



Charles A. Csuri

Beyond Boundaries, 1963 – present

Charles A. Csurí

Beyond Boundaries, 1963 – present

Janice M. Glowski, editor



college of the arts

advanced computing center for the arts and design

Published in conjunction with the exhibition:

Charles A. Csuri: *Beyond Boundaries*, 1963 – present
SIGGRAPH 2006, Boston, Massachusetts, USA
30 July to 3 August 2006

Editor: Janice M. Glowski

Historical and Recent Animation Producer: Keith Kelley

Contributing Artist: Charles A. Csuri

Art Gallery Chair SIGGRAPH 2006: Bonnie Mitchell

SIGGRAPH 2006 Chair: John Campbell Finnegan

Catalogue design by Eva Dujardin Dale and Monica Fox

Body text: Bembo, designed by Francesco Griffo and Monotype Design Studio

Headline text: Frutiger, designed by Adrian Frutiger

Printing by West-Camp Press, Inc., Westerville, Ohio

Distributed by BreakPoint Books, Columbia Station, Ohio

© College of the Arts, The Ohio State University

ISBN 0-9787275-0-9

PHOTOGRAPHIC CREDITS:

© Coral reef tiles and coffee table: Caroline Reagh

Cover: *Entanglement*. 2002. Lightjet print on paper with laminate.

Unix environment and AL. 182.9 cm x 243.8 cm (72 x 96 in.). no. 56 (detail).

NOTES ON SYNTAX:

Works from the various *Infinity* Series are named according to their specific title and frame number, followed by the name of the series. See, for example, *Festive Frame 47*, *leo* series and *19th Century Space Station Frame 0321*, *stillASTO* series. For archival purposes, series names follow the syntax Csuri used to name the computer files when generating the series' frames.

NOTES ON HARDWARE AND SOFTWARE:

The specific hardware Csuri used to create the early works (1963-1974) is noted in the art captions. For works created from 1989 to the present, Csuri worked in a UNIX workstation environment that allowed programming in C, C++, Scheme, and AL. He and his collaborators have used a range of Sun and SGI workstations, as well as the rendering capabilities of the Advanced Computing Center for the Arts and Design (ACCAD) and the Ohio Super Computer (OSC) environments. Because of the complexity of these collaborations, captions for works made during this time only record that Csuri worked in a UNIX environment and, when known, note the specific software used.



Published in conjunction with ACM SIGGRAPH

An exhibition of this size would not have been possible without generous support.

We would like to thank the donors, lenders, and contributors to the *Beyond Boundaries* exhibition and the accompanying catalogue:

Funders:

ACM SIGGRAPH
Dr. Gabe and Sandi Campbell
DPI, San Francisco, CA
DreamWorks Animation SKG
FastFrame, Columbus, Ohio
Jeffrey Katzenberg
Pixar Animation Studios
Daniel M. Slane

The Ohio State University:
Office of Academic Affairs
Department of Athletics
Office of the President

Lenders:

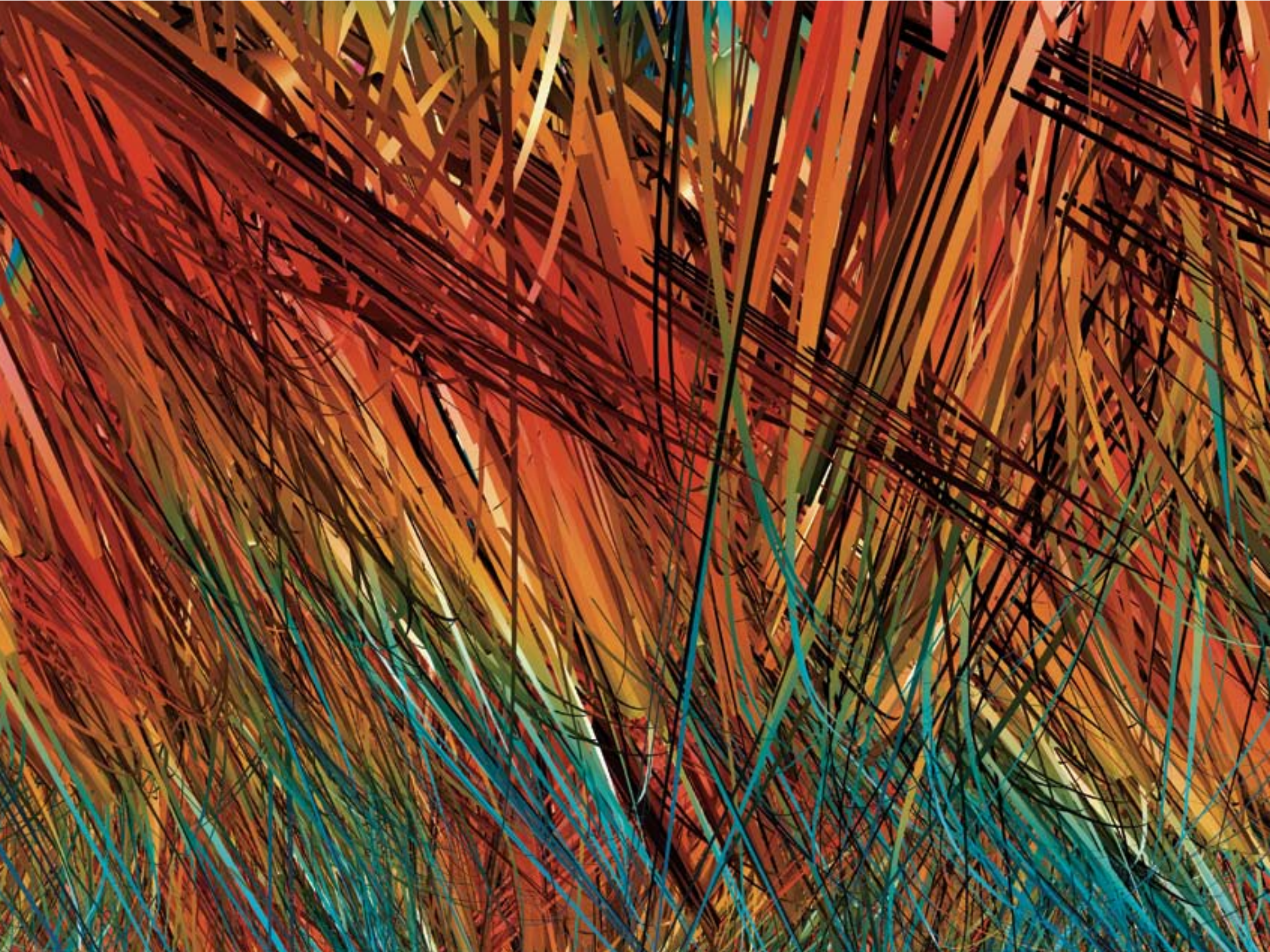
Advanced Computing Center for the Arts and Design (ACCAD)
Dr. Roy Gottlieb, D.D.S.
Ohio Supercomputer Center (OSC)
Mr. and Mrs. Kevin Reagh

