updated and replaced in order to avoid data loss, which means significant expenditure.³¹

If an archive is dependent on public funding, then it is particularly vulnerable in times of economic crisis, and it is “not realistic to suppose that funding levels will be maintained in the future.”³² If an archive is funded privately, it cannot be expected to have the same responsibility when selecting the heritage it chooses to preserve.³³

The option always remains open to commercialize a selection of an archive’s holdings.³⁴ However, the majority of the symposiums’ participants emphasized the need for collaboration between archives around the world. There is a need for “a European lobby to promote modern policies for the conservation of culture.”³⁵ “Intensive collaboration among different institutions” could result in the definition of a series of standard formats, and would also facilitate the interoperability of archives.³⁶ It is by reaching agreements with public and private archives and institutions, as well as participating

26 Waelder 2010, p. 2.

27 Pau Alsina, quoted in: *Ibid.*, p. 10.

28 Alain Depocas, quoted in: *Ibid.*, p. 5.

29 Yves Bernard, quoted in: *Ibid.*, pp. 5, 22.

30 Antoni Mercader, quoted in: *Ibid.*, p. 27.

31 Waelder 2010, p. 5.

32 Mike Stubbs, quoted in: *Ibid.*, p. 7.

33 *Ibid.*, p. 24.

34 Concha Tejedor, Director of Documentation and Photographic Collections at the Spanish language news agency EFE (Madrid), argued that, archives were “not considered interesting until they started to be financially profitable.” (Tejedor, quoted in: Waelder 2010, p. 28.) Digitization, as well as saving material from possible destruction, also helps to generate new collections by suggesting new ways to access the material. She argued that, in the case of EFE’s photo collection, commercializing the collection provided a firm basis for sustainability and profitability, while drawing attention to previously unknown artists who had not received the attention they deserved.

35 Yves Bernard, quoted in: Waelder 2010, p. 22.

36 Marcos García, quoted in: *Ibid.*, p. 7.

with other European agencies,³⁷ that a common front can be established for the preservation of twenty-first century digital culture.³⁸

“The funding infrastructure of media art [conservation projects] so far, has normally promoted projects for two, three, or more years, neglecting sustainability. A structure which updates, extends and contextualises research – whether in historical or contemporary contexts – is required. The funding and support of infrastructures which have been built in the end of the last century are not suitable for scientific and cultural tasks in the humanities of the twenty-first century.”³⁹

An adequate conservation strategy, therefore, must not only deal with the specific works of art that are to be preserved, it must also embrace a new understanding, adopting a new open-ended discourse. In the words of Antoni Mercader, coordinator of GAMA, in an interview with LABoral:

“We believe in the need to transubstantiate everything related to cultural and artistic patrimony as well as the institutions that, until now, have been its guardians. We believe collective compromise, networking, and database storage to be the paradigms of strategies for interoperability and promotion of the production of meaning.”⁴⁰

At the symposium at LABoral, an entire session was dedicated to the specific possibilities offered and the challenges posed by the conservation of media art. We will look at two of the examples discussed there.

The first example is The Daniel Langlois Foundation for Art, Science, and Technology, Canada, which was presented by Alain Depocas, former Head of the Research and Documentation Centre (see also his contribution in this volume, pp. 145–153). He emphasized the possibilities that digitization has opened up for his organization. Their documentation strategy is a model for all media archives around the world. A “private, charitable organisation”⁴¹ dedicated since 1997 to the conservation, research, and cataloging of media art, the foundation has financed more than two hundred projects resulting in

37 The European Union 7th Framework Programme: *Opportunities for Researchers from the Socio-economic Sciences and Humanities* lists the work programs – which focus on technology and networking projects in the humanities – that received European funds in 2010. Cf.: Seda Göksu, *European Union 7th Framework Programme: Opportunities for Researchers from the Socio-economic Sciences and the Humanities*, The Scientific and Technological Research Council of Turkey, (TÜBİTAK), 2008.

38 Waelder 2010, p. 28.

39 Oliver Grau, “Renewing Knowledge Structures for Media Art,” in: *EVA London 2010: Electronic Visualisation and the Arts*, 5–7 July, 2010, p. 292, available online at: <http://ewic.bcs.org/content/ConWebDoc/40999>, accessed 08/01/2012.

40 Antoni Mercader in an interview with LABoral, unpublished.

41 Available online at: www.fondation-langlois.org/html/e/page.php?NumPage=513, accessed 08/01/2012.

a collection of some of the most important pioneering media artworks since the 1950s. Its priorities focus upon conservation and exhaustive documentation: keeping original pieces as well as records of the context of production and the contemporary art scene. The documentation is comprehensive, preserving every possible aspect of the context in which the work was created. This is necessary because their archive structure is based on the interconnection of modules: “individuals, organizations, events, works, documents, terminology and technologies” which, through digitalization, “allow relationships to be set up among them.”⁴² A new version of their website will soon open up access to visitor participation, where people can leave their own contributions to the documents.⁴³ In addition, the foundation announced its DOCAM Technological Timeline project which, through data visualization, will allow “connections to be made from an art work to the technology and from the technology to individual works,” relating works of art through the evolution of the technologies that underlie them.⁴⁴

The second example is the iMAL - center for digital cultures and technology, presented by its director, Yves Bernard. iMAL is an interesting case that hovers between the vast virtual extension of its online archive and its physical space in Brussels, whose concept is based on a dual commitment to interconnectivity and communication. Beginning in 1999 as a non-profit project to support artistic practices related to new technologies, iMAL has quickly had to confront the exponential task of archiving the prolific production of artists working with digital media.⁴⁵ At iMAL, the website is the archive, which extends to social networks. This not only makes the documents accessible and able to be indexed, it also opens them up to the comments and reactions of the general public. No data is ever deleted, so that the archive constantly grows, and metadata is added to everything that is published. Bernard pointed out the advantages of digitization. By keeping documents online – on popular sites like Flickr or YouTube – iMAL reaps the double benefit of keeping their expenses low while also guaranteeing – in theory, at least – that their archives would be preserved even if the organization itself were to disappear.

Nonetheless, the digital archive needs a physical dimension as well. The Brussels headquarters of iMAL opened in 2007 with an area of 600 square meters dedicated to exhibitions and to a laboratory and workshop for artists. Not all media art can be fully digitized and some works cannot be shown only

42 Alain Depocas, quoted in: Waelder 2010, p. 23.

43 The process of automatically incorporating content added through social networks and public participation, thereby allowing these archived documents to exchange text, is known as letting the documents “talk amongst themselves.” (Jaron Rowan, quoted in: Waelder 2010, p. 7)

44 Alain Depocas, quoted in: Waelder 2010, p. 23.

45 Available online at: www.imal.org/en/page/about-imal, accessed 08/01/2012.

on the internet.⁴⁶ A physical space is needed for exhibition and storage.⁴⁷ And artists and creators need a place to gather and exchange ideas – part of the strategy to disseminate new cultural practices.

In many ways, the question of “how to balance physical space and virtual spaces remains open.”⁴⁸ However, after becoming familiar with LABoral and seriously reflecting on the task of digital art conservation, the proposal is that a new communication platform is needed that will balance virtual and physical spaces, not merely in a practical or managerial fashion, but *on the level of its discourse*.

LABtv

“The radio spectrum – the electromagnetic space through which radio and TV broadcasts, mobile phone and GPS signals and WiFi networks circulate – is the real estate of the information society. The infrastructure that keeps it going – from antennas that crown the most emblematic buildings to the hundreds of satellites in orbit – is the most ambitious feat of engineering that human beings have ever achieved; and the way it has been gradually colonised and conquered throughout the 20th century has radically transformed the construction of our societies, the articulation of cities, and our individual relationships.”⁴⁹

In October 2010, LABoral launched its own Internet television channel: LABtv. It is a new platform for the communication and dissemination of, as well as education and experimentation in, televised discourse. The objectives of LABtv can be summarized as follows: to establish full public access to the audiovisual material held in the Mediateca_Archivo through the LABtv channel; to produce content in accordance with LABoral’s program; and to found a dynamic and participative online forum alongside the activity program, based on the proposals and discussions of the users themselves.

The projected implementation strategy will give LABtv a role in all five of LABoral’s areas of activity. The intention is to initiate a dynamic that will naturally progress into the creation of new projects in the future. The initial content of the online channel – to have a video on demand structure – will come from the archives of documented activities from the first three years of LABoral’s existence. By allowing this audiovisual content to reach a wider audience, LABtv thereby fulfills the function of a virtual exhibition space. The

46 Yves Bernard, in: Waelder 2010, p. 21.

47 In an interview with LABoral, Yves Bernard confirmed the continual exacerbation of this problem for iMAL when storing the ever-growing number of hard drives needed to keep their data.

48 Yves Bernard, quoted in: Waelder 2010, p. 22.

49 José Luis de Vicente, “Reclaim the Spectrum,” in: *Zemos98, La Televisión No Lo Filma*, vol. 8, 2006, p. 236, available online at: www.zemos98.org/festivales/zemos988/pack/libro_LTVNLF.pdf, accessed 08/01/2012.

next element of the implementation strategy is to form work groups and hold technical training workshops as well as theoretical studies in communication.⁵⁰ The hope is that these *research* activities will feed back into the project itself, generating more ideas.

LABtv can be used to advance education by continuing the TV-LAB project: the Experimental Television Laboratory. Started in 2009 in collaboration with neokinok.tv, it is a communication platform and an experimental mobile television set, set up and maintained through an educational program that is run in collaboration with local schools and associations.

Experimenting with television also allows one to better understand the multiple realities shown in the communication media as well as to express ideas with creative freedom. In LABoral, the television is not merely an information transmitter but also an artistic medium. New proposals will always be considered in an effort to produce more content. With its intended structure as an online interactive community, LABtv will also disseminate the activities and practices of the new technological arts. In this way it also participates in the public mediation area of LABoral's activity. Visitors will be able to access as well as comment upon presentations, interviews with resident artists, workshops, and more besides. We view this as making new tools of communication available for collective speech.

Conclusion

"The documents in a particular archive are not only conserved documents, but are selected according to a set of discriminatory criteria or decisions. [...] These points of reference are not simply constructed from the conceptual foundation that a particular archive draws upon, but are rather a set of statements that occur in their multiplicity not in their certainty. The criterion of discrimination in this sense is an *affirmative act* for all the archives and devotes special attention to local media art production."⁵¹

After reviewing the activities of LABoral Centro de Arte y Creación Industrial, as well as the *de facto* status of its Mediateca_Archivo, we have reached the conclusion that the most conceptually sound conservation policy must be based in the performance of *affirmative speech acts*. By implementing an Internet communication platform such as LABtv, we intend to speak out, to disseminate the discourse in which the "core" of the art that passes through our galleries – with its inherently decentralized structure – is conserved and

50 A close relationship and collaboration will also be established with Radio Televisión del Principado de Asturias (RTPA), the Radio and Television station of the Principality of Asturias.

51 Ida Hirszenfelder, *Characteristics of the 8 GAMA-Archives*, available online: www.gama-gateway.eu/index.php?id=40, accessed 08/01/2012.

made accessible to all. Only in this way can we hope to – one day – awaken our own society to the value of its own ephemeral cultural productions.

It is true that LABORal is not faced with some of the more specific challenges of media conservation, which are manifest in the many faces of technology's corrosive obsolescence. However, this does not mean that we should be indifferent to it, or to the plight facing so many of our respected colleagues and their institutions. On the contrary, just as our policies are driven by the objective of interoperability, and our discourses are informed by the openness of probative dialog, so too must our actions be networked and collaborative. Otherwise, we face the real possibility that our work may have been in vain, as we watch our own cultural heritage slip into digital oblivion.

Archiving Strategies at LABORATORIA Art & Science Space

Daria Parkhomenko

The main objective of LABORATORIA Art & Science Space, founded in 2008 by and based at the Karpov Institute of Physical Chemistry, is to become an environment for developing a new type of relations between art, science, and society, as well as for channeling various forms and kinds of creative energy. An important aspect in this context is also to maintain the tensions and energy that guarantee the quality of collaboration between artists and scientists. My vision as director of LABORATORIA is a constant transgression of art and science boundaries in order to establish an independent zone. Here, in this zone, we have freedom, we can provide new opportunities for artists – we are building a new utopia.

LABORATORIA is an environment where media artists and media scientists can meet, where artworks and scientific discoveries have equal status, where rational and irrational blend. Our activity is based on addressing a kind of scientific experience. This is why artworks created in LABORATORIA are peculiar and demand a nonstandard approach and method of archiving. The characteristics of Science art emerge from novelty and purity of an experiment; our very first exhibition was therefore titled *LABORATORIA. Experiment #1* (July 30–August 30, 2008). In preparation for this exhibition, young artists and scientists participated in a dialog that shared ideas and concepts from different fields. I organized a series of “guided tours” exploring the Center for Materials Science and Metallurgy based at the Moscow State Institute of Steel and Alloys to initiate and facilitate discussion. The scientists and researchers provided insights into their work in the field of nanotechnology and presented the structures of new materials. Next, the artists showed their preliminary studies to the scientists. The resulting exhibition was not understood as a final product but rather as an ongoing process. The expanding and undefined field of Science art changed the parameters of the artworks, corrected interpretations put forward by the scientists, and created an “atmosphere of inspiration.” All the participants expanded their horizons, some of them discovering new perspectives on staging “experiments” at a different level.

To illustrate this collaborative endeavor, I would like to delve deeper into LABORATORIA’s actual practice and describe four further examples of our activities in the area of exhibited works. The artworks are from artists based in Canada, USA, and Russia. Their background is significant: Nicolas Reeves was trained as an astrophysicist and architect; David Bowen studied sculpture and engineering; the art group Where The Dogs Run consists of members

with backgrounds in art, architecture, and radio engineering. Further, there is an important collaborative and interactive work created by artist Valia Fetisov and neurobiologist Olga Svarnik, which is most significant in connection with archiving strategies, because in this case the scientific research was the core of the project.

The project *Between Heaven And Earth* consists of an interdisciplinary platform where a Science art object, the *Cloud Harp* (2009) by Canadian artist Nicolas Reeves, served as a center and as a springboard for interdisciplinary discussion. Researchers from science and art institutions that engage with clouds and sky either as natural science or a symbolic phenomenon took part in the discussion. An historian of religion, a paraglider, a meteorologist, a composer, an atmospheric scientist, an astronomer, and the artist shared their opinions about the *Cloud Harp* and other issues they saw fit to discuss. The *Cloud Harp* is a meteo-electronic installation that transposes physical parameters of the atmosphere into sounds using laser technology, a telescope, and a specially written code that transforms more than thirty parameters of clouds into music instantaneously. The sculpture architectonics resembles a totem, and the structure that houses the equipment is made from rare wood. In the Lab Garden outside the main space of LABORATORIA, where the *Cloud Harp* was located, several types of documentation describing discussions

Nicolas Reeves
Cloud Harp
 2009
 Meteo-electronic
 installation
 © LABORATORIA Art
 & Science Space



referring to the project were exhibited for visitors, transforming the Lab Garden into an open-air educational experience.

The *Cloud Harp* was shown in LABORATORIA for four months and played music seven days a week, 24 hours a day, in real time. This work is unique in its triple individuality as a physical, technical, and poetic object. The musical sequences that it produced were presented both live, in LABORATORIA's garden, and streamed on the Internet.

There is a strong tradition of storing and conserving art objects, but how does one capture a real time, 24/7 piece of variable sound? The sounds produced by the installation were recorded throughout the entire period of the exhibition. At the end the artist selected several fragments that reflected the variation of the sound in relation to the weather. With changes in the weather conditions (and thus of the physical features of clouds), the music also changed. *Cloud Harp* was not a museum piece, but a way to explore both artistic creation and scientific investigation in a mix that benefited both types of thinking. In this context the artwork was not only a free-standing piece of thoughtful public art or a work that generated public fascination and enjoyment, but also a scientific experiment defined by the duration and interpretation of its processes and results.

This emphasis on the performative or experimental (by means of process) qualities of the works exhibited represents the basic ideals of LABORATORIA perfectly. As LABORATORIA is not a museum, the conservation of the physical parts of new media artworks is rarely, if ever, its goal. Most of the time we manage to produce several types of documentation, but the conservation issues still loom large, and it is preferable for us to ponder the qualities of new media artworks that we show.

New media artworks presented by LABORATORIA usually have several common characteristics. Like other pieces of contemporary art they are primarily idea-based: their physical and technical appearance is subject to a number of changes that are not related to the work's qualities. It is an art that can be upgraded (the laser, telescope, computer, and other pieces of technology of the *Cloud Harp* can be exchanged over time for more effective ones). There is a clear and articulate idea at their core (that also makes them similar to other contemporary artworks), but one can, given time and motivation, repeat them under other conditions, using other materials, and in a quite different context. These qualities raise two sets of important questions. One of them is copyright, a topic that has a clear and precise relation to the conservation process, because when an institution conserves a work of art, it always preserves authorship first, and content second. The other set of questions is dedicated to the outcome of the work, which has several additional dimensions due to roundtable discussions, talks, and interdisciplinary research. If a work not only invites, but facilitates discussion, what exactly has to be conserved? Its traces are theoretically endless. One can say that this holds true in all

cases of artworks in museum pantheons, but the importance of discussion is even more pronounced when a piece is interactive and produces content (celestial music in the case of the *Cloud Harp*) beyond its immediate appearance.

Thus for several reasons, such a work of art can not be reduced to its aims and to the means to achieve them – ideas and technical devices that are prone to change over time. While Nicolas Reeves, for example, put a lot of thought into the appearance of *Cloud Harp*, designing it, using different types of expensive woodwork, the function of the work invites several visual interpretations. It does not exist as a fixed-form artifact: it is ever changing. Music is an extension of the actual piece, and as such can be conserved and presented as a reminder of the other aspects of the work.

Another example of a work that is variable in shape and technologically updatable is an installation by American artist David Bowen, *Tele-present Wind* (2010). This installation consists of a series of twenty-one tilting mechanical devices connected to thin, dried plant stems installed in the gallery and a dried plant stem connected to an accelerometer installed outdoors on the roof of the institute where the artist works in his native town of Duluth (Minnesota, USA). When the wind blows, it causes the stem outside to sway. The accelerometer detects this movement and transmits it in real time to Moscow by Internet, where it triggers a group of actuators within the gallery. Thus the stalks in Moscow LABORATORIA are moved by the Minnesotan wind.

Bowen gave detailed instructions about what kind of botanical material the installation needs, the length of the stalks, etc. So in the preparatory phase, our assistants were scouting for pieces of dry plant stems near the buildings that house LABORATORIA. The artist placed the utmost importance on the fact that the installation had to function no matter what material was used. Paradoxically, dry plant stems are hugely important for the visual impression of the work, but without the mechanisms and codes of the devices that come with them, they completely lose their meaning. The artist prescribed the technology: he is not collecting actual images. We could conserve the dry wood, but would it be anything more than a dead artifact?

What makes *Tele-present Wind* especially close to the *Cloud Harp* is the concept of transmitting and analyzing data collected in real time. There are devices that collect information and interpret it to create either a by-product of their existence (a DVD in the case of *Cloud Harp*) or a physical phenomenon (the movement of the stems in the case of *Tele-present Wind*). And as we know very well, transmitters of information are subject to constant market-induced change.

Bowen's other installation, *Fly Drawing Device* (2010), produces drawings based on the subtle movements of houseflies. When flies enter a small chamber, sensors detect their movements. These movements are transmitted to a microcontroller that articulates a drawing arm in real time based on the

fly's movements. When no fly is detected in the chamber, the paper scrolls down and the device waits until a new fly enters the chamber to begin another drawing. It is interesting to note in this context that when we conserved the flies' drawings, we did this following an old art tradition that considers works on paper as museum artifacts, no matter whose hand (or in this case, movement) produced it. LABORATORIA follows also this kind of traditional museum approach, what in some cases makes fully sense.

In these cases, the problems of conservation and copyright are even more opaque than in the field that is commonly called new media. That is why we stress the importance of discussion events in LABORATORIA because such discussion platforms not only support the show, but also turn into a session of analyzing and presenting data connected to the type of information processed by the work of art. I must also stress the "live," performative aspect of this type of work that puts ephemerality at the center of the process and makes it the operating principle. Variability of the images and/or sounds produced (and sometimes the parts of the work itself) become a unique characteristic of the work.

Installation of Experience (2011) was created by Valia Fetisov, artist, and Olga Svarnik, neurophysiologist, head of the Laboratory of Neurophysiology and Neurocognitive System Interfaces, National Research Center "Kurchatov

David Bowen
Tele-present Wind
2010
Interactive installation
© LABORATORIA Art
& Science Space

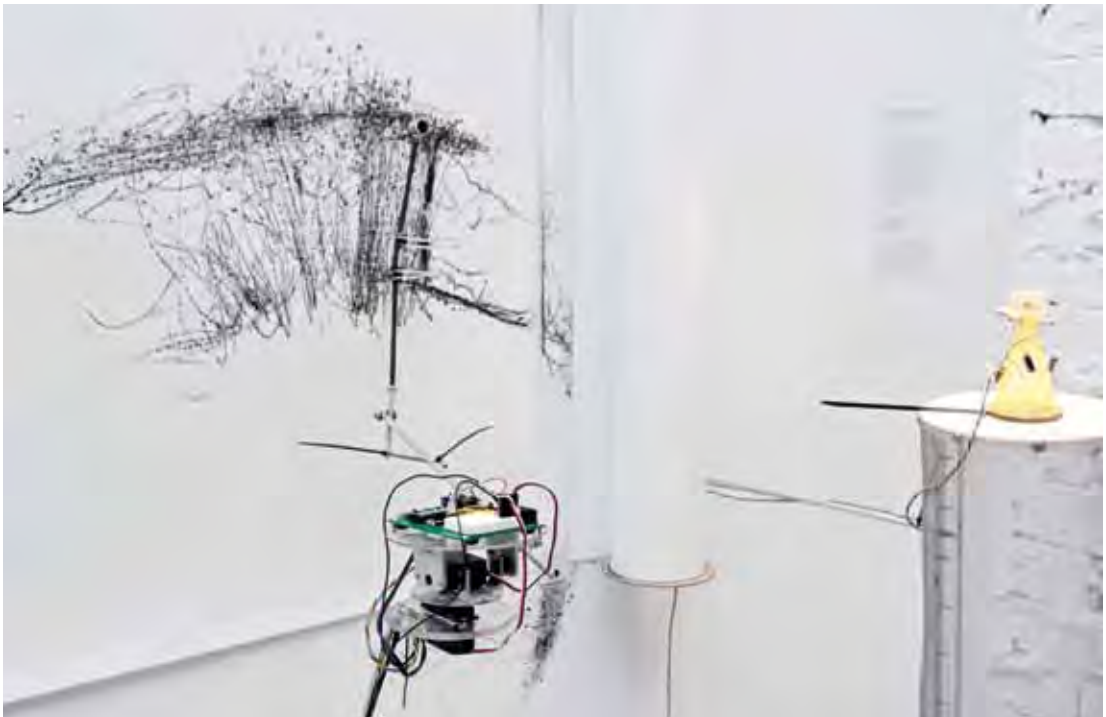


Institute.” In her research, Olga Svarnik examines the behavior of rats and mice in experimental conditions. In this installation, the situation is reversed: a human being is put in the position of a rat, and his/her behavior in this difficult situation (the doors of the small room where the experiment takes place don’t open, whatever the person is doing) is surveyed, recorded on the Closed Circuit Television (CCTV) camera, and archived.

While the artist Valia Fetisov aimed to create the atypical environment and put visitors in a situation similar to the one in which rodents find themselves during experiments (thus referencing to social problematic), the scientist Svarnik was able to gather experimental material which she would otherwise be unable to collect, accessing a wide sample. The archive of the results was further used for behavioral research, and is potentially valuable not only for neurophysiologists, but also for sociologists and psychologists. It is remarkable how the artistic interactivity and entertainment aspect of the artwork gradually dissolves, and gives way to scientific consistency as the venue for experiment.

The *Installation of Experience* is a small room, which can only be entered through automatic sliding doors. There is a TV set in the room on which a video film is screened. Once inside the installation a visitor realizes that he/she is trapped. The automatic doors do not behave in the usual way – they shut as soon as you get close and they open if you step back. At the same time

David Bowen
Fly Drawing Device
 2010
 Interactive installation
 © LABORATORIA Art
 & Science Space



Diskussion
Creativity Catalyse
 2009
 © LABORATORIA Art
 & Science Space



you can see the “experiment” with the previous visitor on the video, who in the same way could not figure out the new principle of how the doors work. The artist presents the spectator with different choices: to try out and interact with electronics, to understand the meaning of the video shown on the screen and perhaps to find an answer, or to do nothing and wait for the doors to open by themselves. The project, designed in collaboration with a specialist in neurophysiology and neurocognitive interfaces, gives the audience an opportunity to feel like a laboratory rat and also to become a part of an experiment that helps us to define patterns of human behavior within an unusual situation. What is particularly important is that one can compare the results achieved during the *Installation of Experience* with the available scientific data on the behavior of the animals in similar conditions. The project was research and the results of the experiment were the essential findings to archive. We preserved the data that is part of artistic and scientific research and thus the project transcends the boundaries of new media artwork and becomes material for a scientist.

Another type of work that LABORATORIA often exhibits is exemplified by *Fields* (2009), an installation by Where The Dogs Run, an art group from the Russian city of Yekaterinburg. *Fields* was created in collaboration with scientists from the Modern Nanotechnologies Center at Ural State University. The project was built around ferrofluids, a material used in nanotechnology experiments. Ferrofluids are colloidal mixtures composed of nanoscale ferromagnetic particles suspended in a carrier fluid, usually an organic solvent or water. Some of their properties, like electroconductivity, are still the subject of investigation and research. During the course of the experiment, the ferrofluid

becomes strongly polarized in the presence of a magnetic field. Due to the instability caused by a magnet beneath the dish, it constantly changes shape in amazing configurations. Rotation of permanent magnets creates moving fields influencing the ferrofluid. The patterns are never repeated. This transmutation could be considered as a purely technological process; however, the artists decided to control the process visually – the shape of the ferrofluid resembled an eye that follows the movements of a viewer. Artists filmed the emerging configurations with two micro-cameras and projected the image (on a screen or a wall).

Where The Dogs Run work closely with aesthetics of abstraction. They are interested in the image in the form of new technological landscapes (the topic of landscape has been their preoccupation for a long time). But the images on the screen remain variable, and there is no fixed product to be collected. This can be seen as an extension of the landscape problem, following questions that have been put forward since the Romantics; what is an invented landscape? What is a captured landscape? How realistic can you possibly be?

This work is as technologically advanced as possible today. Maybe in a hundred years' time the technology used here will be common, or just be remembered as an historical artifact. And this piece will belong to a museum. But what kind of museum, a museum of art or a museum of technology?

Where The Dogs Run group
Fields
 2009
 Interactive installation
 © LABORATORIA Art
 & Science Space



In any case, conservation remains a problem: What can be considered as a relic from an experiment? If it is a DVD, then we are getting close to the domain of collecting video art. If it is the whole installation, who could possibly store it (the problem of storage in Russian institutions is very vital)?

This is the reason why LABORATORIA's main goal is to create presentations, events, and interactions around the presented works. We think that what matters most in this field is the information, research, and ideas accumulated after and during the live, real time process. Maybe in the future there will be a way of formalizing storage of Science art, but for now it has to be a catalyst for discussions, encounters, and exchanges, leaving a trace in the cultural fabric and influencing further explorations in its wake.

Some of the content developed in this article can be further researched on the website of LABORATORIA Art & Science Space, available online at: <http://newlaboratoria.ru/www/eng/>, accessed 07/26/2012.

The Digital Oblivion. Towards a Material History of the Media

Peter Weibel

In the following I would like to reconsider some of the fundamental principles and basic problems involved in the restoration and conservation of media art. With regard to the word “memory” I want to propose a material argument: memory is storage technology. Further, I shall attempt to provide an explanation as to why one seeks to store anything at all, and discuss the main problems which result from this today, in the digital age.

First, a distinction must be drawn between the “digital heritage” and the “analog heritage,” for compared to the thousand-year-old analog heritage, the epoch of the digital heritage has been extremely short. However, by handling the analog heritage we can learn how to proceed today in the age of digital heritage. In this respect, the title *The Digital Oblivion*, which we took for the first symposium held as part of the project *Digital Art Conservation*, is highly provocative. For what we need is a “digital memory” for our “digital heritage” and not “digital oblivion”.

What we are currently experiencing is a kind of third phase in the preservation of our culture. The first phase focused on the conservation of buildings, landscapes, objects, and subjects. This goal was pursued for thousands of years with greater or lesser success. During the subsequent phase, the focus shifted to preserving the images of these landscapes, the images of buildings and cities and human beings, the models of these cities, the sculptures of these human beings. The same holds for the texts, documents, manuscripts, books, and later the films, which reported on people or special events, or that were written about landscapes, cities, and so on. Everything that was preserved in the first and second phases amounts to a gigantic analog heritage. But how much actually remains of the total? Although many studies have been done, their findings differ considerably. If we just take the previous thousand years, then estimates indicate that around three to seven percent of our analog heritage has been preserved. Even if we take the higher estimate of seven percent, it is clear that massive selection has taken place, an enormous amount has been forgotten. Clearly, a similar danger threatens our digital heritage, for the pressure to select is high – which is why in the future even more is likely to slip into oblivion.

To elaborate on this argument, we must go back to the beginnings of storage technology in ancient Egypt. Originally it was not buildings or landscapes that were conserved, but people. Naturally, not all people – and that is very instructive: “preservation” is invariably linked to an enormous

Darwinian pressure of selection. The aim is always to preserve a very special subject for posterity, a Pharaoh, for example. Hence, one could say that the mummy is the first storage medium, the first memory. In a certain sense it was the “hard disk” of the past. In other words, the process of embalming/mummification was a first-generation storage technology. And yet, as mentioned, only a few – namely, the family of the Pharaoh or priests – were mummified. It is not the Egyptian people who are found in the tombs, for selection was determined upon from the outset as a criterion of a view of culture which only wanted to see the elite preserved in its collective memory, not the collective itself.

Herein lies the difference to the present day: in the age of the Internet it is also possible to store collective articulations. For thousands of years, only very little was saved, and this was the prerogative of the “happy few” among the elite. In principle, tradition, conservation, and memory have for thousands of years been the preserve of a few; these were not media of the masses, but media of the elite. From the start, preservation – as we can see from the Egyptians – is storage, but selective storage. Today, the transition from a medium of the elite to a medium of the masses, which would be technically possible, is very difficult to put into effect.

The principle of storage as a principle of selection can also be identified in the Christian tradition, as exemplified by Noah’s Ark. One could characterize Noah’s Ark as the first model of a storage technology. To put it in modern and materialistic terms, the main problem lay in the fact that Noah’s Ark did not have much memory. The ship had only limited space: based on the information in the Bible, it was once calculated that it must have been approximately three hundred meters long. Here, the problem of limited storage space is evident: how many animals can it accommodate? And also the problem of storage time: how long can this ship exist, and from what resources can the human beings and animals on board feed themselves?

Thus, originally, in the analog age, there were limited storage times and very limited storage space. So what were the reasons why the Egyptian Pharaohs were mummified? Mummification was of course a part of the cult of the dead. Storage technology emerged as part of the cult of the dead; namely, as a strategy against death – against disappearance and oblivion. And this is the reason why storage technology is a technology of immortalization, a negation of death. Storage technology is the attempt to defend landscapes, objects, and subjects against death. Thus a storage medium is always a medium of immortalization.

The problem is that these media of “immortalization” change; that is, the storage techniques, the storage media, change. The desire for immortality and the fight against death, in other words, the fight against oblivion, against disappearance, and against loss, remain. Yet, what does change is the manner

in which we conduct this fight. In former times mummies were utilized as media of preservation and conservation, then cultural heritage was preserved in books, and today we have digital storage technology, which, in turn, throws up its own unique set of problems.

The following example illustrates this. When the universal genius Buckminster Fuller turned twelve – and it is a clear sign of genius that at the age of twelve he entertained ideas of such import – he decided to start collecting all of his papers and letters in a daily diary. When he was twenty-three he named this collection of drawings, manuscripts, programs, protocols, invitations, articles, and reports of everything he had found “Chronofile,” later known as the Dymaxion Chronofile. When he died in 1983 at the age of eighty-eight, he left behind 200,000 documents, 120 leather-bound volumes, and 625 card indexes with five hundred cards each. With this Chronofile, which is now housed in the Stanford University library and weighs a total of 45 tons, Buckminster Fuller developed a personal kind of mummification of his own memory. The Chronofile is the product of a life of excessive self-observation, the product of an immense effort of immortalization in order not to be forgotten, but remembered.

“Bucky” Fuller did not wish to survive physically or materially, but immaterially and symbolically. This is significant for the transition from analog to digital heritage. In the analog phase, one wanted buildings and people to survive materially, whereas in the digital phase it is a matter of symbolic death. For James Bond “You Only Live Twice.” With reference to Jacques Lacan it could be turned around: “You only die twice.” This is a paradox. You die once physically, which is bad enough, but when you die symbolically you are dead and gone forever. And the second death is worse. This is why, like Buckminster Fuller, we become cultural repositories or cultural creators who attempt to survive at least symbolically.

With respect to the storage medium, there is a further difference between Egyptians and Christians. Christians continue to promise physical resurrection – something, incidentally, that painting also adopted in the service of religion – an immortalization whereby Jesus Christ physically ascended to heaven, and the dead, including us one day, will physically sit next to Jesus Christ at the End of Days. Essentially, the technology of immortalization, the Christian promise of immortality, is an ancient Egyptian promise extending beyond all limits.

Today, however, we are concerned with symbolic, not with physical storage. The culture of memory has shifted away from the field of real operations to the field of symbolic operations, to the field of codes, signs, and texts. Hence real storage is transformed increasingly into symbolic storage, storage of symbols or signs. Digital heritage emerged from the original desire to strengthen us; not to remove the defects or deficits of earlier storage technologies, but to construct a wall by virtue of which we can be far more certain of

at least surviving symbolically after our physical demise. Thus the memory has been upgraded. The phase of wall paintings, of sculptures and pictures, which originally served to “immortalize” the priests, the kings, that is, the elites, ecclesiastical and military power, is over. Today, the storage media and the Internet have committed to a kind of democratization of storage space. The principle of Noah’s Ark has been expanded by digital storage space.

The problem with analog storage technologies, the picture, for example, turned on the fact that they were not mobile. They were tied to a place and in the beginning could not be duplicated or published unless it was the portrait of a monarch on a coin. Coins were, in fact, mobile storage media since they could be taken anywhere, and were an expression of authority and claim to power. In other words, exhibiting the storage space was, to some extent, exhibiting the sphere of power: the desire for immortality has also extended itself territorially through multiplication. The idea underlying this is simple: the more people who remember a person or an event, the less these will be forgotten. If one hundred people remember me, there is a strong chance that I will not be forgotten. If one million people remember me the odds are even greater. When Elvis sold twenty million records, the word was that “twenty million people can’t be wrong!” This marked the beginning of the quota, the origins of the principle of the age of the quota: to ensure that a person or an event will not be forgotten through the number of people interested in the storage medium.

After analog storage technologies, such as paintings, prints, coins, and books, a new storage technology suddenly appeared, namely, photography, and with it the first “culture clash”; for the introduction of the negative and with the aid of machines it was now possible to produce unlimited copies. All of a sudden, it was not only the elite who had access to portraits – created by painters – but through photography now the masses could also have portraits made as well as copies of them. In other words, with the advent of photography, a storage technology that became a mass medium, there existed for the first time a storage technology for the masses, not only for Pharaohs, aristocrats, and the rich. Not everyone can paint a picture, and neither can everyone pay for a painting. A painting expresses a double monopoly: on painters who mastered this storage technology, and on the wealthy, who were able to make use of this storage technology. It was always a circle of the “happy few”. Unsurprisingly, painters were not too pleased when photography appeared on the scene which ended painting’s monopoly as a storage technology. But that was the whole idea: everyone could have a picture of her- or himself, everyone had the right to their portrait, and thus essentially everyone could be a pharaoh because they now possessed what formerly had only been the preserve of royalty and pharaohs: one’s own portrait. And that is why George Eastman, the founder of Kodak, began advertising in 1888 with the slogan: “You press the button, we do the rest.”

One recognizes this principle today, when visiting companies in Germany – something which I am personally frequently required to do as a museum director – to attract sponsors or acquire lenders. Every second German businessman really does say “Come over to my place, I would like to show you something.” He then shows me a portrait of himself, by Andy Warhol, for example. Many German businessmen own portraits by Andy Warhol because they think that Warhol was a famous painter, and that when he does a portrait, then the person portrayed will also be famous. In terms of storage technology, Andy Warhol perverted the medium of silkscreen printing because he again used the possibility of mass reproduction for a cult of aristocracy or oligarchy. In this sense he was an entirely anti-democratic artist, since he had so to speak promised the wealthy to make portraits of them in order that in this way they would achieve immortality. Essentially, he claimed to be a Diego Velázquez. Velázquez, a Spanish painter of the Baroque period and one of the most important portrait artists of his time, painted portraits of kings and royal families. “I am the new Velázquez in the age of mass technology, of mass storage, and will also make you businessmen kings and pharaohs by painting your portraits,” could have been Warhol’s advertising slogan. Interestingly, this trick actually worked.

Thus, in contrast to painting, with photography the first democratic storage medium arrives, which is why painters have fought against photography for a hundred years. They fought to retain their monopoly on picture production. For a long time the prevailing view was that photography is a good storage medium, but it is not an art. Even as late as 1937 the great photographer Man Ray held an exhibition, and produced a catalog, with the title *La Photographie n'est pas de l'art* [Photography Is Not an Art]. He was fed up with constantly having to defend himself and of perpetually having to point out to his artist friends that he, too, is an artist. Hence, whenever a storage medium loses its monopoly, a struggle against its successor storage medium commences. Something similar can be observed currently with respect to newspapers. Initially the newspaper publishers fought the Internet as a storage medium; in the meantime it has been welcomed, and today all large newspapers have an online edition. Metaphorically speaking, this signifies that over the course of the development of storage technology, Noah’s Ark has been transformed from a medium of exclusion – there is only space for a select few – to a medium of inclusion – there is space for everyone.

However, millions of landscapes, buildings, objects, and sculptures have already been lost, and exist only as photographs. The analog heritage has already disappeared and is only accessible as digital heritage. But what will happen to these photographs in the future? Who will preserve them? We are presently confronted with the problem that I explained above: the problem of their second death. We lose these buildings, we lose these objects, and we lose these landscapes: they disappear. And yet we still have the photographs.

Even though these are analog storage media, they are located on the threshold of the digital age, since photographs can be digitized and conserved, and with the digital versions of these photographs at least the memory of the landscapes and special buildings can be retained. Yet only a few institutions have the time and resources to digitize analog heritage and thereby to preserve it, at least as a symbolic medium. And yet it is precisely this digitization of our memory which ushers in the third phase of preservation, which is directly upon us and which we must master if we wish to conserve the analog. Thousands, no millions, of landscapes and especially buildings exist as photographs. But who will preserve them? If we do not preserve them, not only will the photographs be lost, but also the analog heritage.

I would like to return to the example of Buckminster Fuller to elucidate the current problem of storage. All the Chronofiles from Buckminster Fuller's archive, which fill several rooms, can now be stored on a digital storage medium. Not only is it possible to archive all texts, all pictures, drawings, and photographs that Buckminster Fuller collected, theoretically, we could also archive all the films that he saw, all the pieces of music he ever listened to, all the books he ever read, and all the telephone conversations he held. Not only are we able to preserve what he collected himself, but also everything which he did not collect. And we can store all this on a USB flash drive no bigger than the size of a thumb. This is what constitutes the change: the storage space has become enormous, while the storage media have become incredibly small. A standard, cheap MP3 player provides two gigabytes of storage space. It stores more than six hundred pieces of music or six hundred images; it is music player and photo album in one. The biggest USB data storage device currently on the market has one terabyte. At the moment the ZKM | Publications department has four archive hard disks each with a maximum of one terabyte storage space: all of them are full. A storage medium with two gigabytes can store around 500,000 DIN A4 pages of text. What this means is that in the near future – and herein lies the paradox – nobody will be able to produce enough bytes over the course of their lifetime to fill a memory stick. Life is too short. Through the new storage technology, storage space has become so immense that an entire life has enough space on a flash drive with several terabytes. In other words, even if one were to record everything from birth till death, everything a subject read, heard, said and did, the storage space would still be larger than the amount of data to be saved.

Thus, the paradox consists in an attack by storage space on storage time. We have too much storage space, and no longer the possibility to fill it. In a sense, the storage space is the black hole into which storage time disappears. One experiences this daily when watching television. In former times, similar conditions prevailed in cultural production as in nature. Nature requires millions of years to make diamonds out of carbon. This principle also holds

for artists: somebody spends two years writing a novel which one can read in six hours. A film team requires one year to shoot a film the broadcasting time of which perhaps extends to ninety minutes. Hence, it is always about compression of time. However, if, for example, you need to fill one hundred TV channels each day, millions of hours of programs are required for one hundred channels. Herein lies, so to speak, the attack of the present on time, because it is no longer possible to raise this level of output. The result is the invention of the talk show, or reality TV, where, in a sense, what is produced, is immediately broadcast. So little storage time remains to us that we neither wish to, nor are able to store, but instead immediately broadcast what we do. We no longer have any time to save. The storage spaces must be permanently filled. Distribution has primacy over content. This is also the secret behind the success of YouTube and all the other video portals: that which human beings do is immediately available in “real time” – a term the computer introduced. In this sense, our present-day culture is fundamentally a real-time culture: we have accepted the loss. What happens is already past, perpetual “oblivion” has already begun. Mass culture has not got a memory. This is why the TV companies broadcast the same feature films every year without the public noticing.

The number of events and experiences which have been produced by humanity amounts to less than the size of the storage space available to us. This is the central axiom of the digital age. The storage space is increasing in size; the problem is, on the other hand, that storage time is becoming less and less. Altogether, the total shelf-space of the Library of Congress in Washington D.C. is 900 km long. If digitized, the 29 million books stored there would require around ten terabytes of storage space – a piece of cake. The objective of the project “My Life Bits” by Microsoft is to record everything a person does in their life. According to Microsoft – they assume an average human life – two terabytes would be required for this. By way of contrast, for the digitization of the inventory of the Library of Congress one would require ten terabytes, but for the digitization of a human life, only two terabytes. Today, it is already common to use hard disks with four terabytes. Hence, in terms of storage technology, for the preservation of a life one requires very little storage space. We have more storage space available than storage time: more space than content. And this is the reason why the leveling frequently complained of, namely, the standards in television, are sinking, why the standards in radio are sinking; materially speaking, this amounts to a problem of the attack by storage space on storage time. It is no longer possible to produce enough quality to fill the available storage media and storage space. After zapping through television programs, one arrives at the conclusion already echoed by Bruce Springsteen’s famous song, *57 Channels (And Nothin’ On)* (1992).

The second problem, to be addressed in the following, has already been thematized in the form of a future vision in a book called *Reinventing Nature? Responses to Postmodern Deconstruction*, edited by Michael E. Soulé and Gary Lease and published in 1995: in the year 2045, grandchildren rummaging around an attic stumble across a letter dating from the year 1995 together with a CD-ROM. The letter explains that the key to their happiness is saved on the CD-ROM. The children are excited, since they know about the myth of the CD-ROM from old films. Perhaps, if they are lucky, they may even find an old CD player, however, the necessary software is no longer available.

In 1999, the ZKM | Center for Art and Media Karlsruhe produced the CD-ROM *Media, Architecture, Installations* with the complete works of Antoni Muntadas in collaboration with the Centre Pompidou (Paris), which, due to just such a problem can no longer be played today. Thus, even though it is intact, under certain circumstances a CD-ROM or DVD-ROM may not be playable since the necessary systems preconditions are no longer available. In terms of storage technology they have a ten-year shelf life. On a magnetic tape, the information would be securely stored for around thirty years, whereas the material, the information, on a magnetic disk falls victim after five to ten years to the abyss of oblivion for eternity. The attack by storage space on storage time, the attack of the present on time, is so extensive that we have a storage space which tends towards the endless, and a storage time which, de facto, tends towards real time. This is the paradox of digital culture: the storage space virtually expands to the infinite; the storage time implodes towards zero.

The following examples are also a good illustration of this theme. The BFI (British Film Institute) has 200,000 hours of film on U-matic tapes. The BBC (British Broadcasting Corporation) owns 600,000 hours of film material. In view of the fact that around five hours are required to digitize one hour of film, then millions of hours would be required to digitize these tapes. To execute such a project requires an incredible amount of money, an incredible amount of time where time is money – a huge staff – staff is also money – and, furthermore, actual time in order to transfer once again, by way of digitization, past time to future time. Such a project can de facto no longer be carried out. The BBC conceded that it is impossible to make a selection from 600,000 hours of film; to watch 600,000 hours of film and to evaluate each single film as good or bad, and to make a decision about whether or not to digitize them is an impossibility. This would take around sixty years to complete. Naturally, one could – which thus leads me to an important point – make the selection according to the principle of contingency. The famous Institut nationale de l'audiovisuel (Ina) in France has been allocated the task of documenting all the radio and television programs of France, and to archive the best of them. With fifty channels and broadcasting stations broadcasting 24 hours a day, one would need ten thousand employees for this.

Such personnel expenditures would be impossible. The institute has around fifty employees. And, naturally, these fifty employees do not have the time to listen to all the programs, and to watch all the films before going on to discuss, according to various criteria, what does and what does not warrant being saved. They decided to make the decision according to the principle of contingency. In other words, what had formerly been the case, namely, selection based on quality, is today selection by chance, and herein lies a real problem. We have gone so far that, with digital storage, we no longer combat oblivion, but archive by means of random algorithms. The medium of immortalization has become a medium of contingency. Whether or not something will be saved is purely arbitrary, since it is down to chance whether something will or will not be saved.

Another such example: to mark the 900th anniversary of the original *Domesday Book*, the BBC organized the major *Domesday Project* in the years 1984–1986. The population of the United Kingdom could report on geography, history, and social themes in the area where they lived or about their daily life. The original *Domesday Book* goes back to William the Conqueror (1028–1087), who commissioned the survey around nine hundred years ago to determine “what or how much each landholder had in land and livestock, and what it was worth.” William the Conqueror was the first to levy heavy taxes, and began with a rate of five percent property tax. To be able to do this, he naturally had to know how the property was distributed. As a result, he sent out his men all over the kingdom and by 1086 possessed a systematic examination of the property relations in England in order to calculate how much property tax would be levied. Based on this design, in 1986 the BBC carried out a new “inventory” in Great Britain by sending out millions of school children who “surveyed” everything again. Furthermore, the BBC had statistics and pictorial material from the government. With all the data thus collected, the BBC produced a laser disc, which could be read by a BBC Master computer produced by Acorn Computers – the erstwhile competitor of IBM. The laser disc and the computer were then cutting-edge, the disc contained graphics, films and texts. Twenty-five years later, the project had to be saved through the massive efforts of several universities. After ten to fifteen years, the BBC micro-computer was no longer available since by that time Acorn’s competitor IBM had established itself as market leader. Consequently, there was no longer any equipment available on which the laser disc could be played. Millions of English pounds had been invested, many people worked on it and, after fifteen years, the result could no longer be used – all the information could no longer be read by the normal user, since everything had changed.

Another example I would like to cite is the famous principle of capitalism by Austrian economist, Joseph Schumpeter, referred to as “creative destruction.” Destruction in the name of the new is the credo in all innovation

societies. One can only be innovative if one invents a new medium, where by the former medium is superseded. This capitalist technique found its way to the heart of information and communications technology. The software and hardware changes every five years. The industry is proud of innovation; however, this apparent innovation leads to the fact that former storage technologies no longer function. For this reason – and this could be an important contribution to our civilization – I am of the view that laws are needed to inhibit such developments. Artists work with a certain technology, and clearly have a claim to immortalization. Artists wish to create works which remain forever. This is why we refer to restoration and preservation. A painter does not paint pictures only for them to be thrown away at some later point in time. Media artists are also artists of immortalization. They likewise wish for their works to survive. But they are dependent on the devices they use; on an industry which holds fast to Schumpeter's capitalist credo, and which is committed to innovation, namely, destruction; an industry which withdraws its products in five-year cycles and replaces them with new ones. Thus, legislation must be introduced that compels industry to make a financial contribution to museums and institutions that are committed to the archiving, conservation, and preservation of media art to provide them with the possibility, once industry has changed its storage media, to continue working with older forms of storage media.

In this connection, a classic example is the artistic work of Nam June Paik. In most cases his works use old television sets as basic components. In his gallery in Seattle, Nam June Paik had several colleagues whose sole task was to traverse the globe in search of old television sets. Most of them landed in the hands of Nam June Paik. However, once these television sets give up the ghost in ten years from now, there will be no more old sets in the world to replace the defective sets in Paik's works. At the ZKM | Karlsruhe we have huge warehouses, as big as multiplex cinemas, in which we can collect old television sets for such purposes – as well as old light bulbs, and so on. However, the supply will not last for the next hundred years; with any luck, perhaps for the next fifty years. However, this is only staving off "digital oblivion." Thus I wish to emphasize once more time: we must introduce legislation which forces industry to support our work in the archiving, conservation, and preservation of digital media. Mass media favor forgetting, as does industry. We are living in the so-called throwaway society. Culture is responsible for memory. Cultural technologies constitute cultures of memory. In the digital age, more than ever before, we are in need of an *ars memoriae*.



SiliconGraphics

Symposium II

***Digital Art Conservation.
Practical Approaches: Artists, Programmers,
Theorists***

**École supérieure des arts
décoratifs (ESADS), Strasbourg**

Contemporary Art and Technological Obsolescence

Cécile Dazord

The aim of conservation/restoration is to prevent or correct deterioration caused accidentally or arising over time when it is considered detrimental to the reception or for preservation of artworks. Conservation/restoration has traditionally been carried out in terms of materials and their physical deterioration. Technological obsolescence does not take place at the level of materials (natural or artificial substances that have not been worked upon) but at that of equipment (objects produced industrially for a given purpose or function); it is then not a question of a physical process of aging and deterioration but a social and economic phenomenon that also operates outside the cycles of commercial activity, in which products are replaced by others that are said to perform better. Technological obsolescence is a social phenomenon, closely connected with mass consumption and the processes of innovation that underlie the history of technology.

The question of obsolescence becomes a crucial issue when an industrially produced object is incorporated into an artwork – in the case, for example, of the experiments in light and movement carried out by early twentieth-century avant-garde movements. Works that are affected by obsolescence may, of course, also be subject to deterioration and physical aging, necessitating an approach based on chemical analysis of their materials, or the scientific imaging on which fine art restoration has traditionally been based. Nevertheless, other tools and methods are needed to address the problem of obsolescence. Mass industrialization has revolutionized the way art is made and the nature of artworks. In the field of conservation/restoration these changes have created a kind of ethical and methodological vacuum, an absence or loss of benchmarks, which has to be analyzed before steps can be taken to remedy it. Technological obsolescence thus leads to a reevaluation of the fundamental principles of conservation/restoration and, before that, to a reconsideration of the main ideas at work in efforts to rethink the discipline.

Much has been written on definitions of contemporary art. This is not the place to rehearse the innumerable debates (of varying quality) raised by that question, but rather, taking a strictly pragmatic approach, to observe in the first place the way the concept of “contemporary art” operates, in other words, delimits, structures, and organizes. Since the 1980s, there has been constant growth in the number of institutions, events, specialized publications, and workers in the field of contemporary art. Aside from the fact that it is part of an underlying institutional and economic system with a long history, the

common denominator proposed as defining contemporary art as such is primarily chronological. Its periodization varies from one institution to another, and has changed over time. The 1980s defined World War II. (the year 1945 in particular) as a turning point; twenty years later, 1968 was the crucial year; later still, the advent of contemporary art was located in the 1980s. Let us now consider two great Paris institutions, the Centre Pompidou and the Musée d'Art moderne de la Ville de Paris. The Centre Pompidou labels works as contemporary that were made by artists born after 1920, whereas for the Musée d'Art moderne contemporary art begins in the 1960s.

The definition of contemporary art by periodization alone does not help us to characterize the art that was produced. Unlike the fine arts, which are based on techniques (painting, sculpture, graphic arts, furniture) for each of which there is an established set of skills and responsibilities for conservation/restoration, contemporary art is marked by its extreme heterogeneity and dispersal. The breakdown of categories inherited from the fine arts, and the rejection of any form or type of limitation regarding materials, supports, or techniques, are precisely what makes this artistic production unique and is what gives it its contemporary quality; in other words, a principled claim to be open to "an infinitude of new possibilities" (Adorno).

We find an acute awareness of this phenomenon associated with modernity in the work of Theodor W. Adorno¹ and, later, that of Pierre Bourdieu.² In this context, modernity refers to the profound changes that took place in society in the early twentieth century, in the wake of a process of industrialization of which the contemporary may be considered a second phase or a completion: the emergence of new perspectives when that transformation has occurred and has been recognized.

"It is self-evident that nothing concerning art is self-evident anymore, not its inner life, not its relation to the world, not even its right to exist. The forfeiture of what could be done spontaneously or unproblematically has not been compensated for by the open infinitude of new possibilities that reflection confronts. In many regards, expansion appears as contraction. The sea of the formerly inconceivable, on which around 1910 revolutionary art movements set out, did not bestow the promised happiness of adventure."³

"The cultural revolution which gave rise to this inverse world (the literary and artistic field) could only succeed because the great heresiarchs, in their will to subvert all the principles of vision and division, could count if not on the support, at least on the *attention* of all those who, in entering into the universe

- 1 Theodor W. Adorno, *Aesthetic Theory*, edited by Gretel Adorno and Rolf Tiedemann; newly translated, edited, and with a translator's introduction by Robert Hullot-Kentor, The Athlone Press, London, 1997.
- 2 Pierre Bourdieu, *The Rules of Art: Genesis and Structure of the Literary Field*, translated by Susan Emanuel, Polity Press, Cambridge, 1996.
- 3 Adorno, 1997, p. 1.

of art in the process of formation, had tacitly accepted the possibility that everything there was possible.”⁴ Contemporaneity envisaged as an infinitude of possibilities and as a break with the traditional fine arts thus leads to a revision of the chronology and to situating contemporary art in the experiments of early twentieth-century avant-gardes.

One of the most salient points of rupture between contemporary art and the fine arts was the introduction of industrial artifacts or technical processes into artworks. “Art and Technology – a New Unity”, in the words of Walter Gropius.⁵ With the avant-gardes, technology entered the domain of the visual arts, notably in the form of movement produced by electric motors and of light from artificial sources. Without wishing to restrict the incorporation of industrial processes to specific historical periods or movements, one could say that the history of twentieth-century art is marked by moments that privilege the relationship between art and technology as a motor for artistic creation. The years 1910–1920 are characterized by the production of works that were programmatic or had the nature of manifestos, or which foregrounded technology as a stimulus to creativity. In the years 1950–1960, optical and kinetic art brought movement and light back into the center of art production. Since the 1980s, the technologies of sound and image employed by artists beginning in the 1960s have been represented on a large scale in museum collections. Since the 1990s they have been joined by computer hardware and software, sensors, and network devices.

As a corollary of the “infinitude of possibilities,” emancipation from all kinds of rules and from the notion of a canon has led to the rejection of any kind of technological prescriptivism in the domain of art, and to the promotion of technical virtuosity as a pivotal criterion. Lastly, rejection of the normative use of technology has caused a generalized mistrust and loss of interest in it, at the very time when modern and contemporary art is marked precisely by the incorporation of industrial technologies into works, and when a considerable proportion of twentieth-century art rests on a critical use of technology – reappropriated and freed from any association with the exercise of power.

The dehumanizing use of technology for purposes of control and manipulation by totalitarian regimes in every area of life, including the making of art, intensified their discredit. And the spectacular exploitation of technology as an instrument of mass culture does not suggest a fruitful relationship between art and technology. The fact that technology was thus discredited explains

4 Bourdieu, 1996, p. 58.

5 Walter Gropius, “Programm und Gründung einer allgemeinen Hausbaugesellschaft auf künstlerisch einheitlicher Grundlage” (1910), quoted in Hans M. Wingler, *Das Bauhaus 1919–1933. Weimar, Dessau, Berlin und die Nachfolge in Chicago seit 1937*, Rasch-Dumont, Braschme, 1975 [1962, 1968].

why photography, and then cinema, were confined to the margins of the fine arts and more broadly, the difficulty, in the field of the visual arts, of conserving and restoring works which contain industrial technological elements, or of conceptualizing and dealing with the phenomena of obsolescence.

While empirical conservation/restoration practices have existed at least since the birth of museums, a homogenized, standardized deontology has emerged only very recently. For a long time, therefore, the concepts of *historicity* and *authenticity* were alien to restoration, which was synonymous with recreation or enhancement. The founding of the Istituto centrale per il restauro (ICR, Central Institute for Restoration) in Rome in 1939, and of the International Council of Museums (ICOM) in 1948, are symptomatic of the efforts made in the later twentieth century to turn that practice into a discipline and to create appropriate institutions. The publication in 1963 of Cesare Brandi's *Teoria del restauro*⁶ is often considered the key symbolic moment in the transformation of a set of empirical skills into a theoretical arsenal. Almost fifty years later, Brandi's work is still a remarkably influential point of reference. It brings together texts published in the 1940s and 1950s which form the theoretical basis of conservation/restoration, and it was written before contemporary art succeeded the fine arts in the historical record, or, more precisely, at the very moment at which it emerged. This chronological anteriority means that the theory of conservation/restoration devised by Brandi is limited to the fine arts and cannot extend to contemporary art. At the same time, the fact that they coincided historically suggests that the establishment of conservation/restoration as a discipline was intimately connected with the emergence of contemporary art and the revolution in the field of the fine arts. The close historical link between contemporary art and the theory of conservation/restoration offers considerable scope for thinking about the history of conservation and for the creation of a new paradigm specifically applicable to contemporary art.

Obsolescence is a socioeconomic phenomenon within which contemporary art occupies only one area. The philosophy of technology – which has been partially supplanted by the philosophy of science, with which it is frequently associated – is a privileged domain in which to define technology's mechanisms and the issues it raises. The work of Gilbert Simondon, a leading philosopher of technology, was for the most part written between the mid-1950s and the late 1960s, just when contemporary art was emerging and when conservation/restoration were being established as disciplines. *Du mode d'existence des objets techniques*, his first work, was published in 1958⁷.

6 Cesare Brandi, *Teoria del restauro*, Einaudi, Turin, 1977 [Edizioni di Storia e Letteratura, Rome, 1963].

7 Gilbert Simondon, *Du mode d'existence des objets techniques*, Aubier, Paris, 1989.

Today Simondon's work has been rediscovered and reprinted and is the subject of numerous studies.

As its title declares, *Les Sens de l'évolution technique* (2005) by Xavier Guchet⁸ addresses the idea of technological development, of which obsolescence is only a corollary. A number of concepts or questions raised in it are worth adopting. They enable us to take a new look at the phenomena of obsolescence in the field of contemporary art. The fact of being consigned to oblivion appears as a mode of manifestation that is inherent in technology: a contemporary technology is adopted, integrated, and incorporated, but is not perceived as such; a technological phenomenon is visible only when it is radically new, or is about to disappear: "As Heidegger says, it is precisely when it is no longer in use that the hammer is seen as an object [...]. The appropriation of a technological object, tool, instrument, or machine goes hand in hand with a phenomenon of forgetting: use of a technological device is mastered when it short-circuits the moment of objectification, that is to say, when the device in question is no longer seen as an object at all. It thus seems that on this first level, forgetting is not a trivial phenomenon but one that is essential to the appropriation of a technology [...]. The perfect technological object is the one that is completely forgotten."⁹

This idea reveals the need for serious thinking about the conservation of works subject to obsolescence; if a work incorporates an object or technological component, its role and status have to be evaluated. Distinction can be made between a work in which the technology is an essential component, using a model that is dominant in the fine arts (but not exclusive to them, since sculpture, with molds and casting, breaks that simple paradigm) and a work that uses equipment that can be modified on different occasions, in other words, is subject to interpretation or variation; this time using a paradigm from music. Of course, this distinction is not always clear or precise – far from it! Lastly, a study of the timescales applying to a work, and of the technology involved in it, would appear to be crucial from the point of view of conservation/restoration, in order to gauge the degree of "visibility" of a piece of equipment: a device that was contemporaneous with a work when it was made was, for that very reason, hardly visible at the time; on the other hand, one that was either outdated or ahead of its time, enjoyed heightened visibility. In the context of technological obsolescence, the question of interpretation arises in a radical, crucial way: the constituent elements of works are constantly being overtaken by the processes of production and distribution and being replaced by others, which confronts conservators and restorers with difficult choices. One option is to keep the original equipment (if not its operation, then at least its appearance), which inevitably creates an effect of age. The other option is

8 Xavier Guchet, *Les Sens de l'évolution des techniques*, Editions Leo Scheer, Paris, 2005.

9 Guchet, 2005, pp. 10–11; translated from the French by Imogen Forster.

to update the work, which although this may visibly alter its appearance or its meaning, it does have the advantage of reproducing the effect of transparency or invisibility of the hardware originally used if it was contemporaneous with the work and in common use; that is, it did not attract particular attention. The idea of a unique, fixed state of works is replaced by choosing the modes of presentation or reproduction (variable according to context) associated with conservation/restoration. Every work designed to be shown and seen is thus subject to reiteration and decontextualization, and thus to interpretation. In this regard, Brandi's work is highly relevant when it identifies three timescales connected with a work: its origin or creation, its reception, and the various intervals of time between the two, emphasizing that the reception of a work can never be completely congruent with its origin.¹⁰

The only remedy for this unsatisfactory choice, to the extent that obsolescence necessarily causes some loss (the loss of the effect of transparency or invisibility in a piece of equipment, or of its historicity, uniqueness or specificity), is documentation. Given the inevitable modification of works, documentation is the safety-net: that is where the key tool for restoring reversibility will now be found. Documentation enables us to go back and reinterpret the work on a solid basis. Many of the problems posed by exhibiting a work affected by obsolescence arise from incomplete documentation. The incorporation of industrial technologies into artworks is still a recent phenomenon, going back no farther than the avant-gardes, in other words, to the early twentieth century, but it was not common until after World War II. The documentary culture that prevails in museums springs from the fine arts and is essentially based on iconography and bibliography; technical documentation, which is succinct in the traditional areas of the fine arts (essentially painting, sculpture, and the graphic arts), is more imprecise still when it involves recent industrial technologies, as we see in the phrases used recurrently in captions: "variable dimensions," "various materials," or "mixed techniques."

The exponential growth in the technologies involved has not yet led to the professionalization of the relevant conservators, restorers, and technicians, nor to the development of appropriate tools and methods. In addition, many people engaged in conserving or restoring artworks, for example, technicians (electricians, mechanics, or audiovisual and IT specialists) operate outside documentary circles. This means that a great deal of indispensable information is only transmitted orally, or is archived in a disorganized, personal way on individual hard disks. Information is not and cannot be shared, since it has not been designed to be disseminated. The difficulty associated with documentation lies, in fact, in designing a permanent form of information that can be understood and improved upon by others. There is also a lack of archival

10 Brandi, 1977, p. 20.

activity on the part of businessmen, who do not usually retain documentation about their products.

Construction of a new conservation/restoration paradigm for contemporary works subject to obsolescence inevitably involves the creation of a new documentary model. Alongside historiographic, iconographic, and bibliographic documentation, technological documentation has to become more precise, more professional, and above all, adaptable to each technology.

In 2006, the Contemporary Art Group, part of the research department of the Centre de Recherche et de Restauration des Musées de France (C2RMF, Centre for Research and Restoration of the Museums of France) launched a program devoted to the phenomena of technological obsolescence.¹¹ Two avenues of study and research were followed: the first focused on digitizing silver halide films, the second on the conservation of light sources.

Since the late 1960s, a large and ever-increasing number of works held in contemporary art collections has consisted of still or moving images. Some of these images now exist on supports and in formats that are obsolete, making it increasingly difficult to produce new copies when the working copies are damaged. And when the originals are in a poor state of conservation, it becomes difficult to handle them or to replace them by identical supports. In addition, finding the equipment needed to read (or to publish) these images is problematic. It thus becomes impossible to present some works, and their accessibility and conservation or preservation is threatened. Faced with the combined obsolescence of supports, formats, and reading devices, curators often turn to digitizing the works in question. The aim of the C2RMF project is not to preserve film stock, to address the question of storage, or the durability of the data once films have been digitized, standards for which are being developed. The research carried out by C2RMF aims rather to develop a critical approach to digitizing silver halide films in the context of avant-garde or experimental cinema, which provides a textbook case. This branch of filmmaking, which is independent and on the margins of commercial production and distribution, deliberately uses technology in unconventional ways, thus posing greater problems for digitization. More precisely, the idea is to focus on the modifications inevitably introduced by the change in technology (from silver halide to digital) and in particular, to evaluate the differences in frame-rate and color quality between a silver halide film and its digitized version, with respect to the technologies employed, the parameters associated with digitization, and current projection methods. These issues arise with all silver halide films, but especially in the case of experimental or avant-garde films, which exploit these effects.

11 This work is ongoing but has already led to several communications and publications; cf. the blog ARTOBS, of the Contemporary Art Group, of the C2RMF, available online: www.obsolescence.hypotheses.org, accessed 06/26/2013.

The second avenue of research is centered on official programs for eliminating light sources with a high-energy consumption, and on their impact on contemporary works. During the twentieth century, artificial lighting established itself as an art material in its own right, and the aesthetic issues involved in its use are obviously influenced by technical developments. The planned phasing-out of light sources considered wasteful, such as incandescent light bulbs (EU Directive of 2009¹²), present a new situation for conserving such works. Starting with the contemporary collections of the Centre Pompidou, C2RMF's Contemporary Art Group is carrying out a systematic census of works that include light sources. A blueprint for description, treating works from both the technical and the aesthetic point of view, is being drawn up, using criteria established as part of the study. This initiative is intended to enable curators faced with an obsolescent technology and aware that they will probably not be able to reactivate a work in its original form, to make informed decisions. In the course of the study, the question of the obsolescence of light sources is approached for each work individually. The ultimate aim is to create a documentary model applicable to works containing light sources, and more generally, to those with components derived from industrial manufacturing processes.

The Contemporary Art Group is currently working, with the help of a consulting lighting engineer, on the construction of a documentary model for works incorporating sources of artificial light. With the help of video engineers, it is also describing the modifications caused by digitizing silver halide films, and by the differences between photochemical and digitized images – changes in color effects and frame rate, especially the flicker phenomenon¹³. This description concentrates on the modifications caused by digitizing equipment, such as telecine or scanners, and on all the peripherals involved in reproducing digital images (video projectors and screens), each technology altering perceptibly and in a different way the nature of what we see and hear.

Documenting the changes brought about by the process of conservation/restoration is thus another fundamental aspect of documentation.

Translated from the French by Imogen Forster

12 Commission Regulation (EC) no. 244/2009 of 18 March 2009, implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for non-directional household lamps, available online: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:076:0003:0016:EN:PDF>, accessed 06/26/2013.

13 "Flicker" is a phenomenon inherent in conventional film projection. It is the interruption of the beam of light between each image that creates the illusion of movement; some artists have exploited and exaggerated this effect by juxtaposing strongly contrasting film frames.

Exhibition Closed Owing to YouTube Redesign. Curatorial Practice and Problems in the Conservation of Digital Art.

Raffael Dörig

I am writing here in my capacity as a curator of contemporary art who organizes exhibitions primarily outside the collections and conservation setting. In this context, emphasis is placed on the moment – frequently the moment following the creation of single works of art. In many cases, the works are designed to last for a short period only; they are ephemeral, process-oriented, and are not intended to last; however, they are required to remain intact for the period of the exhibition in one or the other form.

By way of examples drawn from exhibition practice, I would like in what follows to cautiously approach questions, which – I hope – may also be of interest with respect to the discussion on collecting and conserving digital art. Here, I purposely overlook strictly technical questions, and instead concentrate on conceptual and structural aspects relevant to both the exhibition business and to art conservation. The following examples are drawn from the exhibition *Surfing Club*, which I realized in 2010 in [plug.in]¹ (Basel) and in Espace multimédia gantner in Bourogne. The examples clearly illustrate both the moment of translating (art)works taken from the Internet into an exhibition situation, and the understanding and treatment of these by a new generation of Internet artists and the art world. The exhibition is dedicated to a new generation of artists who work in and with the Internet, and who emerged in the context of a loose network around the collaborative Internet platforms Nasty Nets,² Spirit Surfers,³ Loshadka,⁴ Club Internet,⁵ and Vvork.⁶

Of course, there are parallels here to classical net.art dating from the late 1990s. But there are also substantial differences: it is no longer a matter of the creation and definition of a new site for art (and through art, for society), and neither do the big *Netz-Utopien* (network utopias) play a role here. The works are marked far more by the ordinary, everyday use of the computer and Internet, as has meanwhile become commonplace for broad sections of the population – most especially for the generation of so-called “digital natives,” who came of age with the Internet. The digital natives are also among the exhibition artists. They critically examine the mechanisms and aesthetic aspects

1 At the end of 2010, the [plug.in] ceased to operate and was transferred to the House of Electronic Arts in Basel, which was officially opened on May 27, 2011.

2 Available online at: www.nastynets.com, accessed 05/24/2013.

3 Available online at: www.spiritsurfers.net, accessed 05/24/2013.

4 Available online at: www.loshadka.org, accessed 05/24/2013.

5 Available online at: <http://harmvandendorpel.com/clubinternet/>, accessed 05/24/2013.

6 Available online at: www.vvork.com, accessed 05/24/2013.

of the Internet, which today, though largely having become commercialized and subject to increased control under the pretense of copyright protection (as was feared in the later 1990s), still provide a sort of playing field for anarchic, uninhibited thinking. The point is not a strict separation from the commoditized Internet but, for example, a self-evident, playful treatment of the paradox that social exchange, as well aesthetic and political resistance, can take place on commercial platforms such as Facebook or YouTube (along with all the consequences entailed by this).

The standards, templates, and defaults of commercial, popular programs and websites play an important role in the artists' work, and there are strong references to amateur culture, digital folklore, and popular culture occasionally to the point of complete accordance. This becomes evident above all in the treatment of found material: practices such as sampling, remix, mash-up, plunderphonics, found footage film, and suchlike – up until a few years ago known only to a public specialized in these areas – have become commonplace, especially on the Internet and in nonartistic fields.

The group of a new generation of Net artists mentioned in the present text is closely affiliated to the popular cultures of the World Wide Web, as is best illustrated by the "Surf Clubs." These blogs are characterized by a specific practice of collaborative showing, transformation, and commentary of Net-found pieces and their own contributions.

No less remarkable is the treatment of the various artistic scenes and platforms. The Internet is no longer the only place of work (in the sense of a utopian place of democratic access to classic net.art). Artists operate far more with various formats as a matter of course: works, which they relate to the Net cultures may manifest themselves on the Internet, but also in spatial works, and are shown in art museums, "off spaces," and media festivals, or in commercial galleries. Artists see themselves as part of the art world and work with elements such as physical artifacts and exhibitions – something which similarly exerts an impact on questions of conservation.

How such an artifact that has been translated from the Internet into the sphere of art appears, is indicated in the first example by the exhibition *Surfing Club: Untitled* (30.III.2010) by Aleksandra Domanović. In this case we must produce sculptures in order to exhibit digital art. Here, the principle role is played by an underestimated part of digital society, namely, the printer. We thus find ourselves now moving in a contrary direction to the present-day idea of the paperless office. To produce the sculpture, three printers were in operation, non-stop, for a week. The Slovenian artist repeatedly engages critically with the history of former Yugoslavia. By way of a monument for the domain ending "yu" (for Yugoslavia), a symbol of belligerence during the Yugoslavian war that was finally abolished around the time the exhibition took place at

Aleksandra Domanović
Untitled (30.III.2010)
 2010
 Exhibition view
 [plug.in], Basel
 Photo: Bianca Hildenbrand



the end of 2010, she developed a series of paper structures. These consist of several thousands of borderless, printed DIN-A4 pages which, when stapled together, allow an image to become visible. For the exhibition *Surfing Club*, she developed a new installation from three such sculptures. The basic material of the printouts consists in photographs of ultra-nationalists in the Belgrade football stadium. For the production, we received PDF files with several thousands of pages, each of which contained fragments of the total picture on a narrow strip along the border. Aleksandra Domanović published a similar edition available as a free download, and which can be printed out at home (3,500 DIN A4 pages).⁷ Hence, what we have here is a downloadable sculpture. I mention the work not only because of its hybrid format, but above all because, in my view, the artist has the problems of conservation under control. A buyer receives both the finished paper stack, as well as the

7 Available online at: www.aleksandradowanovic.com/grobari.html, accessed 06/22/2012.



Left: Petra Cortright
VVebcam

2007

Right: Aleksandra
Domanović

Untitled (30.III.2010)

2010

Exhibition view

[plug.in], Basel

Photo: Bianca Hildenbrand

PDF and the permission to print out the sculptures again should they be damaged or become yellowed. Furthermore, the artist stresses that the PDF is more important than the sculpture. Being a thoroughly established format, the PDF probably stands a good chance of remaining temporarily readable. Additionally, by scanning the finished paper stack, the PDF can be reconstructed such as to remain close to the original – the two parts can thus replace one another.

Within this group, the medium of video is a far more common format than the sculpture. However, with respect to exhibition formats and conservation strategies, one cannot simply treat these video works as video art – although, naturally, references may be made to the history of video art and experimental film (to the tradition of found footage films, for instance). John Michael Boling's *Four Weddings and a Funeral* from 2006, is an example of a Net-specific practice of found footage video.⁸ *Four Weddings and a Funeral* embodies precisely what the eponymous title of the romantic farce from 1994 promises: what can be seen and heard are videos of four weddings and a funeral found on YouTube. This involves documents of private moments in the life of what

8 Available online at: www.google.com/fourweddings.html, accessed 05/24/2013.

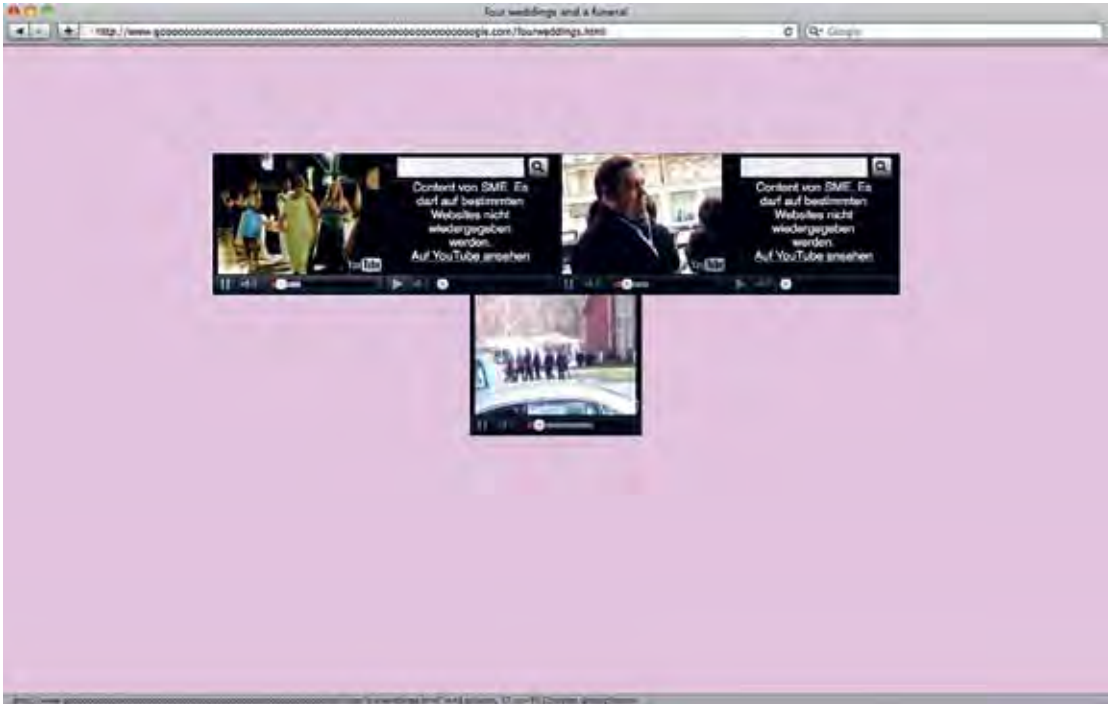
remain, for us, unknown people who, by way of media-technological recordings and publications, are simultaneously witnessed and fictionalized, as well as being further processed as artistic material so as to assume the form of a work of art.

I did not have much contact with John Michael Boling during preparations for the exhibition: there was little more than his blessing to show the projections with visible address bars; namely, as a recognizable Website. However, it became evident to me when viewing the Website once again around the end of 2011 that I ought to have asked some questions in advance. In other words, two of the five videos had meanwhile become inaccessible since the amateur filmmaker had used copyright protected music as a background to her pictures.⁹ This might have also happened during the exhibition, but happily, it did not. The question as to what should have been done in this case immediately led to strategies of possible conservation.

At a first glance, things appeared unproblematic: one could record the work as a video. However, in this case, the aleatory quality of the combinations of unequally long videos would have been lost. If need be, one could remedy this with recording single videos, which could then be inserted as a mask, although this seemed to me rather unimportant if there was a sufficiently long recording. The situation would have been more serious had it no longer been possible to access YouTube when clicking on the corresponding page of the original upload. In the exhibition version this was not possible (since the use of a mouse had been avoided), whereas in the home version, it was possible. A further option for “repairing” the work would be to use other private wedding photographs from YouTube instead of blocked videos; as is well-known the pool of such videos is huge. However, the selection, or selection criteria must be determined by the artist, since the videos are not randomly selected.

Two important points must be born in mind here: First, there are different versions of the works: an Internet version, which is mostly looked at on one’s own home computer, and an exhibition version, which, for example, can assume the form of an object. One should probably also include a third version; namely, a conservation or collection version. Second, commercial, widely circulated programs and platforms causing specific problems are used – this may also be observed in the following example in which, again, YouTube plays a role.

9 The practice of such blocks is hardly predictable. Various factors, such as the interpretation of the copyright, the dispute between Internet companies, such as YouTube or Google, and licensed distributors or the precision of music recognition software play a substantial role here. During the preparation of the lecture on which the present text is based for the symposium Digital Art Conservation. Practical Approaches: Artists, Programmers, Theorists held November 24–25, 2011 in Strasbourg, the relevant videos could not be called up online. On the day of the lecture itself, which was held on November 25, 2011 in Strasbourg, the videos were once again available. This led to the conclusion that country-specific distinctions exist with respect to copyright, or that their interpretation could at least play a role.



John Michael Boling
Four Weddings and a Funeral
 2006
 Screenshot from November
 2011 including two blocked
 videos

Californian artist Petra Cortright (born in 1986) is known for her videos which she records with customary Webcams, often with the aid of software effects that come with the cameras. In most cases, her videos are first released on the video-sharing website YouTube. On display in the exhibition *Surfing Club*, was the work *VVebcam*, one of her earliest videos of this kind dating from 2007. In this piece, she conjugates with stoic gaze the standard animations (emoticons and the like) of a video chat program. With respect to production and publication processes, it would seem at first glance that Petra Cortright's videos are very close to the forms of self-expression on the Internet prevalent among youth, but are actually characterized by a precise game of displacements and mysteries. While this occurs directly in the videos, Cortright also attaches an elaborate list of popular search terms to her videos on YouTube: a method reminiscent of spam.¹⁰ These search terms also affect which videos are classified as "similar" by the YouTube sorting system, and those displayed on the page. And, naturally, these are the terms that attract people expecting something different, and who then express their surprise or displeasure in commentaries.

10 The list comprises approximately 700 words and begins with: "tits vagina sex nude boobs britney spears paris hilton jordan capri honeymoon hollywood lindsey lohan girl woman lady sexy man."



Petra Cortright

Vvebcam

2007

Screenshot, autumn 2011,
showing the video on
YouTube after a number of
redesigns of the website,
shortly before it was deleted
due to contravention of the
terms of use

Australian theorist Lizzie Muller argues in favor of preserving works of media art for an oral history that not only comprises discussions with artists and figures in the art world, but also with the public: “The audience remains a silent majority in the history of media art – much talked about but rarely heard.”¹¹ With the commentaries, we have now, so to speak, built in an oral history. However, these commentaries cannot replace oral history for the recording and conservation of the work. Instead, they once again represent new challenges to conservation. This is by no means intended as a song of praise for the “discussion-friendly” masses of so-called Web 2.0, since the commentaries on Cortright’s video are generally speaking exactly what we are accustomed too on YouTube and similar Web pages: “cool,” “you are cute,” “love it, what’s the song?,” “total waste of time...,” “lamest video ever award,” “get a life...”.¹² Things become interesting when the artist responds – and in a similar vein. Two years ago, for example, “rownerly,” wrote “kill yourself,” to which “petracortright” replied: “i will if u will – k u go first.”¹³ When, for

11 Lizzie Muller, “Oral History and the Media Art Audience,” in: Annet Dekker (ed.), *Sustainable Archiving of Born-digital Cultural Content*. Virtueel Platform, Amsterdam, 2010, pp. 61–68, available online at: http://issuu.com/virtueelplatform/docs/archive2020_def_single_page, accessed 05/24/2013.

12 Comments on *Vvebcam* <http://www.youtube.com/watch?v=GPaCCBE-K1g>, offline since 10 December, 2011.

13 Ibid.

example, “MrSexyman2011” enquires, “is there really any nudity in any of these films on this site?”¹⁴ one clearly identifies an audience which does not consider Cortright’s video as art. What is interesting here is the way in which this becomes perceptible, and reactions tangible. But there is also a public which is aware that it is viewing art, or at least something similar: “I love internet art,” “Truly amazing! The most inspiring video for weeks. I would love to see a music video like this. And the tags are brilliant.”¹⁵

One important quality of the work itself is contained in these, admittedly, not exactly ingenious commentaries; in a playful nonchalant manner it makes mechanisms visible while, in a certain sense, at the same time collects useful and/or representative material from a certain era of a given zeitgeist. The material, were it conserved, would situate the work within its epoch while at the same time capturing an important aspect of digital culture around 2010. Thus, there are elements here that one could characterize as a kind of interactive performance on the YouTube platform. One might also see the videos in the tradition of video performances – albeit made with an “Internet State of Mind.”¹⁶ This leads us back to the question: How does one exhibit this?

In an e-mail to me, the artist wrote: “I think this piece lies on the line between video art and net art/internet art and so it should be shown in a way that represents that.”¹⁷ I can only agree with this: the video itself was made with a Webcam and requisite software – and is also called *VVebcam*. Furthermore, for the foregoing reasons, I felt it important to also include the YouTube context. We agreed that the video should be shown on a flat-screen monitor suspended from the wall: in the YouTube context, the description (the long list) flipped open in the right-hand column and the most recent commentary was visible under the video. The video is looped by way of a script. The public was not able to intervene, and there was neither mouse nor keyboard.

Only a low-resolution screenshot of this version currently exists – and we thus find ourselves in the midst of a problem of conservation: I cannot produce a new screenshot, since YouTube changed its design in the middle of the exhibition period. The exhibition did not have to be cancelled. A somewhat different aspect of the work was emphasized, since the tags under the video were new, whereby the commentaries slipped downwards and, instead of these, “similar” videos were shown to the right. And yet the idea

14 Ibid.

15 Ibid.

16 “All these ideas which, not so long ago, were new and radical, have long-since become a sort of second nature for these artists. Art which has been produced in this way is necessarily ‘for’ the Internet, or has been produced online, but automatically in a kind of Internet State of Mind,” Carson Chan, quoted in: Dominikus Müller, “Für eine Handvoll JPGs,” in: *De:Bug 150*, available online at: <http://de-bug.de/mag/8220.html>, accessed 05/24/2013, translated from the German by Justin Morris.

17 Petra Cortright and Raffael Dörig, e-mail correspondence January 30, 2010.

of making visible elements of YouTube as a platform for a kind of performance in the exhibition version was retained: after additional changes to the YouTube design a few months later in 2011, this would have no longer been the case. Instead of “similar” videos it was now primarily other videos of the same users that could be seen in the right-hand sidebar, in this case, Cortright. To subject oneself voluntarily (and, as will be shown here, artistically substantiated) to the rules of the world’s largest Internet company can have more immediate serious results than changing an exhibition version that was anyway understood as only temporary. Hence, on December 2011, several of Cortright’s videos, among them *VVebcam* (which, at this point in time had already been online for four years), were deleted by YouTube on the grounds that they contravened the rules of the platform. Due to the long list of key words mentioned above, they were classified as spam. Since then, the videos are not retrievable on the original platform, which was far more than just a place in which to show a video.¹⁸

Works, such as John Michael Boling’s *Four Weddings and a Funeral* and Petra Cortright’s *VVebcam* rely on the existing services of the Internet mainstream, and infiltrate streams of *user-generated content*. There are many artistic reasons for this, and not primarily technical ones. Hence, it is not possible to switch, for example, to other software possibilities, which would be advantageous for conservation. Obviously, this is a key problem of genuinely Net-based art, which is connected to dynamic processes: there are things which are simply not within our power. Steve Dietz describes this with reference to a work dating from 1997, which merely cites links to other websites; in other words, this is nothing new.¹⁹

Problems increase when a work of art takes place within the parameters specified by a company like YouTube. Thus, such works cannot become part of a collection in their entirety, as Anne Laforet has demonstrated using the example of Christophe Bruno’s works, which are dependent on the Google search engine.²⁰

Collecting should not primarily aim at a historical rerun. Instead, it is possible to work with more documentary material. This does not exclusively

18 *VVebcam* is archived online as part of the Rhizome Artbase and can still be seen online at: <http://archive.rhizome.org/artbase/53474/vvebcam.html>, accessed 06/20/2012. See: Ben Fino-Radin, *YouTube Censors Petra Cortright, But 'VVEB CAM' Lives on in the Rhizome ArtBase*, available online at: <http://rhizome.org/editorial/2011/dec/12/youtube-censors-petra-cortright/>, accessed 05/24/2013.

19 Steve Dietz, “Collecting New Media Art: Just Like Anything Else, Only Different,” in: Bruce Altshuler (ed.), *Collecting the New: Museums and Contemporary Art*, Princeton University Press, Princeton, Oxford, 2005, pp. 85–101, available online at: www.neme.org/524/collecting-new-media-art.com, accessed 05/24/2013.

20 Anne Laforet, *La conservation du net art au musée. Les stratégies à l'œuvre*, PhD diss., University Avignon, 2009, Editions Questions Théoriques, 2011, p. 176, available online at: www.sakasama.net/conservationnetart/these-en.html, accessed 05/24/2013.

concern, or first and foremost, program codes but social and communicative constellations, which anyway belong to a particular time. If I had to include Petra Cortright's work in a collection, my objective with respect to documenting the performative, ephemeral aspects of the work, would certainly be to go beyond the artist's proposals – for example, by archiving texts written by the author and commentators on YouTube. She sells her works as video files on USB flash drives with a certificate and a contract, which anticipates migration (see glossary, p. 601) to new video formats and data storage media. Hence, this comes relatively close to video art. Nevertheless, YouTube is again still an elementary factor in the sales and collecting process: the price of the video is determined by the size of the audience (hits) on YouTube.²¹

To summarize – and I believe this applies over and above my examples – I would like to argue in favor of conceding different lives, different aggregate conditions, to digital art. Perla Innocenti talks of a dynamic concept of authenticity²² – and I believe that I am thinking in a similar direction.

Basically, these diverse aggregate conditions amount to the following: often the works have a life on the Internet; there, reception is mostly private – hence, a home version does exist. Then there are exhibition versions which, for example, can materialize themselves as an object; the reception takes place in another context, but in its initial form it is contemporaneous, namely, present. And, finally, a conservation or collection version is required as a new form, which includes the experiences of both previous versions, and continues to write or present itself as being historically part of the future and perhaps conceptually contributes to new forms of exhibition. Since time anyway runs on, works become historical.

Whether one opts for standstill or for constant updating and production of new versions – whatever the case may be, in my view it seems reasonable to include curatorial considerations, and, along with the artists, to also compare notes with curators as the first exhibitors and “short-term conservers.”

In the case of the artists cited above, transformations and playing with diverse conditions and variants within digital and physical spaces comprises an inherent part of artistic practice. A collection version can also be fore-armed for several exhibition versions: whether as the historical restaging of software (on original pieces of equipment and software, or by way of emulation [see glossary, p. 600]), an exhibition of recordings and documents, as object, or as hybrid form of all these. This may also already form part of a work, as the final example shows: it is a work by Daniel Keller and Nik Kosmas, who work together under the Aids-3D label, and who focus on our quasi

21 Available online at: www.petracortright.com/videocatalog, accessed 05/24/2013.

22 See Perla Innocenti, “Keeping the Bits Alive: Authenticity and Longevity for Digital Art,” this volume, pp. 217–230.

magical relationship to technology and the myths of the digital age. Their OMG *Obelisk* in *Translation No. 4* was shown in the *Surfing Club* exhibition. The artists originally staged the common Internet abbreviation OMG for “Oh my God!” in an installation, as a kind of altar, thereby reintroducing the religious context. As an animated GIF, the photograph of the installation then developed a life of its own on the Net and was also used by many people as an “Oh my God!” comment again. The above-mentioned *Translation No. 4*, which was on show in the exhibition, was a transformation of the work into a picture-object. Hence it went from virtual Net space to real, three-dimensional space, back into the Net, and then into the exhibition space.

Translated from the German by Justin Morris

Keeping the Bits Alive: Authenticity and Longevity for Digital Art

Perla Innocenti

1. Digital Casualties: Challenges for Digital Art Preservation

Born-digital art (see glossary, p. 599) is basically art that is produced and mediated by a computer. It is an art form within the overall category of “media art”¹ and includes software art, computer-mediated installations, Internet art, and other heterogeneous art types.

The boundaries of digital art are particularly fluid because it merges art, science, and technology. The technological landscape in which digital art is created and used challenges its long-term accessibility, the potentiality of its integrity, and its retention of authenticity over time. Digital objects – including digital artworks – are fragile and susceptible to technological change. We must act to keep digital art alive, but there are practical problems associated with its preservation, documentation, access, function, context, and meaning. The preservation of digital art is at risk: the reasons are technological but also social, organizational, and cultural.²

Digital and media artworks have challenged “traditional museological approaches to documentation and preservation because of their ephemeral, documentary, technical, and multi-part nature.”³ Digital art’s technological

- 1 Christiane Paul, *Digital Art*, Thames & Hudson, London, 2008; Christiane Paul (ed.), *New Media in the White Cube and Beyond. Curatorial Models for Digital Art*, University of California Press, Berkeley, 2008; Alain Depocas, Jon Ippolito, and Caitlin Jones (eds.), *Permanence through Change: The Variable Media Approach/ L'approche des médias variables: la permanence par le changement*, Solomon R. Guggenheim Museum, New York, The Daniel Langlois Foundation for Art, Science and Technology, Montreal, 2003, available online at: www.variablemedia.net/e/preserving/html/var_pub_index.html, accessed 05/24/2013; Oliver Grau and Rudolf Arnheim (eds.), *MediaArHistories*, MIT Press, Cambridge (MA), 2007; Wolf Lieser, *Digital Art. Neue Wege in der Kunst*, h.f.ullmann, Berlin, 2010.
- 2 See, for example, the work done in the DRAMBORA (Digital Repository Audit Method Based On Risk Assessment), created and developed by DigitalPreservationEurope (DPE) and the UK Digital Curation Centre, available online at: www.repositoryaudit.eu, accessed 05/24/2013. Among other benefits, this tool allows the building of a detailed catalog of prioritized pertinent risks, categorized according to type and inter-risk relationships, that includes not only technical but also, for example, organizational and legal risks, in relation to the organization’s mission, objectives, activities, and assets. See: Perla Innocenti, Andrew McHugh, and Seamus Ross, “Tackling the Risk Challenge: DRAMBORA Interactive,” in: Paul Cunningham and Miriam Cunningham (eds.), *Collaboration and the Knowledge Economy: Issues, Applications, Case Studies*, IOS Press, Amsterdam, 2008.
- 3 Richard Rinehart, “The Media Art Notation System: Documenting and Preserving Digital/Media Art,” in: *Leonardo: Journal of the International Society for the Arts, Sciences and Technology*, vol. 40, no. 2, 2007, pp. 181–187, here p. 181; available online at: www.coyoteyip.com/rinehart/papers.html, accessed 05/24/2013.

environment is constantly changing, and the speed of change makes its preservation very difficult. All art is subject to changes; changes can occur at the level of the art object and at context level. In most cases change is very slow, but this is not the case with digital art: change is rapid due to the pace of technological development.

Yet the increased pace of technological development also has wider implications. Digital art, in particular, questions many of the most fundamental assumptions of the art world: What is a work of art in the digital age? What should be retained for the future? Which aspects of a work can be changed and which have to remain as they are for the work to retain the artist's intention? How do museums collect and preserve? Is a digital work as fragile as its weakest components? What is ownership? What is the context of digital art? What is a viewer?⁴

It is not feasible to preserve functioning original hardware and software for centuries to come. And industry has no interest in reproducing old components or making current parts backward compatible. Furthermore, as Richard Rinehart has noted, due to a lack of formal documentation methods and their goal of bypassing the traditional values and practices of the art world, media art works are "becoming victims to their own volatile intent."⁵ Museums have long played a critical role in the creation and transmission of knowledge, culture, and identity.⁶ As they metamorphose from the physical to the virtual, museums continue to serve this custodial role, although their nature and ambit may be very different in the future. As museums invest in collecting digital works, they come to recognize that these works are fragile and may require substantial continued investment in funds and effort to keep them accessible over time.

2. Long-term Accessibility of Digital Art:

Previous Work

Digital art may seem less physical than traditional art, but as Bruce Sterling has noted, "[v]ery little materiality is very, very far from no materiality at all."⁷ The bitstream might be composed of numbers, but the device – the computer – has similar conservation problems as a painting, plus a whole set of new ones.

4 The artist creates the context, the platform, and the set of rules by which the viewer participates and often produces. In an increasing number of cases in media art, however, the viewer is not only a human but also an artificial agent, a software interpreting the artist's work.

5 Rinehart 2007, p. 181.

6 See Tony Bennett, *The Birth of the Museum. History, Theory, Politics*, Routledge, London, New York, 2009; Simon J. Knell, Suzanne MacLeod, and Sheila Watson (eds.), *Museum Revolutions. How Museums Change and Are Changed*, Routledge, London, New York, 2007.

7 Bruce Stirling, "Digital Decay," in: Depocas, Ippolito, and Jones, 2003, pp. 10–22, here p. 15; available online at: www.variablemedia.net/e/preserving/html/var_pub_index.html, accessed 05/24/2013.

Digital preservation is not only about preserving the bits we use to represent information, but about keeping these bits *alive*; as an ongoing activity to maintain the value and performance of digital objects, including digital artworks. In the words of Seamus Ross, digital preservation is about “maintaining the semantic meaning of the digital object and its content, about maintaining its provenance and authenticity, about retaining its interrelatedness, and about securing information about the context of its creation and use.”⁸ Conservation and restoration are relevant; however, they are part of a larger group of activities to ensure longevity for digital objects: collection and repository management, selection and appraisal, destruction, risk management, preserving the context, interpretation and functionality of objects, ensuring a collection’s cohesion and interoperability, enhancement, updating and annotating, scalability and automation, storage technologies and methods.

In the last decades much work has been done on maintaining the long-term accessibility of electronic, media, and digital art, as well as documenting media and digital art to keep it accessible in the future. Some of the key projects and initiatives in this area began already in the 1970s (for example, Electronic Arts Intermix [EAI] New York [USA]; the Netherlands Media Art Institute [NIMk] [Amsterdam, the Netherlands], and others were launched in the following decades (for example, V2_Capturing Unstable Media, Matters in Media Art – Collaborating towards the care of time-based media, Forging the Future: New Tools for Variable Media Preservation, and Documentation and Conservation of the Media Arts Heritage [DOCAM]).⁹

8 Seamus Ross, “Digital Preservation, Archival Science and Methodological Foundations for Digital Libraries,” Keynote Speech at the European Conference on Research and Advanced Technology for Digital Libraries (ECDL) 2007, Budapest, Hungary, September 17, 2007, p. 2, available online at: www.ecdl2007.org/Keynote_ECDL2007_SROSS.pdf, accessed 05/24/2013.

9 More information on the Electronic Art Intermix (EAI), New York, available online at: www.eai.org/index.htm, accessed 05/24/2013; more information on the Netherlands Media Art Institute (NIMk), available online at: www.nimk.nl/, accessed 05/24/2013. Further projects and initiatives developed over the last decades are: Independent Media Arts Preservation, Inc. (IMAP), New York, since 1999, available online at: www.imappreserve.org/, accessed 05/24/2013; International Network for Conservation of Contemporary Art (INCCA), Amsterdam, since 1999, available online at: www.incca.org/, accessed 05/24/2013; Variable Media Network, Solomon R. Guggenheim Museum, New York, Daniel Langlois Foundation for Art, Science, and Technology, Montreal, 2000–2004, available online at: www.variablemedia.net/, accessed 05/24/2013; AktiveArchive, 2002–2011, Bern University of the Arts (BUA), Bern, Swiss Institute for Art Research (SIK-ISEA), Zurich, available online at: www.aktivearchive.ch/content/projekte.php, accessed 05/24/2013; Archiving the Avant-Garde: Documenting and Preserving Variable Media Art, University of California at Berkeley Art Museum and Pacific Film Archive (BAM/PFA), Berkeley, 2002–2010, available online at: www.bampfa.berkeley.edu/about/avantgarde, accessed 05/24/2013; 404 Object Not Found. What remains of Media Art?, *medien_netz_kunst*, Dortmund, 2002–2003. Sadly, this project is no longer available online. A project description can be found at: <http://nimk.nl/eng/404-object-not-found-what-remains-of-media-art>, accessed 05/24/2013; V2_Capturing Unstable Media, 2003, V2_Institute for the Instable Media, Rotterdam, available online at: <http://capturing.projects.v2.nl/>, accessed 05/24/2013; Matters in Media Art – Collaborating towards

These projects and initiatives have contributed to raising awareness about some of the challenges of digital art preservation, examining media and digital art works, exploring specific documentation aspects, and initiating collaboration with other institutions. However, much of this work has been survey-like and not particularly well founded from either a theoretical or methodological perspective. The theoretical aspects of the problem of digital art preservation and curation have not been examined so far with much grounding in experimentation, or any response to the theoretical and methodological dilemmas posed by digital art (e.g., transience, emergence, and lack of fixity). Further, the long-term preservation of documentation for digital art has not yet been systematically addressed. Documentation for digital art is at risk as much as digital artworks themselves, and needs sustainable business and organizational models to be preserved in the long-term. It is evident that digital art is a new phenomenon that requires a new suite of methodologies.