Contributors:

Terry Barrett, The Ohio State University [TB]
Wayne Carlson, The Ohio State University [WC]
Ying Chua, The Ohio State University [YC]
Janice M. Glowinski, The Ohio State University [JMG]
Matthew Lewis, The Ohio State University [ML]
Su-hsing Lin, Shu-Te University, Taiwan [SL]
Thomas Linehan, University of Texas, Dallas [TL]
Karla Loring, Museum of Contemporary Art, Chicago [KL]
Ariana Maki, The Ohio State University [AM]
Maria Palazzi, The Ohio State University [MP]
Margit Rosen, KHM | Academy for Media Arts [MR]
Anu Vedagiri, University of North Carolina, Greensboro [AV]
Zhou Yan, Kenyon College [ZY]

A complete list of exhibition and catalogue credits is located on the enclosed *Beyond Boundaries* DVD.

*For Charles A. Csuri and the artists, animators,
researchers, and educators who share in his legacy.*



Contents

Acknowledgements	9
Foreword	11
Introduction to the Exhibition	13
Introduction to the Catalogue	Janice M. Glowski 17
Beyond Boundaries	Charles A. Csuri 21
A Record of Decisions: Envisioning Computer Art	Margit Rosen 25
Early Works	1963 to the mid-1970s 48
From Object to Object Transformed	Thomas Linehan 83
Dialogue and Creativity: The Faces of Collaboration	Wayne Carlson 85
Exploration and the Artist's Tools	Maria Palazzi 93
Middle Works	late 1980s to the early 1990s 98
Master of the Digital Renaissance	Karla Loring 119
Later Works	mid 1990s to the early 2000s 126
Randomness, Chance, Process: The <i>Infinity</i> Series	Matthew Lewis 147
Recent Works	2002 to 2006 156
Biographical Sketch	173



Acknowledgements

There are many brilliant people whose contributions to the world go unrecognized. It takes the foresight and vision of others, first, to see the significance of an individual's contributions, and, second, to expend the time, energy, and resources to make visible another's genius and role in history. It has been remarkable to witness the assembling that made the *Beyond Boundaries* exhibition and catalogue possible. Bonnie Mitchell, the Art Gallery Chair for SIGGRAPH 2006, worked tirelessly from the outset. In proposing the exhibition, she boldly extended the annual Art Gallery beyond its usual conception, allowing for unprecedented acknowledgement of one of computer graphics' early pioneers. Maria Palazzi, the Director of the Advanced Computing Center for the Arts and Design (ACCAD), The Ohio State University (OSU), worked closely with Mitchell to launch the exhibition. She liaised between OSU and SIGGRAPH, solicited donations, and provided oversight on all fronts. Her leadership, clear-minded approach, and sensibilities acted as the project's fulcrum. As Chair of SIGGRAPH 2006, John Finnegan simultaneously envisioned an exhibition of Csuri's work and backed our efforts at each step in the process. Without the support of Karen Bell, Dean of the College of the Arts, OSU, who allowed her communications and

design staff to produce the catalogue, it's unlikely that the knowledge generated from the *Beyond Boundaries* exhibition would be preserved. Special thanks goes to Nancy Marzella, of the OSU Development Office, who generously gave her time and energy to secure essential funding for the exhibition.

Keith Kelley worked side-by-side with Chuck, designing and producing over six DVDs for the exhibition. His diligent efforts include the informative *Beyond Boundaries* DVD with voice-over by Csuri, which accompanies this catalogue. Special thanks go to Wei Lin and Mayumi Kamata, who provided the Chinese and Japanese subtitles, respectively, that Kelley incorporated into the *Beyond Boundaries* DVD.

Elizabeth Nielson digitized and edited high-resolution scans of Csuri's art from the late 1980s and early 1990s. These works no longer existed in electronic form at the exhibition's outset, and their preservation and preparation was a long and arduous process. In this context, thanks also goes to Joe Harmon for offering his image editing expertise. Esther Palmer created three-dimensional renderings of the exhibition space, and Ariana Maki assisted in

numerous ways, including the final image editing, art print and framing coordination, and catalogue writing. Her good humor and careful attention to detail came at just the right moments.

Eva Dujardin Dale and her design team, Greg Bonnell and Monica Fox, worked tirelessly against extraordinary deadlines to ensure the catalogue's completion. Eva's composure and ability to problem solve made the project truly enjoyable. Pat Riechel, Associate to the Dean, College of the Arts, OSU, kindly offered oversight of the catalogue's publication process. Wayne Carlson and Matthew Lewis generously offered their technical and historical knowledge of Csuri's work and research environments for the catalogue and exhibition timeline.

Several ACCAD staff members and students also helped with the exhibition. Elaine Smith served as the Administrative Assistant and masterfully wielded the numerous approval forms and purchase orders necessary for this undertaking. Glen Shere, ACCAD's Systems Manager, worked with Keith Kelley and meticulously laid out the exhibition's equipment specifications and technical requirements. His efforts were both reassuring and greatly appreciated. Aline Davis, Information Assistant at ACCAD, and graduate students Brent Zorich, Tyler Ayers, and Dan Guinn, offered their time and energy to prepare and transport artwork.

Len and Ellen Berglund of FastFrame, in Columbus, Ohio, framed, to archival specifications, over forty artworks, including the early computer drawings on fragile, pin-fed computer paper.

This was no easy task, as many of these works had been stored in mailing tubes for more than thirty years. It was, quite simply, a pleasure to work with them.

A very special thanks goes to Chuck's family. Lee Csuri, Chuck's dynamic and good-humored wife, repeatedly allowed the intrusion of their home while we scoured for early works and transported art to and from the Csuri household. Caroline Reagh, Csuri's daughter, spent a great deal of time to identify companies that could print artwork at the necessary quality and archival specifications. Caroline and Kevin Reagh, as well as Dr. Roy Gottlieb, D.D.S., generously allowed art from their private collections to be publicly exhibited.

Working with Chuck on this exhibition, and particularly on the catalogue content, has been delightful, inspiring, and an amazing learning experience. Gratitude to Charles Csuri, however, extends beyond the boundaries of this exhibition. The inspiration of his life's work and the beauty of his art have touched many lives, and it is no exaggeration to say that the world of computer art, graphics, and animation has been significantly influenced by Csuri's strong character, hard work, and integrity. Thank you, Chuck, from all of us who have been inspired, enchanted, and changed by your art.

Janice M. Glowski
Editor

Foreword

When Bonnie Mitchell approached me about a retrospective show of Charles Csuri's work, she had no idea that I had been thinking the same thing. You see, in a long, roundabout way, Charles Csuri had a hand in where I am today. Kismet? Maybe. I believe in those kinds of things. Serendipity, kismet, pay it forward, what goes around comes around, stuff like that.

Growing up in the 60s and 70s as the son of a computer salesman, (IBM, DEC, and Honeywell), computers weren't a foreign concept to me. They were room-sized machines capable of enormous calculations. They were the HAL 9000, the ENIAC, the M5Computer that James T. Kirk outwits in *Star Trek Episode 53, Season 2*. I played ZORK! via modem. I had an ASCII portrait made from a digitized image of myself. I took a BASIC programming course. WOPR took over the world and played Global Thermonuclear War. Computers were a mix of reality and fiction for me. Somewhere between the fact and fiction, my father mentioned the name Charles Csuri and the fact that Csuri was using computers to create art and animations (This is the start of the long, roundabout journey). But at that age, I had interests other than computers. I was going to be an actor.

Then kismet intervened.

As an MFA candidate in acting at The Ohio State University, I went to a presentation by the Advanced Center for Computer Art and Design (ACCAD). The session included animated films that they had shown at some conference called SIGGRAPH. (Little did I know how that would come back to me). After watching in amazement—*Tuber's Tivo Step* by Chris Wedge and *Snoot and Mutley* by Susan Van Baerle and Doug Kingsbury – I knew what I wanted to be when I grew up. The very next day I signed up for computer graphics courses and I bought my first graphics computer, an Atari 1040 ST. Soon I was doing digital paintings, creating wireframe models, and animating stuff. I was creating CG worlds! This was a life-changing event for me. From that point on, I was moving toward a new career in computer graphics. The journey continues to this day.

So, having said all that (I told you it was a long, roundabout journey), I think it's fitting that as the Chair of SIGGRAPH 2006 I give back to the SIGGRAPH community and to my alma mater, The Ohio State University, and especially to someone whose art

and seminal work in computer graphics inspired me to become the teacher and computer graphics fine artist that I am today. With this retrospective at SIGGRAPH 2006, we celebrate the artistic and technological accomplishments of Charles Csuri, one of the pioneers in computer graphics. We share this work and its importance with the new generations of computer graphics professionals as well as the computer graphics pioneers. We acknowledge Charles Csuri's place in the history of computer graphics, and we seek the inspiration of his triumphs and tribulations.

Most important, respect the work, the processes and the efforts. Look again and again at the pieces and reflect on the historical context and the ground breaking innovations that these artworks represent. Then, pay it forward and tell someone what you have discovered. It's kismet.

John Campbell Finnegan
SIGGRAPH 2006 Conference Chair

Introduction to the Exhibition

Back in the early 60s, who would have known that digital art would be an embedded part of contemporary 21st century culture? Even twenty-five years ago most people could not imagine that computers could be used to create art. When I was majoring in both computer science and fine arts in Wyoming in the early 80s, everyone around me thought I was crazy. Little did I know Charles A. Csuri, a pioneer with an incredible vision dating back to the 60s, had already paved the way for the digital artists to come. It wasn't until I became actively involved in ACM SIGGRAPH that I first heard of Charles Csuri. In 1990, he presented on a panel chaired by Barbara Mones-Hattal entitled: "New Methods, New Artforms" with Ken Snelson, Sally Weber and Tony Longson, where he showed 26 of his images and talked about how the computer had changed the way he created art. Csuri stated, "I like responding to an image and allowing an accident to give me an idea, rather than feeling as though I have to control the process every step of the way. I am also intrigued with the idea of the two-dimensional painter space mixed in with three-dimensional." I was inspired by Csuri's ability to com-

municate human spirituality using tools that were so inorganic in nature. His presentation sparked my interest and led me to look further into his past.