3. An Interdisciplinary Methodological Approach to the Preservation of Digital Art

The goal of the research project Preserving Computer-Generated Imagery: Art Theory, Methods and Experimental Applications¹⁰ that I am conducting at the University of Glasgow (UK) is to contribute to laying the foundations for

the care of time-based media, Museum of Modern Art (MoMA), New York, San Francisco Museum of Modern Art (SFMOMA), San Francisco, and Tate, London, since 2003, available online at: www.tate.org.uk/about/projects/matters-media-art, accessed 05/24/2013; PACKED vzw – Centre for Expertise in Digital Heritage, Brussels, since 2005, available online at: www.packed.be/, accessed 05/24/2013; PANIC (Preservation webservices Architecture for Newmedia and Interactive Collections), since 2003–2005, Distributed Systems Technology Centre, The University of Queensland, Brisbane (Australia), available online at: <http://pandora.nla.gov.au/tep/49720>, accessed 05/24/2013; Inside Installations: Preservation and Presentation of Installation Art, Netherlands Institute for Cultural Heritage (ICN), Amsterdam, 2004–2007, available online at: www.inside-installations.org/home/index.php, accessed 05/24/2013; 40yearsvideoart.de, Initiative of the German Federal Cultural Foundation, Halle an der Saale (Germany), ZKM | Center for Art and Media Karlsruhe, and K21 Kunstsammlung Nordrhein-Westfalen, Düsseldorf, 2004–2006, available online at: www.40jahrevideokunst.de/main.php?p=3, accessed 05/24/2013; Ludwig Boltzmann Institut Medien. Kunst.Forschung, Linz (Austria), 2005–2009, available online at: www.lbg.ac.at/taxonomy/term/162/all, accessed 05/24/2013; Forging the Future: New Tools for Variable Media Preservation, 2007–2008, available online at: <http://forging-the-future.net/>, accessed 05/24/2013; Documentation and Conservation of the Media Arts Heritage (DOCAM), Daniel Langlois Foundation for Art, Science, and Technology, Montreal (Canada), since 2005, available online at: www.docam.ca/, accessed 05/24/2013.

- 10 See Perla Innocenti, "Theories, Methods and Testbeds for Curation and Preservation of Digital Art", in: *IS&T Archiving 2010 Preservation Strategies and Imaging Technologies for Cultural Heritage Institutions and Memory Organisations Conference*, 1–4 June 2010, The Hague. Cf. idem, "Bridging the Gap: Interdisciplinary Reflections on Authenticity, Longevity and Potential Collaborations" in: Leo Konstantelos, Clive Billenness et al., *Preservation of Complex Objects*, vol. 2: *Software Art*, JISC, Glasgow, 2012.

a preservation framework of digital art and to identifying interdisciplinary synergies with areas such as digital preservation, philosophy of art, archival science, and information management. Digital art is data designed to be constructed (represented, viewed, experienced) in particular ways, whose theoretical implications need consideration. The methodology that I have chosen is bottom up, to try to understand how digital art works. This means that I start with the works, the conservators, and the creators. I have decided to adopt a two-step approach, which involves onsite visits to major international collectors of digital art, in-depth interviews with their staff, and experimentation with test beds to assess preservation methods and processes.

The method I am using is a mix of humanistic, social science, and engineering approaches. The humanistic element is the art history element, and reflecting on what is a work of art in the digital age and what is the context of digital art. I present some “Reflections on Authenticity and Longevity for Digital Art” in a following section of this paper, ideas which have been further shaped by my social science approach.

3.1 Social Science Approach

From a social science perspective, I have visited some of the most important collections of digital art and conducted a whole series of interviews. This has given me a window on the practices of different organizations working with digital art. I have borrowed methods from anthropology and grounded theory. Ethnography has become a common feature in social studies of scientific knowledge and technology, in particular thanks to Stephen Woolgar.¹¹ In my ethnographic process of observing digital art, I am looking at key digital art organizations and how they are collecting, curating, preserving, displaying, and financing digital art. I am conducting onsite in-depth interviews, visits, and observations because what I am told is sometimes at variance with what is being done. The organizations that I am targeting and selecting for my case studies are major international collections of digital artworks and digital art documentation. I have visited ZKM | Media Museum at the ZKM | Center for Art and Media Karlsruhe (Germany), the Ars Electronica Center (AEC) in Linz (Austria), the Hirshhorn Museum and Sculpture Garden (Washington D.C., USA), the Smithsonian American Art Museum and the Lunder Conservation Center (Washington D.C., USA), the San Francisco Museum of Modern Art (SFMOMA) (USA), the Berkeley Art Museum (USA) and Pacific Film Archive (BAM/PFA) (USA), the Museum of

11 Steve Woolgar, “Technologies as Cultural Artefacts,” in: William H. Dutton, (ed.), *Information and Communication Technologies: Visions and Realities*, new edition, Oxford University Press, Oxford, 1996, pp. 87–102; Geoff Cooper, Christine Hine, Janet Rachel, and Steve Woolgar, “Ethnography and Human–Computer Interaction,” in: Peter J. Thomas (ed.), *The Social and Interactional Dimensions of Human–Computer Interfaces*, Cambridge University Press, Cambridge (MA), New York, Melbourne, 1995, pp. 11–36.

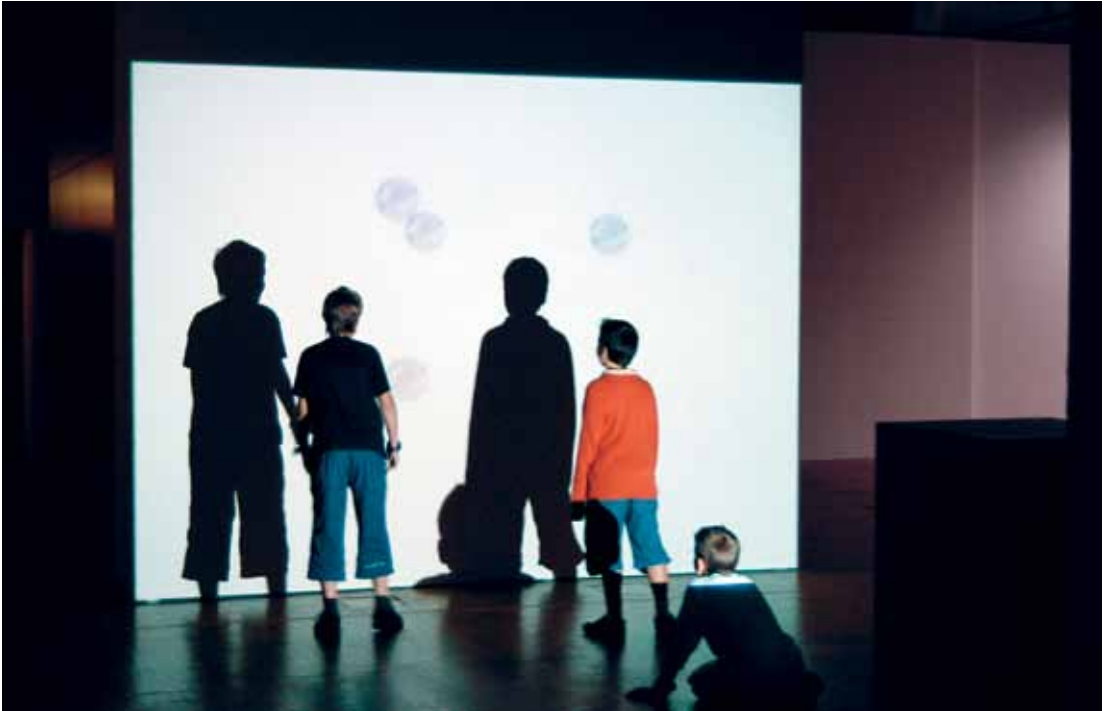
Modern Art (MOMA) (New York, USA), and the Whitney Museum of American Art (New York, USA), and the Netherlands Media Art Institute (NIMk) (Amsterdam, the Netherlands).

The complexity of achieving the objective of longevity and the myriads of changes that can occur over time means that we need to talk with organizations that have decades of experiences to understand what needs to be done in this area. Interviews with stakeholders of digital art preservation (museum directors, conservators, curators, registrars, technicians) are a new approach in this area. I have also conducted interviews and observations with selected digital artists (John Gerrard, Studio Azzurro, Maurice Benayoun) for an additional analysis of relevant aspects of preservation for digital artworks.

3.2 Engineering Approach

For computer-based art preservation is more than just a question of trying to understand the problem. We also need to take time to see what might be possible because – as I have concluded after my first visit at ZKM | Karlsruhe – preserving and exhibiting digital art is as much a museological problem, as it is an engineering problem. One of the fundamental challenges in the preservation of digital art is that the work of the conservators tends to be ad hoc. It is also based upon responsiveness to unique situations and not constructed on a body of theory and practice, as other aspects of art management and restoration tend to be. This is hardly surprising as digital art is a new phenomenon. So in the second phase of my investigation, I designed engineering experiments to advance the understanding of the processes and methods by which digital art can be preserved and handled. For example, to preserve digital objects, we need to be able to extract essential characteristics – the significant properties¹² – of the digital object from a file, to decide whether approaches such as migration (see glossary, p. 601) and emulation (see glossary, p. 600) will work for maintaining digital objects in accessible form. This is a new approach to research in this area.

12 See the conference papers by M. Guttenbrunner, J. Wieners, A. Rauber, and M. Thaller, "Same Same But Different – Comparing Rendering Environments for Interactive Digital Objects," in: Marinos Ioannides, Dieter Fellner, Andreas Georgopoulos, and Diofantos G. Hadjimitsis (eds.), *Digital Heritage*, Third International Conference, *EuroMed 2010*, Lemessos, Cyprus, November 8–13, 2010, Proceedings, Springer, Berlin, Heidelberg, 2010, pp. 140–152, available online at: www.euromed2010.eu/e-proceedings/content/full/140.pdf, accessed 05/24/2013; and by Margret Hedstrom and Christopher A. Lee, "Significant Properties of Digital Objects: Definitions, Applications, Implications," in: *Proceedings of the DLM-Forum 2002. Access and preservation of electronic information: best practices and solutions*, Barcelona, May 6–8, 2002, European Communities, Luxembourg, 2002, pp. 218–223, available online at: www.ils.unc.edu/callee/sigprops_dlm2002.pdf, accessed 05/24/2013.



Wolfgang Muench,
Kiyoshi Furukawa
Bubbles
2000
Interactive multi-user
installation with real time
video tracking system
ZKM| Center for Art and
Media Karlsruhe
Photo: Franz Wamhof

4. Reflections on Authenticity and Longevity of Digital Art

Two aspects emerged from the first phase of my investigation which strike me as key for digital art preservation: the intrinsic performing nature of digital art, and the dynamic nature of digital art authenticity.

4.1 Digital Art as a Process of Components' Interactions

The ability to establish authenticity in a digital object is crucial for its preservation.¹³ Although the concept of authenticity is highly nuanced in the digital age, it is still a starting point for discussion about digital art. However, to talk about authenticity we need to look at how digital art is created and rendered. For example, the image of the work *Bubbles* (2000) by Wolfgang Muench and Kiyoshi Furukawa, is a process of many components interacting: specifically, the file in which the data matrix representing the image is stored, and the software capable of interpreting and rendering this data form. To explore this example in full, we would also need to discuss the hardware, the

13 Seamus Ross, "Position Paper on Integrity and Authenticity of Digital Cultural Heritage Objects," in: *Digicult. Integrity and Authenticity of Digital Cultural Heritage Objects*, Thematic Issue 1, August 2002, pp. 6–8, available online at: www.digicult.info/downloads/thematic_issue_1_final.pdf, accessed 05/24/2013.

data projector, the screen, and the relationships (including intended effects) that all this has with the viewer.

4.2 Digital Art as Performance

This interaction of components leads me to think that all digital art is a performance, and more than a performance between the viewer and the object.

In this particular instance, the performance that I am referring to is the *performance* of the work. Because a digital artwork consists of a set of code, for the artwork to *become*, it must be performed. Before the viewer can interact with the digital artwork, this process of becoming has to occur. For example, in the case of John Gerrard's 3D real-time work *Grow Finish Unit (Eva, Oklahoma)* (2008), the algorithm developed by Gerrard needs to be performed in order for the work itself – the real-time 3D – to come to life.

This problem isn't actually unique to digital art. For example, in the *AktiveArchive* project, Joanna Phillips and Johannes Gfeller have written some interesting reflections on reconstruction and well-informed reperformances of video art.¹⁴ However, in the field of digital art, it is almost another construct. Some groundbreaking work in the documentation of performances has been done by Richard Rinehart, former digital media artist and director of the Berkeley Art Museum and Pacific Film Archive (BAM/PFA) (USA) at the University of California (USA). Rinehart produced a promising theoretical approach based on a formal notation system for digital and media art creation, documentation, and preservation: the Media Art Notation System (MANS).¹⁵ He compared media art to the performative arts, because media art works do not exist in a stable medium, and are inherently variable and computational. Their preservation is thus an interpretative act. Given the similar variability of music and media arts, Rinehart considers a mechanism like a musical score as appropriate for binding the integrity of media art works apart from specific instruments.

14 Joanna Phillips, "The Reconstruction of Video Art. A Fine Line between Authorised Re-performance and Historically Informed Interpretation," in: Irene Schubiger (ed.), *Reconstructing Swiss Video Art from the 1970s and 1980s*, JRP|Ringier, Zurich, 2009, pp. 158–165; Johannes Gfeller, "The Reference Hardware Pool of *AktiveArchive* at Bern University of the Arts. A Basis for a Historically Well-Informed Re-performance of Media Art," in: Schubiger 2009, pp. 166–174. Some useful reflections are also found in: Erma Hermens and Tina Fiske, (eds.), *Art Conservation and Authenticities. Material, Concept, Context*, Proceedings of the International Conference, University of Glasgow, September 12–14, 2007, Archetype Books, London, 2009; Howard Besser, "Longevity of Electronic Art," in: David Baerman and Franca Garzotto (eds.), *International Cultural Heritage Informatics Meeting: Cultural Heritage and Technologies in the Third Millennium*, Proceedings from the ichim01 Meeting, Milan, Italy, September 3–7, 2001, vol. 1, Archives & Museum Informatics, Pittsburgh, 2001, pp. 263–275; available online at: www.archimuse.com/publishing/ichim_01_TOC1.html, 05/24/2013.

15 Rinehart 2007.

John Gerrard
Grow Finish Unit
(Eva, Oklahoma)
 2008
 Hirshhorn Museum
 and Sculpture Garden,
 Smithsonian Institution,
 Joseph H. Hirshhorn
 Purchase Fund, 2010
 © Hirshhorn Museum and
 Sculpture Garden Collection
 Photo: Lee Stalsworth



4.3 Instantiations, Authenticities, and Documentation in Digital Art

Considering digital art as performance leads to some interesting reflections about its instantiations. As Seamus Ross has observed, the “[...] first renderings of digital objects might best be referred to as an initial ‘representation or instantiation’ (II). The problem is: how can we record the functionality and behavior as well as the content of that initial instantiation (II) so that we can validate subsequent instantiations? Where subsequent instantiations (SI) share precision of resemblance in content, functionality, and behavior with the initial instantiations, the ‘sis’ can be said to have the same authenticity and integrity as the ‘IIs’.”¹⁶ This notion of “precision of resemblance” is intended to reflect the fact that initial instantiations of digital objects and subsequent ones will not be precisely the same, but will have a degree of sameness. This degree of sameness will vary over time – in fact in the case of

16 Seamus Ross, “Approaching Digital Preservation Holistically,” in: Alistair Tough and Michael Moss (eds.), *Record Keeping in a Hybrid Environment: Managing the Creation, Use, Preservation and Disposal of Unpublished Information Objects in Context*, Chandos Press, Oxford, 2006, pp. 115–153.

digital objects it is likely to decline as the distance between the initial instantiation and each subsequent one becomes greater, although this degree of variation may be mitigated by such circumstances as, for example, the frequency at which the digital object is instantiated. Thus each time a digital work of art is instantiated, it has a greater or lesser precision of resemblance to the initial instantiation, which the artist created. The subsequent instantiations represent with greater or lesser degrees of accuracy the intentionality of the artist. Whether they have greater or lesser degrees of authenticity is a separate, but fundamentally important question, and needs to be considered in the context of, for example, the authenticity of performances. The UNESCO Guidelines for the Preservation of Digital Heritage mention the question of assessing an acceptable level of variance of such instantiations.¹⁷ This was also recently highlighted by Richard Rinehart, in relation to the ecological balance of changes in the technological environment of digital art.¹⁸

The intrinsic performing nature of digital artworks makes them allographic rather than autographic works, following the distinction described by Nelson Goodman.¹⁹ Thus I would like to draw a parallel between the instantiation of the code in a digital work, and the instantiation of the notation in a music performance, as described by John Butt²⁰ and Dennis Dutton.²¹

We often assume that music notation is a rigid set of instructions. In reality, sometimes notation is the result of performance; sometimes it is a reminder, and sometimes it is just an example. There is no single process from notation to performance. The notation is going in all directions, with a complex relationship between sender and receiver. In his seminal book *Playing with History: The Historical Approach to Musical Performance*,²² John Butt has questioned whether “authenticity” is still an appropriate term for music performance given that, in performance terms, it tends to condemn its negative to a sort of

17 UNESCO (National Library of Australia), Guidelines for the Preservation of Digital Heritage, Report, 2003, § 16.7, available online at: <http://unesdoc.unesco.org/images/0013/001300/130071e.pdf>, accessed 05/24/2013.

18 Perla Innocenti, Interview on curation and digital preservation of time-based/media art with Richard Rinehart, University of California, BAM/PFA, March 25, 2010. In Rinehart's presentation at the *Second Symposium on the Preservation of Complex Objects: Software Art*, POCOS Preservation of Complex Objects Symposia, October 11–12, 2011, Glasgow, this concept was further stressed.

19 Nelson Goodman, *Languages of Art: An Approach to a Theory of Symbols*, Oxford University Press, London, 1969. In the chapter on “Art and Authenticity,” Goodman distinguishes between two basic kinds of artworks, based on the relationships between an artwork and its copies. In the chapter “The Unfakable,” Goodman mentions that in autographic works, even the most accurate copy is not considered authentic, whereas in allographic works there are many possible alternative versions of a composition, all of which might be considered authentic.

20 John Butt, *Playing with History: The Historical Approach to Musical Performance*, Cambridge University Press, Cambridge, 2002.

21 Denis Dutton, “Authenticity in Art,” in: Jerrold Levinson (ed.), *The Oxford Handbook of Aesthetics*, Oxford University Press, New York, 2003; available online at: www.denisdutton.com/authenticity.htm, accessed 05/24/2013.

22 Butt 2002.

fake status. In music, partly through Butt's effort, we now tend to use the term "historically informed performance." Reflecting on nominal authenticity in the arts, Dutton writes, "the best attitude towards authenticity in music performance is that in which careful attention is paid to the historic conventions and limitations of a composer's age, but where one also tries to determine the artistic potential of a musical work, including implicit meanings that go beyond the understanding that the composer's era might have derived from it."²³

The dynamic notion of authenticity of digital art might seem to be in contrast with the notion of material authenticity that has been constructed for historical artworks. If we look at authenticity in object conservation in museums, authenticity is a term associated with the original material components and process in an object, and its authorship or intention. For example, in his critique of traditional conservation ethics, Jonathan Kemp describes "authenticity in the sense of 'original material', traditionally one aspect of an object charged with the assignation of a 'truth value' that legitimizes some aesthetic experiences."²⁴ However, these conservation principles are socially constructed processes mediated by technology-based practices, whereas the object keeps changing: it deteriorates, its context might change, and the way that it is conserved and redisplayed will change. The role of conservators and of museums also changes over time. Therefore, the conservators are caught between reconciling fidelity to the original artist intention, and fidelity to the passage of time. Joseph Grigely also argued that any work of art is subject to a "continuous and discontinuous transience"²⁵ that is integral to its authenticity. This means that any work of art – including digital art – is not fixed in a single point in time, but it is rather in a "continuous state of becoming," as Heather MacNeil and Bonnie Mak have elegantly pointed out.²⁶ Like in Penelope's tale, conservators are actively constructing and reconstructing the authenticity of a work based on their understanding of its nature and the current conventions and assumptions for conserving it.

These reflections on instantiations and authenticity led my attention to the concept of authenticity in electronic records. As Jennifer Trant has noted, "[a]rchives have been challenged to manage electronic records as evidence for several decades [...]."²⁷ Like art conservators, archivists and record keepers

23 Dutton 2003.

24 Jonathan Kemp, "Chapter 6: Practical Ethics v2.0," in: Alison Richmond and Alison Bracker (eds.), *Conservation. Principles, Dilemmas and Uncomfortable Truths*, Butterworth-Heinemann, London, Amsterdam, Boston, Heidelberg, 2009, pp. 60–72, here pp. 60–61.

25 Joseph Grigely, *Texuality: Art, Theory and Textual Criticism*, University of Michigan Press, Ann Arbor, 1995, p. 1.

26 Heather MacNeil and Bonnie Mak, "Constructions of Authenticity," in: *Library Trends*, vol. 56, no. 1: Preserving Cultural Heritage, 2007, pp. 26–52, here p. 33.

27 Jennifer Trant, "Emerging Convergence? Thoughts on Museums, Archives, Libraries and Professional Training," in: *Museum Management and Curatorship*, vol. 24, no. 4, 2009, pp. 369–387, here p. 373.



Jeffrey Shaw
The Legible City
 1989–1991
 ZKM_Collection
 © ZKM | Karlsruhe

are concerned with issues of fidelity. The trustworthiness of a record rests primarily on its fidelity to the original event, from which the record arises. The concept of provenance – a well-documented chain of custody – is thus a fundamental archival principle, which helps in establishing authenticity.²⁸ This has parallels with my reflections on instantiations of digital artworks. If we look at computer-based art from the point of view of performance and archival authenticity, then what is really important is a trustworthy chain of documentary evidence about the work: genuine origins, custody, and ownership in the museum collection. Authenticity is not an original condition, rather it is a dynamic process. Digital artworks are pushing the boundaries of

28 In archives authenticity is “the quality of being genuine, not counterfeit, and free from tampering, and is typically inferred from internal and external evidence, including its physical characteristics, structure, content, and context.” See: The Society of American Archivists (SAA), *A Glossary of Archival and Records Terminology*, available online at: www2.archivists.org/glossary/terms/a/authenticity, accessed 05/24/2013. In terms of evidence, “provenance is a fundamental principle of archives,” defined as “information regarding the origins, custody, and ownership of an item or collection.” See: The Society of American Archivists (SAA), *A Glossary of Archival and Records Terminology*, available online at: www2.archivists.org/glossary/terms/p/provenance, accessed 05/24/2013.

traditional conservation practices and the notion of historicity. To take an example, let's look at the preservation strategy devised by the *digital art conservation* project for the interactive media art work *The Legible City*, 1989–1991 by Jeffrey Shaw in the ZKM | Media Museum (for the case study on this work see pp. 488–518). This strategy could be seen as the equivalent of rewriting an older music score to adapt it to a modern or different instrument. On one hand, this iconic interactive installation is based on proprietary, work-specific software (see glossary, p. 601); on the other, it uses obsolete hardware and custom-made components. Such a combination makes the preservation of *The Legible City* a costly and risky business – the price of maintaining its Indigo 2 computer (no longer produced by Silicon Graphics) and because of the potential weak point represented by its specially built analog-to-digital converter. Conservators at ZKM | Karlsruhe examined, documented, and created a fully functional replica of this converter (the interactivity intended as part of the installation was also recorded), and software porting (see glossary, p. 601) to another operating system has been evaluated by the ZKM | Karlsruhe as a more sustainable long-term preservation solution for the work-specific software.

Some conservators and curators might argue that the replacement of the historical software and analog-to-digital converter challenges the historicity and originality of the artwork. However, digital art collectors need to come to terms with the fact that it will not be possible to guarantee original working equipment forever: to be kept alive, digital artworks will need to be adapted to a new technology.²⁹ *The Legible City* at ZKM | Karlsruhe is in the state of becoming. This idea of becoming is clearly referenced in the work about constructions of authenticity of Heather MacNeil and Bonnie Mak,³⁰ and goes back to the notion that digital art becomes, which I mentioned earlier. Digital works are in a state of evolution.-

5. Conclusions: For a Dynamic Preservation Model of Digital Art

With this paper, I hope to stimulate discussions about current and future approaches for digital art preservation, and contribute to the interdisciplinary foundations of a scientific framework for digital art preservation.

Authenticity – as MacNeil and Mak clearly pointed out³¹ – is a social construct, whose parameters and contents are always changing and under negotiation. Authenticity allows us to author stability in our disciplines. The current fast-paced digital environment defies the traditional structures of stability that have been authored for traditional art. Therefore, our approach to digital

29 Perla Innocenti, Interview on preservation of digital art of with Dr. Bernhard Serexhe, ZKM | Media Museum, Karlsruhe, August 12, 2008.

30 MacNeil and Mak 2007, pp. 26–52.

31 Ibid., p. 44.

artworks should be variable and digital object-responsive, with a level of variability tolerance to match digital art's intrinsic variability and dynamic authenticity, as outlined in this paper. The designated community for whom we are preserving should also be identified, together with the modality of reinterpretation of digital works and of preserving the related digital documentation. In conclusion, if conservation for digital art is a moving target, then our scientific methodology should be a moving gun.

Acknowledgments

I am deeply indebted to Professor Seamus Ross at the Faculty of Information, University of Toronto, for his precious suggestions, guidance, and support throughout this research, and more recently to Professor John Butt at the University of Glasgow, for sharing his knowledge and experience on musical performance. I am also very grateful to all my interviewees for the time and helpful insights that they have shared with me regarding conservation and preservation for digital art.

Obsolete Equipment: A Research Project on Preserving Equipment in Multimedia Art Installations

Emanuel Lorrain

The relationship between artistic intentions and the equipment used is an essential aspect of the conservation of multimedia art, for which the ever-shorter life spans of technical equipment pose a major problem. To deal more effectively with conservation issues arising from the obsolescence of electronic equipment used in installations, PACKED vzw – Centre of Expertise in Digital Heritage in Brussels, in collaboration with the Netherlands Media Art Institute (NIMk) in Amsterdam, set up the research project Obsolete Equipment (The preservation of playback and display equipment in audiovisual art, 2009–2011).¹ The project based on eighteen case studies deriving from five Belgian and Dutch institutions² and studied the ethical and technical issues raised by the need to preserve these works. Twelve of the case studies centered on video installations and the other six featured installations using computer components. During this process, experts from ZKM | Center for Art and Media Karlsruhe, the Tate Modern in London, iMAL – center for digital cultures and technology in Brussels, and the Bern University of the Arts (BUA) were invited to share their expertise.

This article first outlines the context and aims of the project; it describes the process of digitization that the collections are undergoing and explains how this leads from issues associated with the preservation of analog works to those involving works that were born digital (see glossary, p. 599). Next, various aspects of preserving works that use equipment containing computer components are discussed. Various research options and the results obtained in the course of the project are reviewed, and the work carried out as part of a case study on Bill Spinhoven van Oosten's *I/Eye* (1993) is discussed.

A Project in Two Stages

Analog and digital video equipment have many elements in common and they pose the same problems for conservators: wear and tear due to intense use,

1 The goal of this project was to improve and guarantee the long-term digitization and preservation of audiovisual works affected by the obsolescence of equipment for playback and display. Available online at: www.obsolete-equipment.org/?q=en/content/obsolete-equipment, accessed 05/24/2013.

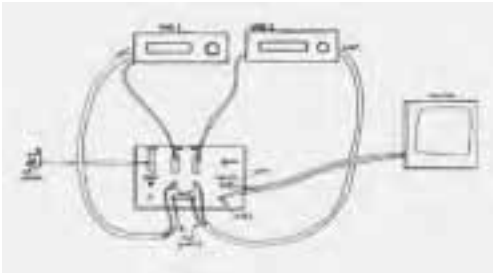
2 These were the Cultural Heritage Agency of the Netherlands, Amersfoort; the Kröller-Müller Museum (KMM), Otterlo; Museum van Hedendaagse Kunst Antwerpen (M KHA), Antwerp; the Netherlands Media Art Institute (NIMk), Amsterdam; the S.M.A.K. (Stedelijk Museum voor Actuele Kunst), Ghent; and the Stedelijk Museum Amsterdam. Available online at: www.scart.be/?q=en/case-studies, accessed 05/24/2013.



Hans Op de Beeck
Insert Coin-Highway Car
 1999
 Video sculpture, color,
 sound
 3 min 9 sec
 140 × 60 × 70 cm
 © M HKA

Insert Coin – Highway Car (1999), a work by the Belgian artist Hans Op de Beeck, which was studied in the first stage of the project, provides a perfect illustration of the conservation strategy of analog to digital migration. This interactive “video sculpture,” created in 1999 and acquired by the M HKA (Museum van Hedendaagse Kunst) Antwerp in 2000, consists of a green cabinet containing a 15” CRT monitor (see glossary, p. 599) which recalls the arcade games of the 1970s and 1980s. As with those games, a video invites the visitor to insert a coin in the slot of the cabinet. When a coin is inserted a second video appears, in which a sad-looking child sits in a “kiddie car.” Originally, the work operated by means of two VHS recorders concealed in the cabinet, which read, simultaneously and without interruption, two separate cassettes. A purpose-built electronic circuit made it possible to switch from the signal of one reader to the other when a coin was inserted. In 2009, the museum replaced the original system with a flash card reader (see glossary, p. 600) containing two video files, which imitate its functionalities by means of a small program and a photosensor. Although the migration strategy chosen by the M HKA has greatly simplified the maintenance required to keep the work functioning (for example, it is no longer necessary to replace the VHS tapes when they deteriorate) and has allowed the museum to get rid of a system that is obsolete, now it has to engage with entirely new aspects specific to the

the natural aging of their components, and external factors of the conditions in which they are stored and exhibited that lead to damage. The Obsolete Equipment project was carried out in two successive stages; the first dealt with video installations and the second with works containing digital components. The research carried out in the first stage of the project provided a natural transition to the more specific problems posed by the conservation of artworks described as “digital.” In fact, as the obsolescence of the technical components of works forces us to find solutions that make it possible to continue to exhibit them, the technical distinction between “video works” and “digital works” is not particularly meaningful. Whether it is a question of digitizing the analog signal or, where possible, of replacing the original equipment and media by more up-to-date substitutes, the strategies employed for preserving (analog) video art nowadays often involve a process of partial or total migration (see glossary, p. 600) to digital technology.



Sketch of the original system of Hans Op de Beeck's video sculpture *Insert Coin-Highway Car*, drawn by Kees Reedijk
© Hans Op de Beeck, Kees Reedijk

conservation of digital media: codecs, file formats, licenses, data storage, data corruption, and so on.

Why Preserve Equipment?

As migration (as in the case of *Insert Coin - Highway Car*) can offer a satisfactory solution and may even make it easier to display works of art, why should we be interested in preserving the equipment?

Hans Op de Beeck's work provides the beginnings of an answer to that question. While it has been possible to update the video recorders that are a component of *Insert Coin - Highway Car*, there is no way that the CRT monitor could be migrated into a more up-to-date technology. So far, manufacturers have not been able to offer conservators a satisfactory alternative to the 4:3 format, or to the specific qualities of the image produced by a cathode ray tube. Replacing the CRT screen with a LCD screen, for example, is not a viable option for preserving the appearance of Hans Op de Beeck's work. When the original monitor began to show signs of excessive wear, the only solution available to the M HKA was to find a new CRT of the same size for the monitor. In audiovisual installations, the display technology, the screen, is frequently the most difficult element to replace when it becomes defective and is obsolete. Unlike a "reader" (the equivalent for digital art is probably the computer), the screen is, with some exceptions, always visible, and for that reason it is an important part of the work's appearance. The case studies and the interviews with artists carried out during the project show that frequently, but not always, substituting a reader with a more modern one will have less effect on the work than replacing a screen.³

Over and above its pure functionality, equipment plays an important role in situating a work in a particular historical period by providing information about the technical and cultural context in which it was conceived and made. This context is sometimes an essential element in understanding a work's meaning and even its artistic value. In the case of installations where the equipment is an integral part of their design or works that consist of a hack or a modification designed to highlight a specific characteristic of a piece of equipment,⁴ any solution involving substitution will entail some loss. Thus it

3 Sometimes the playback equipment occupies a central place in the work. This is the case with *Oratorium for Prepared Video Player and 8 Monitors* (1989) by Frank Theys, which was studied in the first phase of the project. Available online at: <http://obsolete-equipment.org/?q=en/content/anatomy-analogue-preservation-frank-theys-video-installation-oratorium-prepared-video-player>, accessed 05/24/2013.

4 I refer here to works like *Prepared Gameboy Reboot* (2010) by Gijs Gieskes, or *EAT SHIT* (2008–2009) by Nullsleep, shown in the exhibition *Playlist* presented at iMAL – center for digital cultures and technology, Brussels, from June 4 to August 21, 2010. See the interview with Yves Bernard (iMAL), conducted as part of the Obsolete Equipment project, available online at: <http://obsolete-equipment>.

is still necessary to collect and maintain a certain number of pieces of equipment and spare parts which are considered vital for preserving a work's integrity. The importance of the original equipment for the work's functionality, appearance, and historicity has to be assessed on a case-by-case basis.⁵ Of course, in spite of all best efforts, there will always come a time when a piece of equipment is completely worn out and it will be impossible to replace it with an identical model. Nevertheless, conservators should be wary of hastily giving up storing equipment and embracing other conservation strategies, such as migration or emulation (see glossary, p. 600), because the original version of a work will always be the benchmark for judging whether these strategies have succeeded or failed. Preserving the original equipment in working order is often indispensable for making such a comparison.⁶

Collections: The Current Situation

The first finding to emerge from the project is that collecting and storing equipment has been too long neglected by institutions that preserve media art. Even in ideal situations where the original equipment was acquired at the time the work entered the collection, it has very often been poorly preserved, lost, or sometimes used for other purposes than showing the work. For collections accustomed to conserving more traditional items, such as paintings or sculpture, for which good practice has long been established, collecting and preserving equipment is still a new task that may seem far removed from the traditional role of an art conservator. Yet finding a satisfactory way of storing equipment requires little more effort than storing more conventional objects. Most of the risk factors that threaten the integrity of electronic devices are the same as those that affect other types of objects held in museums: age, storage conditions, environmental factors such as sunlight and oxygen, or phenomena like the corrosion and oxidation of metals.

The reasons for our long failure to pay due regard to conserving equipment must therefore be sought in the fact that it was not seen as an integral part of the artwork. A lack of understanding of the complex connections and interdependencies that exist between a digital work and the many elements that constitute the technological context for which it was created has contributed to this delayed awareness of the problems caused by technological obsolescence – perhaps even more for digital than for video art. Digital art has suffered from being considered an immaterial, virtual form of creation, made up exclusively

[org/?q=en/content/interview-yves-bernard-imal](#), accessed 05/24/2013. Also (analog) video art abounds in works of this type.

- 5 See the interview with Pip Laurensen, conducted as part of the Obsolete Equipment project, available online at: www.packed.be/en/resources/detail/interview_pip_laurensen/interviews, accessed 05/24/2013.
- 6 The only alternative to a functional piece of equipment is access to detailed documentation of the work, its behavior, and all its components. Unfortunately, such documentation is rarely available.

of 0s and 1s, for which the equipment required was assumed to be no more than a “vector” which was interchangeable with some other. However, the preservation of a work that has digital components consists not only in saving the data it contains, but also in preserving the hardware and software infrastructure that enables it to be experienced over and over again. A computer program does consist of lines of code, but it is almost always written with reference to certain specific technical conditions and material criteria. When these are no longer available, there is a serious risk that the work will behave differently, or even that the data will not be usable at all anymore.

Storing Equipment

One of the objectives of the project was to draw up a list of simple recommendations to art collections for storing their electronic equipment.⁷ A number of good and bad practices were identified through information gained in a series of interviews with conservators, collectors, electronics engineers, and technicians, as well as from documentation provided by manufacturers. Obviously, such recommendations are always a compromise between what is ideal and what is feasible in a given context. In most cases, they are based on common sense, as illustrated by the four examples given below.

1. Heat and sudden changes of temperature increase the risk of equipment failure. Peaks in temperature, which are highly stressful for all components, have the effect of damaging soldered joints, shortening the life of components, and accelerating chemical reactions inside machines, for example. A stable storage temperature of around 18–20°C is a good compromise.

2. Excessive humidity causes hydrolysis and thus the chemical degradation of materials such as plastic, the appearance of rust on metals, and condensation inside machines and their components. Too dry an atmosphere, however, creates static electricity, a major consequence of which is erasure of the content of an EPROM (erasable programmable read-only memory) on a motherboard. A relative humidity of 45 percent in the storage area is a good compromise.

3. Dust, and other particles present in the air, attract humidity and prevent thermal exchange with the outside environment by blocking the means of ventilation and airflow provided by the manufacturer. When dust gets inside a machine, it covers its components and makes them more liable to overheat. Equipment can be protected from dust by keeping it covered, storing it on shelves, or keeping it in boxes.

4. A number of dangers originate from inside the equipment itself. Removing batteries and accumulators is an indispensable precaution which prevents damage to other parts of the machine (for example, printed circuit

7 See www.obsolete-equipment.org, accessed 05/24/2013.

boards) if they leak, for this makes repair complicated or impossible. However, this has to be done with caution, because some batteries that are part of the motherboard, for example, enable the computer to retain the parameters of the Basic Input/Output System (BIOS),⁸ and in these cases they must be backed up beforehand.

Recommendations like these – which are simple to implement – are the basis for achieving more effective storage of electronic equipment than has hitherto been the case. Besides storage, there are other rules based on common sense that must be followed when the machines are used, such as use of the correct voltage⁹ or high-quality electrical cables. Nevertheless, even without being switched on and stored in ideal conditions some components will become unstable as they age, and cause malfunctions. But good storage conditions and regular maintenance will help to delay possible breakdowns and prevent a machine's premature demise.

Procedures for Switching Equipment On

When works are exhibited and the equipment is in near-constant use it is subject to the greatest amount of wear, and each period of use reduces the total working lifetime envisaged by manufacturers. But while periods of non-use may extend the life of some parts of the equipment (for example, the cathode ray tubes of monitors), problems can also arise from a machine being stored for long periods when not in operation. Although few statistics are available on breakdowns of electronic equipment connected with periods of dormancy, information gathered in the course of the project suggests that regularly switching on equipment that is stored for long periods may prove beneficial. It allows some electronic components with a high failure rate, such as condensers, to retain their specifications longer and in that way avoid breaking down. Especially the mechanical parts found in hard disks or the belts in some floppy disk readers may benefit from this, for it allows them to retain their shape and mobility.

The principal argument against such procedures is that they entail additional handling of the equipment, which increases the risk of accidental damage. However, running the equipment on a regular basis offers an opportunity of rapid identification of a machine or a component that requires maintenance, repair, or simple replacement with an identical part. However, there is no scientific evidence supporting such procedures, nor have any precise statistics been compiled that indicate how frequently the operation should be

⁸ BIOS are, for example: date and time, type of hard disk and floppy disk readers, hardware and software extensions, startup disks, etc.

⁹ Voltage in Europe changed from 220V to 230V during the 1980s. This means that components designed to run at 220V on equipment manufactured before the change now have to withstand 10 volts more, which reduces their life span.



Defective capacitor in the
main supply circuit of a
computer
© PACKED vzw

performed or for how long. In terms of frequency, the recommendations made during the interviews with engineers and technicians vary from once a month to once a year, and for duration, from one hour to half a day. This kind of calculation is always a matter of finding a balance between the maximum number of hours a machine has been used and the risk of experiencing breakdowns due to long periods of inactivity. If an institution decides to implement such a schedule for all its equipment, the decisive factor of its success would probably be the resources of time and personnel involved.

Repair of and Technical Familiarity with the Equipment

When an original piece of equipment has to be replaced, technological obsolescence more often than not means purchasing a replacement on the secondhand market. A further negative consequence of manufacturers' policies is that it is easier to purchase a new model than to repair the old one, which has led to the gradual disappearance of repair services and, consequently, of technical knowledge about these machines. For collections that do not have in-house specialists with that kind of expertise, it is very difficult to find people who still have the requisite skills to carry out procedures for maintaining and repairing obsolete electronic equipment.¹⁰ And even experienced technicians will not be able to repair a piece of equipment unless they have access to the necessary resources¹¹ and spare parts. Thus storing as many pieces of equipment as possible, even if they are defective, can in some cases enable a technician to "cannibalize" one machine to make another one work again. In addition to this, the equipment being produced today, in which the circuits are increasingly complex and miniaturized, can no longer be repaired at the level of the individual component. When a modern electronic machine breaks down, an entire module (for example, a motherboard or a power unit) usually has to be replaced.

In the framework of this project it was not possible to analyze the types of breakdown that could potentially arise with every category of video and computer equipment. The range of technical expertise required, the many types of equipment that can be found in a collection, and the number of variables that have to be taken into account (such as length of use, age, the particular model involved, etc.) ruled this out. It would only be possible to draw

¹⁰ Study of discrete electronic components is also gradually disappearing from the training curriculum of technicians and engineers in favor of studying digital technologies.

¹¹ Electronic diagrams, user manuals, and instructions for maintenance, etc., all of which contain the information needed to maintain or repair a piece of equipment.

up such a list for the purpose of anticipating breakdowns and identifying the most important parts to stock if each artwork were to be considered separately. Although it is not centralized anywhere, this sort of knowledge about computer equipment does still exist: computer collectors, retro-gaming clubs, and communities of enthusiasts devoted to particular machines have built up over many years a profound knowledge of the weaknesses of specific pieces of equipment.¹² The majority of these resources are only found on the Internet, scattered around various forums and websites, which makes their long-term availability uncertain. For that reason, in the absence of initiatives to future-proof these valuable resources, the task of collecting them falls upon those whose job it is to conserve the artworks of which they are a part.

The Example of Bill Spinhoven van Oosten's *I/Eye*¹³

To demonstrate how the results of the project were enriched by a series of case studies, this section is devoted to the work carried out by Hanna Barbara Hölling (NIMk) in collaboration with artist Bill Spinhoven van Oosten on his installation *I/Eye* (1993/2011).

I/Eye consists of a (concealed) computer and a base upon which stands a video monitor with a camera above it. The camera records people's comings and goings in front of the work, and the black-and-white image of an eye, which occupies the whole screen, follows their movements. By reversing the paradigm of the relationship between the work and the spectator, the artist places the spectator in the unaccustomed position of the one who is being looked at. Since the first time the work was showcased in Amsterdam, at NIMk, *I/Eye* has been subject to many improvements and changes, for example, its color and degree of resolution. The initial program was written in BASIC V assembly language (see glossary, p. 599) for an Acorn Archimedes A410 computer using a RISC OS operating system. During the time *I/Eye* was exhibited at NIMk, an Acorn RiscPC 600 was also used. Bill Spinhoven van Oosten later used these two computers to create other installations.¹⁴ Over the course of time, he added modules to the Archimedes A410 and later cannibalized it when it became defective. Bearing in mind the generally poor state this computer was in, and the modifications that had been made to it, any hopes

12 See the interview with Mathieu Charreyre from Association WDA, conducted as part of the Obsolete Equipment project, available online at: <http://obsolete-equipment.org/?q=content/interview-mathieu-charreyre-wda>, accessed 05/24/2013.

13 This section is largely based on the case study carried out by the NIMk. See: <http://obsolete-equipment.org/?q=content/case-study-report-ieye-1993-2011-bill-spinhoven>, accessed 01/21/2013. See also the article by Hanna Barbara Hölling, "Versions, Variations, and Variability: Ethical Considerations and Conservation Options for Computer-Based Art," in: *Electronic Media Review*, vol. 2, American Institute for Conservation of Historic and Artistic Works, Washington, D.C., 2013.

14 At the time, equipment of this type represented a major investment and for that reason artists often used the same machine to make several installations.

of recovering its “original” condition proved at the very least illusory, and it was therefore decided to use an Acorn RiscPC 600 to reconstruct the work. Although it was in better condition, this computer nevertheless contained two defective parts that prevented it from working correctly: the motherboard and an acquisition module for digitizing the camera image.

Thanks to Acorn computer enthusiasts the artist was able to find and replace the two components with identical ones. Subsequently, a version of the program for *I/Eye* written for the Acorn RiscPC was found in the artist’s studio. Once the various pieces of historical hardware and software had been assembled and were up and running, the artist embarked on creating an emulated version of the work.

The more recent computers had an improved rate of data processing, however, and this meant that the program was executed too quickly. Given the very close relationship between the behavior of the work and the original hardware, the decision was taken to emulate, in the C# programming language (see glossary, p. 599), the ARM processor for which the program was originally written. By doing this, the hope was to create a version of the work that would be as close as possible to the original. To ensure that this new version would remain stable and functional in the years to come, its dependence on a specific type of hardware had to be limited. It was therefore implemented on a virtual machine, which ensures that the work can run on any computer that uses the x86-64 architecture.¹⁵ In the context of the project, NIMk organized an event titled *To Transfer or to Transform*,¹⁶ in which the restored version of *I/Eye* and the one using a virtual machine were shown side by side.

The Importance of Documentation

With a number of works studied in the project, the inventory of their component parts contained merely references to “a computer” or “a CD-ROM”; this was the only information given. But to understand the complexity of a digital work, and to be in a position to preserve it, it is essential to possess a detailed description of how its hardware and software are configured, and this must be done as soon as it enters the collection. When the original pieces of equipment are lacking, only full documentation can provide the necessary guidance for reinstalling, restoring, reconstructing, or reprogramming a work. As we have seen, the resolution of a screen or the power of a processor can play a significant role in a work’s appearance and behavior. For these reasons, it is

15 Since its first introduction in 1978, the market penetration rate of this architecture in the office computer segment has increased by more than 95 percent. Bill Spinhoven van Oosten asserts that this huge presence on the market and the importance of invested capital guarantee that a virtual machine which is able to simulate this material will still be available for several years to come.

16 Available online at: <http://nimk.nl/eng/to-transfer-or-to-transform/to-transfer-or-to-transform-4>, accessed 05/24/2013.

Bill Spinhoven van Oosten
I/Eye
 1993
 Presentation of the
 video installation at
 the Netherlands Media
 Art Institute (NIMk) in
 Amsterdam
 © NIMk archive



essential to record the way it works, its appearance and behavior, as well as all the interdependencies that exist between its hardware and software components. This information about the work will be crucial when decisions have to be taken about its conservation.¹⁷ For successful conservation, the contribution of technicians from outside the institution, or of people who helped produce the work, will be of great assistance to collections who lack the requisite technical knowledge.

Projects such as Documentation and Conservation of the Media Arts Heritage (DOCAM),¹⁸ Matters in Media Art – Collaborating towards the care of time-based media,¹⁹ and Inside Installations: Preservation and Presentation of Installation Art²⁰ promoted the interview as a tool which was subsequently adopted by a great number of collections. Participation of the artist, the programmer, their assistants, and others greatly enhances the understanding of a work and the documentation on it. If at a future point in time

17 See the interview with Tabea Lurk and Jürgen Enge, conducted as part of the Obsolete Equipment project, available online at: <http://obsolete-equipment.org/?q=content/interview-tabea-lurk-and-juergen-enge>, accessed 01/21/2013.

18 The project Documentation and Conservation of the Media Arts Heritage (DOCAM) was founded in 2005 by the Daniel Langlois Foundation for Art, Science, and Technology, Montreal. Available online at: www.docam.ca, accessed 05/24/2013.

19 The project Matters in Media Art (2005–2012) is a collaboration between the Tate London, the Museum of Modern Art (MoMA), New York, and the San Francisco Museum of Modern Art (SFMOMA). Available online at: www.tate.org.uk/about/projects/matters-media-art, accessed 05/24/2013.

20 The project Inside Installations (2004–2007) was coordinated by the Netherlands Institute for Cultural Heritage (ICN). Available online at: www.inside-installations.org/home/index.php, accessed 05/24/2013.

someone is involved in preserving a work who was not engaged in its creation, access to such documentation will spare them long and tedious hours of trying to understand it. Adequate documentation facilitates a clear understanding of the essence of the work, how in the course of its different versions that essence has perhaps been lost, or, on the contrary, has been preserved thanks to a particular technology. As we have seen with *I/Eye*, works with digital components tend to follow a dynamic life cycle, changing their technologies and forms to compensate for the obsolescence of their components. For this reason they need specific documentation.

“Ultimately, it is the documentation that will survive the work, becoming its historical witness and sometimes supplementing any remaining fragments and relics.”²¹

The Obsolete Equipment project made it possible to draw the attention of participating collections to the urgent need to undertake the preservation of the equipment associated with the works for which they are responsible. It is now up to these collections to put the measures in place that are required to meet this need effectively. The issues addressed in this article will continue to be vital in the future for all of the works being created today. Planned obsolescence and the impact of the reduction in manufacturing costs on the quality of components, mean that products appear on the market which are not made to last. Works created for mobile devices, or using tactile interfaces, will see their components become obsolete even more quickly. Furthermore, for a whole category of recent works, where the artists deliberately use old, outmoded technology,²² the notion of obsolescence itself becomes an essential aspect of the work. In view of the increasing number and the complex nature of the digital creations that are now entering collections, it will be more important than ever to take a proactive approach, so that the problems presented by the long-term preservation of these works can be identified and anticipated even before they are acquired.

Translated from the French by Imogen Forster

21 Extract from the DOCAM Documentary Model, available online at: www.docam.ca/en/documentation-model.html, accessed 05/24/2013.

22 Eight-bit computers and games consoles, such as the ZX Spectrum, the Commodore 64, the Nintendo Entertainment System, for example, or old analog machines such as audiocassette readers.

Machinic Conservation – “Data Carvery” and the Temporality of Technical Time

Jussi Parikka

“[A]nalogue media, to be preserved, must not be played: each replay is a partial erasure and a new recording – an overlay. Digital preservation relies instead on the frequent rereading, erasure, and rewriting of the content.”¹

If you think that conservation and archiving technical media of an audiovisual nature is difficult, imagine the future. The future archivist has to find out a way to account for the various projects stemming from technologies such as RFID (*radio-frequency identification*), cloud computing, peer-to-peer networks, various mobile platforms, and so forth – all characterized by the lack of a single object, or a representational content, and reliant on other modalities. For code-based art, conservation of the machines to allow transcoding and future proofing is seen as one strategy,² however, it is a strategy that still does not address the other form of time inherent in technical media, namely, that of decay.

Hence, conservation and decay forces us to think about time, and the way to understand time as part of technical and digital culture. In short, machines are not only of time, they process time. This, however, applies to archives as well: archives do not *contain* time; they *are of* time and material. The conflation of the two in the age of technical media is one of the most interesting theoretical challenges to a “post-Foucault” understanding of the archive, as well as a pressing challenge to any attempt to conserve the heritage of machine-based culture. This is captured well in the epigraph by the media archaeological artist Paul DeMarinis, as well as in the idea that we should not only worry about the conservation of content or machines, but also about the paradoxical task of how to conserve entropy.

The idea of machines as a mode of processing time is also one of the key ideas concerning time-critical media, a concept mainly developed in the Berlin media studies scene and by scholars such as Wolfgang Ernst.³ In this

1 Paul DeMarinis, “Erased Dots and Rotten Dashes, or How to Wire Your Head for a Preservation,” in: Erkki Huhtamo and Jussi Parikka (eds.), *Media Archaeology – Approaches, Applications, and Implications*, University of California Press, Berkeley, Los Angeles, London, 2011, pp. 211–238, here p. 223.

2 See “Conservation Death,” with thanks to Jonathan Kemp for this short meditation, available online at: http://xxn.org.uk/doku.php?id=conservation_death, accessed 05/24/2013.

3 See Axel Volmar (ed.), *Zeitkritische Medien*, Kadmos, Berlin, 2009.

concept, machines suddenly become a challenge to the historiographical mode of writing about and understanding technologies and, for instance, media art in time: instead, they are themselves processors and producers of temporalities that are not always registered by our ordinary ways of preserving and recycling time – history that still is tied to a meaning-generating and narrative way of seeing time.⁴

This paper focuses on this potential contradiction between *historical time* and what could be referred to as *machinic time*. What I mean by machinic time is closely connected to the very concrete idea of machines – especially machines in the age of technical media. It does, however, also imply a reference to the much wider notion of “machine” that one finds in the philosophy of Gilles Deleuze and Félix Guattari: here, the machinic is a way to understand how bodies of various kinds relate to each other and assemble agencies, environments, and space-times. The machinic is a perspective on the intermingling of aggregate bodies, “attractions and repulsions, sympathies and antipathies, alterations, amalgations, penetrations, and expansions.”⁵ The machinic does not merely reproduce but produces something new, in the same way that the archival is not a mark of the past, but a production of reality.⁶

Machines assemble; and even though with machines Deleuze and Guattari did not necessarily refer to technical machines, their idea can offer us a way to understand that regime, too; more specifically, the hyphenated archival-machine that is itself a contradictory enterprise torn between conservation and materiality, refrigerating and entropy. Thinking through the machine is one way to approach time in a new way – conserving, recycling, reusing, remixing, channeling, and governing time and time-critical entities. A juxtaposition of historical time versus machinic time (which for theorists like Wolfgang Ernst corresponds to the setting of history versus media archaeology) leads to another interesting question of direct relevance to projects concerning digital art conservation. The question about time operates on at least two levels. First, there appears to be a fundamental dissonance in trying to fit together “conservation” and “dynamics” – dynamics being one of the defining characteristics of digital media environments. From an aesthetic category concerning updatability to a technical characteristic of our computing machines as “time-critical” and processual (all technical media and computer processes are by definition temporal, from processor clock times to

4 See Wolfgang Ernst, “Let There Be Irony: Cultural History and Media Archaeology in Parallel Lines,” in: *Art History*, vol. 29, no. 5, November 2005, pp. 582–603.

5 Gilles Deleuze, and Félix Guattari, *A Thousand Plateaus*, trans. Brian Massumi, Continuum, London, 2007, p. 99.

6 See Knut Ebeling, “Die Asche des Archivs,” in: Georges Didi-Hubermann, and Knut Ebeling, *Das Archiv brennt*, Kadmos, Berlin, 2007, pp. 33–183, here pp. 54–59.

the revolving nature of storage media such as hard disks), the dynamics at the center of technical media constitutes a fundamental problem for the mindset of conservation. Frozen time does not belong to the machinic. To be more specific, software is not an object that you can just store and preserve – you can with the source code (see glossary, p. 602), but that is not what software is about, as I shall elaborate.⁷

Second, the nature of projects that understand the investigation of decay and time as the medium-specific characteristics of technical media are also a puzzle for the mindset of conservation. Entropy does not fit in, and projects that are ostensibly about the nature of digital as radical, entropic temporality (or in other words, the materiality of the informational) are bound to be non-conservable. The archive is defined by what is missing from there.

Of course, the heritage industries have been trained to deal with “time” in the form of erosion and maintenance of objects, but such “things” that are fundamentally processes seem to present a new issue. Hence, it is no wonder that we are forced to think more about conservation through using – and reusing, remixing, reappropriation of cultural heritage. In such a solution, cultural heritage becomes a form of popular culture that is kept alive by its usability. The best way to conserve is to admit that variation is part of the conservation – there is no stable object, only the processuality can become part of the work. This, of course, resonates with many of the cultural practices that are being underlined as part of contemporary participatory social media culture, and in such a strategy, the difficulty of dynamics becomes transposed as part of the sphere of users.

This emphasis on the users is not the only possibility to account for the dynamics of technical media. What it entails is an explication of media archaeology’s relation to time – to see media archaeology as an expansion of our perspectives on time. It is followed by an explication of some practical problems concerning managing dynamics as an archival question in software and network culture, and then by examples of an expanded notion of time. Lastly, I will use some recent art projects to offer an expanded notion of the archive that conflates with an understanding of the technical – something which might actually help us think about what it means to engage with cultural heritage in the age of technical media decay. As such, instead of “conservation,” the defining temporal horizon becomes that of “decay”⁸ – including as part of some art practices themselves. This means, to adopt a Kittlerian stance, not only thinking about computing as an object, but as the modality in which any

7 See Doron Swade, “Preserving Software in an Object-centred Culture,” in: Edward Higgs (ed.), *History and Electronic Artefacts*, Clarendon Press, Oxford, 1998, pp. 195–206.

8 Thanks to Julian Oliver (personal communication, November 2011) for this formulation.

kind of conservation can take place – or fail.⁹ It also takes inspiration from Wolfgang Ernst's media archaeology as well as an emphasis on the media-specific processuality, the transformational quality, of the archive.¹⁰

One key notion here is “medium-specificity” as a crucial requirement for understanding the materiality of the media at hand. Hence, besides talking through the media archaeological method and its relevance for digital art preservation, I want to address some recent art projects that relate media archaeology to computer forensics, and point towards the question of the machine as the archive. Thus the final section is concerned with the question of what to do with artistic practices that are more suitable for interrogating the entire idea of “conservation” and acting as conduits for a dynamic notion of time in digital culture, based on erasure and rewriting.

Times of Media Archaeology

Media archaeology has been developing as a fresh way of understanding the presence of old media – apparatuses, technological systems, ideas, discourses, practices, and also imaginary media – in new and emerging media cultures. As such, it was related to new historicism, new film histories, and the burgeoning new media (arts) field of the 1990s as well, while at the same time it consistently drew attention to the persistence of the past in the discursive terrain, which for various reasons emphasized the future. Far from pursuing antiquarian interests, scholars such as Erkki Huhtamo and Siegfried Zielinski, along with film theorists like Thomas Elsaesser, and media historians and philosophers such as Friedrich Kittler, offered various versions of a methodology, but with a shared interest in the stratification of media cultures.

What is significant from our perspective is how various approaches developed new ways to think about time – not just technologies, but technologies of and in time. Huhtamo's way was to emphasize the notion of *topos* – the recurring cultural and primarily discursive topics that circulate in various situations. These can include the various discourses of virtuality, disembodiment, tele-technologies, and so forth – and more strategically, as Huhtamo points out – the use of topics in advertising (he mentions, for instance, the theme of “little people” inside machines as one example). Furthermore, Huhtamo uses the notion to discuss the importance of archives, or the tension between contemporary digitization enthusiasm and storage-mania in a culture that still is focused on the uniqueness and novelty of technological progress.¹¹

9 See Friedrich Kittler, *Draculas Vermächtnis: technische Schriften*, Reclam, Leipzig, 1993, p. 8.

10 See Ebeling 2007, pp. 54–59.

11 See Erkki Huhtamo, “Dismantling the Fairy Engine. Media Archaeology as Topos Study,” in: Erkki Huhtamo and Jussi Parikka (eds.), *Media Archaeology. Approaches, Applications and Implications*, University of California Press, Berkeley (CA), 2011, pp. 27–47.

Another way of elaborating how temporality has been redeveloped in a media archaeological context is, of course, Siegfried Zielinski's theory about the “deep time” of the media.¹² This is a paleontological take on pushing our temporal understanding deeper and deeper, so to speak, into the media past in order to understand the notion of presence and future in the contemporary. This provides another way of seeing media cultures as layered, stratified. This was already how Sigmund Freud saw the “apparatus” of memory, but with the emphasis that even if stratified, memory is always temporally in motion, dynamic.¹³

Offering an even more consistent summary of various media archaeological approaches, the Amsterdam-based film theorist Wanda Strauven has flagged the same theme in terms of how media archaeology has operated as a critique of temporality through mapping “1) the old in the new; 2) the new in the old; 3) recurring *topoi*; or 4) ruptures and discontinuities”.¹⁴ As we can easily imagine, such different temporalities could nicely translate to interesting curatorial strategies, too.

In other words, what if we are dealing with multiple, overlapping, and interlapping histories and times? This is one of the questions posed by a variety of media archaeological inquiries and this resonates with theoretical challenges. Hence, while we could mention the polyphonic notion of historical temporalities in the plural by Fernand Braudel, we can as easily nod towards Manuel De Landa's accounts of thousands of years of nonlinear history that includes such nonorganic regimes as rocks as well.¹⁵ Jonathan Sterne has put this recently in similar terms: “[...] if the span of media history in human history amounts to approximately 40,000 years, we have yet to really seriously reconsider the first 39,400 years.”¹⁶

Some commentators of digital culture and art like Josephine Bosma have also argued for novel temporalities. In this connection Bosma cites the *Clock of the Long Now* initiated by Stewart Brand, which functions on a layer of “deep time” (recalling Siegfried Zielinski's concept), and also the American artist James Tobias' wonderful idea of “*queer clocks*: devices that diagram,

12 See Siegfried Zielinski, *Deep Time of the Media. Toward an Archaeology of Hearing and Seeing by Technical Means*, trans. Gloria Custance, The MIT Press, Cambridge (MA), 2006.

13 See Sigmund Freud, “Letter to Fliess, December 6, 1896,” in: *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, vol. I (1886–1899), Vintage, London, 2001, pp. 233–239.

14 Wanda Strauven, “Media Archaeology: Where Film History, Media Art and New Media (Can) Meet,” in: Vinzenz Hediger, Barbara Le Maître, Julia Noordegraaf and Cosetta Saba (eds.), *Preserving and Exhibiting Media Art: Challenges and Perspectives*, Amsterdam University Press, Amsterdam, 2013.

15 See Manuel De Landa, *A Thousand Years of Nonlinear History*, Zone Books, New York, 2000.

16 Jonathan Sterne, “The Times of Communication History,” position paper presented at the conference *Connections: The Future of Media Studies*, University of Virginia, April 4, 2009.

express and interpret unfamiliar temporal relations.¹⁷ To me, this captures excellently the potential media archaeological spirit of investigating non-human and fresh temporalities that are at the basis of how we see culture, cultural heritage, and our lives in technical media environments.

Frozen Time and Media Dynamics

After this introduction to how temporality becomes revitalized in media archaeology, I want to turn to thinking about media dynamics and its relation to the archival question. This, too, is a question of temporality, and hence it is worthwhile to expand our notions of time in order for those ideas to feed into practices as well.

At this point I want to bring in some ideas of Wolfgang Ernst's, a professor at the Humboldt-Universität zu Berlin [Humboldt University Berlin], as an approach for elaborating frozen times and media dynamics. In short, Ernst argues that the symbolically based writing of histories is inadequate to understand how archives and memory work in technical media culture, which by definition is not meaning-based. Tapping into the same ideas as Friedrich Kittler, who elaborated some time ago the technical nonhuman nature of recording technologies like the phonograph, which not only save meaningful sentences, but also the noises of the body and basically anything that is within the frequency range and registered by the cold instrument, Ernst describes the agency of the machine as the primary instance where conservation happens.

For Ernst, the machine as an operational diagram – operational mathematics, when talking about machines in the technical age – is at the center of the archival question. Far from claiming that everything is an archive, however, Ernst outlines how the machine, the machinic, is a condition of what is archivable in the first place. Through his continuous juxtaposition of writing and narrative-based modes of cultural and technical inscription, Ernst defines, for example, the type 80 Webster Wire Recorder (1948) as one such cool archaeological apparatus that obediently registers more than the human voice. Ernst describes how it can pay “equal attention to all kinds of sounds without ever being affected by their emotional value. With a cool archaeological sense for signals (instead of semiotics, as in cultural semantics), the machine registers all kind of electromagnetic vibrations – and thus comes closer to the real world than any alphabet can. Magnetic wire or tape register signals – whether sound, images (video AMPEX), or data (IBM computers) – and make no distinction between human, physical, and machinic senders of such messages.”¹⁸

17 See Josephine Bosma, *Nettitudes. Let's Talk Net Art*, NAI Publishers, Rotterdam, 2011, p. 169.

18 Wolfgang Ernst, “Media Archaeography: Method and Machines vs. History and Narrative of Media,” in: Huhtamo and Parikka 2011, pp. 245–246.

What we get from Ernst’s media archaeology are two challenges for archiving technical media arts: 1) How do we account for the machinic, which in the first place is one condition of registering culture, and in the age of technical machines, might be more than the semantic? 2) How do we then account for the signals, registered and processed, as the main focus of conservation? In short, how does one conserve signals? Again, as flagged at the beginning, this is the question that an archivist of, for example, a RFID or network ping-based art project would confront.

This demand for a medium-specific approach is one of the questions that are raised when we start to focus, as media art has done so well, on the material forms of expression themselves as the object, or more accurately, the event of conservation. Naturally, this relates to the different ways in which artistic practices over decades have been defined by their performative, distributed, and processual nature, with a focus on event rather than object, and as such, an expanded notion of the aesthetic as smoothly interwoven with a larger ecology within which it takes place. What if conservation itself is a medium-specific notion, and as such, not suited to the mindset of how cultural memory works in the age of digital machines?

The idea of conservation as “cold” refrigerator practices that aim to cool down processes might seem antagonistic to time-critical notions of culture. At some level, this aspiration of refrigerator cultural heritage has been part of certain ways of understanding conservation as a regime of stepping outside temporality, erosion, and noise. In terms of materials, the fight against deterioration has informed our approach to various media materials, from various paper-related formats to film and sound. What is important when discussing digital art conservation is, of course, the digital – a term that needs to be specified in relation to the specific dynamics of software which is a regime of calculations in time, of processing. This means approaching the algorithmic as primarily executed set of instructions.

Indeed, as Wendy Chun has pointed out, software is so much more than the source code, which itself does not do much without the entire ecology of compilation and processing. This is also a practical challenge (how do you push conservation of a project to include the conservation of an entire ecology in which that project takes place) to theoretical challenges. What applies for software, indicates how we should think of digital culture as well – not as an object of conservation, but as a platform in which we think conservation – and even of such antithetical issues as decay. If the spatial institutions of archives and museums, and the various writing-based document cultures have provided us with a framework of conservation until now, it is quite clear that network dynamics and time-critical media are something through which we need to think about any digital “conservation” project.

Hence, despite the ongoing enthusiasm for preservation and archiving at the core of contemporary digital culture, “from online museums to the

YouTube phenomenon Geriatric1927[sic!], from Corbis to the Google data banks that store every search ever entered (and link each to an IP address, arguably making Google the Stasi [Staatssicherheit – former East German intelligence service] resource of the twenty-first century),”¹⁹ we need to argue that instead of assumed permanence, the key characteristic of digital memory is the coupling of degeneration with regeneration. Wendy Chun argues that only because even on a technical level digital memory never just *is* but also degenerates, and hence needs to be maintained, regenerated and rejuvenated, the whole ontology of memory and archives is closer to a dynamics of renewal than just mere storage. This is again a related point to that of Paul DeMarinis’, already quoted above.

Entropic Materiality

Conservation in the age of erasure and rewriting sounds oxymoronic. To get some kind of a grip on the nature of the electromagnetic, signal-based or, for instance, software-based arts we need to account for events instead of objects, processes instead of products, and nonhuman material instead of human semiotics. Art that refuses to think of the medium as mere medium, but instead takes it as its material, presents a problem to any mindset of conservation that is unwilling to address the media archaeological question: how to think through the conditions of expression and the conditions of conservation, both of which are technological. Consider, for example, electromagnetic art – let’s take Joyce Hinterding’s projects – where the media technological art project cannot be distinguished from the broader ecology of electromagnetism²⁰; this is merely a wider issue that any network art encounters, where the ecology has to do with technical infrastructures.

Of course, work on archival projects is increasing. A good example is the recent declaration of Media Art History,²¹ a much-needed initiative that will be able to facilitate communication, exchange, and documentation. It also flags the very fact that we are at the infancy stage in so many ways, and even such basic, key things like sustainability of the networks around media art history, archiving projects, documentation, and so on are needed. And yet, as part of this, we can use such declarations and the momentum generated to build new ways of thinking about the media art history archival plans to extend what we mean by archive.

The question that we need to address becomes whether we are happy just to build commemorations and metadata of various digital art works, platforms

19 Wendy Hui Kyong Chun, “The Enduring Ephemeral or The Future Is a Memory,” in: Huhtamo and Parikka 2011, p. 188.

20 This relates to Douglas Kahn’s recent projects on electromagnetism as well as the “Natural History of Media.” Available online at: <http://vimeo.com/31533978>, accessed 05/24/2013.

21 Media Art History. Platform for the Histories of Media Art, Science and Technology, available online at: www.mediaarthistory.org, accessed 05/24/2013.

of memory, or whether we could also develop experimental frameworks where we engage with dynamic media art works in new ways. Perhaps we need experimental archives, and archives of experimentation, that through speculative projects would set out to engage with the ontologies, epistemologies, and practical concerns of mapping the intertwining of digital art, time, and dynamic media. Archives of this kind would actually be about investigating the conditions of the archivable in the age of digital media. In this case, themes such as time, entropy, decay, materiality of informational art, and the like would be touched on by such event-based, experimental archives.²²

Let’s not allow object-oriented histories and archaeologies to fool us – the big challenge is to think through what to do with decay and processes, and how to tap into cultural heritage, and hence also conservation of digital art that is about electromagnetic fields, number crunching, networking pings, and screens that are only stable when they refresh.

I am not trying to downplay how exciting and important it is to create archives and collections in which the more stable forms of such artistic practices can be found; machines, documentation, and other forms that lead us to even begin to think about executed art. Yet, if we really want to use cultural heritage institutions to understand not only media art objects, but the technical, temporal contexts in which such art has to operate as material, we need more; we need ways of investigating the *a priori* of the archive in the age of decay, entropy, and technical materiality.

Meanwhile, as a modest suggestion to supplement our temporal orientation, I have in mind some recent projects that engage with an extended forensics of media in order to tap into the material dynamics of digital art. In these cases, we may be dealing less with art that is digital, than the digital as a form of artistic epistemology, mapping the materiality of the media through artistic practices.

Projects such as the Institute for Algorhythmics²³ “sonic archaeology,” which attempts to map the sonic unconscious of our digital devices and hence develop an aesthetic understanding of information cultures, is one way to understand the archive as a technical condition of the seeable and the hearable. Here, the archive moves from conservation to what allows conservation to happen, and the machinic sphere in which time takes place.

The name “Algorhythmics” refers to techniques of tapping into the sonification of algorithmic cultures to reveal patterns, rhythms, and the

22 Nina Wenhart presented interesting ideas about experimentality and the archive as part of the Transmediale In/Compatible PhD workshop, Berlin, November 2011. The event was coorganized by Transmediale Festival and the Digital Aesthetics Research Center (DARC), Aarhus University.

23 The Institute for Algorhythmics was founded in 2008 by Shintaro Miyazaki. It is an independent project for art, exhibition, science, and design. Available online at: www.algorhythmics.net/en/?page_id=2, accessed 05/24/2013.

controlling of regularities. To quote the whole list of methods, at times referred to as “auscultation,” involves hardware and software methodologies:

- A, a hardware-based approach, where audificating hardware tools like electromagnetic coils, differential amplifier, HF-modulators and detectors, logic analyzers, and other devices are used to reveal the hidden sounds and rhythms of our – mainly digital – information systems like portable computers, netbooks, smartphones, MP3 players, digital cameras, and so on.
- B, software-based methods, which make crucial information processes in computational processors (CPUs on motherboards, microcontrollers, etc.) audible by attaching to applications and reading their opcodes, thread states, and memory space at runtime. Much of the software work is possible because the open source (see glossary, p. 601) movement has already provided much of the source code to do this through programs like GNU Debugger (gdb) or GNU Binary Utilities (binutils). All we need to do is peel off the relevant sections of the source code and share.
- C, case studies where both methods are combined to achieve useful and meaningful surplus knowledge about our machinic environments.²⁴

One could say that this work is artistic computer forensics: where an increasing amount of innovative cultural heritage of born-digital content is created with computational techniques that excavate digital memory devices and software platforms on their material level, this artistic work attempts a more speculative, related take – at least in spirit – on the invisibility that governs our world of perceptions. It extends the digital archaeology work from source codes and stability to living networks and operational media. Both deal with the translation of the nonrepresentational sphere, the algorithmic sphere, which can be seen as closely related to the sonic regimes of art.²⁵ Governance and the archive move inside the machine, and hence, the work of archiving actually becomes mapping the living archives of digital technology that operationally cater to us with worlds of aesthetics, automated global economics, as well as grey everyday life.

Perhaps this mock computer forensics, digital archaeology, could even be termed “data carvery,” to point up its method of slicing and opening, of opening up devices for their juicy operational interiors. Further, this emphasizes the resistance to conservation in some current art practices that are more likely to be attracted by circuit bending and hardware hacking of existing,

24 See Sonic Archaeology wiki, available online at: www.algorhythmic.com/archeology/wiki/index.php?title=Sonic_Archeology, accessed 08/27/2012.

25 See Wolfgang Ernst, *Digital Memory and the Archive*, Jussi Parikka (ed.), University of Minnesota Press, Minneapolis (MN), 2012.

operational, dynamic media platforms – from simple 1970s electronic toys to closed high tech gadgets like iPhones.

Data carving, as introduced by Martin Howse, Danja Vassiliev, and Gordan Savičić, is one such playful, minor form of opening up the technological and its regimes of time and memory by opening up the hard drive with carving methods.

“Data carving treats the user’s hard drive (and memory chips) as a surface for constant excavation. Reverse engineering daily data sediments promotes new forms of digital archaeology, with hard disk *trouvé* as rich seams to be opened and mined for mineral and personal gems.”²⁶

Again, as a mock version of digital forensics such art practices take as their object the processual temporality of computer technologies. In other words, they are less suited as objects of conservation, than as taking the impossibility of conservation as their object. One implicit lesson drawn from a variety of contemporary technological and digital art practices seems to be that machinic conservation only exists when it does; or put differently, only when it is in operation.

Similarly, the workshops on “re- and decrystallization” by Jonathan Kemp and Ryan Jordan (London) as well as Martin Howse (Berlin)²⁷ can be seen as hands-on investigations into what is the complex materiality of informational ecology; in that case, they are also a chemical exercise to extract the valuable metals and other things crystallized in our technical machines.

To parallel the work of dismantling that takes place in Asian and African sites, a work of obsolete media technology recirculation, the workshops did not investigate the histories of abandoned media devices, but rather their internal archaeological temporalities – what times they contain in the form of their inner materials. Just as we may need to begin thinking about garbage and waste as more important temporal contexts, also in media arts, these projects extend to the entropic temporalities in which we have to think about the unpleasant ecologies of temporality that go together with obsolescence and e-waste. The notion of the crystal then becomes a way to understand the various times condensed and crystallized in media technologies, and hence the work of “de” and “recrystallization” as artistic openings to machines as time.

All these are pointers towards interesting themes from a digital art perspective; instead of cultural practices of the conservation of art, they address the event of investigating how time *is* in digital culture. The work of cultural and media

26 Berlin Substrat Radio #2 Data Carvery, available online at: <http://reboot.fm/2011/08/14/substrat-radio-2-data-carvery/>, accessed 05/24/2013.

27 Workshops on “decrystallization” of hardware components organized by Jonathan Kemp, Ryan Jordan and Martin Howse in London (May 27–28, 2011) and Berlin (July 18–20, 2011); see <http://xxn.org.uk/doku.php?id=decrystallization>, accessed 05/24/2013.

theory is continued in digital art practices, which themselves, paradoxically, remain a problem for the mindset of conservation and heritage. Perhaps one of the challenges for heritage institutions and practices is both to develop into sites of conservation, and into events of conservation; active places where memory can be investigated, in motion. Even large institutions like the London Science Museum are extending their curatorial and related practices to “co-curation” with an expanded group of stakeholders participating in the process of bringing out an exhibition; perhaps, similarly, we can develop other extended practices. Not conservation of digital art, but digital art as the problematization of conservation.

Emulation as a Conservation Tool for Digital Objects. The European Union's KEEP project

Jean-Philippe Humblot

1. Introduction

The Audiovisual Department of the National Library of France (BnF), like a number of heritage institutions throughout the world, collects a variety of resources which raise new technical questions. This is especially true of the large category of digital objects, including electronic documents, which have a limited lifespan and are subject to constant technological change as well as the unpredictable obsolescence of the equipment upon which they depend.

This article offers an overview of these institutions' conservation policies and of the strategies employed to preserve digital data stored on media received under legal deposit (floppy disks, optical disks, cassettes, cartridges, etc.), and the attempt to achieve independence from reading platforms through the use of special software: emulators (see glossary, p. 600). I shall outline the thinking that led to the launch of Keeping Emulation Environments Portable (KEEP), the European project which brings together archival institutions who share the same problems as the BnF, and whose aim is to combine their efforts in developing long-term solutions for preserving and accessing e-resources. Further, this article describes the main avenues of research that were pursued, the different topics studied, and the outcomes anticipated. Finally, the results obtained are described as well as the conclusions that can be drawn from the KEEP project.

2. The BnF and Legal Deposit of Digital Objects

The National Library of France (BnF) is the beneficiary of early attempts, in the fourteenth century, to collect the manuscripts that were then held in the Bibliothèque du Roi (Royal Library), an initiative for which Charles V (1364–1380) and the bookseller Gilles Mallet can take credit. However, the act that truly founded the library, the “Ordonnance de Montpellier” of 28 December 1537, which established legal deposit, was initiated by François I (1515–1547) and his adviser, Guillaume Budé: “We have considered the means by which might be collected, placed, and assembled in our library all the works of our times worthy of being seen, that have been or will be compiled, extended, corrected and amended, so that men might have recourse to the said books, in case by chance they should later become lost to human memory [...].”¹ From

1 C. Fournier, “Le dépôt légal”, in: *Documentation et bibliothèques*, vol. 39, no. 2, 1993, p. 96.



National Library of France
(BnF), Paris
Photo © Wikimedia
Commons

that time onward, every publication had to be deposited in the Bibliothèque du Roi, although it was not until the reign of Louis XIV that this obligation was enforced. The Royal Library became increasingly important under successive monarchs, and was opened to the public in 1692.

In France the scope of legal deposit was gradually extended to cover prints (1672), lithographs (1817), photographs (1851), sound recordings (under a Law in 1925 and a Decree in 1938), and films (under Decrees in 1963 and 1975). *Multi-média*, understood as digital objects stored on a range of media, was included as a category in 1975, followed by audiovisual works in 1977. At that time the term “multimédia” was applied to (predominantly educational) documents in various media, such as language-learning packs consisting of a book, plus slides or audiocassettes. The 1980s saw the increasing publication of periodicals that included a digital storage medium (a floppy disk or software cassette, or later an optical disc) and by this route the first examples of software entered the BnF’s collections.

The extension of legal deposit to electronic documents, software, and databases was formalized by a Law in 1992² and a Decree in 1993,³ supplemented

- 2 Loi no 92-546 du 20 juin 1992 relative au dépôt légal; available online at: www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000723108&categorieLien=cid, accessed 07/05/2013.
- 3 Décret d'application no 93-1429 du 31 décembre 1993 relative au dépôt légal; available online at: www.legifrance.gouv.fr/affichTexte.do?cidTexte=LEGITEXT00006082758&dateTexte=20090223, accessed 07/05/2013.

by legislation in 2006 on copyright and related rights in the information society (DADVSI).⁴ Its scope extends to the Internet and other publishing formats, thanks to the deliberately broad terms in which it was drafted. The *Code du patrimoine* now stipulates:

“Software products and databases are subject to legal deposit if they are made available by the publication of a physical medium, regardless of its nature. Legal deposit also applies to the signs, signals, texts, images, sounds or messages of whatever kind of any communication to the public by electronic means.”⁵

Today, the BnF’s multimedia collection of software and electronic documents numbers about 65,000 items, or almost 100,000 data storage devices. In addition to legal deposit, which has been comprehensive and effective since 1993, the collection has been enhanced over time through targeted acquisitions and donations, which have made it possible to supplement the collection with items published in the 1980s (before the Decree was passed) and to include a representative sample of foreign publications. The collection consists of items designed for use on platforms as diverse as the earliest personal microcomputers (Oric, Commodore, Thomson, Apple, Atari, Amstrad, etc.), the leading products of the 1990s and 2000s (IBM PC compatible computers running under Microsoft DOS or Windows, and Apple Macintosh computers), as well as the majority of games consoles (Nintendo, Sony, Sega, Microsoft, etc.), and some mobile platforms – smartphones and tablets, for example. Most of the items held consist of floppy disks (5¼- and 3½-inch, etc.) and optical discs (CD-ROMs, DVD-ROMs, Blu-ray, and some others), plus cassettes and a large number of cartridges in various formats. There are also less systematic holdings of hard disk drives, USB flash drives, and memory cards. In all cases, the life span of these storage media is not more than a few decades.

With the rise of downloading portals, the current trend is towards increased sales of non-material products. This presents a new challenge for legislators and for the BnF because online publication has in part lost its territorial character – as in the case of platforms produced by foreign publishers such as Apple and Nintendo – meaning that the criteria for collecting, handling, and describing items have to be redefined. This dematerialization also presents new technical difficulties, since it involves increasingly polymorphous items, published fragmentarily and in multiple versions.

4 Loi no 2006-961 du 1 août 2006 relative au droit d’auteur et aux droits voisins dans la société de l’information; available online at: www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000266350, accessed 07/05/2013.

5 Code du patrimoine, art. L.131-2; available online at: www.legifrance.gouv.fr/affichCodeArticle.do?cidTexte=LEGITEXT000006074236&idArticle=LEGIARTI000006845516, accessed 07/05/2013.

3. Issues Arising for the Conservation and Accessing of Digital Objects

Three major issues for conservation of digital objects can be identified: first, recovery of the information contained in the original medium with a view to migrating (see glossary, p. 601) it. This presupposes the use of reading devices that are often antiquated and have to be made to interact with contemporary equipment. It also requires the ability to circumvent the various mechanisms used to prevent copying: technological protection measures, or TPMs. Second, these items are frequently accessed using equipment that it may not be possible to maintain successfully in the long term, and for which an alternative has to be found. This problem is overcome by the use of a specific form of software called an emulator, which can simulate the operations of a particular piece of hardware on a contemporary one, such as a IBM PC compatible computer running under Windows. Third, there is the question of “future-proofing” this software itself, since experience shows that software that worked perfectly under an earlier operating system frequently does not do so on a current one.

3.1 Media Transfer

The BnF has been aware of these issues for several years; it has given them formal consideration and has drawn up a plan for the preservation of digital objects, referred to as the PCDM. Several instances of large-scale transfer have taken place, both in-house and outsourced, in which the digital resources are copied and saved in the form of disk images (see glossary, p. 600).

In drawing up the specifications for a transfer operation, close attention has to be paid to the different types of storage media, specifically their physical format (floppy disk, CD-ROM, etc.) and the format of the data they contain (IBM PC compatible systems or Mac). In fact, technology that is suitable for a particular medium, stored in a given format and designed to be used with a given piece of hardware, is rarely transferable to another type using a different format. For instance, copying a 3½-inch Amiga floppy disk does not require the same software or hardware as copying a 3½-inch IBM PC compatible floppy disk, even though both have the same dimensions.

Another factor to be considered is the possible presence of one or more TPMs. Each type of protection may require specific tools, which considerably increases the range of solutions that have to be adopted, and requires a preliminary diagnostic stage. The protection mechanism itself has to be saved, for purposes of archival completeness of the preservation phase, and its presence, even a virtual one, is indispensable for running the item. The task of conservation requires that documents are not denatured, and that as far as possible they are not treated individually, a process for which the BnF does not have the necessary resources – unlike hackers, who can directly alter software and remove its integrity checks.

3.2 Emulation

Once the data contained in the original medium has been extracted and stored as a disk image, there are two possible courses of action: it can either be put on a new carrier medium which is identical with the item that has been acquired by the library and can be run on the appropriate platform, or recourse may be had to a program that can be run on a contemporary platform (a PC running under Windows, for example) and which replicates the interactions offered by the original platform.

The first scenario, which is theoretically viable, is never followed in practice, since it presents many obstacles: it is difficult, even impossible, to reproduce an often antiquated medium (which involves the need to obtain blank media, and the specific hardware for writing the data on the medium which is probably no longer obtainable). Moreover, some media were produced using large-scale industrial methods, not individually, and it is impossible to keep the hardware for storing or reading data in working order indefinitely.

A solution to the problem of access based on the original hardware may be preferable for recent documents, but it is out of the question in the medium term. In practice, today, a user wishing to consult an item designed for the contemporary Nintendo Wii console will be able to use that piece of hardware, on which an library assistant has installed the original item that was requested, but it will be a different matter if the request involves an item designed for a games console made in the 1980s, such as the Nintendo NES; that type of console is now too antiquated to be offered to users, or to be maintained in working order. Therefore, the scenario most commonly seen consists of virtualizing, in other words “dematerializing” the carrier medium (for which an equivalent disk image is substituted) and the hardware on which to read it, which is replaced by a piece of software called an emulator that can simulate its operation. Such a program should make it possible both to interpret all the commands that make up the item, in the same way as on the original machine (called the “target” machine), and to recreate the interactions that this machine offers the user, by emulating its graphic and audio functions, and the peripherals (mouse, keyboard, joystick, etc.) of the machine on which it runs (called the “host” machine).

3.3 An Example: The Thomson TO7 (1982–1984)

Thomson microcomputers were extraordinarily popular in France in the mid-1980s as a result of the government plan, “Computers for all,” the aim of which was to introduce young people to this exciting new technology. The initiative led to the provision of 120,000 computers in French primary schools, and gave a boost to the educational software industry. The BnF has a collection of several hundred items dating from this period.

Media designed for use on Thomson platforms are mainly cassettes, or more rarely cartridges in proprietary format, and floppy disks. The cartridge

reader is an integral part of the machine, while the other media require an external reader. The computer is connected to a television set by a SCART cable, and has an alphanumeric keyboard and an original device, the light pen, which is pointed directly at the screen.

In the process of transferring these items, the cassettes were read and digitized using modern reading devices. The record thus obtained was analyzed using software that made it possible to extract binary information (0s and 1s) based on demodulation algorithms. The 0s and 1s are actually represented by variations in the magnetic signal at different frequencies. This operation enabled us to generate disk images containing all the programs recorded on both sides of each cassette.

There exist a number of software emulators of Thomson platforms, written and developed by enthusiasts. We were able to verify that the disk images generated from cassettes ran perfectly using these emulators in a contemporary software environment.

3.4 Advantages and Disadvantages for the User

As we see from the above example, emulation (see glossary, p. 600) enables us to display in a window of the host machine everything that would have appeared on the screen of the target machine. Its audio capacities are reproduced, and the keyboard of the host computer enables us to type characters in the same way as on the machine that is being emulated. The light pen is not available on contemporary machines but the mouse can be used in a similar way. In this case, the user's experience is thought to be very close to that of using the original machine.

There are, however, significant differences, which must be borne in mind. First, the processing power of the host machine is in no way comparable with that of the target machine: the latter had a processor running at 1 MHz, and was thus able to execute a maximum of one million commands per second, while today's machines perform between one thousand and ten thousand times better. It is therefore often necessary to slow the emulation down artificially, in order to keep levels of performance close to those obtained using the original hardware. That capacity also offers researchers an undeniable advantage: they no longer have to wait fifteen or twenty minutes for the whole of a cassette to be read, before they can begin to consult it; an image file is read in a few seconds and, unlike a cassette, it never fails.

There may theoretically be other advantages for the reader. One could mention a number of functionalities that are innovative in comparison with those offered by original machines, in particular anything connected with extracting information while the item is being consulted: taking a screen-shot, saving a user experience or workflow in the form of a video or audio file, storing a memory state that makes it possible immediately to find a specific point in the consultation, interrupting and resuming the reading, cheating, etc.

The Thomson T07 microcomputer was introduced to the market by Thomson SA in November 1982.
Photo © Wikimedia Commons
Photo: Rama



Among the sometimes insurmountable disadvantages of using the strategy of emulation we would emphasize the loss of the peripherals that are specific to the target machine: for example, the Thomson T07's light pen cannot be reproduced in exactly the same way on a contemporary machine. Similarly, the majority of game consoles have very specific user interfaces, of which it is not possible to provide an equivalent on a contemporary PC. In this respect, one of the most extreme cases is that of the Nintendo Wii, which offers a great many peripherals: exercise bikes, guitars, handlebars, weapons, movement recognition devices, etc., all designed to enrich the experience of using the console.

3.5 Emulation versus Migration

In the world of conservation, emulation is clearly distinguished from migration techniques. Migration (see glossary, p. 601) is suitable for items described as “static” (text, sound or video), which offer little interactivity and are associated with specific visualization software, such as Adobe Acrobat or Microsoft Word, or an image editor or audio/video player. As this software is constantly upgraded, certain older formats are no longer supported, only more recent ones that offer more advanced graphic effects. This was also the case, for example, with PDF or Word documents: as successive versions of



Thomson TO7 emulation on Windows, screenshot

these products appeared, the older formats were no longer supported. Original files had therefore to be “migrated” to new formats. In general, this technique works satisfactorily and guarantees that an old document can still be read on a modern machine. Nevertheless, experience shows that the migration process sometimes entails deterioration of the document and the loss of some information; in the case of documents consisting of text it is not uncommon to discover that certain details of the page layout are lost. It is foreseeable that as items are migrated again and again, in the long

term they will suffer irreversible damage.

In contrast with the technique described above, emulation is not an attempt to upgrade the document itself, but to preserve the player or reader in working order: rather than migrating a document to the new version of Acrobat, we aim to preserve access to older versions of the software. In the case of “dynamic” digital objects that presuppose the on-going execution of calculations by the machine for which they are designed, migration is not an option, since it means that programs have to be rewritten in their entirety. The image of the object that is produced in the transfer process does not have to be edited, but one has to be sure that the emulator is one that will be compatible with future platforms.

4. KEEP: Keeping Emulation Environments Portable

The aim of the KEEP project is to devise solutions for the various problems mentioned above, by combining the efforts of a number of European Union institutions concerned with heritage which face the problem of conserving digital objects: in addition to the BnF, which initiated the project, they are the KB - Koninklijke Bibliotheek/National library of the Netherlands in The Hague, the German National Library (DNB) in Frankfurt, and the Computerspielemuseum (CSM) in Berlin. Other institutions collaborating in the project include the University of Portsmouth (UPHEC) in the United Kingdom, IT companies Joguin SAS (Grenoble) and Tessella tlc (The Hague), and the network maintained by the European Games Developer Federation (EGDF).

The project is divided into “work packages” or WPs, corresponding to the following areas of research: the framework required for transferring media (KEEP Transfer Tool Framework: WP1), the association of image files with a suitable and correctly configured emulator (KEEP Emulation Framework: WP2), the definition of a model of technical and bibliographical metadata for the description of multimedia documents, coupled with a system for browsing and searching for documents, based on the metadata (KEEP Emulation Framework GUI and metadata: WP3), and a portable virtual machine designed to make emulators future-proof (KEEP Virtual Machine: WP4).

The work of testing and integrating these various components, taking into account existing standards and external tools, such as format registries, open archival information systems (OAIS), and the relationship with the Open Software Foundation, is carried out on different levels by WPs 1, 3 and 5, respectively. Lastly, WP6 is concerned with publications and communications, and WP7 with the project's administrative framework.

4.1 Media Transfer (WP1)

As indicated above, transfer of the media that make up digital object collections is a priority, due to their rapid rate of obsolescence and because it is impossible to maintain playback platforms in working order in the medium term. The great number of software and hardware solutions leads to great complexity in performing transfer operations. The KEEP project has therefore foregrounded this issue by restricting its remit to floppy disks and optical discs.

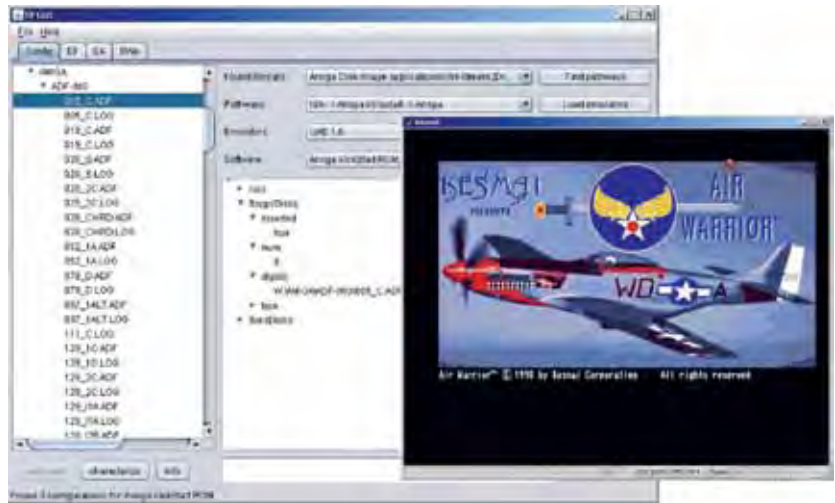
Several operations were carried out: an inventory of existing media formats, an inventory and checklist for a certain number of transfer tools, and the specification of a general framework (Transfer Tools Framework or TTF), designed to create standards for the use of these tools, and for workflows, the format of the images produced and the technical and bibliographical metadata that enables them to be described. This metadata makes it possible to organize the search for documents within the collection and to specify the software and hardware needed to execute documents, especially those that are emulated.

Modules enabling automatic interrogation of external registries such as Digital Record Object Identification (DROID), PRONOM,⁶ or Mediapedia, were created in order to make it possible to view the content and to access the metadata. Lastly, consideration was given to the conditions for interfacing with the different OAIS systems for digital archives adopted by libraries: SPAR (System for Preservation and Shared Archiving) at the BnF, kopal (Co-operative Development of a Long-Term Digital Information Archive) at the DNB, and e-Depot at the KB, and to the possibility of inclusion in the interoperability model offered by the Open Planets Foundation (OPF).

In parallel with this, a study of the legal constraints was carried out to determine the precise limits imposed on preservation by French, Dutch, German, and European Community law, for example, copying or emulation of hardware. Although it was recognized that heritage institutions present a special case, the study threw light on the existence of important restrictions designed to protect copyright and patents. It was therefore decided to work

6 PRONOM is an online technical registry of file formats and software products. Originally developed by the National Archives of the United Kingdom at Richmond as an internal resource for assistance with the acquisition and long-term preservation of electronic files, it is now accessible to the public. For more information, see: www.nationalarchives.gov.uk/PRONOM/Default.aspx, accessed 07/05/2013.

KEEP Emulation Framework, starting an Amiga computer game, screenshot



with the various legislative bodies in order to obtain some relaxation of these restrictions, and instead of delivering the TTF, to develop a certain number of prototypes designed to demonstrate the feasibility and relevance of the different functionalities initially envisaged.

4.2 Selection and Configuration of Emulators: The Emulation Framework (WP2 and WP3)

The second objective of the KEEP project initially consisted of creating a protocol for programming emulators to meet users' needs, in order to standardize interfaces and to simplify their use, which is often extremely complex. The functionalities that were identified as the most useful for research needs (saving states or user experiences, taking screen-shots, rewind, guidance for users, etc.) were meant to be made more accessible. However, it soon became clear that such an idea was far too complex to implement, since emulators would have to be partially rewritten. It was therefore decided to limit the undertaking to assistance in choosing and configuring emulators.

The Emulation Framework enables the user to select a document in the form of a file image or a standard file (in that case, a static, text or graphic document). The platform makes it possible to analyze the nature of the selected object, and to offer a virtual architecture capable of replicating it. The user is guided right up to the final stage of launching the emulator configured with the loaded document.

Analysis of the selected file uses both the built-in format database, as well as external services for identifying files, such as DROID or the Trustworthy Online Technical Metadata Database (TOTEM), developed in the framework of WP3. This tool handles all the existing environments for three types of

hardware architectures: IBM PC compatibles (operating systems, or couplings), the Commodore 64, and game consoles.

The Emulation Framework is written in the Java programming language, and thus uses an almost universal virtual machine. It is open and versatile, and supports emulators written specifically for the host machine, but also those written in Java or for the KEEP Virtual Machine.

So far, the Emulation Framework has a limited user interface, but a more specialized interface is in preparation. In particular, it will allow browsing of the metadata associated with documents and semantic searching (WP3).

4.3 A Universal Virtual Machine: The KEEP Virtual Machine (WP4)

The weakness of a strategy based on emulation is that it relies on the ability to maintain emulators in working order. But since we are dealing with traditional computer programs, intended to be run in a given software and hardware environment, how can we be sure that they will be able to run on future systems? It is precisely the aim of the KEEP Virtual Machine (KVM) to answer that question. This is the most ambitious part of the KEEP project, since its objective is to describe and create a virtual machine that is sufficiently universal to run all kinds of emulators, and whose essential characteristic is to be easily portable, in other words, adaptable to any future computer architecture. A program verified and validated for the KVM would thus be considered future-proof.

The KVM is based on a model consisting of a series of increasingly complex layers, of which the simplest offers only two instructions, and can be very quickly adapted to any machine capable of performing calculations. This is, of course, only possible at the cost of major trade-offs in terms of speed of execution. At the highest level, the KVM offers an instruction set comparable with that of the latest processors, with capacities and performances in line with those required to run an emulator. In addition to implementing this virtual machine, there are plans in the near future to adapt a free compiler (see glossary, p. 599), GCC (the GNU Compiler Collection), so that it will be possible to compile programs written in C (as is the case with most emulators; see glossary, p. 600), and to generate files that can be executed by the KVM. Using GCC it has been possible effectively to recompile the open-source Vice emulator, which simulates the Commodore 64 microcomputer.

5. Conclusion

KEEP is the first international project to put emulation at the center of conservation strategies. A number of difficulties have arisen, which can be put down to over-ambition, but they have been partially overcome. Lastly, substantial advances have been made, encouraging heritage institutions to adopt virtualization technology.

The publications arising from the project are available on the official website, www.keep-project.eu, and the KEEP Emulation Framework can be downloaded at this address: <http://sourceforge.net/projects/emuframework/>. Other online resources will be accessible, including the TOTEM database, the user interface of the Emulation Framework, and the improvements made by the Open Planet Foundation (OPF) for handling dynamic objects.

The project has led to fruitful collaboration among institutions that are often isolated and uncertain as to the strategies they should adopt in conserving the sort of atypical collections represented by their multimedia holdings. It has also helped software developers become more aware of needs associated with the preservation of national and cultural heritage. Lastly, it has brought to light the need for changes in the law that would make effective conservation programs possible.

Translated from the French by Imogen Forster

Information Freeze: Decay of Technical Information on the Internet

Paul Jansen Klomp

What if we want to present a present-day computer-based work in thirty to fifty years from now?

There is a good chance that the hardware, which functions properly at the moment, will no longer be functional after thirty years have passed. A computer that is stored, even in optimal conditions, will fail at a certain (largely unpredictable) moment in the future due to autonomous decay processes that render parts of the computer inoperable. In the long term, we can expect repair or replacement of the computer to be impossible. If we then want to show a representation that is as close as possible to the original work some kind of emulation (see Glossary, p. 600) or simulation is inevitable.