Csuri first attended a SIGGRAPH conference in 1975 in Bowling Green, Ohio. This was the 2nd SIGGRAPH conference, at a time when vector and raster graphics were battling it out to become the graphic standard (maybe the battle has never ended). Csuri presented a paper entitled "Computer Animation" and showed a real-time rotating object at the film screening. Everyone was so amazed they stood up and clapped after it played. Csuri had already been working with computer graphics for ten years and was one of the few artists working in the field. In 1979, Csuri co-presented a paper entitled, "Towards an Interactive High Visual Complexity Animation System" with R. Hackathorn, R. Parent, W. Carlson and M. Howard. He discussed a processing technique they developed at The Ohio State University that allowed the computer to simulate smoke, fire, water, hair, bark and grass. In 1985, he presented on a SIGGRAPH panel,

“Aesthetics of Computer Graphics” with Mihai Nadin, Frank Dietrich, Thomas Linehan and Hiroshi Kawano. He focused on computer graphics as an art form that needed its own evaluation criteria.

As well as presenting at numerous SIGGRAPH conferences, Csuri also exhibited his work in the art gallery and showed both his and his student’s animations at the Computer Animation Festival. Between 1981 and 1992 alone, twenty-five animations from Cranston/Csuri Productions, Inc., The Ohio State University students or Csuri himself were screened at SIGGRAPH. In 1996, two of Csuri’s large-scale prints were exhibited in *The SIGGRAPH Bridge* art exhibition. That same year, *Golden Mask* (Catalogue 39), an image of a gold, fragmented, polygonal mask was chosen for the cover of the SIGGRAPH proceedings. Csuri was also honored at a special reception during the conference.

Csuri’s name has always been well known in the SIGGRAPH community. He is respected as a computer artist, an accomplished researcher, a pioneer in computer animation production and a man who has accomplished amazing things. It was no surprise in 1998 that Joan Truckenbrod chose to exhibit Charles Csuri’s work in the SIGGRAPH pioneering digital artists show, *Touchware*. Csuri exhibited *After Paul Klee* (Catalogue 10) and *The Past Casts Shadows* and dazzled the audience with the brilliance of his work. In his artist statement he claimed, “Thirty-four years later, I find the problem of art is still the same, which is to create a meaningful structure to reveal aesthetic content. However,

I have been affected by computer processes and procedures. I came from a traditional background as an artist, with a relatively simplistic viewpoint about structure and nature. My conception of nature and an object has been expanded by science and computer graphics.”

In the late 90s, as a volunteer project, I decided to document the work of pioneering digital artists by creating artist profiles on the SIGGRAPH website. Deeply inspired by Charles Csuri’s images at SIGGRAPH and in the feature on Csuri that appeared in *Smithsonian Magazine* in 1995, I decided to create an artist profile website that focused on his work. I contacted him and much to my surprise, he sent me boxes of original documents. I fully understood the historical importance of the pivotal *Cybernetic Serendipity* exhibition, and here was the original catalogue in the box of materials Chuck lent me for my research. As I handled these original documents, I felt as though I was reliving the origins of digital art.

Not only was Chuck Csuri a wealth of information, he was a pleasure to work with and an amazing person. We finished the website, and I didn’t have contact with Chuck again until 2005 when he sent a message to the chair of the Computer Animation Festival, Terrance Masson, telling Terrance that he would like to show three of his newest images at SIGGRAPH. Chuck had recently started creating very large-scale prints on canvas and the surface quality, as well as the sense of presence obtained through size, was extremely exciting to him. Terrance forwarded the mes-

sage to me since I was the SIGGRAPH 2006 Art Gallery Chair. Knowing Chuck's previous work, I suggested that SIGGRAPH host a retrospective exhibition. The idea snowballed. Everyone I talked to became very excited and supportive of the idea. Ohio State University got involved and spearheaded the project, the SIGGRAPH Conference Advisory Board granted partial funding for the exhibition and donations came from numerous sources. The show expanded from a few images exhibited in the hallway to a dedicated space in the gallery with over 70 works (many very large-scale). It was a huge undertaking for all involved, especially Chuck who had to go through his archives and resurrect and print works dating back to the early 60s. Chuck also worked tirelessly to produce a new body of high-resolution animations primarily for this exhibition.

The SIGGRAPH 2006 *Intersections* art exhibition hosted the first extensive retrospective of Charles Csuri's work computer art-

work, displaying forty-three years of his creative efforts. A panel of authors, researchers, and artists also presented on a panel along with Chuck Csuri to discuss the evolution, relevance and conceptual development of his work from 1963 to present. The exhibition curator, Janice Glowski, was the essential link that brought it all together. She worked with Chuck to organize, print and frame the art, create this amazing catalogue, and chair the panel discussion. The exhibition was on display from July 30 to August 3, 2006 in Boston, Massachusetts, USA.

Charles Csuri has been an inspiration to thousands of digital artists and researchers around the world. This exhibition is a tribute to him as our way of saying thank you for his dedication and creative contributions to the field of digital art and animation.

Bonnie Mitchell

SIGGRAPH 2006 Art Gallery Chair



Introduction to the Catalogue

Janice M. Glowski

It's easy to look at the history of computer graphics and to note Charles Csuri's role as the "father of digital art and animation." We can point to the millions of dollars of research monies he obtained from the National Science Foundation (NSF) and other funding agencies, to his role in establishing the Advanced Computing Center for Art and Design (ACCAD) at The Ohio State University and Cranston/Csuri Productions, Inc. (CCP), and to the legacy of innovative efforts that continue to ripple through the computer science, visualization, and animation arenas, to name a few. We can even point to Csuri as a forerunner in the burgeoning field of art and research, whose dialogue, today, is taking center stage in fine arts academies throughout the world. All of this is to say nothing of the art objects that document his ongoing and extraordinary aesthetic journey. Frankly, his contributions are staggering.

The *Beyond Boundaries* catalogue begins the process of unraveling Csuri's numerous contributions. It provides a historical overview of his art from 1963 to 2006 and offers a range of artistic examples from the four major periods in which he created computer

art. Significant attention has been given to the contextualization of Csuri's early works (1963 to the mid-1970s) for a number of reasons. First, the relationship between Csuri's art and research is most apparent during this period. In addition, as Margit Rosen's outstanding study, based on her forthcoming dissertation on early computer art, demonstrates, Csuri's creative process, his intentions, and his choices during this early period are a window into the artist's way of thinking about computer art, which influences his work to the present day. The early period also establishes a foundation for many of the themes that recur in Csuri's art and shape his creative process, such as transformation, randomness, collaboration, and hierarchical levels of control. Several essays in this catalogue focus on these themes and how they manifest artistically during specific time periods. For example, Thomas Linehan's "From Object to Object Transformed" considers Csuri's view of the art object through the lens of transformation and randomness, particularly within the context of early works, such as *Random War* and *Feeding Time*. Matt Lewis's essay "Randomness, Chance, Process: The *Infinity Series*" looks similarly at the role of randomness, the process of chance, and hierarchical control, but

within the context of the generative art movement and Csuri's later works.

Collaboration has also been central to Csuri's artistic process. Wayne Carlson's essay "Dialogue and Creativity: The Faces of Collaboration" historically traces Csuri's collaborative process within the context of his research groups and entrepreneurial endeavors, while briefly clarifying the nature of Csuri's collaborations within the context of the academy and the history of art. Although Csuri's contributions to the computer animation industry, particularly during his years with CCP, are acknowledged, a detailed discussion is beyond the scope of this project. Therefore, specific works from this period are not included in the exhibition or catalogue. Examples of works created by CCP can be viewed at The Charles Csuri Archive at The Ohio State University, at csuri.wmc.ohio-state.edu. Similarly, Csuri's earliest art, created in traditional media, are left for study beyond this exhibition.

Key transitional moments in Csuri's career are also highlighted throughout the essays. In addition to Rosen's acknowledgement of Csuri's transition from oil painter to computer artist, Maria Palazzi's essay "Exploration and the Artist's Tools" reveals a seminal period in Csuri's life, the late 1980s to the early 1990s. Palazzi describes Csuri's reentry into the fine arts world and identifies this period as a time when Csuri creates the core artistic tools that he employs and, ultimately, masters by the beginning of the twenty-first century. As is revealed throughout this catalogue's art

and writings, Csuri's art is situated squarely within the lineage of master artists. Karla Loring's essay "Master of the Digital Renaissance" explores Csuri's later and recent works, from the mid-1990s to the present, within an art history context. In doing so, she begins what will certainly be an extensive discourse about Csuri's role within the history of art.

The lacuna of critical writings relating to Csuri's work is significant. Therefore, short entries written from an art criticism perspective are given in this catalogue for specific works of art. These brief writings seek to engage the fine arts and historical communities and to represent voices largely unheard in the computer graphics world. In some cases, they offer much-needed clarification about Csuri's approach to making digital art. For example, Terry Barrett's insightful and educational entry on *Emily's Scribbles Frame 300* from the *fishscrib* series offers pithy and illuminating statements about Csuri's processes and products (Catalogue 63). It is the hope of all of us involved with this exhibition that the topics addressed in the essays and the analyses offered within the entries will prove to be useful across disciplines, and that they will seed the ground for further research and study in the areas needed to understand Csuri's art.

Several works recorded in the catalogue require special recognition. *Random War*, a seminal and historically important work, was recreated for the exhibition from the original large-format negatives, which were discovered only months before the launch of this exhibition (Catalogue 24). The electronic version of *Random*

War, which was conceived as a series, no longer survives, and the whereabouts of the original silkscreen print on plastic that was exhibited in the *Cybernetic Serendipity* show at the Institute for Contemporary Art, London, England, in 1968, is unknown. Only a fragment of the work, showing a small section of the soldiers printed on plotter paper, remains. The recreation of *Random War* for the *Beyond Boundaries* exhibition, therefore, marks a significant moment in the history of art. Six pages from the artist's sketchbook also offer a unique look into Csuri's history (Catalogue 16). The sketches describe Csuri's vision of animation, *n*-dimensional art, and interactive systems prior to his having the technological capabilities to manifest them. This sketchbook has been preserved and is documented in the catalogue, as well as viewed publicly for the first time in the *Beyond Boundaries* exhibition. Several award-winning works, such as *Sine Curve Man* (1967), a still from the *Hummingbird* animation film (1969), *Mask of Fear* (1989), *Gossip* (1990), and others, are also included here (Catalogue 17, 19, 32, 35).

Education in the world of computer art, at the time of this writing, is in its infancy. Universities have only recently begun formal training in the history and theory of the field outside of the computer graphics arenas, and much work remains to address the historical and critical study of computer art. As with the early study of "nonwestern" artistic traditions, widespread, historically-based teaching and learning of digital art is hindered by inadequate visual and textual resources. This catalogue seeks to provide educators with high-quality visual images and preliminary tex-

tual content from which to expand educational endeavors. It is also our hope that it will offer starting points for further research into Csuri's life and work.