In the case studies that were conducted for the Inside Installations: Preservation and Presentation of Installation Art¹ and Obsolete Equipment (The preservation of playback and display equipment for audiovisual art)² projects, which resulted in emulations based on full content capture of the installations by Jeffrey Shaw, including *Revolution* (1990) and the not quite finished study of Jenny Holzer's work *Selection of the Survival Series* (1983–1985), it became obvious that to ensure interpretation and capture are correct in terms of timing and content, aiming for a side-by-side comparison of the original and the emulated work is a good approach. As a consequence, for two reasons, to capture the content and to compare the emulation to the original, we need the original work up and running.

To gather the data that is necessary for a successful emulation and check our results, in our case study we followed the steps outlined below. As stated, for executing this sequence, the original work has to be in working order:

- 1 The research project Inside Installations: Preservation and Presentation of Installation Art was coordinated by the Netherlands Institute for Cultural Heritage (ICN) and conducted in collaboration with numerous European institutions and museums. See online at: www.inside-installations.org/home/index.php, accessed 05/24/2013.
- 2 Obsolete Equipment (The preservation of playback and display equipment for audiovisual art) was a research project by PACKED vzw – Centre for Expertise in Digital Heritage, Brussels, in collaboration with the Netherlands Media Art Institute (NIMk), Amsterdam, M HKA (Museum van Hedendaagse Kunst Antwerpen), Antwerp, and S.M.A.K. (Stedelijk Museum voor Actuele Kunst), Ghent. See online at: <http://nimk.nl/eng/obsolete-equipment>, accessed 06/06/2013.

- Copy and store all content;
- analyze behavior by observation;
- document behavior on video;
- combine content and analysis in a formal description;
- create an emulation based on data from this description and the captured content only;
- side-by-side comparison of the emulated work with the original.

Repair and capture for computer-based works has to be begun before the work is twenty years old – but preferably much earlier. The twenty years here is a wild guess; how long can we expect a computer to live? There is some relationship between the era when a computer was manufactured and its expected lifespan. Examples are the inherent decay of germanium transistors (1960s) and badly manufactured electrolytic capacitors (1990s) that make systems from a specific era more vulnerable to decay processes. Recommended practice would be to gather all data concerning a work when it enters the collection, and take the first steps (securing the digital content, documenting appearance and behavior, observe and describe behavior) immediately. To gain access to the stored content, both data carriers (tapes, magnetic or magneto-optical discs, ROMs, EPROMs, or EEPROMs) and corresponding read/write devices must be in working order.

The longer we wait the more problematic repairs will be that precede the capturing process. Besides data loss, computer systems can fail for a multitude of reasons. A common reason lies in dissociation: lost parts, missing software or wrong software version, displaced manuals, or missing hardware or hardware components, like cables or monitors. Another complicating factor is that many computer-based artworks are never sold to collectors. They remain in possession of the artist. This poses a great risk for the completeness of the hardware. It is not uncommon that an artist reuses parts of a previous installation for a new one.

To repair a computer we may need:

- Parts
 - Fuses;
 - switches;
 - fans;
 - capacitors;
 - batteries;
 - add-on cards;
 - motherboards;
 - power supplies;
 - graphics boards;
 - peripherals like mice, keyboards, monitors.

- Operating environment
 - Mains voltage (is raised at a slow rate from 220V AC to 250V AC in Europe);
 - if the work relies on a network: networking components like cables, switches, hubs; several types of network have been used over the years and not all are based on the currently prevalent IP protocol.
- Detailed documentation
 - BIOS settings (PC: noted from the screen at start-up);
 - system configuration;
 - hardware manuals;
 - connector and cabling pin layouts;
 - schematics;
 - parts lists.
- Software
 - Operating system, including updates plus license;
 - Licensing poses a special problem. Operating systems and application programs may require online validation or authorization. Once the server has disappeared, even with a valid key it will become impossible to run or reinstall the software.
 - compilers (see glossary, p. 599);
 - source code (see glossary, p. 602);
 - programs that are required for the work to operate, like communication or network drivers, browsers, terminals;
 - repair and analysis tools, specific to the era;
 - Example: Try to find Vernon D. Buerge's LIST.com, a widespread text and file viewing tool in the late 1980s that was on many DOS computers. It is now very hard to find a copy on the Internet.

When repairing a broken PC, a second, similar machine that can be used as donor can be of great value. Alternatively a (centralized) pool of generic parts such as those mentioned in the above list would help a lot in faultfinding and repair. Where can we expect to find these computer parts at a later point in time? Institutes that collect computers as mere artifacts, with the intention of preserving the physical machine and not so much the function, will not help us. To avoid the risk of damage or loss they will not allow experimental technicians to use parts of their computer systems for repairs. If not computer museums, then who could be interested in collecting and storing this kind of material? The following possibilities exist:

- University computer collections (e.g., Computer Museum at the University of Amsterdam);

- hobbyists, amateurs, and user groups;
- game collectors;
- libraries that need computers for document and image conversion;
- art conservators.

Would these groups be interested in setting up a joint hardware pool or database? Who might organize this? Where should the material be stored, how could the technical personnel for research, categorizing, and testing be funded?

Apart from access to hardware documentation will be needed. This must be gathered, bought, digitized, pooled, indexed, and made accessible. A broad collection of user, hardware, and repair manuals, schematics, chip manufacturer's datasheets, protocol descriptions could thus become available. But probably the biggest problem we will encounter during the next decades is the fact that the long-term operability of our main source of information and software, the Internet, is not guaranteed. Personal sites, like those from user groups that publish information and software for a specific computer brand or system, can become unavailable overnight when the maintainer decides to give up the website. The same holds for collectors' sites. Then there are the driver collections (like driverguide.com), sites from manufacturers like Microsoft, Apple, IBM, Adobe, and of course, the sites of hardware manufacturers providing detailed information, drivers, and test programs for their products. Will these sites be kept up and running for decades? What happens to this information when a company disappears? Can commercial enterprises be persuaded to hand over their information for our purposes of conserving cultural heritage? Can we think of any way they would benefit from doing this? Or can we buy their content on DVD, for the sake of keeping it?

Initiative must be taken to preserve the present Internet state of information. This involves determining the kind of information that is relevant for future use, searching for it on the Web – or anywhere else – grabbing, capturing, and leeching databases, indexing the results and making these results available to anyone who is interested. If we look at the investments that have to be made to secure all the information needed for future computer maintenance and repair, this large-scale approach is clearly not economical and probably not feasible.

A more down-to-earth approach that can be started without too much organizing could be: Look for partners that are interested in setting up a parts and/or a documentation pool. Collect all information on the hardware that we already have in our collections:

- Analyze the components: manufacturer, type, version, year, state, containing system.

- For the I/O, graphics and storage devices used, collect all possible drivers for all operating systems that were on the market at the time of original purchase, not just the software that is needed for a particular system.
- Check (and when making an actual emulation: test) whether the components are supported by any emulation program.
- A shared container format must be designed to hold the different kinds of information and make information searchable and exchangeable between institutions.

In this way, clusters of information will emerge around hardware already present, and time and effort is spread over multiple partners.

It seems that the desire to restore computers to a working state in the near future (say thirty years) will require a huge investment in information gathering, categorizing, and storage. If we don't act soon, it will be simply impossible to repair PCs because we will lack documentation, replacement parts, and software. However, if we don't take action, it will become impossible to exhibit a vast number of works.

Hacking Mondrian

Florian Kaufmann

Introduction

The conservatorial study *Hacking Mondrian* was part of the DORE research project Analit: Analogien des Digitalen¹ (henceforth referred to as Analit) at the Bern University of the Arts (BUA). One of the focuses of the Analit project was conservation measures with respect to electronic works of art; it placed especial emphasis on the transition from analog to digital technologies possible prior to, or alternative to emulation (see glossary, p. 600) or virtualization, in order to keep an artwork functioning for as long as possible on the original hardware. Thus, in the project the attempt was made to identify critical hardware components and to achieve an overview of the possibilities of procuring spare parts.

Part of the study dealt with a selection of artworks by Herbert W. Franke,² because Franke's works were programmed on some of the first computers, which are fortunately still obtainable on the market. This is what makes work on doublets possible. Therefore, equipment analysis could be pursued in a very unrestricted and easy-going manner. Further, a cross-section of problems occurring in hardware can be illustrated through selected works and the relevant computers. Particular computer models were searched for and found through online auctions, at flea markets, and via online forums. Apart from the Digital Equipment 350 professional that was already being traded at over €500 in 2011, all computers were acquired for the purpose of conducting a close examination of their hardware. These included an Apple II Europlus, on which Franke programmed the series *Falter* (1979), and a home computer TI-99/4A, on which he programmed the series *Mondrian* (1980).³

The following remarks are restricted to conservational considerations and those works with reference to hardware used by Herbert W. Franke; the aim

1 The full title is: Analogien des Digitalen: Von der Fallstudie zur allgemeinen Erhaltungsmatrix medialer Kunst [Analogies of the Digital: From the Case Study to the General Conservational Matrix of Media Art]. Sponsored by the Swiss National Science Foundation as part of DORE; duration 2011–2012; project direction: Johannes Gfeller.

2 The selection presented here is based on a list of works with case studies, which resulted as part of the DORE research project. Analit draws on this list on which five computers by Herbert W. Franke are cited from the 1980s, which Franke handed over to the ZKM in 2007, and which he used for the programming and presentation of earlier works.

3 Available online at: www.biologie.uni-muenchen.de/~franke/WsFr5Korr.htm, accessed 05/24/2013.

here was to present his work *Mondrian* as part of the exhibition *Digital Art Works. The Challenges of Conservation* (see pp. 520–563).

Mondrian

Commissioned by Texas Instruments, the series *Mondrian* was programmed by Herbert W. Franke 1979/1980. It is an interactive program for generating graphic patterns and structures.

Reiner Schneeberger reprogrammed *Mondrian* 2009 on the occasion of Franke's eightieth birthday as *MONDRIAN 21* for a Windows system; in this context, the functions and basis of the program were described in great detail.⁴ *MONDRIAN 21* involved new programming without sound and developed on an original flow diagram: “[Almost three] decades later, with *MONDRIAN 21* – coded according to the old program flowchart created by H. W. Franke – this development, so significant for computer art, was saved for the modern era since, as we can see, emulators still exist for Windows XP.”⁵

Together with additional programs, *Mondrian* originally went public in the form of a so-called solid state software cartridge. This cartridge was marketed under the name *Computergraphic* for the TI-99/4 home computer.⁶ In 1979/1980 Texas Instruments put the home computer TI-99/4 and, from 1981, the TI-99/4A on the market. In the years between 1980 and 1984, around two to three million such computers were produced and in 1984 were sold far below the original purchase price.⁷ Incidentally, the TI-99/4 is one of the first, if not *the* first 16 bit home computer.

Initial Situation

During preparations for the exhibition *Digital Art Works*, the question arose as to whether *Mondrian* might once again be presented on the original hardware of an original TI-99/4A home computer.

This computer, together with the corresponding original cartridge, was initially shown in 2010 as part of the exhibition *Herbert W. Franke – Wanderer between the Worlds* (2010) at the ZKM | Karlsruhe.⁸ Due to overheating, the computer crashed quite soon into the presentation. Consequently, there was concern that the *Mondrian* module which had been connected directly to the

4 Available online at: <http://rhizome.org/editorial/2009/jul/23/serie-mondrian-1980-herbert-w-franke>, accessed 05/24/2013.

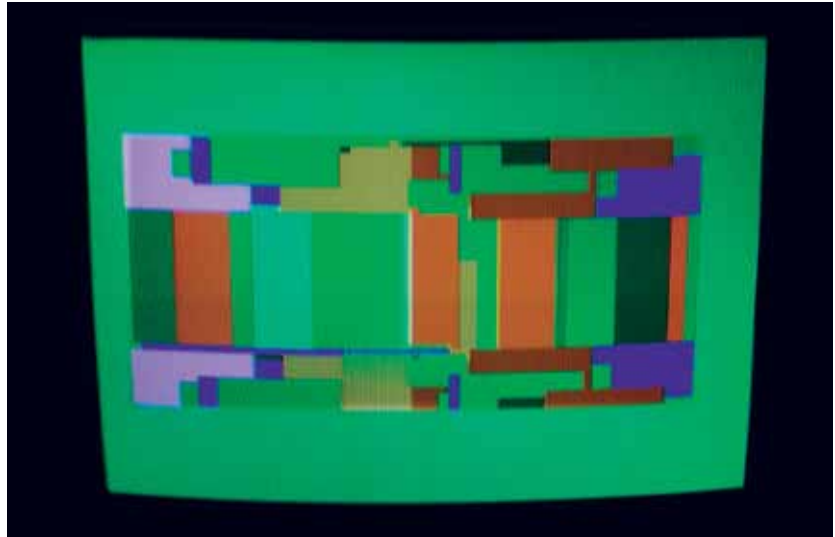
5 Reiner Schneeberger in an interview with the Universal Gazette, 29 September, 2009, available online at: www.avatarkunst.wordpress.com/2009/09/29/2037-auf-einen-kaffee-mit-minimal-blue, accessed 05/24/2013.

6 Texas Instruments Home Computer Systems, Operating manual *Computergraphic*, 1980. Texas Instruments manufactured several cartridges for the TI-99 production series, so-called solid state software or else solid state cartridges. This has to do with one of three storage media (plug-in module) for the TI-99 home computer. See online: www.mainbyte.com/ti99/software/software.html, accessed 05/24/2013.

7 Available online at: <http://oldcomputers.net/ti994.html>, accessed 05/24/2013.

8 Available online at: [http://on1.zkm.de/zkm/stories/storyReader\\$7195](http://on1.zkm.de/zkm/stories/storyReader$7195), accessed 05/24/2013.

Herbert W. Franke
Mondrian
 1979/1980
 Graphic generated by
 the program *Mondrian*,
 here on an original TI-
 99/4A home computer;
 photograph taken from an
 analog screen.
 © Herbert W. Franke
 Photo: Florian Kaufmann



overheated power adaptor might be damaged. This module is extremely rare and, in spite of substantial efforts, it has been impossible to locate a second copy to date. The home computer TI-99/4A, by contrast, can be found relatively easily at Internet auctions and flea markets, and at affordable prices (prices range from €20 to €100).

Based on the problem of overheating described above and the consequent threat of damage occurring to the module, a critical examination of Franke's *Mondrian* is particularly appropriate for the purposes of identifying and solving a whole range of fundamental problems relating to the conservation of original hardware. A further important subtask was to provide a suitable hard and software version for exhibitions. Most of these problems can be generalized and apply to practically every computer dating from 1977 to 1985.

Thermic Undersizing

The problem of overheating was known in advance, yet what remained unclear was whether this had to do with a device-specific error. By means of studies and interviews carried out with TI-99 users, researchers established that the problem was widespread. With a highly sensitive IR thermographic camera and conventional thermometers for spot checks of structural components, the thermic process was recorded after the computer had been switched on: since the power adaptor is situated exactly below the cartridge, the application of plug-in modules causes additional thermic congestion. Heat is relayed to the circuit board and the plug-in contacts, which can lead to contact problems and additional malfunctions. The topology of the power adaptor was examined and an overview of the semi-conductor created. These conductors are a sort of hybrid of a power adaptor from the early period of



Home computer TI-99/4A
1981
Photo © Florian Kaufmann

the home computer and a switching mode power supply, which still remains cutting-edge technology today. The semi-conductors that are used can all be purchased retail, and a total revision of the circuit board is easily possible. The thermic analysis of the cooling element indicated that the power adaptor is not designed for continuous operation. There are typical technical production characteristics of a mass product the limited shelf-life of which is accepted although perhaps not intended. This is reflected especially by undersized cooling elements, and the spatial arrangement of condensers.

Voltage Problems

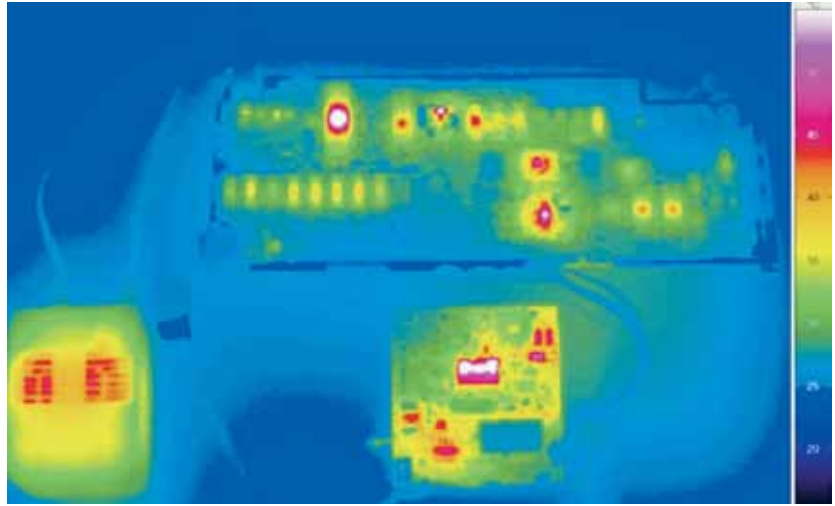
With the appearance of the home computer TI-99/4A a power supply of 220 V was common. This had been increased gradually over the course of the pan-European network since 1986 from 220 V to 230 V (+/- 10 percent)⁹ and is defined in the IEC paper 60038.¹⁰ This increase led to additional stress of already over-stretched structural elements¹¹ in the TI-99/4A. More specifically,

9 Available online at: www.diesteckdose.org/forum/attachment.php?s=267a29cd58bda63f7f2f4b30a0caf65c&attachmentid=4402&d=1243433461, accessed 05/24/2013.

10 Available online at: www.vde-verlag.de/normen/0175004/din-en-60038-vde-0175-1-2012-04.html, accessed 05/24/2013.

11 W. Buchdrucker, M. Kopak, and M. Lange-Hüsken, *Was bedeutet die neue Nennspannung 230/400 V (Consequences of the the new Standard Voltage)?*, DIN-Mitteilungen 70, 1991, no. 8.

Infrared camera shot of
the TI-99/4A circuit board
Photo © Florian Kaufmann



what is significant is that the linear power transformer does not supply an AC voltage of 18 V, but around 21 V. The additional 3 V are transformed by the linear controllers into heat, and further accelerate the local thermic overload.

RAM Chips¹²

In the TI-99/4, eight RAM chips of type 4116 are used as video memory. This chip is typical of an entire earlier generation of home computers, and is also found in the Apple II, Sinclair ZX spectrum, as well as in many arcade machines. By the time the TI-99/4 was launched in 1979, type 4116 chips were already obsolete and had thus become cheap, a fact which explains their widespread use in home computers. The use of three different operating voltages is to be noted, particularly with the chips: +5 V, -12 V and -5 V. One further drawback is that the start-up sequence must occur very precisely: a false voltage sequence could lead to damage to these RAM chips. This is not clear from the data sheets on the type 4116 chips, and was thus only known to people with expert experience in the construction and repair of such components.¹³ Thus, during a current measurement of the -5 volt cable one of the TI-99/4As for the Analit project was destroyed. This entirely negative feature has been exhaustively dealt with in expert forums.¹⁴

¹² RAM stands for Random Access Memory, in contrast to the still common memory with serial input and output. The chip is a wafer-thin silicon platelet less than a few square millimeters in size, which is mostly to be found in black housing, and which is quite correctly referred to as an integrated circuit (IC). Both analog as well as digital circuits can be (highly) integrated in this way.

¹³ Available online at: <http://pdf1.alldatasheet.com/datasheet-pdf/view/103140/ETC/MK4116.html>, accessed 05/24/2013.

¹⁴ Available online at: <http://forums.arcade-museum.com/archive/index.php/t-184793.html>, accessed 05/24/2013.

GROM

The central problem in providing a hard and software version for *Mondrian* designed for exhibition use was to procure the solid state software cartridge with the *Mondrian* program. Since this module is extremely rare, and even a widespread search failed to turn up a cartridge, the only alternative was to produce a copy – or at least retrieval of the code and the creation of a backup copy (a so-called 1:1 Dump) – so that a solution could be developed in the event of a defect.

In contrast to all other modules of comparable home computers dating from this period (1979–1985), Texas Instruments did not use any PROM¹⁵ or EPROM¹⁶ chips, but a specific chip, the GROM chip, custom-made for the TI-99/4. Data sheets on this chip are evidently not available, only information from third parties, who explain configuration of the contacts and provide basic information on the function of the chip. With the TI-99/4, Texas Instruments not only put the first 16 bit computer on the market, but with its GROM chip also introduced a particularly efficient solution for the control of the production and distribution of software modules. These chips were manufactured by Texas Instruments itself, and were not available on the market. Consequently, there was no official data sheet. Their precise function was only deciphered a year later, when Texas Instruments issued special plug-in cards for prototypes that emulated this chip.

In the case of GROM, this involves an “intelligent” read-only memory chip with integrated address counter and identification address. A further obstacle are the programs on the GROMS in Graphic Programming Language (GPL),¹⁷ programmed and only executable when read in these GROMS. A code programmed in GPL has more application possibilities and is considerably faster than the Basic Interpreter (see glossary, p. 600) accessible to the normal user. As a consequence high-performance software could be provided through using the solid state software cartridges. However, due to the architecture of the TI-99/4 home computer it was not possible to program directly in the machine language (see glossary, p. 601). Even when in possession of the selected GPL code, it cannot be burned on a normal EPROM chip before being executed. The entire firmware and the internal connections have never been disclosed by the manufacturer, and were only made accessible by virtue of the laborious disassembly of interested programmers.¹⁸ All in all, a very effective way to control the production and dissemination of software. It ought

15 PROM stands for *Programmable Read Only Memory*. This involves a semi-conductor memory, which can be programmed and read by the user once only (“read-only”).

16 EPROM stands for *Erasable Programmable Read Only Memory* or, for short, *Erasable PROM*. This involves a programmable “read-only-memory” or PROM, and can be read as often as desired.

17 The G in GROM stands for *Graphic Programming Language*.

18 Available online at: <http://home.nexgo.de/cziepke/tifile/tiintern.pdf>, accessed 05/24/2013.

to be noted here that all this took place in 1979, when discussion of the problem of copy protection lacked a certain objective rigor.

The Backup Copy

The lack of precise data sheets and the limitation of these to one type of computer, the TI-99/4 and its successor TI-99/4A, initially made it difficult to read GROM chips and thus to work. Happily, there is a worldwide TI-99 fan community¹⁹ with approximately fifty to one hundred active users, who work intensively with this computer and regularly develop hardware and software as well as diverse emulators. Furthermore, this community had read practically all cartridges that were available at the time, which were cataloged and more or less made available on the Net. Through a mailing list of these fan forums, it was possible to obtain almost all technical details.

The search for the *Mondrian* module, though not offered under this name, was similarly carried out by way of these mailing lists. It included two additional programs on a module called *Computergrafik* – evidently not a fast seller for it is practically untraceable today. However, a disk image (see glossary, p. 600) – the selected content of this module – as well as a completely scanned operating manual was found with the help of the fan forums. One initial step was the testing of the disk image on a TI-99 software emulator for a Windows computer. There are currently approximately ten different emulators. For the tests carried out as part of this analysis, a Classic99 emulator²⁰ was used on a Windows XP environment.²¹ The software image could easily be loaded and executed. Thus, it was possible to ensure, without any error, that the right version of the module was available and functioned. This also saved the additional construction of a readout device with which the original at the ZKM | Karlsruhe could have been copied.

The Way Back to the Module

The question now was to integrate this disk image again in a plug-in module in one form or another. Due to the attributes of the TI-99/4 and TI-99/4A hardware architecture it is not possible to do this by means of a simple EPROM plug-in card. For this reason, we considered programming a modern microcontroller, which behaved exactly like an original GROM chip. However, a scanned article from a renowned computer journal was found in 1985 through the TI-99/4 forum,²² which described a purely hardware-based GROM emulator that reproduced a GROM chip with the help of logic chips and an EPROM. Unfortunately, the article is not comprehensive and is only

19 Available online at: ti99-4a@yahoogroups.com, accessed 07/16/2012.

20 Available online at: www.mainbyte.com/ti99/howto/classic99.html, accessed 05/24/2013.

21 Available online at: www.99er.net/win994a.shtml, accessed 05/24/2013.

22 *TI-Revue. Das Magazin für TI 99/4A & TI PC*, no.5/85.

available as a poor quality scanned copy. For this reason it was impossible to acquire the necessary information from it in order to produce a circuit board.²³ However, out of time considerations the attempt was made to reconstruct the GROM chip, since the expense lay only in the production of a circuit board and the programming of an EPROM. The templates for the printed circuit board (PCB)²⁴ were vectored with a software, and several conducting paths were retouched by hand.

In retrospect, it would have been easier to create a completely new draft of the diagram and layout, and to produce the card from scratch: the card was constructed experimentally, and the EPROM with the computer graphic image was programmed and tested. Due to the qualitatively poor template and as a result of the incomplete scheme, this solution initially failed to function – although no additional time was to be invested in an elaborate search by way of a logic analyzer.

The option of emulation per microcontroller was pondered once again. In this connection additional valuable contacts to TI-99 users were established; thus, access was made to a code fragment and theoretical considerations for a GROM emulator by way of a microcontroller.²⁵ Out of practical considerations, a slightly modified controller was used. For efficient debugging, a bootloader version was used, namely, the software could also be transferred without programming devices by any given computer with a USB port on the controller. One should mention here that the entire programming environment, as well as the software for the creation of the layout, is based on Open Source (see glossary, p. 601).

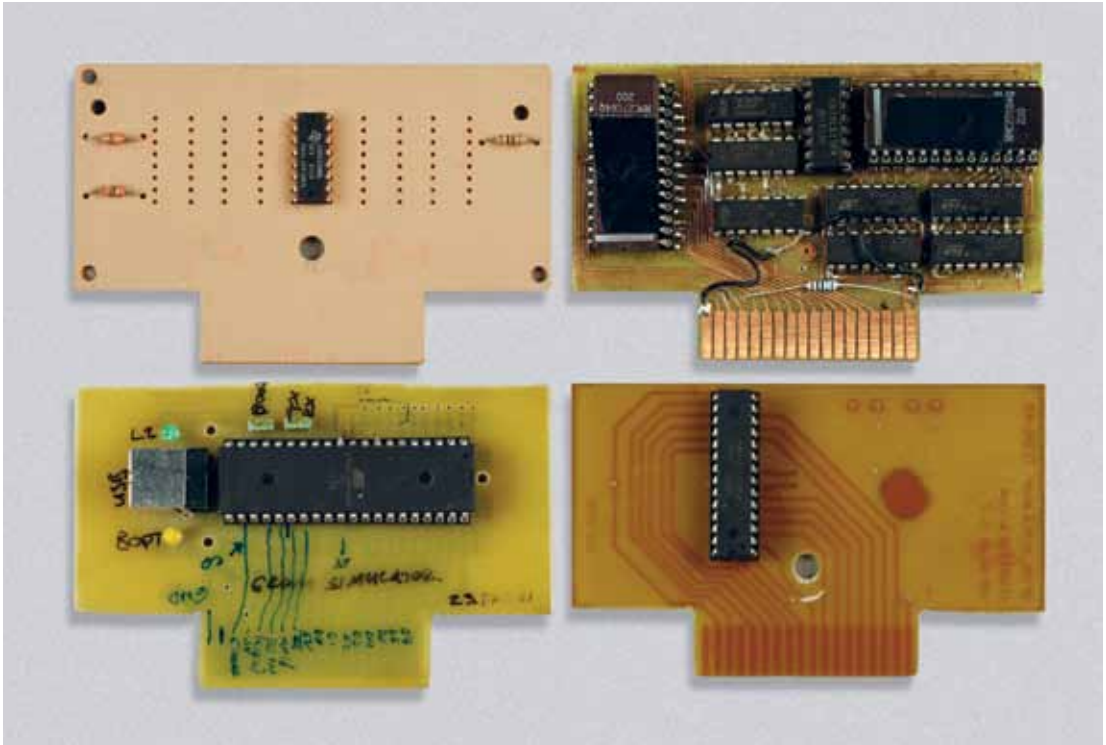
In addition, a new print board was created and the emulator was programmed in the programming language C (see glossary, p. 599). The actual code amounts to about 80 lines, and is transferred with the 4 KB large software image of the module to a commercial Flash-based microcontroller by Atmel (ATmega644).²⁶ The main task of the emulation software is to communicate with the corresponding input and output pin (the so-called I/O pin) of the TI-99/4 computer and, when desired, to read and make available the corresponding bytes from the original software memory of the controller. Here, no special functions are used, and the software may be adapted to any other microcontroller possessing the required number of input and output pins. Subsequently, the card can be plugged into the TI-99/4A home computer as usual. The chip behaved exactly like the original GROM chip – and thus

23 The common practice in the electronics scene is as follows: the layout of the Printed Circuit Board (PCB) is disseminated as print; the (home) user transfers the graphic optochemically to copper-clad circuit boards and corrodes away the interstices. After the holes have been drilled, the components can be soldered in.

24 The term *Printed Circuit Board* (PCB) is also referred to just as circuit board, small PCB.

25 Available online at: www.harmlesslion.com/cgi-bin/onesoft.cgi?118, accessed 05/24/2013.

26 Available online at: www.atmel.com/Images/doc2593.pdf, accessed 05/24/2013.



Evolution of the *Mondrian* cartridge, original cartridge, EPROM chip, bootloader (gnusb), Atmel microcontroller (ATMega644) (f. l. t. r.)
Photo © Florian Kaufmann

nothing was altered in the performance and timing of *Mondrian*. Purely in visual terms, namely, with respect to the appearance of the hardware, only the modified chip can be recognized. Even though it was possible to produce an optically identical solution because the circuit board is built into housing, this was not implemented. Neither was there any clarification about the extent to which such a copy should be visible to the visitors, or whether merely a remark in the description is sufficient.

Provision of Hard- and Software for the Exhibition *Digital Art Works. The Challenges of Conservation*

In order for *Mondrian* to be shown as a part of the ZKM_Collection during exhibitions in the future, a specimen TI-99/4A was modified “in terms of hardware.” All changes were created and documented such that the original condition can be restored again at any time, which, in restoration, corresponds to the commandment of reversibility. To sum up, the following work and modifications were carried out:

1. External power adapter

The supply board, which – thermically rather unfortunately – was located below the plug-in module, was removed from the main housing and, together

with a transformer adapted for 230 V, was positioned in an external housing. All cooling elements were optimized and enlarged. The condensators were changed and replaced with more modern 105°C long-life industrial condensers. Furthermore, in the switching power supply, low ESR-electrolytic capacitors (for example, the Panasonic FR series)²⁷ were used to keep the temperature low by means of the improved pulse stability and, through this, to keep electricity loss to a minimum.

2. Chip Cooling

The chips, which have been identified by means of a thermographic camera, have a higher temperature when in operation, and were therefore provided with cooling elements.

3. Keyboard Sequencer

After switching on the TI-99/4A home computer, the right program must be selected and started via the keyboard. In addition, the program has a built-in screensaver, activated after approximately ten to fifteen minutes. This is of course entirely inappropriate for an exhibition situation. It therefore makes sense to automate these tasks: to avoid unnecessarily modifying the original hardware, the sequencer attached to the matrix plug-in was installed in the keyboard. The automation of the keyboard consists of a small microcontroller (PIC12F675)²⁸ and a quadruple analog switch (CD4066).²⁹ This simulates, so to speak the pressing of the desired sequence of keys and, by a further simulated means, deactivates the starting of the screensaver at ten minute intervals. The advantage of this solution is that a user can continue to work at the keyboard as per normal at any time.

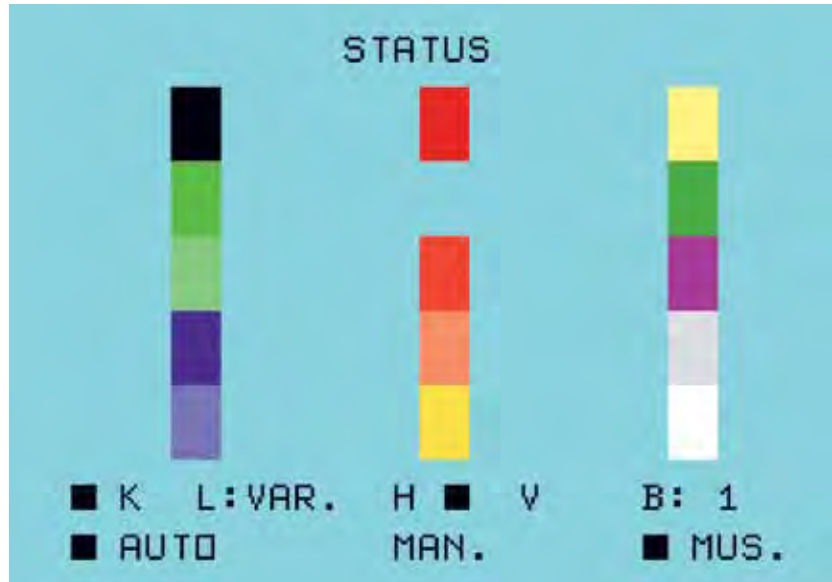
Through disassembly of the original code and its modification, a pure software which starts automatically and does not call up a screensaver is conceivable. However, this would only be possible at considerable effort, and would have the disadvantage that the application of the original module of the exhibition use as described here (automatic starting, no screensaver) would not be possible.

27 Available online at: www.rutronik.com/uploads/media/24_Panasonic_FR_Series_Promotionx.pdf, accessed 05/24/2013.

28 Available online at: www.microchip.com/downloads/en/devicedoc/41190c.pdf, accessed 07/16/2012.

29 Available online at: www.fairchildsemi.com/ds/CD/CD4066BC.pdf, accessed 05/24/2013.

Herbert W. Franke
Mondrian
 1979/1980
 Menu of parameters
 Screenshot taken from the
 TI-99/4A (Classic99)
 © Herbert W. Franke



Results

One of the results of this work on Herbert W. Frankes *Mondrian* is a modified hardware as well as a duplicate³⁰ of the original *Computergraphic* module which are now available for exhibition purposes. The development of the GROM emulators in such a short time was only possible thanks to the help of the TI-99 users, who regularly exchange information and know-how in relevant forums. Circuit diagrams, software, and our experiences were made available to the community via these forums as Open Source projects.³¹ In many ways, the partial emulation of obsolete hardware by way of modern microcontrollers is a good way to maintain the entire functioning hardware environment for as long as possible. This is particularly the case for storage media, power supply components, and in any case for the reproduction of complete processors that are no longer available.

With regard to earlier home computers (namely, all models between 1975 and 1985), a substantial network of collectors and users can be drawn upon, who possess comprehensive knowledge about specific hardware, and this makes analyses such as the present one possible. By means of the conservational measures relevant to *Mondrian*, as well as the analysis of other

³⁰ Functionally speaking, it is a duplicate: the original software code is unchanged and is read by the computer in the same way as the original module. However, since an original, empty GROM chip was not available, the chip was emulated. Therefore, it is a kind of hybrid: when the cartridge is closed, you can (purely functional) speak of a duplicate, but may not leave the emulation of the chip aside.

³¹ Available online at: www.floka.com/grom_gnusb.html, accessed 05/24/2013.

computers used by Herbert W. Franke, a significant number of the problems could be illustrated which may occur in the context of restoration and conservation of digital art. Through preventive measures, and especially for versions of the original hardware and software designed for exhibitions, these can be kept in operation for decades – providing that one deals with the problem points at the right time, and does not wait until the devices “break down” and are shelved in the depot.

Translated from the German by Justin Morris

How Deep Is Your Source?

Aymeric Mansoux

Introduction

Within the realm of archiving and conservation, free and open licenses are a useful tool to make both the reuse and the preservation of digital art more feasible.¹ Even though it is undeniable that such licenses have an overall positive effect, they do however struggle when it comes to defining the components, materials, and assets that have been involved in the creation of a work. The lingo used in such licenses stems from the world of software and despite its adaptation to cultural works, it still hasn't got rid of the binary nature of its origin. When a software license requires the access to its source, it refers to the source code (see glossary, p. 602), a well-known object in the making of software that is easy to define and identify. While this perfectly fits a particular form of art, in particular art that involves computational processes, it is questionable whether this concept of source code can be literally ported to other digital cultural expressions, such as moving or still digital images, sounds, and by extension multimedia and rich media works.

In this paper, I argue that such works require both a media-specific as well as a metaphorical understanding of what source code is in the context of art, music, and design in order to make free and open licenses valuable for conservation, archiving, and of course in-depth study and reappropriation of the former. Behind this challenge lie the issues of accessibility and control with free cultural expressions and open knowledge, and how these compare with their software-centric parent definitions.

A Brief History of Software Freedom

Source code is a collection of computer instructions written using a human-readable computer language.² The source code can then be either compiled in machine code (see glossary, p. 601) and executed manually to perform some tasks as a stand-alone program or as part of a larger software. But it can also be interpreted, in which case the source is both translated and executed on the fly.

The role of source code in the production and manipulation of software is essential. Its access allows virtually any modification of the latter, whether it is about adding new features or fixing bugs. This importance is best

1 Anne Laforet, Aymeric Mansoux, and Marloes de Valk, "Rock, Paper, Scissors and Floppy Disks," in: Annet Dekker (ed.), *archive2020. Sustainable Archiving of Born-digital Cultural Content*, Virtueel Platform, Amsterdam, 2010, pp. 21–29.

2 See Wikipedia, the free encyclopedia, "Source code," available online at: http://en.wikipedia.org/wiki/Source_code, accessed 05/24/2013.

exemplified with the free software movement, and the creation of the Free Software Foundation (FSF) in 1985. Since its very beginning, the goal of the FSF has been to provide an alternative to the proprietary software model (see glossary, p. 601) that relies specifically on controlling the access to and distribution of source code and compiled software.

“The word ‘free’ in our name does not refer to price; it refers to freedom. First, the freedom to copy a program and redistribute it to your neighbors, so that they can use it as well as you. Second, the freedom to change a program, so that you can control it instead of it controlling you; for this, the source code must be made available to you.”³

The foundation, as well as its early attempts to define software freedom (see glossary, p. 600), has been an inspiration for many, including Ian Murdock, the founder of the Debian operating system.⁴ This influence was further demonstrated as this project grew and published its own free software guidelines, in which crucial importance was given to source code.⁵

Eventually, this guideline was modified a few years later to serve as the Open Source definition⁶ (see glossary, p. 601) of the newly founded Open Source Initiative (OSI) which resulted from the 1998 call to embrace the term “open source.”⁷ Yet, probably the most important text written on free software is about the four essential freedoms of program users:

“The freedom to run the program, for any purpose (freedom 0).
The freedom to study how the program works, and adapt it to your needs (freedom 1). Access to the source code is a precondition for this.
The freedom to redistribute copies so you can help your neighbor (freedom 2).
The freedom to improve the program, and release your improvements to the public, so that the whole community benefits. (freedom 3). Access to the source code is a precondition for this.”⁸

3 Richard M. Stallman, “What Is the Free Software Foundation?,” in: *GNU’s Bulletin*, vol. 1, no. 1, 1989, pp. 8–9, here p. 8, available online at: www.electricsheep.org/, accessed 05/24/2013.

4 See Ian Murdock, “A Brief History of Debian (Appendix A: ‘The Debian Manifesto’),” 1994, available online at: www.debian.org/doc/manuals/project-history/ap-manifesto.en.html, accessed 05/24/2013.

5 Bruce Perens, “Debian Social Contract,” Version 1.0, 1997, available online at: www.debian.org/social_contract.1.0.en.html, accessed 05/24/2013.

6 See Bruce Perens, “The Open Source Definition,” in: Mark Stone, Chris DiBona, and Sam Ockman (eds.), *Open Sources: Voices from the Open Source Revolution*, O’Reilly Media, Sebastopol (CA), pp. 171–188.

7 See Eric S. Raymond, “Goodbye, ‘free software’; hello, ‘open source’,” 1998, available online at: www.catb.org/~esr/open-source.html, accessed 05/24/2013.

8 Richard M. Stallman, “What Is Free Software?,” 2000, available online at: <http://web.archive.org/web/20000302065400/http://www.gnu.org/philosophy/free-sw.html>, accessed 05/24/2013.

According to Bruce Perens, these freedoms established by Richard M. Stallman were only published on the Free Software Foundation website after the creation of the OSI, “as an alternative to the Open Source Definition.”⁹ He suggests, however, that they probably existed prior to their online release. As a matter of fact they even existed as three freedoms,¹⁰ which are now numbered 1, 2 and 3. The freedom 0 was added at a later stage.¹¹

These parallel efforts from the FSF, Debian, and the OSI work as both a guideline for new, and a filter for existing contracts specific to intellectual property: the licenses. Indeed, good will, manifestos, and announcements are clearly not enough to enforce consistently these visions and definitions. So in order to enable the latter, the license works as a contract between the copyright holder of the source code (for licenses relying on copyright) and its user. It makes sure that software freedom and openness are ensured once the software is published, and at the same time it provides legal mechanisms in case of non-respect of the license.

In practice the relationship between source code, license, and accessibility is clearly visible in the way the Debian operating system is put together. With a standard installation, Debian provides the usual graphical user interface desktop metaphor similar to Mac OS or Windows, and a collection of several free and open source software both for general and specialized tasks. What is interesting is how this operating system is connected to several repositories of software and their respective source code. The latter is distributed as packages, collections of files that can be copied or downloaded from offline and online data storage and installed on one’s computer. More specifically, source packages provide several items: the original source code written by the author(s) of the original software, as well as optional patches to apply on top of it and the license(s) under which these files are published; the metadata of the distributed software, that is its description, category, list of author(s) and maintainer(s), etc; the conditions of its access in the means of technical dependencies. Finally, any changes in these files are logged and stored in the packages themselves. These changes combined with the storage of previous versions of the software, and its source code, as well as the ability to access these at any time literally turn the Debian operating system into a software archaeological excavation site.

In addition, these packages can be mirrored by anyone with enough space and bandwidth, and are currently available on nearly five hundred officially

9 See Bruce Perens, “Re:1997 ?,” 2009, available online at: <http://news.slashdot.org/comments.pl?sid=1129863&cid=26875815>, accessed 05/24/2013.

10 See Richard M. Stallman, “What Is Free Software?,” 1998, available online at: <http://web.archive.org/web/19980126185518/http://www.gnu.org/philosophy/free-sw.html>, accessed 05/24/2013.

11 See Richard M. Stallman, “What Is Free Software?,” 1999, available online at: <http://web.archive.org/web/19990430060825/http://www.gnu.org/philosophy/free-sw.html>, accessed 05/24/2013.

registered servers across the world.¹² From a user perspective, package managers or an administrative software can then be used to install, remove, or upgrade software, and as a consequence maintain one's operating system to one's liking. This process is not unidirectional; users are given the possibility to help and give feedback by writing documentation, submitting bug reports, writing patches for their favorite software, even maintaining such a software themselves by becoming official maintainers and, why not, official Debian developers as well. Most importantly the whole infrastructure can be reappropriated and derived into new projects, new Debian-based operating systems, and software collections.¹³ In that sense the Debian infrastructure is not a classic form of dedicated archiving system: instead, here archiving, conservation, distribution, and access are merged into one replicable structure.

Such a participatory living archive is possible because of the access and distribution of the source code by the means of a techno-legal framework that allows for a certain fluidity and manipulation of information from the public lists where software maintenance is discussed to the private computers where it is effectively manipulated and executed. It is a great example of how source code can become an invitation "for creative practice encouraging collaboration and further development of existing work on the level of contribution, manipulation and recombination, and its further release under the same conditions in the public domain."¹⁴

Now, whether a work would be source code itself, its manifestation through the execution of the compiled code, or a combination of both, it's not a big stretch to see how Debian can be an inspiration to support art that fits within this form.¹⁵ Ultimately, both public and private collectors, venues, and libraries could benefit in a cooperative and distributed resource for free and open source code poetry, net.art, generative art, and software art. Generally speaking, the same would apply for media art where software elements could

12 "Debian Worldwide Mirror Sites," 2011, available online at: www.debian.org/mirror/list-full.en.html, accessed 05/24/2013. See also Annet Dekker, and Jeroen van Mastrigt, "Serious Archiving: Preserving the Intangible by Capturing Processes," in: Dekker 2010, pp. 79–87.

13 The Ubuntu operating system is probably the most popular example of such a fork. Available online at: www.ubuntu.com, accessed 05/24/2013.

14 Joasia Krysa, and Grzesiek Sedek, "Source Code," in: Matthew Fuller (ed.), *Software Studies: A Lexicon*, MIT Press, Cambridge MA, 2008, pp. 236–243. Here "public domain" should probably be understood in the sense of a resource commonly put together and publicly accessible, as most free and open source software is not in the public domain. They are copyrighted material and made available through the license mechanism discussed above. However, it might be worth noting that Creative Commons CC0 license, that aims at simplifying the waiving of copyrights and related or neighboring rights, is currently compatible with the FSF General Public License (GPL).

15 See Javier Candeira, "Towards a Permanently Temporary Software Art Factory (Notes for the Sustainability of Software Artifacts)," in: Olga Goriunova (ed.), *Readme 100. Temporary Software Art Factory*, Books on Demand GmbH, Norderstedt, 2006, pp. 105–121.

that effectively runs as a screensaver, the same cannot be said, thankfully, for all software art.²⁰ But what about works that are neither source code nor software based? While software is undeniably a cultural expression,²¹ all cultural expressions are obviously not software. How would that practically work? Enter free culture...

Free and Open Content for the Masses

The 2000s saw the birth of several projects and movements that found their inspiration in free and open source software. The transition from software to culture and knowledge is, for instance, clearly visible in the *Manifiesto de Hipatia*²² that connects free software to activism through the value of knowledge access. Yet, being driven by different understandings of what freedom and openness mean in the context of culture and knowledge, in practice the more explicit definitions that follow can differ greatly from one to another. These differences are also made visible in their selection of licenses that match their respective intentions and agendas.

First of all, possibly the closest adaptation of software freedom to a broader cultural context are “The Four Kinds of Freedom of Free Knowledge”:

“The freedom to use the knowledge, for any purpose (freedom 0).

The freedom to study how the knowledge applies, and adapt it to your needs (freedom 1). Access to the source information is a precondition for this.

The freedom to redistribute knowledge so you can help your neighbor (freedom 2).

The freedom to improve the knowledge, and release your improvements to the public, so that the whole community benefits (freedom 3). Access to the source information is a precondition for this.”²³

Another one is the Free/Libre Knowledge definition, from the Free Knowledge Foundation (FKF) that has been created to describe what users should be free to do with cultural expressions:

20 In particular, this case was discussed during the FLOSS+Art panel during the 2007 edition of the make art festival, taking as example whether or not a “user friendly” program exit mechanism should be implemented in a work from Martin Howse, now that the software was distributed in Puredyne.

21 See Matthew Fuller, *Behind the Blip: Essays on the Culture of Software*, Autonomedia, New York, 2003, pp. 11–32.

22 Mario Teza, Luiz Teza, Diego Saravia, Juan Carlos Gentile, and Luis González, “The Hipatia Manifesto,” Buenos Aires, 2001, available online at: www.hipatia.net/index.php?id=manifiesto_en, accessed 05/24/2013.

23 Ismael Peña-López, “The Four Kinds of Freedom of Free Knowledge,” in: *ICTlogy*, no. 1, October 2003, available online at: <http://ictlogy.net/review/?p=12>, accessed 05/24/2013.

- “(o) use the work for any purpose
 - (1) study its mechanisms, to be able to modify and adapt it to their own needs
 - (2) make and distribute copies, in whole or in part
 - (3) enhance and/or extend the work and share the result.”²⁴

Yet another are the “essential freedoms,” written as a guide to decide whether or not a license can qualify to a free culture license:

- “The freedom to use and perform the work [...]
- The freedom to study the work and apply the information [...]
- The freedom to redistribute copies [...]
- The freedom to distribute derivative works [...]”²⁵

A further approach is the open content definition, which is an attempt to make a stronger distinction between rework and remix. It is also a twist on the four freedoms, and in this case it has been renamed the “4Rs Framework”:

- “Reuse – Use the work verbatim, just exactly as you found it
- Revise – Alter or transform the work so that it better meets your needs
- Remix – Combine the (verbatim or altered) work with other works to better meet your needs
- Redistribute – Share the verbatim work, the reworked work, or the remixed work with others”²⁶

Finally, another notable effort is the Open Definition, or Open Knowledge Definition, that “sets out principles to define ‘openness’ in relation to content and data.”²⁷ The definition, too long to reproduce here, has been directly derived from Bruce Perens’ Open Source definition, which, as mentioned previously, was itself derived from Perens’ own work on the Debian’s free software guideline.

With such a strong affiliation both in style and content, the link of the Open Knowledge Definition to their parent software-centric definitions is blatant. In spite of that, if we take a closer look, even though the first attempt in porting the software freedom to knowledge did mention the idea of source

24 Available online at: http://en.wikipedia.org/wiki/Libre_knowledge, accessed 05/24/2013.

25 “Definition of Free Cultural Works,” Version 1.0, available online at: <http://freedomdefined.org/index.php?title=Definition&oldid=4582>, accessed 05/24/2013.

26 David Willey, “Open Education License Draft,” blog posted August 8, 2007, available online at: <http://opencontent.org/blog/archives/355>, accessed 05/24/2013.

27 Open Knowledge Foundation, “Open Definition”, Version 1.1, 2012, available online at: <http://opendefinition.org/okd>, accessed 05/24/2013.

in its definition, the efforts that followed stopped mentioning it. The reason for this is simple: while computer software is a cultural expression, not all cultural expressions are computer software. Therefore, the computer-specific issue of source code can be seen as not so relevant in a broader approach to free culture and open knowledge.

Towards the Borges Public License

Seeing now that the free culture license definition, the open knowledge definition and other approaches are not a perfect transposition of free and open source software due to the lack of or incomplete approach to defining what is a source, we must then ask ourselves how this can impact free/libre/open content/knowledge/expression/work (FLOCKEW).

First of all from a simple qualitative perspective, it means that any content is fine to publish and distribute. For instance, a low-resolution, highly compressed, photo or video can be distributed freely under these licenses. While this work perfectly qualifies as FLOCKEW, its value becomes questionable when the high-resolution, raw, or less destructively compressed “original” still remains under monopolistic exclusive rights. Another aspect is what the freedom defined project calls the “practical modifiability” of a work that is licensed with certain free culture licenses: how in practice a work can be appropriated and modified by someone else. For instance, if the licensed work is an image composed of several elements, its practical modifiability is affected if the author decides to publish such an image as a flatten-down work or if instead she or he also provides the layers used to make this final image.

Furthermore, there is an unavoidable recursion triggered by the existence of such external “source” files. Indeed, and still using the example of a digital collage, we can ask ourselves what would happen if the layers provided were themselves derived from other “originals”? Shouldn't they be included as well? What about the font used for a caption or logo, what would be the practical modifiability of a rasterized text layer? Would it make sense to provide the font file? If we want to practically modify the file, beyond the one-dimensional mash-up or remix, such elements are very much needed.

A last problem arises with the licensing of these media assets. If an author would distribute the “source” of his or her work, this source being a distinct cultural expression itself, the author is free to distribute the material under separate licenses. Is it acceptable then for free content to have its assets under non-free culture licenses? And is it acceptable moreover if these external cultural expressions are freely licensed, yet using closed standards from proprietary software?

To address such issues Rob Myers imagines what an ideal cultural source would be. He suggests to consider five attributes: transparent, in an easily editable text-based format; full quality, in a standard that permits the recreation of the final format; complete, so that all the materials to produce

the distributed work are provided; unencumbered, that is, free of patents and DRM (Digital rights management); structured, as provided in a descriptive format, such as vector graphics.²⁸ Even though the open definition excludes explicitly software from its definition of knowledge, therefore avoiding the question of source in the distribution of open works, the question of the source is actually covered by the freedom defined project. In fact to be a truly free cultural work, a work must respect four more conditions, one of them is being specific about the idea of source data:

“Availability of source data: Where a final work has been obtained through the compilation or processing of a source file or multiple source files, all underlying source data should be available alongside the work itself under the same conditions. This can be the score of a musical composition, the models used in a 3D scene, the data of a scientific publication, the source code of a computer application, or any other such information.”²⁹

However, unlike with free software licenses this condition is not contractual. It is simply part of a guideline to decide whether or not a work can be called a free cultural work. Put differently, an author does not have to respect this condition when using a free culture license. In practice it is thus possible to distribute non-free works with free culture licenses, literally turning the popular understanding of free culture into a messy mix of both free and non-free cultural expressions.

At this point things can start to get fairly confusing. What started as a simple exploration into the transposition of free software to free culture, is now ending up in a maze of concurrent definitions. Each of them pointing to a “Choose Your Own Adventure” labyrinth of licenses, where every step seems to further obfuscate the source of the problem, literally. As a matter of fact Creative Commons even use the misleading term “approved for free cultural works”³⁰ for its licenses that respect the free culture license definition, whereas it really should say that such or such licenses are free culture licenses; no less, no more.

No matter how annoyingly picky it may seem, the question of cultural sources must be raised. It is essential to do so in order to understand the

28 See Rob Myers, “Cultural Sources”, blog posted August 26, 2007, available online at: <http://robmyers.org/weblog/2007/08/26/cultural-sources>, accessed 05/24/2013.

29 The Definition of the Free Cultural Works project, “Definition of Free Cultural Works,” Version 1.0, 2007, available online at: <http://freedomdefined.org/index.php?title=Definition&oldid=4582>, accessed 05/24/2013.

30 The affiliation is made visible with a graphical badge in the human-readable summaries of their licenses. See online <http://creativecommons.org/weblog/entry/8051>, accessed 05/24/2013.



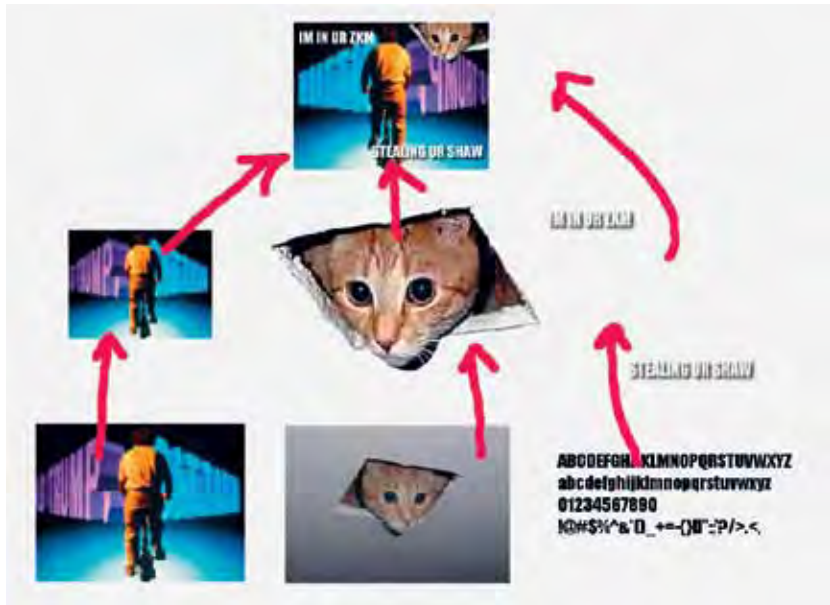
ZKat
Highly compressed and
therefore license-free
thumbnail
© Aymeric Mansoux

value and the limits of a FLOCKEY in the context of archiving and conservation. As we see now, without source information and in the case of conservation and reappropriation, the advantage of such practice is limited. Truth is, if there is such a thing as an artwork “source code”, it must contain much more information than remixable elements. Such a source is made of everything that a work contains, from the dirt that feeds its roots to the canopy. Such a radical approach should not to be understood solely from a paratextual or paramedial perspective, but instead in a very practical way as best exemplified with the *PrayStation Hardrive*³¹ published in 2001. This is a CD-ROM that contains raw data from the hard drive of media artist Joshua Davis; data that is meant to be explored, studied, and reused. While the content is in fact far from being a bitstream copy of his drive, it is nonetheless quite an impressive collection of 3637 files, including many Macromedia Flash “source” files, making the intention behind the project close to the free and open source ethos.³² In practice this parallel is more of a misunderstanding of how free software and open source operate as the files have been released without any licenses,³³ making the drive fall into the gooey swamp that is unspecified

31 Joshua Davis, *PrayStation Hardrive* (CD-ROM), System Design Limited, 2001.

32 See Matthew G. Kirschenbaum, *Mechanisms: New Media and the Forensic Imagination*, MIT Press, Cambridge (MA), 2008, p. 54; Boris Čučković, and Hrvoje Stančić, “Open Source in Art: Originality, Art Process and Digital Preservation,” in: *INFuture2009: Digital Resources and Knowledge Sharing*, Second International Conference “The Future of Information Science” (INFuture), November 4–6, 2009, Proceedings, pp. 157–167.

33 E-mail from Joshua Davis to the author, June 8, 2012.



ZKat sources?

Diagram to illustrate the generation of the ZKat thumbnails from the underlying "sources"
© Aymeric Mansoux

public domain and default copyright laws. Yet its impact on the Flash community, both as an educational and cultural artifact, is a very direct illustration that without a dump of an artist's storage device no complete works or biography can be written.³⁴

In the end, a thorough publication of properly licensed source materials for works of art is rare and is limited to artists and collectives already close to free and open source software communities. Exposed to such practices in the software they use, some of them eventually apply the same philosophy to their own work, and make many elements of the latter publicly available in repositories, using different software licenses.³⁵ Such an attitude towards the meticulous sharing of source material is unlikely to become popular due to the complete or partial disappearance of an articulated concept of source in the licensing of FLOCKEY. This is the reason why some free culture licenses, more specifically from Creative Commons, should not be used for software.

Even though there is no such thing as a "bitstream" license yet, some efforts to take into account these issues are worth mentioning. For instance,

34 See Florian Cramer, "Peer-to-Peer Services: Transgressing the Archive (and Its Maladies?)", in: Franziska Nori (ed.), *adonnaM.mp3 – Filesharing, the Hidden Revolution in the Internet*, Museum für Angewandte Kunst (MAK), Frankfurt, 2003, available online at: www.digitalcraft.org/index.php?artikel_id=502, accessed 05/24/2013.

35 See Chun Lee, *Art Unlimited: An Investigation into Contemporary Digital Arts and the Free Software Movement*, PhD diss., Middlesex University, London, 2008, available online at: eprints.mdx.ac.uk/4963/1/ChunLeeThesis.pdf, accessed 05/24/2013.

as early as 2004, the Open Art Network started to work on the Open Art license, also known as the “View Source”, or simply the “Source License.”³⁶ In this non-free³⁷ license it is stipulated that “source file/s for the work must remain accessible to the public.”³⁸ Unfortunately, there is no consideration of the nature of the standard used for such source files. It can be a proprietary format using proprietary software, and would still be, not without problems, considered as a valid source for the open art license.

Another take on the question can be found in Valentin Villenave’s ongoing, yet to date unpublished work on a new license that would solve some of the source issues discussed so far. Villenave is an active member of the Copyleft Attitude Community³⁹ from which the free culture Free Art license was born. In the latter the concept of source is mentioned, but is not clearly defined. This lack of clarity is the point of departure for Villenave’s new license in which the artist would be required to provide all intermediary source materials that were used during the creation of a work of art, including sketches, research, and all versions of these. If at any given time a source element is involved, it must be provided, so as to avoid the situation where what is given access to is in fact a summary of the work and not the work as a whole.⁴⁰ With this extra step we are now witnessing that our problem is expanding even beyond the recursive vertigo triggered by diving into the sources of cultural sources: it is also reaching the context in which these very sources are created. After all, if we are aiming at providing the source code of an artwork, the capture of the creative process is completely relevant.⁴¹ And so without noticing it, the frustration deriving from the lack of definition of artistic sources makes us drift into the analysis and recording of the artistic practice itself. Defining an artistic source is as problematic as defining art, yet our access to increasingly sophisticated legal and technological tools, which can enforce a fine-grained versioned capture of the artistic creation, directly feeds into our desire to sample and make tangible the “participation mystique” of the poet.⁴²

Indeed, if there is more to these sources than just a flatten-down object, nothing is preventing us from also providing electroencephalographic data,

36 Open Art Network, “The Source License,” 2004, available online at: <http://web.archive.org/web/20041208023918/http://three.org/openart>, accessed 05/24/2013.

37 The license prohibits commercial use.

38 Available online at: <http://three.org/openart/license/index.html>, accessed 05/24/2013.

39 Available online at: <http://artlibre.org/licence/lal/en>, accessed 05/24/2013.

40 Valentin Villenave, “Re: Sources d’une œuvre,” 2011, available online at: https://listes.april.org/www/arc/copyleft_attitude/2011-10/msg00042.html, accessed 05/24/2013.

41 See Dekker, van Mastrigt 2010, pp. 79–87.

42 Carl Gustav Jung, *Modern Man in Search of a Soul*, trans. W.S. Dell and Cary F. Baynes, Chapter “Psychology and Literature,” new edition, Routledge, London, New York, 2001, pp. 155–176.

DNA samples, cosmological models, and more, thus transforming the capture of pretty much any phenomenon into the source of a work of art becoming noumenon. If anything at all we might well rename our speculative “bit-stream” license the Borges Public License, a real treat for the Babel librarians and their lawyers, but very likely a nightmare for artists agreeing to sign with their blood such a devilish contract in exchange for an immortal openness.

Conclusion

Until a serious copyright reform, or why not complete abolition, takes place, it is undeniable that projects that promote FLOCKEW are very much welcome and needed. Practically speaking the usage of licenses that fit the free culture license definition or the open knowledge definition simplifies a lot and unifies the process of archiving, distribution, and access to culture and knowledge; that is, of course, in the very specific context of works respectful of existing copyright laws.⁴³

However, the ability to modify practically, therefore reappropriate or maintain such expressions, should not be taken for granted. This situation puts free culture and open knowledge in a completely different camp to the one of free and open source software. By not taking into account the articulation of sources, free culture and open knowledge can only provide an ersatz of the freedom found in free software. In the end, what software freedom achieved for the user is disappearing in its cultural transposition as the author is brought back into a position of complete control over the reusability of his or her work by others. This is possible because the author is the sole judge to decide whether or not to provide sources, and what constitutes them.

So even if FLOCKEW licenses are very effective to fluidify information, they have no effect on its actual usability. In that sense, Creative Commons licenses can give a false sense of security. All the issues covered in this paper represent as many potential backdoors waiting to be exploited, as well as many opportunities to misunderstand how this whole legal infrastructure operates. The very use of the cumbersome FLOCKEW acronym is just the tip of the iceberg.

At the same time, it is clear that no solutions can be satisfying when it comes to trying to define sources both within a free culture and artistic context. There can only be specific workarounds. Any rational attempt to define artistic sources is simply not working because a general “one size fits all” definition of such sources will always tend to exclude practices rather than include them. Besides this, there is a risk with trying to find a compromise by simplifying and limiting the scope for valid sources of cultural expressions. Doing so would only benefit certain forms of practices by

43 See Aymeric Mansoux, “The Sound of Network Topologies,” in: *Neural*, no. 38, 2011, pp. 19–22.

turning art into the byproduct of rationalized transformations – as we can see with remix culture.

The strength of free culture and open knowledge is not so much of being a technical tool that can solve copyright problems. Instead, it should really be appreciated here as a device that makes suddenly tangible the obfuscation and secrecy found in art practices and art preservation. The most important aspects are the dynamics and values that are found in communities involved in sharing cultural expressions. The organization of such communities can effectively help rethink and reinvent the access to culture in the age of distributed infrastructures by opening up the institutional walled gardens of conservation. Museums, art institutions, and archives urgently need to look closer at the different models of sharing in which the preservation of content can be globally scaled and accessed publicly while still benefitting from the love and care of a network of dedicated collectors, instead of building a business model around zombified works, exploiting their every possible permutation, and thus replicating at a different scale the exploitative cultural dead-end found in the relationship between media industries and copyright.

The question still remains, *how deep is your source?*

M=5!éx-0šń \$iá†

Igor Štromajer

The following article presents the reflections of artist Igor Štromajer concerning digital art. The artist gives an artistic analysis of the issue of preserving digital art; Štromajer discusses the question of whether digital art can or should be preserved at all.

An e-mail written by Štromajer to Anne Laforet (École supérieure des arts décoratifs [ESADS], Strasbourg) explains his point of view regarding the preservation of digital art, his motivation, and the contents of his article, which he sees as the extension of his project *Expunction – Deleting www.intima.org Net Art Works* (1996–2011)¹.

Editor's note

Dear Anne,

You know I'm not an academic, but an artist. An artist who is trying to be as radical as possible.

At the symposium in Strasbourg I had a great time, but at the same time I had a strange feeling of being a kind of clown, some kind of a curiosity among serious people. They were all trying to find ways to preserve and archive things, and then at the end I came along as the one who deletes his works. You know very well what I mean; we already talked about it. And I found my role just perfect; I actually enjoyed it, because in reality I am a clown. So, all is well.

This text was carefully thought through. It talks about the deleted works of mine, about my *Expunction* project in a very personal, intimate way. It wasn't easy to write it, but I'm satisfied with the result. Now I'm kindly asking you to "read" it, to go through it, to see how it functions, because I'm seriously considering asking you if this very text could be my contribution to the debate.

As you can "see" the text says everything – and nothing at the same time. It talks about my process of deleting the works, and it is done exactly as my deleted works are (were): all versus zero, everything versus nothing. As my works are (were), it is also a gesture of resistance. So it is more a textual

1 Available online at: www.intima.org/expunction, accessed 05/24/2013.

extension of the *Expunction* project than a reflection of it. I'm not much of a reflecter, you know. This text refuses to add some conceptual surplus-value to my *Expunction* project by reflecting it, contextualizing it, and embedding it in some theoretical or artistic references – something that theory (related to the field of art) is doing so often.

My text is structured in seven chapters and it is very formal. I'd like to point out that this really is a text, not a visual structure. It is not drawn, it is carefully written. It needs to be read, not seen. The reader has to discover that this storm of signs is a pleasurable interruption of the flow of information, reasonings, and data.

The title of the text is

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and it has seven chapters:

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In my opinion, it is the most beautiful text I have ever written. Honestly. It may seem radical at first glimpse, perhaps even hard to read at the beginning, but after a couple of paragraphs it becomes clear, easy to read, and even perfectly understandable. It has many details, combinations, associations, and references.

Waiting for your response, dear Anne.

Thanks in advance,

!gor

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xN7ĂŞĐČ# ý, # ,klô<xČĂĴ8Ů†# ·Ō_&řLYŽ^ # «ăřŦřéaăzn3N(ăžH‘‘óŁ# ĚŁ;#
KWgá@# ŠŘ# (l6ĚŦ)áb:Í‘,S0Í# LĚY,0‘~ŭŦx%ŌŭMÍŦĚ# ‘ # ôix°B°ŦX.č,—
hŮŮĚŮăŦ@# -# ‘ŦfŦ# rRMú# # I@9# # ôf# 0]° ĀIE# # # Ă# # # ôĪēžŭ#
V?Ŧ_# ô·nŽž# Ō™# iB«~0“~‘N đJXăŮ06”Š~...@<fızŌ# š,2Ě5Ž ĀWVĐW#
[LμŚŌŌň.Ě ŠİG‘,ÇAMjĚŦČ# # Žē# 08fcsZ×ă&‘čzn# ,lĴ‘cĚxR=dĚş7ŦEă#
ĚšđİŌş[~ĐİđŌ™Ă†3# »0# †,...lôn“ĚFWČİS# ŮčcMŌŦŦm# “# “AP”#
o ĚRH,\~D# „Č™!# Ka^~ŌL# fHhž>zşş7LJH# †# ±nw# ŘŭŌ“†±~
»ZĂ3-Ă-|# “úe6İLă# đŚμŽa“# í0,MHes:M)Gág;côă@Ž‘ŦG\# Ō| x‘si?ŌŠ...#
†đ?# 9P<=Ō# # hŭ,,ôČ[ĤmŭL[ĚeB# _uŌŮ|·v2Ŧ# Đ+/Ř8±6†íúliG=ŌŦh“ #
·ŮŠXL=ŁŦ~‘lô”„# # A# „~ŦĚC!LhŁŌ†“Đylşn~“# „ŌQ,‘eŦđw# Ž Y,~ # ĚŮčĚ,·÷#
Ů# ,ŦŦŦĂŌŭ# Ŧăa# }<Ěđ Č«Ůn/tđ|0# Ăăv# =...‘ž SĐŌLE...ŦXŦS6N@čđ—Řē#
Rá~Lo# Ł0# oôd/|†ēŦ“8# éŌŠĚ,ēŮ# *~Aă÷ē0Ă# # # 9Wc|W>@ŦŦŦwús‘ŠŦŦPŦ#
E~2Pz# o# ýŽ# ŦŦĂŦ# č:Ĵ‘2# “žŌŽ·· |ĪQ Ě# Ī# # çŭšLnŭ Hē—ş# 0~μĂ0P#
mxĂ†9č># nú đă. GŦÍ/k÷ĚôśŚĪšLi,,\čß# ;.ß;La# &qY*Ě|‘ŦHq{Žřô Ý8{ ×,-@
ŦSjş>đ# â Yăú# Ř·Ů)śi# ‘ŘŦ# n@|Ěcl‘L”Ō|÷3śŦ Ŧ†2?ş “2(ŌZŮVŮ&Ŧ# }#
Ō @kĚ×ăx|ßBfē^ŭ~WintŚ&zŌ@□ # ůj# 3ve# ůş0±gô~ŚŮŦş>đNă# 6# “>Ž#
ēĚşăŭpXĚ,,

III. Á!a@ĚHMEI

Đ_Ŧc9—p~ŦéRš0# 9# # U>n# E# ŌĪ# ôÁČ0†wzŦ# ~_Đŭ0ÇŦVd
°@4ČŮmşKPVTĚ# AŚ2ś2± ČŦ,\ăYŦ0Y0ßxôĚfč# Ō“ĂŦSĂ# ŽžgôdYēŌŦ?©Ō4#
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fŦ# ©séŌ·jč†# Ě[c~Y±™ĂēŦŦř İĚŦŦ“ČkŦ8—0Č# ?eQŦMhobş”~đμŘ †i;Ŧ# e,Ī#
ô“čč# A”a# cşŁ# ;|hb·İŌq~.İİ“İLşŦH7Ō# Q~‘İ·G04ŌđŦŦ“S# J=ŦşŌş“~ô#
ĪeK÷~“Ăđ·©~[š*~^, # Ă©,ĂŌŦF“çqŦ# úŚ5Č# Ě~ĐđQ# wŦŦŭşĂČ# Ă# č|=ş# ř“
R~5k00/04XŮhŭdz# S†ž40# Ř·Ŧ)0+ # |çēĚŦŮăŌ~ŌŦ—ĚŌziQşWşŦŦZŌ:žYŦ{ß}
bŦ PM# 2!Pe~Ůb# # Ō~şş,~ 6°~bpĂX# ~ŌB· Ě0# :šă# Ō# `şHş0%# U&C“#

č ~{bqĂşŞm# Ě# # F.# # L~ # iL%*K“Ě~Pj# Ĺ8# # A# # H0b# Ło0û)řicé`]
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e&:Sšš# aWM # ĂŤk&Đ ŤlĤC-é# Ň#

d“,0@Jă áv*Ť Ž# 5f{5oçpŽgšNczĚ# Ó7<δ# ü.Ó\μřYĴđČ~b”Zy: ĺb# z[# V~#
~ m \$o00«3Ž-ŘthŁ># ŌĂ4\b•&4Vc# # 0±4ŮFI9# E8~ÇŠeS# \$[0Ň# f# q±lc#
wnR\$~m”\$ŌRTSx0~ # kĂĹ7Ō×# Č# áĹŌř×# ŠŘŁc l# I# i4,é\ČT”Wz^O+@ęĂĹ
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t!zHQôδ>ěČ“ŮOkčtă+~ @ĚGô,bĚžör\$# # B6# # \ŌNŌ# IpŽ”Ů/”Č7t# #
GqŮ# ŮÉ<# „...# l# *\$ĂşŮyŮ7i«ű|”T# M’VKli,,č# -# # AİŁk# ĂTV* 2~#
>Ię”©_jt9# ^,~«Ÿ±š# ...F] Ĺ# # # ’U# -+ŤB,DQ%# ŠĆ, # Ĵ”# d`šFLA%If—
şşμĐeMu4dW)Ś’ŌŮM# <V\$Ě# Y# ĚEAÇyL0# J Ă•DP 3# ad# đŇ, iŇfăăş8’?

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†P’-Ů0”ŮŸ%”Ăg # ŽcŁ# 0 Ě# # 5p+L...*Ť# Ů# # %HŌ@F Yl# # # ř<h,5t#
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j&ăq]LŮ)U# <,Aşq~%hZ+`«fěŌca# # ü,MLİĂ# ĐÍŌĚdLŮdĹ-Ō—l2Ů#
ŮŮŮ<d # Ž—wĹēBĹđyôç”2ñô÷# # ŸŸ# ,2’...BăŹ”NOP|JŮ# %Žť ž;”~Ç’#
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c’# ĹxĹAyoŌ,©i;`áQW/ĐŁ†# # Ž0,hl—X:© |ş”0Ă&LĴĹĂ# †JIpŌĂătŇĴ# -#
BĴ”u# Ă# # †ĹT,5ŮŌ,ikš ey# “# # # ±-j4ĚŠVŌ”fUŞ@Ă0†#B%XdRj; u«{ę|©B#
ıĹ”Ňđ# ©.osB 7Č # žéad”w}ž*@PŽw.İ0İĂĐ# @ # ŮăăăbKŌčđW#w~*ç ((#
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zô o# \$ - > ` \_ ` ó`éogiă# wă÷”# ŤiŌ”d@č Ť# Ĵ””Şf ŽđšŇôĐĐ=Ť*ŤęŤr”udw
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ũ~điŌ # ç# [šž+±xú'xĀž# |R AñMĀ*# ůŤl]# úXť# kžĖ# ž8?+*I# +X,~#
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 Ž9ŃŌĀš# •D"éHhÁČŠĐ# ©@m~ŌüŌĀ# †hŌekŏll# o#)Ÿ^»tD#
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 .XRŠŌ

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 ĀLĪĖŤ'ť# Č:ĹŤŤ)9ŕKk|ŏđŷŤŤRŠb# FĹlJĀQŮJ~ll,^<# ,# /hP~Ĺ~Ť÷μGwzŏ~N...
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 ý# ÷cG.)J?Ad# Ė/ĖŮŮŤ—qçç_g# N# ĭž,wža-;Bđ@xyxŤ...~d# VHz# Ŗv,ł<# I/
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 t-jLŮu~4Ů~ŮđVš~x# ĖđH,~?~ZH' # ť# # Đđ# # Ťđj# llŮđHl# '5~# # □Ō'~đ;~e-
 %%%&llZš+Id§.ŃkēĀ,ll™JJŌ±łš# Ť†Āy2# Ė,,ũ »ll&ŌŮ ħŤL# S'‰stμ,đšll~ĐiNF#
 ā;±c;Ėμ# ĤlPaŤŤ# †# # llŮG# Ť# G# Ōčc# šĖĹUUUY# Ů~# „šX...ç # C# #
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 ~Ń@# # # # HQ# # ŠŃ Ťg@'N# DŮ §~" # L# # I'Sq,,llĖXS# fl# ů,DG# hllť#

ČW`# pčÉ# ç†&\*`oÄâ# # dr`cBl\*V<»QF# Ózi>`μ,jd# Ožg| Óáâ—
Tk`llčfn9sÖ`Ü`„ÖoqUBf5`lläü{ NŮ`Z×cFw# -to`ll`Jh™Ö</`=-Ç†}R# Rú*F`°o;çQ#
_# é, /W+>`R`?Š...zÖ|<# =guč# Äñ# zia9# TÇ{+R,o@`# DZdÄ,`# ,Ö#]
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¢Ä# # `O# †Ü,K†š`*# `°o`l<# qzNÝ#)L`lYĐ öhd8`l6R+kN# # @PäQäl#
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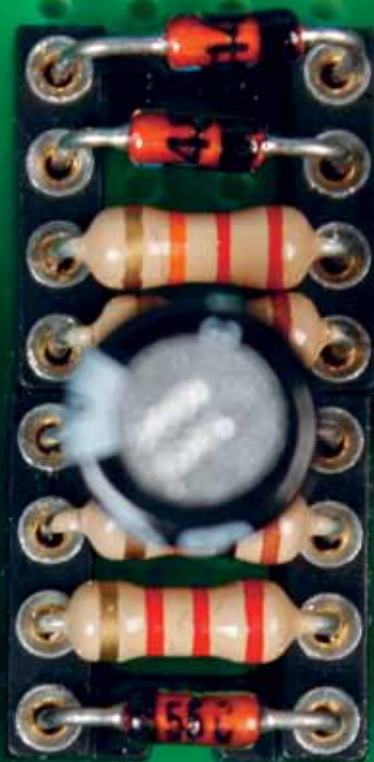
Zú)5`>3. `5ô# L# Ö`B>.,m/\glŮH`l`# R`ü÷`Él+LlŮN@`ř`B+ôI+x Yē†J# ,l†čŽ
š¤.gí# OS)WE# # Ž`ŠL™XŽā ēO`t7M|`# &Š«# # @M`l` Üb(+`# Ç`lclq`lR`~`l,i|8
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,Ě.,÷δTÓ# áN64ŮŮl`\_q, l|d|6czBē Ly9ŮČLŠ†(# öh`Đ# N-AUčsŮl` ?M#
_ae-ÄYē# `VÖÄ`Z-žB†=β/LŸ`N`l;žl`x# L_5úJšpšŽü|lŮN# ŠÖWā.G
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|Kúq`l`^™†lš@Žó|`# Š[čřš|`LŮř†f9o># Lđ\# @9# eál# `aČp|ÁTz?—
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Case Studies

Herbert W. Franke

Hervé Graumann

JODI

Marc Lee

Nicolas Moulin

Michael Naimark

Nam June Paik

Samuel Rousseau

Antoine Schmitt

Jeffrey Shaw

Digital Media Art Demands Commitment!

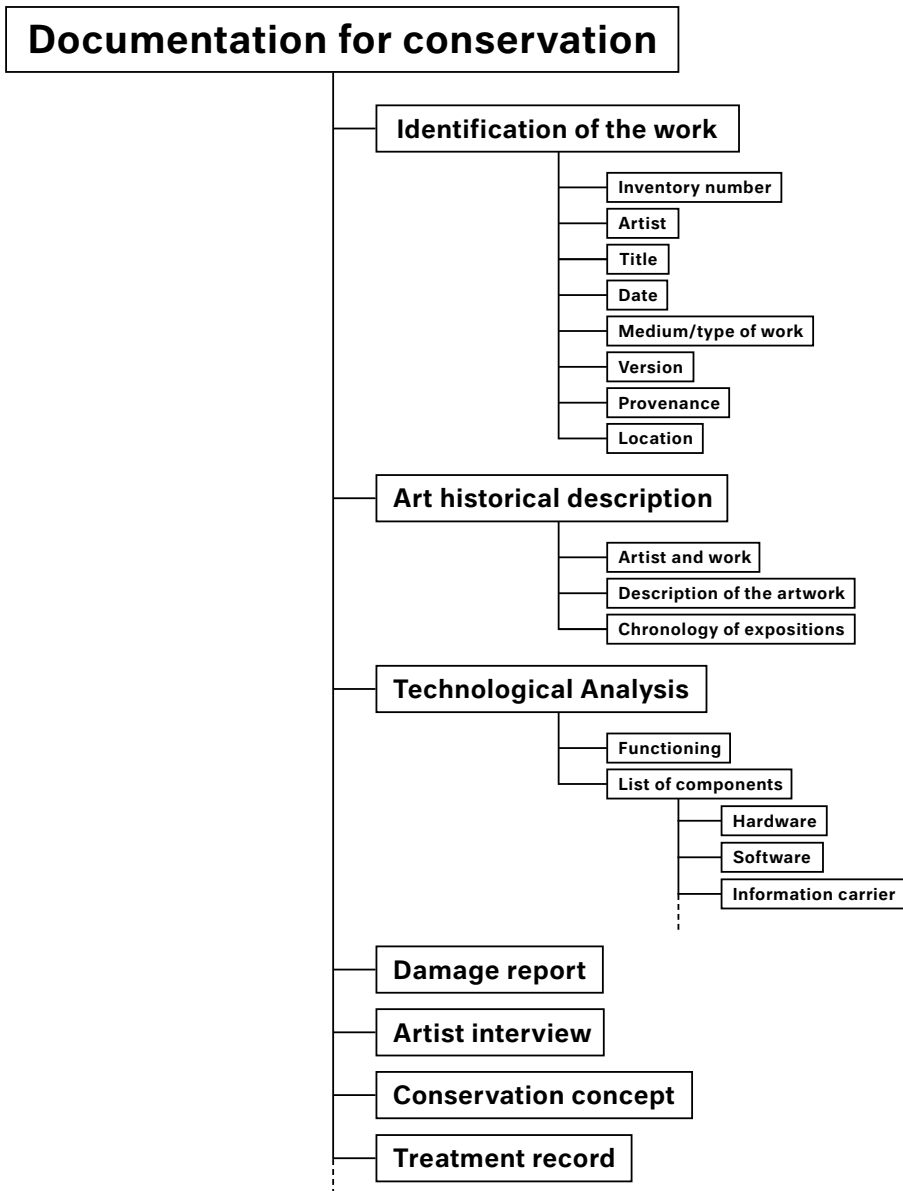
Arnaud Obermann

The reference to commitment is not only with respect to recipients of media art, but concerns particularly the dedication of the institutions and their employees. The institutions participating in the research project *digital art conservation* were aware of the necessity of declaring this even prior to the beginning of the project. Unfortunately, the facts indicate that without additional time and expenditure public and private collections are only rarely up to the task of preserving media art. In general they are incapable of mastering these challenges within the framework of the everyday museum context, both in terms of personnel and infrastructure. Also among the project partners and associated institutions failures do occur. The results of the research project *digital art conservation* are indebted to the ingenuity of these institutions, and their readiness to grant insights into their inner structures and working processes. The project partner Vidéo Les Beaux Jours in Strasbourg, who was responsible for the smooth cooperation and communication with the Fonds régional d'art contemporain (Frac) Alsace, Sélestat (France), and the Musée d'Art moderne et contemporain (MAMCS), Strasbourg, deserves special mention.

The selection of the ten works of art examined and documented in the research project's case studies was carried out in accordance with the agreement made by the project consortium. For the purposes of making a preselection, digital works of art in collections located in the Upper Rhine region were examined. The final selection of objects covers a wide spectrum: interactive installations, net.art, video art, computer art, and a work (*oss/....* by JODI; see the case study, pp. 366–382), which, due to its medium of distribution, a CD-ROM, completely evades strict categorization. With a view to the conservation issues involved with digital art, the selection of works needed to cover as many different problems and approaches to solutions as possible.

At the outset of the project it was decided to take the collective results of previous projects, such as *Inside Installations: Preservation and Presentation of Installation Art*¹ (the S.M.A.K. (Stedelijk Museum voor Actuele Kunst),

1 *Inside Installations: Preservation and Presentation of Installation Art* (2004–2007); Netherlands Institute for Cultural Heritage (ICN); Tate, London; Restaurierungszentrum der Landeshauptstadt [State Capital Restoration Center], Düsseldorf; S.M.A.K. (Stedelijk Museum voor Actuele Kunst), Gent; Museo Nacional Centro de Arte Reina Sofía, Madrid; Foundation for the Conservation of Modern Art (SBMK), The Netherlands; online: www.inside-installations.org, 01/29/2013. See also: Tanja Scholte and Glenn Wharton (eds.), *Inside Installations: Theory and Practice in the Care of Complex Artworks*, Amsterdam University Press, Amsterdam, 2011.



Ghent, and the ZKM | Karlsruhe were among the participants) and Matters in Media Art – Collaborating towards the care of time-based media² (Tate, London, and Museum of Modern Art [MoMA], New York), and classify them according to methodological considerations. The frequently quoted preservation strategies – the hardware preservation (storage), emulation, migration, and reinterpretation (see glossary, pp. 600–602) – first defined by the Variable Media Network (participants included the Guggenheim Museum, New York, and the Daniel Langlois Foundation for Art, Science, and Technology, Montreal), served as a basis for developing concepts of conservation and the implementation of the individual case studies.³

To create a common basis for surveying the artworks, the project partners agreed on a comprehensive documentation structure, which was also flexible and could be adapted to the specific requirements of individual works of art, and to the specific requirements of the institutions. The documentation structure took into account the special requirements of digital media art in that it offered the possibility, among others, of recording hardware and software characteristics. In a joint effort the documentation structure was created in three languages (German, French, and English) using the Open Source variant of the software xMind,⁴ which facilitates ongoing augmentation and additions. The documentation structure was developed using the following resources:

- the documentation structure developed by Anne Laforet for the Espace multimédia gantner;⁵
- several drafts (so-called prompt sheets)⁶ of the project Matters in Media Art;
- the *Metadatenblatt zur Erfassung von Netzkunst* [Metadata Sheet for the Registration of net.art] developed by Tabea Lurk and Jürgen Enge;⁷
- the existing indexes of information of the ZKM | Karlsruhe, such as the *data recording* and *situation survey* documents of the in-house restoration

2 Matters in Media Art (2003–2015); Tate, London; Museum of Modern Art (MoMA), New York; San Francisco Museum of Modern Art (SFMOMA); online: www.tate.org.uk/about/projects/matters-media-art, 01/29/2013.

3 See Variable Media Network, online: www.variablemedia.net/e/index.html, 01/29/2013.

4 XMind, “Professional & Powerful Mind Mapping Software,” online: www.xmind.net, 01/29/2013.

5 See Anne Laforet, *Documentation artistique et technique pour les œuvres de la collection de l'Espace multimédia gantner*, documentation structure, 2010, unpublished.

6 Especially the *Computer-based artwork prompt sheet* and the *Computer-based display equipment prompt sheet*, online: www.tate.org.uk/about/projects/matters-media-art/templates-acquisitions, 01/29/2013.

7 This was developed as part of the research project AktiveArchive under the direction of Johannes Gfeller at the Bern University of the Arts. Tabea Lurk and Jürgen Enge, *Metadatenblatt zur Erfassung von Netzkunst*, online: www.aktivearchive.ch/fileuploads/pdfs/netzkunst_metadatenblatt.pdf, 01/29/2013.

department,⁸ the exhibition and collection databases (mainly created with the proprietary database management system FileMaker), and the inventory database of the ZKM | Museum and Exhibition Technical Services.⁹

In addition, the *Modul zur Erfassung interaktiver Installationen* [module for registering interactive installations], developed at imai – inter media art institute (Düsseldorf) by Tiziana Caianiello and Julia Giebeler, was tested and applied to three case studies (see the works by Herbert W. Franke, pp. 324–342, Michael Naimark's *Karlsruhe Moviemap*, pp. 420–440, and Jeffrey Shaw's *The Legible City*, pp. 488–518).¹⁰ The module is used to produce a differentiated description of interactive qualities and takes into account the range of interaction possibilities provided by the works under study.

In principle, museum documentation, described by Volker Rodekamp, President of the Deutscher Museumsbund, is the “tool for *all* museum employees,”¹¹ was the basis for creating a concept of conservation and the resultant measures.¹² As Alain Depocas, former director of the research project Documentation and Conservation of the Media Arts Heritage (DOCAM), rightly concluded already in 2001 “[...] the best preservation efforts [of digital media art] are insufficient without the support of structured documentation.”¹³ Due to inadequate and lax documentation guidelines and the lack of academic studies of the works, the future of numerous digital artworks is acutely endangered.

With regard to structure and content, the complexity of digital works of art demands a rethinking or modifying of collection policy. Prior to the actual acquisition of digital artworks certain parameters should be researched in

8 In May 2011 Nahid Matin Pour became head of the department of restoration.

9 Results of the research project *mediartbase.de* were also taken into account. In addition, efforts are underway at the ZKM | Karlsruhe to identify a supra-institutional solution in the form of a museum management system, which can likewise be pursued by the project team.

10 See Tiziana Caianiello and Julia Giebeler, *Modul zur Erfassung interaktiver Installationen*, Düsseldorf, 2010, unpublished.

11 Volker Rodenkamp, “Vorwort,” in: Deutscher Museumsbund e.V. (ed.), *Leitfaden für die Dokumentation von Museumsobjekten – von der Eingangsdokumentation bis zur wissenschaftlichen Erschließung*, Deutscher Museumsbund e.V., Berlin, 2011, p. 4; online: www.museumsbund.de/fileadmin/geschaefts/dokumente/Leitfaeden_und_anderes/LeitfadenDokumentation.pdf, 01/29/2013; translated from the German by Arnaud Obermann.

12 See Foundation for the Conservation of Modern Art, “The Decision-making Model for the Conservation and Restoration of Modern and Contemporary Art,” in: IJsbrand Hummelen and Dionne Sillé (eds.), *Modern Art: Who Cares? An Interdisciplinary Research Project and an International Symposium on the Conservation of Modern and Contemporary Art*, Foundation for the Conservation of Modern Art, Netherlands Institute for Cultural Heritage, Amsterdam, 1999, pp. 164–172, here: p. 166.

13 Alain Depocas, “Digital Preservation: Recording the Recoding – the Documentary Strategy,” online: www.fondation-langlois.org/html/e/page.php?NumPage=152,01/29/2013.

order to guarantee the future preservation of these works, that is, the preservation of cultural heritage by the acquiring institution. Certain questions have to be answered, for example: What equipment is required for showing a work in its authentic form? Which components of the equipment are visible to the viewer and therefore are especially significant? After purchase, in what form will the artist hand over the work? Maintaining a work in its original condition for as long as possible is the objective, but in the process the ephemeral quality of these artistic works should not be negated. For it is not only works of net.art that are ephemeral, although they may leave irrevocable traces on the World Wide Web. Hence, what will remain in the future if no dedicated equipment is used to present works, or there are no binding parameters (see the case studies on Nicolas Moulin's *Viderparis*, pp. 404–419, and Marc Lee's *TV-BOT*, pp. 384–402)? For works in which their technical components are part of the aesthetic experience, which solutions will enable authentic presentation in the future (see, for example, the case study on Hervé Graumann's *Raoul Pictor cherche son style...*, pp. 344–364)?

In order to obtain satisfactory answers to these intricate questions, artists need to be consulted and included in the process of documentation and conservation. As part of the selection process of the case studies for the project, all living artists were contacted to seek an exchange of ideas. Furthermore, in some cases, the former assistants of the artist were contacted – mainly programmers responsible for the implementation of the work concepts – with a view to supplying missing or incomplete information. To ensure that the project partners and the external collaborators all followed the same procedure, the *Concept Scenario: Artists' Interviews* of the Netherlands Institute for Cultural Heritage (ICN), developed in 1999, was used as a basis for the artist interviews.¹⁴

The discussions were productive and profitable, since the artists are not more protected from the effects of the digital revolution than the collecting institutions. They went their own way in order to preserve their works and, to some extent, the works' concepts for the future; they also drew conclusions from personal, negative experiences (such as data loss due to theft).

A substantial part of the preservation of digital media art involves data backup. However, the complexity of the works as mentioned above, the interplay of diverse technical components, and the heterogeneity of these objects all confront museum personnel with far more complicated tasks. Even the transfer of information relevant to a work from one storage medium to another can potentially be disastrous and must be carried out with the

14 Netherlands Institute for Cultural Heritage/Foundation for the Conservation of Modern Art, *Concept Scenario Artists' Interviews*, Amsterdam, 1999, online: www.sbm.nl/uploads/concept-scenario08_08_2011_164905.pdf, 01/29/2013. See also Lydia Beerkens (ed.), *The Artist Interview: For Conservation and Presentation of Contemporary Art. Guidelines and Practice*, Jap Sam Books, Heijningen, 2012.

necessary care. Shrinking financial resources, deficient know-how in information technology, and fluctuating personnel are grounds for concern as well as careless treatment of the collection objects (through inadequate storage conditions, for example) and nonexistent concepts for backing up data.

Since 2009, virtualization has been increasingly used as a conservation strategy for preserving digital media art.¹⁵ However, in view of the condition of the works in their respective collections, this strategy was not an option in the project *digital art conservation* (see the case study on Marc Lee's *TV-BOT*, pp. 384–402). Unfortunately, it was necessary to undertake certain work on the art objects during the research project – for example, the creation of disk images (see glossary, p. 600) – which should have long since been addressed as basic groundwork.¹⁶

All conservation measures were coordinated by the ZKM | Karlsruhe. Supported by the ZKM | Museum and Exhibition Technical Services (which includes the department of restoration) and by external collaborators; the project team was able to evaluate interventions prior to their implementation. The registrars of the institutions involved, who provided access to existing information and arranged test installations of the works, made important contributions to the success of the case studies. During all phases of the project, particular value was attached to photographic documentation of the works' physical components. This was also done with a view to future restaging of the works which can at times be complex.¹⁷ Here, the legibility of the photographs as a record of the work was of particular concern.

Since the emergence of the so-called new media, training and practice in conservation science has undergone a dramatic transformation.¹⁸ Various conservation strategies have been developed, documentation models and structures created, and numerous research projects completed. However, in spite of the fact that there is an increasing need for action, recognition of the work done by this field is still lacking. The question was asked as early as

15 See Netherlands Media Art Institute (NIMk), "To Transfer or to Transform #4," online: <http://nimk.nl/eng/to-transfer-or-to-transform/to-transfer-or-to-transform-4>, 01/29/2013.

16 Bernhard Serexhe, "Foreword and Acknowledgments," this volume, pp. 13–16.

17 See also Jeffrey Warda (ed.), *The AIC Guide to Digital Photography and Conservation Documentation*, American Institute for Conservation of Historic and Artistic Works, American Institute for Conservation, Washington, D.C., 2006.

18 See Carol Stringari, "Beyond 'Conservative': The Conservator's Role in Variable Media Preservation," / Au-delà de la 'restauration': le rôle d'un restaurateur dans la préservation des médias variables," in: Alain Depocas, Jon Ippolito, and Caitlin Jones (eds.), *The Variable Media Approach: Permanence through Change / L'approche des médias variables: la permanence par le changement*, Guggenheim Museum Publications, New York, The Daniel Langlois Foundation for Art, Science, and Technology, Montreal, 2003, pp. 55–59, here p. 55, online: <http://variablemedia.net/pdf/Stringari.pdf>, 01/29/2013.



Trial set up for the computer
installation *Raoul Pictor
cherche son style ...* (1993–
1997) by Hervé Graumann
Photo © Frac Alsace

1997: “But what will happen if [...] there is no longer a computer on the market with the correct operating system for the software?”¹⁹

However, the wake-up call has barely been heard by the institutions, and appeals to take timely action fade away without any evident consequences for the conservation of digital media art: interdisciplinary collaboration is rarely encouraged, and knowledge is lost (also due to high staff turnover) which is apparently accepted without instituting countermeasures early enough. It cannot be denied that the standard institutional documentations exhibit considerable weaknesses, especially with regard to the complexity and variety of digital art.²⁰ But what will remain of such works if a rigorous practice of documentation is not established that can be integrated into everyday museum practice?

19 Axel Wirths, “Media Art between Reproducibility and Progressive Interactivity,” in: Kunstmuseum Wolfsburg (ed.), *Wie haltbar ist Videokunst? Beiträge zur Konservierung und Restaurierung audiovisueller Kunstwerke / How Durable is Video Art? Contributions to Preservation and Restoration of the Audiovisual Works of Art*, symposium at Kunstmuseum Wolfsburg, 11/25/1995, Wolfsburg, 1997, pp. 61–72, here p. 67.

20 See Hans D. Christ, “Stan Douglas, ‘Win, Place or Show,’” in: Ursula Frohne, Mona Schieren, and Jean-François Guillon (eds.), *“Present Continuous Past(s)”: Media Art. Strategies of Presentation, Mediation and Dissemination*, series 02 of the University of the Arts Bremen, Springer, Vienna, New York, 2005, pp. 124–131, here p. 131.

The preservation of digital art is a preemptive and proactive process,²¹ which is clearly demonstrated by the case studies presented in this chapter. Only the future will show whether or not the expansion of existing approaches to include documentation of detailed information, both for the virtual as well as physical work components, as well as the interventions implemented, have proved efficacious. The testing of new methods to preserve digital media art (such as porting or screencast [see glossary, p. 601, 601–602]) and their innovative implementation is absolutely necessary. Results, such as those elaborated in the research project by Bernd Lintermann with the porting of *The Legible City* (1989–1991) by Jeffrey Shaw, are far too rarely taken note of and applied profitably to comparable objects.

The increasingly rapid transformation of technology makes it imperative to make a thoroughgoing study of digital works immediately after their introduction into a collection,²² which requires financial investment by the respective institutions. In the case of digital works of art it is invariably data backup which ought to be the first priority, and not, as is often to be observed, the work's presentation in the museum.

And what is the fallback option? Should only relics of defunct works, like obsolete hardware, be exhibited in the future, as Johannes Gfeller memorably describes,²³ instead of functioning digital art works?

In the following texts on the case studies for the project *digital art conservation*, the demand for commitment needs to be particularly emphasized. The findings gained by researching the ten works should encourage institutions to review their own collections and, where necessary, to take appropriate steps for action. Procrastination and hesitation may have very serious consequences, as will become apparent at the latest when action is unavoidable.

Translated from the German by Justin Morris

21 See Agnes W. Brokerhof, Tanja Scholte, Bart Ankersmit, Gaby Wijers, and Simone Vermaat, "Installation Art Subjected to Risk Assessment – Jeffrey Shaw's *Revolution* as Case Study," in: Scholte and Wharton 2011, pp. 91–101, here p. 97.

22 Naturally, an evaluation of conservation requirements should be carried out prior to the acquisition of a work; however, in the everyday work of the museum this is seldom the case.

23 See Johannes Gfeller, "Training in Media Conservation," this volume, pp. 567–583.



From left to right:
Herbert W. Franke
ORCHID (1984–1992)
TROPIC (1984–1992)
ABROLL3 (1994)
RAHMEN4 (1992)
Computer animations
Installation view *Digital Art Works. The
Challenges of Conservation*, CEAAC, Strasbourg
Photo © CEAAC, Strasbourg
Photo: Klaus Stöber

Herbert W. Franke (*1927, Vienna, Austria)

ORCHID, TROPIC, WALDWOHN, ABROLL3, RAHMEN4

1984–1992

ZKM_Collection, Karlsruhe

Hardware:

- DEC Professional 350 (P/OS)
- PC (MS-DOS)

Software:

- In-house developed (program languages BASIC-11, QuickBASIC; programmer Herbert W. Franke)

Conservation Strategies:

- Hardware preservation (storage)
- Emulation

Documentation:

- Arnaud Obermann
- Claudia Röck

Conservation Concept and Conservation Measures:

- Daniel Heiss
- Arnaud Obermann

Text:

- Chiara Marchini Camia
- Arnaud Obermann
- Katrin Willert

Five partly interactive computer programs created by the artist Herbert W. Franke, a pioneer of computer art, are analyzed in the following case study. The works, designed and programmed by Franke in the years 1984 to 1992 were presented to the public for the first time as part of the exhibition *Digital Art Works. The Challenges of Conservation* (October 29, 2011–February 12, 2012) at the ZKM | Media Museum of the ZKM | Center for Art and Media Karlsruhe. The particular challenge of this case study had to do with the fact that the project team was confronted with a mixed lot of obsolete computers the hard drives of which first had to be read and the gathered data secured. Further, it was necessary to develop viable options for presenting the five computer programs. To ensure the preservation of the works, strategies of hardware preservation (storage) and emulation were adopted.