When I began this project, I felt that I knew something about Charles Csuri's contribution to the history of art. As we prepare for the exhibition to open, it's clear that much has been learned, and that what remains are more questions than answers. It will take generations to unearth Csuri's myriad contributions, and generations more to explore them fully. Throughout this process, we will do well to remember that, in his various roles as educator, researcher, and programmer, Charles A. Csuri is foremost an artist.



Beyond Boundaries

Charles A. Csurí

What is meaningful to me is a world of art in the context of history. I find there are relationships between great works of art, irrespective of the time in which they were created. I can see it and feel it when I compare primitive art, the works of Titian, Michelangelo, Rembrandt, Cézanne, Picasso, and other modern artists. I find links between them based upon a concept of visual structure. The more difficult aspects of art, however, are the works' content and meaning. What is it that gives a great work of art such a presence and an aura of grandeur? Standing near Michelangelo's statue of *David* is an awesome experience. The work was created by a god, not a mere mortal.

I often asked myself, how were these artists able to break free of their historical roots and move their art to another level? Did they abandon their past? There is no easy answer to these questions, yet it is fascinating to me to contemplate how their works represent forms of innovation. To what extent is art itself innovation? While I do not find the answers I seek, I do see that the works of the great masters serve as models or reminders of the meanings of art.

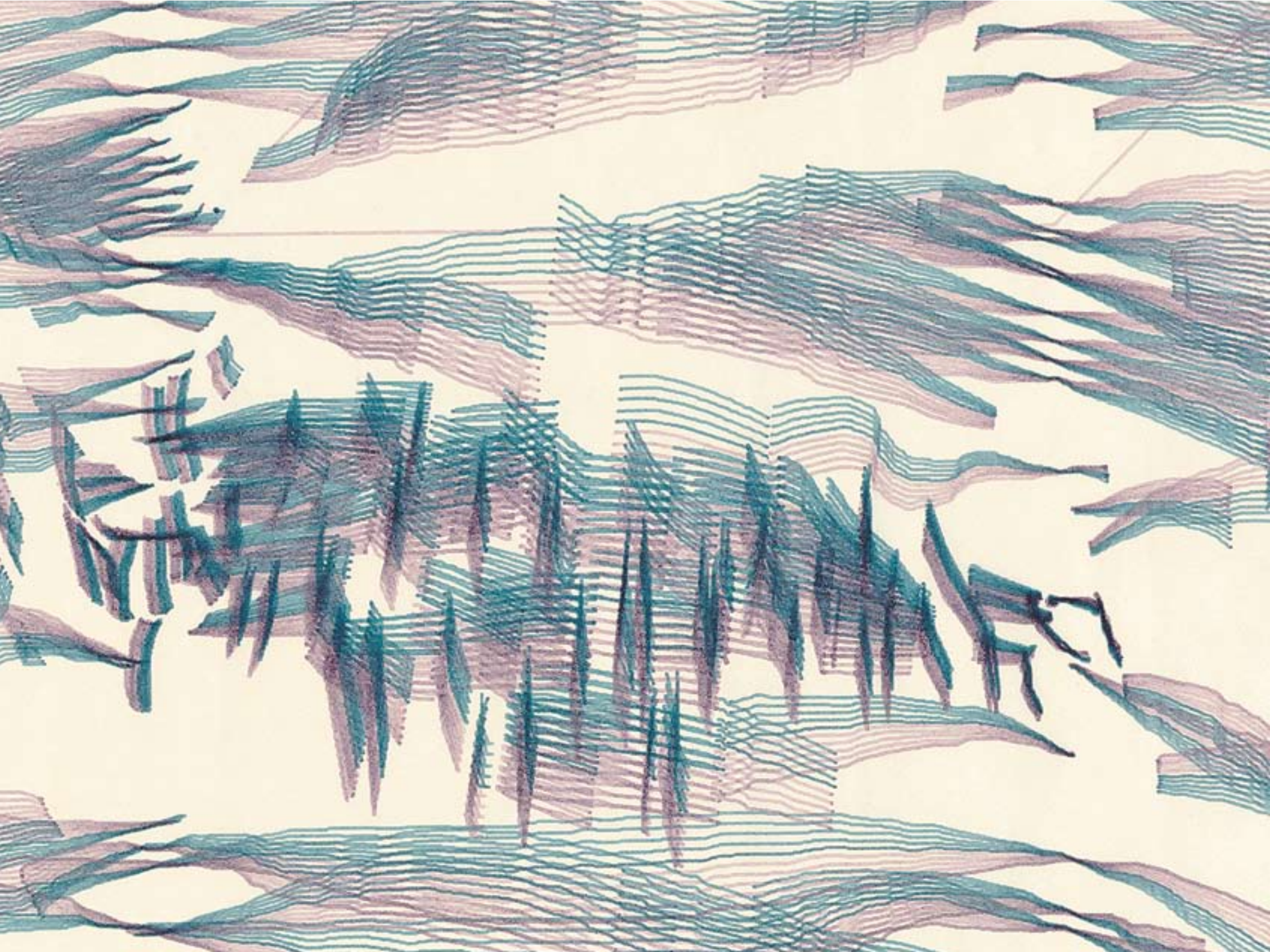
I might have created some special problems for myself by embracing computer technology. In my search for personal ways to express myself, I have found the technology to be deceptive. It can easily take me away from a goal of personal expression. Advanced techniques often distort the reality of true innovation. Innovation is not simply doing something different. While technological advances have great appeal and I embrace them, there is a realization that somehow I must find the art in the work.

When I began working with the computer, I had to look closely at how it could be used within an artistic context. How might I work with this new medium in a way that would offer me greater freedom? Where is the sense of play and fun in this universe of linear logic? Is there something new buried in this logic, or is the innovation within me? Over many years, I have shaped a software environment that offers me methods and strategies that allow me to work more freely. I realized early on that I preferred an approach to making art that allowed for multiple solutions to a problem. The software was designed to reflect this idea. As a consequence of this choice, an art object becomes many statements about the same thing.