Work Description

All five of Herbert W. Franke's works – *ORCHID*, *TROPIC*, *WALDWOHN*, *ABROLL3* and *RAHMEN4* (1984–1992) – are computer programs which generate graphic animations for computer monitors or television screens in real time. Two of the five works (*ORCHID* and *WALDWOHN*) are interactive. With these programs, the animated graphics can be modified within certain parameters by the viewer using the computer keyboard.

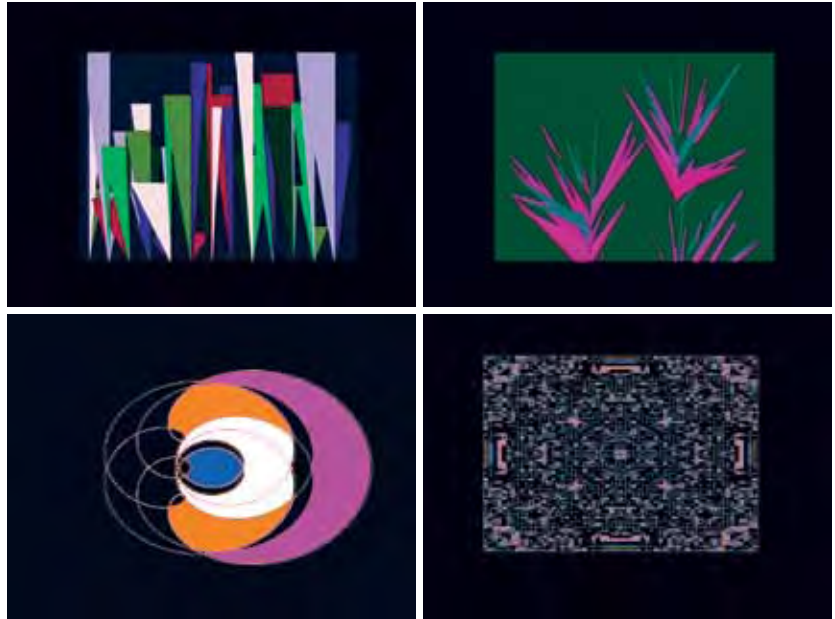
In the work *ORCHID*, which Herbert W. Franke programmed on a DEC Professional 350 computer, triangular color patches gradually begin to form from the bottom edge of the screen, they overlap and are positioned side by side. Here it is possible to shift the graphics en bloc to the top or bottom using the keyboard.

WALDWOHN was also produced on the DEC Professional 350. Here, step-by-step, triangles with different widths and heights are drawn side by side on the screen's dark surface. The graphics resemble a highly abstract depiction of a forest – perhaps this is the reason for the title. The triangles move very slowly towards the upper edge of the monitor before gradually disappearing from view. Via the keyboard the user can alter the color, form, and size of each subsequent triangle.

Another work programmed on the DEC Professional 350 is *TROPIC*. In this case, however, the possibility of interaction plays no role at all: the viewer is unable to alter the parameters of the graphics using the keyboard. Viewers are only able to watch flat triangles of various sizes and colors being constructed. The triangles line up like leaves on an invisible vertical line, overlap one another and the overall impression is of a kind of tropical palm: the colors



The artist Herbert W. Franke and his work *WALDWOHN* (1984–1992) Exhibition photo
Digital Art Works. The Challenges of Conservation, ZKM | Media Museum
 Photo © ZKM | Karlsruhe
 Photo: ONUK



From left to right:
Herbert W. Franke
ORCHID (1984–1992),
TROPIC (1984–1992),
ABROLL3 (1994),
RAHMEN4 (1992);
Computer animations,
screenshots

of the background and the “leaves” change with the rhythm of their growth, which is based on an algorithm.

ABROLL3 and *RAHMEN4* are also not interactive. However, unlike the work *TROPIC*, Franke developed these two works on a 386 personal computer with the MS-DOS operating system (Microsoft Disk Operating System).

ABROLL3 features the representation of a fine line that curves and folds back on itself in a circular movement against the monitor’s black background. Once a figure has been completed, the intersections are colored according to a random principle. Then a new rotation cycle begins. Over the figure that already exists a further figure is drawn with only minimal deviations, and surface areas are again colored at random.

In the work *RAHMEN4*, a mosaic-like pattern of cells is drawn on the dark screen. The individual cells have different colors, but nevertheless form a mirror-symmetrical pattern. Always beginning from the top left, the colors change cell by cell and line for line, until a new symmetrical pattern emerges.

As Herbert W. Franke programmed these works on his own personal computer, that is, he worked on a CRT computer monitor (see glossary, p. 599), it can be assumed that the artist envisaged that his computer programs would be presented on screens of this type. In the interview which was held with the artist as part of this case study (see excerpt from the interview, pp. 340–342), Franke says that playback on a computer monitor is ideal, but that he is open to the option of presentations using projection.

These works were presented for the first time in the exhibition *Digital Art Works. The Challenges of Conservation*. It was only during the course of the case study that the artist selected the versions of his works that he considers complete and worthy of exhibition. The numbers given in the works' titles as, for example, in *ABROLL3* and *RAHMEN4*, refer to the version of the respective computer program, which was actually selected.

Art Historical Context

Along with Frieder Nake, Georg Nees, and Manfred Mohr, Herbert W. Franke is one of the pioneers of computer art in German-speaking countries.¹ He studied physics, mathematics, chemistry, psychology, and philosophy at the University of Vienna where he gained his PhD in electron optics in 1950. After holding a position at the Vienna University of Technology, he worked in industry until 1957. Since then, he has been working as author and artist, with a primary focus on the relationship between technology and art. In his writings on art theory Herbert W. Franke investigates the issue of the human perception of art, in which context he analyzes the attractiveness of certain pictorial motifs by drawing on cybernetics and information theory using physical parameters such as order/complexity and redundancy/innovation.

His interest in explaining art's power of attraction by means of scientific concepts is also the point of departure for his own artistic work. In the mid-1950s, Franke experimented with images generated with the oscilloscope and the analog computer. Building on this, in 1967 he created his first digital computer graphics. His entire artistic career since then has been devoted to the medium of the computer. In the 1960s he had to rely on using the computer systems at universities, research institutes, and on industrial systems to generate graphics from his own flowcharts and to print them out on a mechanical plotter.² After purchasing his own first PC at the end of the 1970s, Franke programmed his graphics himself – including on Apple computers in the program language QuickBASIC (see glossary, p. 599) or using the Mathematica program of the software manufacturers Wolfram Research. In general, the starting point of his method of working is a mathematical formula, which he then visualizes on the computer as a graphic. Franke is interested in using the visualization of certain mathematical functions to improve understanding of them or to make them comprehensible in a different way whereby the result also has artistic aspirations. In this connection, Franke says that it is

1 See Wulf Herzogenrath and Barbara Nierhoff-Wielke (eds.), *Ex Machina: Frühe Computergrafik bis 1979. Die Sammlungen Frank und weitere Stiftungen in der Kunsthalle Bremen. Herbert W. Franke zum 80. Geburtstag*, exhib. cat., Kunsthalle Bremen, Deutscher Kunstverlag, Berlin, Munich, 2007.

2 Herbert W. Franke gave a computer scientist friend precise instructions in the form of flowcharts for creating the graphics, for example. See the excerpt of the interview with Herbert W. Franke conducted by Arnaud Obermann, 06/27/2011, pp. 340–342.

not very meaningful to write a computer program just to produce one single graphic. He is much more interested in following the modifications to a graphic which result from changing certain parameters. "In the strict sense [...] a single image is not the adequate form of presenting computer art [...]," says Franke.³ Correspondingly, since the late 1970s computer animation is probably the most important genre in his oeuvre.

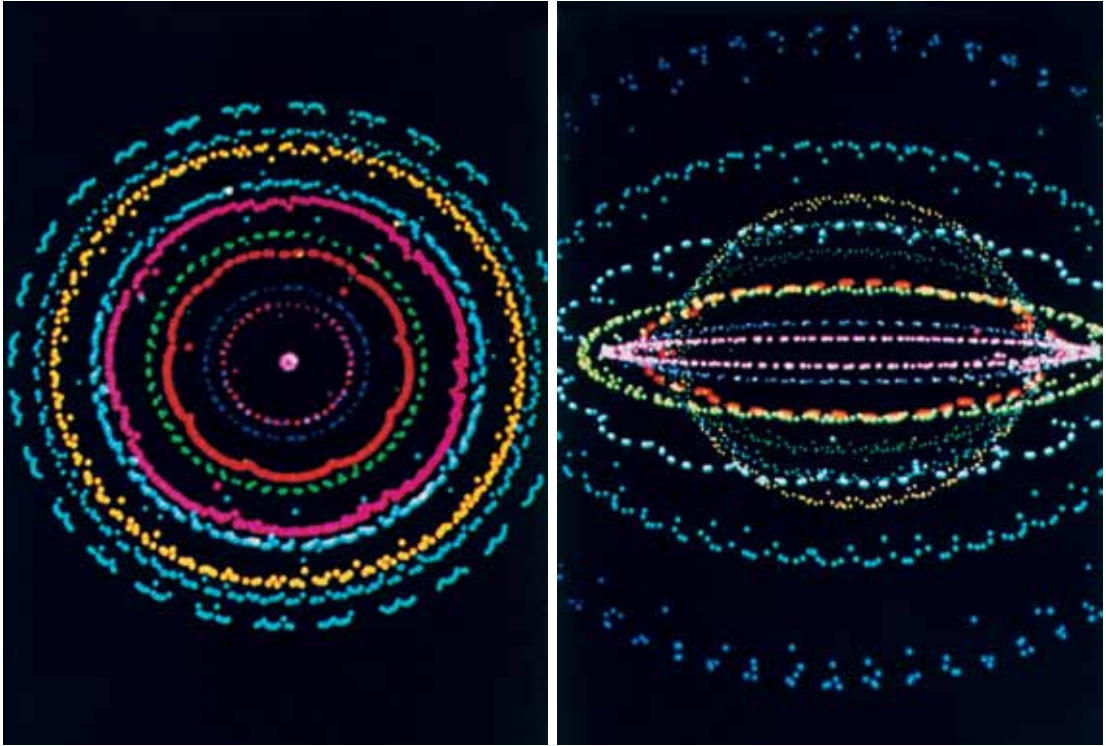
The five works covered in this case study are exemplary of Franke's artistic concerns. They are computer animations in which single geometric elements continually change their shape through certain movements (horizontal and vertical shifts, rotations) and the variation of certain parameters (dimension, colors). In these works Herbert W. Franke experiments with mathematical principles, for example, symmetry and the continuity of functions, which he also treats in his theoretical writings. The presentation of these works on a computer screen is thus an essential element of his work, as was already evident in his early works with oscilloscopes. Even at that time it was possible to present mathematical functions as graphics on a screen by coupling the oscilloscope to an analog computer. The results were captured by the camera, in static photographic images, and by the film camera, in moving images. With the reproduction of the graphics on a screen – in contrast to producing a printout with a mechanical plotter – it was also possible to represent mathematical functions in their temporal dimension. And there was a further advantage: it enabled Herbert W. Franke to work interactively; namely, to intervene directly in the respective process. This interactivity is also provided for the viewer in *ORCHID* and *WALDWOHN*. A predecessor of Franke's computer animations was the famous Bouncing Ball program of 1949⁴ written by Charles Adams, which is one of the first programs to have used computer screens in a significant manner⁵ and, when extended to the computer game, included the element of interactivity. Aesthetically, Franke's works examined in the case studies are reminiscent of the films of John Whitney. A pioneer in the field of artistic computer films, Whitney's films *Permutations* (1966) and *MATRIX I, II and III* (1971–1972) were programmed on an IBM computer. However, conceptually, Franke's animated graphics cannot be compared with the early "computer films" of Whitney and his sons John Jr., Mark and Michael, or of John Stehura, for whom programming was only a means to an end and the reference to mathematics merely represented a "*number game*."⁶

3 Herbert W. Franke quoted from: Heike M. Pieler, "Herbert W. Franke und die Entdeckung neuer Bilderwelten," in: Herzogenrath, Nierhoff-Wielke 2007, pp. 64–107, here p. 90, translated from the German by Justin Morris.

4 See Margit Rosen and Peter Weibel, "Die Zukunft eines künstlerischen Mediums," in: Herzogenrath, Nierhoff-Wielke 2007, pp. 182–210, here p. 192.

5 See Jan Hurst, et al., "Retrospectives II: The early years in computer graphics at MIT, Lincoln Lab, and Harvard," in: *ACM Siggraph Computer Graphics*, vol. 23, issue 5, December 1989, ACM, New York, pp. 39–73.

6 See Gene Youngblood, *Expanded Cinema*, E.P. Dutton & Co., New York, 1970, p. 239.



John Whitney
Permutations
 1966
 Computer film, 16 mm,
 color, sound, 8 min

Provenance

The computer programs upon which the works discussed here are based were found on the computers and hard drives that Herbert W. Franke donated to the ZKM | Center for Art and Media Karlsruhe in 2007.⁷ His donation was made with the proviso that the data on the hard drives would be recovered and saved. With the help of the artist, it was possible to identify the works *ORCHID*, *TROPIC*, *WALDWOHN*, *ABROLL3*, and *RAHMEN4* among the extracted data and programs.

Course of Action

At the beginning of work on the case study the hardware that had been handed over by the artist was noted and documented (Arnaud Obermann and Claudia Röck). Next, all data on the hard drives and computers was recovered and saved (Daniel Heiss). Further, an interview was held with the artist (see the excerpt from the interview, pp. 340–342). In this context

7 See Herbert W. Franke's deed of donation, October 24, 2007, Egling, 2007, unpublished. The project committee decided in advance that only things found on the donated machines would be considered. Franke had offered subsequently to donate additional programs produced on these desktop computers that had been saved on data storage devices.

Herbert W. Franke selected the works that he considered worthy to be presented to the public. Consequently, these selected works became the focus of the case study and were prepared for presentation in the exhibition *Digital Art Works. The Challenges of Conservation*, which, amongst other strategies, was achieved with the aid of emulators (see glossary, p. 600) (research and implementation: Daniel Heiss and Arnaud Obermann).

Documentation

Among the case studies for this project, Herbert W. Franke's donation of October 24, 2007[8]⁸ represents a special case. Franke handed over his antiquated desktop computers to the ZKM | Karlsruhe but at that time this was not followed up by inventorying, as is common practice with museum documentation: the individual elements were not registered nor were they entered in any collection database. It was only the deed of donation and the museum staff that were able to provide information as to the whereabouts of the old hardware. At that point in time even the artist was unable to say whether there were any artworks programmed by him on the computers. This is documented in the deed by the request to recover any programs that may exist.⁹

It was not until September 2010 that the computers donated by Franke were examined and made to run again as part of the preparations for the exhibition *Herbert W. Franke – Wanderer Between the Worlds* (October 16, 2010–January 9, 2011)¹⁰ at the ZKM | Media Museum. Subsequently, as the first step of the case study, an inventory was made of all elements of the donation, for only thorough registration of details allows clear and exact identification and thus ultimately that contemporary objects can be preserved.¹¹ A photographic documentation of the donated elements was carried out at the same time.

Since it was unclear at the beginning of this case study whether the donated computers and hard drives actually contained works by the artist and whether it would be possible to get the computers up and running again (the artist had stored the hardware for many years in the cellars of private houses) a special procedure was obviously called for.

After recovery of the data, it was viewed together with the artist. During the course of this Franke made a short list of the programs which, in his view,

8 Ibid.

9 The following sentence is taken from the deed of donation: "Should programs be selected from HWF [sic] on the hard drive, we request a copy of this," see *ibid.*

10 See the exhibition *Herbert W. Franke: Wanderer Between the Worlds* (October 16, 2010–January 9, 2011), ZKM | Media Museum, project space, curated by Susanna Päch and Bernhard Serexhe, available online at: [http://on1.zkm.de/zkm/stories/storyReader\\$7195](http://on1.zkm.de/zkm/stories/storyReader$7195), accessed 05/24/2013.

11 In the documentation of the hardware, a special cable was included which was essential for using one of the computers. This BCC03 cable, serves both as a monitor cable as well as for connecting the LK201-AG keyboard.

This photo shows the condition in which the collection of antiquated desktop-computers was handed over to the project team.

Photo © ZKM | Karlsruhe



were suitable for presentation in a museum.¹² From this point onward, the documentation could proceed specifically because only the limitation to the five works selected enabled a detailed and critical analysis of each of the programs. The documentation of the available source codes (see glossary, p. 602) followed accordingly. As *ORCHID* and *WALDWOHN* were both interactive works, in both cases the “module for the capture of interactive installations”¹³ was applied and tried out.

When he wrote the programs Franke had made a point of producing an adequate commentary of the source codes,¹⁴ which made the documentation

¹² See Obermann 2011, excerpt, this volume, pp. 340–342.

¹³ Tiziana Caianiello and Julia Giebeler, *Modul zur Erfassung interaktiver Installationen*, Düsseldorf, 2010, unpublished. The text summarizes the results of a project entitled *Konkretionen des Flüchtigen. Zur Problematik der Erhaltung und Re-Inszenierung von Medienkunstinstallationen* that was conducted at imai – inter media art institute, Düsseldorf; translated from the German by Justin Morris.

¹⁴ Commentary on source code refers to annotations within the code. A source code that includes such annotations is more comprehensible to third parties.

of the works significantly easier. Thus no great efforts were required to document the control commands, as can be illustrated by the work *WALD-WOHN*, for example:

```
50 REM angaben für steuerung
52 REM ziffern 0 bis 9 für farben
54 REM - löschen*~@
56 REM q,w,e,r - verbreiterung der figuren
58 REM reihe a bis ö - untere begrenzung; nachher noch + drücken!
60 REM reihe y bis . - höhe ; nachher noch + drücken!
62 REM „ä“ scroll aufwärts, „ü“ scroll abwärts, „p“ scroll = 0
64 REM „-“ set fill on, „#“ set fill off
```

Conservation

Herbert W. Franke's donation of antiquated desktop computers includes the following:

- Apple II Europlus (produced between 1979 and 1983)
- Apple IIGS (produced between 1986 and 1992)
- DEC (Digital Equipment Corporation) Professional 350 (produced as of 1984; the year production ceased is unknown)¹⁵
- PC with 80386 microprocessor (unknown manufacturer; the processor was produced between 1985 and 2007, but was replaced in 1989 by a high-performance 80486 microprocessor)

Only the complete data on the hard drives of two of the computers (the DEC Professional 350 and the 386 PC) – including office correspondence, documents, programs, sketches, and artworks – were recovered, saved, and analyzed. Reading the data on the PC was not problematic, because the computer has MS-DOS and Microsoft Windows 3.1 installed and an IDE hard drive.¹⁶ However, the DEC Professional 350 presented a number of difficulties.

15 The DEC Professional model series machines (DEC Professional 325, 350, and 380), along with the DEC Rainbow model series, are seen as a failed attempt by Digital Equipment to regain a foothold in the market for microcomputers. See John Holden, *Production PDP-11 Models*, available online at: www.psych.usyd.edu.au/pdp-11/models.html, accessed 05/24/2013.

16 IDEs (Integrated Drive Electronics) are a widely used parallel hard drive interface for connecting hard drives, disk drives, and tape recorders. See Christian Vilsbeck, *IDE-Grundlagen*, 1999, available online at: www.tecchannel.de/storage/extra/401440/ide_schnittstelle_kabel_stecker_ata_festplatte_master_slave, accessed 05/24/2013.

DEC Professional 350
The labels give
information about the
former storage location.
Photograph taken for
documentation purposes
Photo © ZKM|Karlsruhe



So as not to endanger the operating system by removing the hard drive, 5.25" floppy disks and the integrated dual floppy disk drive (RX50) of the computer were used to read the data.

This procedure turned out to be more complicated than expected because the manufacturers, Digital Equipment Corporation, had developed what for that time was an advanced storage method, by which means 396 kilobytes could be saved on a single density disk.¹⁷ By contrast, a single density disk formatted with MS-DOS Version 2.0 only had a storage capacity of 160 KB. This problem has been exhaustively documented by Kees Stravers, and thus it was relatively easy to solve it.¹⁸ Dealing with the less familiar, menu-based operating system P/OS (Professional Operating System)¹⁹, which was a standard installation on the DEC Professional 350, required a considerable time for getting used to.

After the cleaning and maintenance of the computers, and the subsequent data backup, the artist had to evaluate the material and to make a selection – it would not have been possible to locate the works found on the computers within Franke's oeuvre without his assistance.

From a range of QuickBASIC (on the 386 PC) and BASIC-11 programs (on the DEC Professional 350)²⁰ and their various versions, the artist selected five presentation-worthy works. In the case study interview Franke said of these

17 See Kees Stravers, *The RX50 FAQ*, available online at: <http://home.claranet.nl/users/pb0aia/vax/rx50.html>, accessed 05/24/2013.

18 Ibid.

19 See Frank da Cruz, *Columbia University Computing History. A Chronology of Computing at Columbia University*, available online at: www.columbia.edu/cu/computinghistory, accessed 05/24/2013.

20 See glossary, p. 599.



PC with 80386
microprocessor
Photograph taken for
documentation purposes
Photo © ZKM|Karlsruhe

different versions: "... most of the programs I have written – this applies of course now as before – exist in several versions, of which the first is usually the least useful and not worth preserving, and the last then meets the demands that I make on myself."²¹ An example of this is that the final version of the work *ABROLL3* contains many programming instructions, which are simply missing in older versions. It was only after the extremely valuable and necessary selection undertaken by the artist that we could complete the documentation, and begin preparations for presenting the works within the exhibition context.

The procedural steps described in the following were carried out without any problem in the works *ABROLL3* and *RAHMEN4*, both QuickBASIC programs.²² With the help of the free software (see glossary, p. 600) DOSBox²³, the programs could also be run authentically on all current operating systems. DOSBox is a software (an x86 emulator) which in the case of Herbert W.

21 See Obermann 2011, excerpt, this volume, pp. 340–342.

22 The version numbers were adopted in both cases because Franke had also used them in the commentary of the source codes. Here, for example, the information from the source code of *ABROLL3*: "program ABROLL3 – Serie EUKLID, H. W. Franke, December 1991 (K), new Oct. 94."

23 See DOSBox, available online at: www.dosbox.com/information.php?page=0, accessed 05/24/2013. Version 0.74 is the most up-to-date and is obtainable, for example, for Microsoft Windows, Linux, and Mac OS X.



DEC Professional 350 with integrated dual floppy disk drive (RX50)
 Photograph taken for documentation purposes
 Photo © ZKM|Karlsruhe

Franke's programs imitates an MS-DOS operating system and corresponding hardware environment. In detail, here particular stress was placed on guaranteeing full-screen view and displaying the programs at the processor performance to be simulated.²⁴ To have a further point of reference for potential future conservation and presentation needs, the programs were run on the 386 PC and the outgoing VGA signal was picked up. In the exhibition, which accompanied the project, CRT color monitors were used which corresponded to the aesthetics of the original display equipment to offer visitors the most authentic presentation possible of these programs.

In the case of the BASIC-11 programs that were found on the DEC Professional 350, three programs were selected from over 150: the work *TROPIC*, as well as the two interactive works *ORCHID* and *WALDWOHN*.

The search for a suitable emulator for presenting these programs did not take long: the emulator Xhomer, a mechanical emulator designed especially for the DEC Professional 350, proved appropriate for presenting the works in an exhibition context.²⁵ However, working with this program, which was

²⁴ For the presentation of the works *ABROLL3* and *RAHMEN4*, the simulated processor power, the emulation speed of DOSBox (default setting 3000 cycles) was reduced to 800 cycles.

²⁵ See Tarik Isani, *The Xhomer Project*, available online at: <http://xhomer.isani.org/xhomer>, accessed 05/24/2013.

produced in the programming language C (see glossary, p. 599), was problematic: without making substantial interventions in the source code, Xhomer did not enable a consistent, authentic full-screen presentation nor could the processing of the programming instructions – the source code of *TROPIC*, for example, is only around 60 lines – be slowed down to achieve a realistic performance of the machine simulated.²⁶

The project team continues to work on a solution for the adequate presentation of the BASIC-11 programs. Xhomer is well documented and the source code is available for download. Due to time constraints an adaptation has so far only been partially addressed.

The programs of *ORCHID*, *TROPIC*, and *WALDWOHN*, however, were run successfully on DEC Professional 350 for documentation purposes, and a recording was made. For this, the composite video signal (sync-on-green) was transmitted with a BCC03 cable and then tapped. The recordings of the computer programs make it possible to present the works in the future even without a suitable emulator. With this kind of playback, however, the quality of the real-time presentation of the program, as emulation (see glossary, p. 600) guarantees, is not achieved.

Conclusion

In spite of the unclear initial situation – whether it was still possible to get computers and hard drives donated to the ZKM | Karlsruhe into running order and whether works by Herbert W. Franke would be found on them at all – this case study yielded a satisfactory number of results. Furthermore, this example underlines once more the necessity for rigorous practices in documentation. Especially positive about this case study is the fact that it was possible to preserve several programs from the very early phase of digital art, to document them, and prepare them for public exhibition.

The findings described here in treating the works programmed by Herbert W. Franke – backups, selection of the programs, emulation and, finally presentation in the context of an exhibition – offer a glimpse of the potential challenges and approaches with respect to the acquisition of unresearched digital artifacts and hardware. The huge amount of time, funds, and personnel devoted to the computers and hard drives donated by Franke within the frame of the research project, would not have been possible in addition to the daily work of the museum. In this respect, the project team did not have access to any standardized instructions.

Thanks to the artist's support and a precise assessment of the individual works, the exhibition which accompanied the project was able to present to

26 See Tarik Isani, "Known Problems," in: *The Xhomer Project*, available online at: <http://xhomer.isani.org/xhomer>, 05/24/2013.



Cable labeled BCC03; it serves probably as monitor cable as well as port for the keyboard. Photograph taken for documentation purposes

Photo © ZKM | Karlsruhe

the public a small, representative group of works. Furthermore, after the successful conclusion of the project, it is now possible to carry out more in-depth research into Franke's working methods.²⁷ In the future museums and other institutions concerned with the preservation of heritage will be increasingly confronted with donations like Herbert W. Franke's.

Translated from the German by Justin Morris

27 The contribution of Erich Gantzert-Castrillo to the recording of these working techniques deserves a special mention. See Elisabeth Bushart and Erich Gantzert-Castrillo, *Was ist artemak?*, available online at: <http://artemak.hfg.edu/index.php/About>, accessed 05/24/2013, translated from the German by Justin Morris.

ORCHID, TROPIC, WALDWOHN, ABROLL3, RAHMEN4,

An Interview with Herbert W. Franke

Arnaud Obermann

Excerpt from the interview conducted on June 27, 2011, at ZKM | Karlsruhe

When did you decide to work with computers?

Herbert W. Franke: I started experimenting with an analog computer in 1956. Back then digital computers were only available to large institutions. I felt it was very tempting to use an electronic machine for rendering drawings because the drawing process itself couldn't go fast enough for me. When I tried to draw by hand, I always wanted to be done quickly because I was curious how the result would turn out. In short, I decided to get hold of an analog computer and to connect it to a device with a screen. A friend built me the switching system for the computer processes, and an electronics hobbyist loaned me an oscilloscope for the output of results – the images. Unfortunately, the screen was very small, its diameter was only five centimeters. But I was still amazed how impressive it is to have pictures of mathematical functions in front of you practically within a fraction of a second thanks to such resources.

The motive for these activities was artistic. I had already begun to work with experimental photography. As a physicist, I came up with the idea that certain physical processes could be visualized very well by photographic means – for example, oscillatory processes. The aesthetic component of these images seemed to me to be highly interesting, and I therefore wanted to experiment in this area. That is what I tried to do first of all with self-made mechanical oscillating systems. I pursued it for about two years, and it gave me the idea of looking for other possibilities that corresponded to my wishes even

better. The first step in this direction was the aforementioned combination of an analog computer and an oscilloscope.

Had you then fixed on a specific computer?

In the early days of computer graphics, and especially in their use for aesthetic purposes, the question was not only how one finds a suitable computer, but also whether one can get access to it. The systems were very expensive; only a few industrial laboratories and universities had larger computers. Furthermore, it was difficult to convert the previously mentioned screen displays into the form of prints or photo enlargements. At that time there were still no terminals available for digital computer graphics. The first output devices for visual representations were mechanical systems, so-called plotters, in which a pencil was drawn over a plane that was covered with paper. Such plotters are still in use today for specific purposes.

Around 1965 I learned that some physicists and programmers were going to use digital systems in the area of art. They were people from universities and staff from technical companies who had to do with computers because of their work. I asked around where it might be possible to experiment with a computer, but unfortunately had to wait several years before being able to do so. My first computer graphic came about in 1969, without my ever setting eyes on a computer. It was customary then to prepare programs as far as possible and then give them to a computer lab for further processing.

The lab then produced the drawing according to the program, which one could collect a few days later.

In my case, a computer scientist friend came to the rescue. I gave him my data in the form of a so-called flow chart, which then had to be translated into a machine language (see glossary, p. 601). This could be done only by a specialist who worked with a specific machine; as an outsider you could not even get near it. Our collaboration was a success: I got a series of drawings that differed mainly in their colors and pictorial elements [squares and circles], but that in principle had the structure which I had designed; I was very satisfied with the result. I had practically solved two problems: first, my desire to produce something aesthetically appealing with a computer was fulfilled; and second, I had made a contribution to the discussion whether artistic work can be programmed, captured, and assessed mathematically.

How do your works originate?

With some of my works I made pencil sketches of the idea, but these were the exceptions. I come from physics, and the associated mathematics offers possibilities of visualizing formulas. The visualization of the formula $x^2 + y^2$, for example, results in a circle. I use mathematical formulas just like a composer uses musical notation – to produce the idea that I envisage in my mind. Usually I started with the program and entered the corresponding relationships, which the image then visualizes, in the form of formulas. But programmers with completely different remits also seldom arrive at a working program with the first step, but rather at a rough draft, which still contains errors and needs to be improved. For this reason most of the programs I have written – this applies of course now as before – exist in several versions, of which the first is usually the least useful and not

worth preserving, and the last then meets the demands that I make on myself. But of course there are also quite different reasons to write several versions. I have thought, for instance, of retrofitting some animation programs with music. That is, in addition to the purely graphic version, there would also be versions that could be played together with musicians or conducted on a synthesizer, which then creates the sounds.

What would be the ideal way to present your works?

I think it is problematic transferring computer graphics that were generated with an old computer system to newer systems. It is much more desirable, in my opinion, when an old computer is set up and running again. Viewers can then see not only the artistic result but also the means by which it was produced. And if one begins with the external circumstances and compares the old systems with the new, one is struck by the fact that today a laptop, which fits into a briefcase, can achieve much more than could be achieved back then with a computer that occupied an entire room. One can of course also show this contrast – for example, by writing modern versions of the old programs and presenting them on a modern computer. This results in new ideas and thus opportunities to try new paths.

Do you take steps to preserve your work?

Well, that is actually a problem. I have often been confronted by the question whether one should try to adapt results that seem worthy of preservation to the changes of systems over time so they can be shown later. This must, I think, be decided case by case. There are methods by which this can be done very well – it depends on the system one was working with –

but often enough there are difficulties in keeping the old system operational. Often it is necessary to replace hardware – for example, corroded switching units. Another problem is the storage of programs and their adaptation to modern programming languages.

So I can't really answer your questions in general. I have myself recorded and documented computer animation on video and was for many years satisfied with the result. And when today we sometime succeed in running old programs on modern computers with the help of emulators (see glossary, p. 600), it is still obvious that the image appearance is a different one – as a result, for instance, of the improved color palette of modern screens.

Why have you given your computers to the ZKM?

I have often been asked whether I would donate my old computers – mainly by technical museums. I replied that I am a bit attached to these devices; I have worked with them for years and can't give them away without thinking about it.

It is important for me that they go to an institution where they will be well maintained. I mean of course not only the computer hardware – the metal, the plastic, the wiring – but

above all that they remain operational – so they can be used for presentations. This requires a successive adaptation to advances in digital technology. If an institution receives these devices and fulfills these conditions, then it will have to carry out little repairs in the course of time: system components can break down and will have to be replaced. Most museums were not prepared to do this. They merely wanted to archive the computers, as is done with archaeological finds. And that of course is exactly what I did not want done: I wanted the original computers to be maintained, as far as possible, but also that their operability be guaranteed; maintaining the function is more important to me than maintaining merely the device itself. And this is the reason why I finally came to an agreement with the ZKM. We spoke about these questions in our first discussions. And I offered to donate my computers on the condition that it be assured I am informed when a computer is restored and set in operation. We came to an agreement about this, and the ZKM assured me it had a capable department that could service the computers professionally; for me that was a prerequisite for the donation.

Translated from the German by Jonathan Uhlauer



Hervé Graumann
Raoul Pictor cherche son style ...
1993–1997
Screenshot

Hervé Graumann (*1963, Geneva, Switzerland)
Raoul Pictor cherche son style ...
1993–1997

Frac Alsace Collection, Sélestat, France

Hardware:

- Apple Macintosh LC 475
- 14-inch Apple Macintosh M1212 CRT color monitor
- Inkjet printer HP DeskJet 870cxi

Software:

- Executable Macromedia projector file

Conservation Strategies:

- Storage (hardware preservation)
- Reinterpretation
- Long-term preservation of the data

Documentation:

- Pascal Bion
- Nelly Massera
- Arnaud Obermann
- Claudia Röck

Conservation Concept and Conservation Measures:

- Mirco Fraß
- Arnaud Obermann

Text:

- Chiara Marchini Camia
- Arnaud Obermann

The installation *Raoul Pictor cherche son style ...* (1993–1997) is one of the few digital artworks in the collection of the Fonds régional d'art contemporain (Frac) Alsace (Sélestat, France). The work's aesthetic appearance is heavily dependent on the original hardware – a cathode ray tube monitor and an inkjet printer from the 1990s. This represents a special challenge for preserving the installation. Within the context of the case study, the strategy of hardware preservation (storage) was pursued. Also worthy of note is that prior to the research project *digital art conservation* and independently of conservation measures taken by Frac Alsace, the artist had already realized a reinterpretation of this work as a web application and as an iPhone and iPod touch app.

Work Description

In the installation *Raoul Pictor cherche son style ...* (1993–1997) the life and work of artist Raoul Pictor, a fictional figure created by Hervé Graumann, is acted out on the screen in simple computer graphics. The computer monitor permits as it were a look inside the studio and shows the painter at work. Various activities can be seen in random succession: Raoul Pictor walks up and down the room, drinks a glass of wine, flips through a book, and plays guitar before getting down to work. For the viewer, easel and canvas are only seen from the rear. After several minutes have passed he leaves the studio with the finished canvas tucked under his arm, and thus disappears from the screen.

In a further step, the work leaves the virtual level and emerges into the reality of the exhibition space: the picture painted by Raoul Pictor is printed out as a graphic on an inkjet color printer. Each of Raoul Pictor's creations, and thus each printout, is unique: it is created by the program just before printing, and selected at random from a range of possible motifs and colors. After the print command has been sent to the printer, the file of each painting is deleted from the computer. The color print is signed, dated, and numbered, and can be taken home by visitors to the exhibition.

The installation consists of a computer, a color monitor, and a color inkjet printer. Whereas the computer was presented in an earlier version of the

Hervé Graumann
Raoul Pictor cherche son style ...
 1993–1997
 Original printout of the
 "painting" generated by the
 program
 © Frac Alsace, Hervé
 Graumann



Raoul Pictor cherche son style... Nr 8 ad-02
 Frac Alsace. Mercredi, 26 octobre 2011
<http://www.raoulpictor.com>



Hervé Graumann
Raoul Pictor cherche son style ...
1993–1997
Installation with CRT monitor
and inkjet printer
Photo © CEAAC, Strasbourg
Photo: Klaus Stöber

work together with a monitor and printer on an antique wooden table, in the version examined here, which is in the Frac Alsace collection, the computer remains concealed in a custom-built display cabinet. The devices used correspond to standard 1990s workplace equipment. The three-dimensional representation of the studio, which fills the entire monitor screen, corresponds to the dimensions of the CRT monitor (see glossary, p. 599), so that the monitor rather resembles a box or a doll's house in which the studio is contained. The installation also comprises acoustic elements: when Raoul Pictor plays the guitar in one of his "creative breaks," the strumming of a guitar is heard. In addition there is a melody which can be accessed via the program's menu keys, but in the context of an exhibition it can only be heard by the museum staff, since only staff are allowed to operate the computer.

Art-historical Context

Like in his other works, in *Raoul Pictor cherche son style ...* (1993–1997) Hervé Graumann engages with the principles of computer science and the new media. While still an art student at the former École supérieure d'art visuel in Geneva alongside his classical artistic training he started to experiment with computer programming. Decisive factors here were his interest in music and sequencers – devices that record, edit, or play back music, which became generally available at that time – and his interest in graphic reproduction, and the reproducibility of artistic works specifically connected with this. Initially, Graumann's artistic investigations with the computer took the form of experiments in which he combined digital and analog techniques, for example, transferring computer-generated and laser printer-produced lines to photo-engraving. From the 1990s onward, he engaged in a conceptual way with the principles of the new media both in his digital as well as his analog works.

Graumann's work *Armoire II* (1990) consists of a wardrobe which the artist, following the principle of sampling that comes from digital photography, divided into a grid of single three-dimensional numbered pixels; he then reassembled them in accordance with the numbering. In the installation *Yes or No?* (1999/2000), randomly arranged floor lamps are turned on and off by a preprogrammed circuit, which points both to the programmed automatism of the computer and to the binary principle on which it is based.

The software-based work *Raoul Pictor cherche son style...* is not only an examination of the new media, but at the same time it treats art historical themes and questions: the representation of the artist's studio, which however denies the observer a view of the canvas, goes back to a historical tradition of depicting artist's studios, as in Diego Velázquez' *Las Meninas* (ca. 1656), for example. At the latest since the emergence of Surrealism, and the method of *écriture automatique*¹ propagated by André Breton, artists have

1 See André Breton, *Manifeste du Surréalisme. Poisson Soluble*, Kra, Paris, 1929.

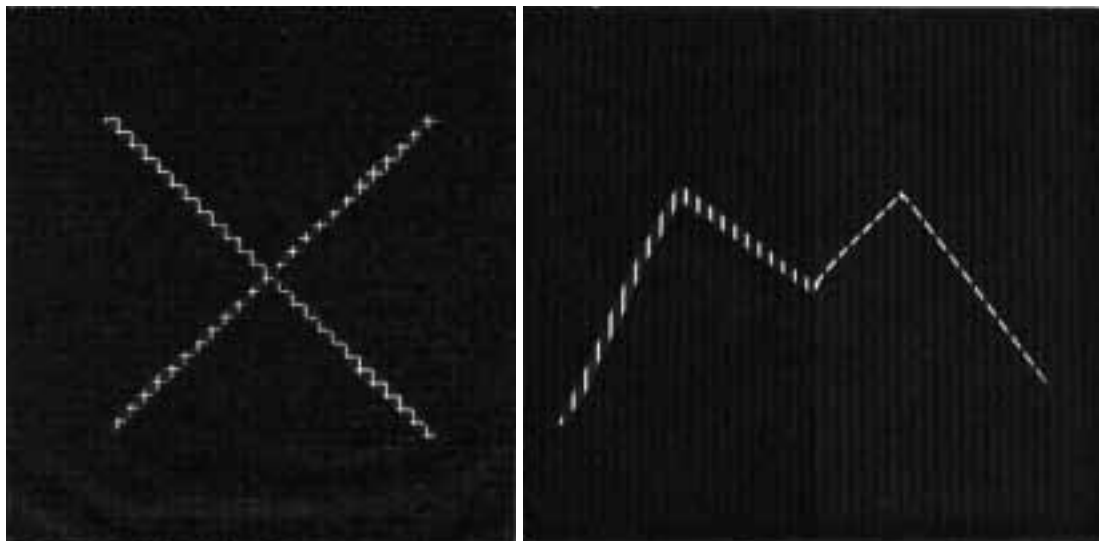
Hervé Graumann
Armoire II
 1990
 Cut-up furniture, marker
 pen, glue
 189 x 36 x 36 cm
 Private collection
 © Hervé Graumann



engaged with the question as to whether automatic creation divorced from the conscious intention of the artist is possible. This question is also addressed in the work *Raoul Pictor cherche son style ...* and is continued by addressing the topic of artificial intelligence (AI) by attributing intelligence and decision-making powers to the animated character shown on the computer screen. Thus, Graumann belongs to the tradition of computer artists who began experimenting with the automatic generation of poetry and prose in the 1970s. The knowledge gained from the discipline of artificial intelligence, which emerged around 1950, in the 1990s was applied primarily in the field of computer games.² The aesthetics of *Raoul Pictor cherche son style...* not only suggests parallels to computer games of this period because of the comic-like graphics, but also because of the constraints imposed on the figure's scope of action.

While exploring the question as to programmable automatism provided Graumann with an incentive to work on *Raoul Pictor cherche son style ...*, the

2 See Lev Manovich, *The Language of New Media*, The MIT Press, Cambridge (MA), 2001, p. 33.



From left to right:

Hervé Graumann

Untitled (X)

1988

Linocut, photoengraving

11.2 × 10.5 cm;

Untitled (M)

1988

Linocut, photoengraving

11.9 × 13.0 cm

© Hervé Graumann

artwork also arose from a desire to rationalize the work processes of his graphic production – definitely as a reflection of a certain commercial logic. Instead of creating graphics on the computer in real time, for *Raoul Pictor cherche son style ...* Graumann was able to write a program capable of creating unique graphics on the basis of elements which he had preprogrammed – and not only far quicker than he himself, but, thanks to the random principle, also in a theoretically unlimited quantity. Thus, in a vivid and playful manner the work reflects a critique of the notion of the artist genius,³ according to which an artistic creation originates not only in the mind of the artist, but necessarily reproduces preexisting motifs and schemas.

Provenance

The work *Raoul Pictor cherche son style ...* (1993–1997) was acquired by Frac Alsace in 1997,⁴ but has not been exhibited since.⁵ In addition to the artist's

3 See Ernst H. Gombrich, *Art and Illusion. A Study in the Psychology of Pictorial Representation*, Phaidon, London, 1960; Roland Barthes, "The Death of the Author," in: Stephen Heath (ed.), *Image Music Text*, Hill and Wang, New York, 1977, pp. 142–148.

4 The work was sold by the Geneva gallery Galerie Antoine Meier which represented Hervé Graumann at the time.

5 The exhibition manager at Frac Alsace, Pascal Bion, was unable to find any entries in the archives which indicated an exhibition. Because the exhibitions at Frac Alsace had not been systematically documented its presentation cannot be ruled out entirely. Several versions exist of the installation, which were purchased by public and private collections. Amongst others, the work is owned by the following public collections in Switzerland: Fonds municipal d'art contemporain (FMAC), Geneva; Musée cantonal des beaux-arts, Sion; Bundesamt für Kultur, Bern; Aargauer Kunsthaus, Aarau. In addition, the installation was exhibited at various international art exhibitions, for example, at the 3rd Biennale de Lyon in 1995, and at Art Basel 27 in 1996.

fee, the gallery's offer to Frac Alsace provided for the levying of a charge for each printout produced by the installation and given to the visitors. The contract stipulated the annual registration of the number of printouts and the calculation of the corresponding levies, as well as annual renewal of the license for the use of the work. Since Frac Alsace did not accept this clause in the contract, it forfeited the opportunity to exhibit the work.⁶

Course of Action

Prior to the beginning of the case study in 2010, no steps had been taken to ensure the long-term preservation of the work *Raoul Pictor cherche son style ...* (1993–1997). Frac Alsace, a regional public collection of contemporary art, is a relatively small institution and it does not specialize in media art. Added to this is the fact that, in France, when institutions of this kind commission IT specialists necessary for getting such a work to function, the institutions have to comply with complex bureaucratic procedures. As a consequence, in the everyday maintenance of collections such specialists are only seldom called upon. As part of the case study, conservation strategies for preserving the installation were proposed and finally implemented for the first time following the documentation of the installation⁷ and a discussion with the artist.

Documentation

The installation *Raoul Pictor cherche son style...* (1993–1997) comprises a desktop computer (Apple Macintosh LC 475)⁸, a 14-inch CRT color monitor (Apple Macintosh M1212), and an inkjet printer (HP DeskJet 870cxi). For the visitor, the computer, together with keyboard and mouse, is concealed within a display case constructed especially for the installation; only the monitor and printer are visible. An exhaustive inventory, including a list of all the individual parts belonging to the work – which would have facilitated their identification – had not been made when the project began. The work had only been allocated an inventory number in the collection database of Frac Alsace; beyond this, no other steps in documentation had been carried out.

Thus, one of the first measures was to register and document with photographs all components of the work. As mentioned at the outset, in all case

6 Today, the artist's opinions respecting authorial rights and royalties have changed fundamentally. He now sees the value in making the graphics generated by the installation publicly accessible and available free of charge. The fact that his application for iPhone and iPod touch (2009) is also free of charge demonstrates this. See *Raoul Pictor* at iTunes, available online at: <http://itunes.apple.com/de/app/raoul-pictor/id328337770?mt=8>, accessed 05/24/2013.

7 The project partner Vidéo Les Beaux Jours in Strasbourg was coordinator of the activities of the other French institutions associated with the project, and, in this function, facilitated the collaboration with the Musée d'Art moderne et contemporain (MAMCS), Strasbourg, and Frac Alsace, both of which participated in the case studies, but were not official project partners.

8 The computer used was manufactured between 1993 and 1996, and was sold on the European market also under the product name Apple Macintosh Performa 475.



Back view of the Apple
Macintosh LC 475
Photograph taken for
documentation purposes
Photo © ZKM | Karlsruhe

studies great value was placed on precise photographic documentation to make future reconstruction of the work easier. The detailed photos – here as an example the back of the computer – provide information about particular aspects of the cables, for instance, and can be referred to for support in the event of reconstruction.

In addition to documenting the hardware components used in the installation, a comprehensive documentation of the computer software and its functioning was also aimed at. This was only realized during the course of the research and after consultations with the artist. For security reasons, prior to handing over the work to Frac Alsace, Hervé Graumann had made the work-relevant files “invisible” to the user with the aid of the program ResEdit, to rule out the possibility of inadvertent deletion. For example, the image file *atelierorig8*, which is a component of the work’s image background in PICT format,⁹ is manipulated in this way. It should also be mentioned here that the last program version (2.1.3) of ResEdit supported by Apple was published in 1994, and the proprietary program (see glossary, p. 601) was not originally installed on the computer used for the installation.

9 The PICT format is a graphics format developed by Apple. Due to the fact that it is widely used, the format continues to be supported; however, with the introduction of the operating system Mac OS X, it was replaced by the PDF format.



Start-up of the work after
14 years in the depot
Photo © ZKM|Karlsruhe

The software documentation compiled provides information about the operating system used (Mac OS 7.5.3), the programs or files necessary for the presentation of the work, and their locations. In addition, the software documentation contains instructions for the obligatory annual activation of the program by way of a key generator,¹⁰ which the artist was so kind as to hand over during the research project. A list of the files used by the program provides information about media type, storage location (by means of the list of absolute pathname), the file size, and the file extension. In the specific case of the file *cacheporte*, the information is registered as follows:

- Media type: image file
- Storage location: Macintosh HD:Desktop Folder:Raoul Pictor_Frac
Alsace:cacheporte¹¹
- File size: 16 KB
- File extension: none¹²

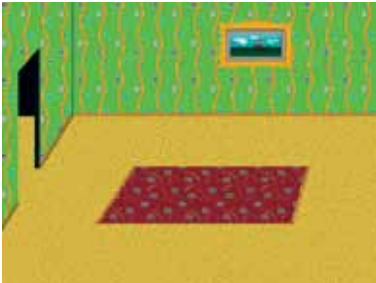
10 Key Generator is a program that issues a licensing key with which the software can be activated. In the case under consideration here, it concerns the executable file *Proj.ControlCode_Frac*.

11 The pathname is listed according to the operating system or the operating system shell.

12 The classic Mac OS operating systems do not associate files with the corresponding programs on the basis of the file ending. This information (the file type, for example) is deposited in the resource fork.



Screenshot of the software ResEdit



The picture file *atelierorig8* together with the file *cacheporte* build up the background of *Raoul Pictor cherche son style ...*

© Frac Alsace

Conservation

After Frac Alsace purchased the installation, the display case in which all the components were housed was kept in the depot. Before the *digital art conservation* project made its first assessment of the work the installation had already been put into operation by a representative of the Frac Alsace collection. At the time an apparent defect in the monitor was detected. In the instruction manual of the Apple Monitor LC 475, this was described as follows: “Screen is dark, audio and at least one drive operate, fan runs, and LED is lit.”¹³ This problem is frequently discussed in various Internet forums, for example, in MacUser.de (“reviving Mac LC 475”¹⁴). The manufacturer’s support pages also address this problem, although the model is obsolete and has been out of production since 1996 (“The loss of video signal on some Macintosh computers can be caused by the lithium battery, on the logic board, having a low voltage.”¹⁵).

After checking the back-up battery, the voltage of which amounted to less than three volts, this lithium battery was exchanged and it was possible to boot the computer. The monitor then played back the video signal without a problem. After reentering a number of system settings, such as the current date and time, the work was put into operation once again following the handbook written by the artist, after fourteen years in the depot.

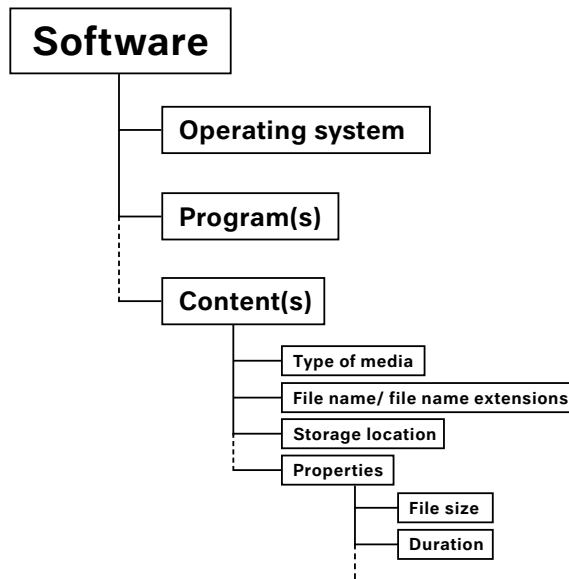
However, in order to be able to analyze the installation, two further obstacles had to be overcome. The program – generated on the basis of a Macromedia-Director projector file,¹⁶ with the version 4.0.4 – could be started, but promptly issued an error message, which requested that a new licensing code for the work be obtained from the artist (also displayed were the artist’s telephone and fax numbers, as well as an email address). Without valid codes – they expire one year after acquisition of the license – the program only runs in demo mode, and it is not possible to print out any dated “paintings.” The following message is displayed: “You’re not a registered user! If you register, you’ll get wonderful paintings.” It is also not possible to access the program’s menu or change the parameters for the productivity, output rate, and volume of the work in the submenu “Settings.” Only after entering a valid code does the printing out of the graphics become possible once again.

13 Apple Inc., *Service Source Macintosh LC Series/Quadra 605*, available online at: http://tim.id.au/laptops/apple/legacy/quadra_605.lc_series.pdf, accessed 05/24/2013.

14 MacUser.de, *Thema: Mac LC 475 wiederbeleben*, available online at: www.macuser.de/forum/f11/mac-lc-475-a-574254, accessed 05/24/2013.

15 AppleInc., *Macintosh Computers: Low Battery Can Cause No Video*, available online at: <http://support.apple.com/kb/TA35928>, accessed 05/24/2013.

16 See Cyrus Dominik Khazaeli, *Multimedia mit Director. Projektplanung und Interfacedesign für Mac und PC*, Rowohlt, Reinbek near Hamburg, 1998, p. 250.



Surprisingly, at this point it was ascertained that a printer driver was missing, which leads one to assume that the work was put into store directly after purchase, without its functionality having been tested. Installing a printer driver onto an obsolete computer can prove problematic, because current interfaces cannot be used for this.¹⁷ However, once the relevant driver on the customer service page of the manufacturer Hewlett-Packard (HP) was downloaded, the driver was successfully transferred to the original computer, albeit using an external SCSI hard disk.¹⁸ Furthermore, in addition to a functioning hard disk and cable, a so-called terminator was required (used to terminate the SCSI chain).

Once the installation had been restored to an intact, presentable condition, initial measures were implemented at the ZKM | Center for Art and Media Karlsruhe in agreement with Frac Alsace to ensure long-term preservation of the work. However, the implementation of these steps was once again hindered by the artist's precaution. Because Graumann had made a backup of his work with the data protection program FileGuard from the manufacturer Intego, neither a disk image¹⁹ (see glossary, p. 600) of the original hard disk could be created, nor the necessary files copied onto an external storage

17 For example, Apple first switched to the USB interface with the introduction of iMac in 1998, thereby replacing the in-house Apple Desktop Bus (ADB). See Dwight Spivey, *Mac Bible*, Wiley, Hoboken, 2009, p. 17.

18 The Small Computer System Interface (SCSI) is a standardized memory bus, which can serve to connect to external periphery devices, such as hard disks.

19 See FileInfo.com, *Disk Image File Types*, available online at: www.fileinfo.com/filetypes/disk_image, accessed 05/24/2013.



Presentation of the app for iPhone-/ iPod touch in the exhibition context.
Installation view *Digital Art Works. The Challenges of Conservation*, ZKM | Media Museum
Photo © ZKM | Karlsruhe
Photo: ONUK

device. Fortunately, Graumann had copies of these files, which he had carefully archived as non-copy protected duplicates on a storage medium, and willingly made these available to the project team.

With respect to Frac Alsace's IT infrastructure, which is not oriented toward preservation of digital art, several alternatives were considered in order to ensure the continued existence of the installation in this collection in a functioning and authentic condition:

After purchasing various replacement devices,²⁰ an Apple Macintosh Performa 475, an equivalent model to the Apple Macintosh LC 475 originally used, was configured with the same operating system and the necessary files. Files that could not be copied due to the FileGuard protection were replaced by the files supplied by Graumann at the original location within the file system. The key generator was also transferred, since this is necessary in order to generate the annually required codes for the license extension. After

20 Replacement devices are certainly still available for purchase, for example, on eBay where they cost between 15 and 45 Euro.



Error message of the file protection program FileGuard in French, screenshot

a successfully completed function test, a disk image of the hard disk was generated. Should one of the components fail, for example, during an exhibition, there is the option of immediately replacing the part in question. Further interventions by the museum personnel will not be necessary, since – like the original computer – the newly installed computer has also been prepared for museum presentation, and only requires simple on and off routines.²¹

In order to facilitate a replacement as soon as possible after a hard drive crash, another hard disk was given to Frac Alsace. Exchanging the hard drive was rehearsed and the functionality of the replacement hard disk was tested. Additionally, a disk image was given to Frac Alsace as a DMG file, which serves the redundant data backup (see glossary, p. 601).

Graumann originally created this work with the authoring system Macromedia Director.²² To this end, the artist taught himself the programming language Lingo, which he says “allows beginners to program in a relatively simple way.”²³

As already mentioned, all that was found on the computer prepared by the artist was the projector file *Raoul Pictor* that can be executed as an independent program, and can also run without an installed version of the authoring system. However, such a file does not permit more detailed insight into the work’s development process, such as the programming. For this, one has to consult the original project file in DIR format, which was used to compile²⁴ the program. Thus, after it has been created, such a project file cannot be modified any more, but only called up.²⁵

For the presentation of the installation, two image files are essential: *atelierorg8* and *cacheporte*. Further, these files make it possible to distinguish between the various editions of the works. Both image files are so-called external files, the location of which should not be changed because otherwise their connection to the projector file is lost.²⁶ This possibility is eliminated by creating a disk image as an additional conservation measure. The disk image is a complete copy of the data medium with respect to the file system structure.

21 Programs that should run without manual intervention after the computer is booted, can be defined as start objects. See David Pogue and Joseph Schorr, *Macworld Macintosh Secrets*, IDG Books Worldwide, Foster City, 1997, pp. 190–191.

22 Macromedia was taken over in 2005 by the North American software company Adobe Systems.

23 See the excerpt from the interview with Hervé Graumann conducted by Pascal Bion, Nelly Massera, and Arnaud Obermann, 06/27/2011, this volume, pp. 361–364.

24 In principle, the translation of the program code into the machine language (see glossary, p. 601) of the processor is carried out when compiling. The result of this process is an executable program.

25 See Khazaeli 1998, p. 250.

26 Ibid.



Hervé Graumann
Raoul Pictor cherche son style ...
 2006
 Web application
 Screenshot
 © Hervé Graumann

Conclusion

In order to guarantee the most authentic presentation of Hervé Graumann's work *Raoul Pictor cherche son style ...* (1993–1997) in the future, and thus to preserve the look and feel (see glossary, p. 600–601) of the work, it is recommended that the hardware preservation measures (see glossary, p. 602) outlined here are followed.²⁷ In this work both of the peripheral devices – inkjet printer and CRT monitor – are integral elements of the sculptural perception of the work. Should these devices fail and be exchanged by equivalent but not identical replacement devices,

the authenticity of the appearance of the installation is jeopardized.

The conservation and usability of the printer – which played a secondary role in the context of this research project, but which is essential for the work of art as a whole – has to be guaranteed for an authentic presentation of the work. Several identical replacement devices as well as compatible ink cartridges were located and purchased on the secondhand market (via eBay, for example). One advantage of the printer model used for the work is that the printhead is integrated in the ink cartridge. A clogged or damaged printhead can therefore be remedied simply by changing the cartridge. For the future, the use of refillable color cartridges should be considered.

Thanks to the fact that the installation's devices were originally very common and popular, although they are obsolescent, all elements of the installation can still be purchased secondhand. At the same time, one must not overlook the fact that the technical components still only have limited lifespans. What remains unclear is how long the conservation measures carried out as part of this project will ensure the preservation of the work. Even unsuitable storage can have drastic consequences: oxidation, corrosion, and UV radiation all accelerate deterioration of the installation and shorten the period in which the work can be presented.

The potential failure of the computer, which would necessitate replacement by an up-to-date model, would represent a considerably more complex problem. As one solution, emulation (see glossary, p. 600) appears to be unproblematic; however, connections to the peripheral devices would make additional interventions necessary. The printer, for example, is connected via proprietary, serial interfaces of the manufacturers.

27 Pip Laurenson summarizes the significance of the look and feel for a work of art as follows: "Aesthetic integrity relates to the look and feel of visible components and the outputs of the system (i.e. qualities of the sound and image). Historical integrity refers to links made by the visible components and discernible outputs of the system to the time the work was made." Pip Laurenson, *The Management of Display Equipment in Time-based Media Installations*, available online at: www.tate.org.uk/file/pip-laurenson-management-display-equipment-time-based-media-installations, accessed 05/24/2013, p. 3.

Graumann has consistently sought to preserve his work concept. As mentioned above, in 2006, in addition to the original installation, he created a web application²⁸ for which he learned the programming language ActionScript as well as Lingo, and in 2009 he developed a Raoul Pictor app for iPhone and iPod touch²⁹, for which he enlisted the services of a programmer. In both cases, this involved reinterpretations (see glossary, p. 601) of the original work that reflect the technological zeitgeist of the era when it was developed, which is certainly seen through critical eyes by the artist.³⁰

With the purchase of the replacement devices and their adaptation for museum presentation, the preservation of the installation is guaranteed for a limited period of time. In addition to the artist's efforts for a contemporary presentation of the work, it was necessary to take steps for conservation of the original digital objects, whereby in the final analysis the risk of data damage and data loss can be minimized. Institutions, which do not have the possibility of carrying out a redundant data backup ought to consider the alternatives so as to ensure the continued existence of the digital artworks in their collection.

Translated from the German by Justin Morris

28 The Web application is available online at: www.raoulpictor.com, accessed 05/24/2013.

29 The development environment Xcode was used for creating the app. According to information provided by the artist, programming was done in the language Objective-C. For iPhone and iPod touch app, see also footnote 6.

30 See Bion, Massera, and Obermann 2011, excerpt, this volume, pp. 361–364.

Raoul Pictor cherche son style ...

An Interview with Hervé Graumann

Pascal Bion, Nelly Massera, and Arnaud Obermann

Excerpt from the interview conducted on June 27, 2011, at ZKM|Karlsruhe

How did *Raoul Pictor cherche son style... come into being?*

Hervé Graumann: To answer your question I'll have to take a shortcut, because between the moment when I started handling a mouse, opening files and copying stuff onto floppy disks, and the beginning of the development of *Raoul Pictor cherche son style... [1993–1997]* five years later, I began, for example, to print on a friend's laser printer lines and grids which I then transferred onto photogravure plates. Using a typographic printing process that involved several plates, I integrated the grids created on the screen with an engraving. In other words, I incorporated lines produced on the computer in the traditional engraving process. Exchanging a burin for a keyboard – that was the first big step, a considerable evolution. Then in 1993 I bought an ink-jet color printer. I already owned a small Mac, an LC [Macintosh LC], with a 12-inch color screen; I now had the printer [HP Deskjet 500c] as well. A whole factory on my desk! Perhaps that had already been the case with my Amiga [Commodore Amiga] but I felt I now had a complete system: a color printer and a color screen. I told myself I really needed to do something with it, and that it could be interesting.

The idea of the figure of the painter in his studio is a very familiar subject in painting – see, for example, *Las Meninas* [Diego Velázquez, *Las Meninas*, 1656, Madrid, Museo del Prado] – came to me very quickly. I knew it was a machine that could be programmed and could work in a non-linear way – that was the important point – and that it could mimic life, well, almost ... because

we tend to think the more something is technological, the less it's organic. Here, the fact that it didn't have to be linear offered that touch of the unexpected which no system, apart from analog systems, could offer at that time. Like when I put a brush on the end of a piece of string and I'm not sure what's going to happen. In this case I made a little studio with a painter in it, and I tried to make him function, and do things, without knowing what the result would be – until the virtual painter completes his painting and the printer delivers an original, unique, signed “painting.”

What interested you about working with computers?

Curiosity, and the aspect of novelty. When files or software are involved nothing is easier than to make a copy – an exact copy of the original. A radical paradigm shift was taking place. Also, programming something seemed very interesting; it was basically like making a logical sculpture. I'm certainly no programmer, but starting with a date and a name, thinking about it, coding and decoding and seeing that it worked, that you're making something that functions properly – that was great fun. Only those new devices allowed you to do that. And you can also play around with images and bits of text.

I also found that the computer seemed to embody a kind of indifference. That seemed to derive from a sort of ability these machines have to treat text, numbers, images, and sounds without differentiating among them. Since it was all a matter of 0s and 1s, everything seemed

to obey the same rules. It was a new sort of system with which you could do anything you liked. I found that indifference beautiful, and I wanted to feel just as free myself in relation to traditional media, to be able to work with painting, objects, photography, or pixels.

And also curiosity about our relationship with reality, which seemed to be changing. I have never seen myself as a “techie” artist or someone who makes exclusive use of digital tools, probably due to lack of technical competence. When I was making paintings, it also involved this machine, arranging colors in alphabetical order in different languages, for example, or including a database or a spreadsheet in the painting. It was a machine that seemed to enable me to interrogate the world with a new imagination, to think about reality and history.

What steps would have to be taken if in the future the components of your work are no longer replaceable?

I’m here to discuss that very question, in fact, and I don’t think I have ever really discussed it in connection with this work. I have described problems of that kind, but for other installations, especially *Yes or no?* [1999/2000], which used lamps. I recommended that they buy a large quantity of incandescent light bulbs, because the time the energy-saving ones take to light up would spoil the way that installation works. We are all in the same boat: the work belongs to you (or more correctly to the Frac Alsace). I believe that whoever buys a piece ought, in principle, to maintain it. But we don’t really know what collectors do with the works they acquire. We’re never safe from the risks of humidity, or a flood, and these works, recent as they are, soon become obsolete.

Are some of its components replaceable?

Yes, I was just thinking about that. One time when I was moving house, I threw out the grey table [he is referring to the grey table on which *Raoul Pictor cherche son style...* was presented when it was first exhibited in 1993] and yet I liked it a lot! I felt that table could well have had its place in the studio of a painter who wears a beret. We used to do our work on a table, and now we do it on a computer placed on a table. Having said that, I think you can still find old prewar-style tables like it, but that one was the original – or perhaps the “originating” – stand on which I showed my installation for the first time. A table like that can easily be replaced by another, I’m not too bothered about that.

Would it be possible, then, to replace some components of the work by ones that were the same or nearly the same?

We were talking just now about a 12-inch screen because the first version of my installation was on a 12-inch. This question of screen size arose very early on: the first version of *Raoul Pictor cherche son style...* on the 12-inch screen [512 × 384 pixels] had hardly been written when the 14-inch [640 × 480 pixels] screens came out, and the 12-inch weren’t being made any more. I felt it was essential that the image of the studio should fill the whole screen. If the 12-inch version was shown on a 14-inch screen there would be a black border round the image, and that meant it would already have been restored. Adapting it for a 14-inch screen helped me learn a bit more about programming and bring it up to date. So yes, I feel it is a good idea to keep the original version for as long as possible, because it is instructive to see these machines and the way things worked at the time. There is

perhaps an element of nostalgia in seeing those low-definition images.

**What happens when the elements
can no longer be replaced?
Is that the end of the work?**

No, not necessarily, that is another reason why I have always adapted this installation. Adaptation is a way of conserving it and at the same time exploring new possibilities offered by the way the technology has developed. Even though a printer isn't necessarily present with the iPhone version, I show that the original consisted of a computer connected to a printer. People can picture the original installation with the help of a document which also contains the programmed piece of animation, which is more or less original, and can also be the subject of evolution. You could also make a more realistic animation, but it is not obligatory. It is often on account of the colors that I have defended this aspect of "animation." Screens have amazing colors, if you want green, you put a bright green, if you want pink, you put a bright pink. And the painting is in 2D. Insert a more realistic figure? And that might make you want to make a version that was more "ghost-like", with a realistic figure who was there, living and performing on the screen.

But then again, I've also noticed that most of the people who look at it don't see the non-linear element, and think the painter is going to take a drink before going to read. He sits down, takes a drink, paints, and then goes out. I have found that some of the limits of nonlinear programming lie in the fact that people often don't notice it, and that's a pity, in the sense that they might think this was a traditional animated film, for example. But I admit it's probably true that the difference between painting and going for a drink, or going for a drink and painting, isn't very great (in terms of animation). Except

that it is fun to be able to do it in an aleatory way. In the iPhone version [2009], the painter still begins by painting, for reasons of timing: he has to go and paint at least once, so he goes straight to his easel, while that wasn't necessarily so in the previous versions. That's due to the length of the painting "session," which is one minute on the iPhone and more like four or five in the installation.

**Was the iPhone application
designed as a conservation tool?**

Something like that, yes. But I would still like to have taken more advantage of the specific possibilities of that device. While I was in China, I had a Chinese assistant make oil paintings of a number of images derived from the application. Why not implement a direct command? There would be no further need for a printer, there would be a painter connected directly to the apparatus! These are questions that had perhaps not been posed before. The idea was that the iPhone application should also contain something of the work's history [in the application there is a "chapter" that documents the different versions of the work]. This probably helps to contextualize the object, because the App Store is not a cultural space like a museum: when an object is exhibited in a gallery or a museum, it's immediately seen as art, but one can't be sure when it's presented somewhere else. I have also realized that this project has taken the form of a Russian doll, except that it's the physically smallest element that contains the larger ones. And it's also practical, you can slip it into your pocket!

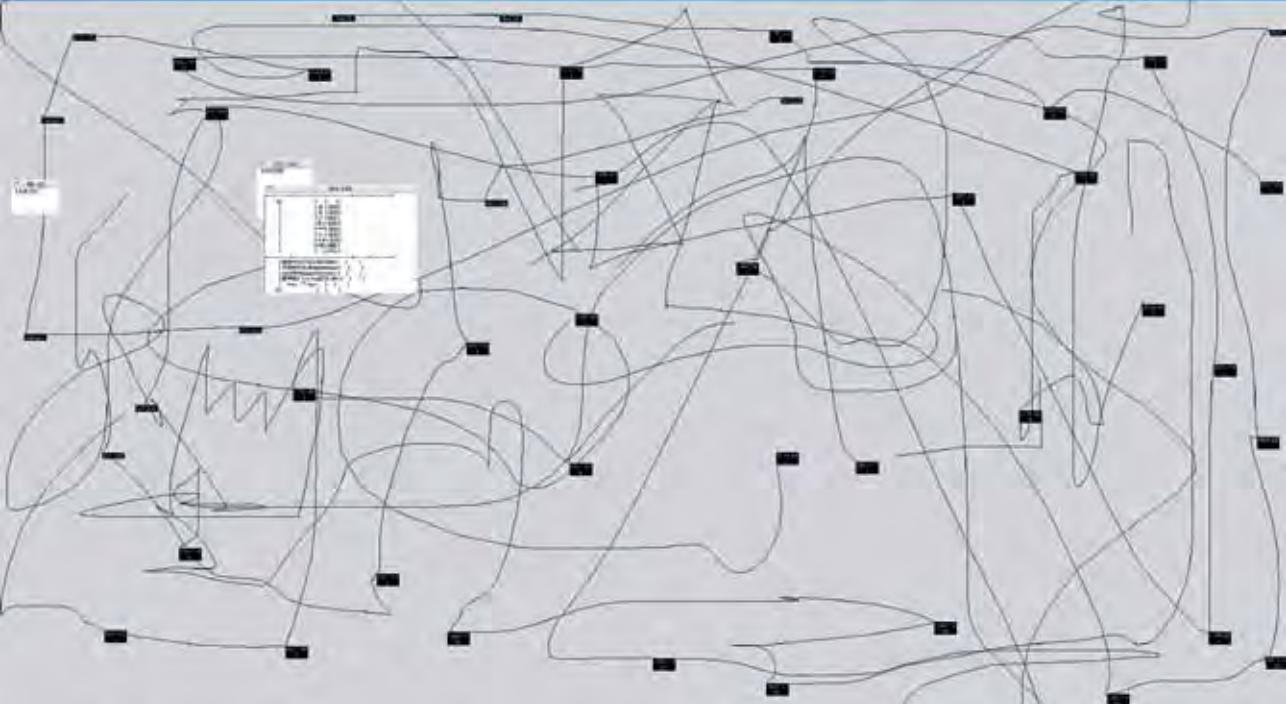
**The work has not been presented
to the public for a long time...**

That's one reason why I've perhaps continued to look for other avenues. It's not so much that a

work of this type has to function at all costs, but a painting has its own independent existence. In contrast, these objects are like people in their first or their third age: you have to give them a bit of support, plug them in and switch on the power to make them work. And only human beings can do that. And I'm not saying that a painting hangs itself on its own, but there are all these adjustments, the connections, the ink, and so on. There are more parameters: there is, in fact, at any given moment, a responsibility to keep the object working if you don't want it to deteriorate for lack of maintenance; but above all, if the installation is working, you shouldn't look for ways of updating the system. These are specific everyday devices in which software is installed, the device in itself is not the work, just as the canvas is not the picture, but the two are

connected. But these sophisticated machines are delicate. You buy a car, you drive it, and once it's had it, you accept the fact. You can always take everything out of the glove compartment, buy another, and drive it away. Computers keep changing their systems and applications may not run on a new machine. Traditionally, one would like works to survive over time. With works of this type you have to accept that that's the way they are: you operate them and you look for spare parts to make them work longer. That said, I've always imagined that if the installation were no longer to exist, a piece of it, a trace, would survive, in the form of the abstract printed images it once produced. Until they disappeared, too.

Translated from the French by Imogen Forster



JODI
OSS/.....
1998–2005
Screenshot of the CD-ROM version

**JODI (Joan Heemskerk, born 1968, Kaatsheuvel,
Netherlands and Dirk Paesmans, born 1965, Brussels,
Belgium)**

OSS/....

1998–2005

Collection of Espace multimédia gantner,
Conseil général du Territoire de Belfort, Bourogne, France

Hardware:

- 1 CD-ROM (Mac OS X/PC Windows)

Software:

- 3 programs designed using Adobe Director MX 2004
(.... in the version for OS X, #Win in the version for
Windows, #Reset and %20)

Conservation strategies:

- Migration
- Porting

Documentation:

- Anne Laforet
- Valérie Perrin

Text:

- Anne Laforet

The case study foregrounded the specific features of *OSS*/..... One of these is that the work is designed to be viewed on personal computers, not in a museum environment. Another is that the programs can only be preserved in conjunction with the modes of access to them, which are specific to the work, and in keeping with the type of experience the artists seek to create in those who interact with it.

Work description

oss/.... is a work on CD-ROM by the two artists known as JODI, which consists of three programs: (or #Win in the version for Windows), #Reset and %20. The artists presented two versions: one on CD-ROM (dating from 1998–2005, part of the collection of Espace multimédia gantner and the subject of this case study) and an online version accessible at <http://oss.jodi.org/>.

oss/.... explores various physical components of a personal computer – the screen, the mouse and the keyboard – using the different programs on the CD-ROM. The default interface of the computer is transparent, and the user just clicks directly on the programs to launch them.

The program, running under Mac (or #Win under Windows) features the mouse: lines traced by its movement, its position whenever it stops, windows with illegible fragments of text, opening at inopportune moments, syllabic sounds, and so on. The title *oss/....* refers to the way passwords are generated. #Reset offers a variant of the screen: lines scroll down, grey, white or black depending on the mode and speed, following a time lapse and interaction with the mouse. Lastly, %20 (from the source code [see glossary, p. 602] representing a blank space in a URL) focuses on the keyboard and its relationship with what is happening on the screen: the program takes a screenshot of the desktop and transforms its appearance according to parameters activated by different keys. The changing rhythms to which the sound and the images (which are often stroboscopic) move, tend to make users feel confused and doubtful about the state of their own data, while at the same inviting them to enjoy exploring the effects devised by the artists.

Art Historical context

Joan Heemskerk and Dirk Paesmans, who are JODI, are two of the first artists to be associated with net art, that is, creation of art by and for the Internet. JODI are interested in the dramaturgy of the personal computer. Since the mid-1990s, they have systematically deconstructed the conventions of contemporary IT practice. In their methodical exploration of the Internet and the

JODI
oss/....
1998–2005
Screenshots taken when
running the program
...., which visualizes
movements of the computer
mouse by lines or position
coordinates.



JODI
 OSS/•••
 1998–2005
 Screenshot taken when
 running the program #Reset
 which is activated by use
 of the computer mouse and
 offers a variant of the screen
 as component of the PC.



computer the artists turn back to front and upside down everything they encounter: they play with browsers (% *WRONG Browser*, 2001¹), operating systems (*OSS/•••*²), web design codes (for example, % *Location*³), and games interfaces, such as *SOD*,⁴ which modifies the *Wolfenstein 3D* video game, or *Jet Set Willy Variations* ©1984, in which emulators transform a game designed for a ZX Spectrum computer. More recently, they have hijacked Web 2.0's flagship sites and applications, and have exposed the APIs (application programming interfaces) of Blogger (Google's blog platform), and online map sites (*GEOGOO*, 2008⁵). They have installed keyboards on skateboards, which send random messages to Twitter, generated by the skaters' movements (*SK8MONKEYS ON TWITTER*, 2009⁶) and experiment with different types of screens. They also create audiovisual performances in which they use, for example, the program %20.

OSS/••• is one of their best-known works, especially famous for its web interface. It was conceived as an example of a work that deconstructs human-machine interfaces, and has attracted widespread comment, in many texts and critical publications on digital art. It is a work that has inspired others, in particular *sOS* (2001–2008) by Jon Satrom and Ben Syverson, which JODI mentioned at the conference *Digital Art Conservation. Practical Approaches: Artists, Programmers, Theorists* in Strasbourg. The aesthetics of perturbation

1 Available online at: www.wrongbrowser.com/ or <http://wrongbrowser.jodi.org/>, accessed 07/15/2013).

2 Available online at: <http://oss.jodi.org/>, accessed 07/15/2013.

3 Available online at: www.jodi.org/, accessed 07/15/2013.

4 Available online at: <http://sod.jodi.org/>, accessed 07/15/2013.

5 Available online at: www.geogoo.net, accessed 07/15/2013.

6 Available online at: <https://twitter.com/sk8monkey>, accessed 07/15/2013.

that characterizes JODI's approach is the inspiration for the aesthetic of "fun," of play, that is seen in *sos* (which, ironically, stands for Satromizer OS, an operating system based on the effects created by Jon Satrom). *sos* is an operating system for art designed for use on an iPad, based on the idea of the artistic "glitch," or malfunction. While *sos* is in some ways like a conversation with *oss/....*, it is in no way a version of it; the two works are not alike in either their concept or the way they were made. *oss/....* was awarded the International Media Art Award at ZKM | Karlsruhe in 1998.

Provenance

oss/.... is part of the collection of Espace multimédia gantner (Bourogne, France) and was acquired on CD-ROM in 2005. This version is already up-dated because the original no longer worked at the time of purchase (the Mac OS 9 operating system, on which the first version was created, was already obsolete when preliminary discussions about acquiring the work were held). The migration was done by the artists themselves. Espace multimédia gantner holds publication rights in respect of this CD-ROM version, which it can add to the collection's catalog and offer copies to the public for sale, as, for example, at the exhibition *Digital Art Works. The Challenges of Conservation*.⁷ The CD-ROM is also available via the collection's reference interface in the multimedia library at Espace multimédia gantner.

Case study procedure

The case study consisted mainly of an in-depth analysis of *oss/....* that involved detailed study of the work's programs by way of a series of readings and a long interview with the two artists. Circumstances did not allow the source code to be studied, and it was not possible to organize any form of preventive conservation. However, the time-span of the conservation process still exceeds that of the *digital art conservation* project, and will allow further work to be carried out.

Documentation

oss/.... was originally a CD-ROM distributed free with the Dutch magazine *Mediamatic*,⁸ which was then adapted by the artists in the form of a website.⁹

The CD-ROM user interface is "transparent" by default, in contrast to the interfaces of the 1990s that frequently offered a browsing experience which was unique and content-specific. The interface of *oss/....* creates the

7 *Digital Art Works. The Challenges of Conservation*, ZKM | Karlsruhe (Germany), 10/29/2011–02/12/2012; Espace multimédia gantner, Bourogne (France), 02/25/2012–04/28/2012; CEAAC, Strasbourg (France), 06/16/2012–09/23/2012, and House of Electronic Arts Basel (Switzerland), 01/18/2013–03/31/2013.

8 See *Mediamatic*, vol 9, No. 2/3, "The context issue," 1998, available online at: www.mediamatic.net/8424/en/the-context-issue, accessed 07/15/2013.

9 Available online at: <http://oss.jodi.org/>, accessed 09/14/2013.

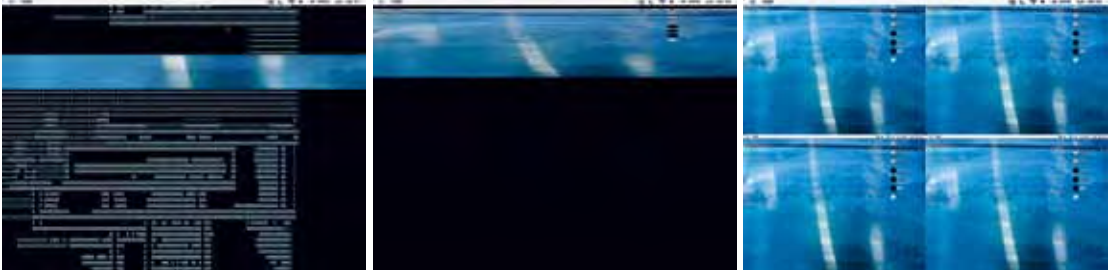
impression that it is a CD-ROM that has just been burned (for back-up and storage purposes), and that the user is “inside the artists’ computer” at the moment it is being burned. The first version (1998), which ran under Mac OS 9, was different to the one reprogrammed in 2005: in addition to the three folders containing •••, #Reset, and %20, it also included a large number of empty, untitled folders (with the default icon for Mac OS 9 folders), which added to the user’s confusion. The sort of manipulation that made it possible in 1998 to burn whatever was happening on the desktop was no longer available when it was updated in 2005; although the artists consider this loss acceptable, they regard the 1998 version for Mac OS 9 as the original. Another difference between the two versions for Mac is that the Mac OS X version has a menu bar, unlike the version for Mac OS 9. As far as the programs running under Windows are concerned, in addition to the different name given to one of them (#Win, in place of •••), they are not exactly the same as the Mac version: they exploit some aspects of Windows (such as the screenshot which includes elements that “spill over” the desktop, causing glitches) which seemed strange and interesting to the artists while they were experimenting and working on the first version of OSS/.... This process involved about a year’s work.

Further, the default icon of the programs is not that of pieces of software made using Adobe Director, but consists simply of a large black dot. It is a reference to the dot (•) in the title of the work, and to the dots used to conceal passwords.

The CD-ROM does not have a sleeve, but is simply a white disk marked “OSS/....” to preserve the mystery of what it contains.

After producing several thousand copies of the CD-ROM as giveaways with *Mediamatic* magazine, JODI wanted to adapt the work for the Internet, and they wrote programs for a special interface to download the programs. The “translation” of the CD-ROM’s transparency took the form of making the browser and the Internet disappear, in order to create, in a way that was identical to the programs, a dramatic situation directly on the desktop of a personal computer. Opening the URL <http://oss.jodi.org/> means that the web page “shrinks” and becomes a black square of 100 × 100 pixels before it generates a large number of pop-up windows that are animated in a stroboscopic choreography and the browser has to be closed hastily to stop the “ballet.” While all these pop-ups are dancing about, the three programs are automatically downloaded, separately, with file names that appear to be random. The online program checks which operating system (Mac or Windows) is being used and selects the appropriate version of the three pieces of OSS/.... software, which are then downloaded to the desktop of the computer.

The work is designed to be watched on the users’ own PC; they have to experience it using their own data in order to create a personal relationship with it. The artists want to create surprise and confusion, and to play with the



JODI
OSS/....
1998–2005
Series of screenshots
taken when running the
program %20; it takes
screenshots of the
desktop and converts
them analogously to
the input signals of the
keyboard into visual
effects.

idea of a degree of anonymity. That is why, for example, in the exhibition *Digital Art Works. The Challenges of Conservation*, the work was not presented on a computer: a demonstration of the programs by the artists was shown and CD-ROMs were made available to the audience.

One of the difficulties regarding documentation concerned interactivity. This involves human–machine interaction, with different modalities for each of the three programs. Without such interaction on the part of the user, nothing happens: in the case of and #Reset, the user has to click with the mouse, and with %20, they have to use the keyboard. While it is possible to identify the mode of interaction of each program, it is rather complicated to document in detail. Thus, with %20, it is not easy to decide whether the visual or auditive changes are the result only of interaction with a specific key, or if other random elements come into play. Pressing a particular key may change the display, but repeating the operation a little later may not necessarily produce the same result. All of this contributes to the confusion that the artists wanted to create with this work.

Conservation

Condition of the work at the beginning of the project:

At the beginning of the case study, the work ran under the Mac and Windows platforms for computers that were contemporary, or slightly older. JODI had developed an “aesthetic of dysfunctionality” by doing things that are the opposite of standard IT practice. This practice was still sufficiently contemporary (new procedures have obviously emerged since 2005) for the artists’ work still to be readable – and appreciated – by computer users and those with an interest in digital art. The programs could be executed and understood, both technically and conceptually, by those who wished to experiment with and/or experience them. At the same time, some elements that were beyond the artists’ control meant that the “good condition” of OSS/.... had become precarious. The way in which it was disseminated (that is, the degree of surprise and confusion involved in accessing the programs, whether via the CD-ROM or the website) was as important as the programs themselves. Many computers on the market no longer have a CD-ROM drive, while web browsers have by default added functions that interfere with what the artists were



CD-ROMs of the work
OSS/.... (1998–2005) by
 JODI
 Exhibition view *Digital Art
 Works. The Challenges of
 Conservation*,
 ZKM | Media Museum
 Photo © ZKM | Karlsruhe
 Photo: ONUK

trying to do with the interface of the website <http://oss.jodi.org/>. Contemporary browsers such as Firefox, Safari, and Chrome block pop-ups by default, which prevents the windows on the web page moving according to a regular pattern. That function can, of course, be deactivated, but that entails the user's knowing beforehand that the site consists of pop-up windows, which diminishes the effect of surprise and confusion. In addition, browsers now routinely open a dialog box before each file is downloaded; here again, this function reduces (if only partially) the sense of disorientation and wonder that the two artists wish to create in the user. And the fact that *OSS/....* has become well known also contributes to the loss of these effects for users who may have read or heard about the work. Nevertheless, the personal relationship of users with their machines and the way in which *OSS/....* affects them are still important.

Conservation concept:

OSS/.... still works, although it is hard to know at what point it will no longer be possible to run it. The work is closely linked with the computers that were contemporaneous with it, including their social and technical contexts. Its three parts explore the components of personal computers as they became widely used in the 1980s; that is, a microcomputer with a central processor, as well as interfaces for data entry (a keyboard and mouse for standard entry) and output (screen and printer for standard output). A portable computer still retains the distinction between these three elements, but this is no longer the case with tablets or smartphones. With these devices, the screen, keyboard and mouse, which JODI have explored and deconstructed in making this work, lose their autonomy. The physical and ergonomic aspects that the two artists brought into play have disappeared in favor of other practices and ways of working; for the artists, this does not amount to an acceptable alteration, but represents a demarcation line between what is the work and what is not.

Less crucially for conservation, the equipment used to experience the work exerts an influence on it. The type of screen, whether analog (and large) or digital (and flat), affects the way a program is displayed: the appearance of the lines is actually different. The *#Reset* program, for example, produces glitches on a CRT (cathode ray tube) monitor (see glossary, p. 599), but not on a flat screen. The work was originally programmed on an analog monitor, and when it was reprogrammed at the time it was acquired in 2005 no particular account was taken of differences in the screen display, especially as flat screens were not the norm in the early 2000s.

If it were the case that the work could be shown only on a dedicated computer in an institution, rather than being executable on the user's personal computer, its "life expectancy" could be prolonged, since in a museum setting

it may be possible to continue to use pieces of older equipment (especially generic ones, like those on which *OSS/....* can be run) by replacing elements that no longer work and making repairs wherever feasible.

Similarly, the existence of emulators for Mac and Windows platforms makes it possible to show the programs on machines that have more recent operating systems. The current popularity of these two operating systems leads one to imagine that they will be available in the future. However, emulators of these platforms are not at the moment used sufficiently widely, and are not available by default on current computers, or even easily downloadable free of charge, as are, for example, emulators of platforms that are obsolete but still productive for old video games and maintained by communities of enthusiasts. These are the conditions under which emulation could be a suitable strategy for *OSS/....*. Otherwise, the software would have to be specially installed, and this would involve having specific expectations, instead of being surprised by a program as the artists intend. The personal relationship with the work that JODI envisage does not (at its most effective) involve a nostalgic return to an old digital environment, but a relationship in the present that involves one's normal working environment, data, and habits, all of which are disturbed and called into question by *OSS/....*. This is the characteristic of the work that featured prominently in critical discussions and users' experiences, especially when it first appeared, in the late 1990s.

Since emulation (see glossary, p. 600) is not an option in the short term, solutions such as reprogramming or porting (see glossary, p. 601) the work have to be considered. The work could not be migrated (see glossary, p. 601), because the Adobe Director software with which *OSS/....* was designed is no longer being developed. In addition, at the moment only the artists possess the source code for this work. This source code is specific to Director, and the Lingo script language is not compatible, as such, with a different programming environment. During the interview with the artists, JODI mentioned that Flash, which is also developed by Adobe (previously by Macromedia), could provide an alternative for reprogramming, since in their opinion the program is fairly simple (one of Lingo's features is a syntax that is simple and easily read by English speakers). Further, Flash is no longer limited to vector graphics, as it was in its early days. However, Flash is proprietary software, and its development could be halted at any time, as happened with Director, in line with commercial policy or in response to the emergence of other programming practices. A free, open programming environment would mean that this dependence could be reduced, but still without resolving all the problems inherent in obsolescent data.

The three programs (.... in the version for OS X, *#Win* in the version for Windows, *#Reset* and *%20*) were written in different modes which have to be taken into account when they are ported to another programming environment. For example, *%20* is programmed in the following way: when it is

launched, the software first makes a screenshot of the computer's desktop (in the current version, this is done using an "xtra" in Director, a library added to perform a supplementary function). It is this image (and not the active desktop) that is manipulated by the visual and audio effects provided by the artists. Depending on which keys are activated, the image of the desktop turns black-and-white, is duplicated, moves rapidly, or even combines these various elements.

The sound created by the different programs consists of frequencies that change according to the human-machine interaction; they are sounds produced by the machine, with different modes of amplification and modulation. Some external sounds – short samplers of phonemes – are also present in

The artists want to be involved in any porting operation; first, because they own the source code, and second, because they are in a position to appraise certain elements, such as the speed of this or that action, regardless of whether the porting is carried out by themselves or by others. Computing speed is constantly increasing, something that is in general positive for a work like *OSS/...*. Yet at the same time, some effects could be negatively affected by too high a speed, such as the stroboscopic effect caused by rapid alternation between black and white, which may become a constant grey if the change from black to white and vice versa is too fast.

Similarly, in, when the windows (full of fragments of random code) are generated, there appears to be only a few of them, because machines were slower in 2005. A solution adopted by the artists in order to provide a large number of windows is to make frequent screenshots, and to have some windows active, in front of an image of others with which one cannot interact, but which lie under the active windows. Screen resolutions have also changed, and depending on the size of the user's screen, the windows may appear in groups, usually towards the left hand side of the screen.

For the artists, the mode of access to the work is just as important as the programs themselves, and a conservation strategy specific to this work would not be effective if it only included one of these aspects. Access is independent of conservation of the programs, but unless it is preserved, this work cannot be distributed. The support on CD-ROM is practically obsolete. The "art CD-ROM," which was a rich form for creativity in its day, has almost disappeared, and the cinema, rather than artists associated with digital art, has appropriated the DVD-ROM. In addition to works on CD-ROM, in those days many magazines were distributing CD-ROMs containing demonstration versions of programs (especially for connecting with the Internet), advertising, etc. It was in this context that the first CD-ROM version of *OSS/...* operated. Online works are closest to the CD-ROM as a cultural format. The USB flash drive is not its contemporary equivalent, since it is mainly used for storage and not (or very rarely) for distribution. As long as a physical support

that is as popular as the CD-ROM does not emerge, the most suitable option for *oss/....* would appear to be the Internet. The programs are already online at the URL <http://oss.jodi.org/>, which belongs to the artists. Espace multimédia gantner has acquired the right to distribute the work on CD-ROM, but not online. This decision would seem to have the advantage of making the programs accessible for downloading, in a way that preserves the relationship between the computer and the user. Nevertheless, putting them online would require a specific device, either one designed by the artists as a new translation of the *oss/....* interface, or dedicated solely to its conservation.

Presentation of possible alternatives:

The interview with JODI (see pp. 379–382) revealed that the two artists do not always agree on potential conservation strategies. At the same time, they cannot imagine showing the work on a public computer, except as a last resort: if the CD-ROM could no longer be read, if the site was no longer online, and if the programs were impossible to execute. We would then be talking about a form of documentation of the work, but certainly not of the work itself. To show *oss/....* on a public computer with which the user had no direct relationship would be the equivalent for the artists of being interested only in its visual effects, and they are not the goal of the work, but the means of creating that relationship. It would thus be a question of using a computer dating from the late 1990s or early 2000s, with an analog cathode ray tube monitor, a central processor, a keyboard, and a mouse. It would be even more relevant to have a video of a person experiencing the project on equipment of that kind, even if nowadays these computers are obsolete and the relationship between the user and the demonstration computer would probably evoke nostalgia rather than intimacy.

Conclusion

The challenge presented by *oss/....* is to make the project visible for the public on their own machines. demonstrates the difficulty of conserving works that have a number of overlapping layers of obsolescence (programs, readers, mode of access to the data) and above all, are shown outside the institution in which one can still design a specific device, visible or not, depending on the options for conservation, curatorial decisions, and/or the wishes of the artists involved. It has to be possible to experience this project on several digital platforms, and on a variety of equipment, with a means of access to this data compatible with the approach adopted by the artists. The decision, for the moment, was not to modify the programs, or the mode of access to the work, and to see how, in the short term, digital ecosystems will evolve. The information collected for the case study will thus make it possible to carry out one or more appropriate interventions, from the point of view both of Espace multimédia gantner and the artists.

The two works in the collection of Espace multimédia gantner, JODI's *oss/••••* and Antoine Schmitt's *still living* (see also the case study, pp. 472–487), which have been studied as part of this research project have in common the fact that they were produced using the same software, Adobe Director, as were many major works in the 1990s and 2000s. Nevertheless, they each have different characteristics, as well as distinct approaches to conservation.

A solution (developed or funded by a group of cultural institutions) that would make it possible specifically to compensate for the obsolescence of Director would probably not be suitable for every program written in it, such as *oss/••••*, even though it would be a valuable tool for making data and individual works durable.

Translated from the French by Imogen Forster

OSS/....

An Interview with JODI (Joan Heemskerk and Dirk Paesmans)

Anne Laforet and Valérie Perrin

Excerpt from the interview conducted on March 3, 2011,
at Espace multimédia gantner, Bourgogne (France)

**Could you describe your work
OSS/.... and say something about
your artistic intention?**

Dirk Paesmans: The CD came with a magazine;¹ we made it specifically to be distributed with a magazine. Ten years ago, there was this trend of magazines offering free CDs. We wanted to have a kind of disc that did not say what it was: it did not say “this is going to be a video or software.” So it was a CD with a totally white surface, with no explanation on it, only a series of letters followed by password-style dots (*OSS/....*). That was a stylistic choice in a way. It was meant to look a bit mysterious. So you wanted to try out the CD-ROM, because it made you curious. And then there was this kind of personal chaos which started on your computer, where you were getting these problems with your screen, etc. And even if you didn’t know that it was part of an artwork, it did not say that it was going to do some manipulation with your desktop. So the CD-ROM could have a movie on it, or music, or some kind of graphics; we wanted it to be a surprise. The main point was surprise. We didn’t want to be mysterious – that’s exaggerated – but the truth is that the surprise element was important because we didn’t want to say to begin with that you would be surprised or you would see something strange. This is also something that we like about working with the

Web: for the user it is unclear what it’s going to be. Surprise, and then, what you get to see, what happens, once you’ve put the CD-ROM into your computer, you don’t know if this is what is meant to happen. You fear that maybe you’re looking at a real problem, a technical problem or at something that is wrong. You don’t know if that’s part of the art or not, if it’s art or not.

Joan Heemskerk: The thing is that with the CD-ROM, you put it into your own computer and so the experience is really personal: you have a one-to-one relationship. Also with works on the Web, you see the work on your own computer, it’s not a public computer in a space that you don’t care about. It’s really about the software entering your personal computer and making you think about your own computer – at least that was our idea. At that time, computers had a mouse, a keyboard and a screen, and the different parts of *OSS/....* are about the windows, the screen, the keyboard, the mouse, how it all works.

Paesmans: There are three parts [programs] on the CD: one that is really working a lot with the keyboard, one that really tries to focus on what the mouse can do, and then one that glitches²

1 *Mediamatic*, vol. 9, no. 2/3, “The Context Issue,” 1998, available online at: www.mediamatic.net/8424/en/the-context-issue, accessed 02/11/2013.

2 “This term is usually identified as jargon, used in electronic industries and services, among programmers, circuit-bending practitioners, gamers, media artists, and designers. [...] A glitch is an unpredictable change in the system’s behavior, when something obviously goes wrong.” Olga Goriunova and Alexei Shulgin, “Glitch,” in: Matthew Fuller (ed.), *Software Studies*, MIT Press, Cambridge (MA), London, 2008, pp. 110–119. The term can also be used as a verb.

elements on the rasterization³ of the screen. We had it in our mind, really, to have these three elements.

Heemskerk: No, it was more that we also wanted to discover what is a keyboard, what is a screen, and what are the characteristics of these elements.

How does the edition that was commissioned by the Espace multimedia gantner differ from the first?

Heemskerk: For the Espace multimédia gantner, we made a “2.0 CD-ROM” which is made for OS X. However, the original was for OS 9 and PC/Windows. But it did not make sense to put a OS 9 version of the CD-ROM with the catalog⁴ at a time when people already had OS X. So we updated it, but when you made a CD-ROM in 1998, it was like a blueprint of everything you had on your desktop. If you had open folders and you burnt them on the CD-ROM, at the moment where you put the CD-ROM back into the computer, your desktop is somewhat mirrored by the CD-ROM, the same folders pop up.

But at some point you also distributed OSS/... online?

Paesmans: Yes, it's still online [see <http://oss.jodi.org/>]. [...] After the CD-ROM, we tried to...

we thought that access to the CD is kind of limited because there's like thousands of copies with this magazine, so we should put it on the Web and we tried to find a similar style. First we made the CD, and then after that was finished we thought: how can we translate this confusion? How can we make it into a website? And then it became maybe one of the better websites. It closes the browser immediately, so suddenly you get only a little black square, and more of those pop-ups which start moving around. The shield of your browser is gone, you look at your own desktop, the browser is gone and there's all this stuff moving around, and you realize that it's almost in your computer.

Heemskerk: After a while, you get a pop-up message that it starts downloading.

Paesmans: And then on top of this, if you wait long enough, after two or three minutes it automatically downloads the three different programs we made for the CD-ROM to your desktop, and then, if you managed to quit your browser, you see there is something left on your desktop. And you ask yourself: “Should I open it or not?” Because it doesn't say what it is. Normally it's not safe to do that. Anyway, it's about confusion. That's why I would not want to say: we're going to make a virus or a pseudo-virus or something which is confusing. You cannot say that from the start, people have to decide themselves whether they are confused. You cannot say, I'm going to scare you. They have to *be* scared. In the movie theater, in the dark, comes a shadow and you are afraid because someone uses the language [of cinema], they know where you are, in the cinema, and they make it dark. We know that everyone will be alone at a computer, and when you make a problem there, you create a little drama. We try to think about the typical situation of one user in front of this trying to deal with a problem. [...]

3 Rasterization is the operation of converting an image described in a vector graphics format (shapes) into a raster image (pixels or dots) for output on a video display or printer or for storage in a bitmap file format (Wikipedia), available online at: <http://en.wikipedia.org/wiki/Rasterisation>, accessed 02/07/2013.

4 Jean-Damien Collin (ed.), *Quelques pratiques artistiques à l'ère de la numérisation. Collection 35 Œuvres / Some artistic practices of the digital age. Collection 35 works*, vol. 1, Les presses du réel, Dijon, 2007.

The website for *oss/....* is a really good website for what it needs to be, it's already a translation. We went from a surprise with the CD-ROM, which focuses on your personal desktop, to making the browser on the Web disappear as though you don't have Internet access anymore, the normal interface of your Internet. You think, did it collapse? Did it crash? What is it? It starts to circle around your screen and then it leaves little drops. That's already strange. Is it a long crash or something? Is it over? But that's only the beginning because you then have the software pieces we want to deliver. We didn't do much more of this type of work. It's very unusual, very untypical. I don't know anyone else who has done that, to put it simply.

What are the most significant differences between the OS 9 and OSX versions of OSS/....?

Heemskerk: The original version of *oss/....* was made on OS 9 and on PC – I think it was Windows 95 – so you work with the physical things – the computers were different, but also the GUI, the graphical user interface. So if you see this icon, the icon we used from the 1990s, it's not one of the shaded icons you see today. [...] Yes, the windows that pop up, it's also OS 9, the old Windows style; they are not shaded, with round forms, they are square. In this sense the work does change over time because already today it's not convincing anymore – if you see these icons and folders, which are from an old system, integrated into your current system.

Paesmans: [...] When we upgraded to OS X, we made a version of the *oss/....* 2.0 for the Espace multimédia gantner, we changed probably the icons we used, and also the software anyway grabs whatever is on the screen. So in that way the software is never dated. The technical specificity, or rather the technical trick of

the work is that it doesn't do anything inside your computer. It takes a picture of your computer. It does "click," it takes a screenshot, and then it starts playing with this screenshot. And because the screenshot is a layer on top, you think it's still your computer's desktop, whereas it's actually a screenshot of your desktop which is going this way and that way and that way, while your real desktop is standing still under it. You take a picture, lay it on top, and then the program starts doing things with the picture. That's the good part of it because if you manage to take the screenshot, the photo, then you are in the real moment of now, whenever you do that. So the technical trick of *oss/....* is to execute manipulations with the screenshot of the computer at that time. With regard to trying to preserve the work – if there's a need to port the work, if it's not working anymore – you could rewrite it in any kind of programming language and the first thing it has to do is take a screenshot of the desktop. And the second thing the work needs to do is to make a similar manipulation as you can see with the CD-ROMs we made before. The typical variations are like flipping up and down. I mean all the variations you can see in the older version, and to start the different effects or manipulation, these should be triggered by the keyboard or by the interface of the moment. Perhaps it will be a screen when all the keyboards are on touchscreens, like on the iPad or the iPhone. That might be good also, I don't know.

In what ways can the work accommodate technological change in the future?

Paesmans: For example, I would not mind – I think it's actually a good idea – making a website with the source code which is only in Lingo, with a "CaptureScreenshot" function. I'd have to ask Joan for permission first, because I

haven't really thought about this. Put it online, make a website of it, and put the download together with it. I think it would be very simple. I don't know what Joan thinks about it. To me it sounds like a good idea. [...] A basic rethinking which needs to happen is whether to and how to change the CD model. [...] We two also have to find a compromise. I'm all enthusiastic and say: "Put it on the web with the source code in Lingo." But we never discussed this. I've just thought about it now. I think, I would do it like that, but of course we have to talk about it. I can see that Joan is hesitating. We have to think about it a bit longer.

What is the significance of the medium of the CD-ROM for OSS/....?

Paesmans: Maybe the confusing and interesting thing about the work is that the CD-ROM was unique, and we used this possibility in combination – as I said – with OS 9, the memory of which would burn onto the CD-ROM. A mess of unordered design of folders, it would burn onto a CD but that mirror situation had already disappeared when we made the second edition; maybe it was a mistake [see also the case study by Anne Laforet, p. 366–378]. Again, I didn't pay a lot of attention to the second version. The power of that CD-ROM, of the memory part of

the CD-ROM, had already disappeared. Basically, the real reason for using a CD-ROM has actually also disappeared. There's no really smart reason for keeping the CD-ROM. The second CD-ROM doesn't produce anything unique you can't reproduce in another medium.

Heemskerk: But for us the distribution of *OSS/....* was the most important.

Continuing to distribute it was the most important thing?

Heemskerk: Yes, but I think that nowadays the distribution on CD-ROM is ridiculous so... I think you should always start from the first *OSS/....* and then see... Like you said, Espace multimédia gantner is conserving the second edition of *OSS/....* but the reason why that is done is because when we were asked to put it in the collection we said no, it's about the distribution of the work, it's about personal relationships, not about something you put in the computer and put in an exhibition. Then we said we would adapt it, but in a sense the question was how could *OSS/....* enter a contemporary art collection. And it had already been ported to another system with the same type of distribution, so perhaps in the future it will need a different distribution system.



Marc Lee
TV-BOT 1.0
2004
TV-BOT 2.0
2010

Installation view *Digital Art Works.*
The Challenges of Conservation, ZKM |
Media Museum
Photo © ZKM | Karlsruhe
Photo: ONUK

Marc Lee (*1969, Knutwil, Switzerland)
TV-BOT 1.0, TV-BOT 2.0
2004, 2010

Digital Art Collection/Store [*TV-BOT 1.0*] & Sammlungen
des Bundes, Bundesamt für Kultur, Bern [Federal Art Collections,
Federal Office of Culture, Bern] / Loan of the Confederation to the
House of Electronic Arts Basel [*TV-BOT 2.0*]

Hardware:

TV-BOT 1.0

- Computer with Internet connection
- CRT television set

TV-BOT 2.0

- Computer with Internet connection
- Flat screen TV

Software:

TV-BOT 1.0

- Operating system PC or Mac
- Browser IE, Firefox, or Safari
- RealPlayer Plug-in

TV-BOT 2.0

- Operating system PC or Mac
- Browser IE, Firefox, Chrome, or Safari
- Flash-Plug-in

Conservation Strategies::

- Migration
- Reinterpretation and video documentation

Documentation:

- Marc Lee

Conservation Concept and Conservation Measures:

- Marc Lee und Doris Gassert, in cooperation with
mit Arnaud Obermann und Anne Laforet

Text:

- Doris Gassert

The work *TV-BOT* by Swiss artist Marc Lee occupies a special place in the *digital art conservation* research project. *TV-BOT* is not only born-digital art – namely, art that originated in a digital form – it is also an Internet-based work that draws its content from the World Wide Web. Thus, the functionality of *TV-BOT* is dependent on parameters external to the work and on the technological infrastructure of the Internet, which is constantly developing. The original version of *TV-BOT* became unusable only six years after its creation and had to be updated by the artist, who reprogrammed the Web application, together with a slight aesthetic “update,” thus producing a reinterpretation and adding 1.0 and 2.0 to distinguish the new versions.

Work Description

TV-BOT (version 1.0 and 2.0) is an Internet-based news channel which, using an application developed by the artist, collects only brand-new stories from radio and television streams, from text-based newspaper and Google news headlines, as well as from Webcam images and Twitter messages (version 2.0), before recombining these into its own television program. Behind the automated selection of international content is a software programmed by Marc Lee, which scans and selects the flow of data exclusively on the criterion of “liveness”: *TV-BOT*, “the world’s most up to date television station,”¹ only shows news that is not older than an hour, radio and television streams are transmitted live. Via the URL www.1go1.net/56ktv, users have immediate access to the *TV-BOT 2.0* 24 hours a day 365 days a year and take in only the latest information in images and sound.

The *TV-BOT* begins with a text-based address and welcome to the viewers and introduces itself as “Live Stream *TV-BOT*,” which is reporting on the “latest world news.” Whereas in the case of *TV-BOT 1.0*, the steps for this are described in precise detail – tracing news, indexing, analyzing, verification, recombination – the information given to the viewers in version 2.0 is much shorter. Instead, *TV-BOT 2.0* presents as an introduction a map of the world, on which pop-ups of Webcam pictures from various cities appear by means of automatic mouse clicks. Once fifteen of these pop-ups have covered the world map – a sort of preview of the coming transmission that is familiar from television news programs – a short fade to black transition marks the beginning of the main program of *TV-BOT 2.0*, which then begins preparing the very latest news: “I zap for you, 24 hours, 365 days!”²

The graphics make explicit reference to international television news channels such as n-tv or CNN. In typical television aesthetics, a red “live” signet was added to *TV-BOT 2.0* at the bottom left of the screen to underline that the radio and television news is being transmitted in real time. To the other contributions from Twitter,³ Google news headlines, or webcam images a URL is added, along with the location of the recording, the date, local time, and precise information as to when these messages were last updated. Sources are given on a green background band, Twitter messages get a blue one, and the very latest headlines have a red one. The visual representation and ordering of the news proceeds according to a predefined template, which loops approximately every four minutes and is endlessly filled with dynamically generated content. In the background there is either television or Webcam stream that fills the one screen, or two overlapping ones; the sound

1 Available online at: <http://www.1go1.net/index.php/Main/TV-BOT?userlang=en>, accessed 05/29/2013.

2 “I zap for you, 24 hours, 365 days!” is a message which *TV-BOT 2.0* plays right at the beginning.

3 Twitter messages are integrated in Version 2.0.

also derives from various sources and is heard in the respective original language. In contrast to the original version, *TV-BOT 2.0* has been given a logo: a revolving globe at the bottom right of the screen.

Art Historical Context

The media artist Marc Lee, who also works as a software developer, investigates in his artistic practice the growing interlinkage in culture and the influence of the Internet on the information society. His predominantly Internet-based, interactive works reflect on contemporary digital information and communications technologies, and engage with the infinite data and information space of the World Wide Web – often with a critical look at the changing functions of media companies and consumers that have been transformed by the new media.

Marc Lee, who worked for many years in a media company, creates artworks that consistently center on the medium of television and its digital transformation. For example, the work *Loogie.net TV – Be the First to Know!* (2003) shows current television news programs about self-selected themes on the basis of individual search queries. From this, a tailor-made newscast is created, generated solely by computer algorithms. This project won the tpc creatVty award 2003 in the category of media art/visual design, for as “basic research, media satire, and art installation” all in one, it skilfully reflects “the visions and limits of our information society.”⁴ Similarly, *Breaking the News – Be a News-Jockey* (2007) leaves it to the media consumers to initiate the search for themes: the work makes the user a live performer – a “news jockey” – who juggles snippets of current information from which a large-format projection is generated. Marc Lee creates with his works a world composed of up-to-the-minute headlines – from all over the world. Viewers find themselves mainly in the midst of the stream of Internet information as can be retrieved, for instance, on Google, Twitter, Flickr, and Wikipedia by mouse click. Yet here there is a break with the apparent objectivity of the news: the fictionalization of events, their manipulability by the media, as well as the promises of what new media of communication can deliver are ironically exposed and critically scrutinized in Lee’s works.

TV-BOT also interrogates the information economy of our contemporary networked culture. “Bot” is derived from robot, and it designates a software application that independently carries out a repetitive task. This is exactly what Lee’s programmed Web application does: it constantly searches the Internet for the most recent news reports, and automatically puts together a newscast with the “latest world news.” The Net-based playback of dynamic

4 The jury’s assessment of the tpc CreaTVty award 2003 by Martin Roth, available online at: www.loogie.net/press/Loogie.net_de.pdf, accessed 05/29/2013, translated from the German by Justin Morris.

content from the World Wide Web surpasses all traditional television stations for topicality: the dominant attributes of *liveness* and *newness*, with which contemporary newscasts woo their audiences and at times disregard ethical criteria, are exposed here because all forms of filter have dropped away. *TV-BOT* displays the plethora of up-to-the-minute information, but without making any demands as to its content, or investigating its relevance or triviality by means of defined criteria. At the same time, “‘real time’ as a dogma of media society is interrogated by Marc Lee in an ironic way,”⁵ a media society that is illuminated by *TV-BOT* at the interface of television and Internet – and at a time, moreover, when it is becoming increasingly hybridized with respect to its mechanisms and functions.

Provenance

TV-BOT 1.0 originated in 2004 as part of the Xcult project 56kTV – bastard channel, an online project curated by Reinhard Storz at the interface of television and Internet.⁶ From there, the work found its way into the Digital Art Collection/Store launched by Reinhard Storz and Annette Schindler, a collection of digital media art with an integrated “art store.”⁷ Digital Art Collection/Store understands itself as a “model collection which presents different options in the practice of ownership, archiving, and preservation of digital art.”⁸ In collaboration with the artist a materialized, purchasable work package was defined which gets around the ephemeral and processual nature of the work by offering for sale a recording of several minutes of the *TV-BOT* program in a digital format.⁹

Following the suggestion of the House of Electronic Arts Basel within the framework of the case study the most recent version 2.0 was purchased from the Schweizer Bundesamt für Kultur (BAK).¹⁰ The acquired package contained the source code (see glossary, p. 602) of the work, the documentation compiled as part of the case study, as well as the first recording of a

- 5 Sabine Himmelsbach (ed.), *gateways_Kunst und vernetzte Kultur*, exhib. cat., Goethe-Institut Estland and Kumu Kunstmuseum Tallinn, Hatje Cantz, Ostfildern-Ruit, 2011, p. 124.
- 6 See 56kTV – bastard channel, 2004, curated by Reinhard Storz, available online at: www.56k-bastard.tv, accessed 05/29/2013.
- 7 Digital Art Collection/Store used the Website as virtual exhibition space, catalog and art store at the same time, available online at: www.digital-art-collection.net, accessed 05/29/2013.
- 8 Annette Schindler and Reinhard Storz, “Digital Art Collection/Store – Ein neuer Ort der Schweizer Medienkunst,” in: Markus Schwander and Reinhard Storz (eds.), *Owning Online Art. Zum Verkauf und Besitz netzbasierter Kunstwerke*, Academy of Art and Design, Basel, 2010, pp. 125–128, here p. 126, available online at: www.oaart.ch/publikation/inhalt/PDF/12-Schindler-Storz-d.pdf, accessed 05/29/2012, translated from the German by Justin Morris.
- 9 Since *TV-BOT 1.0* now no longer functions, only sequences are for sale that were recorded prior to its updating.
- 10 The work is in the possession of the House of Electronic Arts Basel as a loan, whereby responsibility for conservation is transferred to the Basel institution, which is specialized in electronic/digital media art.

TV-BOT-2.0 program sequence from 2010 on DVD signed by the artist. Apart from conservation issues, the purchase of *TV-BOT 2.0* raises a number of questions regarding the integration of Internet-based works of art into the art market. "Such works violate the traditional understanding of ownership in art; fundamental categories such as the concept, reception, and durability of works of art must be thoroughly revised."¹¹ The drafting of a purchase contract, which accounts for these work-specific aspects, thus turns out to be a complex and lengthy undertaking.

Course of Action

TV-BOT 1.0, which Marc Lee had created in 2004, was updated and expanded aesthetically in connection with and supported by the online project Beam me up: Version 2.0 thus came into existence.¹² Due to the introduction of a new technical standard, in just six years *TV-BOT 1.0* was no longer functional. Only a software update could guarantee the presentation of up-to-date content from the World Wide Web. This situation provided the occasion for including *TV-BOT* as an exemplary case study of the *digital art conservation* project. Genuine Internet-specific works of art, which dynamically include data suppliers from the Internet, are dependent on a great number of work-external components, commercial formats, and the technical standards of the Internet impacted by economic factors, which make the work particularly susceptible to failure.

The case study profited from the special circumstance that it was possible to develop and execute the work documentation and conservation concept in close collaboration with the artist. One part of the documentation was the numerous interviews conducted with the artist with the object of enhancing the conservation concept through an understanding of the logic of the work,¹³ the basic technical functionality, the central criteria and parameters of the work, and the artistic intention, all of which are essential for the "aesthetically satisfying functioning"¹⁴ of the work. Coordinated by Doris Gassert, strategies of documentation and conservation measures were discussed with Marc Lee,

11 Schindler, Storz 2010, p. 126, translated from the German by Justin Morris.

12 Beam me up, 2010, curated by Reinhard Storz, available online at: www.beam-me.net, accessed 05/29/2013.

13 On the concept of work logic, see Tabea Lurk, "Zur Alterung von Netzkunstwerken," in: Schwander, Storz 2010, pp. 53–68, here p. 56, available online at: www.oaart.ch/publikation/inhalt/PDF/06-Tabea-Lurk-d.pdf, accessed 05/29/2013: "The work logic identifies the core components of the work of art, and describes the intertwining of the accompanying digital modules." Translated from the German by Justin Morris.

14 Hans Dieter Huber: "Über das Sammeln, Erhalten und Vermitteln von Bits und Bytes," in: Hans Dieter Huber, Hubert Locher, and Karin Schulte (eds.), *Kunst des Ausstellens. Beiträge – Statements – Diskussionen*, Hatje Cantz, Ostfildern-Ruit, 2002, pp. 365–380, here p. 377, available online at: www.hgb-leipzig.de/artnine/huber/aufsaeetze/bits_and_bytes.pdf, accessed 05/29/2013, translated from the German by Justin Morris.

Arnaud Obermann, and Anne Laforet. These strategies, which were mainly implemented by the artist himself, are elucidated below.

Documentation

TV-BOT 2.0 is a Web application that runs on a Linux Web server and is programmed in PHP/MySQL/ActionScript. The browser plays the Flash file *tvbot20.swf*, which controls the entire application and influences the visual appearance according to a defined template. It adapts itself proportionally to the browser's window size, and is located on the foremost level. It also includes two inline frames, which playback and control live radio and TV streams in defined areas: The inline frame *Video* (TV stream) also adapts proportionally to the size of the browser, and is located on the rearmost level. The inline frame *Radio* plays back live radio streams, but remains invisible to the viewers.

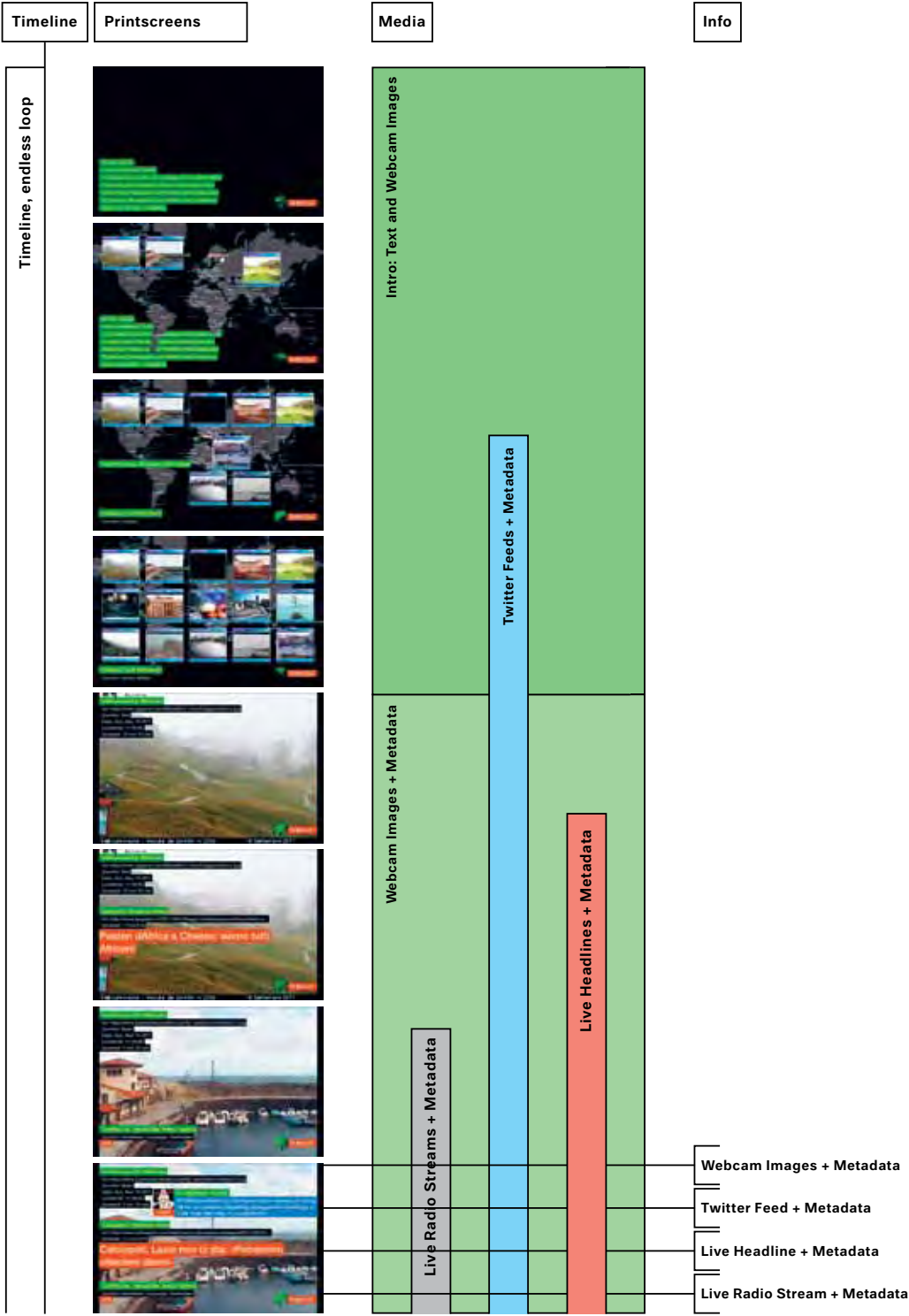
The template is filled with dynamically generated content by the Flash file calling up content, including metadata, with ActionScript elements via PHP scripts, which access the database compiled by the artist and external Internet services.¹⁵ The contents of the referenced sources in the database originate from external Internet services, such as Google news, Twitter, various online radio and TV stations, as well as selected Webcams and thus are also subject to their functionality. Referenced sources in the database are accessed at random. These are dynamically tested by the Internet services and only presented if they are less than one hour old. So that *TV-BOT* can allow content to appear, all services assume a minimum amount of content, which presupposes the manual maintenance of the database by the artist.

For *TV-BOT 1.0*, RealPlayer was used. At the time when the work was created, in 2004, RealPlayer offered the only possibility of dynamically integrating live audio and video streams in the browser. Since 2008, this is also possible with Flash. The standardized Web language of RealPlayer was SMIL (Synchronized Multimedia Integration Language): a Web language comparable to HTML, but which also features a timeline for representing multimedia and time-synchronized content. In order to test the RealPlayer audio and video files for their playback quality, a RTMP check was written in programming language C++ (see glossary, p. 599).¹⁶

Because of the fact that media companies were increasingly changing their live streams from RealPlayer to Adobe Flash Player format, there was not enough content anymore available for *TV-BOT 1.0*, so its program also had to be rewritten in 2010. Today, *TV-BOT 1.0* only exists as a documentation video

15 The limitation to a certain number of sources is necessary since the dynamic access of data would otherwise lead to several failures in the work.

16 RTMP (Real Time Messaging Protocol) refers to the network protocol of the same name, which is used for live streams on the Internet.





Service	Source	Description	Minimum number	If minimum number is not attained
Webcam images	Various URLs	Currently, there are 748 online and 132 offline Webcam images referenced in the database	15	Old images
Live headlines	news.google.com	Google news headlines from the national editions of Australia, Germany, UK, France, Italy, Canada, New Zealand, Spain, and the USA	15	Old headlines
Twitter feeds	twitter.com	News from search term "News"	0	Nothing appears
Live radio streams	rferl.org	Currently, there are 16 functioning radio streams referenced in the database	2	No sound
Live TV streams	livestream.com	Currently there are 11 functioning tv streams referenced in the database	2	No videos

registered in 2005, which preserves the first version as a "historical sequence."¹⁷ This documented time slot records how the first version looked originally.

When presented in an exhibition, both versions of *TV-BOT* run side by side on television sets in full screen mode; thus they get the classic framework of television. To accentuate the evolution and historicity of the work, the artist prefers Version 1.0 to be shown on a CRT monitor, analogous to the technical standards prevailing when the work was created, and Version 2.0 to be presented on a flat screen monitor. The slightly altered aesthetic surface, but especially the dated news and content, signal that the two versions are different, and lead viewers to suspect that *TV-BOT 1.0* is a recorded work, whereas *TV-BOT 2.0* is an Internet-based work that is "executed" live.

17 The concept was proposed by Tabea Lurk, a specialist in the archiving and conservation of digital media art, who initially supervised this case study, and now lectures on digital conservation at the Bern University of the Arts (BUA).

Conservation

The first fundamental conservation measure was the reinterpretation (see glossary, p. 601) of *TV-BOT 1.0* carried out by the artist in 2010. An analysis of the potential sources of error pointed to a problem with the integrated Media Player, a commercial program for playing audio and video data, with which the online radio and television stations streamed news on the Internet in *TV-BOT 1.0*. Due to the introduction of a new standard, the Adobe Flash Player, and the increasing conversion to Flash streaming, a sufficient amount of current content could no longer be played on *TV-BOT 1.0*: RealPlayer could not play back the data from the media companies streamed in Flash format. “If one wished to hold on to the work,” claimed Marc Lee, “one had to convert to Flash. There was no other alternative to this.”¹⁸

Whereas the programming of the audiovisual appearances is carried out with reciprocal script elements and is proceeded in a stable manner in the work itself, all content of the *TV-BOT* is subject to the functionality of external Internet services. Due to their “context sensitivity,”¹⁹ Internet-based works of art require ongoing adaptation to their Net environment, such as the conversion of obsolete formats into up-to-date ones. For this reason, the estimation of the state of conservation is sobering: it is only a question of time before the most recent version 2.0 becomes technically obsolete and will be “closed down,” since a transfer to the new format HTML5 is already looming on the horizon. Hence, it is quite possible that future generations of browsers will no longer support the Flash format, whereby, in the long-term, *TV-BOT 2.0* can only be played on old browsers. At the same time, there may be a shift to new formats, which, in turn, Flash may be incapable of integrating.

Consequently, as further conservation measures, the artist documented the source code and identified the fragile elements. The software documentation provides information about the script elements of the application and the interfaces to external Internet services. Due to the programming with up-to-date Web technologies, in this way necessary modifications could be delegated to a given programmer. Furthermore, Marc Lee also developed installation instructions for the migration (see glossary, p. 601) to a new server. At present, *TV-BOT 2.0* still runs via a server administered and maintained by the artist himself.²⁰

In addition to the classic software update, Marc Lee also updated the appearance of *TV-BOT 2.0*, and thus carried out a reinterpretation. The look and feel (see glossary, p. 600–601) of *TV-BOT 2.0* is oriented especially on the first version, but was continually adapted to the ongoing changing of visual

18 See unabridged version of the interview with Marc Lee conducted by Fabienne Blanc, 04/04/2011, unpublished, translated from the German by Justin Morris. The interview is published in excerpts in this volume, pp. 400–402.

19 Lurk 2010, p. 56, translated from the German by Justin Morris.

20 See for long-term issues relating to server maintenance: Lurk 2010, p. 62.

standards, and thus “modernized” to “contemporary” designs.²¹ On the one hand, the pace at which the shift from TV, radio, and Webcam images is completed accelerates in order to adapt to the speed of the present flood of our news. On the other hand, *TV-BOT 2.0* also responds to the meanwhile enormously increased relevance of social networks and includes the community platform Twitter, which did not yet exist when the original version was first developed. The updating of the appearance is frequent in the case of works of net.art, as Tabea Lurk points out: “Many artists continually or sporadically update the appearance of their works and continually appropriate new forms, formats, and strategies of communication, and thereby augment their own scope of applicability.”²² At the same time, Marc Lee also used updating as an opportunity to provide a more manageable structure of the *TV-BOT 2.0* for audiences. “[F]or me it is still the same work,” insists Marc Lee. “It has had a classic software update and a bit of re-branding [...]”²³

The designation of the version added to the title is a clear testimony of the artist’s awareness of the necessity of developing the work further, and the genesis of the work is rendered visible by juxtapositioning the different aesthetic appearances. In the case of restoration and conservation as well as

```
> curl --connect-timeout 4 --head $ImageUrl
HTTP/1.1 200 OK
Date: Sun, 18 Sep 2011 11:35:20 GMT
Server: WebSitePro/3.0.37
Accept-ranges: bytes
Content-type: image/jpeg
Last-modified: Sun, 18 Sep 2011 11:35:17 GMT
Content-length: 9664
> if((Date - Last-modified) < 3600 seconds){ Use me }
```

* [not older than an hour] example of code



* [pop-up window] example



* [images and corresponding metadata]

```
server=Apache/2.2
servertime=Sun, 18 Sep 2011 11:35:20 GMT
lastmodified=Sun, 18 Sep 2011 11:35:17 GMT
sec=3 sec
url=http://www.comunebn.it/webcam/current.jpg
title=Chiesa di Santa Sofia
date=Tue, Apr 17 2012
country=Italy
std=17
```

* [metadata of Webcam images as text file]

21 Blanc 2011, excerpt, this volume, p. 400–402.

22 Lurk 2010, p. 55, translated from the German by Justin Morris.

23 Blanc 2011, excerpt, this volume, p. 400–402.

a possible necessity for the reinterpretation of *TV-BOT 2.0*, namely, a transcription of the original code for possible repair of the work, the documentation of its aesthetic appearance serves as a starting point. For this reason, the appearance was documented in addition to the program structure by filming the *TV-BOT* program with a screen recording software and saving it in digital AVI format (Audio Video Interleave). In contrast to the creation of screenshots, the audiovisual recordings also capture the temporality and dynamics of the work. It captures the surface of the work, and thus also the contemporary visual codes and aesthetic characteristics as a documentary time window. The genesis of the work *TV-BOT* thus becomes an expression of the continual adaptation of our habits of perception to the rapid development of media information and communication forms of the Internet age.

However, as documentation, the *TV-BOT* program automatically becomes a “historical sequence”: it is inevitable that the core element of the work is lost during the recording, namely, the actuality of the news, which is less than an hour old, or is transmitted in real time. This conservation strategy is thus comparable with the conservation practice in performance art: only one production of the program at a definite point in time is recorded. A further conservation strategy discussed as part of the case study is that of encapsulation or virtualization, as was tested by Tabea Lurk and Jürgen Enge for Lee’s work *Breaking the News – Be a News-Jockey* (2007).²⁴ In the case of an encapsulation, the relevant hardware and software components are identified and transferred to a virtual environment. “VMS [virtual machines] provide an authentic computer environment. They offer an interaction-oriented, live-time surrounding that keeps original coding and enables so far sustaining unique cultural values and technological heritage.”²⁵ The advantage of an archive version of the *TV-BOT 2.0* created on a VMware server would be that the original code would remain untouched, and thus – in contrast to technical updating – would retain its authentic historical components. The authors argue that “[d]igital components proven to be important should not simply be replaced by others. The altered elements may contain important cultural information. They derive from a specific technological era and demonstrate specific technical developments. The original coding and display not only suggests aesthetic enunciations but also provides important information about certain technological and historical environments: the original setting has influenced in one way or another artistic formulation.”²⁶

24 See Tabea Lurk and Jürgen Enge, *Sustaining Dynamic Media Objects and Digital System Environments. An Assessment of Preservation Methods for Computer Based Artworks*, 2010, available online at: www.hfg.edu/images/b/b4/LurkEnge_SustainingDynamicDigitalObjects.pdf, accessed 05/29/2013.

25 Tabea Lurk, *Virtualisation as Preservation Measure. A Contribution to the Handling of Born Digital Media Art*, available online at: www.aktivearchive.ch/fileuploads/pdfs/Virtualisation_Summary.pdf, accessed 05/29/2013.

26 Lurk, Enge 2010, p. 8.

As the authors themselves remark, a virtualization does not aim at a maintenance of the functionality, but at the maintenance of the substance.²⁷ However, in the case of *TV-BOT 2.0*, a virtualization would infiltrate the essential quality of the work – the topicality of its content – inasmuch as the “encapsulated” program of the *TV-BOT* would be assembled from archived, and thus historically fixed content. Consequently, like in a video recording, the artist’s main criterion, namely, *liveness*, would be lost. For this reason, as part of the case study, the software documentation including a description of work-relevant components, as well as the documentation as “historical sequence” by way of video recordings, was initially preferred with respect to effort and expenditure.

Conclusion

To maintain the functionality of the work in keeping with the artistic intention is the primary incentive behind the conservation of *TV-BOT*, a project which makes the criterion of topicality the chief characteristic of his artistic statement. And yet ongoing technical adaptation to the Internet’s economically conditioned rules of the game is a time and cost-intensive affair, for which the respective collecting authority or artist is unable to generate sufficient funding, time, or even interest. However, owing to the work’s dependency on a multiplicity of external factors an elaborate software updating does not guarantee the aesthetic functioning. Thus, as with its predecessors, in the case of *TV-BOT 2.0* one must reckon with a limited lifespan from the outset. Should *TV-BOT 2.0* no longer function, the program can be maintained as a historical sequence: however, the genuinely Internet-specific work then becomes a temporally frozen video-loop – and thus a documentation of its surficial appearance.

At the same time, each technical update presupposes a not insignificant intervention in the source code of the *TV-BOT*. For this reason alone, the monolithic work concept is incapable of capturing the processual work, because its structure is constantly subject to the dynamic transformations of World Wide Web. These latter exert a direct impact on the content and the appearance. Thus, for example, for some time now the *TV-BOT 2.0* has sprinkled us not only with the most up-to-date news, but also with commercials: they have “crept in” because, amongst other things, the videos on the Website www.livestream.com, from which the *TV-BOT* program draws its video content, is upstreamed by so-called pre-roll video ads. Preventing this meanwhile common form of online video advertising would require an additional intervention in the programming, which is why – including the artist wherever possible – one ought to evaluate whether the modification of the content corresponds to the work’s original artistic statement, and thus should be

27 See *ibid.*, p. 4.

accepted as a part of the natural further development. This, by contrast, presupposes conceiving the work as “the work’s modular continuum”²⁸ and hence, as Hans Dieter Huber states, “assumes [...] a fundamental changeability of the original.”²⁹

At the same time, the artist does limit the structural changeability in that he himself divides the *TV-BOT* into different versions, and thus historically fixes content and appearance. He thereby reserves the right, after the sale of the versions, to further develop the work graphically and also in terms of content. Indeed, Marc Lee also prefers to dedicate himself to the artistic development of the new rather than the tedious maintenance of the old. For the artist, a purely technical updating, which fails to examine critically the new with temporal changes in terms of content and appearance, is out of the question. However, sensitized by the case study he does not exclude a version *TV-BOT 3.0* – perhaps, even in 3-D, should the contemporary 3-D boom, which is now on the wane again, morph into the standard form. The various stages of the *TV-BOT* narrate a diachronic historical development, the technical and aesthetic codes and visual standards of a rapidly changing information society, but also the possibilities of the conservation of a genuine, Internet-specific work of art – and its repercussions for our understanding of digital art.

Translated from the German by Justin Morris

28 Lurk 2010, p. 56, translated from the German by Justin Morris.

29 Huber 2002, p. 373, translated from the German by Justin Morris. In the case of the commercials, the artist decided to accept these as an element of the work, where the adverts caricature to the point of absurdity the increasingly commercial side of what the media offers. But what would happen if the Twitter platform suddenly ceased operation? Should another, similar community platform be integrated, or should the source be omitted, which sooner or later would lead to an aesthetic degradation of *TV-BOT 2.0*? Such potential scenarios and, consequently, identification of the constants and variable elements of the *TV-BOT*, should be discussed and laid down with the artist when the work is purchased.

TV-BOT

An Interview with Marc Lee

Fabienne Blanc

Excerpt from the interview conducted on April 04, 2011, at ZKM | Karlsruhe

How did this work originate?

Marc Lee: The project goes back to a request from Reinhard Storz. He launched a project in 2004 called 56k-bastard Channel TV and asked artists to contribute. The format was actually a television format, but one that you could watch on the Internet – a television format running online. I had already worked with dynamic content, but here the question was: How can you have dynamic content running online in as close as possible to real time – that is, content people are looking for? For my contribution I took the idea of imitating a news stream with totally up-to-the-minute news, where possible even faster with the news than the regular channels. I set it up so that the items shown were never older than one hour. That's actually unusual, because news channels often show repeats or small ready-made pieces. However, my project, the *TV-BOT*, trawls the Net for the very newest items using various search engines and feeds. This creates a sort of collage, an own TV station.

What effect should the work have on the viewer?

Among other things I wanted to show how simple it is to imitate a news channel. *TV-BOT* doesn't have the same quality as a news channel, but it does have another quality: the newest news. This channel is actually more topical than the other news channels. The thing that makes *TV-BOT* special is that you write the software once, and then the program runs 24 hours

a day, 7 days a week, all year round. Now and again you have to do a software update. What is more you don't need any staff, whereas regular news channels need lots and lots of people to keep their programs running and up to the minute. Of course such news channels do not rely on the Internet for their material: they do research which is in turn based on researching other media. They use Reuters and other sources. They don't use the Internet as an archive, or only to a limited degree. The *TV-BOT*, by contrast, only uses material found on the Web and makes a news channel out of it. Obviously, as I said, it's not the same quality. Nevertheless, it is astonishing how much information you can get out of it from just a quick look.

Further, I tried to use some of the same techniques of visualizing informations that CNN or n-tv work with – they have a main program, and while it is running stock prices or currency rates run along the bottom of the screen as well. Some have a third window showing other information. The design aims to keep you watching as long as possible; even if the main theme doesn't interest you, you'll stay tuned in. I tried to copy this in the *TV-BOT*: you should always have the feeling that you need to stay on the web site, it won't get boring, there's always something happening, you are well informed. Naturally, it is a rather pseudo-informedness. You just get information that someone or other has written, you digest it, and that's about it. To put it bluntly it's just a waste of time. That was also part of the concept: I wanted to collage that a little.

What software did you use for *TV-BOT*?

Back then RealPlayer was the only possibility. No other software allowed you to show live audiovisual content online. With Flash it wasn't yet possible to load dynamic video and audio files and QuickTime didn't have dynamic capability either. It was important to me to integrate periodically short videos from news channels and news from radio stations. So only RealPlayer would work and RealPlayer also supported another standardized Web language – SMIL [Synchronized Multimedia Integration Language]. SMIL is actually a very clever language, although it is not well known any more. SMIL gives you the possibility of writing like in HTML but also having a timeline. So, for example, you can have a slide show with images and accompanying texts but also load dynamic video as well. In the meantime, this has all changed a lot. RealPlayer is hardly used any more – nowadays there are hardly any television or radio stations which broadcast online using RealPlayer. Everything has migrated to Flash. But things continue to evolve – the tendency now is away from Flash Player, and you can do a lot of things with HTML5, although that only works with some browsers. That's why I reconstructed *TV-BOT 1.0* – I more or less left the back end the way it was originally, but the front end runs on Flash Player. The material is shown using Flash Player.

What changed between the versions 1.0 and 2.0 of *TV-BOT*?

The changes in content and visuals from *TV-BOT 1.0* to *TV-BOT 2.0* are quite minimal. In *TV-BOT 2.0*, I include Twitter as a feed. And in general it all runs a bit faster – the changes between TV images, radio material, and webcam images of the news feed are accelerated a bit. So it's all

a bit more CNN-ish to keep the entertainment factor as high as possible. But contentwise, not much has changed. For the look and feel, I've stayed pretty close to the original. I modernized it a bit – I changed the look of the texts, the fonts and added new material. There is now a "Live" icon, for example – that comes up when it's a live radio program or something live on television. The structure is a bit better, it's arranged a bit clearer. You can see which fragment corresponds to which subject matter.

Is it still the same work?

Yes, for me it is still the same work. It has had a classic software update and a bit of re-branding in the form of a logo: a revolving globe. I made it a bit more sexy. More contemporary in some ways, but substantially still the same project.

How long will this version, *TV-BOT 2.0*, last? When will you have to do the next update?

The first update came after six years. For the Internet that's a long time without an update. Six years is extremely short for art historians, but online it's relatively long. A lot happens in six years, so I'd guess that in another six years media companies will not be streaming with Flash. Then it will be time for another update. From where we are now, I'd guess it will be HTML5. I reprogrammed *TV-BOT 2.0* myself. I would rather be spending my time on new projects instead of bringing old ones up to date, but at the same time it's fun to update an old piece and has its own set of challenges: there is always room to optimize the work technically, aesthetically, and in terms of content.

I don't know how I will react when *TV-BOT 2.0* stops working again. Then I will have to think about whether it's worth updating it again. Or one could consider documenting the

work really well. With this work that would work quite well: record several hours of video footage and that would be the documentation of the work. Obviously, it is something else entirely if you exhibit the “genuine” work with “real” data: that means to access the “live” material, which is actually the core of this project – that the data displayed are completely up-to-the-minute.

How can *TV-BOT* be accessed?

TV-BOT is publicly accessible. You can access version 2.0 online at www.1g01.net/56ktv or via the link on my personal website 1g01.net. The *TV-BOT* website is hosted by Hetzner, a hosting center in Germany, which is paid for by Reinhard Storz. He rents two servers there, which I administer. One server runs Reinhard Storz’s projects – including www.xcult.org – and the other one is for my projects. The deal is that I administer both and get one of them to use for my work. The arrangement works pretty well. *TV-BOT* is freely accessible and you can check it out, day or night, it’s always live. That’s the

great thing about it. You are always fully up to date: if you don’t know what the latest news is, just go to this *TV-BOT* and you’ll be inundated with the very latest information.

Has the work already been documented in some form?

No, this work has not yet been documented at all. To document the work would mean documenting the hardware and above all the software: what scripts there are and what they do, which search engines it uses, and so on. That would be one part. The other part would be how the interface functions, the part that is displayed with Flash. How does it integrate the various media? You’d probably need images for that, video would be even better. I think video would be the best way to document the dynamics of the material. The best solution would be to film the screen. The video recordings would then be part of the documentation.

Translated from the German



Nicolas Moulin
Viderparis
1998–2001
Digital video projection/slide
show with 50 images (random
order), color, sound
Photo © MAMCS

Nicolas Moulin (*1970, Paris)

Viderparis

1998–2001

Collection of the Musée d'Art moderne et contemporain (MAMCS), Strasbourg

Hardware:

- PC (Microsoft Windows)
- Video projector
- CD player
- Audio amplifier
- Loudspeaker

Software:

- Creation: Adobe Photoshop
- Presentation: AquaSoft DiaShow

Conservation Strategy:

- Migration
- Data backup

Documentation:

- Franck Knoery
- Nelly Massera
- Arnaud Obermann
- Claudia Röck

Conservation Concept and Conservation Measures:

- Arnaud Obermann

Text:

- Chiara Marchini Camia
- Arnaud Obermann

Nicolas Moulin's work *Viderparis* (1998–2001) is an audiovisual installation created with common software and using only commercially available audiovisual equipment. The strategy used to preserve this installation, which is currently owned by the Musée d'Art moderne et contemporain (MAMCS), Strasbourg, was migration. This could be implemented without impairing the work's authenticity. As long as the specific parameters of the installation are maintained, the projection software and equipment used is discretionary. The conservation concept for this case study consists of a detailed documentation of how the installation should be presented – which has been specified by the artist – and the formulation of a data backup strategy for the media content of the work.



Nicolas Moulin

Viderparis

1998–2001

Digital video projection/
slide show with 50
images (random order),
color, sound

Photo © MAMCS

Work Description

The multimedia installation *Viderparis* (1998–2001) by Nicolas Moulin bases on a digital slide show in its own darkened space, in which images are displayed in random order and at regular intervals. Fifty digital images are shown, accompanied by a looped sound track giving off a low hum.¹ The photographic street scenes of Paris projected on the wall are photomontages from which all traces of human and plant life have been removed. The road junctions, squares, and streets look familiar, except that trees, traffic, and people are missing and the building facades are closed off with concrete from the road surface up to the first floor. It is a lifeless, depopulated city that is presented here; only the architecture still attests to former human existence.

The photomontages were produced from analog slides.² In addition, to produce *Viderparis* the artist took his own pictures of asphalted and concreted-over areas, pavements, balconies, windows, and facades and assembled them into a repertoire of urban construction archetypes typical for Paris. Through digital editing of street scenes, Moulin produced with these elements very precise photomontages in which the lower part that corresponds to the

1 Nicolas Moulin composed the electronic soundtrack, which accompanies the images, in collaboration with the musician Jimmy Tomenou.

2 See the excerpt from the interview with Nicolas Moulin conducted by Nelly Massera and Catherine Mueller, 06/10/2011, this volume, p. 416.



Nicolas Moulin

Viderparis

1998–2001

Digital video projection/
slide show with 50
images (random order),
color, sound

Photo © MAMCS

ground floor of the depicted building was reconstructed. The artist paid great attention to the consistency of pictorial reproduction, as can be seen in the attention accorded to correct shadows, reflections, and so on. As a result, in spite of their evident defamiliarization of the content, the effect of the montages is highly realistic. The random and endless sequence of images underlines the labyrinthine character of the city of Paris.³ The title *Viderparis* contains the French verb *vider*, to empty, while at the same time recalling the Latin *videre*, to see.

Art-Historical Context

Nicolas Moulin studied art at the École Nationale Supérieure d'Arts de Paris-Cergy from 1989 to 1994. Since that time, the central medium of his oeuvre has been the image, although he also works in sculpture and installations. The central motif of his works is landscape, whereby his special interest lies in architecture. For example, Moulin engages with the question as to what it takes for a piece of architecture to become a monument. Thus, in his sculptures and photomontages – he characterizes both as “agglomerates”⁴ – Moulin features both fictive and real monuments.

³ Ibid., p. 417.

⁴ Ibid., p. 417.



Nicolas Moulin
Viderparis
 1998–2001
 Digital video projection/
 slide show with 50
 images (random order),
 color, sound
 Photo © MAMCS

With his work *Datchotel Ryugyong* (2007), a model of the Ryugyong Hotel in Pyongyang on a scale of 1:100, Moulin created a monument to the “liquidation of the utopias.” When building began in the 1980s, the hotel was planned as the tallest building in North Korea and the world, but today it still remains unfinished.⁵ In *Goldbarrgorod* (2008) the artist assembles old computer hardware components into desolate urban landscapes. Nicolas Moulin describes the way he works as “postcontemporary.” In his opinion, with the postmodern era, humankind has passed over into posthistory.⁶ Postmodernism questioned the notion of linearity from past to future, and thus the very idea of the future itself, as well as of the avant-garde and progress. Moulin’s dystopian landscapes devoid of human beings mix past and future and, in doing so, cast a critical glance at the history of the Cold War which is evoked by the Soviet-era appearance of the buildings in his pictures. Moulin experimented according to his own statement with the distortion of reality for the first time in the photomontages for the series *Novomond* (1996–2001).

The installation *Viderparis* reflects Moulin’s intention of creating a “vitri-fied” world, a “pale imitation” of reality, in order to underscore the fact that

5 See unabridged version of the interview with Nicolas Moulin, conducted by Nelly Massera and Catherine Mueller, 06/10/2011, unpublished. Parts of the interview appear in this volume, pp. 416–419.

6 Ibid.

reality is always viewed through metaphorical tracing paper.⁷ Here, Moulin seems to refer to Jean Baudrillard's postmodern theory of the simulacrum according to which the mass media imitation of reality is not just a copy, but becomes its own independent reality.⁸ In *Viderparis* Moulin seeks a high degree of realistic representation which, in his opinion, is not necessarily attained by high resolution alone. It has far more to do with showing something to people, which conveys to them the impression of already knowing it. In this way they do not question the authenticity of what has been shown.⁹

The installation is also political: it is a metaphor of the future of our cities, because in his view our society is moving towards "clinical death."¹⁰ *Viderparis* poses the question as to how far a world constructed by humans is conceivable without them. In this way the work also alludes to the genre of science fiction. In the interview with the artist conducted as part of this case study, Moulin cites the novels by Philip K. Dick and the short stories from *The Terminal Beach* (1964) by J. G. Ballard as among of his most important sources of inspiration.¹¹

Although in the interview Moulin is adamant that in the installation the images must be presented in random sequence, he has also published the images of *Viderparis* as a book.¹² His concern was to facilitate "democratic" access by offering an affordable version of the work. However, together with his Galerie Chez Valentin, he categorically excluded the possibility of offering prints for sale.

Provenance

Viderparis (1998–2001) exists in three editions. The edition that was investigated by this case study was acquired by the Musée d'Art moderne et contemporain (MAMCS), Strasbourg, in 2002. Two further editions are owned by the Musée d'Art moderne de la Ville de Paris and the Galerie Chez Valentin, Paris.

Course of Action

The key parameters of the work *Viderparis* were recorded in the documentation phase of the case study. An artist interview (see the excerpt from the interview, pp. 416–419) supplemented the analysis of the installation and the evaluation of the options for preserving this work by Moulin that are viable in a museum context. Finally, recommendations – also coming from the artist – were formulated for the redundant data backup (see glossary, p. 601) and for storage in formats suitable for archives.

7 Ibid.

8 See Jean Baudrillard, *Simulacra & Simulation*, University of Michigan Press, Ann Arbor, 1994.

9 See Massera, Mueller 2011, unpublished.

10 Ibid.

11 See Massera, Mueller 2011, unpublished.

12 See Nicolas Moulin and Norman Spinrad (eds.), *Viderparis*, Isthme éditions, Paris, 2005. See also Massera, Mueller 2011, excerpt, this volume, pp. 416–419.

Documentation

The initial position of the work when this case study began demonstrates clear parallels to the conservation issues found in Samuel Rousseau's video installation *Untitled (papier peint vidéo)* (2003)¹³: In both cases – Rousseau's work, as well as *Viderparis* by Nicolas Moulin – there is no specific equipment dedicated to these particular works; in other words, the technical equipment used to display them can vary each time they are presented without causing any obvious aesthetic changes in the work. Further, both works were handed over to the acquiring institutions on optical storage media. When Moulin handed over *Viderparis* he gave the museum two CD-Rs (Compact Disc-Recordable): one contained the image data, and the other the audio files. Once the work had been incorporated into the MAMCS collection in 2002, it was given an inventory number (55.002.11.1) for identification purposes.¹⁴

Since that time, *Viderparis* has been exhibited twice: first, in an exhibition presenting works in the MAMCS collection (May 24–August 25, 2002), and second, in the exhibition *Temps, mémoire, diction, disparition* at the Musée des Beaux-Arts et d'Archéologie de Besançon (June 1–September 18, 2006). However, there is no record of what equipment was used on these two occasions. The MAMCS does not possess its own IT equipment for exhibitions but depends on the support of a municipal service provider of the city of Strasbourg. To give our project team a first impression of the multimedia installation, Franck Knoery, registrar at the MAMCS, arranged a test setup of the installation in the exhibition room originally used for its presentation.

At the time of its acquisition in 2002, Nicolas Moulin sent instructions about the setup of the installation to the MAMCS by email. These instructions were checked and recorded as part of the documentation for the case study.¹⁵ When the artist's instructions were checked, an error was corrected: the artist's instructions mistakenly refer to the superordinate file *VIDERPARIS* and to the data file, although on the CD-R in the museum's possession, the data file is named *showvp* and the decisive file as *vipa*. All the data¹⁶ needed in order to present *Viderparis*, both image and audio data as well as the project file *vipa*, were noted. The image files were documented with particular reference to image resolution and the specification of dot density (in dpi). For example, the image file *viderparis13* was recorded with the following values:

13 See the case study on Samuel Rousseau's work *Untitled (papier peint vidéo)*, this volume, pp. 456–471.

14 The MAMCS collection can be searched via the portal Videomuseum, available online at: www.videomuseum.fr, accessed 05/23/2013. The inventory number of the work of art is listed in the detailed display.

15 See Nicolas Moulin, *VIDER PARIS INSTRUCTIONS DE MONSTRATION ET D'INSTALLATION*, instructions for the assembly of the installation *Viderparis* (1998–2001), 2002, unpublished.

16 See *Computer-based artwork prompt sheet. Media Elements for Computer-based Artworks*, available online at: www.tate.org.uk/about/projects/matters-media-art/templates-acquisitions, accessed 05/23/2013.

Test set-up of Nicolas Moulin's digital video installation *Viderparis* at the MAMCS, Strasbourg
Photo: ZKM | Karlsruhe



image resolution 4724×3126 pixel, dot density 400 dpi. In the case of the audio titles, the duration of the individual pieces was recorded.¹⁷

Conservation

The production of the installation *Viderparis* took a number of years (1998–2001). During this time, the artist was fully engaged in editing the digital images of his photographs: the source material of the total of fifty projected images in the installation are scanned and digitally edited analog photographs.¹⁸ For this, Moulin used the photo editing program Adobe Photoshop (version 5.0).¹⁹ The finished photomontages he delivered to the purchasers of his works as JPEG files. The reason for his choice of this format was the easy handling of the data volume and the unproblematic display by the selected slide show software.²⁰ According to the installation instructions of the Galerie Chez Valentin,²¹ the following equipment is required for presentation:

17 The soundtrack was handed over on a CD-R in audio CD format. Corresponding to the Red Book Standard, the audio material was recorded with a sampling rate of 44.1 kHz and a Sampling depth of 16 bits with two channels. See "2.2.1 Analog mode: Audio," in: DOCAM Conservation and Preservation Committee, *Conservation Guide. A Preservation Guide for Technology-Based Artworks*, available online at: www.docam.ca/en/22-content-media/221-analog-mode-audio.html, accessed 05/23/2013.

18 During assessment of the image data, indications as to the working process became visible. For example, the files *viderparis23* and *viderparis27* prove that after the scanning process, the crop tool was not used efficiently.

19 See Massera, Mueller 2011, excerpt, this volume, pp. 416–419.

20 See Massera, Mueller 2011, unpublished.

21 See Galerie Chez Valentin, *Notice d'installation. Matériel nécessaire*, installation instructions for the work *Viderparis* (1998–2001) by Nicolas Moulin, Paris, unpublished.

- PC with 256 MB system memory (operating system: Microsoft Windows)
- Video projector with a light intensity of 1200 ANSI-Lumen²²
- CD player
- Amplifier
- 6 loudspeakers (loudspeaker performance: 30 watts)²³

Since the display of the images according to the random principle constitutes an essential aspect of the work concept of *Viderparis* for presenting the work Moulin prefers to use the proprietary software (see glossary, p. 601) DiaShow from the provider AquaSoft, which guarantees this function.²⁴ Additional parameters, which must be adhered to at all costs for the presentation of the work, are a display duration of 32 seconds per picture, the selection of the preconfigured crossfading effect alphablending (soft), and display in full screen mode in conformity with the original aspect ratio of the images. Moulin saved all slide show settings in the project file *vipa* (file update: .ads). As a precautionary measure, the artist enclosed with the directions for setting up the installation instructions for the configuration and for adjusting program parameters for *Viderparis*. These instructions enable the user to run the slide show in the intended form even without the project file.

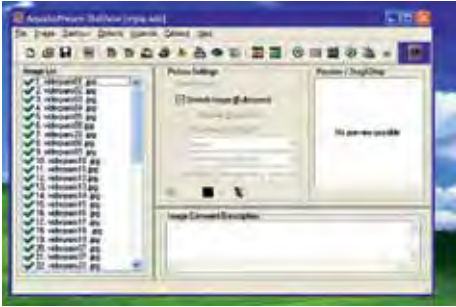
A defect in the technical implementation of the work had already been noted during the trial run. The images of the city vary in size: for example, the resolution of the image *viderparis13* is 4724 × 3126 pixels, whereas *viderparis25* has 4724 × 3425 pixels. During the course of setting up the installation – the artist requests the projection surface to be white with the surrounding space painted grey – this leads to complications. The image format of the projection is 4:3. Since none of the photomontages corresponds to this format, in spite of the adjustments made during projection (“full screen mode,” “aspect ratio maintained”) there are areas on the white projection surface that are not covered by the images which the software fills out with the selected background color – black. The fact that the white of the blank areas of the projection surface stands out in clear contrast, is something that observers find disruptive.

Similar to the endless sequence of random images, the sound should also be continually present. The soundtrack is repeated by means of the repeat function on the CD player. It would have been technically possible with the software used to integrate the soundtrack; however, Moulin did not do this.

22 A minimum size of the projection is not specified either in the artist's instructions or in the gallery's guidelines. In the interview, Moulin refers to a minimum height of 1.90 meters. See Massera, Mueller 2011, excerpt, this volume, pp. 416–419.

23 In the instructions of the Galerie Chez Valentin, Paris, six loudspeakers are stipulated as required equipment for setting up Moulin's installation. Moulin's specifications, however, demand only two loudspeakers. This discrepancy was clarified during the course of the artist interview. See Massera, Mueller 2011, unpublished.

24 The inexpensive software DiaShow by AquaSoft (version 3.5.2) was acquired by the museum after the installation had been purchased.



Screenshot of the software AquaSoft DiaShow, which was used to program *Viderparis*

He has agreed to a future digitization, and thus to embedding in the software AquaSoft DiaShow, the program version 3.5.2 of which supports the audio file formats WAVE and MP3.²⁵ In this case, future presentations of the work could dispense with the use of CD players.

In the course of the case study the use of alternative techniques of presentation were considered. The project team found that tying the work to a new specific physical medium, for example, a BeagleBoard, PandaBoard,²⁶ or a flash card media player (see glossary, p. 600), would not be expedient for the preservation of the work.

The focus of the conservation concept for the installation *Viderparis* was placed on data backup, since the existing visual storage medium – two CD-Rs – carries a major risk because of its vulnerability. To date, the MAMCS has been unable to guarantee proper storage of these information carriers. They should be stored in accordance with the ISO norm at a constant room temperature of 23°C and a maximum relative humidity of fifty percent.²⁷ A redundant data backup, which Moulin also expressly recommended during the case study interview has not yet been carried out. Moulin is expressly in favor of this measure as he considers the unlimited reproducibility as an “advantage of these working techniques.”²⁸

Unfortunately, the format of the image files originally provided by the artist is not adequate for long-term archiving. However, Moulin has agreed to supply the image data at a later point in time in the more appropriate TIFF format. This data format is suitable as a digital master.²⁹ The present soundtrack should be digitized with a sampling rate of up to 192 kHz and a sampling depth of 24 bits, in order to achieve audio quality equivalent to present-day standards.³⁰ The container formats WAVE and AIFF are suited to this purpose.³¹ In the interests of retaining the original acoustic pattern data compression (see glossary, p. 600) should be strictly avoided.

25 See Massera, Mueller 2011, unpublished.

26 The BeagleBoard is a single-board computer, and the PandaBoard is a further development of this. Both versions of the design are not expensive to buy. Available online at: <http://beagleboard.org>, accessed 05/23/2013.

27 See Image Permanence Institute, *IPI Media Storage Quick Reference*, p. 7, available online at: www.imagepermanenceninstitute.org/shtml_sub/msqr.pdf, 05/23/2013.

28 See Massera, Mueller 2011, excerpt, this volume, pp. 416–419.

29 See Markus Enders, “Bilddokumente,” in: Heike Neuroth et al (eds.), *nestor Handbuch. Eine kleine Enzyklopädie der digitalen Langzeitarchivierung. Version 2.3*, 2010, chapter 17, p. 12, available online at: http://nestor.sub.uni-goettingen.de/handbuch/artikel/nestor_handbuch_artikel_422.pdf, accessed 05/23/2013.

30 See Winfried Bergmeyer “Audio,” in: Neuroth et al. 2010, chapter 17, p. 59, available online at: http://nestor.sub.uni-goettingen.de/handbuch/artikel/nestor_handbuch_artikel_425.pdf, accessed 05/23/2013.

31 Ibid., chapter 17, p. 60.

Conclusion

The proprietary software DiaShow manufactured by AquaSoft that was originally used by the artist, still runs on current operating systems (Windows XP, for example). The DiaShow product line of software is still being developed and enhanced. The most recent version is available for the operating systems Windows XP, Windows Vista, and Windows 7, and DiaShow has a large user community.³² However, before purchasing any up-to-date program version in the future one should check whether the range of functions still corresponds to the presentation of *Viderparis*.

Since for Nicolas Moulin the software used is in principle irrelevant so long as the parameters he specifies are maintained, alternative developments in the field of free software (see glossary, p. 600) should also be kept in mind. In the course of the case study³³ it was possible for the first time to document the parameters that are significant for the work. Since the mid-2000s, the fragility of optical storage media has also been debated in the press and specialized publications.³⁴ In order to guarantee the stability and long-term preservation of the work, the goal should be to separate the data from the data carrier. The MAMCS should certainly take advantage of the artist's offer to hand over the image data in a format suitable for archiving. Here, there should be particular emphasis on a strict separation between presentation media and formats on the one hand, and archive media and formats on the other.

Translated from the German by Justin Morris

32 See *AquaSoft Diskussionsforen*, available online at: <http://forum.aquasoft.de/index.php>, accessed 05/23/2013.

33 See Massera, Mueller 2011, unpublished.

34 See Thomas Littschwager, "Daten für die Ewigkeit," in: *Chip*, no. 07, 2007, pp. 76–82.

Viderparis

An Interview with Nicolas Moulin

Nelly Massera and Catherine Mueller

Excerpt from the interview conducted via Skype on June 10, 2011

In what way would you say your artistic practice has developed over the course of time? Which media or techniques do you use?

Nicolas Moulin: One could say that the medium in which I work is the “image” – everything that has to do with the image. But this is not all since the essence of my work turns on the idea and dimension of landscape. Thus, to a certain extent my work also naturally represents a critical investigation of architecture. In other words, I also work with volume. However, I am primarily dedicated to the image. Incidentally, I have been photographing since my schooldays. Photography is a very old technology. Today, with respect to our age, it is less a question of photography itself and far more about what one is able to do with it. I have tested and newly created endless versions of what one refers to as the “image” by video technology, photography and photomontage. *Viderparis* [1998–2001] is one of the first examples of my involvement with photomontage. In other words, I am a photographer because I use a camera, but I generate images to the extent that I also use photographs which I have created on a computer, or which I project. My treatment of photography has something nomadic about it: I’m not a studio photographer; I do not belong to the school of those who reconstruct scenes in the studio. I am far more somebody who works with landscapes, somebody who takes photographs or videos and then uses these in models or installations by collecting or retouching them. I have recently become a big collector of images which

have not necessarily been produced by me. I find this important because images transgress the limits of the concept of authorship.

How would you describe your method of working?

I am afraid I shall have to disappoint you, since I do not, in fact, have a working method. While I do not work according to a certain method, I do have an approach. With respect to the idea of landscape in which I am interested, my most important method is to execute it: one is only able to talk well of things about which one has knowledge and in order to know them, one must work with them. A decisive phase in my work consists in being on the move and in being in different places I find interesting. In a further phase I collected raw material, which could be a photograph – it is here that my work with images begins. This photograph served me as a basis for finding ideas, as the basis for reflection on an entire series of works: this involves both source material for photomontage as well as a database of photographed forms, which allow me to reflect on spatiality, installations and to think further.

A further phase of my work then followed, which I draw on continually, namely, on 3D video technology. I also work together with a friend, a professional 3D developer called Philippe Cuxac. I have made almost all my films based on computer graphics with him. Thus, one could refer to my way of working as collaborative. Philippe Cuxac comes to Berlin and we work mostly at night, always based on real

things: namely, when we work with 3D technology, then this invariably takes place on the basis of photographic documents. Ultimately, we work with highly developed technologies, although we do continue to draw on very simple, almost rustic methods: we even make collages in 3D. My photomontages have a very realistic effect – one may do this when working with computer technology – although, in the end they still remain photomontages, in other words copy-and-paste products, although not only. Today, for example, one is not only able to copy and introduce images with Photoshop, but one can distort them, turn them over, stretch them, etc. So, this is my method of working, and this method follows the style of reconstitution. One could almost compare this with the production of chipboard: one takes chippings, glues them together and thus produces a board – an imitation. In my works I almost work in exactly the same way: I produce agglomerates, I produce “realistic” views from various elements made of innumerable small single parts. So, this is my method.

Why did you decide in favor of the projection method in the case of *Viderparis*?

An important question. I wanted to project these images ever since beginning work on this piece; I didn't want a copy on paper. This was simply because I conceived of this work as a cheeky gesture towards a certain kind of cinema. This work does, in fact, refer to cinema and its manner of functioning – not in the sense of a film but far more as a universe or a fiction into which one may step. This also enables me to show the images in a random sequence. I used a computer program for the random-based reproduction of images: thus, there was no beginning or end [of the projection], which perhaps also emphasizes the labyrinthine character of Paris.

The ultimate question is whether one should make copies of the work since it has enjoyed very great success. Many people requested that I sell them a copy, but I invariably refuse this – much to the dismay of my bank account, which continues to suffer as a consequence – since I wish to remain radical. I refused to make copies of *Viderparis*, since making a bourgeois painting from a science fiction film did not correspond to the meaning of this image. I lack the necessary cynicism for this. No, for me it made no sense, because I would have otherwise gone from projected image which distinguishes itself by a certain authenticity, to pure illustration. One major problem when working in a “realistic” or if you will, in an objective register, is the following: if one does not stage all these figures in a meaningful way, one slips into the illustration of something that one cannot grasp, and this is what I wished to avoid. I wished to avoid *Viderparis* becoming an illustration. Naturally, this would only be suitable for a calendar... It would have been possible to advertise this way ... But I did not want this. I consequently decided to remain steadfast and to only produce *Viderparis* as an installation. It is as if one would ask a musician who has just had a hit to give away his music for advertising or to make an appearance in TV entertainment programs... I am not interested in this. In agreement with my gallerist, I decided never to make copies of *Viderparis*. In the case of other works, by contrast, I do copy images, although for other reasons. With the series *Novomond* [1996–2000], for example, I did this because it involved a work of photography. More specifically, this involved the work *Pôle* [1996],¹ which exists as projection, and which I developed together with Bertrand Lamarche. However, in that it also involved photographic

1 *Novomond* is a series of photographs from which *Pôle* was decoupled and set up as an installation.

work, copies could also be made. With *Viderparis*, it is something different: this is a photo-montage, a work which gains nothing as a copy. Furthermore, there is also an acoustic dimension to *Viderparis*: a penetrating sound accompanies the images in an infinite loop. With a copy, by contrast, this acoustic level is lost...

I nevertheless made a small concession – in fact, it is not really a concession but far more a decision which I made, and I like the idea very much: we recently decided to produce a book² so as to make this work accessible to people without them having to wait until they are able to see it somewhere. I admire this concept of dissemination, because one thereby operates at a very democratic level: the book costs thirty euros, and is available in bookstores; anyone can buy it, and keep a trace of this work. In my opinion, the book represents a possibility in contemporary art to “democratize our work.” I belong to those who do not believe that holding exhibitions with free admission for the masses, such as the Monumenta, contributes to the real democratization of art. As far as I can see, this represents a vulgarization of art, whereas the real democratization of art is to leave a trace to everyone. I thus see myself as a kind of “Ayatollah” of the book.

You were present on the occasion of the first presentation of *Viderparis* held at the Musée d'Art moderne et contemporain in Strasbourg in order to set up the installation yourself; you also provided guidelines. However, there are several parameters which the museum can adapt itself, such as sound and size of image. How much leeway do you allow here?

The leeway is the projection in which one may submerge oneself. If you produce a projection of the dimensions 1.00 × 0.80 meters, this is tiny, the size of a mere handkerchief. In this case, it is no longer particularly interesting, because a certain spatial dimension must emerge. The necessary spatial dimension is oriented on people. The average human being measures between 1.50 and 1.90 meters tall. In the projection, ideally the image should thus be taller than 1.90 meters. This is a purely technical aspect.

Otherwise, I place considerable value on the projection space being painted grey. This is quite important simply because grey is neutral: it is neither entirely white nor black, red nor green. And it is precisely this neutrality which is interesting, since it allows the image to exist in the way I wish it to – as if it was admitted, as if the environment might also be the extension of the image. I do not think that this grey simply has to do with the artist's mood: it simply functions well.

How do you deal with the aging process and decay of your works and thus with the question of conservation?

As you can no doubt imagine, here I have recourse to philosophy. In the case of my sculptural works, their decay is already anticipated in their construction. I would even go as far as to say that I am curious to see in which way they will decompose over the course of time. In the case of photographs, things look different because they are more complicated; a photograph must be available in good condition so that it can be adequately perceived. I have really been very lucky that people wish to buy my photographs ... In so far as the images are digital, I save them on hard disks. Should somebody who bought one of my images have subsequently destroyed it, I can send the file to the photo-

² Nicolas Moulin, *Viderparis*, Isthme éditions, Paris, 2005.

graphic lab again, and the person in question can collect and pay for the “new” image.

Viderparis is also among those works in digital form: in principle, these files do not age since they are comprised of ones and zeros. In essence, the problem of conservation only refers to storage media on which one saves the information. At the time I sold *Viderparis*, the data were on the CD-ROM – today it is ridiculous to save the work on CD-ROM. Those in possession of a CD-ROM, could just as well save the data on a disk drive. In any case the data remain the same; one may save them wherever one wishes, on a server or a USB flash drive. One may also make any number of copies of the CD. If you save the data on a disk drive, I recommend that one also makes a duplicate copy: in this way one has it even if the disk drive is destroyed. And whoever no longer has the files may contact me, and I can send it to them via Internet. Thus, there are no longer any problems. However, the question of long-term conservation represents another problem: one must regularly replace storage media by up-to-date models, very simple. In Strasbourg they still have the CD-ROMS.³ I recommend keeping the CD-ROMS, but to make several copies of the data, and to save these on external disk drives or USB flash drives, just in case technical problems appear. Undertake exactly the same thing with audio files. It is much easier this way. This is the advantage of these techniques.

Would you be able to accept the fact that in the future your works might vanish altogether?

This will cease to be a problem when I am no longer alive, but so long as I am still alive, this would upset me. But, if I'm still alive, I would still have traces of these works. In any case, everything is destined to disappear, even the most stable things. Apparently, only bronzes remain intact for a very long time, even for many millions of years. Aside from a number of works by Mathieu Mercier and the French artists, not much will remain ... One should send a work like *Viderparis* into outer space with the radio telescope at the Arecibo observatory, since, as you know, data get lost in space and are thus immortal ... They are everlasting!

Translated from the French by Imogen Forster

3 Musée d'Art moderne et contemporain Strasbourg (MAMCS) purchased *Viderparis* in 2002. The work was handed over to the museum in the form of two CD-ROMs: one contains the image files, the other the audio files.



Michael Naimark
Karlsruhe Moviemap
1991
Interactive installation
Installation view
*Digital Art Works. The Challenges
of Conservation,*
ZKM | Media Museum
Photo © ZKM | Karlsruhe
Photo: ONUK

Michael Naimark (*1952, Detroit, USA)

Karlsruhe Moviemap

1991, 2009

ZKM_Collection, Karlsruhe

Hardware:

Version 1991 (original)

- Apple Macintosh IIsi (Mac OS)
- Apple Macintosh Portrait Display
- Laser disc player Pioneer LD-V8000
- Video projector

Version 1991 (condition 2006)

- Apple Power Mac G5 (Mac OS)
- TFT monitor
- Video projector

Version 2009 (reinterpretation)

- PC (Linux)
- Touch screen
- 2 video projectors
- Silver screen
- Polarized 3-D glasses

Software:

Version 1991 (original)

- In-house development
(Christoph Dohrmann)

Version 1991 (condition 2006)

- Development environment Max/MSP
(Matthew Biederman)

Version 2009 (Reinterpretation)

- In-house development
(Martin Schmidt)

Conservation Strategies:

- Migration
- Reinterpretation

Documentation:

- Esther Neumann
- Arnaud Obermann
- Claudia Röck

Conservation Concept and Conservation Measures:

- Mirco Fraß
- Daniel Heiss
- Christian Nainggolan
- Arnaud Obermann

Text:

- Chiara Marchini Camia
- Esther Neumann
- Arnaud Obermann

The interactive installation *Karlsruhe Moviemap* (1991, 2009) simulates a street-car ride through the city of Karlsruhe. This work had already been the object of different conservational measures prior to the beginning of the *digital art conservation* project. The objective of the first series of measures, which can be termed the strategy of migration, was to preserve the original work of 1991. The result of the second conservational intervention, which involved a reinterpretation, was completely new and, with respect to appearance and functionality, a version of the work which differed significantly from the original. Over the course of the case study, earlier conservational measures were documented and further steps for the work's conservation initiated.

Work Description

The original version of the *Karlsruhe Moviemap* was produced in 1991. In 2009, a reinterpretation (see glossary, p. 601) of the work was completed on the initiative of ZKM | Center for Art and Media Karlsruhe, which was realized on the basis of the original concept, but represented as a more up-to-date and modified version of the installation.

In the first version of the work, the viewer operates a control switch mounted on a base in a dark room to control the sequence of images projected, which reproduce the view from a streetcar driver's cab. Throughout this virtual journey through Karlsruhe, the streetcar can be steered forwards or backwards, and at junctions to the left, to the right, or straight ahead. On a small CRT monitor (see glossary, p. 599) next to the control switch on the imitation control panel, viewers can see their position on the streetcar network.

For the original version of the *Karlsruhe Moviemap* the recordings for the projection were produced using a 16 mm stop frame camera, which was mounted on a special streetcar that drove up and down the entire network in both directions. The camera was connected to the streetcar's hubodometer and, depending on the location, it took a photograph every two, four, or eight meters. Although the projected pictures appear to be in time with the driving speed as controlled by the viewer, their sequence is fixed. Only one picture exists for each point of the streetcar network, and this same image is

Michael Naimark
Karlsruhe Moviemap
 (reinterpretation)
 2009
 Interactive installation
 Installation view *Digital Art*
Works. The Challenges of
Conservation,
 ZKM | Media Museum
 Photo © ZKM | Karlsruhe
 Photo: ONUK



displayed each time the viewer passes this point during the virtual journey. Thus, the surroundings, passers-by, car drivers, and light conditions are always the same. The journey around the streetcar network shown does not occur in real time, as might be the case in a computer game, even though the controllability of the filmed images seem to suggest this.¹ The *Karlsruhe Moviemap* is actually a film where the sequences can be called up by a viewer in the selected direction (forward, backward) and speed, but only within the given route of the streetcar.

The second version of the work, which was realized in 2009 by the ZKM | Institute for Visual Media is stereoscopic. For this reinterpretation of the installation, the streetcar network of the Karlsruhe transport system (KVV) was completely reshot, this time with two digital cameras. By means of a dual projection and the use of polarized 3D glasses, a stereoscopic perspective of each view of the streets of Karlsruhe emerges. This effect is ideally experienced directly at the driver control panel from a central position in front of the projection screen. Also due to the high-resolution digital recordings, the experience is much more immersive than in the first version of the work. Apart from the new HD recordings and the stereoscopic projection technology, the new version also distinguishes itself from the old one because an original driving switch from a streetcar now serves as the user interface, and a given position of the streetcar within the network is represented by means of an interactive city map on a touchscreen. From the point of view of conservation this version of the work is a reinterpretation, which is based on the concept of the 1991 version but with respect to content – the original footage – and the general appearance of the work, clearly deviates from the original.

Art Historical Context

Michael Naimark has worked at the interface of media-technology and artistic research since the 1970s. The main focus of his work is on the development of technology for spatial representation. He gained his BSc in 1974 in cybernetic systems at the University of Michigan and, in 1979, an MSc in Visual Studies and Environmental Art at the Massachusetts Institute of Technology (MIT). At MIT's Center for Advanced Visual Studies (CAVS), as a student of Otto Piene Naimark focused initially on developing rotating projectors which would imitate the movement of the film camera at the moment the image was recorded. Next, he joined the research group within the Architecture Machine Group, directed by Nicholas Negroponte, which was working on the *Aspen Moviemap* (1978–1980): Michael Naimark was primarily involved in capturing 54,000 photos of the city of Aspen, which were taken during innumerable car

1 During the guided tours through the ZKM | Media Museum it has often been observed that the installation arouses the expectation in visitors that the streetcar journey – much like a computer game – can be influenced in real time.

Architecture Machine Group
Aspen Moviemap
 1978–1980
 Interactive installation
 Video still
 © Architecture Machine
 Group



drives through the city. On the basis of these recorded images, a simulated drive through Aspen could be navigated by means of a joystick.

The *Aspen Moviemap*, financed by the Defense Advanced Research Projects Agency (DARPA) of the U.S. Ministry of Defense, is considered as the first interactively navigable virtual environment, as well as the first “hyper-media program to be shown publicly.”² After Michael Naimark left the MIT, he developed as an independent artist the concept of the *Aspen Moviemap* in a series of his own works: for the San Francisco Bay Area he created the simulation of a helicopter flight and produced a moviemap of the Madeleine district of Paris for the city’s transport services (RATP). The contact with the ZKM | Karlsruhe was established in 1989/1990 through his former professor Otto Piene. Naimark agreed to develop a new work and was thus commissioned to create the *Karlsruhe Moviemap* for the MultiMediale 2 (1991)³.

When Naimark first heard of the highly innovative Karlsruhe Dual System City Railway,⁴ he hit on the idea of using the streetcar network of the

- 2 Lev Manovich, *The Language of New Media*, The MIT Press, Cambridge (MA), 2001, p. 259. Here Lev Manovich argues with reference to the *Aspen Moviemap*: “Although in the 1990s Apple’s QuickTime VR technology made this technique quite accessible, the idea of constructing a large-scale virtual space from photographs or a video of a real space was never systematically attempted again, despite the fact that it opens up unique aesthetic possibilities not available with 3-D computer graphics.” Ibid., p. 260. The existence of the *Karlsruhe Moviemap* and the other *Moviemaps* in Naimark’s oeuvre contradict this statement.
- 3 The MultiMediale (1989–1997) was an international media art festival which took place every two years, and was organized by the ZKM | Karlsruhe.
- 4 The system, also known as the Karlsruhe Model, connects streetcar networks

city as starting point for the *Karlsruhe Moviemap*. Naimark's interest thereby centered first and foremost in generating a hyper-real cinematic experience of moving through the city for the viewer, and not so much in constructing the simulation of a streetcar journey. Initially, the streetcar network was to serve merely as a predefined navigation structure and as a basis for stable film recordings of selected routes; there was no intention to make it the subject of the work itself. During shooting, however, the focus was on the tracks, and in the installation, the projection was adjusted such that the driver perspective was reconstructed for the viewer on the control panel, whereby finally the network itself literally came into focus.⁵

Like the work *The Legible City* (1989–1991) by Jeffrey Shaw, which was created at around the same time (see pp. 488–518), the *Karlsruhe Moviemap* can also be attributed to the tradition of Expanded Cinema. In addition to the developments in computer animation and Video art, in his book *Expanded Cinema* of 1970, Gene Youngblood describes experiments by artists and filmmakers such as John Cage, Andy Warhol, Stan VanDerBeek, and Otto Piene, which by means of physical environments took the filmic image from the screen and put it into real perceptible space in the 1960s.⁶ In addition to Jeffrey Shaw and Luc Courchesne, Michael Naimark is considered one of the most important exponents engaging with “spatialized filming” in digital art.⁷ The works of Shaw and Courchesne also share the principle of interactivity with Naimark's artworks which in his case primarily manifests itself through the viewer being free to call up filmic action. As already mentioned, in the case of the *Karlsruhe Moviemap*, Naimark's interest is centered on generating an immersive experience for the viewer. In this sense the work displays similarities with works by Luc Courchesne such as *The Visitor: Living by Numbers* (2001), which investigate at the same time the sensory illusion of presence and the particular destinies of people and the stories about particular places.

Because the *Karlsruhe Moviemap* was produced in collaboration with local people and was created for a local audience, Naimark categorizes this work as an example of “folk art.” In an interview he emphasized the significance of collaboration with the staff of the Karlsruhe transport system, and pointed out that the reaction of the viewers to the work is very different when they know the city of Karlsruhe.⁸ With his work *Be Now Here* (1995–1997), Naimark created another immersive environment where, with the aid

and railway lines with one another. The system developed in Karlsruhe was implemented there in the 1980s, and in the meantime has been adopted by other cities. Available online at: <http://karlsruher-modell.de/en/index.html>, accessed 05/22/2013.

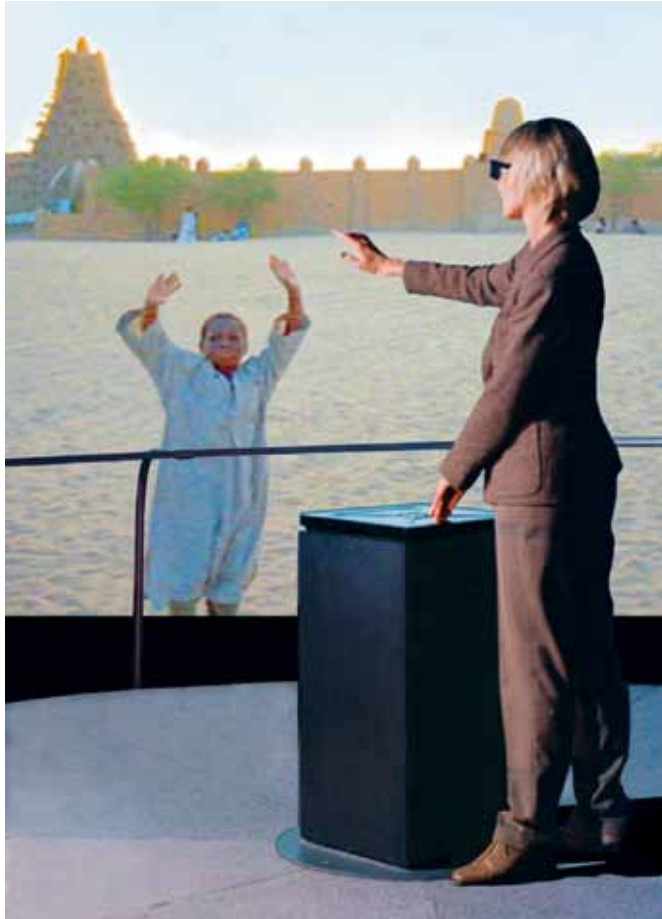
5 See unabridged version of the interview with Michael Naimark conducted by Rebecca Picht, 05/29/1997, unpublished. The interview is partially published in this volume, p. 438.

6 See Gene Youngblood, *Expanded Cinema*, E. P. Dutton & Co., New York, 1970.

7 See Christiane Paul, *Digital Art*, Thames & Hudson, London, 2003, p. 99.

8 See Picht 1997, unpublished.

Michael Naimark
Be Now Here
 1995–2002
 Interactive stereo panorama
 installation
 © Michael Naimark
 Photo: Ignazio Moresco



of 3-D glasses, viewers can experience panoramic images of four places which are all on the UNESCO World Heritage List: Angkor, Dubrovnik, Jerusalem, and Timbuktu. In addition to portraying specific places and their inhabitants, the intention was again to produce the illusion in the viewer of actually being present in the place depicted. For Naimark, the difference between images of real places and simulated images produced by computer graphics lies in the fact that the first entail a real responsibility vis-à-vis the history of the place represented.⁹

Provenance

The 1991 version of the *Karlsruhe Moviemap* was commissioned by the ZKM | Karlsruhe and purchased by the institution in 1993. The new stereoscopic version of the work was produced in 2009 at the ZKM | Karlsruhe, with the

artist's consent. Both versions of the work were realized with the assistance of the Karlsruher Verkehrsverbund [transportation network of Karlsruhe].

Course of Action

Work on the case study began with an examination of the entire history of the installation at the ZKM | Karlsruhe from its production onward. A defect which appeared in the installation while the project was running, further made it necessary to make changes to the control system of the work as it had been in place since a 2006 update (coordination: Mirco Fraß, Arnaud Obermann; implementation: Daniel Heiss, Christian Nainggolan). In addition to preserving the concept of the work through the 2009 reinterpretation, these measures also served to preserve the original installation at least in the medium term. Further, the 16 mm color negative film of the original version from 1991 was digitized and an interview was conducted with Michael Naimark (Arnaud Obermann and Chiara Marchini Camia, see the excerpt from the interview, pp. 439–440).

Documentation

Since it was handed over to the ZKM | Karlsruhe Michael Naimark's *Karlsruhe Moviemap* (1991) has been modified several times by the artist. In the following, distinction must be made between the two above-mentioned versions of the original work, and the reinterpretation produced in 2009:

- Original work: version 1991
- Revised installation: condition 2006¹⁰
- Reinterpretation: version 2009

All components of the installation (1991 version) were listed in an inventory when the work entered the ZKM_Collection. The complex interaction of these components and their functional relationships were not documented prior to 2006.

When preparing a solo exhibition in 2005,¹¹ Michael Naimark contacted the artist and computer scientist Matthew Biederman and engaged him to overhaul several of his works, including the *Karlsruhe Moviemap*. As a result

10 The revision of the work took nearly two years; the initial preparations were in February 2006. This can be inferred from the email correspondence of the ZKM | Museum and Exhibition Technical Services.

11 At the exhibition *Michael Naimark. Interactive and Immersive Film Environments, 1977–1997* (May 22–August 20, 2005, Alyce de Roulet Williamson Gallery, Art Center College of Design, Pasadena, CA) the *Karlsruhe Moviemap* was also presented. See "Michael Naimark. Interactive and Immersive Film Environments, 1977–1997," available online at: www.williamsongallery.net/naimark, accessed 05/22/2013. See also Matthew Biederman, "Artist and technologist," 2006, available online at: www.docam.ca/en/annual-summits/2006-summit/116-artiste-et-technologue.html, accessed 05/22/2013.



Open console of the installation *Karlsruhe Moviemap* (version 1991)
The components originally used are easily identifiable: the Apple Macintosh Portrait Display (above), the Apple Macintosh IIx and the Pioneer laser disc player LD-V8000 by (below).
Photo © ZKM | Karlsruhe

of Matthew Biederman's work on it at the ZKM | Karlsruhe, from 2006 onwards the *Karlsruhe Moviemap* had changed considerably. After this intervention was completed (which will be described in more detail below) no further documentation was produced, in spite of the fact that the installation was constantly on show at the ZKM | Media Museum.

The state of the work when the research project began in 2010 was ruled as the starting point for further research. In spite of the existence of components of the original version of the work as well as information carriers, it was not possible to reconstruct the in-house history of the installation in its entirety. During compilation of the documentation for this project, all components of the installation (state in 2006) were inventoried. After creating a disk image (see glossary, p. 600), the files necessary to the integrity of the work, such as the embedded video file *VBKjpeg*, could be analyzed in QuickTime container format (MOV format), and added to the documentation.

In addition to recording media type, storage position, file size, and file extension, further information about files could be acquired via freeware (see glossary, p. 600) MPEG Streamclip¹², for example, the screen frame rate (29.97 fps; corresponding to the NTSC standard), the screen size (640 × 480 Pixel), and the Codec (SheerVideo) used to create the file.¹³

Conservation

The original version of the *Karlsruhe Moviemap* (1991) is comprised, among others, of the following equipment:

- Apple Macintosh IIsx (produced from 1990 to 1993)
- Apple Macintosh Portrait Display (produced from 1989 to 1992; monochrome 15-inch CRT monitor)
- Laser disc player (see glossary, p. 600) Pioneer LD-V8000

Apart from the projector, all the components were housed in a console. On the console, only the lever, the control buttons, and the Portrait Display, showing the current position on a map of the rail network, are visible. Using software developed by Christoph Dohrmann and several work-specific hardware components, the installation was presented in this form until the end of 2005.

¹² The software MPEG Streamclip enables the user to process and playback as well as convert video and audio material. See "Squared 5 - MPEG streamclip for Mac and Windows," available online at: www.squared5.com, accessed 05/22/2013.

¹³ The designation Codec is derived from the terms *compressor* and *decompressor*. A Codec facilitates the compression of audio and video data.



Screenshot of the original software (version 1991)

The artist used the computer as an intermediary in order to display the route selected by the viewer through the controller with the laser disc player. For this Michael Naimark used the advantages offered by a laser disc (see glossary, p. 600) in CAV format (constant angular velocity), for with appropriate utilization of the laser disc player, it was possible to locate individual frames on the laser disc and display them in high quality.¹⁴

Work on revising the original installation commenced in February 2006 and lasted for almost two years. The internal components of the *Karlsruhe Moviemap* were replaced – or, as Michael Naimark would describe it: “performing a brain transplant while leaving the body intact.”¹⁵ These measures were implemented by Matthew Biederman, who replaced vulnerable components, and finally ported the work concept by way of reengineering.¹⁶ In place of the software programmed by Christoph Dohrmann, Biederman chose to use the proprietary (see glossary, p. 601) graphic development environment Max/MSP by the developers Cycling ’74,¹⁷ and their extension for video editing, Jitter. The video material available on a laser disc was digitized and embedded in the Max/MSP.¹⁸ environment

In order to access single images, which was previously guaranteed through using the laser disc in CAV format, digitization was done using the proprietary I-Frame-only-Codec¹⁹ SheerVideo.²⁰ With this form of compression (see glossary, p. 600), the frames are “coded as independent single images.”²¹ Further, particular emphasis was placed on a smaller file size of the video files, to facilitate unproblematic replay with Max/MSP or Jitter. The loss that inevitably results from compression, which the artist accepted in the interest of trouble-free functionality, explains the lower quality of the projected image. Compression artifacts (see glossary, p. 599) such as block artifacts, are even recognizable to the untrained eye.

14 In the present case, the projected image was decisively influenced by the range of functions of the selected CAV format. This should also be taken into account with regard to the digitization of the laser disc. See also: “5.7 What is the qualitative difference between CAV and CLV?,” in: *The Laserdisc FAQ*, available online at: www.blamld.com/Laserdisc/FAQ, accessed 05/22/2013.

15 Biederman 2006.

16 Ibid.

17 See Cycling ’74, available online at: <http://cycling74.com>, accessed 05/22/2013.

18 The digitization was not carried out at the ZKM | Karlsruhe nor by Matthew Biederman himself. Biederman confirmed this in an e-mail of January 2012.

19 See Toni Steller and Uwe Fleischer, “Grundbegriffe der Film- und Videotechnik,” in: Andreas Vogel (ed.), *Digitalisierungsfibel: Leitfaden für audiovisuelle Archive*, transfer media, Potsdam, 2011, p. 56.

20 See BitJazz Inc., “SheerVideo,” available online at: www.bitjazz.com/en/products/sheervideo, accessed 05/22/2013.

21 Keith Jack, *Video Demystified. A Handbook for the Digital Engineer*, Newnes, Burlington, 2007, p. 585.

	Version 1991 (original)	Version 1991, (condition 2006)	Version 1991, (condition 2006 after defect)	Version 2009 (reinterpretation)
Computer	Apple Macintosh IIsi	Apple Power Mac G5	Apple Mac mini	PC
Operating system	Mac OS	Mac OS	Mac OS	Kubuntu
Version	System 6.0.8	10.3.9	10.5.8	9.10
Software	In-house development (Christoph Dohrmann)	Max/MSP	Max/MSP	In-house development (Martin Schmidt)
Version	X	4.5.7	5.0.8	X
Connection Control Unit	Work specific	Teleo boards	Arduino	10-bit analog-digital converter
Source Footage	Laser disc player	File	File	File
Control Panel	I	I	I	II
Monitor Route Network	CRT Monitor	TFT Monitor	TFT Monitor	Touchscreen

The presentation of the new version of the work required two projectors (passive stereo projection), a silver screen, polarized 3D glasses, and a newly designed user interface taken from a contemporary streetcar driver's cabin, also featuring a touchscreen.

Apart from the further development of the work's original concept, in terms of technical implementation there is no connection between the reinterpretation and the original version of the work (1991). The following comparison of the different versions illustrates this.

Both the revised version of the *Karlsruhe Moviemap* (version 1991, condition 2006) as well as the reinterpretation of the work were presented as part of the ZKM | Media Museum permanent collection display while this project was running and before the exhibition *Digital Art Works. The Challenges of Conservation* was shown.²⁴ Therefore, a basic inventory of the revised version, including ascertainment of the functional connections, had to be carried out inside the exhibition space. First of all, a disk image of the hard disk (Apple Power Mac G5) was made. Already during compilation of the documentation and the testing of the components, it was ascertained that the manufacturer MakingThings had discontinued production and distribution of Teleo boards.

²⁴ In addition, the reinterpretation of the *Karlsruhe Moviemap* was presented in the exhibition *CAR CULTURE. Medien der Mobilität* (June 18, 2011 – January 29, 2012) at the ZKM | Media Museum.

The defective Apple
Macintosh Portrait Display
(screen burn-in)
Photograph taken for
documentation purposes
Photo © ZKM | Karlsruhe



Thus the Teleo boards represent the potentially weak points of the work.²⁵ The components removed from the original version (the Apple Macintosh IIsx, etc.; see table, p. 432) were also evaluated. However, it was not possible to test their functionality since this would have required an intervention in the functioning system (condition 2006). For this reason only a disk image of the computers originally used was created.

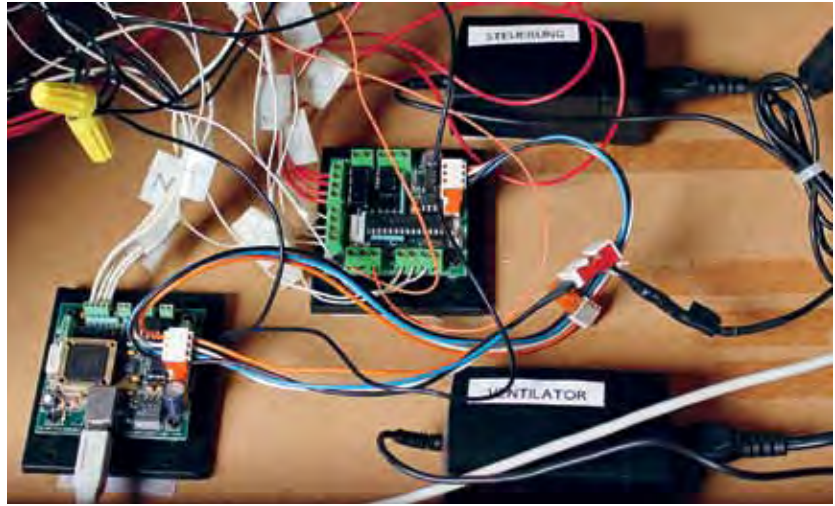
In addition to the laser disc and a Betacam-SP videocassette²⁶ the original 16 mm color negative film is also held in the ZKM_Collection. Neither the laser disc nor the 16 mm film had been stored in optimal conditions.²⁷

25 As before, the Internet presence of the manufacturers MakingThings continues to be maintained and disposes over numerous resources on the products (downloads, schematics, data sheets etc.). See MakingThings, "Looking For Teleo?," available online at: www.makingthings.com, accessed 08/30/2012.

26 This Betacam-SP videocassette is identified as a master and was probably used to produce the laser disc. The video material on the videocassette and the laser disc are identical. The film material is available as uncut 16 mm film.

27 To ensure long-term access to the film material, the film would have to be stored at a temperature of maximum 2°C and a relative humidity of between 20% and 30%. The ZKM | Karlsruhe does not have storage space that meets these criteria. See James M. Reilly, *Storage Guide for Color Photographic Materials*,

Open console of the installation *Karlsruhe Moviemap* (condition 2006) with the two Teleo boards clearly visible (as well as the Apple Power Mac G5 in the front)
Photo © ZKM | Karlsruhe



Film Digitization

Until the beginning of the *digital art conservation* project the 16 mm color negative film did not have a backup. The footage recorded in 1991 is a remarkable document of Karlsruhe city history. It provides views of the urban landscape of the time, which has undergone considerable changes as a result of urban development in the subsequent twenty years. To be able to draw on this unique material in the future, an external service provider digitally scanned the film. Here, a 2K single image scan (2048 × 1556 Pixel) was deemed appropriate. The digitized single images were saved in a compression-free TIFF format with a color depth of 16-bit.

To avoid being subject to restrictions during any future processing of the footage, a backup was made of the single images in full screen with film frames as well as a backup of the single images with zoomed out frames. Finally, all files were saved on LTO media.²⁸

Defect

Throughout the reconstruction of the installation (condition 2006) in the course of the touring exhibition *Digital Art Works. The Challenges of Conservation*, a fault was noticed during the startup of the Teleo Introductory Module. It was necessary to find a suitable replacement since the manufacturers had discontinued the production of the input/output boards. In order to

University of the State of New York, 1998, p. 25, available online at: www.imagepermanenceinstitute.org/webfm_send/517, accessed 05/22/2013.

28 LTO is the abbreviation for *Linear Tape Open*. The term stands for an open standard for data backup on long-term storage media (in the form of ¼-inch magnetic tapes). See Dorcas Müller, "From Analog Restoration to Digital Master," in: Christoph Blase and Peter Weibel (eds.), *RECORD > AGAIN! 40jahrevideokunst*, de – part 2, exhib. cat., ZKM | Karlsruhe, Hatje Cantz, Ostfildern, 2010, p. 511.



Film can of the original 16 mm film of the *Karlsruhe Moviemap* (version 1991)
 Photograph taken for documentation purposes
 Photo © ZKM | Karlsruhe

guarantee the continued presentation of the work, adaptations were carried out on the hardware and software.

All interventions that were carried out as described in the following are reversible. If the defects in the two Teleo boards can be repaired at a later point in time, these can be used again with the corresponding hardware and software configuration. The two Teleo boards were replaced by an Arduino board (Arduino Duemilanove).²⁹

The Apple Power Mac G5 was replaced by a current model of the Apple Mac mini. Thus a change of operating system and program version (by Max/MSP) was unavoidable.³⁰ Accordingly, it was also necessary to make changes to the Max/MSP file. Teleo-specific Max objects (for example, *t.intro.pwm*³¹) had to be replaced in the project file by Arduino objects.

29 Arduino boards – like Teleo boards – are input/output boards that are equipped with microcontrollers. Both the hard and software of the Arduino platform are open-source. See Arduino, “What Is Arduino?,” available online at: www.arduino.cc/en/Guide/Introduction, accessed 05/22/2013; and “Arduino Duemilanove,” available online at: <http://arduino.cc/en/Main/arduinoBoardDuemilanove>, accessed 05/22/2013.

30 The Max/MSP version used initially (4.5.7) is not compatible with Intel-based Macintosh-Computers. See also: Cycling '74, “Max/MSP 4.5.7 System Requirements,” available online at: <http://cycling74.com/downloads/older>, accessed 05/22/2013.

31 See MakingThings, “Max/MSP. A Guide to Teleo and Cycling 74’s Max/MSP,” available online at: www.makingthings.com/teleo/products/documentation/teleo_user_guide/max_msp.html#teleo_objects, accessed 09/03/2012.

Michael Naimark
Karlsruhe Moviemap
 1991
 Interactive installation
 Digitized single full screen
 image including the film
 frame
 Photo © ZKM | Karlsruhe



Michael Naimark
Karlsruhe Moviemap
 1991
 Interactive installation
 Digitized single full screen
 image without the film
 frame (slightly zoomed)
 Photo © ZKM | Karlsruhe



Conclusion

The focus of the case study on Michael Naimark's *Karlsruhe Moviemap* (1991, 2009) was primarily on the preserving of the revised version of the work by Matthew Biederman from 2006. The elements found at the beginning of the project were regarded as the status quo, and measures implemented in order to conserve them.