The creative process works when I am able to live in a space of psychological uncertainty. I'm comfortable with the notion that I don't know where I'm going. It is a journey to somewhere, and I can not anticipate where it will end. I find I am best able to enter this uncertainty if I allow myself to take risks. There is always the possibility of making a mistake and creating something trivial. It helps if I accept the fact that most of what I do is trivial. On occasion, however, I uncover an art object. It is always a contest to break free of the logic, which offers security and a sense of control. The stress that I often feel as an artist is my attempt to break free of this carefully measured universe, a universe where there is a predictable outcome. When I allow myself to play and search in the space of uncertainty, the more creativity becomes a process of discovery. The more childlike and curious I become about this world and space full of objects, the better the outcome. I try to play at the edge of reason and absurdity. It is an invitation to something alive. This approach offers an outcome that is unpredictable, but it is one filled with meaning. Through it, I learn about art and about myself.

Early Period

1963 to the mid-1970s



A Record of Decisions: Envisioning Computer Art

Margit Rosen

Painting with rapid brushstrokes, the young man seems almost to attack the canvas. “I’ve painted with oil and acrylic, and I’ve poured paint, and spread it with knives, and I’ve walked in paint.”¹ If he is not in the studio, he carries the canvas outside in the fields, where he accomplishes a full landscape within an hour. In 1966, only about four years later, the same man, Charles A. Csuri, sits in an air-conditioned clean room filled with the humming of an IBM 7094 mainframe computer. Patiently, he watches the computer-controlled plotter lowering the pen to the surface of the thin paper, drawing a line accurate to a millimeter, lifting the pen, moving it, and lowering it again. After 20 minutes, five overlaying line portraits of a bearded man are accomplished (Catalogue 13).

This scenic confrontation of two phases in the work of Charles A. Csuri might indicate the plurality of a life and lifework that spanned most of the 20th century and beyond. It is the starting point to trace the path of an artist who made use of a broad range of media: drawing, painting, sculpture, and language, as well as computer graphics, film, and animation—media in which

Csuri counts among the recognized worldwide pioneers of technical innovation.

A retrospective allows for seeing relations between the artistic procedures of the different phases, which were perceived by contemporary observers as distinct disruptions. Charles Csuri’s step out of the art world into the computer research laboratory might have been hinted at in a comment by Paul Valéry as he was trying to follow the traces of Leonardo.

In certain extraordinary cases one wonders
perplexed...how it could come to such events....
The inspired man had been prepared already for
a year. He was ripened. He had always thought
about it, maybe without being clear in his mind,
and where the others were still unable to see, he
had observed and combined, in such a way he
was now doing nothing else, than reading in his
secret.²

Charles Csuri had a classical art education, studying art and industrial design and painting at The Ohio State University (OSU). From 1947 on, he taught at OSU, first as an instructor, then as an assistant professor, and from 1963 on as a professor. During his first years of teaching, from 1948 to 1953, Csuri shared an office with Roy Lichtenstein. They had studied together and become close friends. In 1955, Csuri's career in the contemporary art world began. He presented his works in a group exhibition in New York, and the next year, he held his first one-man show in the Harry Salpeter Gallery. Several exhibitions followed. At that time, Csuri already was involved in an intensive conversation and reflection beyond the field of contemporary art. Csuri recalls that, beginning in 1954, he met regularly during the cocktail hour with Jack Mitten, the industrial engineer who introduced Csuri to computer theory and technology. With a Campari, their favorite drink, in hand, their dialogue evolved into the essence and role of the computer. Csuri brought with him prior knowledge of the topic. In 1943, he had been drafted into the Army to fight in Europe during World War II. Before he was transferred, the Army sent him to the Newark College of Engineering, where he passed a one-year program of algebra, trigonometry, analytic geometry, calculus, physics, chemistry, and engineering drawing. The dialogue between the young artist and the engineer lasted for ten years. "We did reach the stage where we talked about the computer as a philosopher, a theorist and an intellect."³ Csuri and Mitten imagined the computer as a medium of rationality that could think through aesthetic theories—proceeding with imperturbable logic from one term to the next. They did not,

however, think of the computer as a possible tool to produce images. Although there is a link in the history of technology between the automated, pattern-producing loom of the nineteenth century and the development of the computer, at that moment, this association was far away. Outside of military projects, until the beginning of the 1960s, visual equipment such as plotters and cathode-ray-tube monitors were something of a rarity.

One day in 1964, without being in search of it, Csuri discovered a picture of an Ingrid Bergman-like female face in profile in a research publication of The Ohio State University's Department of Electrical Engineering (Figure 1). The image had been regenerated by an IBM 1620 computer. A student, J. G. Raudseps, had researched a procedure to reduce the data of a digitized image, without loss of image quality for human perception, when the image was regenerated.⁴ The scanned and compressed image was printed out in nine gray scales on a Flexowriter, a teletype machine also usable for data input. The serendipitous finding of the portrait led Csuri to merge his artistic reflections with the ideas developed over the years with Jack Mitten. One could say that a piece of peripheral equipment, the Flexowriter, had transformed Csuri's imagination of the computer as an electronic brain into an image-generating machine. The artist immediately contacted the OSU laboratory and enrolled in a course for computer programming. In the same year, he created his first digital images, using the FORTRAN programming language and an IBM 7094.⁵