Before the overhaul of the work commenced, and after its reintegration into the ZKM_Collection (2008), a comprehensive documentation of the installation should have been carried out. Preventive measures, such as data backup or the purchase of replacement equipment, were not taken at that time. Further conservational interventions were thus only initiated in 2011, after appearance of the above-mentioned defect. In the future, additional interventions will be unavoidable. In spite of using the open-source Arduino platform, dependence of the proprietary software Max/MSP will continue.

The hitherto insufficient conservation of the *Karlsruhe Moviemap* described above is characteristic of how media art is treated in the museum context. Inadequate personnel structures and the everyday hectic of museum business mean that a rigorous, critical examination of individual works is generally impossible. As in many other cases, after acquisition of the work by the ZKM | Karlsruhe steps were taken after consultation with the artist to optimize the installation for presentation in the museum, which requires a high level of maintenance, as well as for lending it. In the future interventions that become necessary should be at least be documented transparently and comprehensively by keeping a work log.

Through reinterpretation, which is one of the most radical conservation strategies,³² the work concept is also preserved for the future.³³ Naimark expressed his opinion on this in an interview back in 1997: "If somebody used it [the work] as the basis for something else, I suppose I'd be flattered."³⁴

Within the framework of the case study it was also possible to conserve media relevant to the work, for example, the original 16 mm film and the laser disc. Naimark and Biederman considered the option of a high-quality film scan in 2005, but rejected it for financial reasons.³⁵ Possibly – this will have to be substantiated by future conservation measures – with contemporary technical innovations we may now be in a position to present the 1991 *Karlsruhe Moviemap* as close to the original as has ever been.

Translated from the German by Justin Morris

32 See "Terms – Strategies," available online at: www.variablemedia.net/e/index.html, accessed 05/22/2013.

33 The used PC must already be revised. A defective hard disk – RAID (Redundant Array of Independent Disks) was replaced through an adequate SSD disk drive (Solid-State Drive).

34 See excerpt from the interview with Michael Naimark conducted by Rebecca Picht, 05/29/1997, this volume, p. 438.

35 See Biederman 2006.

Karlsruhe Moviemap

An Interview with Michael Naimark, part I

Rebecca Picht

Excerpt from the interview conducted on May 29, 1997, at ZKM|Karlsruhe

Do you consider *Karlsruhe Moviemap* as a completed artwork? Would you mind if in the future someone else were to develop the project further?

Michael Naimark: You may know with that when we initially began this project, we talked a great deal about adding interviews. We had a lot of different ideas. And there was a certain belief that some of us had, that this would be the skeleton on which to add things. This is like painting a moustache on the Mona Lisa. You know, I guess I have two schools of thought about it. There are certain properties that it has, which are very important to me, like the feeling of tight linkage between what you do and what you get. And being able to move at much faster than human speeds. And having a projection that is to scale so that you get this eerie sense of presence. Those are very important to me. If somebody used it as the basis for something else, I suppose I'd be flattered. You know, I can't think of any reason why not.

**The city changes constantly.
Will the perception of the work
change, too?**

Yeah, I mean I thought about that a little. And it's funny because in twenty or fifty years from now, it's not going to be of Karlsruhe; then it will be of Karlsruhe as it used to be. And I don't know – I mean that people, children will look at it and parents will say "This is the old building that's now gone," I suppose. And again I haven't; we can only speculate.

Does that mean that in time the documentary character of the work will increase?

The *Karlsruhe Moviemap*? I think it will become more and more archive material. People like the Paris RATP wanted the movie map as a functional thing. It was actually a funny overlap between supporting an artist, because this was part of an arts commission with several artists, and having something usable. The usability of the *Karlsruhe Moviemap* goes down every day because they add things and buildings change. So yes, the context will change to be one of an old dusty antique, you know, showing these old images.

Karlsruhe Moviemap

An Interview with Michael Naimark, part II

Chiara Marchini Camia, and Arnaud Obermann

Excerpt from an email interview conducted on July 30, 2012

The original version of the *Karlsruhe Moviemap* (1991) has changed considerably over time. In the removal of the laserdisc player and the digitization of the footage undertaken in 2006, another person was involved: Matthew Biederman. What role did he play? And what brief did he get from you? When the work is within geographical reach (this wasn't so much the case with *Karlsruhe Moviemap*), do you undertake the technical assessment and update of your works yourself?

Michael Naimark: First, I'm pretty good technically with cameras, but I am not a computer code-writer, so I require technical support on the programming side.

Matthew Biederman came well recommended. He was artist Jim Campbell's technical collaborator and when he heard that the Art Center College of Design in Pasadena was mounting a survey show of my work, he offered to work with me. He did the technical conversion from computer-controlled laserdisc player to all-digital video. In doing so, the forward-backward speed of the video became more flexible, so in the end, we both had to make decisions about the interface, and we decided to make a more fluid user interface.

In 2009 the ZKM contacted you with the suggestion to create a reinterpreted version of your 1991 work *Karlsruhe Moviemap*, with new

recordings of the Karlsruhe street-car network and stereoscopic projection. Were you happy to accept? Did you see this reinterpretation in the light of the preservation of the original work or did it mean something else to you?

I'm a huge fan of "rephotography" (please see the Wikipedia entry for it, particularly look at "Third View"). The magic of time shifting is largely dependent on perfect registration. This sounds technical, but it's perceptual and conceptual. So when I first heard about the new version, I was thrilled. I did, however, suggest using the original camera system to make sure everything was as perfectly the same as possible. It turns out that 16mm film has much higher resolution than standard video, and the idea of reshooting with the same 16mm camera, then going back to the original 1991 16mm film and rescanning it to HD, *that* would be spectacular [finally the images for the 2009 version of *Karlsruhe Moviemap* were taken with two HD cameras].

As part of the project *digital art conservation* the original 16mm film, which was used to make the 1991 version, was digitized again. The digitization was done in 2K and frame-by-frame. Today, the implementation of this large file would be possible. As the quality of the 2006 digitization of the laserdisc is inferior to the original laserdisc

projection would you support the integration of this new file in the 1991 version of the installation?

Of course!

Over the course of the years, the 1991 version has undergone a series of technological updates, but the external appearance and functionality have remained largely unchanged. Do you see a value in preserving the original version of the work?

Preserving, yes. But if a better user experience can be provided, I'd prefer that. The preserving can be via documentation.

Is the legacy of your work something that you think about? If so, what steps do you undertake in order to secure that legacy?

Legacy is easy: post stuff on a website. Then you've done your job as an artist.

But I have a related concern: impact on culture, and the *Karlsruhe Moviemap* is in a very

interesting position right now. I am sure you have been following the Google Streetview Wi-Fi scandal, and that it broke out in Hamburg then snowballed around the world. Google's view, as well as the general press, is that the German public is unusually sensitive to surveillance and recording, and as you probably also know, several hundred thousand Germans elected to opt out of Streetview. Not long ago, Google announced that it had stopped supporting Streetview in Germany: it gave up.

I work, on occasion, with Google, and know many of the Streetview people. They know my work and I've worked hard to convince them on the inside to be more sensitive to community engagement [www.naimark.net/writing/came-racars.html]. So it's with the greatest irony that I recently emailed them:

"Ironically, there currently is a Streetview-like public exhibition on view in Germany. I made it during an artist residency twenty years ago at the ZKM | Karlsruhe. It's been so popular with the German public that the ZKM recently reshot it entirely, resulting in a unique 'Then-Now' exhibition."



Nam June Paik

Internet Dream

1994

Video wall, three channels,

52 CRT television sets

Installation view

Digital Art Works. The

Challenges of Conservation,

ZKM | Media Museum

Photo © ZKM | Karlsruhe

Photo: ONUK

**Nam June Paik (*1932, Seoul, Korea,
† 2006, Miami Beach, USA)**

Internet Dream

1994

ZKM_Collection, Karlsruhe

Hardware:

Version 1994

- 3 laser disc players
- Video wall controller
- 52 CRT television sets

Version 1994, status 2008 (migration)

- 3 flash card media players
- Video wall controller
- 52 CRT television sets

Conservation Strategy:

- Migration

Documentation:

- Arnaud Obermann

**Conservation Concept
and Conservation Measures:**

- Mirco Fraß
- Arnaud Obermann

Text:

- Chiara Marchini Camia
- Arnaud Obermann

In spite of the title's reference to the Internet, Nam June Paik's installation *Internet Dream* (1994) is the only work featured in the case studies for the *digital art conservation* project which cannot be described as born-digital. The focus of the case study on Paik's work lay on finding an alternative to the original, custom-built video splitting system, which is still being used today, and to install it. The case study also illustrates how the conservation of early video installations, which are based on analog video material, today frequently involves digitization and replacement of the work's most diverse components.

Work Description

Nam June Paik's video wall *Internet Dream* (1994) consists of a total of 52 CRT television sets (see glossary, p. 599) which display rapidly changing color image sequences from three video sources. The video wall is constructed as follows: in the middle are four blocks of screens each of which contains nine 13-inch screens. Framing this middle area on three sides are sixteen further television sets: the top row has six 13-inch TVs, and on the left and the right there are five 20-inch screens. All four blocks of screens in the middle display image sequences from one video source, and each block is turned 90° away from the one next to it. The images shown on television sets arranged around the central area alternate between the other two video sources. All the television sets in the video wall are fitted into a grey-colored steel frame, equipped with tailor-made openings for each device. The three videos, *RTL Stars*, *Cars*, and *Main Channel 2*, show jump-cut edited video sequences: scenes from cinema films and car races, as well as psychedelic-like changing geometric forms. The entire wall of video screens seems to pulsate and evokes the "noise" produced by modern communications networks.¹

Art Historical Context

Nam June Paik was one of the key artists of the Fluxus movement, and a pioneer of media art. After studying composition in Tokyo, Munich, and Freiburg, and first tries in the field of experimental music, in Cologne he began composing his own pieces in 1957, and organizing his own concerts (1960). In addition to participating in actions of the Fluxus group (from 1962), from the mid-1960s Paik devoted himself increasingly to the electronic image as an artistic medium.² Exhibitions held in Wuppertal (1963) and New York

Nam June Paik
Internet Dream
1994
Video stills
From left to right:
RTL Stars, *Video Cars*, *Main*



- 1 Sebastian Steinert, "Nam June Paik, Internet Dream," in: Johannes Brümmer (ed.), *Nam June Paik. Werke aus der Sammlung des ZKM*, exhib. cat., EnBW Energie Baden-Württemberg AG, Karlsruhe, 2008, p. 33; translated from the German by Justin Morris.
- 2 See Lars Movin, "The Zen Master of Video Nam June Paik between Minimalism and Overkill," in: *Nam June Paik Video Sculptures: Electronic Undercurrents*, exhib. cat., Statens Museum for Kunst, Copenhagen, 1996, pp. 10–48, here pp. 18–31.

Nam June Paik
Global Groove

1973

Video, color, sound, 28 min

Video stills

© Collection Mnam/Cci,
Centre Pompidou, Paris



(1965) in which he presented modified television sets caused a sensation.³ The portable video cameras that became available in the mid-1960s he immediately used for his works. In the years 1969 to 1970 Paik developed a video synthesizer with his friend, the electrical engineer Shuya Abe, which enabled the editing of up to seven video sources in real time.⁴ At the series of events entitled *Video Viewpoints* at the Museum of Modern Art (MOMA), New York (1975), Paik summed up his multifaceted oeuvre: his dream was to unify art and communication.⁵ Thus, Paik's most significant works are perhaps those he designed for television broadcasts. In 1973 he produced the video *Global Groove* for the American broadcasting company WNET Channel 13. This work was exemplary for Paik's eclectic style in the treatment of television images, while at the same time it defined television as a global medium that gives space to both Western *high* and *low culture* and to the articulation of other cultures. Apart from the interviews and performances held especially for *Global Groove*, the video presented frenetically paced image sequences from a variety of fields: Japanese commercials, classical ballet, Indian drum dance.⁶ Ten years later, with *Good Morning, Mr. Orwell* – his first large-scale television program transmitted via satellite – Paik created a live version of *Global Groove*.⁷ On January 1, 1984, the program, which Paik had produced himself, opened “Orwell's year” and was transmitted live from studios in New York, San Francisco, and Paris to Korea, Germany, France, the Netherlands, and the USA. With live performances by representatives of the international artistic avant-garde and pop culture, it was both a provocative and an optimistic commentary on promoting intercultural dialog through the medium of television.

3 In the Galerie Parnass, Wuppertal, the exhibition *Exposition of Music – Electronic Television* was held from March 11 to March 20, 1963; the Galería Bonino, New York, exhibited *Nam June Paik Electronic Art* (November 23–December 11, 1965).

4 See Nam June Paik and Shuya Abe, *Paik/Abe Synthesizer*, available online at: <http://www.medienkunstnetz.de/works/paik-abe-synthesizer/>, accessed 06/12/2013.

5 Movin 1996, p. 16.

6 See John G. Hanhardt (ed.), *The Worlds of Nam June Paik*, exhib. cat., Solomon R. Guggenheim Museum, New York, ABRAMS, New York, 2000, p. 223; Movin 1996, pp. 39–40.

7 Hanhardt 2000, pp. 230–231.

The title of the work discussed in this case-study – *Internet Dream* – references the emergence of a new master medium of global and intercultural communication; namely, the Internet. Commissioned by the Rockefeller Foundation, in 1974 Paik wrote the essay “Media Planning for the Postindustrial Society”⁸ in which he proposed that the cities of Los Angeles and New York should be connected by means of an “electronic superhighway, a broadband communication network of household satellites, coaxial and glass fiber cables, etc.”⁹ With this analog concept of a network based on television technology, Paik quasi anticipated the digital technology-based Internet. The work *Internet Dream* can be assigned to a series of video installations Paik designed at the end of the 1980s as commissioned works in increasingly larger dimensions. These include, also with respect to theme, the video wall *The Electronic Superhighway: Continental U.S.* of 1995. This work comprises 51 video sources and 313 television screens of varying dimensions and models which, taken together, create a gigantic map of the USA.¹⁰ The interstate borders are marked by neon tubes, and each federal state displays all kinds of glimmering television images. Like many of his other installations *Internet Dream* illustrates the way in which Paik engaged with modern communication technologies in his art, and contradicted the skeptic of these technologies: for this reason he underlined the great “noise” that is generated by the sheer quantity and diversity of information circulating. As early as 1963 in the context of his first exhibition with modified television sets, Paik wrote: “My experimental television is not always interesting, [...] but not always uninteresting: like nature which is beautiful not because it changes beautifully, but simply because it changes.”¹¹

Paik welcomed the forms of expression of the avant-garde and popular culture openly and unconditionally, and his attitude to technological developments was the same. The installation *Internet Dream* is testimony to this enthusiasm in that it thematizes a technology which was still evolving when the work was created.

Provenance

Internet Dream was originally commissioned in 1994 by RTL Television for the foyer of the television company in Cologne, Germany. When the company moved from Cologne to Berlin, the installation was donated to the ZKM | Karlsruhe in 2003.¹²

8 Available online at: www.medienkunstnetz.de/source-text/33/, accessed 06/12/2013

9 Nam June Paik, quoted in: Peter Weibel, “Nam June Paik. Der Metaphysiker der Medien,” in: Brümmer 2008, p. 8; translated from the German by Justin Morris.

10 Since 2002, this installation is in the possession of the Smithsonian American Art Museum, Washington, D.C. (donated by the artist).

11 Gene Youngblood, *Expanded Cinema*, Dutton, New York, 1970, p. 302.

12 RTL Television GmbH, *Schenkungsvertrag*, 2003, work records in the ZKM | Media Museum archives, unpublished.

Course of Action

The case study began with the testing of the functional range of the video wall controller. Analysis of this component yielded reference values so as to facilitate any future replacement of the device. Alternatives were also investigated, and the range of electronic devices currently available inspected. Furthermore, at the ZKM | Laboratory for Antique Video Systems the original optical information carriers (laser discs¹³; see glossary, p. 600) were digitized.

Documentation

The work donated to the ZKM in 2003 was presented for the first time in 2005 in the ZKM_Subspace of the ZKM_Cube at the exhibition *Masterpieces of Media Art from the ZKM Collection* (September 19, 2004–October 29, 2006) in the ZKM | Media Museum.¹⁴ It was not possible to obtain information about any interventions made since the installation had been produced, or after the work had been purchased by the private television company RTL. Unfortunately, there has been no reply to an inquiry made to the vendor, the Carl Solway Gallery.

A comprehensive report on conservation and restoration by Fenna Yola Tykwer at the ZKM was not produced until 2010. Based on existing records of the ZKM | Museum and Exhibition Technical Services and the documented actual state of the installation in June 2005, it was possible to make a description of the “intermediate statuses” from 2003 onwards. The report includes a detailed list of the individual elements of the work following their inventory numbers, as well as comprehensive instructions for assembling and dismantling the installation. Here, the focus was mainly on the defects, and thus on the technical overhaul of the television sets. Apart from the ZKM | Museum and Exhibition Technical Services inventory database and this report no further sources of information about the work and its elements existed. Moreover, only after an in-house investigation was it possible to determine where the four laser discs that had been donated with the installation were stored.

The auxiliary devices originally used, three laser disc players, had not been given to the ZKM as part of the donation. As DVD players were used for the above-mentioned first presentation of the work at the ZKM_Subspace, digitization of the original laser discs must have been done already at that point in time.

In the course of preparations for the exhibition *Nam June Paik – Works from the ZKM Collection* (October 23, 2008–January 18, 2009) in the foyer of the

13 The four laser discs are all dated 04/12/1994 and labeled as follows: *Cars*, *RTL Stars*, *Main Channel P1*, *Main Channel P2*. Since only three video sources are required for the presentation of the work, until now the video material of the laser disc *Main Channel P1* remains unaccounted for.

14 See ZKM | Mediagramm, January/February 2005, p. 14–15, available online at: www.02.zkm.de/mediagrammarchiv/show.php?y=2005&i=01-02#Mediagramm_2005_Nr.64_Seite_14_randlos.jpg, accessed 06/12/2013.



Nam June Paik
*Electronic Superhighway:
 Continental U.S.*
 1995
 Video wall, 51 channels, 313
 CRT television sets
 © Nam June Paik Estate
 Photo © Smithsonian
 American Art Museum

ENBW building in Karlsruhe, the players were replaced again and, from this point onward, the installation was presented using three flash card media players (see glossary, p. 600).¹⁵

Before the project began, the digitization of the laser discs in June 2005 for the first presentation of the installation at the ZKM Subspace had not been precisely registered.¹⁶ Since the files were only available in compressed form, the case study's first measure was to carry out a new digitization.

Conservation

Over the course of work on the documentation, one technical component of the installation, the split screen generator,¹⁷ proved to be particularly “endangered” and difficult to replace, and therefore became the focus of conservation efforts. The split screen generator ensures the distribution and output of the video signal (the video *Main Channel P2*) to 36 of the total of 52 color television sets, and is thus decisive for the installation's appearance.

15 For the exhibition *Nam June Paik – Works from the ZKM Collection* (October 23, 2008–January 18, 2009) at the ZKM | Karlsruhe, see online: [http://on1.zkm.de/zkm/stories/storyReader\\$6373](http://on1.zkm.de/zkm/stories/storyReader$6373), accessed 06/12/2013.

16 The present digitization of the laser disc point to 06/21/2005 as the creation date.

17 This designation is originally taken from the documents of Jochen Saueracker (longstanding assistant of Nam June Paik). Additional common terms are image splitter, video wall controller or processor.

A demo setup was presented at the exhibition to explain the function of the video splitter. Exhibition view *Digital Art Works. The Challenges of Conservation*, ZKM | Media Museum
Photo © ZKM | Karlsruhe



In order to play the videos *Cars* and *RTL Stars* on the other sixteen television sets, two video signal distributors were used, which transmitted a given signal to each of eight devices. Since, as mentioned above, the original laser disc players were not donated to the ZKM | Karlsruhe, it is not possible to make any definitive statements about a putative synchronization of the three video sources.¹⁸ However, the different lengths of the video material suggest that such synchronization did not exist.

To develop and implement measures to conserve the split screen generator, it was necessary to analyze the functional range of this device. The device is a special design made by the South Korean manufacturers DASH Systems¹⁹; instructions and construction plans were not available.²⁰

In the museum presentation of the installation, the preconfigured setting AUT of the MV-45 generator is used. Here, the split screen generator sends out an incoming video signal to the four blocks each containing nine television sets. Thus the split screen generator divides the video signal into nine sections and distributes these fourfold and identically.

The distribution of the signal, the so-called splitting, is based on digital signal processing. For this, the input signal²¹ is first digitized and converted

18 Via an external synchronization signal (for example, through a Black Burst/Sync-signal generator) numerous laser disc player models (such as the Pioneer LD-V8000) can be temporally coordinated with one another.

19 The manufacturer DASH Systems supported Nam June Paik in the technical implementation of many of his works, for example, in the case of *Megatron/Matrix* (1995). See DASH. Systems, *Technical Support for Mr. Paik Nam June, Video Artist*, available online at: www.dashsys.com/products/paik.html, accessed 06/12/2013.

20 Unfortunately, a request to the manufacturer for any information that might still exist remained unanswered.

21 At present, three flash card media players are used and the video material as composite video signal in NTSC format.



The so-called split screen generator MV-45 is a custom-made system by DASH Systems.
Photo © ZKM | Karlsruhe

according to American SDTV standards in 720×480 pixels.²² Next, the signal is processed for output to nine television sets, and thus renewed conversion into an analog composite signal. As a result, the first pixel of the first image line (720 pixels) of the original image is repeated three times. Thus, the first monitor (the device on the left in the uppermost row of the block of screens) displays only 240 pixels of the first image line of the original signal. Consequently this first line is also repeated three times in the vertical. Here, the first color TV set displays only 160 image lines of the original signal.²³

The splitting process is done by the VRAM chips (video random access memory). These have two separate ports capable of simultaneously carrying out the reading and writing processes.²⁴

During preparation of a presentation of the installation for the retrospective *Nam June Paik* at the Museum Kunstpalast Düsseldorf (September 11, 2010–November 21, 2010) and the Tate Liverpool (December 17, 2010–March 13, 2011), the split screen generator was opened and the complex circuits were

22 See Toni Steller and Uwe Fleischer, "Grundbegriffe der Film- und Videotechnik," in: Andreas Vogel (ed.), *Digitalisierungsfibel, Leitfaden für audiovisuelle Archive*, Transfermedia, Potsdam, 2011, p. 45.

23 Robert Simpson describes in his book *Videowalls* the splitting process by way of a block of devices comprising sixteen television sets. See Robert Simpson, *Videowalls*, Focal Press, London, 1991, p. 22.

24 Ibid., p. 25.

tested for defective components as well as faulty soldered joints. With the exception of the replacement of two fans, which improve air circulation to the inner parts of the device, no other measures were carried out. In order to guarantee trouble-free presentation of the work as part of the exhibition *Digital Art Works. The Challenges of Conservation* (October 29, 2011–February 12, 2012), the generator was tested again in 2011.

The project team considered the split screen generator in the broadest sense as a black box.²⁵ With the aid of a video signal generator, a standard input signal (to the NTSC technical standard) was fed in. By recording the processed, output video signal, it was possible to generate a reference for replacement devices used at a future point in time.

As the split screen generator is always used with the preconfigured setting AUT, the video installation *Internet Dream* falls under the category of “nonprogrammed video walls.”²⁶ In the future, an alternative model, illustrated on p. 453, could be utilized for the presentation of the work.

Devices with comparable functionality were formerly produced by numerous manufacturers (Barco, Electrosonic, Pioneer, and others) and continue to be made by several suppliers (Avenview, Hetec).²⁷ Video signal distributors, which distribute the signal to the sixteen television sets around the center of the work, are still produced and are not expensive to buy. An adequate replacement for the custom-made design of the split screen generator by DASH Systems has yet to be found. The equivalent devices are expensive and a purchase should not be made without a test phase.²⁸

The first digitization of the laser disc was carried out at the ZKM | Laboratory for Antique Video Systems in June 2005.²⁹ However, at that time, owing to the large amount of data, the generated digital surrogates could not be maintained as uncompressed data. Thanks to the introduction of the so-called back-up tools for the storage of digital surrogates on LTO media,³⁰ the laboratory can access the digital master at any time.³¹ In 2012, all laser discs belonging to the work were digitized; this time with a quantization of ten bits.

25 The term black box is used here according to its significance in systems theory, not according to its arthistorical definition of the black box installations of contemporary art.

26 Simpson 1991, p. 69.

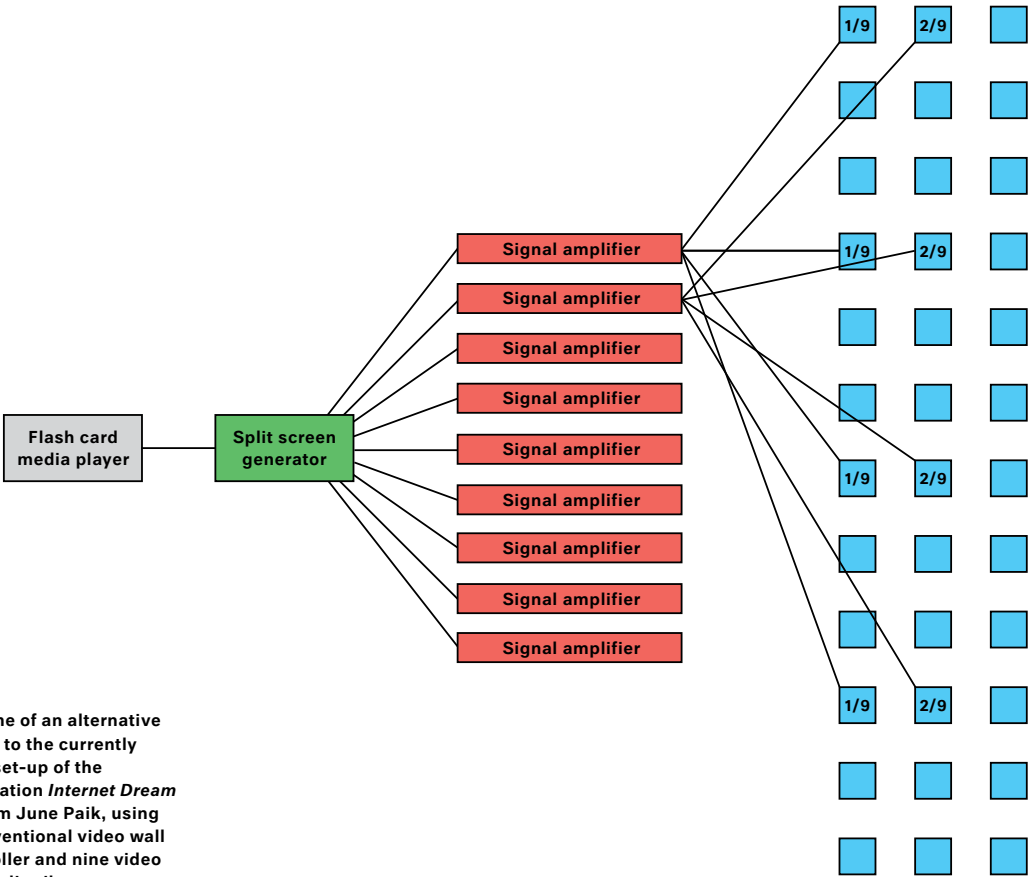
27 As part of the exhibition *Digital Art Works. The Challenges of Conservation* (October 29, 2011–February 12, 2012), a corresponding device could be presented for the functionality of a video wall controller.

28 The current starting prices begin at 6,000 Euro.

29 Here, the laser disc *Main Channel P1* was not accounted for.

30 LTO is the abbreviation for Linear Tape Open. The concept stands for an open standard for the data backup on long-term storage media (in the form of ½-inch magnetic tapes). See Dorcas Müller, “From Analog Restoration to Digital Master,” in: Christoph Blase and Peter Weibel (eds.), *RECORD > AGAIN! 40jahrevideokunst. de – part 2*, exhib. cat., ZKM | Karlsruhe, Hatje Cantz, Ostfildern, 2010, p. 511.

31 See Müller 2010, p. 511.



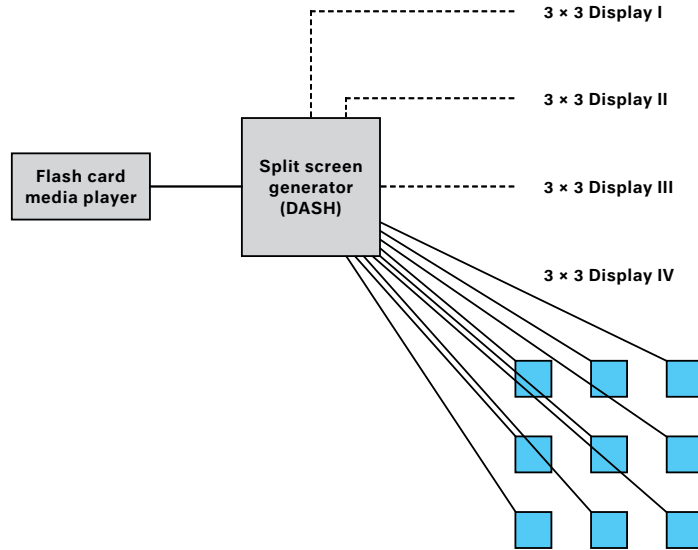
Scheme of an alternative model to the currently used set-up of the installation *Internet Dream* by Nam June Paik, using a conventional video wall controller and nine video signal distributors.

Conclusion

Since the split screen generator used is a special custom-built design, a future intervention in the form of a technical overhaul is inevitable.

One aspect of the case study was to search for and analyze alternatives to the split screen generator which are currently available on the market. Solutions were purposely sought that offered failure resistance.³² Alternative solutions utilizing custom software were excluded for the time being.³³ In order to facilitate trouble-free presentation and straightforward assembly of the installation, primarily all-in-one-devices³⁴ were short-listed for selection.

32 Most devices currently on offer are designed for operation 24/7.
33 Software-based solutions, such as introduced in the second half of the 1990s, would be disproportionate and have disadvantages. See Robert Simpson, *Audiovisual technology: A short history of the videowall*, available online at: www.blooloop.com/Article/Audiovisual-technology-A-short-history-of-the-videowall/166, accessed 06/12/2013.
34 An all-in-one device would correspond to the functionality of the split screen generator and should not make the complex installation more difficult than it already is.



Scheme of the split screen generator currently in use for Nam June Paik's *Internet Dream*

Unfortunately, before writing this report it was not possible to expose the candidate replacement devices to the routine museum requirements in a trial run; however, this is planned before the research project ends.

The digitization of the video material that was carried out again at the ZKM | Karlsruhe in 2012, has at least preserved the material that was on the acutely endangered visual information carriers. Furthermore, for the first time in almost a decade – since the installation was incorporated in the ZKM_Collection in 2003 – it is now possible to compare safely the video material of the two laser discs labeled *Main Channel*. In the future the video installation *Internet Dream* will not be able to escape the digital revolution. The digitization of the video data in 2005 already anticipated this, and foreshadows the replacement of other analog components of the work by digital ones.

Translated from the German by Justin Morris



Samuel Rousseau

Untitled (papier peint vidéo)

2003

Video projection

Installation view

Digital Art Works. The Challenges of Conservation,

ZKM | Media Museum

Photo © ZKM | Karlsruhe

Photo: ONUK

Samuel Rousseau (*1971, Marseille, Frankreich)
Untitled (papier peint vidéo)
2003

Frac Alsace Collection, Sélestat, France

Hardware:

- Video projector
- Auxiliary device (DVD player, flash card media player)
- DVD/flash card

Software:

- Final Cut Pro
- Adobe Photoshop
- Compressor
- DVD Studio Pro

Conservation Strategy:

- Documentation of the work stages for the reconstruction of the installation
- Data backup

Documentation:

- Pascal Bion
- Nelly Massera
- Arnaud Obermann

Conservation Concept and Conservation Measures:

- Moritz Büchner
- Arnaud Obermann

Text:

- Chiara Marchini Camia
- Arnaud Obermann

Samuel Rousseau's digital video projection *Untitled (papier peint vidéo)* (2003) is the only site-specific work that is the subject of one of the case studies for the *digital art conservation* project. Before this study was done, it was necessary for the artist to be in attendance each time the installation was set up. Amongst other things, this was due to the fact that the adjustment of the projection required the use of several programs, and the artist had not given any detailed instructions for this to the Fonds régional d'art contemporain (Frac) Alsace. Over the course of the study precise information was obtained from the artist for the requisite adjustment of the projection. Furthermore, each step in setting up the projection was documented so that in future, the assembly of the work can be done without the artist in attendance.

Work Description

Untitled (papier peint vidéo) (2003) is a site-specific video installation in which one or more video projectors project animated wallpaper patterns onto the walls of the exhibition space. Like standard paper or fabric wallpaper, the four patterns belonging to this work from the Fonds régional d'art contemporain (Frac) Alsace Collection consist of individual decorative motifs that are repeated and regularly distributed across the surface. The wallpaper is composed of short animations of graphic objects or groups of objects that carry out simple actions, such as rotations, which are repeated in a continuous loop and combine to form a pattern. Since 2003, Samuel Rousseau has developed further animated patterns for this work.

The four wallpaper patterns that belong to the installation are based on the following animated motifs: flowers blossom and grow; after they have withered, new flowers with different colors appear; trucks, motorbikes, cars, and scooters arranged in a diamond shape rotate on their own axes; pairs of eyes shift their gaze from left to right while around them eye-shaped ovals appear; soup spoons and cooking pots, represented as seen from above and from the side, rotate rapidly. All the motifs are represented against a white background. The materials on which the motifs are based are photographs that the artist edited with Photoshop to give them more the appearance of graphics. The looped animations each last for about thirty seconds, but consist of films of up to three or four minutes which are, in turn, projected in a loop. The different patterns were created by the artist as decoration for the rooms of a house.

For each presentation of the work the artist sets up the projection so that it fits the designated projection area exactly – several walls of a room may serve as projection surfaces. Door or window frames, furniture or other



Samuel Rousseau
Untitled (papier peint vidéo)
 2003
 Video projection
 Installation view
*Digital Art Works. The
 Challenges of Conservation,*
 Espace multimédia gantner,
 Bourogne, France
 Photo © Frac Alsace
 Photo: Chiara Marchini
 Camia



Samuel Rousseau
P'tit bonhomme
 2006
 Video projection, loop
 © Samuel Rousseau,
 Courtesy Galerie Claire
 Gastaud et Aeroplastics
 Photo: Suzanne Hetzel

objects, which limit or partially conceal the walls, are omitted from the projection. In this work, the artist breaks away from the familiar framework of the classic 4:3 rectangular projection screen and fills the available space in an immersive manner.

Art Historical Context

Samuel Rousseau has been working as an installation and video artist since the early 1990s. He completed his training in art at the École supérieure d'art et design de Grenoble, and after his studies he worked at improving his knowledge and skills in handling the new media. Since the beginning of his artistic activities, he has worked with digital video technology and explored the potential of digital image processing. In various artistic experiments, since the early 1990s Rousseau has sought to break out of the rectangular 4:3 format, which symbolically reiterates the motif of a painting, a television screen, and a computer screen as windows on the world.¹ His video projections enter into a dialog with the space where they are displayed – interior and exterior spaces alike. Rousseau is thus one of the artists who, from the late 1990s, have utilized software to extend the technical and discursive frames of projection in the most diverse ways; others are Rafael Lozano-Hemmer and Paul Chan, for example. A characteristic of Rousseau's works is that they often humorously subvert the expectations of the audience. In *P'tit Bonhomme* (1996), for example, the video of a tiny figure is projected onto a real staircase; the figure tries to climb it, but repeatedly fails.

This ironic intervention in existing architecture has parallels with some of the subversive interventions and strategies of street art and public art. In the work *Le Géant* (2003), which Rousseau presented in 2003 as part of the event *Nuit Blanche* held at the Théâtre de la Gaîté (since 2010 La Gaîté lyrique, a center for digital arts and music) in Paris, a video of a naked man rolling around on the floor was projected from inside onto the windows of the façade. Seen from outside, it looked as though a giant was trapped inside the theater, and was trying to get out.

Like *P'tit Bonhomme* and *Le Géant*, *Untitled (papier peint vidéo)* is also a site-specific work; however, it is not situated in a public space but in the domestic sphere. The medium of wallpaper was introduced into concept art by Daniel Buren, amongst others, with works such as *Within and Beyond the Frame* (1973). Although in *Untitled (papier peint vidéo)*, Rousseau makes reference to 1970s critique of institutions, as does Daniel Buren's art, Rousseau's work is rather to be understood as ironic play that sneaks into daily life.

¹ See Anne Friedberg, *The Virtual Window. From Alberti to Microsoft*, The MIT Press, Cambridge (MA), 2006.



Samuel Rousseau
Le Géant
 2003
 Multi-channel video rear
 projection
 Nuit Blanche, Théâtre de la
 Gaîté, Paris
 © Samuel Rousseau
 Courtesy Galerie Claire
 Gastaud et Aeroplastics

Additionally, in *Untitled (papier peint vidéo)* the principle of seriality is taken up, which features strongly in street art – the use of stencils in graffiti, for example, can be traced back to the trade of painting and decorating. Here, the idea of technical reproduction is replaced by the process of digital reproduction, which manifests itself, for example, in the copy & paste approach of digital image processing. Much in the same way as the series – as repetition in space – was important for twentieth century art, the loop – as repetition in time – is a fundamental element of the aesthetics of the new media. The short visual loops of the proto-cinematographic devices, which were relegated to popular culture after cinema developed and became established, were rediscovered and used in the early digital films.² Rousseau's luminous video wall-papers are playful interventions into everyday life and at the same time a tribute to the technology on which they are based.

2 See Lev Manovich, *The Language of New Media*, The MIT Press, Cambridge (MA), 2001, pp. 315–316.

Provenance

In 2004, Frac Alsace purchased the work *Untitled (papier peint vidéo)* in the form of four video wallpaper patterns as digital data files from Galerie Anton Weller, Paris, which represented Samuel Rousseau at this time. These patterns are part of a limited edition; only three copies of each pattern are sold.

Course of Action

Following documentation of the work in various locations by the registrar of Frac Alsace, Pascal Bion, as well as by Nelly Massera and Arnaud Obermann, a discussion was held among all participants to review the existing information and the artist's instructions. Afterwards, Pascal Bion and Nelly Massera conducted a lengthy interview with Samuel Rousseau with a view to gaining insights into the artistic intention behind the work, the production of the wallpaper, and the process of adapting the projection to each exhibition space. The documentation on the setting up of the installation was executed as part of preparations for the exhibition *Digital Art Works. The Challenges of Conservation* October 29, 2011–February 12, 2012 at the ZKM | Center for Art and Media Karlsruhe by Arnaud Obermann by way of screencasts (see glossary, pp. 601–602). This documentation was used to formulate precise instructions which, in the later stages of the exhibition (see pp. 520–563) were used successfully to set up the work.

Documentation

When the work was incorporated into the Frac Alsace collection, the artist only handed over two optical data carriers, DVD-Rs (Digital Versatile Disc – Recordable). A data carrier with a cover insert inscribed “Papier peint vidéo; 3 + 1; Fichier de travail; Notice de fabrication” contained video files for the projection, as well as information on constructing the installation; the other data carrier labeled “Papier peint vidéo; DVD de consultation” contained various video files for visual inspection purposes. To present the video wallpaper a projector and a media player are required. At Frac Alsace, dedicated equipment was not used.

Records of the devices used to present the work before the case study was undertaken were not kept by Frac Alsace, and neither was the experience gained there during presentation or problems that arose documented. In order to record and pass on this information and experience in the future, a section was included in the documentation structure as part of the *digital art conservation* project in which the presentation history can be recorded. Here the equipment used and any problems connected with using it were registered, each step of the work undertaken was logged, and an introduction to handling the software required for implementing the work was written.

Up to the beginning of the project, copies had not been made of the fragile optical data carriers nor had a readout of their content been transferred to a



Still of the recorded
screencast
Video made for
documentation purposes

more durable storage medium (see redundant data backup, glossary, p. 601). The work was registered by Frac Alsace by allocation of an inventory number. The data carriers, the only objective components of the work, were documented in accordance with the project's documentation model within the category "technological findings." An analysis of the individual video files revealed, for example, that one of the files (*fleursammulti.mov*) used the Sorenson video codec³ and was stored in a quite strongly compressed form.

As mentioned above, the work only achieves its effects through adjusting the projection to fit the architectonic conditions prevailing in the exhibition space and, where necessary, also taking furniture and other features into account. This process of adapting the projection was at the center of the documentary strategy of this case study. The work had been presented several times since Frac Alsace purchased it, and the artist had always carried out the setting up of the installation in person. In order to set up the installation in the future without Samuel Rousseau having to be present, it is necessary to have precise, but also flexible instructions. To support this, the recording of a screencast is available for reference. To avoid the necessity of viewing the

3 The term codec is derived from the English words *compressor* and *decompressor*. A codec facilitates the compression (see glossary, p. 600) of audio and video data.

screencast each time the installation is set up (this takes around one hour and forty-eight minutes), a log of the procedure's steps was created which corresponds to the temporal sequence of the screencast and contains references to the time code.

Conservation

Rousseau's starting material for the wallpaper patterns are four "classic" animations with different motifs in QuickTime container format (MOV format). He produced these animations with the programs Adobe Photoshop and Final Cut Pro. The image aspect ratio is 4:3, and the image size is 720 × 576 pixels.

According to the artist's instructions regarding the installation of the work⁴ the following equipment is required for the set up (and partly also for the presentation):

- a video projector with a light intensity of (at least) 1,500 ANSI lumen
- a DVD player (as auxiliary device)
- a computer (the operating system requirements are not defined), on which a video and film editing program (this is also not defined) is installed as well as a DVD burner
- a video interface (in the form of a video recorder or a video camera)⁵

In line with the technology commonly used for presentation in museums today, DVD players are replaced by the more reliable and robust flash card media player (see glossary, p. 600).

During the artist interview, Rousseau described for the first time the process of space-specific adaptation and the steps required to achieve it. In addition, he described how this is implemented in the programs Final Cut Pro, Adobe After Effects (as an alternative he mentioned Apple Motion), and DVD Studio Pro (the DVD authoring application is part of the Final Cut Studio Program package) as well as with regard to the equipment listed above. In addition, for setting up the work at the ZKM | Karlsruhe in preparation for the exhibition *Digital Art Works. The Challenges of Conservation*, Rousseau offered his help in creating a screencast. This recording provides more detailed information about the necessary work procedure.⁶ Before, however, programs from different providers for creating screencasts had to be compared in order to decide in favor of a particular product – also in view of the cost involved. As the artist used his own computer during the set up, selection of which

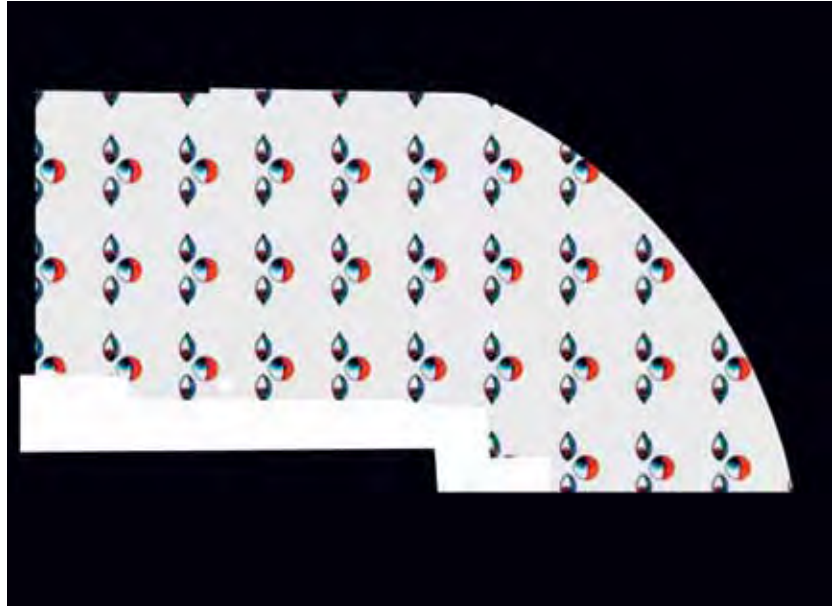
4 The instructions for assembly of the installation are on the data carriers. See Samuel Rousseau, "texte tech papier V," installation instructions, 2004.

5 In this case, the interface serves to transmit the video signals.

6 See the excerpt from the interview with Samuel Rousseau, conducted by Pascal Bion and Nelly Massera, 05/29/1997, this volume, pp. 469–471.

Still of the video projected
on the left side of the
exhibition space for
Samuel Rousseau's
*Untitled (papier peint
vidéo)*

Adapted to the space
requirements at Espace
multimédia gantner,
Bourogne



screencast software to take was restricted to those compatible with the operating system on the artist's computer (Mac OS X). A proprietary software (see glossary, p. 601) was chosen which enables saving the recorded videos in uncompressed form (10 bit, 4:2:2), and which supports both the recording of system sound as well as mouse visualization and mouse click counter.⁷

Once the work had been set up, it was possible to summarize the screencast in writing before it was evaluated. In retrospect, it is clear that the artist primarily used the program Final Cut Pro to string the four animations together and to make the images fade in, as well as to mask the areas not covered by the projection. Finally, one of the files in MOV format was exported from Final Cut Pro and then saved with the encoding software⁸ compressor (formerly part of the Final Cut Studio Program package, and now available separately) in the target format MPEG-2.⁹ In order to be able to set up the work in future

7 Synium Software, *Screenium 2*, available online at: www.syniumsoftware.com/de/screenium/screencasts.html, accessed 07/26/2013.

8 An encoding software is used to compress and convert audio and video signals. One widely used program, for example, is the freeware MPEG Streamclip. See Squared 5, *MPEG Streamclip*, available online at: www.squared5.com, accessed 07/26/2013.

9 MPEG-2 is a standard set by the Moving Picture Expert Group. It involves a compression format (see glossary, p. 600) with which a higher degree of compression can be obtained while maintaining excellent visual and sound quality. See Toni Steller, Uwe Fleischer, "Grundbegriffe der Film- und Videotechnik," in: Andreas Vogel (ed.), *Digitalisierungsfibel. Leitfaden für audiovisuelle Archive*, transfer media, Potsdam, 2011, p. 77.

Still of the video projected
on the right side of the
exhibition space for
Samuel Rousseau's
*Untitled (papier peint
vidéo)*
Adapted to the space
requirements at Espace
multimédia gantner,
Bourogne



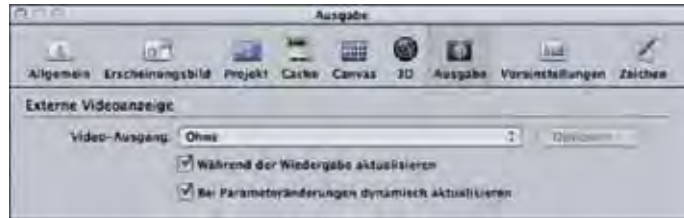
in the most uncomplicated way possible, a great number of software options was considered. In the end the program that Rousseau had suggested as an alternative was selected, Apple Motion, because it features an external video display, and therefore a preview of the mask generated for a particular projection, which had been adapted to the actual conditions of the envisaged projection areas. After testing the software at the ZKM | Karlsruhe, the work was set up at the second site of the exhibition, at the Espace multimédia gantner in Bourogne, without the artist being in attendance. Due to the specific architectonic features of this venue, two projectors and two synchronized flash card media players were used.

As mentioned above, at the time the work was purchased only two DVD-Rs were delivered to Frac Alsace. Thus the objective is the conservation of these data carriers, or long-term access to the files they contain. Proper storage of optical data carriers requires an ideal temperature of 23°C, and a relative humidity of fifty percent is recommended.¹⁰ Storage at temperatures under -10°C and exposing the data carriers to direct light should be avoided.

Further, backup copies of the DVD-Rs should be made. For this purpose, the data files can be saved on an in-house as well as on an external server. Separating the information (for example, the video files) from the information

10 Image Permanence Institute, *IPI Media Storage Quick Reference*, available online at: www.imagepermanencyinstitute.org/shtml_sub/msqr.pdf, p. 7, accessed 07/26/2013.

Screenshot of the compositing and animation software Motion used for setting up *Untitled (papier peint vidéo)*
An external video display is possible in this version of the program (4.0)



carrier (DVD-R) is indispensable for long-term preservation of the work. To guarantee permanent access to the work-relevant files the work must be given an absolute pathname in the Frac Alsace collection database. The artist is also of the opinion that it is absolutely necessary to protect the data by depositing backups in different geographical locations.¹¹

Conclusion

As a result of the case study, employees at Frac Alsace were to be given detailed instructions for setting up the installation as well as recommendations for the acquisition of hardware and software. However, the envisaged software recommendation was not passed to Frac Alsace because shortly before completion of the case study, in 2011 a new version (5.0) of the compositing and animation software Motion was published.¹² One feature of the software necessary for installing the video wallpaper – the external video display – was no longer supported in the new program version.¹³ Hence, a new search for possible alternatives is unavoidable, and these may involve greater expense. In cases such as this, users of proprietary software can only hope for an update that includes this necessary feature. In the future, developments in the area of freeware (see glossary, p. 600) might also be helpful. This is an attractive prospect not least because of the dwindling financial resources available to the cultural sector. For example, a very promising editing program for video and film is Lightworks,¹⁴ the roadmap of which¹⁵ can be traced on the Internet.

11 See Bion, Massera 1997, this volume, pp. 469–471.

12 Due to the low price (which even included purchase of the required program compressor) and the functional scope of the program, the program Motion from Apple was chosen.

13 See Provideo Coalition, *Motion 5: Five Missing Features*, online: http://provideocoalition.com/index.php/mspencer/story/motion_5_five_missing_features, 12.12.2012.

14 See Lightworks, *Tech Specs and Compatibility*, online: www.lwks.com/index.php?option=com_content&view=article&id=13&Itemid=174, 12.12.2012.

15 During software development the roadmap provides information – a project plan – about the different stages through to the conclusion to the project. Cf. Lightworks, *Roadmap*, online: www.lwks.com/index.php?option=com_content&view=article&id=51&Itemid=177, 12.12.2012.

Screenshot of the
compositing and
animation software
Motion (5.0)

The feature necessary for
the set-up of the work –
the external video display
– was not implemented.



Without the artist's support and the disclosure of his working method when he created the installation, even the case study's first objective – comprehensive documentation – could not have been achieved. In his discussion with Pascal Bion¹⁶, Samuel Rousseau also underlined the necessity of creatively experimenting with the given spatial situation, and during the interview held out the prospect of new wallpaper patterns in HD format.¹⁷ Thanks to the screencast and the successful documentation, the site-specific reinstallation of the work can now be implemented without necessitating the presence of Rousseau in person. Hence, the project team was able to set up the installation and adapt it to the specific conditions of the exhibition space accurately for the exhibition *Digital Art Works. The Challenges of Conservation* in Espace multimédia gantner in Bourogne (Territoire de Belfort), which is impressively demonstrated by the photographs taken of the exhibition.

Translated from the German by Justin Morris

¹⁶ See Bion, Massera 1997, this volume, pp. 469–471.

¹⁷ The video files originally provided by the artist were in standard definition format (SD PAL, 720 × 576 pixels); however, future patterns will be created in high-definition format (HD). The latter format has a greater number of lines and higher image resolution.

Untitled (papier peint vidéo)

Interview mit Samuel Rousseau

Pascal Bion and Nelly Massera

Excerpt from the interview conducted via Skype on May 17, 2011

How did you come up with the idea of the “video wallpaper”?

Samuel Rousseau: The idea for the “video wallpaper” [*Untitled (papier peint vidéo)*, 2003] came from an observation of reality. When I started working with video, only SD was used, so a format of 576 × 720 pixels. That is a bit like asking a painter to always paint canvasses that are the same size, say three by four meters. Yet the most important thing in life for me as a person and as an artist is freedom. That’s really fundamental for me, to be free in relation to technology, the art market, institutions and all that. I’m ready (again) to starve to death if need be. It is really hard work being an artist, but it is also a commitment. That is why I wanted to break out of the format, to stop being a prisoner of the 4:3 ratio, to make a round video or an oval video, a video that could start to go out of shape. I also wanted to immerse the viewer in video, to stop having the viewer positioned in front of the video work – like in the cinema, where you get people to sit down and you show them something with a beginning, a middle, and an end. That’s what I wanted to show with the video wallpapers. Ultimately, I think that video wallpapers work when you turn your back on them, in other words when you stop paying attention to them, when they become part of an environment. They exist to surround your life and not for any kind of contemplative relationship.

I’ve always been fascinated by architecture, and by interior design, too, and I wanted to decorate walls, literally, with video works. I used technology to cut up the video wallpaper

the way an interior decorator might cut up ordinary wallpaper, so that there was a real correlation between the work being screened and the screen itself, in this case an interior design, with all the accidental elements that involves, such as windows, furniture, pictures, knick-knacks, sculptures, whatever. So I was dealing with interior design and introducing into it a work that also questions its own status, that asks what is video wallpaper? Is it art? Is it design? Is it consumerist? Is it brilliant? But there is also the idea of change and time: I create my works in a temporal context, in a manner that the audience can approach them at absolutely any moment. That means there isn’t really a beginning, or an end, and there is no real middle. I want people to approach my work the way you would a painting or a sculpture. When I sell video wallpapers, they always come in a series of three copies. There is a kind of catalog and people choose. It was the same with the Frac Alsace,¹ they have got three wallpapers, because there is also the idea of change. To put it a bit crudely, you might get up in the morning wanting a particular kind of atmosphere. Come mid-day you feel like a different atmosphere, and in the evening something different again, and with just a remote control you can change the atmosphere in your home.

How did you decide on the various patterns?

¹ The Fonds régional d’art contemporain (Frac) Alsace purchased *Untitled (papier peint vidéo)* for its collection in 2004.

Following the same principle. It all reflects a kind of bestiary of ordinariness: it is not about showing extraordinary things, but ordinary ones. I conceived the video paper by using paper wallpaper as a source of inspiration. What is wallpaper about? It is the juxtaposition of serial patterns, which allows it to have a visual coherence when you put one length next to another. Here I recreated exactly that. I created video lengths that are a juxtaposition of motifs that work side by side, because you can have an image, then another image, then another image, and, if you want, you can cover a wall two hundred meters long with two hundred video projectors. And what I liked was creating variations according to the environments. So there is a wallpaper for children, a wallpaper for the living room, a wallpaper for the kitchen, and a wallpaper for the parents' bedroom. Now I would like to make other video wallpapers that are more linked to the space. But that is work for the future. When I was making the video wallpapers, I realized that I could push back the walls. It's amazing, when you put on the flower wallpaper you have flowers spinning round, you have flowers appearing everywhere and disappearing at the moment they reach the same plane as the ones that are spinning. When multiplying the subject on a pretty large wall, you get to create a new dimension and that is really interesting. I would like to take the experiments a bit further in that direction. That will be a new generation of video wallpaper.

How do you proceed when you install the video wallpapers?

The first thing is to choose the walls. The walls have to be chosen according to what happens to be on their surface and in the environment. So if I have to decide between a completely white wall where there is nothing happening and a wall with a fireplace or a window, I will

immediately choose the one with the window and the fireplace because it will allow me to use cuts that are wilder, more interesting and suited to the meaning.

So technically what happens is, first I set up the video projectors to cover the wall and overflow onto the floor and ceiling and the adjacent wall, and then I connect on my computer with a video interface to the video projectors and I project live. In other words I use the video projector as a control screen and I cut up my wallpaper and place it in the space. Because, of course, when I install the wallpaper, the video projector is a bit too high or a bit too far to one side, so I have to adjust my images and create anamorphoses so they can be read upright – so they are aligned, to put it simply. Then I literally cut them up using caches on the random elements – windows, fireplaces, pictures, vases of flowers, and so on. Then you disconnect the computer and replace it with either a DVD player or a multimedia player, or a hard disk, or whatever.

Are you always present to install the work in person, or do you allow the museum or gallery to do this without you after the first time?

I have compiled a kind of technical spec sheet, because if I'm gone, my work has to live on after me. But most of the time I'm the one who does the installations because I am really demanding when it comes to my work and how it is shown. Actually, I prefer to be in control of the technical aspects.

Should the DVD player be hidden from the viewer?

Yes, because it is not good when it is visible in the exhibition space. You have to ask yourself what it means when you leave equipment lying around; it's not about hiding it, but making it

invisible; in other words not making it present in the space and focusing attention on the work rather than the technology.

Are there any specifications for the space?

Anything is possible. Imagine a corridor with no random elements, thirty meters long, with the images projected by fifteen video projectors – that would be fantastic. The video wallpaper allows you to make an image one hundred meters long if you want to and if you have the hardware to do it.

Do you make backups of your works? Do you use RAID?

Well no, I don't use RAID [Redundant Array of Independent Disks] but I've got backup hard disks. What happens when I sell a work is that, I sell the object and with it I sell two DVDs for use. I advise people to use one of the two DVDs and to store the second DVD in a cool dark place so it deteriorates as little possible. Along with that I give them either a hard disk or a DVD with a professional video in a completely different format, much bigger, which will enable them to burn new DVDs in the future, when the DVDs handed out initially are no longer usable or when they become obsolete because of newer video formats. So customers are responsible for their master. For my part I still have the piece on hard disk and on CD. Soon I'm going to copy all my backup hard disks onto other disks that I won't keep at home, in case there's a fire or – because this did happen – I was burgled and I had a hard disk stolen and I lost a lot of work.

So you talk about keeping your backup copies on an external or distant server?

Yes, an external server or just a hard disk that you give to someone you trust who won't do something stupid with it and you gradually fill up the hard disks that are geographically far apart. I trust in hard disks because writing to hard disks is a physical process and even solar winds don't do them any harm.

Would you agree to the individual steps of the installation process being recorded for documentation and conservation purposes, so the work can be installed without you in the future?

Of course, because I hope – maybe it is a bit ambitious – that my work will outlive me. I hope I'm making work that isn't too closely tied to its era, or a time bound up with fashion. The best compliment anyone can give me with regard to my work is to call it "unclassifiable." They can't put it in a box because I'm simultaneously doing video, sculpture, and installations linked to space and time. So I have positioned myself at the crossover of different concerns and genres. I think that's very important. And I want my work to outgrow me and it's doing that. Take the work *P'tit bonhomme* [1996], for example: it is fifteen years old, and they recently showed it again. It didn't have a single wrinkle. And as long as there are stairs and people with legs to use them, that piece will work. It isn't tied to its time.

Translated from the French by Trista Selous



Antoine Schmitt

still living H, I, J

2006

Screen installation of animated
computer graphics

Installation view

*Digital Art Works. The Challenges
of Conservation,*

ZKM | Media Museum

Photo © ZKM | Karlsruhe

Photo: ONUK

Antoine Schmitt (*1961, Strasbourg, France)
still living H, I, J
2006

Collection of Espace multimédia gantner,
Conseil général du Territoire de Belfort, Bourogne, France

Hardware:

- USB flash drive
- 3 PCs (Mac OS X, OS 10.4, or 10.5 / Windows 98, XP, or Vista)

Software:

- 3 programs (*still living H, still living I, still living J*)
with versions for Mac OS X and Windows (compatible with
Windows 98, XP, and Vista) operating systems.

Conservation Strategies:

- Emulation
- Porting

Documentation:

- Anne Laforet
- Valérie Perrin

Text:

- Anne Laforet

The case study foregrounded the specific features of *still living H, I, and J*, and in particular the relationship between the quality of the movement created by the algorithms and the animated visual forms it takes.

The three works were programmed by the artist in a programming environment that appears to have come to an end, making migration nonviable. First, emulation, and more importantly, porting, are the conservation strategies that have been considered. In this connection, free software appears to offer the most sustainable option for the target programming environment.

Work Description

still living is a series of works by Antoine Schmitt, made in 2006 and currently consisting of ten pieces. Espace multimédia gantner has acquired three of them for its collection: *H*, *I*, and *J*. Each piece is autonomous and independent of the others, with no interaction outside the work itself, apart from date and time displayed on the computer screen, emphasizing that the program is being executed in real time. These screen installations represent graphics used in the sphere of business and the stock exchange: curves, pie charts, and bar graphs. The graphics move, driven by internal forces: the algorithms designed by the artist.

still living H consists of three vertical bars and a pie chart: only the colored areas –sometimes blue, sometimes red – move; most of the surface remains white and motionless. The gentle swaying movements are very subtle.

The composition of *still living I* consists of two curves, blue and red, which are horizontally symmetrical and which intersect. Their slow, unpredictable movements are also represented by bar graphs and a pie chart.

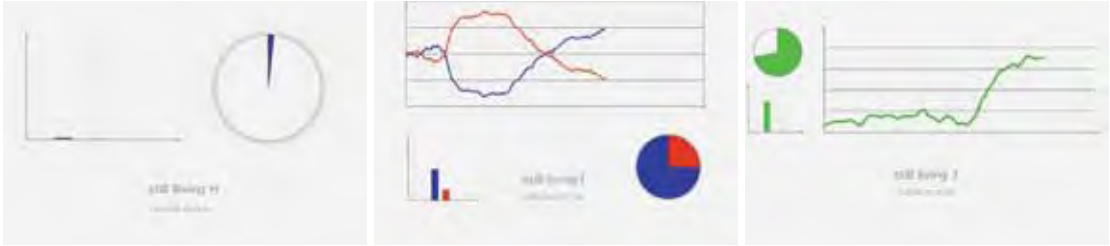
still living J follows a frenetic, jumpy, random curve, like a representation of the stock exchange. Alongside the green curve, a pie chart and smaller bar graphs perform the same lively movements.

Art Historical Context

Antoine Schmitt is a French artist who has used code since the 1990s as a tool to explore the idea of movement and its relationship with form. Originally a software engineer, he specialized in artificial intelligence and human-machine interaction; he has created a series of installations, many of which are minimalist. Some are screen-based, like *TIME SLIP* (2008), *Vexation 1* (2000), and *Le Pixel Blanc* (1996–2000), some are online, like *puppetpresident* (2004),¹ or based on a building in the street, like *City Sleep Light* (2010).² They take the form of working systems, designed to address the notion of movement in terms both of form and point of view. Schmitt draws on kinetic and cybernetic art traditions, revealing and literally manipulating the forces at work in order to question the modalities of free action within complex systems of reality. He puts the program at the center of his work, working either alone or in collaboration with other artists: his projects include the CD-ROM *infinite CD for unlimited music* (1999) together with Vincent Epplay, the CD-ROM *Machiavel* (1998) and the opera for one hundred communicating rabbits, *Nabaz'mob* (2009), with Jean-Jacques Birgé, and the interactive performance *extra ball* (2011) with Patricia Dallio, Malte Martin, and Uriel Barthélémi.

¹ Available online at: www.puppetpresident.net/, accessed 07/15/2013.

² The installation *City Sleep Lights* was presented at the Média Façades Festival Europe 2010 in Brussels, Berlin, Helsinki, Linz, and Madrid (see <http://www.citysleeplight.com/mff2010.html>, accessed 07/15/2013) and during the 2011 Fête des Lumières in Lyon (see www.citysleeplight.com/debrousse/index.html, accessed 07/15/2013).



From left to right:
 Antoine Schmitt
still living H
still living I
still living J
 2006
 Animated computer
 graphics
 Screenshots

Antoine Schmitt's use of code has made him one of the best-known artist-programmers. Among his awards are two for "software art" from the transmediale festival, Berlin³ and he has exhibited his work in settings where his relationship with algorithm-based art has been especially important, such as the *CODEDOC II* event at the 2003 Ars Electronica Festival in Linz. The work *still living J* was purchased by the Digitalarti⁴ investment fund in 2010.

still living is one of Schmitt's most formalistic pieces, and one of the most political in the sense that the series deals with the quantification of something that is real and "alive." It forms part of his interrogation of what is alive, and the nature of the real, in which the notions of behavior and autonomy are present in different ways in different works. *still living* also foregrounds what he calls the "aesthetic of action" that is made possible by programming.

Provenance

The installations *still living H*, *I*, and *J* have been part of the collection of Espace multimédia gantner since it acquired them in 2009. These software works are stored on a USB flash drive supplied by the artist. After a number of experiences with works that no longer functioned and which forced Schmitt to reprogram them if he was to continue to exhibit them, he takes a work's durability into account when he sells it. He supplies the work in the form of an executable program for Mac OS X and Windows 98, XP, and Vista operating systems, a user's manual containing instructions for installation and presentation, the source code (see glossary, p. 602) in Adobe Director MX 2004 format, and a license. The license sets out the conditions of sale, and of copying, exhibiting, and maintaining the work, and stipulates that only the principal copy of the work may be shown to the public, not the back-up copies. As a result, the work cannot be shown in two places at the same time. The license also stipulates that the technical instructions and instructions for installation that make it possible to exhibit the work in an appropriate way form part of the work itself. Lastly, since the source code is sold with the

³ Available online at: www.antoineschmitt.com/bio/, accessed 07/15/2013.

⁴ Available online at: www.digitalarti.com/en/blog/digital_art_promotion/still_living_j_antoine_schmitt_2006, accessed 07/15/2013.

executable files, it is subject to a condition: it may be used only to maintain the work and may not be exhibited, distributed, copied, or sold separately.

Course of Action

This case study was an in-depth analysis of *still living H, I, and J*, which comprised detailed observation of the three works, and several discussions with Antoine Schmitt. It was also based on a study carried out in 2009 by three fourth-year students at ESIEA (École Supérieure d'Informatique, Électronique, Automatique): El Mehdi Moussalit, Othmane Rami, and Younes Brija, all from the Art et Recherche Numérique (ARNUM) workshop, under the direction of Claire Leroux (director of ARNUM), and Anne Laforet. The students explored a number of conservation strategies, and attempted to reprogram *still living* in Java language. It was not possible to complete the process in the time allocated to the students for the project.

Documentation

The *still living* series was made using the tenth version of Adobe Director software (Adobe Director MX 2004). This was the first version in which it was possible to write encapsulated executable programs for Mac OS 9, OS X, and Windows (it had previously been necessary to obtain separate licenses for Mac and Windows platforms). Versions of *still living H, I and J* are available for Mac OS X and Windows, Mac OS 9 having become more or less obsolete by 2006 when they were made. There are therefore six programs in the Espace multimédia gantner's collection.

The ten works that make up the series are also presented online.⁵ They are the same works, with the same source code (see glossary, p. 602) as for the screen installations, with the addition of some lines which appear above the compositions, containing the title of the series, the initials of the first ten works of the series (*A to J*), which can be activated with a click of the mouse, the words "a collection of visual installations by Antoine Schmitt" and a link to a page of information about *still living*. Schmitt takes the view that the online work is in effect his artist's copy, since he offers three copies of each piece in the series for sale.

The installation of *still living H, I, and J* require a minimum configuration in order for them to function. The computer has to be an Apple, running under Mac OS X 10.4 or 10.5, or a PC under Windows 98, XP, or Vista. In both cases a processor of at least 1 GHz and a graphics card with a resolution of 800 × 600, 1,280 × 1,024 or 1,440 × 900 are needed. The works are exclusively visual.

Each work in the series is presented in a cool, industrial style, with the equipment as invisible as possible, following the artist's instructions in the

5 Available online at: www.gratin.org/stillliving/, accessed 07/15/2013.

documents he supplies with the works, which include photographs of them in various installations. The pieces *still living H, I, and J* may be exhibited together or separately. Antoine Schmitt recommends that the works be installed on flat screens, although *still living* has been shown using other equipment, such as projections, screens on stands, and computers, each time taking care to preserve its affinity with the world of business communications. And whatever type of screen is used, it must not be too big.

Antoine Schmitt's intention is to give each work in the *still living* series a specific quality of movement, which is a central motif of his work. To achieve this, he pays special attention to its visual aspects (composition, colors, typography, graphic elements displaying a formality associated with industrial capitalism) in order to make them transparent. The animated graphics are the manifestations of the underlying movement. They are its visual representation, selected by the artist to emphasize their different qualities.

The movements are created by an algorithm, written in Lingo, the scripting language of Adobe Director, which produces a value between 0 and 1. It is this value (or in some cases, values) that is made visible by the animated graphics. The artist created random modules, but he also assembled, using random editing in real time, fragments of recorded movements. These movements, taken from the living world or imitating the human one, explain the title of the series: still lifes that come "alive" through the algorithms in the program. The work is not interactive. For the spectator it involves sensing the different qualities of movement and experiencing the way in which this is articulated with the familiar forms of pie charts and bar graphs in a neutral space that could be a company's foyer.

Conservation

The works *still living H, I, and J* were acquired in 2009 and are executable on a contemporary computer without adding software or changing its configuration. The artist supplied a certain amount of information, including recommendations for maintenance. The source code shows how the work functions, and makes it possible to carry out the maintenance required to exhibit it to the public. No preventive conservation was needed or undertaken during the period that the *digital art conservation* project was running.

At present, Adobe Director software is not being developed by Adobe, who own it (it was previously developed by Macromedia). The last version, 11.5, was released in 2009, and there are no signs that it will be updated in the short or medium term. The community of users is shrinking, despite the software's popularity in the 1990s and 2000s. Director enables users to create a wide range of interactive projects, in two and three dimensions and on a variety of storage media and platforms (CD-ROM, DVD-ROM, Internet), as well as installations. Part of Director's success was due to the ease with which its

programs can be put online: they can be read in a browser using the Shock-wave plug-in (see glossary, p. 601) for Mac and Windows operating systems. Director's script language, Lingo, created by John Henry Thompson, has syntax that is simple and easy to read (for English speakers), although it has evolved since it was created, becoming more like other programming languages. From Adobe Director MX 2004 onwards, Director has accepted, in addition to Lingo, the ECMAScript language, the standardized version of JavaScript, another object-oriented language.

In terms of the durability of works designed with Adobe Director, the approach developed by that software, since its creation in 1994, has no equivalent in terms of proprietary or open source software (see glossary, p. 601). Unless there is a change in the way Director is developed and distributed, as with Blender (a proprietary software that was paid for in part, and was acquired by its designer and users and turned into free software under the supervision of a foundation), an alternative way of reprogramming a work like Schmitt's *still living* will have to be found in the form of software that will make it possible to implement the algorithms created by the artist and to animate the graphics.

Migration (see glossary, p. 601) is not a viable conservation strategy, or only in the very short term, if there is continued development of Adobe Director and if certain visual elements need to be updated (for example, in the case of a significant increase in the screen resolution of contemporary computers, or if it is impossible to run encapsulated programs correctly). For the artist, it is essential that the work is executed in real time, and that viewers have the feeling the movements are generated at the very moment they see them. The display of the time and date below the title of the work (the only feature for which it requires information external to the program, retrieving the time displayed on the computer) contributes to this sensation of the here-and-now.

Emulation (see glossary, p. 600) makes it possible to preserve what currently exists, that is, the source code of the work in its environment. An emulator allows the executable file to be run on new platforms. The popularity of the platforms on which *still living* runs (Mac OS X, Mac 10.4, and 10.5 as well as Windows 98, XP, and Vista) make it likely that many high-quality emulators will be available in the short and medium term; however, they must be able to preserve the elements that the artist considers important. In the course of an interview with Antoine Schmitt the question of the dividing line between acceptable changes and unacceptable deterioration was discussed.⁶ For example, it is not acceptable to the artist to show the work on a black-and-white monitor, or with poor color, or on a computer that is too

⁶ See the excerpt from the interview with Antoine Schmitt conducted by Anne Laforet, 06/11/2011, this volume pp. 484–487.

slow. It is also not acceptable if the composition of the graphics on the screen is spoiled by low resolution or by a format that no longer maintains the relationship between the different types of graphics, as designed by the artist. Antoine Schmitt is in favor of emulation, on condition that the quality of the movement is not compromised by the emulator's interpretation of the code. He has no preference for either emulation or reprogramming, provided that the work is respected and is shown without any distorting alterations. He also wishes to be kept informed, and if necessary, consulted, on these issues, as well as in connection with any conservation measures carried out on his work.

Porting (see glossary, p. 601) to an environment different from that of Adobe Director thus appears to be one of the main strategies for making this work durable. This option has both a technical and a strategic dimension. Technically, it is a question of finding software that will make it possible to write autonomous programs and that can handle the design and movement of the graphics equally well. Strategically, open-source software seems more appropriate, if possible, in the case of reprogramming, in the sense that publication and sharing of data, and direct collaboration between developers and users in developing the software make it easier to adopt and maintain a programming environment. In this way, the risk that development may be halted if there is a change in commercial policy can be avoided, as long as the open-source environment is supported by a large community of programmers – developers as well as users. A piece of free software that is not used very much is not more durable than proprietary software. After using Adobe Director for many years, Antoine Schmitt now works with Processing because in his opinion that particular free software – designed for use by artists by Casey Reas and Ben Fry⁷ – is very versatile.

The core of the work is the algorithms of movements designed by Schmitt which are what gives the works their specific qualities. The algorithms that control the movement and the animated graphics can be dissociated when the work is ported to a different environment. More important even than the source code (which includes the graphic elements), is the question of preserving the algorithm that controls the movement. The central algorithm could, if necessary, be ported to another language as long as the quality and dynamics of the original movement were preserved.

Regarding the work's elaborate visual aspects, its capitalist formality, the source code in this second category could also be replaced, provided that the visual effect remains as close as possible to the specifications drawn up by the artist. Schmitt has set a number of parameters: composition (spatial arrangement of the different graphic elements), bright colors, typography, heading (title, time displayed on the computer), clarity of pixels, texture, running speed as he has set in the code, and so on.

7 Available online at: <http://processing.org/>, accessed 07/15/2013.

Screen resolution and format could be important factors in reprogramming. If the resolution of a future computer makes the composition appear smaller on the screen, a lower screen resolution will have to be simulated, while preserving the work's appearance. Similarly, the format of a screen affects the artist's visual composition, and the proportions between the various elements. For example, in the period between the time when the work was made and the time it was acquired, the 16:9 format became popular, in addition to 4:3. The artist could easily compensate for this change by modifying his code in such a way that the format was retained and a composition designed to suit that format.

still living includes contextual elements, namely, the graphic codes (pie charts, curves, etc.) used to represent movement. At present, these elements are instantly recognizable, more or less universal, and associated with commercial visual culture, and it does not seem likely that they will become obsolete in the immediate future. However, they will have to evolve in the short or medium term. In the course of discussions with Antoine Schmitt, it was suggested that they could be changed to reflect the aesthetics of the era in which the work is exhibited. In Schmitt's view, the purpose of this work is not to change over time; the elements it contains correspond with the period in which it was made. At the same time, he does not object to such changes, especially if the work is completely reprogrammed.

The way in which the work is made available to the public is also associated with that type of institutional communication, which will change just as much as the graphics. The artist's recommendations for exhibiting it are more open to interpretation than the work itself, and are therefore more likely to change over time.

The three student software engineers who studied the issue of making *still living H, I, and J* more future-proof before the *digital art conservation* project began, suggested using Java to reprogram the work. They were unable to complete the task in the time allocated, and did not produce a visual result that was compatible with the work. However, this does not mean that their proposal is irrelevant. In support of their suggestion they emphasized several advantages of Java. It is a universal language, in the sense that its programs are executable on all platforms that have a Java virtual machine. It can be ported to several platforms, using Java Runtime Environment (JRE), which interprets the code written in Java, converts it to native mode, and executes it, making the code independent of the platform. It is also possible to access some elements of the target machine using standard libraries. The fact that Java is object-oriented makes it compatible with the requirements of a work like *still living*. It is a popular language, similar to C++ (see glossary, p. 599) but much simpler, which makes modular programming possible, so that the objects can be reused separately. It is also a widely documented language. Code written in Java can be integrated into Web pages, using applets,

applications that can be displayed and interpreted by browsers. Java also has the advantage of backward compatibility. A program executed in an earlier JRE can be executed in a more recent one, and a program developed in an earlier Java Development Kit (JDK) environment can be modified in a more recent one. The Java source code is published under the GNU General Public License (GPL) under the name OpenJDK, which has become a standard. The openness of the Java platform has enabled a community of developers and users to create and develop their own libraries. Java includes some powerful, comprehensive, basic graphic libraries, and others designed for drawing, which means that it can generate graphics such as curves, bar graphs, and so on, to represent quantitative data in an application or an image. These libraries include JfreeChart,⁸ which the students used. Many other forms of multimedia, including 2D, 3D, animation, video and interactivity, can also be handled using Java. But the students also drew attention to the disadvantages of Java for this work. Java consumes a large amount of resources, which means that the code is executed slowly. Interpretation of the code by the virtual machine inevitably makes execution slower than if it were compiled directly in machine language (see glossary, p. 601). That may be the case with some compilers (see glossary, p. 599), which offer much faster execution, but it reduces the portability of the code, which can now only be run in one architecture.

The choice between the various strategies involves hardware and software considerations, at the time when a specific intervention has to be made. Social and technical factors, and the resources an institution has at its disposal, lead to a choice that enables the public to experience a work free from distortion, in which the quality of movement and the precision of the graphics have been preserved.

Conclusion

The installations *still living H*, *I*, and *J* are “living still lifes” (hence their names), as a result of the movement that underlies them and the programmed internal forces which animate their graphics. To Antoine Schmitt, *still living* is an attempt to remove the power of the image and to go beyond it, to what it is that produces it: movement. At the same time, that quality of movement means that the work’s source code has to be executed in real time, for the foreseeable future, and this influences the choice of a conservation strategy. Recording (whether it involves capturing the work’s image or the data that creates movements that could be replayed) can never be an option as a way of presenting the work. Capture of that kind would have documentary value only and would not be capable of producing the sense of movement that the artist

8 JfreeChart is a Java programming interface (API) used to create graphics and diagrams. Available online at: www.jfree.org/jfreechart/, accessed 07/15/20123.

wishes to create in the spectator. This determination to keep the algorithm at the center of the work can also be seen in Schmitt's personal strategy for making his works durable, especially when one of them is purchased. The addition of the source code, for purposes of maintenance, to the executable files and recommendations for installation and display, gives institutions and collectors more confidence in a work's longevity, although this is not a universal solution for every work of digital art. The source code gives us fuller knowledge of the work, and in association with the artist's general recommendations, allows us to envisage performing a porting that will be compatible with the technology that exists when it is exhibited.

Translated from the French by Imogen Forster

still living

An Interview with Antoine Schmitt

Anne Laforet

Excerpt from the interview conducted on June 15, 2011,
at Espace multimédia gantner, Bourogne

You've talked about using Adobe Director (MX 2004) software to develop this work. It looks like there aren't going to be many better versions of this software, unlike what was happening before. What's your feeling about this particular software in relation to the conservation and durability of your work?

Antoine Schmitt: The issue is broader than that. What would force me to port *still living* to a different software would be if contemporary computers could no longer run it. In that case it would be an obligation. But where conservation is concerned, I was already thinking about the idea of porting *still living* to another environment, thinking that this would make it easier to conserve it in the future. So I could do this myself, or have it done elsewhere, either for actual conservation purposes or to reassure potential buyers that the work can be preserved and maintained more easily. The key equation in all this is that, if one day the work no longer functions as it is, the simplest way to reprogram it – perhaps not the simplest, but the only possible way – would be to reprogram it in an environment that exists at that point in time. It's very likely that in an environment like Director it will stop working. Thus, in the future it won't be possible to reprogram the work in that environment, it will have to be reprogrammed in a different environment. In this case, it is better to use an open-source environment (see glossary, p. 601) that is more likely to exist in the future because there is a community of programmers

who will maintain it over the long term, unlike proprietary software, which is dependent on commercial policy and that can bury an environment overnight.

What do you think are the main characteristics of such an environment that are essential for your work?

There are two aspects: the technical aspect and the strategic aspect. On the technical side, ultimately there aren't many constraints. It just has to be an environment that allows the creation of autonomous programs that function – but not that make films, for example, as a contrast. An environment that makes it possible to run programs, and that allows you to draw on a screen, to do something visual, to manage the drawing of the graphics. So that is the technical side of things. At the strategic level, once again I come back to the idea of open-source: in my view it is strategically far more intelligent for future maintenance to work in an open-source environment than in a proprietary environment.

Is the use of the original source code important for *still living*, even though this may imply a perceptible change?

For this work, I think the most important thing is in fact not to preserve the source code as code, but as an algorithm of movement, remembering that in fact, in this particular work – as I was saying – there is the movement algorithm itself,

so the little program that generates movement as such. Then there is the whole dimension of representing this movement in a graphic manner, which also involves bits of programs that draw the curves. These things are completely secondary and can be completely transformed, or replaced by others. There it really doesn't matter. What is really important is the central algorithm. You might plan to use the same source code, of course, but you can also imagine transposing it into a different language as long as it retains the algorithm and also the dynamics of its functioning.

Where the composition of the image is concerned – the presentation – what are the elements that combine to give an authentic version of your work?

For the image what is important are the colors with a certain latitude because these are bright, fairly basic colours: pure red, pure blue, etc. The colors, but also the overall composition, in the traditional sense of the word as the arrangement of different elements in space. What is equally important and what I haven't talked about yet, is the label, the caption. In the image there are not only graphic forms, but also a typographic element – text – which is the title of the work that appears in the image in a particular font, and the time displayed by the computer. The present time is a really important element of the work because it is subliminal and because it enables the spectator to know – even if not consciously – that it is happening here and now and that it is not a recording: it shows the present time here and the spectator can become aware of it. So these different elements, fonts, colors, composition, are important aspects of the image.

What about the resolution of the image?

Let's say it isn't fundamental. What is important is to respect to the maximum what is possible: if one day this work has to be shown on screens with much higher resolution, which was not envisaged at the outset, the original resolution has to be simulated. The idea is to preserve the grain, the detail as it is today, and also the scale. Because if the image is reduced to the resolution of a screen with much higher resolution, the image will be much smaller. That's no good. The ideal is to keep the physical dimension of the image at its original maximum. So we have to adapt to higher resolutions and simulate a lower resolution in a geometrical shape that remains constant.

What about the speed at which the image moves, the fluidity of movement, what are your thoughts on that?

Where movement is concerned, it is important not to sink below a certain dynamic level, a certain processing power. If you go below a certain processing power the movements get slower, softer, and that will clearly be perceptible. However, if you use much more powerful computers, then there aren't any problems because I limited the speed it runs at, the processing speed, so that in any case the movements wouldn't go faster. But if the computer is not powerful enough, obviously it cannot process fast enough and so the movements will be slower. That is when it becomes problematic.

In relation to the program's external data, you've mentioned the importance of the time display. Are there other data external to your program that interact with it?

In fact there aren't any other external elements; there is no data search on the Internet or links

to the viewer or to some sensor. The program is totally autonomous apart from displaying the time. However, it is important for the computer to be set to the right time because the program takes the time from the computer and displays it. So when the work is exhibited it is important to check that the computer displays the right time, because this could create a discrepancy. You can either use a computer connected to the Internet that sets the time automatically, or you must check regularly that the computer is more or less keeping time. It does not have to be accurate to the second, but the viewer has to feel that it is the time of now.

Do you think you should be consulted systematically about any restoration or reprogramming?

It is not indispensable, but as far as possible: yes.

More generally speaking, what is your approach to conservation and restoration?

Actually, that is something I am becoming more and more aware of. I became strongly aware of this aspect when I wanted to show a work and couldn't because I couldn't find a computer I could run it on. This work had been made on computers – or actually on operating systems – that are no longer made today. That was the moment I realized I had to start thinking about this question. However, I have several approaches to these issues. Today I have moved to an open-source environment for my development. I do everything, more or less everything, in Processing [an open-source programming language] – to give it its name – which is a very multifunctional environment in my view that allows me to do whatever I like. And it is open source, so potentially it has a much longer environment lifetime than a proprietary environment.

Do you have any preferences for a particular conservation strategy or strategies, such as storage, migration, emulation, reprogramming, reinterpretation or hybrid strategies? Do you have a feeling that some are more relevant to your work in general and to *still living* in particular?

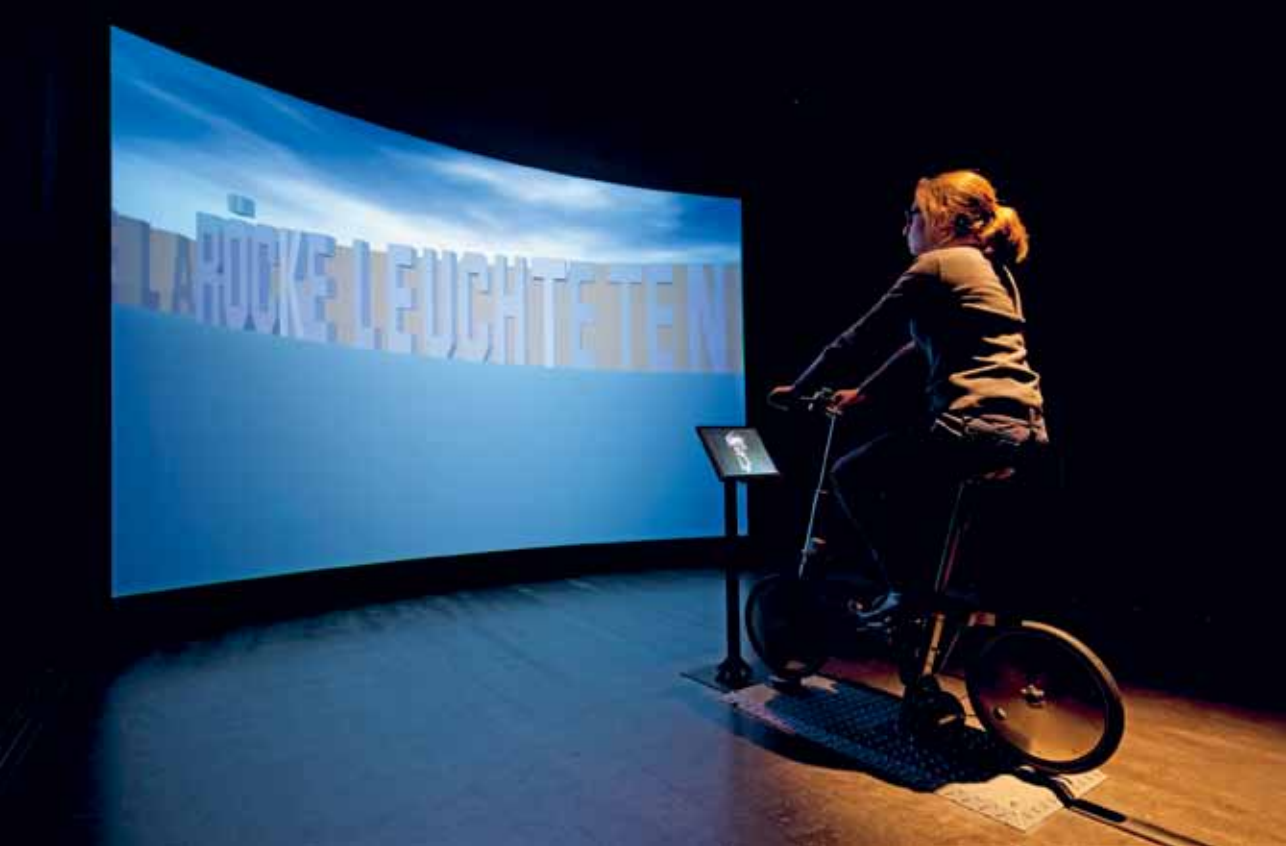
I think strategies should be chosen that will preserve the artwork – that's a kind of tautology: you must stick to what already exists as much as possible. After that I don't really have a preference. However, I do like emulation because in some way emulation preserves the cocoon in which the work exists. So if it's possible to emulate without changing it... Any porting or recoding of a work is inevitably going to involve alterations to the material itself, whereas emulating a system is more like cutting out what is around the work and then transferring it. So it seems that emulating will less alter the work, but at the same time it is not really that clear-cut, because emulation always has its disadvantages, which still affect the work. So let's say, *a priori*, I don't have any preferences.

Is there anything you haven't had a chance to say about your piece in relation to these questions that seems important to say now?

Yes, I think it is important to talk about the materials that make up the work and the fact that today, in my conservation strategy, I have decided to provide the work as an executable program, and to provide instructions for the work; that means instructions for its technical and aesthetic functioning. This enables the people who exhibit it, who have bought it and want to show it, to have guidelines and advice on the best conditions in which to exhibit it and to

know the limits that are to some extent acceptable – even if it is subjective – for exhibiting and preserving the work as it is. Where future conservation is concerned, I provide the source code for the work in its current environment, in Director, which makes it easier for a potential buyer to preserve the work for the more distant future. And, in purely contractual terms, the work comprises all this: executable on Mac and Windows, source codes, and installing instructions. So all that is part of my strategy for dealing with the problem of obsolescence and porting, the maintenance and preservation of the work. That is something I think it is important to say. Otherwise, I haven't got anything else to say.

Translated from the French by Trista Selous



Jeffrey Shaw
(with Dirk Groeneveld)
The Legible City
1989–1991
Interactive installation
Installation view
*Digital Art Works. The
Challenges of Conservation*,
ZKM | Media Museum
Photo © ZKM | Karlsruhe
Photo: ONUK

Jeffrey Shaw (*1944, Melbourne, Australia)
The Legible City
1989–1991

In collaboration with Dirk Groeneveld (*1956, Amsterdam, Netherlands)
ZKM_Collection, Karlsruhe

Hardware:

- SGI Indigo2 (IRIX)
- PC (Linux)
- Stationary bicycle (Huib Nelissen)
- LCD monitor
- Analog-to-digital converter

Software:

- In-house development (Gideon May)

Conservation Strategies:

- Storage (hardware preservation)
- Migration
- Porting

Documentation:

- Arnaud Obermann
- Claudia Röck

Conservation Concept and Conservation Measures:

- Mirco Fraß
- Daniel Heiss
- Bernd Lintermann
- Arnaud Obermann
- Claudia Röck

Text:

- Bernd Lintermann
- Chiara Marchini Camia
- Arnaud Obermann
- Claudia Röck

The installation *The Legible City* (1989–1991) by Jeffrey Shaw is based on work-specific, proprietary software on the one hand, and on the other commercially available, but now obsolete hardware, as well as custom-designed hardware. Various issues pertinent to the preservation of complex digital installations resulted from this constellation, which are discussed in detail in this case study. Accordingly, to preserve the work it is necessary both to ensure the functionality of the software, and also the correct connection to the user interface – in this case, a custom-built stationary bicycle. With this work, the ZKM | Karlsruhe pursued the conservation strategy of storage (hardware preservation). Up to the start of the project, the ZKM | Karlsruhe followed the strategy of hardware preservation for the conservation of this work. Furthermore, the software was ported as part of the present case study, so that it can run on current operating systems.

Work Description¹

A stationary bicycle is operated by a user in a darkened space in the installation *The Legible City* (1989–1991) to simulate a bicycle ride through the streets of Manhattan, Amsterdam, and Karlsruhe. The visitor is actively integrated into the installation by using the bicycle, which is positioned in front of a screen onto which three-dimensional street views of the different cities are projected. The city views are composed of computer-generated three-dimensional letters that form the buildings along the sides of the streets and at the same time make up words and sentences that have literary or historical references to the depicted location. Visitors can speed up or slow down the velocity at which the images appear by pedaling faster or slower. By moving the handlebars the user can select the direction to be taken through the virtual city. Also on the handlebars is a switch for selecting which city should be depicted – New York’s Manhattan, Amsterdam, or Karlsruhe. A small LCD screen is mounted directly in front of the bicycle, which shows the exact current position of the cyclist in the virtual city as a blinking white dot on a ground plan of the virtual city being explored.

The texts that the “letter buildings” construct refer to the actual places. Some are fiction, and some are based on historic archive material. For example, the textual formations of Manhattan are on eight fictional story lines in the form of monologs by famous and unknown local people, including the architect Frank Lloyd Wright, the business tycoon Donald Trump, and a taxi driver.² The different monologs are distinguished by different colored letters. In the Karlsruhe version, the texts are based on local history, and also feature local people like Karl Drais, the inventor of the *draisine* also known as a velocipede, the forerunner of the modern bicycle. Through these texts, the virtual bicycle tour becomes a nonlinear reading experience that alternates between different stories.

The real physical energy of pedaling on the stationary bicycle is transferred to the sequence of images of the virtual city. This simulates movement and consequently that a certain distance has been covered in the virtual space of the “Legible City.” The hardware, as well as all the other technical components of the installation, is not visible to visitors. Ideally, the images should be projected onto a curved screen extending from the floor to the ceiling. The projection screen should also be wide enough to fill the viewer’s entire visual

1 What is described is the installation, as exhibited at the ZKM | Karlsruhe over the course of many years. In the exhibition history of the work, there were many variations in the construction, for example, in one case the stationary bicycle was placed on a platform, in another, the 3D simulation was projected directly onto the wall of the exhibition space.

2 The texts of *The Legible City* were written or compiled by theater director Dirk Groeneveld. For a description of these texts, see Christiane Paul, *Digital Art*, Thames & Hudson, London, 2008, p. 72; Kathleen Lapie, *Installation Interactive: Une Analyse. The Legible City de Jeffrey Shaw*, Monographie École du Louvre, Paris, 2002, appendix, p. II (description by Jeffrey Shaw).

Jeffrey Shaw (with Dirk Groeneveld)
The Legible City
 1989–1991
 Detail of the push button
 (on the original stationary
 bicycle)
 Photograph taken for
 documentation purposes
 Photo © ZKM | Karlsruhe



field when seated on the stationary bicycle, so that when “on tour” the cyclist can be completely mentally immersed in the virtual city.

Art Historical Context

With his interactive spatial installations, Jeffrey Shaw has exerted a decisive influence on digital art since the late 1970s. Indebted to the participatory art forms of the 1960s, his artistic interests focused on breaking down the traditional distance between work of art and observer, as well as exploring the spatial illusions generated by image media in the tradition of the avant-garde film.³ After interrupting his studies of architecture and art in Australia, Shaw studied art for a year at the Accademia di Belle Arti di Brera in Milan before continuing his studies at Central St. Martins College of Art and Design in London, where he initially specialized in sculpture before turning to film. In London he came into contact with the ideas of the Fluxus movement and took part in the *Destruction in Art Symposium* (DIAS)⁴ as an observer in 1966, which Shaw has said represented a key experience for him. In 1969, Shaw

3 Early works by Shaw, such as *Emergences of Continuous Forms* (1966, with Tjebbe van Tijen) or *Corpocinema* (1967, with Theo Botschuijver, Sean Wellesley-Miller, and Tjebbe van Tijen) draw on abstract pictorial motifs, unconventional projection surfaces, multiple projections, and so on; on pre- and early cinematographic techniques and forms, and can be classed as experimental film as it was frequently expressed in Europe during the 1960s. For a description of Shaw's early works, see, for example: Anne-Marie Duguët, “Jeffrey Shaw,” in: Jeffrey Shaw and Peter Weibel (eds.), *Future Cinema. The Cinematic Imaginary after Film*, The MIT Press, Cambridge (MA) / London, 2003, pp. 376–381 and Söke Dinkla, *Pioniere interaktiver Kunst von 1970 bis heute*, Hatje Cantz, Ostfildern, 1997.

4 *The Destruction in Art Symposium (DIAS)*, September 9–11, 1966, Africa Center in Covent Garden, London.

Jeffrey Shaw, Theo Botschuijver, Sean Wellesley-Miller, and Tjebbe van Tijen
Corpocinema
 1967
 Air-filled structure and audiovisual event
 Photo © Jeffrey Shaw



founded the Eventstructure Research Group in Amsterdam (1969–1979) with Theo Botschuijver and Sean Wellesley-Miller; the group realized large-scale experimental projects in public spaces. Already in 1967, in collaboration with Botschuijver, Wellesley-Miller, and Tjebbe van Tijen, Shaw realized *Corpocinema* (1967), a large, air-filled transparent dome made of PVC onto which films and slides were projected from the outside. Inside the dome, through the use of smoke, foam, and pyrotechnics, different conditions were produced for “capturing the projection.” The group worked several times with transparent pneumatic structures, such as the *Waterwalk Tube* (1970), a transparent, air-filled tube 250 meters long through which visitors could walk on water in almost direct contact with Masch Lake, in Hanover. These two projects were not only spectacular events designed to awe visitors, they also centered on audience participation as the works’ core statement. In these works, audience participation was direct, on the physical level, whereas in Shaw’s later computer works participation shifted to the virtual realm. A precursor of these computer-based works by Shaw is the “reactive slide installation”⁵ *Viewpoint* (1975, in collaboration with Theo Botschuijver). The viewer looks through a glass window, onto which sequences of images of different events are projected, at a space behind the window. What actually takes place in this space on the other side of the window pane is supplemented by the virtual level of the projections. The possibility of actively determining or altering one’s virtual angle or viewpoint in a three-dimensional space was provided for the user in Shaw’s first computer-controlled interactive installation *Points of View* (1983). Viewers could use a joystick to change the image projected on a

5 Dinkla 1997, p. 102.

Jeffrey Shaw, Theo
Botschuijver
Viewpoint
1975
Installation with
projection system
Installation view 9th
Biennale de Paris, Musée
d'Art moderne de la Ville
de Paris
Photo © Jeffrey Shaw



screen in front of them, which showed fifteen hieroglyphs on a square field as “actors.” The user was able to tip the image of the “stage” on its vertical and horizontal axis, whereby various soundtracks linked to the image were played, which included spoken quotations by well-known artists and poets.⁶ Dirk Groeneveld, who collaborated on this work and on the *The Legible City*, has described *Points of View* as “three-dimensional story.”⁷

Narration and spatial experience were connected in the installation *The Narrative Landscape* (1985–1995) in an even more striking manner. With the aid of a joystick, the user can select various images and, on the basis of predetermined program architecture, “freely” combine narrative fragments, images and recorded texts. With computer-generated and projected images, as well as with the virtual reality thus created, Shaw establishes a link with the concept of Expanded Cinema,⁸ a 1960s and 1970s movement which was open to viewer participation and actively sought to include this in the image itself.⁹

The Legible City carried forward the artistic approaches of the above-mentioned works in various directions. The starting point for this installation was the intention to facilitate a sensory and spatial experience of virtual reality not unlike the arcade games of the 1970s. As in earlier works of Shaw’s, signs – in this case letters – structure the “bicycle ride.” Instead of

6 Ibid., p. 104.

7 Dirk Groeneveld, cited in: Lapie 2002, appendix, p. LI.

8 See Gene Youngblood, *Expanded Cinema*, E. P. Dutton & Co., New York, 1970.

9 See unabridged version of the interview with Jeffrey Shaw conducted by Rebecca Picht, 1997, unpublished.

following a relatively constrained branching navigation structure, as was still the case in *The Narrative Landscape* where the viewer was only given a limited number of options for the “path” that could be taken at each navigation level, moving around in *The Legible City* was to have a more network-like structure comparable to that in real cities, and be individually adaptable, because “a city is at the same time a concrete structure and an immaterial pattern of experience [and] its identity is a psycho-geographic information network.”¹⁰ The first time visitors use the installation they are usually quite amazed because their real bodily movements and efforts are immediately converted into the distance travelled. With the direct influence of their bodies, users act in virtual space. In an earlier form of the work’s presentation (in 1990), the stationary bicycle was placed on a small platform; in this way the user became the performer, and the ride through the virtual “letter city” became a spectacle for other people in the exhibition.¹¹

The Legible City is digital art that lays claim to a material presence in space, and which generates an immediate physical and sensory experience in the viewer. By using a stationary bicycle instead of a hand-controlled joystick, as in *Points of View* and *The Narrative Landscape*, for example, viewers have to use their entire bodies to set the installation in motion and to experience the work, although from a technical point of view their exertions are not necessary for the virtual ride.¹² In this respect, the work is a reaffirmation of the body in art – in line with new technologies. From a pragmatic point of view, for Jeffrey Shaw the advantage of digital technologies is also that programmed software modules can be used for specific artworks, which can then be adapted in order to create new works. Thus, for example, the software programmed specifically for *The Legible City* also serves as a basis for Shaw’s later work *The Virtual Museum* (1991).

Provenance

The Legible City, was created in 1989 for Ars Electronica Festival (September 13–16, 1989) in Linz, and ARTEC’89, the first international biennial held in Nagoya, Japan.¹³ The prototype was exhibited for the first time in 1988 at the exhibition *Het Postmoderne aan Kinderen Verklaard* held at the

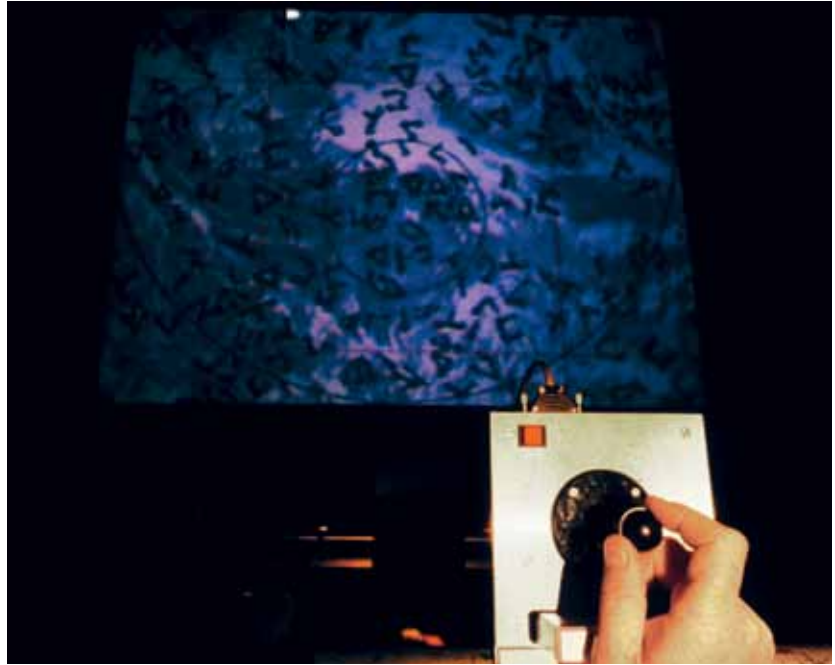
10 Jeffrey Shaw, quoted in: Lapie 2002, appendix, p. II.; translated from the English by Chiara Marchini Camia.

11 For example, in the exhibition *L’Immagine Elettronica*, Museo della Cattedrale Ferrara, May 16–19, 1990, Ferrara, Italy.

12 In the prototype of the *The Legible City*, which was produced in 1988 and presented in the “Buchstaben-Gebäude” [Buildings of Letters] as “Drahtgittermodelle” [Wire Grid Models], a joystick served as user interface. See Dinkla 1997, p. 114.

13 See The Chunuchi Shimibun (ed.), *The 1st International Biennale in Nagoya. ARTEC’89. Official Catalogue*, Nagoya, 1989, pp. 46–47.

Jeffrey Shaw
The Narrative Landscape
 1985–1995
 Interactive installation
 Photo © Jeffrey Shaw

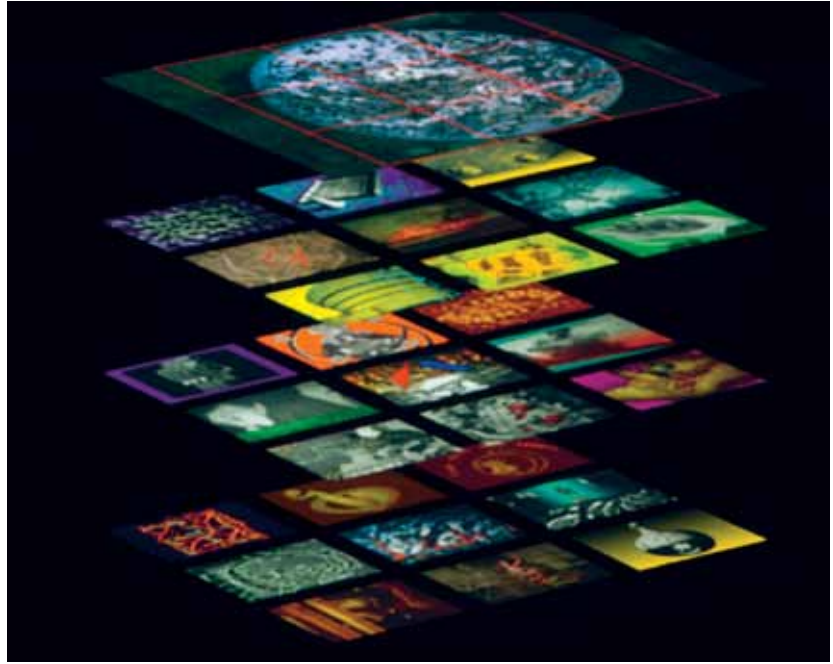


Bonnefantenmuseum Maastricht.¹⁴ The version extended to include the Karlsruhe cityscape was produced in 1991 at the ZKM | Institute for Visual Media, which Jeffrey Shaw directed from 1991 to 2003, and has since been added to the ZKM_Collection.

Course of Action

Since being acquired by the ZKM_Collection in 1991, the *The Legible City* (1989–1991) has been shown successively using various workstations – high-performance desktop computers – of the Indigo series of the manufacturers Silicon Graphics International (SGI). Production of their high-end graphic workstations that were used in the film and video ceased in the 1990s, which is why one has to rely on secondhand SGI computers. Since the appearance of very high-performance PCs on the market, it would have been possible to use commercially available computers for many years which are less expensive and entail considerably less risk and maintenance costs; however, until the project *digital art conservation* began, porting had not been considered as an option. Therefore, for the present case study the key objective – in consultation with the artist – was the porting of the installations to a current operating system.

14 See Dinkla, 1997, p. 114.



Jeffrey Shaw
The Narrative Landscape
 1985–1995
 Interactive installation
 Photo © Jeffrey Shaw

Documentation

While Jeffrey Shaw was director of the ZKM | Institute for Visual Media (1991–2003), the interactive network installation *The Distributed Legible City* (1998/1999)¹⁵ was produced as an enhanced variant of *The Legible City* (1989–1991), and numerous changes were made to the *The Legible City* itself. For the most part, these interventions are not documented.¹⁶

At the beginning of the case study, a fully functioning test construction of *The Legible City* was installed in the project's studio. This served, first and foremost, as a means of testing the available components of the work, and of documenting the possibilities of user interaction according to the *module for the recording of interactive installations*.¹⁷ These components of the installation that were available at the time of the test installation were defined as the status quo of the “museum version,”¹⁸ noted down, and recorded on photographs.

15 See Jeffrey Shaw, *The Distributed Legible City*, available online at: www.jeffrey-shaw.net/html_main/frameset-works.php, accessed 11/27/2012.

16 A decisive version of the work which was also altered later by Jeffrey Shaw was the fade-in of the city map (by pressing a button) in the projected image. The only evidence of this alteration is a video made by the ZKM | Institute for Visual Media (see the illustration p. 508).

17 Tiziana Caianiello and Julia Giebeler, *Modul zur Erfassung interaktiver Installationen*, Düsseldorf, 2010, unpublished. This text is a summary of the results of the project *Konkretionen des Flüchtigen. Zur Problematik der Erhaltung und Re-Inszenierung von Medienkunstinstallationen* located at the imai – inter media art institute, Düsseldorf.

18 To respond flexibly to loan requests from other museums, a travel version of *The*



Jeffrey Shaw (with Dirk Groeneveld)
The Legible City (prototype)
 Interactive installation
 Installation view
Het Postmoderne aan Kinderen Verklaard, 1988,
 Bonnefantenmuseum
 Maastricht
 Photo © Jeffrey Shaw

Although the work was already included in the ZKM_Collection's database, due to the many changes made by the artist, the database record no longer corresponded to the current version of the installation. The information in the inventory database of the ZKM | Museum and Exhibition Technical Services was more up-to-date, but still inconsistent.¹⁹ To develop a concept for conservation of the work, it was urgently necessary to analyze the complex interplay of single components and functional interconnections, and to record the technological findings, which provide information about the materials used and the physical components.

For example, the following information concerning proprietary software (see glossary, p. 601) was recorded:

Legible City was prepared with the agreement of the artist with almost identical components. Only the color of the base plate of the stationary bicycle was a difference perceivable by the visitor: in the museum version, the base plate is grey, in the travel version it is green.

¹⁹ The inventory database of the ZKM | Museum and Exhibition Technical Services records both technical components as well as work-specific furniture and material by way of inventory numbers in the form of barcode labels. For example, the computer used in the museum version of *The Legible City* (inventory number: 100 013 832) has been falsely assigned to the artwork *Bar Code Hotel* by Perry Hoberman.



Back of the SGI Indigo2 workstation with the appropriate cable connections
 Photograph taken for documentation purposes
 Photo © ZKM | Karlsruhe

- Work-specific programming: yes
- Programmer: Gideon May
- Programming language: C (see glossary, p. 599)²⁰

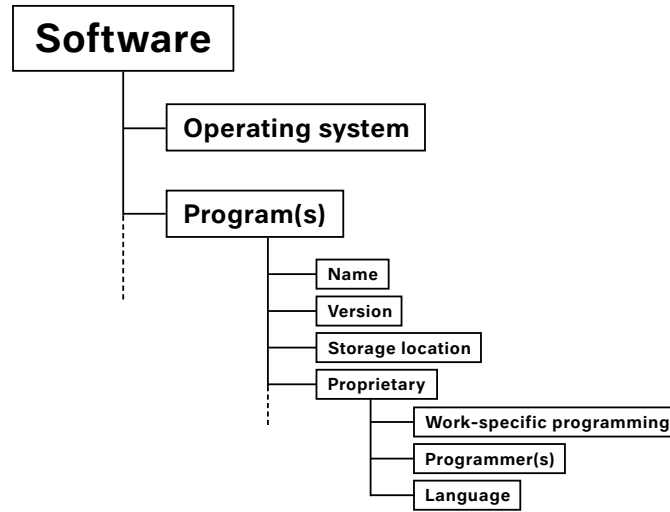
To present the work the following components are used:

- SGI Indigo2²¹
- A stationary bicycle (a bicycle designed by Huib Nelissen [Haarlem, Netherlands], which serves as user interface)
- Analog-to-digital converter (this was specially constructed for the work and comprises an individually programmable microcontroller)

In the course of preparing for the test, disk images (see glossary, p. 600) of the original, existing hard disks were created and tested. The functionality of these images was additionally tested by inserting of identically equipped computers in the original SGI computers.

²⁰ See Jeffrey Shaw, *The Legible City. An Interactive Installation by Jeffrey Shaw in Cooperation with Dirk Greoneveld and Gideon May*, Amsterdam, 1990, p. I.

²¹ The SGI Indigo2 a computer which, considering the period of its production (produced from 1992 to 1997) is equipped with a high-performance graphic card (Maximum Impact).



Documentation structure
for the case study on
Jeffrey Shaw's *The Legible
City*, 1989–1991

Due to the as yet undocumented functionality of the analog-to-digital converter, which also represents a special, custom-built model of the work, the necessity for a conservational strategy for this device was recognized early on during the documentation process. The analog-to-digital converter represents an indispensable link between the user interface, namely, the stationary bicycle, and the computer.

Conservation

Until the project *digital art conservation* began the ZKM | Karlsruhe had exclusively pursued the strategy of hardware preservation (see glossary, p. 602) with respect to *The Legible City*. To preempt the difficulties that cessation of production of SGI Indigo2 computers would cause, several computers of this model were purchased in time, serviced, and properly stored.²² However, this strategy did not guarantee long-term preservation, and considering the art-historical relevance of this work, it can be considered inadequate.

When considering alternative conservation measures, the strategy of emulation (see glossary, p. 600) was not an option because, due to the complexity of the computer architecture of the workstations produced by SGI, all attempts to program a functioning emulation had so far failed. The programmer of *The Legible City*, Gideon May, confirmed this problem in a conversation²³ and also

22 Over 20 computers of the model SGI Indigo2 are found in the inventory of the ZKM | Museum and Exhibition Technical Services.

23 The conversation with the programmer and artist Gideon May took place on November 23, 2010. Among other things, May was responsible for porting the work *The Fruit Machine* by the artist Agnes Hegedüs, which he also originally programmed.



Stationary bike designed by the engineer Huib Nelissen to replace the bike originally used for *The Legible City*. This modification was realized during the period from 1991 to 2003, when Shaw was director of the ZKM | Institute for Visual Media.

Photograph taken for documentation purposes
Photo © ZKM | Karlsruhe

for transmitting the direction of travel) and the pedaling speed (the speed is calculated by a tachometer built into the stationary bicycle) of the bicycle, as well as alternation – triggered at the press of a button (switch) – between the three city views.²⁵

To build a replica of the analog-to-digital converter, which was part of the conservation measures undertaken at the ZKM | Karlsruhe, it was necessary to identify all electronic components and to test the existing hand-drawn circuit diagram. Claudia Röck also traced this circuit diagram (with the program TinyCAD), so that it could be incorporated into the work documentation as a PDF file.

The requisite components were subsequently ordered and soldered by hand onto a new circuit board. Fortunately, all electronic components were still procurable including the four built-in microcontrollers. One of these microcontrollers²⁶ was specially programmed for the analog-to-digital converter. Thus first there had to be a readout of the corresponding program which was then transferred to a structurally identical microcontroller. For this

25 Jeffrey Shaw commissioned Jaap van Manen to build the analog-to-digital converter. See also the draft of the same, this volume, p. 505.

26 This concerns the microcontroller of the manufacturers Atmel AT89C2051.



Original stationary bike for
The Legible City
Photograph taken for
documentation purposes
Photo © ZKM | Karlsruhe

purpose, a universal programming device called BeeProg+²⁷ was used. The readout of this microcontroller can be obstructed by the setting of lockbits.²⁸ In the present case this had not been done and so there were no problems reading and saving the program, which is now available as binary code.

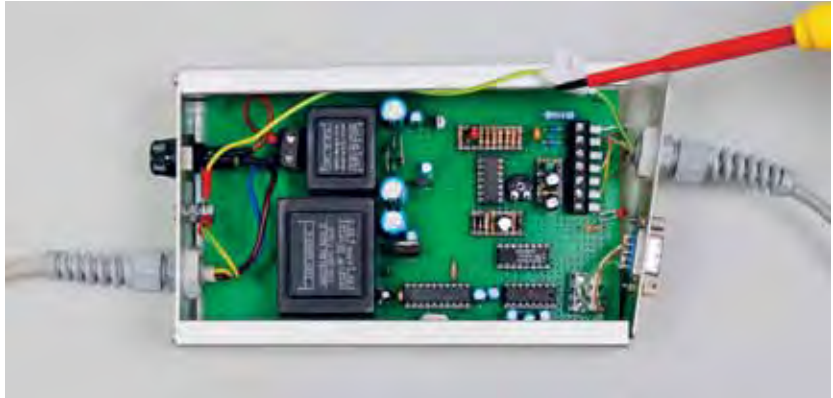
For the long-term preservation of the analog-to-digital converter the microcontroller represents a potential source of danger since there is no guarantee that the manufacturer will continue producing these for an extended period of time. As a precautionary measure, these should be stocked up in advance and stored under optimum conditions. Given that the transfer of the program to a non-structurally identical microcontroller is problematic, reengineering should be considered. For this, the analog-to-digital converter should be treated like a black box and only the input and output signals measured to facilitate subsequent creation of an equivalent replacement for the analog-to-digital converter.

Through the detailed documentation and the possibility of creating a fully functioning, identical replica of the analog-to-digital converter, the weak

27 See Elnec, *BeeProg+*, available online at: www.elnec.com/products/universal-programmers/beeprogplus, accessed 11/27/2012.

28 See Atmel, *Atmel 8-bit Microcontroller with 2K Bytes Flash, AT89C2051*, p. 6, available online at: www.atmel.com/Images/doc0368.pdf, accessed 11/27/2012.

The original analog-to-digital converter of the interactive installation *The Legible City*
 Photograph taken for documentation purposes
 Photo © ZKM | Karlsruhe



point of the work was temporarily remedied. After a successful test, the reconstruction of the analog-to-digital converter was used as a component of the installation *The Legible City* shown as part of the exhibition which accompanied the project *Digital Art Works. The Challenges of Conservation*. In addition, the reconstruction of the analog-to-digital converter represents an essential prerequisite for all further conservation measures, for example storage (hardware preservation) and porting (see glossary, p. 601).

Porting to an Up-to-date Platform

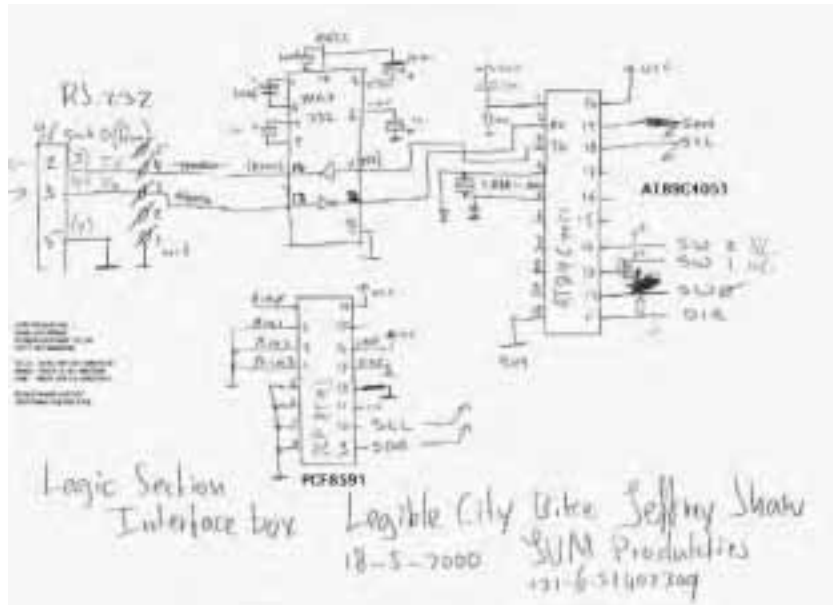
The first step in the porting process consisted in reviewing the stored data. The installation itself is fully functional on the computer model SGI Indigo2 Impact with R10000 processor; the source code (see glossary, p. 602) of the application software is on this functioning system. However, what this system lacked was a programming environment²⁹ and various program libraries³⁰ for compiling the code, among these are libraries, which do not fall within the manufacturer's scope of delivery – in other words, they were created by a third party supplier, or directly by the application software developer. Fortunately, SGI has put large parts of its own operating system IRIX³¹ and other software on the Internet, so that various utility programs and libraries can be found as source code. Linux was selected as the target platform for the porting. Linux is a free Unix variant³² that runs on the most

29 An integrated development environment is a software application that provides comprehensive facilities to computer programmers for software development (for example, interpreter, compiler, etc.).

30 As a rule, program libraries are an element of a development environment. They frequently unify used program routines and shorten the programming time.

31 From the 1980s, SGI developed its own operating system IRIX. This UNIX variant derives from the UNIX system-V family.

32 UNIX is a high-performance operating system which was developed in the 1970s by Bell Laboratories. Current variants of the multiple-user system – one distinguishes between Unix derivatives (IRIX, Solaris) and UNIX-like systems (Linux, Mac OS X) – exist for computers, workstations, and mainframes. See



Scan of the hand-drawn circuit diagram of the analog-to-digital converter for *The Legible City*
Photo © ZKM | Karlsruhe

diverse hardware platforms (including on Apple computers), which is constantly adapted to new hardware, and, current expectations are that due to its origins (Unix), it will have a long lifespan. So that the porting lasts for as long as possible, it has to be as independent as possible from third-party software.

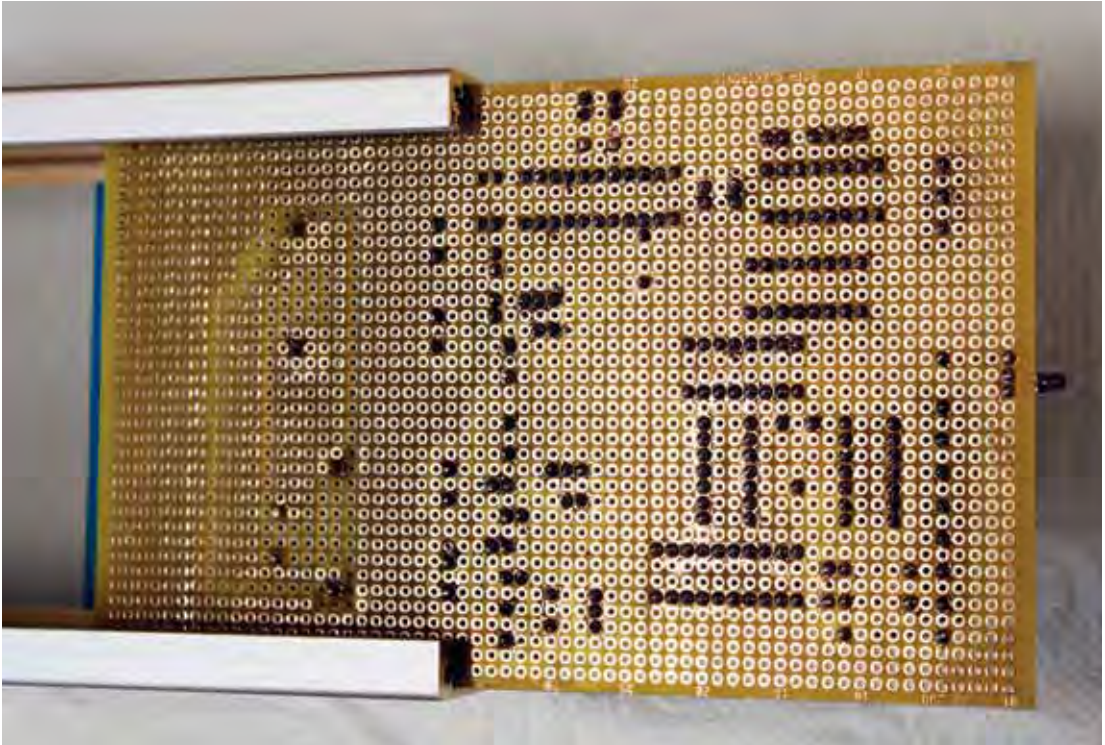
In order that the porting is adapted to the original in the best possible way, it was decided to do it in small steps. This meant successively replacing software modules and, in each porting step, maintaining an executable system which can be tested for its differences to the original. With regard to the Linux platform, the porting took place in two stages. In stage one, all necessary software modules were replaced for which there was a functional equivalent on the SGI source platform, such as the transition to OpenGL,³³ the integration of window administration GLUT (OpenGL Utility Toolkit), the conversion of concurrency³⁴ on pthreads,³⁵ and the implementation of missing

Paul E. Ceruzzi, *Computing. A Concise History*, The MIT Press, Cambridge (MA), 2012, pp. 11, 129.

33 For programming its own graphics hardware, SGI developed a graphics programming interface called IRIS GL (Integrated Raster Imaging System Graphics Library) from which, following the generalization by various companies as a standard, OpenGL emerged in 1992. Alongside DirectX, developed by Microsoft as proprietary, today OpenGL is the industrial standard in the programming of graphic applications and drivers for graphic cards by all graphic card manufacturers. OpenGL can be used under Windows, Mac OS X, Linux, and various other UNIX variants.

34 Concurrency (also multithreading) means the simultaneous processing of several threads. Essentially, a thread is a sequence of executions within a program.

35 POSIX threads – also characterized as pthreads – are authored according to the POSIX standard (Portable Operating System Interface). This was defined so as to guarantee compatibility between operating systems.



Intermediate stadium during the rebuilding of the analog-to-digital converter for *The Legible City*
 Photograph taken for documentation purposes
 Photo © ZKM | Karlsruhe

libraries on other platforms as source code (this provides the possibility to read image and 3D objects). In a second step, the code was installed on a Linux computer, and compiler directives³⁶ (see glossary, p. 599) adapted in Makefiles,³⁷ Mistakes in translation due to differences in developmental platforms eliminated (for example, missing, unused header files),³⁸ and the reimplemented readout of serial ports and the runtime performance of the application adapted to the different, faster computer hardware.

After analysis of the software, it was ascertained that the following sections needed to be considered during porting:

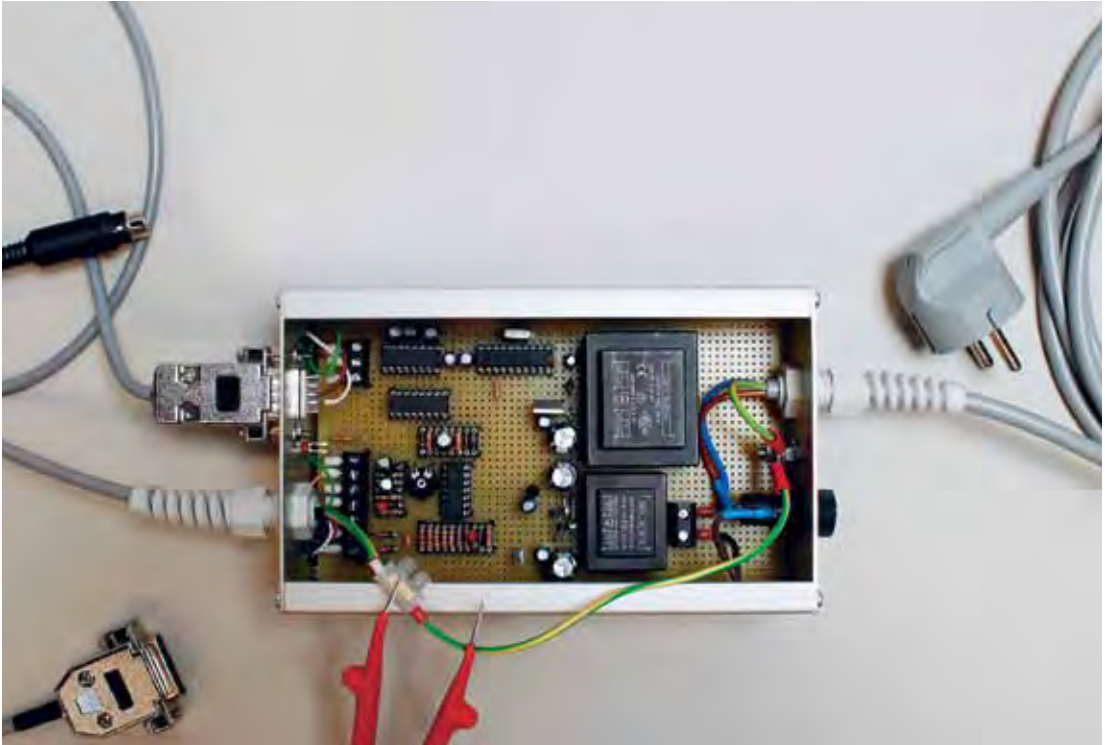
- Programming of the graphics
- Programming of the window system³⁹

36 By a so-called compiler instruction (also compiler directive) one understands integrated instructions for the compiler in the source code.

37 Makefiles are created with the aid program make – likewise part of the POSIX standard. The compilation of source code files can be controlled by make, which is especially appropriate for large-scale projects.

38 Owing to their size, programs are frequently divided into translation units. So-called header-files contain information on these translation units and declarations of operating systems functions and program libraries.

39 The window system is a part of the graphical user interface. The primary task of the window system is the administration of program windows.



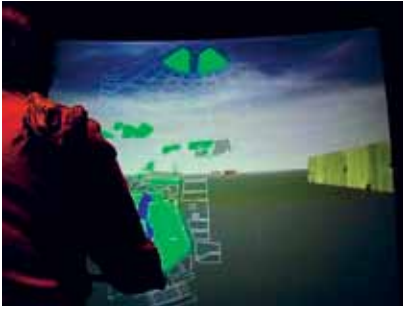
The analog-to-digital converter for *The Legible City* after the reconstruction was finished
 Photograph taken for documentation purposes
 Photo © ZKM | Karlsruhe

- Treatment of the assets. These are digital resources, which do not form part of the source code, but which are necessary for the representation. In the following case, these are:
 - Images used as textures
 - 3D objects such as letters and architectonic elements
 - Positions and color specifications of the letters, surface information on the ground, such as paths, lawns, and rivers
- Input/output of user data
- Dynamic behavior

Programming of the Graphics

Porting of the code by IRIS GL⁴⁰ on OpenGL appeared indicated, because OpenGL is not only an industrial standard, but is conceptually oriented on IRIS GL. Through very similar concepts in the lighting model and in the treatment of textures, the possibility of an exact, pixel agreement of the ported version with the original version is available. Porting is supported by SGI

40 "Integrated Raster Imaging System Graphics Library, a proprietary graphics API (program interface) developed by SGI. It serves for the generation of 2-D and 3-D computer graphics on IRIX-based workstations," available online at: http://de.wikipedia.org/wiki/IRIS_GL, accessed 02/06/2013.



Fade-in of the city map to the projected image of *The Legible City* (was to be canceled later)
Still from a documentation video of the ZKM |
Institute for Visual Media

through the auxiliary tool with which parts of the source code can be automatically translated into a new code. This automatically generated code is not directly available, but saves the manual replacement of functional calls for which there is a direct equivalent. Hints on possible implementation variants are also provided. This approach reduced possible conceptual mistakes that influence lighting, texturing, and consequently the visible result.

The porting of IRIS GL to OpenGL was effected with the tool *toogl*.⁴¹ In an iterative process, the relevant software modules were automatically translated with *toogl*, the results were analyzed and adapted manually before finally being compiled by original software modules. As a result, during compilation the original code can be translated selectively from the same software module, or from the ported version. The original code thus remains preserved and the porting decisions can be tested in the comparison of code lines in the same software module. For material, light, or textural treatment, aid functions were implemented, which abstract from the various concepts of the programming interfaces.

Programming of the Window System

Every operating system uses its own window and input administration. Under IRIX, this administration is part of IRIS GL; under Linux, X11 is used, and under Mac OS X Aqua. The use of OpenGL demands a layer of software, which binds the hardware acceleration to the window system, for example, GLX (OpenGL Extension to the X Window System) under X11. In view of the window administration, the programming of OpenGL is thus extremely platform-specific. GLUT is one of the software interfaces between OpenGL and the window system, which abstracts from the platform used and offers an API (Application Programming Interface), which is the same for all platforms. GLUT realizes the connection of OpenGL to the window system and administers user inputs such as mouse and keyboard operations. GLUT was originally developed by Mark J. Kilgard while working at SGI, and also exists in versions for Linux, Mac OS X, and Windows. Due to its long history and wide dissemination, one may confidently assume that it will be retained in the future. GLUT does not form part of the operating system, but is a software library, available as source code for different platforms and, where needed, may be adapted and translated for new platforms.

Since the origins of IRIS GL and GLUT are close to one another, the code construction for window administration and user input are similar in

41 *toogl* stands for "to OpenGL" and is a command-line program developed by SGI, which, with the aid of text replacement, replaces program commands in IRIS GL by program commands in OpenGL.

structure, such that the porting of the software modules, which contain the window treatment, remain relatively constant as far as structure is concerned. Luckily, GLUT is also available on the Internet as source code for IRIX, and such that it may be integrated on the source platform.

Treatment of the Assets

Images which are used as textures:

The images used in the installation are available in RGB format⁴², an image format developed by Paul Haeberli at SGI. His library *libimage* for reading these images is available in source code and integrated in relevant excerpts as a library in porting. It must be adapted with reference to the sequence of bytes whereby the existing processors of several bytes internally save existing numbers. An integer is usually assembled by the computer from four sequential bytes. The bytes to the left and to the right saved on the SGI computers must be saved on more modern hardware. This only becomes relevant if the software uses programming techniques which presuppose a certain sequence.

3D objects, such as letters and architectonic elements:

The 3D objects are available in a 3D format developed at SGI, which is meanwhile no longer in use: *sgiobj*. The program libraries for reading these objects were not available. Here, the free source code for reading the 3D objects was also found on the Internet in the relevant extracts and could be integrated as library in the porting. The letters representing the houses in the streets were packed into the archive above the Unix command *ar*, and above a library the source code of which was not available during running time. The missing code was circumvented in that the archive was unpacked with *ar* and, for reading the single letters, the code rewritten. Luckily, the original code of the standard archiving command was used under UNIX so that access to the single files was possible via the operating system.

Positions and color specifications of the letters, surface information on the ground such as paths, lawns, and rivers:

Position and color specifications are saved as text files. Access to these data is part of the original source code. The same holds for surface information on the ground such as paths, lawn surfaces, and rivers which are saved in vector files as text files.

42 This grid-graphic format (data alteration: .rgb) was developed especially for the SGI workstations. See FileInfo.com, *.RGB File Extension*, available online at: www.fileinfo.com/extension/rgb, accessed 11/23/2012.

Input/Output of User Data

While the installation is operated via the stationary bicycle, for reasons of efficiency, during the porting, it should also be possible to operate the work by keyboard and mouse. The operation of keyboard and mouse was converted to GLUT, which was possible with minimum effort as a side effect of the adjustment of the window administration. The reading of the serial ports was adapted to Linux and Mac OS X.

Dynamic Behavior

What is meant by dynamic behavior is the temporal course of image generation, especially the influence of the user input via the stationary bicycle. In the original source code, data are read via the serial port in a concurrent process, and the current state, namely, speed and steering direction is read in each frame of image generation. A partial stretch which the bicycle should cover in the virtual world is determined in each of these image frames. Thus, the course of the path taken by the user depends directly on the speed in which the hardware represents the sequence of images. In the original version, these amount to a maximum of 60 images per second, but they could be less. In that this temporal behavior of the work is not deterministic, namely, cannot be reconstructed with formal processes, approaching the time response of the porting as far as possible on the temporal behavior of the original version, can only be attempted.

Summary

In the porting of the interactive work *The Legible City* it was possible to access the partly incomplete installation source code programmed by Gideon May. The parts of the source code, which were not available, could be replaced by a source code available on the Internet. In that the original version of the work was implemented on SGI computers, a platform that likewise had a decisive influence on the development of graphic software standards, and which is comprehensively available on the Internet as a freely available source code, software concepts could be transferred to current standards without having to substantially change the structure of the original software. As had been originally sought, the ported version of the work is running on different platforms, such as Linux or Mac OS X, and used software including GLUT is completely available in source code. The porting was carried out in small steps, which facilitated a comparison of the software modifications with the original in each step of the work, thus minimizing differences. Given the concurrence of the processes, the dynamic behavior cannot be identically illustrated, but was approximated to the original behavior.



Jeffrey Shaw (with
Dirk Groeneveld)
The Legible City
1989–1991
Interactive installation
Installation view
*Digital Art Works. The
Challenges of Conservation*,
ZKM | Media Museum
Photo © ZKM | Karlsruhe
Photo: ONUK

Conclusion

In order to make a comparison between the ported version and the original work, and, where necessary, to be able to introduce corrections, a further measure suggested itself, which was yet to be implemented at the time of writing up the case study: a simultaneous recording of both the analog input signals (per storage oscilloscope) and the digital output signals (per RS232-analyzer) of the analog-to-digital converter, as well as the video signal should serve as reference.

Experience and knowledge acquired in the process of porting *The Legible City* will be useful in the future for the conservation of other works in the ZKM Collection.⁴³

Although the porting of the work was successful, the ZKM | Karlsruhe will also seek to retain the original hardware for as long as possible in order to present an authentic performance of the work. However, in the future a clear distinction should be made between presentation of the ported version

43 Aside from the already executed interactive installations by Perry Hoberman and Agnes Hegedüs, three additional works were presented with the aid of SGI workstations.

of the work and the original version. Not until acceptance of the ported version has been received from Jeffrey Shaw, which the artist has ensured the project team will be forthcoming,⁴⁴ will the conservation endeavor be completed.

After the work had been documented in detail as part of the case study, it was possible to institute measures that will guarantee the continued existence of this installation in the long-term. Taking the motto *act don't react*⁴⁵ as a program, preparations of a preventive nature were introduced. Hence, defects which may arise in the future can be compensated. In spite of the redundant data backup (see glossary, p. 601), regular testing of the disk images continues to be absolutely necessary; it underlines the proactive nature of preserving digital works of art.

Translated from the German by Justin Morris

44 See Marchini Camia, Obermann 2012, excerpt, this volume, p. 518.

45 See Harald Krämer, "Agieren statt reagieren: Zum Wandel der Dokumentation," in: *Rundbrief Fotografie*, special issue 6, 2001, pp. 31–39.

The Legible City

An Interview with Jeffrey Shaw, part I

Arnaud Obermann

Excerpt from the e-mail interview conducted on October 29, 2010

***The Legible City* was updated several times. Were you always involved in the changes that were made? Do you technically reconsider and update your artworks?**

Jeffrey Shaw: I update the artworks only where the original solutions were either technically or aesthetically inadequate. Sometimes this “inadequacy” only becomes clear when the work is in public use – for example, the original large bicycle was difficult for many people to mount, and was quickly damaged.

The appearance of *The Legible City* also changed because of the obsolescence of the CRT projectors [the ZKM used to use an Electrohome Marquee 8500 projector]. When were you confronted with this? And in what way did it affect the artwork itself? Has the concave projection screen, as used at the ZKM, always been part of the installation as well as the black box?

A concave screen gives an added perception of depth to the image, but not all exhibition situ-

ations can afford to do this. I am satisfied with any projection technology that can deliver a high quality image. *The Legible City* benefits from having a completely dark black box environment, no matter that brighter projectors can now allow more ambient light.

Since the SGI [Silicon Graphics International Indigo2] is also now threatened with obsolescence, do you think that programming on a different operating system is the appropriate solution for preserving the artwork?

SGI machines are now obsolete. I’m porting *all* my original SGI applications to PC, which gives better performance and ensures preservation.

What parameters do you consider to be essential to the artwork when it comes to emulating it or porting it to a different operating system?

Yes, porting to PC is sometimes a lot of work for the coder. That means there has to be a budget or a strong personal desire to do this (usually both).

The Legible City

An Interview with Jeffrey Shaw, part II

Chiara Marchini Camia and Arnaud Obermann

Excerpt from the interview conducted on June 21, 2012 at ZKM|Karlsruhe

Is the long-term legacy of your work something that you think about?

Jeffrey Shaw: Yes and no. When I am actually making the work the long-term legacy is irrelevant. Because each work really responds to a, let's say, contemporary need. So it is always located in the present and in certain cultural, social, aesthetic concerns and needs – as far as one as an artist reads a cultural status quo and recognizes certain things that need to be done to be able to move forward. Once the work is done, one begins to see evidence of its destiny. Of course, one sees evidence of its immediate impact and its immediate relevance, which is how it was conceived and what was meant to do. And at the same time you then begin to experience its longevity; you see that the work begins to exist longer than you anticipated. I, anyway, experience a certain pleasure or a certain sense of worth when the piece does achieve longevity. And especially when it starts to go beyond the time of its immediate concerns. Because then it becomes a historical object, and it becomes a reference in terms of art history – and you can see it in a different light. You see it as a moment in time, as a work that did a certain job and did it more or less effectively. And one also sees evidence of its impact and evidence of its ongoing impact. So these are all value-added benefits to the work. It's not something that I work towards, but it definitely gives another level of validation to the work. And some pieces, like *The Legible City* [1989–1991], *The Golden Calf* [1994], and a few other works, manage to maintain their viability

decade after decade. I don't know how long they will keep going. But these works still clearly maintain some kind of relevance.

But there are other works that really just disappear in time. In other words, they did a certain job at a certain moment in time, they were more or less effective in what they had to do, and then they disappear from view. There is also another factor there: all these works are tied to some extent to a specific level of technology, of technological capability. And of course, as you know the technologies evolve. So they also become historical objects in the sense that their technological profile or their technological characteristics get outdated. This is also interesting because with some works, that technological obsolescence in a way does impact the viability and integrity of a work, but in other cases the aesthetic and functional properties of the work can transcend that. In other words, it is irrelevant. The technological obsolescence is irrelevant. And I would say that for a work like *The Legible City* it is irrelevant. The fact that we see computer graphics these days which are much more virtuoso makes no difference to the work. That work simply presents text in an open configuration and it doesn't need to look better.

Are you currently taking any steps to ensure that your work will be preserved in the future?

I have taken certain steps in the sense that I have built a website and the ZKM published a book about my work, which came out in 1997. I would like to see that updated, mainly because I

think it would remain of value especially to students and young artists today. Because I believe this particular history of practice is useful to other people. There are still a lot of lessons that can be learned. And also I think that every artist inevitably pitches their ambition in relation to previous work and takes that as a starting point. Since I have a certain pride in the quality of the work I've done, I think that these works do offer a good starting point, a good point of reference for many younger artists today.

While you were making *The Legible City*, did you think about the fact that the SGIs might become obsolete a few years down the line?

No, I didn't think about that. I was too enthralled by what the SGI machine could do at that moment. The concept for that work had already been in my mind for many years. The first real-time interactive CG [computer graphics] work I did was a piece called *Points of View* [1983]. This was done in the early 1980s. And at that point it was already clear to me that this was a very rich path to explore, a path involving the creation of a virtual 3D world, which the viewer could navigate. *Points of View* did that, albeit in a very, very crude form because at that time I was using an Apple II computer and the graphics performance was limited to a hundred straight lines in black and white, low resolution, lots of jaggies¹ and I think only fifteen frames per second or something. So it was very constrained. But despite those constraints I felt as if I had made a very coherent work with *Points of View*. I resorted to working with Egyptian hieroglyphs, as a way of building a visual language that was complex despite the fact that I only had a hundred straight lines at my disposal.

So each of these works is also a strategy by which one transcends the technological constraints and still establishes something which is aesthetically totally coherent and which is not damaged by these technological constraints.

So *Points of View* did that. I wanted to move further in that direction, and I remember at that time going to Paris and talking to a company who had more powerful real-time computer graphics systems, mainly for the simulation industry. The company was called Sogitec. I described *The Legible City* as a project that I wanted to do. And they quoted me I think the equivalent of something like three million Deutschmarks, so 1.5 million Euro to actually create the work. And then they quoted me an outrageous figure for renting the machinery to show it, because the machinery was as big as two or three full-size refrigerators. These were big machines. At that point I realized that I was too early with that ambition; there was no infrastructure available to me. Certainly, within the economic framework in which I was operating, there was no possibility for me to go forward with this idea.

I moved off into another direction, and I started to do some work, you could say in a 2½D world. The piece is called *The Narrative Landscape* [1985], and it is based on other technology, it's PC-based technology. You could say it's in the world of Photoshop, though Photoshop didn't exist then. But it was a work that involved building images that were 2D plain images, and distributing these images in a virtual 3D space so that one could move through from layer to layer. I was very satisfied with this, and I was able to make a number of works during those years, which was like mid 1980s, that explored this particular approach. The technology I was using was reasonably robust and I could achieve a number of – what I felt – were interesting works at that time.

Then, out of the blue SGI announced their desk-side-machine. I realized here at last was a

¹ “Jaggies” is the informal term for non-anti-aliased images with sharp edges.

resource that would enable me to go back to this sort of 3D space. It was outrageously expensive. I think the list price was around 100,000 US\$ for this machine – imagine that, a machine which now is worth nothing, and the cheapest game computer is probably a hundred times more powerful. Anyway, at that point in time it was an absolute jewel of a machine, and it really could do extraordinary things in the context of what was possible at that time. I was lucky because I was able to persuade them to get me a very big discount of fifty percent, so the price went down from 100,000 US\$ to 50,000 US\$. And then I persuaded the Dutch Arts Council to buy it for me or to give me the money to do the project. And I really lined up people who wanted to exhibit the work. I had a close friend in The Netherlands at that time in Amsterdam, Gideon May, who was a self-taught graphics coder, and I just basically arrived in his office and said: Here is an SGI for you, learn how to use it, please, because we need to make this work together. And he did. He basically taught himself how to code that machine. *The Legible City* was our first sort of product.

But before that I should say, we went through one phase of prototyping before we actually got access to the SGI. I can't remember the configuration, but I did find a graphics card that enabled me to do a wireframe version of *The Legible City*. We did that before we got hold of the SGI machines. There was a kind of a wireframe prototype beforehand. But that was quite cumbersome technology.

At the time you were so enthralled by what this technology enabled that you weren't thinking about the future of the work or the fact that these SGIs would become obsolete. Now with your current knowledge, would you have done it any differently?

I couldn't have done it, there were no other resources around at that time, and in general my feeling at that time was that actually these works could survive. The survival of a work depends on two potentialities. One potentiality is that you can migrate the code from one machine to another machine; that's technically possible. And to some extent that usually is the case, even though it may be sometimes labor-intensive because SGI had an idiosyncratic development environment, and to move it into another environment involved some new coding. The difficulty there is, that coders – and I can understand this – they like to make new work, but it's a pain in the neck to have to port an existing job to another machine.

...just a translating job.

Yes. This should always be possible to do unless there is some technological crisis or technological transformation that breaks the continuity. And the other potentiality, or let's say confidence I had – but this is a bit peculiar – is that as long as the work is properly documented, and to some extent as long as I'm alive, it can be done again. And it's probably easier to do it now than it was then. So, to some extent you could say that with the documentation of *The Legible City*, and assuming that this documentation is thorough – and the more thorough it is the better – you could go to any coder and say, listen, this is what I want you to do, and they would just start from scratch. That's what I did, for instance, with *Points of View*. Because at a certain moment I was asked to show it in Austria, and it was quite clear at the time that trying to resurrect those machines I had used originally would be a hell of a lot of work and difficult and a bit mysterious, because the whole thing was a bit of a hack and a bit esoteric, actually. And the guy who did it had moved to the States, so I didn't have direct contact to that coder any more. Furthermore the

user interface was a very peculiar, sort of partly analog, partly digital device, very complicated, which on more contemporary machines could be done far, far simpler. So actually I worked with another coder, and I would say, we ended up doing a work, which originally probably took about three months, in a period of three weeks because the technological infrastructure was so much better and so many things that were difficult back then were just easy to do.

You already mentioned that some of your works have been ported. How closely were you involved in those processes of porting an artwork like you told us about. Were you always involved for all your artworks?

Only those... I mean the porting really was driven by contexts. In other words, there was another exhibition, or one or another situation, that actually created an impetus to do that. Unfortunately, I don't have the time and I don't have the money to do this just as a hobby. So it is true that if such a context does not appear, some works are in danger. And some works, I would say, are already lost and it will be very difficult to bring them back. There're just some issues to do with loss, which is a bit tragic, but there's nothing I can do about it. For instance *Heavens Gate* [1987]: I only have copies and they are not brilliant copies of the original video. The original video was on a 2-inch master tape. During my movements from one place to another this just disappeared. That's a pity because that was a major work and there is no doubt that the copies I have got are not as good as the original master tape. So that can happen. When the master tape is gone and you've only got lesser quality copies, there's nothing more you can do.

So you were porting more or less when an incentive was given or there was a need to show the artwork?

Yes, exactly, and also some things are less... the overhead is not so dramatic, so it is something I can do off my own bat. So currently I have been asked to show a work at an exhibition in China, and they have very little money, and I was thinking, what work have I got that is cheap, and actually *The Golden Calf* is the only one. But even this work is a bit fragile, there are too many cables in it, it's not as robust as it should be. I realized, I don't need to go down that path any more because I can just do it with an iPad. So I asked Gideon May, who did the original application, to rework it with an iPad. It is going to be so outrageously simple now, and also so robust because basically there are no cables, the whole application will just live inside the iPad, and all I need to do is to put a little steel wire on it to make sure nobody walks away with it. So I'm delighted actually.

There you have another phenomenon: the iPad is not an improvement on the original work, and actually, from a historical point of view, it should look like it did when it was first made. But at this point in time the revision of that work with an iPad is a very appropriate thing to do. It is a coherent, let's say aesthetic step that could be taken, and also somehow rather brings that work into the present in a different way. So it gets resuscitated or gets reborn in a slightly new outfit. And people will recognize that, because the iPad is so ubiquitous. So then you have a peculiar situation where you have in a way two works, which are the same work: you've got the iPad version, that is, today's version of the work, and then you've got the historical example. And the two are in any way woven together, because I don't want to lose the original work by doing the iPad work.

In other words, if anything the iPad work maintains the memory of where it came from, you know, like some kind of genetic code.

The next questions are more specific about *The Legible City*. Since Bernd Lintermann who has worked as a programmer for you is now working on the porting we would like to know if there are parameters that you consider essential to the artwork that shouldn't change?

Look, I am just assuming that he can see the original work and he's just duplicating it. That's all. The only thing I would expect and would appreciate is that it is completely smooth, and there's no reason why *The Legible City* shouldn't be a completely smooth experience. There should be no jitter, no hesitation in its behavior. That's the only, let's say improvement, if any, that I would want from it. I just assume that Bernd is replicating the work as it is. And I don't really think you could do much more than what's already there.

One could, of course, look at the bicycle and decide whether that can be mechanically improved. I've got no problem with that. The design of the bicycle I'm very happy with and I would stick to that, because it's a very easy bike for people of all ages to get on. And I discovered when I used a normal bike that this is not a good thing, because for elderly people they have to make too much effort to sort of throw their leg over a big bike, whereas this bike, which is modeled on the Strida folding bike, is very easy to get on to. So it's very convenient. And because it's

easy to get on to, it's also not so much mechanical stress as you have on a big bike, where people push their weight against it to get on and to get off. So the bike, I think, is OK, but if somebody sees ways of improving it – I mean improving it from the point of view of making it more maintenance-friendly in the long term, thus making it more robust – it's great. And projection is also an issue.

Would you agree to test the ported installation so that you can approve it when it is done?

Oh yes, I can put my seal of approval, absolutely. I can re-sign it, if you like. No problem. So I think if you are going to really meditate on these whole issues, on all the issues to do with long-term sustainability, your biggest problem, your biggest challenge is the mortality of the artists who made these works. Because once they are gone, you're lost.

Hence the interviews...

You won't have the same ease of information. So that's really important. If it's done thoroughly, as I said you could rebuild any work – up to a point. When you look at something like a video work like *Heavens Gate*, I think that would be really difficult to do again. I can't imagine who would do that, because that means going into a video studio and duplicating... it's unimaginably difficult. But when it comes to coding this is more manageable actually. And if you have all the assets, it's possible.



Exhibition

*Digital Art Works.
The Challenges of Conservation*

**ZKM | Center for Art and Media Karlsruhe,
Germany**

**Espace multimédia gantner,
Bourogne, France**

**CEAAC (Centre Européen d'Actions Artistiques
Contemporaines) and École supérieure des arts
décoratifs, Strasbourg, France**

House of Electronic Arts Basel, Switzerland

The Exhibition *Digital Art Works. The Challenges of Conservation*

Chiara Marchini Camia

One of the tasks set out in the outline of the *digital art conservation* project was the organization of a travelling exhibition to present the results of the research undertaken during the project, and also to illustrate the wider set of problems that prompted the project in the first place. The exhibition *Digital Art Works. The Challenges of Conservation* (October 29, 2011–February 12, 2012) would address both a specialist and a wider audience and be shown in the three countries of the partner institutions – Germany, France, and Switzerland. As leader of the research project, the ZKM | Center for Art and Media Karlsruhe was tasked with developing the concept of the exhibition, which would open at the ZKM | Media Museum. The present essay will report on the conception and planning of the exhibition, and will describe its conceptual and physical structure, and, finally, it will reflect on the exhibition's contribution to the research project.

Concept and Aims of the Exhibition

The exhibition's title illustrates the aims and priorities that were formulated for the show: *Digital Art Works. The Challenges of Conservation*. Digital artworks would literally be taken apart and shown not to exist statically, but in a constant state of functioning through various processes – the result of investment of time, effort, and money by the artists as well as the collections holding the works. The set of challenges faced by museums in their effort to maintain artworks in working order and the conservation measures formulated within the project would be the subject of the exhibition.

The concept was developed by the curators of the exhibition at the ZKM | Media Museum – Bernhard Serexhe, Arnaud Obermann, and myself – in dialog with our counterparts at the other two partner institutions involved in mounting the exhibition in France: Valérie Perrin of the Espace multimédia gantner in Bourogne as well as Marie-Michèle Cattelain and Catherine Mueller at Vidéo Les Beaux Jours in Strasbourg. The starting point for the exhibition concept was the selection of works, which were the subjects of the project's case studies. These ten artworks represent the widest possible spectrum of technologies and functions¹ existing in the pool the works were drawn from

1 In their book *Rethinking Curating: Art after New Media* (2011) Beryl Graham and Sarah Cook put forward the argument that new media art is tendentially process- rather than object-oriented and that therefore the concept of "behavior" is better

(collections from the Upper Rhine region, including those of the project partners). It was decided that the evolution of the disciplines of restoration and conservation in light of the specific characteristics of digital art – discussed separately in the two project symposia² – would not be addressed in the exhibition. Instead, the exhibition would present the conservation strategies tested in the case studies, and thus focus on the moment (and moments) of conservation.

At the basis of the methodology employed in the case studies stood four strategies identified by the Variable Media Network³: storage and hardware preservation (see glossary, p. 602), migration (see glossary, p. 601), emulation (see glossary, p. 600), and reinterpretation (see glossary, p. 601). In addition to testing these strategies on digital artworks specifically, the project also refined existing documentation models to fit the particular nature of digital artworks, which also meant according particular significance to the artist interview.⁴

The question posed itself of *how* to present the conservation strategies and the documentation method in the exhibition: How much text and explanatory material was admissible in an exhibition of this kind? What media were best adapted to communicating the individual steps of documentation and conservation (should artist interviews, for example, be presented in text form as full transcripts, or as short video excerpts)? Should we and could we, with regard to the artists' intentions, show the artworks at various stages of "repair"

suited than that of "medium" to describe these kinds of artworks. Following a similar argument, in 1999/2000 the media theorist and curator Steve Dietz had envisaged the categories "interactivity," "connectivity," and "computability" to describe media art. A description of contemporary artworks according to behaviors was also followed by the Variable Media Network (1999–2005), which proposed such categories as "interactive," "coded," and "networked." According to Graham and Cook new media art cannot however as yet be characterized as "postmedia," as a precise description of these artworks needs to take into account the particular behaviors inherent to the technologies employed by the artists. See Beryl Graham and Sarah Cook, *Rethinking Curating: Art after New Media*, The MIT Press, Cambridge (MA), 2011; Jon Ippolito, "Accommodating the Unpredictable: The Variable Media Questionnaire," in: Alain Depocas, Jon Ippolito, and Caitlin Jones (eds.), *Permanence Through Change: The Variable Media Approach*, Guggenheim Museum Publications and The Daniel Langlois Foundation for Art, Science, and Technology, New York, Montreal, 2003.

- 2 The first symposium *The Digital Oblivion. Substance and ethics in the conservation of computer-based art* was organized at ZKM | Karlsruhe, November 4–5, 2010; it was followed by the second symposium *Digital Art Conservation. Practical Approaches: Artists, Programmers, Theorists*, held at the École supérieure des arts décoratifs (ESADS), Strasbourg, November 24–26, 2011.
- 3 The methodology applied within the case studies of the *digital art conservation* project is described in the text by Arnaud Obermann, see, this volume, pp. 315–322.
- 4 Since the mid-1990s, the artist interview has been given increased importance in the conservation process, a development which runs parallel to the increased status of the artist interview as a form of art criticism and curating. For a manual on the artist interview in the conservation of contemporary art, see Lydia Beerkens et al., *The Artist Interview. For conservation and preservation of contemporary art. Guidelines and practice*, Jap Sam Books, Heijningen, 2012.

or “updating”? Was there a way to highlight the conservation issues while allowing the artworks to come into their own?

An important stimulus for reflection as well as a breakthrough in the conception of the exhibition was provided by the workshop *Access To Contemporary Art Conservation*,⁵ held at the Museu de Serralves Porto (Portugal) in March 2011, which Arnaud Obermann and myself attended. The one-day workshop centered on “[...] the exhibition as a crucial element in the collaborative effort to preserve contemporary art [...]”.⁶ Conservators from a range of European institutions discussed the exhibition as the moment that crystallizes the work of conservators and often constitutes the occasion which prompts the conservator to intervene in particular works of contemporary art while also providing the benchmark for future conservation work. Katrin Blanchaert of the S.M.A.K. (Stedelijk Museum voor Actuele Kunst) in Ghent (Belgium) and Sanneke Stigter of the Kröller-Müller Museum in Otterlo (The Netherlands) presented past exhibitions of their institutions, which had actually had the very practice of conservation as their subject. Based on her experience at the S.M.A.K., Katrin Blanchaert discussed a hypothetical model in which information on conservation would be presented in a space parallel to the exhibition space. The setup of two adjacent parallel spaces would allow visitors to cross back and forth between the two, each space informing but not colliding with the other.

In the discussion that followed the presentations, workshop participants stressed the importance of ensuring that the conservator’s efforts were always at the service of the artworks and artists and not the other way round: one should be careful not to upstage the artist, Pip Laurenson from the Tate, London, commented. Crucially, the individual experiences of institutions shared by their representatives at the workshop, such as those of the Kröller-Müller Museum, proved that the public is often deeply interested in the backstage work that goes into maintaining the art, and that an exhibition focusing on conservation could potentially appeal to a wide audience and not just a specialist one.

The Documentation Room

The conception of a documentation room, in which information pertaining to conservation would be communicated in parallel to the presentation of the

5 Organized by the University of Porto (Portugal) and the Cultural Heritage Agency (Netherlands) in collaboration with Museo Nacional Centro de Arte Reina Sofía (Spain) and hosted by the Museu de Serralves in Porto. The seminar was part of the European project PRACTICs, a follow-up project to the Inside Installations project, and funded by the Culture Programme of the European Commission and the Mondriaan Foundation. Available online at: www.cultureelerfgoed.nl/node/1813, accessed 09/16/2013.

6 Available online at: www.incca.org/news/news-archive/208-incca-news-archive/805-access2ca-porto, accessed 09/16/2013.

artworks, seemed to provide an answer to the questions and reservations mentioned above. Thus we decided to follow such a “parallel rooms model,” similar to the one proposed by the S.M.A.K. at the workshop. The advantage of this model lies in the possibility to show hardware components otherwise not visible to the visitors as well as documentation relevant to the conservation efforts in parallel with the exhibited artworks, without compromising the aesthetic effect intended by each artist for his or her work.

Therefore the location dedicated to the exhibition – a L-shaped area on the first floor of the ZKM | Media Museum – was divided into an exhibition space and the documentation room at its center. While the documentation room featured information on the conservation process as well as original, for the most part historical hardware, the exhibition space was dedicated solely to the artworks. Here the artworks were exhibited in their integrity, just as the artists had intended their presentation. In cases where “replicas” of the “originals” had been produced via migration, emulation, or reinterpretation, these new works would be presented alongside their “originals.”⁷ The large area of the space allocated to the exhibition (approx. 860 square meters) enabled the presentation of additional works from the ZKM_Collection to better illustrate specific issues. In order to allow for a scenographic staging of the works, it was decided that the exhibition would have a dimmed light setting – like the rest of the Media Museum – while the space designated as the documentation room, which is flanked by a large row of windows, would be lit by daylight, signalling a space for work and study.⁸

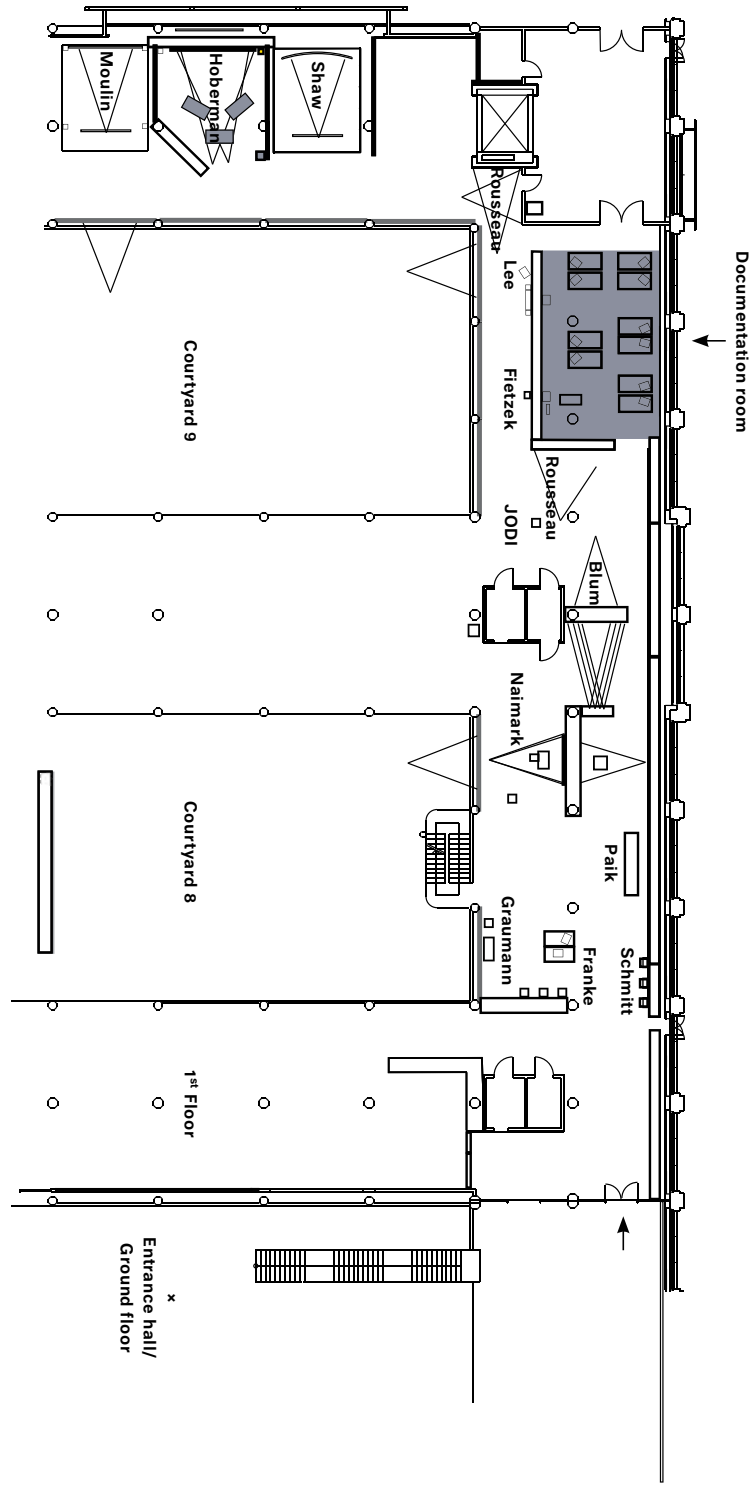
In the exhibition, visitors were provided with information by way of an introductory wall text, a booklet, and an audio guide.⁹ In addition to introductory texts outlining the aims of the project and the methods of the case studies, the booklet included texts on each of the ten case studies, with background information on the artists and artworks as well as on the conservation measures undertaken for each of the works. The audio guide provided similar information on each case study. Exhibited works that were not part of the case studies were accompanied by explanatory wall texts.

While in the exhibition space the focus lay on the artworks themselves the documentation room provided the space and time for the visitor to explore in detail the issues of conservation. On special monitors it was possible to watch the interviews that had been conducted with the artists on the issue of conservation as part of the case studies. On large industrial shelves,

7 This curatorial approach echoes the conception of the exhibition *Seeing Double: Emulation in Theory and Practice*, held at the Solomon R. Guggenheim Museum (March 19–May 16, 2004) as part of the Variable Media Network, in which original installations were shown alongside their emulations.

8 The exhibition design was developed by Matthias Gommel.

9 The wall texts, exhibition booklet, and audio guide were all available in the three languages of the project, German, French, and English.



Exhibition plan
Digital Art Works.
The Challenges of
Conservation, ZKM | Media
Museum
Photo © ZKM | Karlsruhe

artwork replicas, and individual hardware components illustrated specific functions of the works presented in the exhibition space. Above these objects was a display of obsolete audiovisual equipment – CRT laser projectors, laser disc players (see glossary, p. 600), CRT computer monitors (see glossary, p. 599) and other devices that were state-of-the art not so long ago – offering a panorama of the fast-changing landscape of artists' technologies. One wall of the documentation room displayed a large printout of the source code (see glossary, p. 602) of Jeffrey Shaw's interactive installation *The Legible City*, highlighting the source code as the core of the digital artwork, while on another wall a diagram laid out the project's documentation model with a breakdown of its individual categories, including the artist interview.

The Exhibition Space

The exhibition space was laid out in an L-shape on one side of the ZKM | Media Museum's first floor and spanned the two "courtyards" that make up the museum's exhibition area. The exhibition was marked off from the rest of the first floor, which normally hosts several exhibitions simultaneously as well as a semi-permanent display of works from the ZKM Collection, by a large white slightly transparent fabric hung along the barriers on the "courtyard" side of the space. The exhibition space had three different entry points; this meant that it was not possible to construct a chronological or thematic parcours and the exhibition had to make equal sense from all sides of entry. Hence, the installations were arranged in no particular order but rather according to each work's spatial requirements (projection distance, viewing distance, seating, no interference of flickering light from other works, etc.) and with attention paid to the aesthetic, discursive, and technological correspondences between the works. For example, early animated computer graphics by Herbert W. Franke were positioned near more recent algorithmic animations by Antoine Schmitt; two adjacent black boxes contained works featuring virtual meanderings through changing city views (Nicolas Moulin's *Viderparis* and Jeffrey Shaw's *The Legible City*); Marc Lee's *TV-BOT 1.0* and *TV-BOT 2.0* were placed next to Frank Fietzek's *Tafel*, each employing different generations of television sets and computer monitors in installations conceptually and materially tied to particular points in history.

In the following, I will briefly outline the works exhibited and the mode of display that was developed for each of them with a view to highlighting the conservation issues raised while aiming to respect the work's integrity. Although the exhibition had no set parcours, the description starts from the main entrance on the ZKM | Media Museum's first floor (see the exhibition plan, p. 527).

Herbert W. Franke: *ABROLL3*, *ORCHID*, *RAHMEN4*, *TROPIC*, and *WALDWOHN* are animated computer graphics involving a range of geometric investigations

and were programmed by Herbert W. Franke in the years 1984 to 1992. The case study focus lay on testing the strategy of emulation for their presentation on present-day computers. In the exhibition, two of the works were shown running on so-called “DOSBox” MS-DOS emulators (see glossary, p. 600) on current Mac mini computers (Apple). Two further animations were shown on recent computers as recordings of the original video signal from the original DEC Professional 350 personal computer they were programmed on. Lastly, one of the computer graphics was presented on the original DEC Professional 350 personal computer. In this way it was possible to compare the aesthetic outcomes of emulation and recording to the aesthetics of the work conserved using the storage (hardware preservation) strategy. Inside the documentation room, the original computers from which the programs had been extracted were on show, including the original floppy disk drive.

Antoine Schmitt: The three modules from the series *still living H, I, J* (2006) presented in the exhibition feature diagrams and charts in constant motion as a comment on capitalist culture's quantification of life. The project case study focused on documenting the works' functioning and appearance with a view to a possible reprogramming of the work at some point in the future when the Adobe Director software, with which it was programmed and is still being displayed, is no longer available. The high definition graphics and

A visitor interacting with
Herbert W. Franke's work
WALDWOHN
Exhibition view
*Digital Art Works. The
Challenges of Conservation*
ZKM | Media Museum
Photo © ZKM | Karlsruhe
Photo: ONUK



flat screens of *still living H, I, J* presented a strong contrast to the much earlier computer graphics and older computer monitors of the installations by Herbert W. Franke and Hervé Graumann presented nearby.

Hervé Graumann: *Raoul Pictor cherche son style ...* (1993) is a software-based installation in which the paintings produced by a virtual painter on a computer screen are translated into color prints by an inkjet printer. This installation, in which some of the original components had been replaced (in accordance with the storage or hardware preservation strategy), was mounted alongside a “reinterpreted” version of the work, programmed as an iPhone app. In this later version (2009), the painter’s studio has become portable but the paintings produced are only visible on the screen and the materiality of the inkjet print is lost. This pairing of the original installation and its reinterpretation enabled a direct comparison of the aesthetic experience that each produce. While inside the exhibition space the computer of the original installation is concealed inside the presentation plinth, in the documentation room a replica was installed in which the computer and keyboard necessary to operate the work were on display.

Nam June Paik: The video installation *Internet Dream* (1994) is conceived as a “video wall” consisting of 52 television sets showing flickering images from

Obsolete equipment
for Herbert W. Franke's
works presented in the
documentation room of
the exhibition *Digital Art
Works. The Challenges of
Conservation*,
ZKM | Media Museum.
Photo © ZKM | Karlsruhe
Photo: ONUK



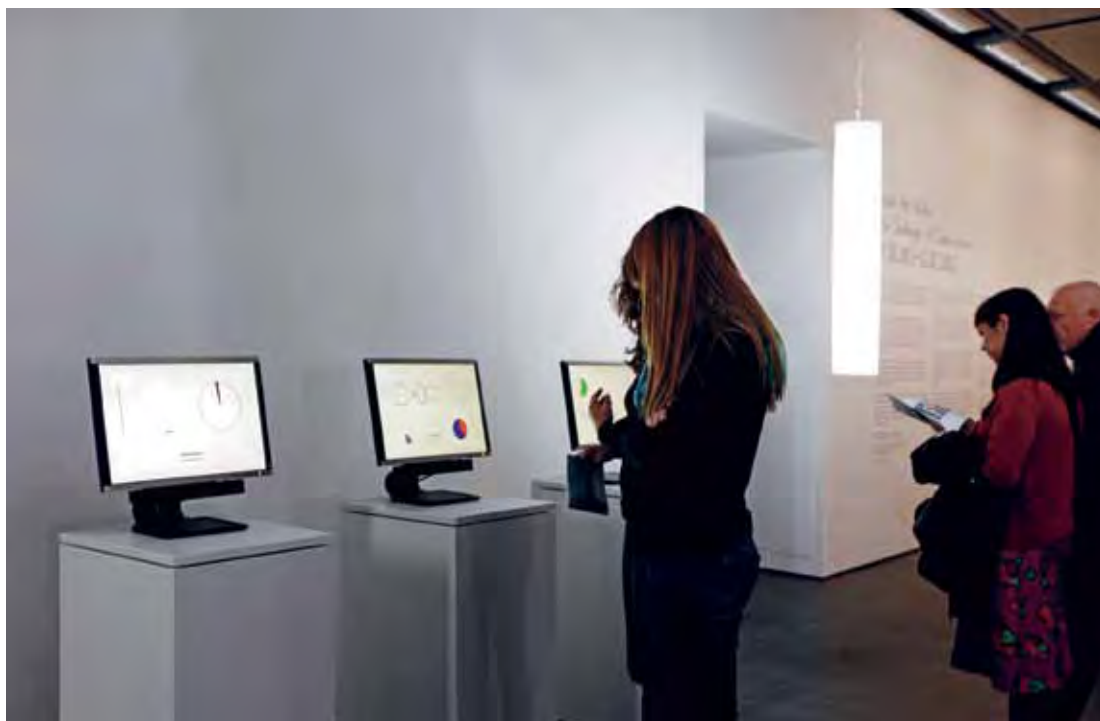
three video sources. This was the only case study of an artwork that was not born-digital (see glossary, p. 599), and stands for the fact that for conservation purposes, video installations are often subject to various phases of digitization. The focus of the case study was to document the functions of the video display system, which distributes three video sources to the monitors. In the exhibition, the video installation was placed at circa one meter from the wall with a spotlight lighting its rear and two Plexiglas barriers at the back protecting the work but enabling view. In this way, while from the front the installation could be appreciated in its integrity, visitors could also take a look “inside” the work and see the back of the CRT monitors, the video display system, and the three flash card (see glossary, p. 600) players which had replaced the original laser disc players. Original laser disc players such as the ones previously employed in this installation were on display in the documentation room. Also exhibited in the documentation room was a video display system which splits the video signal from a single source and distributed it onto four screens.

Antoine Schmitt
still living

2006

Installation view
*Digital Art Works. The
Challenges of Conservation*
ZKM | Media Museum
Photo © ZKM | Karlsruhe
Photo: ONUK

Michael Naimark: *Karlsruhe Moviemap* (1991/2009) is an interactive installation simulating a journey through the streetcar network of the city of Karlsruhe by way of retrievable film stills. The original version of the *Karlsruhe Moviemap* (1991) has undergone various technological updates as a





Hervé Graumann

Raoul Pictor cherche son style ...

Original version with CRT monitor and inkjet printer
(1993) and reinterpretation for iPhone (2009)

Installation view

Digital Art Works. The Challenges of Conservation

ZKM | Media Museum

Photo © ZKM | Karlsruhe

Photo: ONUK

result of wear and tear through exhibition use and the obsolescence of components, which have nonetheless left its external appearance and functionality largely unaltered (strategies of storage/hardware preservation and migration). In 2009, a “reinterpretation” of the work was produced by the ZKM | Karlsruhe in dialog with the artist. The reinterpreted version involves newly taken photographs of the town and a system for stereoscopic projection. In the exhibition, the two versions of the work were placed back to back, each projection on one side of a wall. The visitor always saw one side first, depending on the direction she or he was coming from. Turning the corner, the visitor would come upon the other version and be able to judge the difference in the experience of the two. In the documentation room, the original computer used for the 1991 version of the work was on display.

Heiner Blum: The slide installation *Augentauschen* (1987–1993) was not part of the project case studies but, like Paik’s *Internet Dream*, it illustrates the way in which the conservation of moving image works tends to go hand in hand with their inevitable digitization. While the original installation consisted of four slide carousels and a dissolve unit (which itself has also been digitized as the dissolve is now monitored by a computer), for an exhibition organized in 2009, with the artist’s agreement, the ZKM | Karlsruhe turned the slide projection into a digital video, in an attempt to facilitate the technical maintenance of the installation. As slide technology is fast becoming obsolete, this may in fact be the only feasible option to conserve the work in the long term. Like *Karlsruhe Moviemap* by Michael Naimark, the original and the new versions of the work were shown on either side of one wall, allowing the visitor to directly compare the aesthetic experience of the slide and the digital projections.

Samuel Rousseau: *Untitled (papier peint vidéo)* (2003) is a site-specific video installation which projects animated wallpaper motifs onto the walls of the given exhibition space. In the exhibition three walls were allocated to the work, which bore specific features – for example a door and a fire safety closet – which were left open by the wallpaper projection through respective adjustment to the projection file. The case study relating to this installation focused on documenting the installation process so as to enable the collection owning the work (the Fonds régional d’art contemporain (Frac) Alsace) to reinstall it without the artist needing to be present.

Marc Lee: *TV-BOT* is a net-based artwork consisting of an Internet news channel broadcasting up-to-the-minute world news. Because the first version, *TV-BOT 1.0* (2004) ceased to work a few years after it was created due to changes in the audiovisual format standards on the Internet, the once constantly up-to-date channel can now only be shown in the “fossilized” form of a recorded video sequence. The artist requests for this version of the

work to be shown on a CRT television set only. In 2010 he created *TV-BOT 2.0*, which constituted both a technical and an aesthetic update and thus a “reinterpretation” of the work. This version, which at the time of our exhibition still worked with the current configuration of the Internet, was shown on a flat screen attached to the wall. The side-by-side confrontation of the recorded *TV-BOT 1.0* and the networked *TV-BOT 2.0* incessantly firing away current global news, allowed visitors to appreciate not only the aesthetic changes undertaken in the reinterpretation (for example the more rapid change of images, or the added Twitter banner), but also how net art’s connectedness can be inextricably tied to its meaning. Therefore maintaining the compatibility of the work with the evolving Internet environment (which can usually only be done through reprogramming – strategy of migration) can represent the only adequate preservation strategy for the conservation of net art.

Frank Fietzek: The interactive installation *Tafel* (1993–1994) enables the visitor to slide a small Macintosh CRT monitor horizontally and vertically across a blackboard and identify chalk writing that is not visible on the board itself. This work was not one of the case studies but was included in the exhibition to elucidate the significance of the strategy of storage (hardware preservation) for the conservation of certain artworks. The installation has undergone a series of internal adaptations attributable to the strategy of migration (for example, the mechanical computer mouse originally responsible for the tracking of movement – not visible to the viewer – was replaced with a laser mouse). However, in order to fit the aesthetic of the installation, with its traditional blackboard and specially constructed iron casing, and thus respect the work’s authenticity, the monitor cannot be replaced with a more recent computer monitor. This means that for this work, too, spare parts have to be bought and stored for replacement.

Jeffrey Shaw: *The Legible City* (1989–1991) is an interactive installation involving a stationary bicycle, which enables the interactor to cycle through projected 3D virtual views of the streets of Amsterdam, Manhattan, or Karlsruhe. While over the course of its exhibition history the installation has undergone numerous changes of hardware, notably with a number of different stationary bicycles and projectors being used. For this exhibition the work was installed inside the black box that had been purpose-built for the installation – which Shaw produced at the ZKM | Karlsruhe – including an original CRT laser projector and the convex projection surface originally intended for the work. In parallel to the strategy of storage (hardware preservation), the case study involved commissioning *The Legible City* to be reprogrammed on current operating systems (strategies of migration and porting [see glossary, p. 601]). Inside the documentation room the visitors



Guided visitor's tour at the Espace multimédia gantner in front of the installation *Internet Dream* (1994) by Nam June Paik
Photo © Espace multimédia gantner
Photo: Samuel Carnovali

could ride a replica of the installation, where, unlike in the exhibition space, the Silicon Graphics computer and the analog-to-digital converter which transforms the analog signal generated by the stationary bicycle into digital data, were on show.

Perry Hoberman: Next to the black box of Jeffrey Shaw's installation *The Legible City* the work *Bar Code Hotel* (1994) by Perry Hoberman was shown in a separate section of the exhibition room. In this installation, viewers can scan bar codes printed on different tables with special scanning pens to generate and control objects in a projected virtual environment. This work was not a case study in the *digital art conservation* project but like Shaw's *The Legible City*, it was programmed for and still runs on a Silicon Graphics computer, and thus poses the same conservation challenges: while it has been conserved through storage (hardware preservation) until now, sooner or later it will have to be ported or reprogrammed for different environments if it is to be preserved in the long term.

Nicolas Moulin: Next to Perry Hoberman's *Bar Code Hotel* and in a black box parallel to Jeffrey Shaw's *The Legible City* Nicolas Moulin's work *Viderparis* (1998–2011) was installed. This digital video projection involves a looped slide show featuring views of the streets of Paris stripped of any sign of human life,



Marc Lee
TV-BOT 1.0 (2004) and *TV-BOT 2.0* (2010)
 Installation view
Digital Art Works. The Challenges of Conservation
 CEAAC Strasbourg
 Photo © CEAAC Strasbourg
 Photo: Klaus Stöber

accompanied by a low, droning soundtrack, a *hommage* to dystopic science fiction literature. The case study on this artwork focused on documenting the artist's presentation requirements pertaining to the sequence of digital slides, the mode of transition between each slide, and the presence of the soundtrack, to enable the collection owning the installation to choose the presentation software for reinstallations of the artwork. Representative of digital art that is digital by virtue of its use of digital technology as a tool rather than as a conceptual support, as is the case in software-based works, *Viderparis* illustrated the more basic maintenance problems posed by artworks employing digital technology.

The Accompanying Program

Because our aim was to make the exhibition and the questions raised during the research project accessible to a wider public, a parallel education program was developed at the ZKM | Karlsruhe to broaden the scope of the exhibition and find as many thematic entry points as possible. First, a series of five talks was organized on issues relating to digital media and the consequences of technological obsolescence in day-to-day life: how to backup digital photos in the long term, how to digitize a super-8 film, or to what

extent can emulation help keep computer games alive?¹⁰ With the ZKM | Museum Communication department, a program of guided tours and workshops was devised for young people and adults focusing on changing technologies of artistic production, ranging from working with slides to programming simple computer games and learning the basics of how to program an app. Finally, workshops and guided tours were held in the exhibition with students of conservation, art students, and the participants of the second project symposium, *Digital Art Conservation. Practical Approaches: Artists, Programmers, Theorists* (ESADS, Strasbourg, November 24–26, 2011).

The Exhibition at the Other Partner Institutions

After the ZKM | Karlsruhe, the exhibition traveled to France: first to the Espace multimédia gantner, Bourogne, and after that to the CEAAC (European Centre for Contemporary Art Actions) (this exhibition was organized by the project-partner Vidéo Les Beaux Jours) and the École supérieure des arts décoratifs (ESADS), Strasbourg.¹¹ In January 2013, shortly after the project *digital art conservation* had ended, the exhibition was then taken over by the House of Electronic Arts Basel (Switzerland).¹²

For the Espace multimédia gantner edition, the exhibition was divided among three sites: the Espace multimédia gantner building in Bourogne, the École d'art Gérard Jacot in the nearby town of Belfort, and the city hall in Belfort. The exhibition featured the project's ten case studies, without the additional works from the ZKM_Collection, and a reduced version of the documentation room in which the videos of the artist interviews could be viewed. At the Espace multimédia gantner an extensive education program was also devised around the exhibition, involving various models of guided tours for schools in which such questions as "What is conservation?" and "What conservation problem do these works pose?" were asked. In addition, Anne Laforet gave a talk at the Espace multimédia gantner on the conservation of net art.

In Strasbourg, the exhibition was held at two different sites, the CEAAC (Centre Européen d'Actions Artistiques Contemporaines) and the École

10 At the ZKM | Karlsruhe, a series of lectures was held with the following titles: Boris Jakubaschk, "The personal computer – PC turns 30;" Sven Schönaauer "Introduction to saving digital images for the long term;" Sven Braun "Hacking as art;" Anna Leippe "8mm infinities. From analogue 8mm film to the digital copy;" Andreas Lange "Emulation and the preservation of computer games." Videos of the presentations can be viewed for free on iTunes U.

11 The exhibition took place on the following dates, respectively: ZKM | Karlsruhe, October 29, 2011–February 12, 2012; Espace multimédia gantner, Bourogne, February 25–April 28, 2012 and the CEAAC and École supérieure des arts décoratifs (ESADS), Strasbourg, June 16–September 23, 2012.

12 The exhibition took place at the House of Electronic Arts Basel on January 18–March 31, 2013.



Michael Naimark
Karlsruhe Moviemap
 1991 and 2009 versions
 Installation view
*Digital Art Works. The
 Challenges of Conservation*
 CEAAC Strasbourg
 Photo © CEAAC Strasbourg
 Photo: Klaus Stöber

supérieure des arts décoratifs (ESADS). At the CEAAC, the education program focused on introducing new media art to the centre's public, with guided tours and hands-on workshops which acquainted groups with the use of imaging technologies and computer game design. The ESADS hosted the exhibition's documentation room, with work stations featuring the artist interviews, and with a display of obsolete equipment. Also at the ESADS, the students who had been involved in the seminars of the *digital art conservation* project presented their artistic projects that tackled the question of the conservation of digital art through the related concepts of "performance," "reenactment," and "fidelity."

Conclusion

The exhibition *Digital Art Works. The Challenges of Conservation* provided an interface between the *digital art conservation* project and the wider public. It gave tangible form to the research carried out in the course of the case studies by presenting the artworks in the flesh and communicating through various means the conservation issues they raised and the conservation measures that had been undertaken. While in the publication, the texts on the case studies will delve into the individual steps of the conservation process in considerable depth – documentation, pre-emptive measures, or restorative

intervention – in the exhibition the information was available in more digestible portions, and the public could physically experience the results and implications of the different conservation strategies at hand. By including the artist interviews in the documentation room standing in for the artists and their intentions, the exhibition thus aimed to impart in a concrete way the ethical as well as the technical questions involved in choosing one strategy as opposed to another.

The question of the fragility of digital media and its rootedness in the rampant technological change we are experiencing today is one question which has only recently reached public consciousness and which affects all realms of daily life. The vision of digital media promising to render data immortal has given way to a more disillusioned and cautious understanding of the scope of digital technology. In this respect this exhibition, which focused on the fragility of digital art, proved very timely and it is perhaps due to this timeliness that there was an overwhelming response from the press – it featured in the national as well as international media both in Germany and in France.¹³

The exhibition further marked another significant juncture: institutions such as the ZKM | Center for Art and Media Karlsruhe and the Espace multimédia gantner, which for the past ten to twenty years have acted as commissioners and producers of new media art, are now for the first time visibly and proactively taking on the role of custodians of these works. For institutions that collect digital art, it is no longer merely a question of proposing and explaining works at the conceptual and technological cutting edge. As these productions and acquisitions begin to age, the perspective of the institutions needs to shift and they have to take on the responsibility of communicating the historicity of these works. In the project case studies, strategies were tested in terms of the extent to which they allowed for the historicity of the works to be preserved: the strategy of storage and hardware preservation was advocated as having a place in the conservation of digital art by virtue of its respect for the original media and equipment used to create and display the artwork – contrary to the thesis advocated ten years ago by the Variable Media Network.¹⁴

13 Among others the following media published pieces on the exhibition: ARD, Deutschlandradio Kultur, *Der Spiegel*, *Süddeutsche Zeitung* (in Germany) and *Libération* (in France).

14 The Variable Media Network (1999–2005), coordinated by the Daniel Langlois Foundation in Montreal and the Solomon R. Guggenheim Museum in New York, foregrounded “reinterpretation” as the most appropriate strategy for conserving media art, defined as innately ephemeral. The Variable Media Network’s website states: “[...] the variable media paradigm encourages creators to define their work independently from medium [...]” and “[...] to envision acceptable forms their work might take in new mediums, and to pass on guidelines for recasting work in a new form once the original has expired.” Available online at: www.variablemedia.net/e/index.html, accessed 09/16/2013.

In some cases, however, it was shown, as in Marc Lee's *TV-BOT 1.0* and *TV-BOT 2.0*, that it is only through reprogramming ("migration" or "reinterpretation," depending on the extent of the changes to the appearance and functionality of the work) that it is possible to preserve the authenticity of an artwork to a high degree. The exhibition showed the public at first hand that there are different choices for keeping digital artworks in functioning order, and that each has a different set of consequences for the artwork in question.

List of Artworks Shown in the Exhibition

Digital Art Works.

The Challenges of Conservation

October 29, 2011–February 12, 2012, ZKM | Media Museum

Heiner Blum

Augentauschen

1987–1993

Slide projection, 4 synchronized projections, b/w

Augentauschen

2009

Single-channel video installation, b/w

Both versions are the property of the artist

Frank Fietzek

Tafel

1992–1993

Computer-based interactive installation

The artist

Herbert W. Franke

ORCHID

TROPIC

WALDWOHN

RAHMEN4

ABROLL3

1984–1992

Software-based animations for desktop computers

ZKM_Collection, Karlsruhe (Germany)

Hervé Graumann

Raoul Pictor cherche son style ...

1993

Software-based animation for desktop computer, printer

Frac Alsace, Sélestat (France)

Raoul Pictor cherche son style ...

2009

Software-based animation for iPhone/iPod touch

The artist

Perry Hoberman*Bar Code Hotel*

1994

Computer-based, interactive installation

ZKM_Collection, Karlsruhe (Germany)

JODI*OSS••••*

2005

Software-based work, take-away CD-ROM for use on visitor's own computer

Espace multimédia gantner, conseil général du Territoire de Belfort,

Bourogne (France)

Marc Lee*TV-BOT 1.0*

2004

Internet-based work (recording)

Digital Art Collection/Store, Basel (Switzerland)

TV-BOT 2.0

2010

Internet-based work, Sammlungen des Bundes, Bundesamt für Kultur,

Bern [Federal Art Collections, Federal Office of Culture, Bern] / Loan of the

Confederation to the House of Electronic Arts Basel (Switzerland)

Nicolas Moulin*Viderparis*

1998–2001

Digital slide show, color, sound

Musée d'Art moderne et contemporain (MAMCS), Strasbourg (France)

Michael Naimark*Karlsruhe Moviemap*

1991

Computer-based interactive installation

ZKM_Collection, Karlsruhe (Germany)

Karlsruhe Moviemap

2009

Computer-based interactive installation

ZKM_Collection, Karlsruhe (Germany)

Nam June Paik*Internet Dream*

1994

3-channel video installation, color
ZKM_Collection, Karlsruhe (Germany)

Samuel Rousseau*Untitled (papier peint vidéo)*

2003

Single-channel video installation, color
Frac Alsace, Sélestat (France)

Antoine Schmitt*still living H, I, J*

2006

Software-based animation
Espace multimédia gantner, conseil général du Territoire de Belfort,
Bourogne (France)

Jeffrey Shaw*The Legible City*

1988–1991

Computer-based interactive installation
ZKM_Collection, Karlsruhe (Germany)



Exhibition view
*Digital Art Works. The
Challenges of Conservation*
ZKM | Media Museum
Photo © ZKM | Karlsruhe
Photo: ONUK

Digital Art Works. The Challenges of Conservation

29.10.2011 - 12.02.2012

En tant qu'œuvre d'art, l'œuvre numérique est soumise à la conservation. La conservation numérique est une discipline qui vise à assurer la pérennité des œuvres d'art numériques. Elle se situe à l'intersection de l'art, de la technologie et de la conservation.

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Exhibition view
*Digital Art Works. The
Challenges of Conservation*
ZKM | Media Museum
In the foreground:
Michael Naimark
Karlsruhe Moviemap
(reinterpretation)
2009
Photo © ZKM | Karlsruhe
Photo: ONUK





Michael Naimark
Karlsruhe Moviemap
1991
Installation view
*Digital Art Works. The
Challenges of Conservation*
ZKM | Media museum
Photo © ZKM | Karlsruhe
Photo: ONUK





From top left to bottom right:

Exhibition view
*Digital Art Works. The
 Challenges of Conservation*
 ZKM | Media Museum
 Photo © ZKM | Karlsruhe
 Photo: ONUK

Heiner Blum
Augentauschen
 1987–1993, 2009
 Installation view
*Digital Art Works. The
 Challenges of Conservation*
 ZKM | Media Museum
 Photo © Heiner Blum
 Photo: ONUK

Marc Lee
TV-BOT 2.0
 2010
 Installation view
*Digital Art Works. The
 Challenges of Conservation*
 ZKM | Media Museum
 Photo © ZKM | Karlsruhe
 Photo: ONUK





View of the documentation
room in the exhibition
*Digital Art Works. The
Challenges of Conservation*,
ZKM | Media Museum
Photo © ZKM | Karlsruhe
Photo: ONUK





From top left to bottom right:

Visitors in the documentation room
of the exhibition *Digital Art Works.*
The Challenges of Conservation,
ZKM | Media Museum
Photo © ZKM | Karlsruhe
Photo: ONUK

Frank Fietzek
Tafel
1992–1993
Installation view
Digital Art Works. The
Challenges of Conservation
ZKM | Media Museum
Photo © ZKM | Karlsruhe
Photo: ONUK

Perry Hoberman
Bar Code Hotel
1994
Installation view
Digital Art Works. The
Challenges of Conservation
ZKM | Media Museum
Photo © ZKM | Karlsruhe
Photo: ONUK





Nicolas Moulin

Viderparis

1998–2001

Installation view

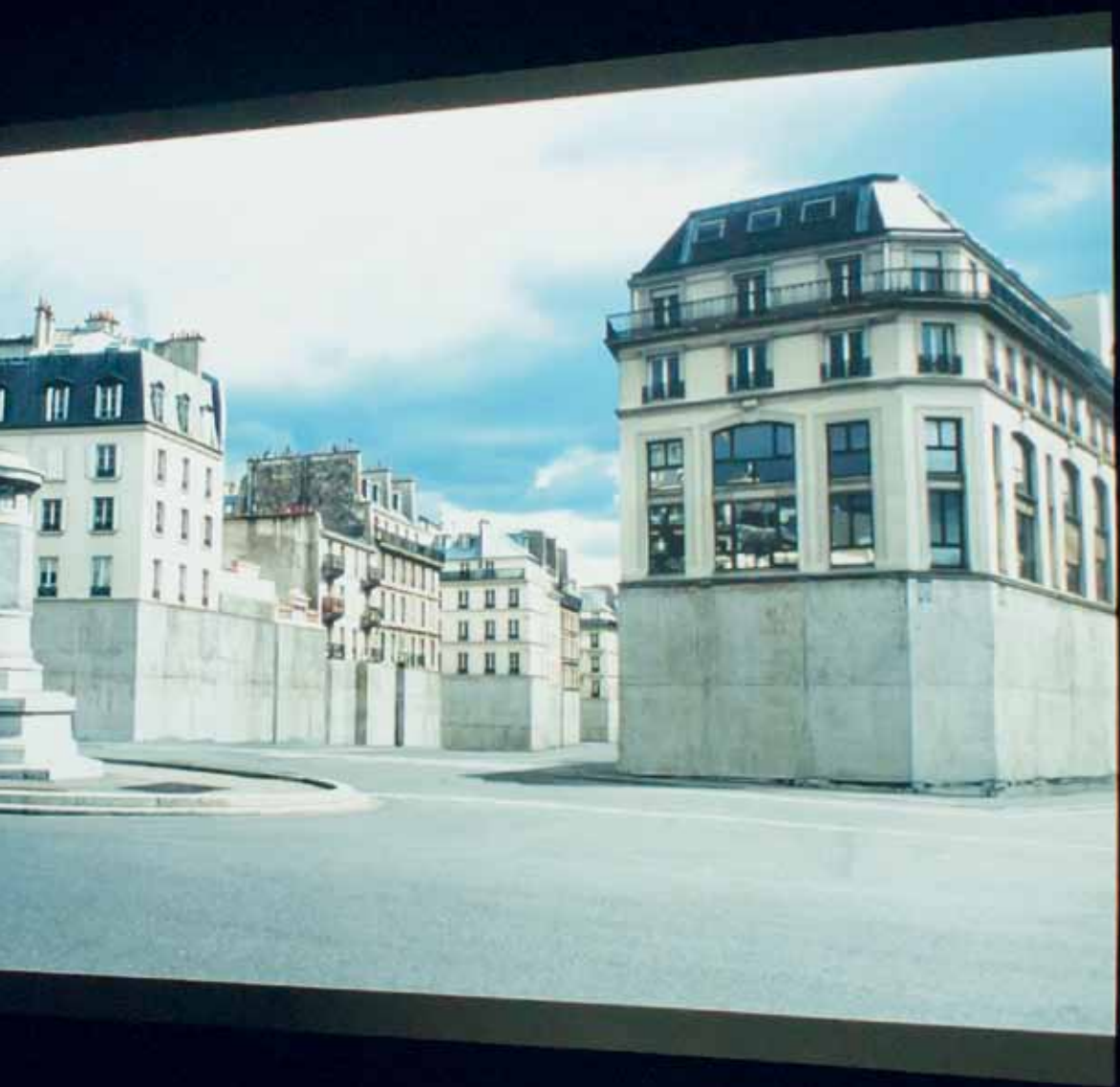
Digital Art Works. The

Challenges of Conservation

CEAAC Strasbourg

Photo © CEAAC Strasbourg

Photo: Klaus Stöber





Exhibition view
*Digital Art Works. The
Challenges of Conservation*
CEAAC Strasbourg
Photo © CEAAC Strasbourg
Photo: Klaus Stöber





Nam June Paik

Internet Dream

1994

Installation view

Digital Art Works. The

Challenges of Conservation

CEAAC Strasbourg

Photo © CEAAC Strasbourg

Photo: Klaus Stöber







View of the documentation
room in the exhibition
*Digital Art Works. The
Challenges of Conservation*,
CEAAC, Strasbourg
© CEAAC Strasbourg
Photo: Klaus Stöber

Hervé Graumann
*Raoul Pictor cherche
son style ...*
1993
Exhibition view
*Digital Art Works. The
Challenges of Conservation*,
CEAAC, Strasbourg
© CEAAC Strasbourg
Photo: Klaus Stöber



Teaching in the Field of the Preservation of Digital Art

Training in Media Conservation

Johannes Gfeller

With the spread of digital art in the early 1990s, media theory took over the paradigm of the primacy of mind over matter from philosophy: in the contemporary context this was manifested in code. Code and source code (see glossary, p. 602)¹ were at once witnesses to and tools of this change, and were rapidly identified as specifics of the newly emerging genre of digital art. Alongside the deep structure of language, and hence discursive analysis, a unique, intensely formalized deep structure of digital code suddenly appeared, which from that point onward became the foundation of all visible expressions. What a promise of things to come: art in the here and now (though not yet online!), mobile, with sound, apparently not fixed. Art that is controlled by an inexorable syntax although it does not seem to be based on any evident mechanism. Art that is no longer associated with the bohemian scene, but with the “game generation.” In the temporal microcosm existing at the time of its origin one could have actually believed that it was the source code, whether documented or not, that ultimately characterized the work, since without this the technical shell – the body of the code, as it were – would not have produced a modicum of aesthetic expression. As an industrial product, the hardware was replaceable, whereas the source code, although endlessly copyable, was unique.

Twenty years later, the hardware of that era is now obsolete, and it is now recognized that absolutizing the source code did the issue a disservice. Whereas a score or a stage direction was and is at least imaginable without actually being performed, code is not.² A digital artwork is not source code alone, but a (technical) performance of this code – as well as signified and signifier, and similarly, these are far more strongly bound to one another than formerly claimed. The obsolescence of the exterior shells is always *post festum*, and it will also overtake contemporary and virtual digital art. Any other standpoint can only be characterized as immune to history.

1 Here, code stands for the philosophical or sociocultural dimension, whereas the source code stands for the syntactically strictly formalized instructions in a program which are to be actually executed before being compiled, i.e., translated into machine language (see glossary, p. 601) and thus, as a rule, are no longer evident to the programmer either.

2 The artist duo JODI, by contrast, created works which refer directly to these paradoxes, and quite some time after the self-referentiality of earlier media art (conceptual photography, video, etc.) had been discredited. See, for example, the legendary *404.jodi.org* by JODI, which interchanged web user interfaces and source text; available online at: 404.jodi.org, accessed 08/12/2013.

While an exhaustive discussion of the conservation strategies of digital art is beyond the scope of this essay, it can take a glance at the places where conservation strategies for digital art have been the daily focus for many years: the training centers for restorers. In the following two such training centers for media conservation will be examined in greater detail: the Bern University of the Arts (BUA), which offers a course leading to a bachelor's degree in conservation and a master's degree program, and the Stuttgart State Academy of Art and Design, which offers a master's course entitled the Conservation of New Media and Digital Information. These are the only two institutions in German-speaking countries (and probably beyond³), which strongly orientate their training programs on the conservation of electronic media, though not exclusively.⁴

As director of the longstanding research project *AktiveArchive*⁵ my official focus so to speak both as a teacher and a researcher is the preservation of electronic art, and it is in this capacity that I participated in the research project *digital art conservation*. Additionally, the Bern University of the Arts was also one of the project's partners. Together with Anne Laforet (research assistant of the Espace multimédia gantner, and lecturer at the École supérieure des arts décoratifs [ESADS], Strasbourg), I co-organized the project's second symposium *Digital Art Conservation. Practical Approaches: Artists, Programmers, Theorists* in Strasbourg. Teaching was explicitly to be included in the *digital art conservation* project, so there was a detailed presentation of the study programs in Bern and Stuttgart, which are to some extent complementary.⁶

In Bern the three traditional subjects of painting and sculpture, graphics, documents and photography as well as architecture and interior decoration at the Department of Conservation and Restoration⁷ were expanded to include modern materials in 1999. To respond adequately to the challenges posed by modern and contemporary art, the field of Modern Media was

3 Status as of summer 2012.

4 In Bern this is a standard master's program (BA and MA), though students' attention is divided between it and the conservation of modern materials. In Stuttgart this involves a two-year master's program, which does not have to be preceded by a bachelor's in conservation, and which also comprises specializations in photography, audiovisual media, and digital information.

5 *AktiveArchive* (2007–2011) is a joint project between the Bern University of the Arts (project direction) and the Swiss Institute for Art Research (SIK-ISEA) in Zurich, funded by the Swiss Office of Culture as part of *sitemapping.ch*. See online: www.aktivearchive.ch, accessed 08/12/2013.

6 The author of the present essay, Johannes Gfeller, was professor at the BUA in Bern from 2001 to 2011 where he developed the field of media restoration. In 2011 he was appointed professor at the Stuttgart State Academy of Art and Design, where he is also director of the master's program for the Conservation of New Media and Digital Information (KNMDI). He is thus entirely familiar with both curricula.

7 Since then the specialization in architecture and interior design has been extended to architecture, interior design, and furniture. Since 2012, the BUA also offers a course in the conservation and restoration of musical instruments.

introduced in the fall of 2000. Since that time these two fields constitute the subject referred to as Modern Materials and Media (MMM). The MMM studio shares its media infrastructure with the *AktiveArchive* project, thus facilitating useful and necessary synergies in (media) art technological research.

The master's study program entitled *Konservierung Neuer Medien und Digitaler Information* (KNMDI) [Conservation of New Media and Digital Information] was launched at the Stuttgart State Academy of Art and Design in 2006 funded by the *Landesstiftung Baden-Württemberg*. In the summer of 2012 long-term funding was procured, so in the Department of Fine Arts KNMDI is now the fifth subject, along with Conservation and Restoration of Archeological, Ethnological and Craft Objects, Conservation and Restoration of Graphic, Archival and Library Materials, Conservation and Restoration of Paintings and Polychrome Wooden Sculptures, Conservation and Restoration of Wall Paintings and Polychrome Stone. Compared to conservation studies in Bern with its focus on synthetic polymers, the Conservation of New Media and Digital Information program has fewer points of contact with the older established study programs. Further, admission to the master's program in Stuttgart does not require a bachelor's degree in conservation, only a comparable degree closely associated with the field, for example, photography, media technology, computer science, art or art history, documentation, archive or library studies. This means that in Stuttgart it is not possible to build upon a common knowledge base. Consequently, the master's program has to impart a great deal of basic information that is normally taught at the bachelor level.

However, establishing a common foundation in the Bern model has also only been achieved to a certain extent. The foundation course, which covers the first two years, is the same for all specializations; only students affiliated to one of the studios can specialize early.⁸ Lectures are held on three days a week; the two other days are devoted to practical work in the conservation studios of the respective areas of specialization. All systems of knowledge that have developed over time tend to concentrate more on already existing, canonized knowledge over and against the new and the not yet established. The same holds true in the case of technical media, not only in restoration (although there it is especially pronounced), but in training as well – that is, precisely where the subject should actually be exerting a compensatory effect. For this reason, the historically evolved specializations, which have been in existence longer, tend to determine what is deemed indispensable for training in restoration.

8 Depending on educational background, the new student is given a studio of his preference, or else spends the first year in the studio for preventive conservation, where basic knowledge is taught, but with a partial omission of the compulsory courses required for a pre-study, a practical in a restoration studio cannot be assumed as a given in all cases.

One can complain about this state of affairs, but it is more useful to investigate the underlying reasons for it both from the point of view of the sociology of knowledge and specifically in terms of media so that new proposals for the training of media conservators can be based on a more precise footing. For the field of digital art conservation is constantly confronted with the same contradiction that first emerged in connection with the preservation of kinetic art, but for digital media is now the key question: conservation of material or conservation of function?

From the point of view of conservation, a “traditional” work of art is primarily determined by its materiality, and preserving this materiality is the focus of conservation science. In this context “traditional” does not mean old, or older than fifty years; what I understand as “traditional” is the fact that the material artifact transports an idea. In this sense contemporary art is also to a large extent “traditional.” Because this concept almost always implies a value judgment, it might be more prudent to introduce the expression “material-based.” The authenticity of the material (and, naturally, its artistic arrangement), which guaranteed the uniqueness of the work, was also the basis of Walter Benjamin’s concept of the aura of a work of art.

Although a material-based work may have a functionality (apart from any social, ritual, or religious function it may have), the preservation of its ability to function falls within the purview of the wide field of restoring electronic works of art. Obviously, a kinetic artwork loses a great deal of its attractiveness when it is “decommissioned.” And yet it can still “function” as a sculpture or art object and may, perhaps, be supplemented by a video or film – providing that such a document was created while the artwork was still in working order. Many kinetic works by Jean Tinguely, for example, no longer function (or only to a very limited extent), but these works possess intrinsic sculptural qualities that are only enhanced, so to speak, by the further dimension of movement. By contrast when a digital artwork no longer functions, whose chief aesthetic characteristic consists in its time-based components, it is a dead work. Yet even in some cases it can still be exhibited as a kind of tool, a kind of artifact, as in the case of the remains of the legendary Paik-Abe synthesizer.⁹ However, this approach is rather the exception

9 Thus, for example, the Paik-Abe synthesizer was shown as part of the exhibition *40jahrevideokunst.de – Die 60er* at the Kunsthalle Bremen, March 25–May 21, 2006. Available online at: www.40jahrevideokunst.de/main.php?p=2&n1=6&n2=2, accessed 11/05/2012. Similarly, the synthesizer was shown at mumok – museum moderner kunst stiftung ludwig wien – in the exhibition *Changing Channels, Kunst und Fernsehen 1963-1987*. Always “used” as a tool since it appeared, it was reconstructed by Paik himself as an exhibition piece long after it had ceased to be in operation: as an electronic sculpture equipped with monitors, which did not originally belong to the composition. For a positive perspective of this “new interpretation”, see online: <http://davidsonfiles.org/paikabesynthesizer.html>, accessed 08/12/2013. The video synthesizer was built by Nam June Paik and the electronics engineer Shuya Abe in 1970 as part of an artist-in-residence stay at the WBGH-TV station in Boston.

and is tinged with sadness because the synthesizer's original function can no longer be experienced; this is clearly seen by the way the relics are presented. Conservation of material and conservation of function are antagonistic aspects and their antagonism changes over the course of time. In the case of mechanical and technical cultural artifacts, for example, worn out parts can be manufactured to correspond exactly to the worn-out original parts. Only the patina they lack reveals them to be non-original parts. In the case of electronic objects, many components fulfilling essential or complex functions can be replaced without altering the object's function as a whole. When such components are located in the device's interior, purists might argue about whether this substitution compromises the object's integrity, since the replacement parts with identical functions frequently have other forms and colors – quite apart from physical originality. We should be satisfied when functional integrity is guaranteed. By contrast, everything pertaining to the external appearance of a work is fraught with the tension that exists between materiality and functionality, and relinquishing a work's sculptural integrity is not something to be taken lightly; decisions need to be made on a case-by-case basis. It must also be assessed as a historically plausible option. What does this mean exactly? The material alteration of a work of media art that affects its sculptural appearance (and we hope that all are agreed that altering its functionality is taboo), should be carried out in a historically informed way, if the radical strategy of reinterpretation¹⁰ (see glossary, p. 601) is not pursued.

These decision-making processes require a certain framework. In the restoration of contemporary art, for example, the *Decision Making Model for the Conservation and Restoration of Modern Art*¹¹ is well established, and provides differentiated and multidimensional guidelines for making decisions. Historicity as a criterion for the correct contextualization of an artwork is one of several parameters given, and plays an increasingly important role as the gap in time increases between when the work was created and when conservation is undertaken. The artist interview, by contrast, which seeks to record both the intention of the work as well as its future treatment as envisaged by the artist and which was promoted to an almost dominant position within the framework of the Inside Installations project¹² of the International Network

10 Reinterpretation is the last and most extensive intended strategy of conservation according to the model Variable Media Projects, following storage of the components, migration, and emulation (see glossary, p. 600). Available online at: www.variablemedia.net/e/index.html, accessed 08/12/2013.

11 Foundation for the Conservation of Modern Art, "Decision Making Model for the Conservation and Restoration of Modern Art," in: IJsbrand Hummelen and Dionne Sillé (eds.), *Modern Art: Who cares? An interdisciplinary research project and an international symposium on the conservation of modern and contemporary art*, Foundation for the Conservation of Modern Art/Netherlands Institute for Cultural Heritage, Amsterdam, 1999, p. 164–172.

12 Available online at: www.inside-installations.org, accessed 08/12/2013.

for the Conservation of Contemporary Art (INCCA), will sooner or later run up against a natural temporal limit which will, in turn, historicize it.

Training in (media) restoration must take these complex issues inherent to the field into account. Students are trained to make decisions and to substantiate them both in terms of theory and in (studio) practice, for example, how to conduct a structured artist interview. But what about ascertaining the historical dimension of a work of art, a genre, or a stylistic approach? This is actually the domain of art history – of course, up to and including contemporary art. Art history provides the necessary background for understanding the work as a work of art. However, for a historical assessment of the (technical) materiality of the work media history is more apposite.

So how do the two training institutions approach the perceived necessity of addressing media history? At this point a first characterization of the study courses independent of ECTS¹³ and course guidebook may be helpful. It is not possible to compare the study courses directly anyway because their study goals and career aspirations are far too different – restorers who work independently at the Bern University of the Arts (BUA) and “preservation managers” at the Stuttgart State Academy of Art and Design. Even the design of the study course in Bern in the field of Modern Materials and Media in which interface competency takes on an ever more important role, suggests that there, too, nobody assumes any longer that one individual is capable of acquiring the entire spectrum of knowledge and competence required to preserve a complex media object with sculptural dimensions. In the Stuttgart model, a preservation manager learns the main features of preventive conservation, and is familiar with the materials, apparatus, instruments, and procedures to a degree that enables acting as mediator or decision-maker between the various specialists in museums, archives, administrative authorities, and service providers. Further, the preservation manager is also familiar with project management.

A few words about the definition of restoration activities and their designations: the term restoration in this context covers all possibilities in treating an object, in so far that it is always – and this is, as it were, the condition of the subject – reversible. The term conservation, by contrast, comprises the procedures of cleaning, storage, documentation, and so on, but not so-called invasive interventions into the object itself. The field of restoration requires more extensive training (thus, a master’s in conservation and restoration), whereas a three-year BA in “conservation” ensures sufficient qualification.

13 ECTS: European Credit Transfer and Accumulation System – the currency, as it were, for study attainment and performance. The credit points are purely quantitative indicators, which should render the study performance achieved in very different ways comparable. By contrast, the description of the individual modules permits a comparison of these study performances in terms of content. The description in terms of content, the finger print, as it were, correlates with the quantitative effort, and thus provides a kind of footprint of the studies in question.

Due to the two-year training course, the work of preservation manager is itself, even at a master's level, clearly located in the sphere of (preventive) conservation, except where a bachelor's degree was previously completed, albeit this is not a condition in Stuttgart.

Whereas the dividing line between preservation management and restoration in one of the three main areas of the master's course at the KNMDI, namely photography, can be clearly drawn and also clearly affirmed, one of the defining features in the other two special areas – audiovisual media and digital information – is that this division tends to become blurred. Thus, whereas the old information storage media as used by audiovisual media are often originals, in the main they tend to require cleaning rather than substantial treatment for which the corresponding qualified training would be necessary. With respect to audiovisual and digital media, the preservation manager is subject to fewer limitations, because these cases concern predominantly industrial products and less artistic artifacts, which are in each case unique.

For the lecturers, who are mainly responsible for designing the areas of specialization in terms of content, the training in Bern offers only a limited flexibility for structuring their teaching units, for example, greater emphasis on the humanities or sciences in order to deal with the object under consideration in an adequate way. With the modules in the main course of studies, the lecturers have a certain leeway in designing the content, but very strict limits are set for the basic studies that all specializations have to follow; this clearly affects the specialization topic of new media the most for it has the least points of overlap with each of the other areas of specialization. Specialized media history with one semester period per week over two semesters, for example, which would actually be necessary for an understanding of media art as well as audiovisual and digital archives, is lacking. To media-specific lectures, which cover the history, technology (including electrical engineering in the physics lecture!), as well as the ethics of media restoration, approximately 27 units (approx. twenty hours) are devoted which extend over a two-year period. This shows the disadvantage of the established structures and courses of the common basic studies years, which are not capable of dealing appropriately with new themes. Whatever is not covered by the lectures in the basic studies has to be integrated into the modules of the main studies, where a “close-up” perspective is facilitated with in small frameworks for dialog, which does offer certain advantages. The instruction in class (in other words, the time spent with the lecturers as opposed to individual study, which the course also demands) of a course comprising four days – depending on the way it is done – is equivalent to one, maximum two semester periods per week.

The course of studies in Stuttgart, by contrast, permits the course director to design studies as media-specific as possible, since the themes do not conflict with the other study courses. However, if one considers the

historical, and also technological spectrum of the three areas of specialization, photography, audiovisual media and digital information, then it is evident that the time limits imposed on the study course severely curtail the greater freedom in subject matter. Added to this is extreme pressure to save funds, which influences the range of choices within the study course; namely, the setting of priorities in the three fields of photography, audiovisual media, and digital information, such that the only choice left to the students is in which two out of the three fields they wish to take their semester examination. In order to collect the required number of credit points (ECTS), one has to cover almost all of them. In so far as the timetable permits, students can also attend Academy events not connected with their own course of studies. Thus, it is recommended that lectures and seminars on general art history are attended, although this is not obligatory. There is also a media-specific art history of the moving image – in one semester experimental film, in the next, video. Each of the three main areas also has its own media history, so there is an option to attend specialized art or media history for four semester periods per week over two semesters. For the technology and conservation of these media, there are separate courses in all three special areas.

Although the study program in Bern tends to be rather narrow, in terms of flexibility of content, the choices for students in all areas of specialization are better. In addition to the obligatory modules, theoretically students are free to attend modules offered in other areas of specialization – naturally, only where the schedules permit. The normal workload, however, is quickly reached for otherwise the required studio presence may not be achieved, for which points are given that cannot be offset by points gained from the seminars. For the area of specialization MMM, with a focus on media (the other area of specialization would be modern materials), modules in the field of photographic material conservation, forming part of the respective specializations of graphics, documents and photography, would be an option. Second, the medialab courses (a particularly good equipment pool in the Department of Art and Design with supervised workstations, as well as introductory and advanced courses for audio and visual processing, which, incidentally, does not replace one's own course of studies) are regularly attended by MMM students specifically interested in media; the lectures of the courses in music and media art,¹⁴ by contrast, are still too infrequently attended, even though they provide valuable complementary teaching.

Let us now turn to other aspects of the functionality of electronic media, for which a research and training institution should constitute a platform for discourse. There are limits to the extent to which analog and digital media artworks can be conserved. These limits become increasingly narrow depending

14 Available online at: www.medien-kunst.ch, accessed 08/12/2013.

on the degree of complexity of the technology employed, especially when we are dealing with technologies that have been “abandoned” by industry and which entirely evade imitation. Nobody would wish or be able to construct new scanners for obsolete magnetic or visual media from scratch, should one day the last of its kind become inoperative, even if still “un-migrated” data storage media with important contents are found. This was already anticipated for disk drives, and a universal microcontroller¹⁵ was designed, which only requires the mechanics of the disk drive, including intact stepping motors and read heads, and whose operating parameters can be freely defined and are adaptable to the specifications of the respective format. Presumably, neither would anyone wish to construct a new magnetic tape for the – depending on the estimation – approximately one hundred or more different helical scanning systems¹⁶ in existence, and which, from the beginning of analog video recording in the mid-1950s through to the digital present – served and still serve both, as memory for digital video formats from 1986, as well as for the later, no longer precisely specified digital data. A reengineering of the signal electronics between video head and demodulator in helical scanning systems is currently the subject of a joint research project being conducted by the BUA and the Department of Technology and Computer Science at Bern University of Applied Sciences.¹⁷ The aim is to completely digitally reproduce the analog demodulation in anticipation that a part of the known image errors in analog video¹⁸ can be efficiently corrected.

The tape-based recording, incidentally, may be understood as paradigm for the transition from analog to digital technologies. It combines mechanical precision and – at least in its digital formats – highly developed signal processing. It is, perhaps, precisely because of this that this technology must be superseded for long-term conservation, since it produced a generation-bound

¹⁵ Available online at: www.kryoflux.com, accessed 08/12/2013.

¹⁶ After the Quadruplex system of the first video generation from 1956, from the early 1960s the helical scanning system became the universal technology. In the latter, at a slow tape speed a writing head or reading head glides over the tape, which is directed at an angle over a cylinder in which the heads are embedded. The high head-to-tape speed is necessary so as to write or to read the considerably higher frequencies (up to 5 MHz for video) of audio signals. The helical scanning system is also used for all tape-based digital formats.

¹⁷ The idea for this comes from Florian Kaufmann, an electronics engineer, who carried out the project for the BUA as a member of the research staff, and who brought with him the necessary experience so as to carry out interventions and capture on the video recorders. The background of this is the expectation that with up-to-date technology it will be possible to gain a better signal quality and thus less signal noise than has hitherto been the case with the, in some instances, forty-year old transistor technology. The project to be carried out in 2013. A contribution by Florian Kaufmann is included in the present publication, this volume, pp. 273–284.

¹⁸ See Johannes Gfeller, Agathe Jarczyk, Joanna Phillips, and Irene Schubiger, *Kompodium der Bildstörungen beim analogen Video / Compendium of Image Errors in Analogous Video (KUNSTmaterial 2)*, Swiss Institute for Art Research (SIK-ISEA), Scheidegger & Spiess Zurich, 2012.

specialist knowledge destined to fall into oblivion once the corresponding industry no longer required it: it is too comprehensive to be further handed down, in a concentrated form, together within the framework of a training in restoration. By contrast, the operation of these devices, in so far as they still function or can be kept operable with an acceptable degree of maintenance, can be taught. For the migration (see glossary, p. 601) of collections or archives, the mastery of these technologies, together with their selective modernization, continues to be indispensable. With the discontinuation of precision engineering components of helical scanning systems over the next ten to twenty years, the problems will by no means be solved, especially because one cannot really refer to a discontinuation: no less than the hard disks that are becoming increasingly smaller while their capacity continually increases, the tape drives for the long-term archiving of digital data continue to be based on the further development of microengineering. Thus, the gap continues to widen between the claim of sustainability and technical feasibility. Even in the field of pure technology, which, especially in telecommunications and digital media has long since referred to itself as microelectronic, the limits of the feasible with respect to the possibility of repairs – which manufacturing has long since ceased to regard – have been reached.

As a rule, for the sculptural appearance of a work, the technology of the information storage and processing briefly outlined here is of marginal importance and can be functionally “decommissioned” while more modern components take over their function.

By contrast, for the interface between the work of art and the human (visual) organ of perception, another technology, the display, is crucial, since it joins together several sculptural and material attributes which are fundamental for the authentic appearance of the work. Whoever thinks now of the archaic tube monitors now is on the right track – although they are thinking too simply. From now on, we are no longer simply dealing with the materiality of the displays, with its “shining light,”¹⁹ but also with its aspect ratio. 4:3 or 16:9 may seem like so much hair-splitting in the context of a comprehensive discussion about media restoration and training in this subject. What further compounds the problem is the fact that fetishization of the cluster of digital concepts, the screens of digital works, along with their materiality, tends especially to disappear off the radar in discussions about issues of conservation, since they “only” render visible the surface structure of the code, but do not, in fact, have anything to do with its deep structure.²⁰ And yet it is they

19 For over half a century this special form of light source brought light to the people of industrialized countries, often for hours – indeed, a light therapy, albeit with an unstated objective, but only slightly varied form: from a rounded to a strictly rectangular contour.

20 The transition from “original” to copy in the same medium was paradigmatically performed by way of a group of works by the artist Herbert W. Franke as part of the exhibition *Digital Art Works. The Challenges of Conservation* (ZKM | Media

who locate the analog or digital work in its historical context. They continue to be a window on the work, even though they are no longer perspectively comprehensible, as is the case with Alberti²¹. Their replacement is as problematic as the installation of modern windows in historical buildings – or, to stay in architectural parlance, by “demolishing” old monitors, one generates homeless works. However, in their new *homes*, they remain strangely uprooted – *homeless*. And “crimes” are committed against them: how otherwise, when not as a kind of “mutilation,” could the rescaling of a video image be described, after all by around 33 percent, when a work has been previously shown with an aspect ratio of 4:3 – the until recently common and in the 1960s valid TV aspect ratio – but is now shown in 16:9 because the edges of the new screen would seem to suggest this? This would be comparable to turning an El Greco into a Rubens! Thus, it would be important to adjust the aspect to 4:3 in the screen menu. And yet the two dark lateral strips which necessarily appear with the correct adjustment are obviously considered more scandalous than completely distorted images. Even electronic pictures are cultural artifacts worthy of conservation – indeed, in their appearance and their aspect, and not merely as archival documents.

What is a course of studies capable of achieving in this context? Elucidation, and once again, elucidation: to point out unacceptable examples, to show what is possible, and, ideally, to show how to do it correctly. However, this “right” is not guided by the personal preference of the conservators or curators, but can be historically researched and is finally verifiable, similar to the study of sources in historical studies. The historically informed presentation of video art, as has been developed in Bern over the last ten years in the project *AktiveArchive*, may by all means be transferred to more recent digital works of art. The effort is not insignificant, and there are other restrictions than in the predominantly analog world of video art. It is precisely these limits that the research project *digital art conservation* investigated, as did the research project *Analogien des Digitalen*²² attached to it. With the means available in

Museum, Karlsruhe, October 29, 2011–February 12, 2012; Espace multimédia gantner, Bourgne, February 25, 2012–April 28, 2012; CEAAC, Strasbourg, June 16, 2012–September 23, 2012). While a monitor reproduced the graphics in a genuine resolution, since it was calculated in real time, another similar work on an identical monitor next to it could be seen as a recording with visibly lower resolution. A good example of how close, especially in digital art, work and documentation can stand next to one another. However, a first lower, almost concealed media change lies in between – and it will not be the last in the long-term conservation of the work of art.

21 In his treatise *Della Pittura* [On Painting] from 1435/1436, Leon Battista Alberti compares the picture (i.e., painting or drawing etc.) to a window (on the world). This window is to be thought of as a cut through the pyramid of vision, the widespread model for human vision in which the eye forms the pinnacle of human vision. Leon Battista Alberti, *On painting: a new translation and critical edition*, translated by Rocco Sinisgalli, Cambridge University Press, New York (NY), 2011, p. 39.

22 *Analogien des Digitalen: Von der Fallstudie zur allgemeinen Erhaltungsmatrix*

the project *AktiveArchive*, I was able to fund a large collection of historical monitors over a ten-year period, which were used within the context of the exhibition.²³ Among others, students were involved in the project so the return flow into teaching was assured. An independent research project focusing on the maintenance and conservation of tube monitors and projectors is envisaged in various forms, but has yet to be carried out. Without doubt, such a project must above all include the engineering technologies, which would certainly lay within the scope of a course of studies in media restoration.

In Stuttgart, a study collection for tape formats and historical monitors is currently being built up. The *de facto* insignificance of the 4:3 aspects for the commercial sector caused the price for relevant used monitors to drop. Hence, this is the perfect time to purchase a sufficient amount of cheap monitors for the historically informed presentation of electronic works of art. In this connection we also ought to consider the tube monitors for computers: a bold prognosis may be made, that these will descend into oblivion even faster than the video monitors – the race is on (unfortunately). Whereas television sets and monitors can (still) be connected to the composite video signal that had been used since the 1950s, and which is still valid, it is especially the older computer monitors which are more closely attached to the specific generations of graphic cards and drivers, both with respect to the signal as well as the mechanical form of the ports. And, as if this alone were not sufficient grounds for their rapid disposal: unlike a TV set, for example, they were never a status symbol, and any possible emotional connection was extinguished, at the latest, with the delivery of the successor model. Such considerations are in any case invalid in the commercial sector: here, such monitors are either disposed of immediately or else shifted to another part of the world.

These two topics should be of importance in training courses in media conservation: embedding one's actions in the correct artistic, cultural, and technological backgrounds, as well as maintaining functionality technically. Historical embedding is meant to ensure that in the technical and frequently necessary transformation of electronic works of art, it is not feasibility that is the guiding principle, but the integrity of the work – also in its historical readability. This could be conceived as a containment of the engineer's desire to create something new, even if "only" within the frame of an existing work.

medialer Kunst (2011/2012), was the title of a BUA research project directed by the author and funded by the Swiss National Science Foundation. This project focused on the conservation of electronic cultural artifacts with a special focus on the transition from analog to digital technologies.

- 23 For example, for the large-scale exhibition at the Museum of Art Lucerne, see Irene Schubiger (ed.), *Schweizer Videokunst der 1970er und 1980er Jahre. Eine Rekonstruktion/Reconstructing Swiss video art from the 1970s and 1980s*, exhib. cat., Museum of Art Lucerne, 2008, JRP Ringier, Zurich, 2009. Exhibition, symposium, and catalog were produced as part of the research project *AktiveArchive*. Over 30 different tape formats, all entirely incompatible with each other, also form part of the collection.

However, this does not apply if the transfer parameters have been properly defined. Ample provision is made for creativity in solution finding, though this must be historically and aesthetically determined: a process that restoration training in the field of media must address, in close collaboration with, and including, engineering. Yet to be able to achieve this, a number of habits must be given up. These concern established (thought) patterns. In restoration, including training, art technology is unthinkable without a modern laboratory directed, as a rule, by chemists: from petrological analysis to bonding agents and pigments to examining mechanisms of degradation in synthetic polymers research is conducted at a high level. In Bern, the proposal to engage a highly qualified electronics engineer with sufficient knowledge and independent experience in the field of media art and media technology with a (small!) quota of teaching, as proper pendant to the art technology laboratory, is an idea that has not yet come to fruition. Unfortunately, the same can be said of the situation in most of the museums, where those responsible for the conservation of works of electronic art are not really trained for the task. One might reasonably object that the preservation of a work of electronic art is not solely a technical question – and the present essay explicitly endorses this view. And yet, there is no institution worldwide in which an electronics engineer is responsible for the conservation of paintings, sculptures, or graphics, unless, that is, the person in question happens to hold a second qualification in restoration.

A master's course of Advanced Studies in Preservation of Digital Art & Cultural Heritage (MAS PDACH) at the Bern University of the Arts (BUA) is still at the project phase. The website provides more detailed information about the degree.²⁴ With the exception of the director, the teaching staff has not yet been announced. In addition to the broad cultural and historical background the orientation is relatively strictly focused on the conservation of software of complex media objects, especially in net art. Should the already foreseeable evident trend in art, away from pure source code and back to the haptic joyfulness and free use of the most recent digital micro-controlled technology used to steer kinetic, visual, or acoustic processes continue – and several signs point in this direction²⁵ – then the MAS PDACH would also only be in part preparation for preserving a wide spectrum of digital artworks. Within the

24 Available online at: www.pdach.ch, accessed 05.11.2012

25 For example, as part of the Shift Festival in recent years in Basel, as well as in rather “unlikely” places such as the Documenta 13, more Arduino microcontrollers were to be seen as net.art. Arduino is an open-source project (see glossary, p. 601) and is based on the development of environment processing and wiring designed to make access to programming and to microcontrollers easier above all for artists, designers, craftsmen, and others who are interested. Arduino is also used a great deal by art academies for the construction of interactive installations. Available online at: www.arduino.cc, accessed 08/12/2013.

framework of the *digital art conservation* project it would only account for one third of the digital works, whereas for the rest, solutions for hardware conservation and engineering would also need to be found.

To be fair, one must also mention that the difficulties listed also apply to the course of studies in Stuttgart, which until now – at least in photography and audiovisual media – only provided the possibility, in-house, of practice in production, though not in conservation. With the new occupancy of the chair for the Conservation of New Media and Digital Information, the following is planned at the Stuttgart State Academy of Art and Design: from the practice-deficient training during the lecture-intensive period of the first year, the development of a study collection (of media as well as equipment and installations) will provide a transition to a mixed form of studying theory and in-house practical work. To date, this has only been realized in the special area of digital information (for example, through participation in competitions) and from spring 2012 it will also be instituted for audiovisual media (which used to be focused on video and has now been extended to include audio). Since fall 2012, in the field of video, a large part of the historical and all modern digital formats (although without HD), as well as almost all important analog formats extending back to the late 1960s are available and can be digitized, uncompressed, with the highest level of quality. Several selected analog and digital audio formats in studio quality complete the spectrum. There is also sufficient material available for simple works of installation. For photography and film, the teaching methods are currently being developed; these are directed toward the practical teaching of simple processes of analysis, but also the digitization of different materials, including calibrated workflow. The course of studies thus takes what is feasible to the limits, given the current personnel resources and the space available. Although studio activities are desirable, this can only be realized in the basic studies (BA and MA). This is the express wish of the conservation and restoration specialization; however, this cannot be realized yet (status: summer 2012) for financial reasons. Thus, we are currently making a concerted effort to seek and find external funding, particularly as part of research projects. Also in this context we are rigorously pursuing the goal of integrating engineering more into the curriculum.

The potential of the Stuttgart course model as part of an undergraduate course would certainly be substantial. Compared with the study course offered at Bern, the media-specific teaching is very good, but there are deficits in practical training. By contrast, the institutional networking of students because of the many lecturers who come from public institutions or companies is a considerable advantage. At the Bern University of the Arts equally great potential would lie in liberalizing the setting of priorities in favor of media modules. But their program would then have to be supplemented, which would be at

the cost of the material modules (within the specialization Modern Materials and Media). Strangely, the reverse is the case; the media modules can be replaced by courses from other areas of specialization, and such that the defined and accredited compulsory modules are, in fact, not compulsory for all²⁶. From the viewpoint of a media curriculum, the current situation in Bern (as of summer 2012) can be summed up as follows: insufficient media-specific input in the basic studies; less than half the modules in the main studies from the third year explicitly relate to media. One definite advantage to be noted, by contrast, is the possibility for students to concentrate from the outset on the studio projects on media. In practice, however, this is scarcely done since the overwhelming majority of media students only make the transfer to the specialization in the second year. The fact that this specialization exists at all, or what its function is, is acknowledged by many only once they have already spent a considerable amount of time at the university. Compared to the usual “career” or training in the field of restoration of paintings, graphics, or murals with a pre-study vocational practical, this often results in a time lag for specialization in media of up to two years. Thus, five years of full-time studies in Bern are not really five years study in media restoration, but three or even only two if one counts the media-specific student working time. Naturally, this is not a statement about the “uses” of other remaining time which may well occur, and, depending on career aspiration, may offer a more wide-ranging qualification. But has a broadening of existing specializations also been proposed? In other words, additional modules from another area of specialization would come at the expense of the planned core competence. By contrast, according to definition, the two-year master’s course in Stuttgart can specifically build on the “media bachelor” – thus, in the end, one part of the practical education, though not in the field of conservation in a narrower sense, would be indeed part of the training. However, this media bachelor has yet to be more closely defined, and neither is it a condition for admission to the course of studies.

Further studies in the conservation of audiovisual media can also be pursued at the Hochschule für Technik und Wirtschaft (HTW) in Berlin within a bachelor’s program – as part of the excavation technology major. It is possible to specialize in the restoration of technical or archaeological cultural artifacts or of photographs, films, and data storage media, as well as excavation technology. The prospectus does list some classes in audiovisual media, but these are rather marginally represented – especially electronic media,

26 A one-sided “studio regulation”, which has either until now been overlooked by the department, or is still tolerated. This shows itself in that students of the specialization MMM may replace the media modules by modules from other areas of specializations as they wish. On the other hand, it is not possible to substitute the material modules by other BUA units better adapted to the interests of the students, for example, from the media areas or the study courses in music and media art.

whereas photography and film are staples. But it is precisely the training in film restoration that is worth mentioning because it is something of a rarity.²⁷

A promising alternative to the study programs in Bern and Stuttgart is currently being planned at the University of Amsterdam: synergetic effects should emerge from a collaboration of the two master's programs entitled Conservation and Restoration of Cultural Heritage and the Preservation and Presentation of the Moving Image, and there are also other new courses such as a Media Art Conservation and Restoration Training Program. As in most cases, wishes and financial possibilities diverge, and Amsterdam is no different; a meaningful relationship of already existing courses and those still to be created has yet to be achieved.²⁸

There is no doubt that media restoration faces great challenges. It must seek to shape itself into a course of independent training with a comprehensive curriculum. The points of contact with the traditional courses of studies in conservation and restoration ought to be aimed specifically at necessities, and at the same time it has to distinguish itself from established study courses. Neither in Bern nor Stuttgart was there a real *tabula rasa* situation which would have allowed the setting up of a fundamentally new curriculum. Not that this would necessarily have been crowned by success, since experience was lacking. Now that we do have experience, it is time for the new media to come into their own. What this entails is a consecutive or fundamental, five-year program in media restoration as well as a focus on the full range of technical media. Such an objective is debatable, however, in view of how much space chemical-optical media, photography, and film, would occupy in a curriculum of this kind in the future (and if at all). Digital convergence, namely, the fact that in the future all content, even of chemical-optical media, will be predominantly preserved in digital form, for the time being, or rather once again, justifies seeing it within the context of electronic media. In this connection, the term electronic media is intentional, since digital technology is a subdomain of electronics, which is, naturally, also confronted with processes of degradation.²⁹

Thus, between the traditional technical media of photography and film and the really new media, understood as digital, is the area of electronics which, as a technology, forms the basis of media (with the above-mentioned

27 Available online at: www.htw-berlin.de/Studium/Studiengaenge/Studiengang.html?courseID=815, accessed 08/12/2013.

28 Information status as of summer 2012: the scheduled start of the program is September 2013. The following website will probably contain more detailed information or a link: www.studeren.uva.nl/ma-restauratiekunde, accessed 08/12/2013.

29 Processes of degradation are, per definition, of a gradual nature: digital degradation does not actually exist; at most there is an excess of a tolerable number of memory or transmission errors.

exception of the chemical-optical). Proficient knowledge in analog as well as digital electronics is indispensable when questions relating to the conservation of works of art based on such technology are to be assessed competently. Such competency of judgment, which presently lies entirely beyond the discipline (namely, of conservation and restoration), must be integrated into the training and be accorded greater importance. In this connection, electronic media art – here not in a narrow sense – ought to be considered, to which, in a historical perspective, also belong advanced forms of computer-controlled works of art. Here, the material sciences should be included in a goal-oriented manner, and such that the physical integrity of the works is not only guaranteed from the standpoint of electronic functions as part of conservational measures.

Close collaboration at the technical basis of the new discipline with electronics engineering is indispensable. This collaboration may be compared to the relationship between the traditional specializations of restoration or, respectively, art technology and the natural sciences, particularly chemistry. In the tensions between the two poles of conservation and engineering, the apparent antagonism between analog and digital technology is no longer an issue: works of art are physical, namely, they have a hardware basis. This is comprised of analog as well as digital elements. The analog elements are subject to aging just as much as the digital ones – although the latter, unfortunately, frequently age with a *digital cliff*, namely, they function (still) or they do not function (any longer). Thus, considered from the point of view of its technical basis, the term “digital restoration” is actually highly questionable. Reference should be made instead to the “restoration of digital objects”. These may be both physical, thus, hardware-based, as well as virtual, namely software based. In that all software requires a material basis, a purely virtual work of art does not exist. However, virtuality may well be a key criterion. In this context, there exists both an interface between conservation and media design – with the selection of conservation tools, just to remain close to contemporary production tools – and between conservation and media theory, where the term *time-based arts* plays a central role. The conservation of electronic media must be grounded in terms of media theory, since only sound knowledge helps to avoid mistakes in the process of selecting conservation measures. Furthermore, with key terms such as digital culture and media archaeology, which are not exclusively oriented on the history of technology, media theory provides a theoretical superstructure for a technical basis. In this respect, in future courses in media conservation the extremely ambitious claim of combining the humanities – understood in a modern sense – with a well-founded knowledge of engineering or in-depth insights into the same, will be realized.

Conservation: A force to employ (or deploy?) in an art school

Francisco Ruiz de Infante and Jérôme Thomas

(in collaboration with Anne Laforet and Pierre Mercier)

With an Introduction by Otto Teichert.

“[...] However, one soon feels one is stuck in a pretty, golden cage, with little movement in or out [...].”¹

As if almost everywhere it is accumulated technological progress and highly sophisticated equipment that initiate the action, the stage entrances and exits.

A theater choked by its own paraphernalia.

As if instability could always be prevented or reversed because it had been foreseen, and averted mechanically.

As if these were devices whose circuits could be endlessly extended, but at the same time were closed in on themselves. A barely human mass of actor-spectators, performing ritual sacrifice to something inexorably reified.

The issues: perfect reproducibility practically guaranteed. Wide distribution assured. Until the next inventory is taken and the entire stock of machines updated.

A nightmarish dilemma or an opportune reappearance: a choice between the trace – truer and better performing than the original – or reinterpretation of the original, with the possibility of infidelity.

It is partly this problematic, which questions the origins of a work, the narratives that make it up, and their possible transmission over time, that the research group at the École supérieure des arts décoratifs (ESADS) in Strasbourg – Arts Hors-Format – has engaged with since our institution became involved in the *digital art conservation* project.

And has permitted itself to explore such peripheral issues as arose, whether they were intrusive, provoked, or actively desired.

1 Extract from *fanzine-archive*, a publication founded in 2012 by a group of ESADS students, following a study visit to Berlin and the digital art festival Transmediale (February 2–5, 2012).

What phenomena (forgetting, hybridization, intensification of reality, etc.), what temporary stability and invariables must a work of art take into account if it is to perpetuate its “own” energy, and if necessary, ensure its historicity?

What understandings, misunderstandings, and contradictions do these combinations and recombinations support and transmit? Is the malleability of meaning, and of the processes involved, compatible with recycling?

“[...] Is it reasonable to come across a Cézanne still life when looking for images of fruit on a search engine? [...]”²

Where is the nub of the matter?

Is it always at the center ?

ESADS, which is now part of the Haute école des arts du Rhin (HEAR), does not offer courses specifically covering the conservation and restoration of works of art,³ still less of digital works. It was precisely this absence of a binding formal structure that enabled a group of students (very diverse, but sharing a curiosity and a liking for “time-based art forms”) to take ownership of the issues that arose while they were involved in the *digital art conservation* research project.

By collectively reformulating those processes of interrogation, and putting them to the test as they designed and completed projects that were predominantly collaborative, the group developed an expertise that brought them together and which continues to grow. HEAR has been permanently “infected,” and, it would seem, for the better.

Those students must be thanked for their contributions, as must the teachers – artists and theorists⁴ – who, in giving them their support, also participated actively in this research.

And our gratitude goes to our partners in this project, funded by the European Union, and to all participants who contributed and enriched it.

2 Ibid.

3 Two state-run art colleges in France offer specific courses in conservation and restoration: the École supérieure d'art d'Avignon (ESAA) and the École supérieure des beaux-arts de Tours-Angers-Le Mans (Esba TALM), Tours campus. They have cross-disciplinary research units. See online: www.esa-avignon.org et www.esbat-tours.fr, accessed 8/7/2013.

4 Jérôme Thomas, Pierre Mercier, Francisco Ruiz de Infante, with additional support from Anne Laforet from June 2011, and the students (who have since graduated): Mohamed Tayeb Bayri, Dounia Beghdadi, Paul Guilbert, Thomas Labouygues, Félix Ramon, Valentine Siboni, and Kevin Senant.

At a time when archives and documents are of increasing interest in the field of art and have a permanent place in art education, its association with the *digital art conservation* project has made HEAR aware of the exceptional opportunity offered by immersion in this interdisciplinary research project.

Besides the professional perspectives, and the expectations that went with them, the project succeeded in preserving a method of working that was unusual, open, and self-managed⁵.

Otto Teichert

Conservation: A force to employ (or deploy?) in an art school

In this text, we propose to discuss and analyze the questions that arose at École supérieure des arts décoratifs (ESADS), Strasbourg – now a part of the Haute école des arts du Rhin (HEAR) – during its participation in the *digital art conservation* research project.

We will consider some of the issues that were addressed in the course of the project and explain how the positions we took in the different working groups evolved. We also want to describe, on the one hand, the always productive moments of doubt that we experienced during the past three years, and, on the other, to draw the possible lessons from that experience for the future of the school.

As we shall see, the desire to involve students actively in the development of our thinking led us to make some unexpected changes of direction when we began to introduce, in a school such as ours, the very broad and complex concept of “conservation.”

Very early on, and in the light of what emerged from discussions with the students in various research groups at ESADS, we decided to broaden the strict definition of the conservation of digital art, so that it resonated with other arts that do not have a firm temporal structure, for example, performance, dance, in situ installations, or happenings.

Our intersecting ideas about technology, the body, the spatiotemporal context, ethics, and sometimes even the poetics of the idea of “permanence” led to very fruitful results.

To give a clearer idea of the context of our work at ESADS, we should say that nine teachers at the school (artists and theorists associated with courses

5 A number of the students and young artists involved in the *digital art conservation* project are pursuing several lines of research related to the project within a new community-based framework: PEZ-corp, see online: www.pez-corp.net, accessed 2/5/2013.

in Art, Communication, and Design/Scenography)⁶ took part in the project, with varying degrees of involvement over the course of our research.

It is also important to realize that, in a project lasting three years, the students who took part in the different events were not always the same ones, sometimes because of the nature of the proposals that emerged, but above all, because of their individual priorities and their plans after graduating and leaving the school. Nevertheless, from a purely “number-crunching” point of view, over sixty students have been involved in the activities and discussions that have formed part of the project since 2010. They come mainly from workshops in theatre design, web-based graphic communication, and especially from the Arts Hors-Format (“free-form art”) research group,⁷ which, because of the nature and scope of its work, was considerably strengthened at the theoretical level by its participation in the *digital art conservation* project. A permanent core of seven students and three professors⁸ was created at an early stage, in order to provide continuity. It was largely their energy, responsiveness, and constant work that made the student project viable.

All those meetings, discussions, experiments and creative work have shown us that the team of students and teachers who took part in the *digital art conservation* project realized the importance of asking every question – formal, conceptual, technical, historical and even metaphysical – raised by the conservation of digital artworks.

A dialectical relationship: Historicity and conservation

It's May 2009, just after our first conversations with our partners in the *digital art conservation* project, and we're asking ourselves how we can ensure that the project will be productive in a school whose primary orientation is towards making art, and not, therefore, towards conservation. 2010 begins, and the work involved in

6 Jérôme Thomas, Anne Laforet, Francisco Ruiz de Infante, Pierre Mercier, Eléonore Hellio, Philippe Lepeut, Jean-Christophe Lanquetin, Bruno Tackels, and François Duconseil.

7 The ESADS Arts Hors-Format research group is made up of artist-professors, theorists, visiting artists, and students. Together, they devise artworks that are not truly immaterial, but are not objects that are measurable by weight or dimensions. The group has formed, dissolved, and re-formed every year for over ten years, experimenting with ways of creating, transmitting, and analyzing the meaning of instability. In Arts Hors-Format, time, space, image, text, sound, the body, and relationships with technology are assumed to be unstable and malleable. Free-form attitudes and works are consciously and deliberately updated to meet technical, social, economic, thematic, and/or physical environments, constructed or already present, in order to reinforce, subvert, or combat them. In free-form works, the spectator's presence is central and goes hand in hand with the conscious problematization of the processes of production, dissemination, and conservation.

8 See footnote no. 4.

explaining and developing the project proceeds slowly... We visit ZKM | Karlsruhe, and read various texts and pieces of documentation.

After our initial meetings with the students, at which we outlined the different areas of work, we soon realized they were living at a time of ever-increasing connectivity and constant accessibility via electronic communication systems. We understood that in a general way, young artists (those at our school, at least) belong to a generation which, via the Internet, is developing an immediate relationship with nonhierarchical information, and that for the most part they use information technology in the “present tense”: everything happens “now.”

As we had expected, the students in the first working group were still relatively unaware (or not directly aware) of the physical fragility and rapid obsolescence inherent in any application of information technology. They had not really thought about “conservation” in relation to their own art projects, and had limited themselves to creating documentation that was sometimes very basic, and to archiving their data, in the form of back-ups and copies, in a rather negligent way.

We began our work by establishing the basic outlines of an analytical seminar directly linked with the case studies proposed by the partners in the project and designed to form part, in late 2011, of the exhibition *Digital Art Works. The Challenges of Conservation*. Works by artists, who included Hervé Graumann, JODI, Jeffrey Shaw, Nam June Paik, Michael Naimark, and Marc Lee, were the subject of the case studies (see this volume, pp. 312–518).

However, that line of research proved difficult to pursue. The students were dubious about work they thought was too “geeky” and “too closely linked with concerns about heritage.” They understood what the issues were, but, as young creative artists, they felt that the problems being addressed were too far away from their own concerns. Weeks passed before we were able to put together a solid group, once we had found different angles of approach from the ones we had first envisaged. Was it a matter of convincing people? No, it was simply one of exploring areas of study that were closer to the act of creation itself, in order to create a genuine awareness of the enormous and long-standing problem of preserving in perpetuity works of art that are in great danger of disappearing and being forgotten from the moment they are created.

But before we could make a real start on this research with the students, we had to understand and define *together* our “area of study,” as well as giving substance to our first ideas about what conserving a digital artwork might mean; at ESADS, it was impossible to “parachute in” to a project that was highly institutional, and to make it work in an experimental way over a period of three years.

In order to move forward we had to reinvent the “specifications” with the students, and bring it to life. We had to know about and analyze critically

some existing conservation strategies to learn how they are sometimes in stark contradiction to the original wishes of those who made them, with the often “contextual” nature of many works, and with their relevance, if account is taken of when they were made and the technology available at the time. We also needed a better understanding of the points of view of museums, collectors, institutions, and artists with regard to the historicity of works often hidden in boxes, or in view of the more or less generally accepted “impossible historicity” of other works deemed too difficult to preserve.

After many discussions around these topics, we saw quite clearly that the historicity of works of art in general, and digital works in particular, is intimately connected with the conservation strategies applied to them. The rapid technological obsolescence of these works complicates the task of giving them a physical presence in art history that can be corroborated by their being held in museums. In the digital arts (but not only there), the strong, widely attested, connections between historicity, ease of conservation, and market value contrast strongly with the fragility of major works which are often very quickly reduced to descriptions of the ways in which they are experienced that are more or less imaginative. These links between historicity and conservation are complex, technically as well as ethically, and we must say here that nowadays they appear to concern the institutions who “own” these works more than they do artists.

It is a well-known fact that artists frequently lack the technical knowledge to maintain their earlier creations in working order, and when the opportunity arises to exhibit an older work, they choose “just” to make changes to the work, sometimes radically altering its form and, as a result, distorting its original meaning.

It has to be emphasized that at the beginning of the project, our students accepted, theoretically at least (and often naively) what seemed to them irremediable: the gradual disappearance of technical equipment, the obsolescence of the systems involved in making an artwork, and the idea that a work can exist only for as long as it withstands the effects of time. However, after the seminar had been running for a few months, and following this approach to the concept of historicity, set against (or alongside) that of history, our students began to feel much more involved as creative artists.

Why should their own work be spared a fate that was obvious? What position were they to take towards their “death foretold”?

Insert no. 1: In September and October 2010, several members of the group took part in the *Nuit Blanche Metz* program, with a networked audiovisual project, *Pontoon Effect*. An “ephemeral” work?
The issue of how to conserve this work/event kept haunting us, and a surprising answer emerged a year later.

**Open minds, multiple meanings, and visits:
from resistance to energy, from fidelity to infidelity.
Presenting results.**

Now it's late 2010, and the students attend presentations at the symposium *The Digital Oblivion. Substance and Ethics in the Conservation of Computer-based Art*, organised by ZKM | Karlsruhe as part of the *digital art conservation* project. Some of them are more like casual visitors but they soon become engaged by the different approaches to the “problem” and by the people presenting them. This series of meetings marks a major turning point, giving the research group cohesiveness and offering us innumerable new research themes. In the development of the project at ESADS there is a clear division into the period before and the period after the symposium.

January 2011. Students' resistance to the idea of conservation turns into an energy that has led us to question in a practical way the meaning of that highly polysemic word. We try to understand the consequences that every possible meaning might have if it is introduced into a work of art in progress. Quite quickly, the word begins to be applied to fields that are on the face of it rather remote, but which have surprisingly similar problems regarding perpetuity: digital art, time-based, and the performing arts. The scope of our research has thus grown dramatically, and the number of students and teachers involved in the project has increased considerably.

The progress and increasing complexity of the project brought to light three closely connected strands of thinking and action:

1. Documentary (interviews, fanzine, website, and study visits).
2. Creative (producing works which were always going to be difficult to conserve).
3. Methodological (organising and curating exhibitions and public events, especially those associated with the second colloquium, entitled *Digital Art Conservation. Practical Approaches: Artists, Programmers, Theorists*, held at ESADS in November 2011).

In the light of the key question: “At what point is the concept of a work betrayed if some of its elements are changed?” our discussions and activities were enriched by a host of new questions.

Very quickly, the notions of version, interpretation, translation, appropriation, repetition, reincarnation, revision, development, transposition, quotation, modification, instrumentalization, and adaptation stirred up and complemented the thinking about conservation, perpetuation, documentation, and notation which had been our starting points. In that way, the complex



Pontoon Effect
2010

Audiovisual and performative art project of a group of young artists of the ESADS Strasbourg (directed by Francisco Ruiz de Infante; coordination: Paul Guilbert), presented at *Nuit Blanche Metz*, September/ October 2010
Photo © ESADS Strasbourg
Photo: Francisco Ruiz de Infante

idea of “fidelity” gradually became central in leading us, more precisely and accurately, to the concept of “infidelity.”

At that point, a new group of professors and students joined the project and a seminar entitled *Infidélités Don Juan* was organized. It offered important and unexpected shifts of ground on the subject of conservation, offering “indirect visions” in relation to the performing arts or time-based art forms: audio, audiovisual, performative, interactive, etc. This was a cross-disciplinary seminar, covering Free-form Art and Theatre-making and focusing on the mechanisms of artistic creation and on the development and persistence of a myth through the ages. The seminar attempted to place its subject matter metaphorically in parallel with that of the conservation of art works. In order not to be excessively abstract, given the vastness of the terrain, it was decided to work in a more detailed way on a familiar myth: the myth of Don Juan.

Taking as a starting-point that archetype and the wide range of works in which it appears, including those by Tirso de Molina, Molière, Lorenzo Da Ponte, Mozart, Peter Handke, Fragonard, and many others, we were able to study the unstable nature of a story, the variants, and the variable interpretations of a work, and to do this across different forms of expression: text, music, installation, film, photography, stage performance, network art, and so on.

In the discussions that followed, the notions of betrayal, lying, simulation, and simulacrum were all “at work.” We needed to gain a thorough understanding of a fundamental idea: the longevity of a myth is often hidden by the ways in which it is constantly being hybridized, updated, and infused with new life.

Without our wishing to eliminate all the ethical, physical, and technical problems of conservation, a new question emerged: Might not processes of hybridization, updating, and translation offer digital art a real hope of survival?

While we still attempted to create exchanges between thinking and creating, it was through the many experiments on the part of the members of the seminar that this analysis evolved and bore fruit in a wide variety of works: readings, stage presentations, audio productions, video films, networked performances, and so on. All this work was presented to the public at some stage, and we tested and compared the different forms of relationship

with audiences in order to feed back into the various subjects being studied, since a one-to-one relationship is an essential element of our research at ESADS. We were thus able to understand and analyze some subtle links between digital art and theater.

Outside the classroom, in the two *Ateliers Déplacés* (“travelling workshops”) organized in Strasbourg in 2011, first at the Centre européen d’actions artistiques contemporaines (CEAAC, Strasbourg) in February, and then, in May, at the Pôle Sud theatre, Strasbourg, as part of the *Nouvelles Scènes* festival, we offered some highly sophisticated opportunities for people to meet and exchange ideas:

These included pop-up exhibitions, dinner with a performance, an audiovisual opera with gaps, cabaret, and a “video triptych festival”, as well as several “round tables”: a very specific type of table which later became an installation in its own right.

Insert no. 2: An invitation to take part, in April of that year, in the international program *Les Jeudi's* at the Centre Georges Pompidou, Paris. Part of the working group chose to address, in situ, using happenings and performance, the notion of the aura of a work in a museum. That activity enabled us to develop our thinking on the historicity and mythic character of certain works of art.

The students who took part in the seminars remained (as creative artists) acutely conscious of all the issues, and they felt intimately involved: they thought and argued passionately about the meaning of each new word that was used and which made it possible to establish experimental protocols for producing works.

To remain focused, the working groups made use of an increasing number of shifts between concepts that were related to a greater or lesser degree, for example: restore/conservé, document/archive, show/interpret. We thought it would be possible to introduce all of these conceptual shifts of meaning from the very moment a digital work was conceived.

Presenting results to further enrich the debate

From September to November 2011, work proceeded at an even faster pace. ESADS organized the second colloquium with the title, *Digital Art Conservation. Practical Approaches: Artists, Programmers, Theorists*.

A solid core of students and teachers worked through the summer to meet the challenge; some students who had already graduated remained associated with the research groups to preserve consistency with the work that had already been done, and they completed a number of the works that had been seen and studied as prototypes during 2010–2011.

Insert no. 3: In parallel with the above (in October–November), the seminar *Infidélités Don Juan* included the act of “transmitting” a key piece in the career of the Spanish choreographer María La Ribot, *Laughing Hole*, which she had devised and presented at the Basel festival in 2006. Three young female dancers and a musician revived the piece under the direction of the original performers, who included La Ribot herself. Our working group tried to obtain a better understanding of the techniques for perpetuating performed works that is closer to the oral tradition than to concepts such as those of a score or a remake.

With each new field of study (proposed, integrated, or added), our glossary on conservation continued to grow substantially. Sometimes we stayed close to the strict definitions of the *digital art conservation* project (transmission, emulation, capture of behavior, compression, simulation, reprogramming, porting, back-up, hardware preservation, etc. [see glossary, pp. 600–602]) and at other times we engaged in dialog with other processes (transmission, capture, domestication, revision, recycling, dumping, pruning, etc.). At times it was not easy to make ourselves understood to our partners. Nevertheless, in the working groups, we knew that each new concept opened a door – theoretical, poetical, or eminently practical – to the potential creation of a new work. Among the activities that took place in the course of the colloquium, the exhibition, *Actes Infidèles / GreenKey*, in different locations within the school, reflected progress along the various strands of research taking place at ESADS. It included the creation by the students of works which questioned the notion of conservation from several points of view, video recordings of students’ interviews with artists including Rosa Menkman, Vicki Bennett, Vito Aconcci, Robert Cahen, and others, and an evening with film screenings and performances devised in the different working groups.

And afterwards?

In late 2011 we analyzed the elements that had emerged from the second colloquium and visited ZKM | Karlsruhe to see the first version of the exhibition *Digital Art Works. The Challenges of Conservation*.

By 2012, several courses forming part of the school’s official program had introduced the issue of conservation in one form or another. The seminar *Infidélités Don Juan* continued to introduce new issues: resonance, multiple points of view, etc. And in response to interest on the part of some teachers and students, a strand of work emerged around the idea of remakes and reenactments.

A second visit to the Transmediale in Berlin in February enabled us to reactivate the documentary strand with a new group of students.

In June 2012 a major organization of the archives generated by the different working groups was carried out and the website of the highly experimental pedagogical section of the *digital art conservation* project at ESADS had



Video triptych festival, video works and performances, presented by students of the ESADS Strasbourg during the festival *Nouvelles – Danse – Performance*, May 20, 21 and May 26–28, 2011, Théâtre Pôle Sud, Strasbourg
Photo © ESADS Strasbourg
Photo: Francisco Ruiz de Infante

reached an advanced state of preparation. The exhibition *Digital Art Works. The Challenges of conservation* was mounted at CEAAC, Strasbourg, with an extension in one of the school's exhibition galleries.⁹ A fanzine devised and produced by one of the project's working groups described the experience of the second study visit to Berlin.

Since the *digital art conservation* project has a higher profile in Strasbourg, the whole of the ESADS community is now aware of the visible relationship between the students's work shown at the *Actes Infidèles/GreenKey* exhibition, in late 2011, and the work of the other partners in the project, carried out around the case studies based on collections of digital art in the Upper Rhein region. We fervently hope that this publication may do justice to the complexity and the quality of the various ways of approaching this crucial question of conservation which were proposed by the students and teachers. While first and foremost it concerns works of digital art, it also embraces a whole range of questions about memory and its possible disappearance through a forgetfulness that is to a greater or lesser degree lazy, or through the well-meaning falsification of traces and documents. As we see it, for the young people currently studying at art schools, these questions are not marginal; on the contrary, they are an integral part of their lives, even in their private use of computers and mobile phones. We also hope that the work we have done will create a better understanding of what research can mean in the context of an art school; how we imagine, produce and disseminate our activities. Our methods may be different from those of universities, but they are no less scholarly or scientific.

⁹ The exhibition was first shown at ZKM | Karlsruhe (October 29, 2012–February 12, 2012), subsequently at Espace multimedia gantner Bourogne, France (February 25, 2012–April 28, 2012), and in Strasbourg (France) at CEAAC and at the exhibition gallery of ESADS. See also the essay by Chiara Marchini Camia, this volume, pp. 523–540.

Following these years that have been very fruitful for the teachers who devised the project, the questions raised appear vital for the advanced teaching of art, and if, as a result of the *digital art conservation* project, a large number of students have been able to grasp the issues in a very direct, personal way, it is up to us to develop this thinking with subsequent generations.

To include these problems connected with conservation in the conception and making of a contemporary artwork is a responsibility that cannot be delegated to others. Things seem not, therefore, to have come to an end now that the specification for the *digital art conservation* project has been met, and now, outside the remit of the project, several avenues of work are opening up for late 2012 and 2013. We can confidently state that the experience of these three years has enabled us to understand points of view and to take them forward, and that even areas of activity of which we have glimpsed no more than a part have whetted our appetites.

Translated from the French by Imogen Forster



Appendix

Glossary

Artifacts (image errors)

In the field of computer graphics and animation, image and audio errors that are undesirable and perceptible to recipients are called artifacts. The term is also used in digital photography.

BASIC programming language

BASIC (Beginner's All-purpose Symbolic Instruction Code) is a general-purpose imperative programming language developed by Thomas Eugene Kurtz and John George Kemeny in the 1960s. With imperative (or procedural) programming, single instructions are organized line-by-line into a series, which are carried out consecutively for the solution of a task. Whereas BASIC is easy to learn, due to the number of dialects the portability – the degree of platform dependability – of the program is limited. Both QuickBASIC as well as BASIC-11 are so-called BASIC dialects.

Born-digital art

The designation born-digital art is used to describe works of media art produced in a digital format from the outset. As distinguished from the generic term media art, born-digital art (genuinely digital art) describes art created exclusively by means of digital media, and which is dependent on this technology for its implementation.

C programming language

The C programming language was developed at the beginning of the 1970s by Dennis Ritchie, and is currently among the most established imperative programming languages (see programming language BASIC). C is a widely used programming language, which goes back to its simplicity and the range of linguistic constructs that allows for hardware-proximate programming. The operating system Unix, the development of

which is closely connected to that of programming language, is written in C. Many more recent programming languages, such as Objective-C and C++, augment the syntax of C.

Compiler

A compiler is a program that translates the **source code** into executable **machine language**. The process of transfer or compilation is preceded by a lexical, syntactic, and semantic verification of the source code. The evaluation of the underlying data structures is followed by the creation of the machine commands. The result of the compilation is, as a rule, an executable program or object file. Compilers frequently constitute a component of the integrated development environment (IDE).

Copyleft

The term “copyleft” describes a contractual clause in licenses governing use or redistribution. Software available under the copyleft license is **free software**, which, in spite of a further development of the original software, is not subject to any additional restrictions with respect to distribution and changes. The GNU General Public License (GPL) is considered the most widely disseminated copyleft license.

CRT monitor

CRT is the abbreviation for cathode ray tube, and CRT monitors use the traditional cathode ray tube. Owing to the rise of LCD (liquid crystal display) technology, and rapidly sinking purchase prices for LCD screens, the demand for CRT monitors in the field of computer and television technology has been dropping since 2000. This has led to most production series of CRT monitors being taken out of production since 2010.

Data compression

Data compression is used to reduce data volume. Essentially, one distinguishes between two methods: lossless compression or lossy compression. Lossless compression, in contrast to lossy compression allows complete reconstruction of the original state. Established compression schemes are JPEG (photography, graphics), MP3 (audio data), and the MPEG standards (for videos).

Disk image

To guarantee the data backup of a complete data medium, a hard disk, a hard disk partition or a disk, the creation of an image is recommended. In contrast to a backup, a disk image contains the file system structures and entire contents of the original data medium (one-to-one-image).

Emulation

Emulation is defined as the replacement of a functionality made available by software or hardware by other software or hardware, which, as a rule, are produced especially for emulation. For example, the behavior of special hardware can be reconstructed by software running on another hardware platform. With the aid of a (software) emulator, the function of an obsolete operating system can be imitated on an up-to-date platform. To facilitate this, recourse is made to the original **source code** of the work. Finally, emulation represents a possible strategy in the conservation of digital art, which seeks to overcome the technological obsolescence of hard and software.

Flash card

The flash card is a rewritable storage medium for storing data. Common areas of application are digital photography or mobile telephony.

Freeware

The term freeware denotes software, which is made available free of charge by its creator. As a

rule, it is proprietary and cannot be changed or sold. This **proprietary software** is thus distinct from **free software**, which, in contrary, is protected by copyright.

Free software

A program is classified by the Free Software Foundation as free software if the user is granted all “freedoms” of use, copying, distribution, modification, and improvement. One necessary precondition for being able to characterize software as free software is unrestricted access to the **source code**. In other words, while free software may be subject to **copyleft** license, this is not mandatory in so far as the criteria (“freedoms”) of the Free Software Foundation are fulfilled. Frequently, the term free software is erroneously associated with software that is free of charge.

Interpreter

The interpreter – in contrast to the **compiler** – is a computer program, which does not translate the **source code** into an executable program, but reviews and processes the code for the program running time (“line-by-line”). Compared to the compiled programs, a clear deceleration of the execution speed may be determined. Like the compiler, the interpreter may also be an element of the integrated developmental environment (IDE).

Laser disc

The laser disc is a visual storage medium in use since the 1980s for playing videos. In contrast to the DVD, considered the laser disc’s successor, the video signal is recorded with analog technology.

Look and feel

The term “look and feel” is used in a number of ways. In the context of conservation, it describes the behavior and the impression of both the technical components (for example, a **CRT monitor** in contrast to a LCD monitor) as well as of soft-

ware (such as when playing them back on a monitor, or their operation).

Machine language (machine code)

Machine language (also called machine code) can be processed by a processor. A program, which is available in a certain programming language legible to human beings, must be transformed by a **compiler**, **interpreter**, or assembler into machine language before it can be carried out by a processor. As a rule, the program commands are available in binary code. Machine language is, in principle, difficult for human beings to read.

Migration

Migration is a strategy for conserving digital art, which may necessitate both the updating of the technical components (hardware) as well as the adaptation of the source material (for example, the **source code** or the embedded video material, etc.). In this context the replacement of original elements by up-to-date technology is often accompanied by a loss and/or change in the authenticity of the work of art.

Open-source software

For the most part, the definitions of open-source software and **free software** are synonymous. Each term describes different movements and philosophies with respect to freely accessible software and its usage. However, for both movements (Open Source Initiative on the one hand, and Free Software Foundation on the other), the disclosure of the **source code** of a software is of primary importance.

Plug-in

A plug-in is an add-on program, which covers a partial function and thus augments the functionality of the total system. For example, in the field of digital image processing, plug-ins offer additional picture effects, which cannot be covered by original software products.

Porting

The porting of software refers to the adaptation of a program so as to execute it in an operating system; in most cases, a more up-to-date system. In the context of the conservation of digital art, porting is part of the conservation strategy of **migration**.

Proprietary software

Proprietary software (also referred to as closed-source software, to underline the distinction to **open-source software**, albeit not without controversy) refers to computer programs in which the license authorizes the user, or the license holder, to use the software – subject to certain conditions: as a rule, distributing it to third parties and making modifications to the program is prohibited.

Redundant data backup

In the case of redundant data backup, identical data are stored on several storage media. Thus, even a defect storage medium does not necessarily lead to data loss.

Reinterpretation

Reinterpretation is a conservation strategy, which radically intervenes in the integrity of a work of art. Here, adaptation to deviating parameters is carried out during the presentation of the work (for example, to contemporary equipment or to the space allotted for the presentation, etc.). In order to avoid a violation of the work's intention, these measures should be taken in consultation with the artist. Particularly in the cases of performative and site-specific works produced some considerable time ago, this strategy may represent the only possibility to see these works again.

Screencast

A screencast is a screen video file in digital format, which records and plays back the processes while using software. The screenshot may be

referred to as a “static” pendant to a screencast, which records dynamic processes.

Source code

The source code (or source text) of a program describes the program sequence in the syntax of the programming language used. In most cases, the source code is available in text form and, in contrast to **machine language**, is readable by human beings. The sequence of a few lines of code is already designated as source code. As a rule, programmers use text editors or integrated development environments (IDE) to create it. Before a program can be implemented by the computer, it must be translated into machine language. For this purpose, the appropriate **interpreters** or **compilers** are used.

Storage (hardware preservation)

This conservation strategy entails the storage, maintenance and, if necessary, purchase of replacement devices and hardware components in order to guarantee the conservation of a work in its original appearance and functionality. Due to the material degradation of some devices (as well as their unavailability on the market), in such cases this strategy cannot guarantee long-term conservation of the work.

Sources:

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[<http://de.wikipedia.org>]

[<http://www.itwissen.info>]

Authors' Biographies

Pascal Bion

Pascal Bion (*1974) has been exhibition manager of the Fonds régional d'art contemporain (Frac) Alsace at Sélestat (FR), since 2004. He is exhibitions organizer and has managed the art collection since 2009. Before taking up this post he took a degree course in spatial design, after which he curated exhibitions, mainly of contemporary art, for various institutions in Alsace. When he started working at Frac Alsace he became aware of the importance of preventive conservation and developed a set of technical and documentary approaches to managing a heterogeneous collection, in consultation with artists and art practitioners. For some years, this experience has also given him the opportunity to interact with Frac's partners and audiences, during training programs offered by the Agence culturelle d'Alsace (Sélestat).

Jean-Damien Collin

Jean-Damien Collin is Head of cultural development at the departmental council of the Territoire de Belfort (FR). 2001–2004 he was director of the Espace multimédia gantner (Bourogne, FR). He holds degrees in physics and chemistry as well as cultural management. Collin was one of the founders of the Fédération Hiéro Colmar (FR), where he organized several hundred concerts and film series, and has developed programs for the Musée Unterlinden in Colmar (FR) and the Musée d'Art moderne et contemporain in Strasbourg (FR). Until 2007 he was a member of the board of directors of Light Cone, Europe's leading distributor of experimental films, where he initiated a series of new projects. He is a member of the academic board for the professional Master's degree in the development of international art and cultural projects at the University of Lyon (FR), and of the boards of directors of the Centre d'Art mobile, the Festival Météo, and the Cultural Committee of the Fondation de France.

Edmond Couchot

Edmond Couchot (*1932) holds the academic degree of *Docteur d'État* and is *Professor émérite des universités*. For twenty years, he headed the postgraduate course in arts and technologies of the image at the Université Paris 8. As a theoretician, he is interested in the relationship between art and technology, and has published around a hundred articles and five books on this subject: *Images. De l'optique au numérique* (1988); *La Technologie dans l'art* (1998); *L'Art numérique* (2003); *Des images, du temps et des machines dans les arts et la communication* (2007); and his most recent publication *La Nature de l'Art. Ce que les sciences cognitives nous révèlent sur le plaisir esthétique* (2012). The anthology

Dialogues sur l'art et la technologie. Autour d'Edmond Couchot (2001) is a collection of contributions about his work. Originally a visual artist, since the 1960s Couchot has created interactive cybernetic installations, which react to sound and require the participation of the spectator.

Cécile Dazord

Cécile Dazord is an associate professor of classics (1994) and a graduate of the École nationale du patrimoine in Paris (2000). 2001–2005 she was the head of contemporary art at the Museum of Modern and Contemporary Art in Strasbourg (FR). In 2006, she joined the research department of the Centre de recherche et de restauration des musées de France (C2RMF), where she is responsible for developing a study and research program on conservation issues which are specific to contemporary art. Within this context, she focuses on the question of technological obsolescence. The activities of the research department's Contemporary Art Group are summarized in a blog: <http://obsolescence.hypotheses.org>.

Alain Depocas

Alain Depocas was head of the Centre for Research and Documentation (CR+D) of the Daniel Langlois Foundation from 1999 to 2011. After studying art history at the Université de Montréal (CA) he worked as documentalist at the Musée d'art contemporain de Montréal from 1991 to 1999. From 2002 to 2004 he was codirector of the Variable Media Network in partnership with the Solomon R. Guggenheim museum, New York (NY). From 2005 to 2010 he was director of research at DOCAM, a research alliance studying the documentation and preservation of media art. Since 2011 he is working as a program officer at the Conseil des arts et des lettres du Québec (CA).

Raffael Dörig

Raffael Dörig studied art history, media studies, and German in Basel (CH). He was curator of Medienkunstraum [plug.in] in Basel (2006–2010), and from 2007 to 2011 cofounder, cocurator, and board member of the Shift Festival of Electronic Arts, Basel, which included crossover exhibitions, music, film and video, workshops, lectures, and performances. In 2011 Raffael Dörig was curator at the House for Electronic Arts Basel which unites the activities of [plug.in] and Shift Festival under one roof, and was responsible for the inaugural exhibition of the new institution, *Together in Electric Dreams. Absent Presence*. His other recent curatorial projects include the solo exhibition of Oliver Laric, *Kopienkritik* at the Skulpturhalle Basel, and a group exhibition on hacking and tinkering in art at Bâtiment d'art contemporain in Geneva (CH). Since 2012 he is the director of Kunsthau Langenthal.

Thomas Dreier

Thomas Dreier is professor of civil law and legal aspects of the information society at the Karlsruhe Institute of Technology (DE). He is head of the Institute for Information and Business Law and the Center for Applied Legal Studies. He chairs the copyright expert group of the German Association of Industrial Property and Copyright, is vice president of the Association Littéraire et Artistique Internationale (ALAI), and a member of the advisory board of the Institute for Art and Law (IFKUR). He formerly worked at the Max Planck Institute for Intellectual Property Rights and Competition Law in Munich (DE). Dreier studied law and art history in Bonn (DE), Geneva (CH), Munich (DE), and New York (NY). He is the author of numerous publications on art law.

Veronika Fischer

Veronika Fischer (Ass. iur.) is a research assistant and doctoral candidate at the Institute for Information and Business Law, Karlsruhe Institute of Technology (DE) where her main focus is on copyright and media law as well as information technology law. She previously worked as an executive assistant and project coordinator at the ZKM | Karlsruhe. Fischer studied law in Tübingen, Freiburg, and Speyer (DE). She is an associate lecturer on art law at the Karlsruhochschule International University, Karlsruhe, and she publishes and lectures on legal issues in the museum (especially with regard to contemporary art).

Doris Gassert

Doris Gassert holds a PhD in media studies and is currently research assistant at the House of Electronic Arts Basel (CH). She studied English, media studies, and law in Basel and completed her PhD in the interdisciplinary ProDoc *Aesthetics of Intermediality: Play, Ritual, Performance* at the Institute of Media Studies, University of Basel. Gassert is coeditor of *Dis Connecting Media. Technik, Praxis und Ästhetik des Telefons: Vom Festnetz zum Handy* (Christoph Merian Verlag, 2011) and *Intermediale Inszenierungen im Zeitalter der Digitalisierung. Medientheoretische Analysen und ästhetische Konzepte* (transcript, 2010).

Johannes Gfeller

Johannes Gfeller (*1956) studied art history, general linguistics, and philosophy, and is cofounder of Container-TV in Bern (1978, CH). From 1983–2001 he was a freelance professional photographer and media technician. 1987–2002 he taught technology and aesthetics of video art at the Institute of Design and Technology Bern and Biel (CH), 2001–2011 he was professor for preservation and restoration of electronic media at Bern University of the Arts, and 2002–2012 head of ActiveArchive. Gfeller is a member of the competence networks in film and video of the MEMORIAV association and since 2006 guest

lecturer at the Academy of Fine Arts Vienna (AT). In 2008, he cocurated the exhibition *Reconstructing Swiss Video Art from the 1970s and 1980s* at the Museum of Art Lucerne (CH). Since 2009 he is a member of the Advisory Council of IMAP, and since 2011 professor and head of the MA course Conservation of New Media and Digital Information at the Stuttgart State Academy of Art and Design (DE).

Rosina Gómez-Baeza

Rosina Gómez-Baeza is codirector and cofounder of YGB Art. She studied English literature and philology at Cambridge University (UK), education science in London, and the history of art and French civilization in Paris. From 1986 to 2006 she was director of ARCO, from 2005 to 2008 president of the Institute of Contemporary Art in Madrid, founding director of the Biennial of Art, Architecture and Landscape of the Canary Islands (2006), and founding director of LABORal Centro de Arte y Creación Industrial (2006–2011) in Gijón (ES). She currently works for the City Council of Madrid on a start-up scheme for cultural and creative industries, Factoría Cultural, Matadero, for the Reina Sofía, and Fundación Banco de Santander, leading research on contemporary art in Spain. She is a lecturer at the Carlos III and Complutense Universities in Madrid and a member of the International Council, Post-graduate Institute of the Universidad Oberta de Catalunya in Barcelona (ES).

Sabine Himmelsbach

In March 2012, Sabine Himmelsbach (*1966) became the artistic director of the House of Electronic Arts Basel (CH). She studied art history at the Ludwig Maximilian University in Munich (DE). 1993–1996 she worked for galleries in Munich and Vienna (AT), and later became project manager of exhibitions and conferences for the Steirischer Herbst Festival in Graz (AT). In 1999 she became exhibition director at the ZKM | Karlsruhe (DE). 2005–2011 she was artistic director of the Edith-Russ-Site for Media Art in Oldenburg (DE). Her exhibition projects include *Fast Forward* (2003), *Coolhunters* (2004), *Playback_Simulated Realities* (2006), *Ecomedia: Ecological Strategies in Today's Art* (2007), *Landscape 2.0* (2009), *MyWar: Participation in an Age of Conflict* (2010), *Culture(s) of Copy* (2011), and *Gateways. Art and Networked Culture* (2011).

Hans Dieter Huber

Hans Dieter Huber (*1953) studied painting and graphic arts at the Academy of Fine Arts in Munich (DE) from 1973 to 1977, and from 1977 to 1986 art history, philosophy, and psychology in Heidelberg (DE). From 1997 to 1999 he was professor of the history of art at the Academy of Visual Arts, Leipzig (DE); since 1999 he has been professor of contemporary art history, aesthetics, and art theory at the Stuttgart State Academy of Art and Design (DE), where he headed

the study program Conservation of New Media and Digital Information from 2006 to 2011. From 2006 to 2009 he was an associate professor at the Graduate Research Group Image, Body, Medium at the Karlsruhe University for Arts and Design (DE). In 2007 he was Senior Fellow at the Internationales Forschungszentrum Kulturwissenschaften in Vienna (AT). Since 2009 he has been a member of the enlarged executive board of the Gesellschaft für interdisziplinäre Bildwissenschaft e.V.

Jean-Philippe Humblot

Jean-Philippe Humblot graduated from the Institut national des télécommunications d'Evry (FR), where he specialized in software engineering, and holds a postgraduate degree in cognitive science and artificial intelligence from the University of Paris-Sud. He was recruited by the National Library of France, Paris, to treat electronic and multimedia documents for the Conservation and Consultation Service of the Audiovisual department. Amongst other things, he applies his expertise to media transfer and computer platform emulation technologies to ensure that the library's collection of multimedia documents remains accessible at all times. At the European project KEEP (2009–2012), he headed the coordination of testing, integrating, and ensuring long-term viability of various developed software components, and participated in the scientific direction of the project.

Perla Innocenti

Perla Innocenti is Research Fellow in History of Art, University of Glasgow (UK). She is currently principal investigator of the EU project MeLA* (see the online publication *European Crossroads*, www.mela-project.eu/upl/cms/attach/20121119/181643911_6953.pdf) and coinvestigator of the EU projects ECLAP and SHAMAN. She was coinvestigator of the EU project DL.org and collaborated on developing the digital preservation projects funded by the European Commission: DigitalPreservationEurope, Planets (Preservation and Long-Term Access through Networked Services), and CASPAR. Prior to this, she was at Politecnico di Milano (IT) researching information systems for industrial design, and coordinating digital libraries activities and projects. She holds a degree in history of modern art from the University of Rome La Sapienza, and a Master's degree in management and communication of cultural heritage from Scuola Normale Superiore di Pisa (IT).

Florian Kaufmann

Florian Kaufmann (*1973) lives in Solothurn (CH) where he works in the fields of media, electronics, and art. In 1998 he graduated with a degree in electrical engineering (Dipl. El. Ing. HTL). From 1999–2001 he worked as an assistant at the Laboratory for Industrial Electronics in Biel (CH) with Andrea Vezzini (PhD) and was responsible for developing electronics and Piezo motors at the

Innovationsbüro Creaholic in Biel. Since 2001 he runs his own art and media studio in Solothurn called “Bricolage Universel.” In the dynamic area located inbetween music, media, and art, Kaufmann is present with his performances, concerts, and workshops. In 2010 he did an internship in video technique with Johannes Gfeller at Bern University of the Arts, and since early 2011 has worked on the research projects AktiveArchive and Analit.

Paul Jansen Klomp

Paul Jansen Klomp (*1956) graduated in painting at the AKI Academy (now the ARTEZ Institute of the Arts), Enschede (NL), and subsequently worked as an autonomous media artist. He specialized in developing and creating hardware and software solutions for media and interactive artworks. In the early 1990s he produced the first commercial version of Corporal Syncstarter, and was involved in the Amsterdam Montevideo/Time Based Arts media lab (later NIMk, now LIMA, Amsterdam). In 1995 he founded kunst & electro, a company dedicated to developing hard- and software for artists. Since 2000 he teaches media art at ARTEZ, Eschede, physical computing for interaction design at the HKU Utrecht, and hardware at the Media Technology Department of the University of Leiden (NL). Recently he contributed to the Inside Installations and Obsolete Equipment projects by working on case studies and by investigating the development of a component-oriented risk analysis.

Anne Laforet

Anne Laforet is an independent researcher. For the *digital art conservation* project she worked in conjunction with the Espace multimédia gantner (Bourogne, FR) and the École supérieure des arts décoratifs (ESADS), Strasbourg (FR). Her special contribution at the Espace multimédia gantner was to devise the case studies and organize the inventory of the collection. At ESADS, where she has taught since 2011, she was joint academic organizer, with Johannes Gfeller, of the conference *Digital Art Conservation. Practical Approaches: Artists, Programmers, Theorists* (2011), and with Francisco Ruiz de Infante and Jérôme Thomas she coordinated the associated exhibition and evening of performances. She holds a doctorate in information science and communication from the University of Avignon (FR), and her thesis on the conservation of net-based art entitled *Le net art au musée. Stratégies de conservation des œuvres en ligne* was published in 2011. She has been making digital art and writing about it since the late 1990s. For further information, see www.sakasama.net.

Bernd Lintermann

From 2005 to 2011 Bernd Lintermann (*1967) chaired the Institute for Visual Media at the ZKM | Karlsruhe, and since 2006 he is a professor at the Karlsruhe University of Arts and Design (DE). Since 2012 Lintermann is

Adjunct Professor at the School of Creative Media of the City University in Hong Kong (CN). As an artist and a scientist, he works in the area of real-time computer graphics with a special emphasis on interactive and generative systems. The results of his research find application in scientific, artistic, and commercial contexts, and include computer-generated images, interactive installations, works for various display environments, and interactive applications for stage-works. Lintermann's works are presented in museums and at festivals all over the world, and he has worked with renowned artists such as Jeffrey Shaw, Bill Viola, Peter Weibel, and the Wooster Group. He has published many scientific papers, including contributions to SIGGRAPH.

Emanuel Lorrain

Emanuel Lorrain is a graduate of the École nationale supérieure d'art de Bourges (FR) and the Département Archives et Images de l'Université Toulouse II-Le Mirail (FR). Since 2009 he has been working for PACKED vzw in Brussels. PACKED vzw, set up in 2005 by four Flemish art organisations (Argos – Centre for Art and Media, Brussels; M HKA in Antwerp; the museum Dhondt-Dhaenens, Deurle; and S.M.A.K, Ghent, BE) is an umbrella organization and a knowledge platform for developing and disseminating information on the preservation of audiovisual art. In 2011 PACKED vzw became a national centre of expertise on digital heritage. Its role is to assist heritage and cultural institutions in Flanders. From 2011 to 2013, PACKED vzw coordinated the EU project Digitising Contemporary Art (DCA), in which 25 partners, including 21 collections of contemporary art in twelve countries, were involved.

Brendan Maloney

Brendan Maloney holds a Ph.D. in philosophy from the University K.U. Louvain (BE). He has given university courses and seminars at the Bachelor and Master level in the field of continental philosophy. He worked for several years at LABORAL Centro de Arte y Creación Industrial in Gijón (ES) under the leadership of Rosina Gómez-Baeza. This rewarding experience taught him the complexities of the issues facing us today with the emergence of communication technologies and the dominance of the information society. He has published on various subjects, including the importance of repression in contemporary philosophy, artificial intelligence, and the emotional and psychological impact of the September 11 attacks. He currently works at Alebat Inno Management.

Aymeric Mansoux

Aymeric Mansoux has been involved in several projects that challenge the understanding of copyright, free culture, and online surveillance: make art, a festival for artists using and writing free software; *Puredyne*, a live GNU/Linux

distribution for media art; *FLOSS+Art*, the first collection of essays on FLOSS and media art; *Naked on Pluto*, a Facebook game about privacy and communication mediation within proprietary and commercial social network software. His latest collaboration, the *SKOR Codex*, is a raw digital data publication documenting the life at a disappearing art institution in the Netherlands. Aymeric is currently a senior lecturer at the Willem de Kooning Academie and the Piet Zwart Institute in Rotterdam (NL). He is also a PhD student at the Centre for Cultural Studies, Goldsmiths, University of London, where he is researching the creative misunderstandings between art, politics, and the law within copyleft practices.

Chiara Marchini Camia

Chiara Marchini Camia (*1985) studied German and art history at University College London and art history and visual culture at the University of Oxford (UK). From August 2009 to January 2010, she worked as a curatorial assistant at the Extra City Kunsthall Antwerpen (BE). Since February 2010 she is a trainee and research assistant at the ZKM | Karlsruhe (DE), where amongst other things she is responsible for coordinating the European research project *digital art conservation*, and curating the exhibition *Digital Art Works. The Challenges of Conservation*. Since 2012 she is a doctoral student at the University of Leiden (NL) where she is currently writing her thesis on the German Essay Film.

Nelly Massera

Nelly Massera (*1974) studied visual art and the history and philosophy of art at the University and at the École des arts décoratifs (ESADS) in Strasbourg (FR), at Winchester School of Art (University of Southampton, Winchester, GB), and at Paris 1 Panthéon-Sorbonne. She has held residencies and has exhibited in France, the United Kingdom, Poland, Latvia, India, Quebec, and the United States. She has jointly organized several exhibitions in outer suburban locations, for which she creates installations that combine video, photography, drawing, and objects. Her work is embedded in a specific social, cultural, and geographic context and interrogates the split between its everyday reality and myth, tradition, and dream. As they walk round and look at them, viewers of these works experience something like a gap, a space in which they have to construct their own experience of the forms and their meaning. In the theater, Nelly Massera creates video sequences that interact with the live performance of actors, and she runs workshops in prisons, schools, and art colleges.

Catherine Mueller

Catherine Mueller (*1967) administers the resource center and is program officer at Vidéo Les Beaux Jours (Strasbourg, FR), an organization whose

mission is to promote and disseminate audiovisual works and film, in addition to offering training and education in the visual image. After studying art history and gaining a degree in documentary information technology, she specialized in developing projects involving the digital management of art collections, first with Videomuseum, a network of museums and other bodies managing collections of modern contemporary art, and later with the Tajan and Artcurial auction houses.

Antoni Muntadas

Antoni Muntadas (*1942) has lived in New York (NY) since 1971. His work addresses social, political, and communications issues, the relationship between public and private space within social frameworks, as well as channels of information and the ways they may be used to censor key information or to promulgate ideas. Muntadas' projects are in a variety of media – photography, video, publishing, the Internet, and multimedia installations. Since 1995 Muntadas has been putting together a series of works and projects titled *On Translation*. The content, dimensions, and materials are highly diverse, and they all focus on the author's personal experience and artistic activities in numerous countries over a period of thirty years. By grouping such works together under this title Muntadas places them within a body of experience and concrete concerns regarding communication, the culture of our times, and the role of the artist and art in contemporary society.

Esther Neumann

Esther Neumann (*1968) lives and works in Stuttgart und Berlin (DE). She studied liberal arts at the Braunschweig University of Art (DE) and gained an MA in Conservation of New Media and Digital Information at the Stuttgart State Academy of Art and Design. Her MA thesis (2012) was titled *Dokumentation des interaktiven Funktionsumfangs Lynn Hershmans interaktiver Laserdisc-Installation Lorna, 1979–1984*. She was also involved in the implementation of conservation and digitization measures at the ZKM | Karlsruhe (DE) to preserve Michael Naimark's *Karlsruhe Moviemap* (1991).

Arnaud Obermann

Arnaud Obermann (*1977) trained as a designer for print and digital media. After graduating from Stuttgart Media University with a degree in library and media management, he gained an MA in Conservation of New Media and Digital Information at the Stuttgart State Academy of Art and Design (DE). Since 2010 Arnaud Obermann has been conservation coordinator for the INTERREG project *digital art conservation* at ZKM | Karlsruhe (DE), and since 2011 associate lecturer for the MA course Conservation of New Media and Digital Information in Stuttgart. He has been involved in several other productions, notably *Expanded Cinema Study Collection* (Tate Modern,

Württembergischer Kunstverein Stuttgart) and *Jürgen Claus: Das audio-visuelle Zeitalter*. He has been working as a conservator for media art at the Staatsgalerie Stuttgart since 2013.

Jussi Parikka

Jussi Parikka, PhD, is a media theorist and reader at Winchester School of Art (UK). He has written extensively on digital culture, its aesthetics and historical formations; for example, the online series *Living Books About Life* with Open Humanities Press. He writes on media archaeology and his most recent book *What Is Media Archaeology?* has just been published by Polity Press.

Daria Parkhomenko

Daria Parkhomenko is director of LABORATORIA Art&Science Space, Moscow (RU), which she founded in 2008. The independent, nonprofit center focuses on fostering links between art, science, and society, based on an interdisciplinary model uniting exhibition, discussion, and education projects. Parkhomenko studied sociology, art history, and cultural management at Moscow Lomonosov State University and Moscow School of Social and Economic Sciences. She has participated in various seminars and discussions, including *Syncretic Transcodings* (2010), CIAM, Montreal (CA); *Art and Technological Sublime*, Centre of Contemporary Culture “Garage,” Moscow; *Robot Autonomy?*, LABORATORIA, Moscow. She took part in the *Art&Science Arctic expedition* 2010, Cape Farewell project, London.

Valérie Perrin

Since 2007 Valérie Perrin, a philosophy graduate, has been director of the Espace multimédia gantner (Bourogne, FR) and has also helped plan and mount numerous exhibitions and programmes of music and experimental film, including the Festival Impétus (Belfort, FR), C’est dans la Vallée (Sainte-Marie-aux-Mines, FR), Shift (Basel, CH), and WRO art center (Breslau, PL). At the Espace multimédia gantner, she has published several works in partnership with Les presses du réel, including *Le Langage des nouveaux médias* by Lev Manovich (2010), *Peter Vogel. Partitions de réactions* (2009), and *Paul Sharits* (2008) as well as the collection’s catalogue. She has been responsible for many exhibitions, articles and podcasts on digital art practice.

Claudia Röck

Claudia Röck (*1966) is currently studying restoration and conservation at Bern University of the Arts (CH) where she specializes in modern material and media. Her principal focus is the conservation of contemporary art, especially of installations. As well as other media artworks, she is particularly interested in the preservation of born-digital art. In 2010, she was an intern on the project *digital art conservation* at the ZKM | Karlsruhe (DE). Before she

began her studies at Bern University of the Arts, she studied environmental engineering at the ETH Zurich (Swiss Federal Institute of Technology), and then worked as an environmental engineer.

Francisco Ruiz de Infante

Francisco Ruiz de Infante (*1966) juggles in his artworks effortlessly with high tech and spontaneous craft, reconstructing the process of memory as it feeds the present – with sporadic bursts of information full of errors, or an endless loop of streaming images. His audiovisual installations have been exhibited at numerous international institutions, including Museo Nacional Centro de Arte Reina Sofía (Madrid, ES), Guggenheim Bilbao (ES), Musée d'Art Moderne (Paris, FR), SITE Santa Fe (US), Stedelijk Museum Amsterdam (NL), ZKM | Karlsruhe (DE). He is currently preparing a complex personal exhibition (*Canopée*) at the Museo del Oro in Bogota (CO), and collaborating on the choreography project *labOfilm* by Olga Mesa. His video works include the feature film *Les Loups* (1995), *Les Choses Simples*, *Écosystèmes / BlueSky* (2007–2011). He is the coordinator of the research group Arts Hors-Format at ESADS in Strasbourg (FR) and codirector of Centre des Rives in the Haute-Marne (FR). See www.ruizdeinfante.org

Ingrid Scheurmann

Ingrid Scheurmann was adjunct professor for heritage science and applied historical building research at Dresden University of Technology (DE) and head of the MA program Preservation of Historic Monuments and Urban Development (2008–2012). From 2009 to 2012 she was director of *Zwischen Historie und Historisierung: Theoriediskurse der Denkmalpflege*, a sub-project of the German Federal Ministry of Education and Research project *Heritage – Values – Dialogue*. In 2005, she curated the exhibition *ZeitSchichten: Erkennen und Erhalten. Denkmalpflege in Deutschland* in Dresden Castle. Since 1995, Scheurmann has worked at the German Foundation for Monument Protection in the area of heritage education. She is a board member of the Landesdenkmalbeirat in Brandenburg, the Arbeitskreis Theorie und Lehre der Denkmalpflege e.V. of the Deutsche Nationalkomitee für Denkmalschutz, and ICOMOS. She has published widely on the history and theory of cultural heritage preservation.

Bernhard Serexhe

Bernhard Serexhe (*1950) studied sociology, psychology, educational science, and art history, and holds a doctorate in art history from the University of Freiburg (DE). He has published extensively on architecture and heritage history, art and media theory. Since 1995 he is a consultant on media policy to the Council of Europe. 1994–1997 he was curator of the Media Museum of the ZKM | Karlsruhe (DE), 1998–2005 he headed the ZKM | Education Department,

and since 2006 he is chief curator of the ZKM | Media Museum. He has held teaching positions at the Russian Academy of Fine Arts in Saint Petersburg (1999), the University of Bern (2000–2001, 2008, CH), the University of Basel (2001, CH), the University of Arts and Design Karlsruhe (2001), the University of Karlsruhe (2002–2006), and the Stuttgart State Academy of Art and Design (2011, DE). 2008–2012 he was Professor for Aesthetics and Media Theory at the Istanbul BILGI University (TR). 2010–2012 he was initiator and leader of the EU-funded research project *digital art conservation*.

Igor Štromajer

Igor Štromajer (*1967) is “an intimate mobile communicator” and multimedia artist. His two best known works are *Ballettikka Internettikka* and *Oppera Internettikka* (1997–2011). He has won several international awards for his work, and his projects are in the permanent collections of prestigious art institutions, such as the Centre Pompidou in Paris; the Museo Nacional Centro de Arte Reina Sofia in Madrid (ES); the Moderna galerija in Ljubljana; Computerfine-arts Gallery – net and media art collection in New York (US); the Maribor Art Gallery (SI). His multimedia projects investigate emotional tactics, intimate political guerrilla and traumatic low-tech communication strategies.

See www.intima.org

Jérôme Thomas

Jérôme Thomas’ work is spread out among (sound) installations, sculptures, videos, and films. Above and beyond their differences, whether they be narratives, objects, or drawings, all of Thomas’ works explore a point of tension, where things or beings fall, shatter, break, and disperse. He has exhibited internationally, including at Nasher Museum of Art in Durham (US), Nabi Arts Center of Seoul, Espace CCF in Hanoi, Novosibirsk State Art Museum (RU), Cinémathèque Française in Paris (FR). Currently, he is writing a screenplay for a feature film and finishing a DVD catalog for five films on behalf of the Césaré (Betheny, FR). He is also codirector of the video workshop at ESADS in Strasbourg (FR) and director of a film production and postproduction company in Nancy (FR).

Peter Weibel

Peter Weibel (*1944) studied literature, medicine, logic, philosophy, and film in Paris and Vienna. Since 1984 he holds a professorship at the University of Applied Arts Vienna, and 1984–1989 he was professor of video and digital art at the Center for Media Study, State University of New York at Buffalo (US). In 1989 he founded the Institute for New Media at the Städelschule, Frankfurt (DE), which he chaired until 1995. 1986–1995 he was artistic director of the Ars Electronica Festival in Linz (AT), 1993–1999 Austrian Commissioner for the Venice Biennale (IT), 1993–1998 chief curator at the Neue Galerie Graz (AT),

and since 1999 he is CEO of the ZKM | Karlsruhe (DE). In 2002 he was awarded the Grand Decoration of Honour for Services to the Republic of Austria, in 2007 he received an honorary doctorate from the University of Art and Design Helsinki, and in 2008 he was made Officier dans l'Ordre des Arts et des Lettres of France. 2009–2012 he was visiting professor at the University of New South Wales in Sydney, and in 2011 Artistic Director of the 4th Moscow Biennial of Contemporary Art.

Klaus Weschenfelder

Klaus Weschenfelder, PhD (*1952) studied art history, Roman provincial archaeology, and education sciences in Munich (DE). He has worked as museum and cultural educator, completed his training at a museum in Hanover, and was museum director in Offenburg and Koblenz (DE). Since 2002 he is director of the art collection Veste Coburg (DE), and since 2009 president of the International Council of Museums (ICOM) Germany. He has published on museum education, museology, and art of the fifteenth to twentieth centuries.

Katrin Willert

Katrin Willert (*1979) studied European and East Asian art history and philosophy at the Ruprecht Karl University of Heidelberg (DE). Since 2002 she has been involved in various art and cultural projects, for example, as cocurator of *raum2* in Mannheim (DE), and as an author of the project *Einraumhaus c/o* also in Mannheim. From February 2010 to May 2012 she worked as a trainee and research assistant at the ZKM | Karlsruhe (DE), including as project manager and cocurator for the exhibitions *Car Culture* and *Dieter Meier. Works 1969–2011 and the YELLOW Years*. Since June 2012 she is artistic director and general manager of the Kunstverein Reutlingen (DE).

Siegfried Zielinski

Siegfried Zielinski (*1951) is professor of media theory, archaeology and variantology of the media at the Berlin University of the Arts (DE), Michel Foucault Professor for techno-aesthetics and media archaeology at the European Graduate School Saas Fee (CH), and director of the Vilém Flusser Archive in Berlin. He was founding director of the Academy of Media Arts Cologne (1994–2000). He is the author of numerous books and articles as well as editor of the book series *Variantology – Deep Time Relations Between Arts, Sciences, and Technologies*, of which five volumes have been published so far (2005–2011). Siegfried Zielinski is a member of the North Rhine-Westphalia Academy of Sciences, Humanities, and the Arts, the Academy of the Arts Berlin, the European Film Academy, the Magic Lantern Society of Great Britain, the board of trustees of the ZKM | Karlsruhe, and Honorary Senator of the Institute of Media Archaeology Hainburg (AT).

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The Book

Preservation of Digital Art: Theory and Praxis.

The Project digital art conservation

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Graphic design
NODE Berlin Oslo, Vivien Anders, AT-Studio

Lithography
COMYK Roland Merz, Karlsruhe

Printed and bound
E&B engelhardt und bauer, Karlsruhe

Fonts
Farnham, Neutral

Paper
Lessebo Design Smooth, white, 115 g/m²

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© 2013 AMBRA | V and ZKM | Center for Art and Media
Karlsruhe

AMBRA | V is part of Medecco Holding GmbH, Vienna

Printed in Germany

ISBN 978-3-99043-538-0 AMBRA | V

 Center for Art
and Media Karlsruhe
Lorenzstr. 19, 76135 Karlsruhe
www.zkm.de

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Supported by the Suisse National Science
Foundation (SNFS)

**Associated project partners: Ososphère, Festival des
Artefacts, La Laiterie, all Strasbourg (France)**
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**Symposium I – The Digital Oblivion. Substance and
ethics in the conservation of computer-based art
(November 4–5, 2010)**
Project management: Bernhard Serexhe
Project coordination: Chiara Marchini Camia

**Symposium II – Digital Art Conservation. Practical
Approaches: Artists, Programmers, Theorists
(November 24–26, 2011)**
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ZKM | Media Museum
(October 29, 2011–February 12, 2012):
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Espace multimédia gantner
(February 25–April 28, 2012):
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digital art conservation



This project was cofinanced by the European Union –
European Regional Development Fund (ERDF)



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