The Artist in the Laboratory

In the computer center, Csuri was surrounded by scientists from different fields of study. The single giant machine, the mainframe computer, drew them together and facilitated interdisciplinary exchange. The artist discussed with the scientists the possibilities of digital image generation and processing, and scientific visualization and artistic research. He produced a large number of drawings, which were mathematically transformed, as well as an eleven-minute computer-animated movie called *Hummingbird* (1967). Most of all, he produced ideas. While his colleagues in the Department of Fine Art observed his new engagement with resentment,⁶ the scientists encouraged him to write a proposal for the National Science Foundation (NSF) in order to receive financial support. The grant application from 1968, entitled *A Software Requirement for Research and Education in the Visual Arts*,⁷ is a document of unique historical importance in its fusion of visionary artistic thought and technological research at the end of the 1960s. The National Science Foundation accepted the proposal and agreed to provide a grant of \$100,000. Csuri was overwhelmed. NSF was impressed by his ideas. Nevertheless, Csuri's case left the program officials with a certain uneasiness. Csuri recalls, "They said they did not want any publicity, because they had never given a grant to an artist. They only worked with computer scientists. They were very fearful of misunderstanding."⁸ It was the beginning of more than twenty years of support for Csuri's work by the National Science Foundation.

Csuri's notion of artistic research is free from avant-garde claims, like those formulated in the 1960s by European artist groups, such as the *Groupe de Recherche d'Art Visuelle*. In contrast to them, he was not concerned with the redefinition of the artist as a researcher in order to overcome traditional ideas of the irrational and socially marginalized creator. These European groups produced paintings, kinetic sculptures, and environments under the new notion of research, working closely within their artistic groups. Csuri, in contrast, crossed the border into the research-and-development laboratories. In building his own research context, he even transgressed the aims of the American art and technology movement as defined by Billy Klüver and Maurice Tuchman, who tried to establish project-bound collaborations of artists and engineers.⁹ Having received the grant by the National Science Foundation and additional support by The Ohio State University, Csuri began to implement a three-part program: building up a library with programs for the generation and transformation of images, developing a graphic console, and establishing an educational program. It should be remembered that it was primarily the military, automotive, and the aviation industries that had been defining the goals for interactive graphical systems and computer simulation. Now, an artist appeared on the scene, defining different goals. He wanted to develop tools for artists—software and hardware—that would enable them to subject drawings to mathematical transformations, to construct multidimensional pictorial spaces, to virtually render sculptures that then could be milled automatically, and to draw objects that could move in these spaces and be manipulated in real time.

Figure 1-A.

J. G. Raudseps.
Profile of a Woman.
1963.
Antenna Lab.

Figure 1-B.

J. G. Raudseps.
Smoothed Figure.
1963.
Antenna Lab.





Rausped's work represents one of the first attempts to interpolate raster data. In sum, his research proceeded in the following way:

Step 1: A black and white photograph of a woman in profile was identified.

Step 2: In order to simplify the grayscale data in the photograph, a painting of the photograph was created.

Step 3: The painting was subsequently photographed and digitized.

Step 4: The grays in the photograph were "quantized," or mapped into regions.

Step 5: The program created by Rausped to interpolate the quantized raster data was implemented.

The goal of this process was to introduce enough gradation in the grayscale that the final output image was indiscernible from the photograph in Step 3.

Explanation of Antenna Lab Images

“What we call ‘real-time,’ that is time which is ‘real’ because the moment of the artistic idea is also the moment of its materialization.”¹⁰ In his research program, Csuri never speaks of the user, but only of the artist.

The Artwork: A Recording of Decisions Taken

What is evident and easy for any artist—to draw a smooth line or a three-dimensional opaque origami swallow, showing only those contours perceptible to the observer and hiding the others—is very difficult to realize if you have to atomize those processes into single steps and instruct a computer digit per digit. As Friedrich Nietzsche claimed, we can understand only a universe that we have constructed completely ourselves. Early developers in computer graphics learned slowly to understand the universe of human visual production and perception, at least a small part of it.

Charles Csuri took up this task systematically and enhanced the computer as an artistic tool, first working with an IBM 1130, then with a PDP 11/45.¹¹ Constructing a tool presupposes the analysis of the production process. Csuri, the artist, was prepared. He followed up an aesthetic interest rooted in his study with impressionist painters John Hopkins and Hoyt Sherman, who taught him to understand Monet, Cézanne, Braque, and Picasso—an interest in the structure of artworks and the decision-procedures involved in their production. Since the 1960s, Csuri

studied the relationship between idea, decision, and physical production, as well as the effects of the art object on the observer. By 1961, he had developed a form of conceptual word poems, anticipating methods of conceptual art that emerged only a few years later. Csuri’s methods allowed him to replace a painting with its verbal description. “The notion of nonvisual cues, such as words, as the art object was of interest to me,” Csuri remembers.¹² *Hand*, a later example of this series from 1965, offers the observer only the verbal description of a hand, challenging the different modes of information communicable by image and words (Figure 2):

Here is a hand—
a hand of a thin, ninety nine
year old man. The skin is
pinkish in color and the network
of veins are clear. The movements
of his fingers and thumb
are slow and stiff and one can
almost hear the crackling of
joints. His hand is rough in
texture and feels warm.

Csuri used words to define an image in the mind of the observer. As a programmer, he would use numbers to define images drawn with electrons on the screen of a cathode-ray tube. Words and numbers stepped into the mimetic, painterly depiction of the world.

HAND

Here is a hand —
a hand of a thin, ninety nine
year old man. The skin is
pinkish in color and the network
of veins are clear. The movements
of his fingers and thumb are
slow and stiff and one can
almost hear the crackling of
joints. His hand is rough in
texture and feels warm.

© 1965 by the artist

Figure 2.

Hand.

1965.

Blueprint.

119 x 102 cm

(47 x 40 in).

Csuri looked closely at the process of creating an artwork, which he perceived as a series of intentional decisions. Marcel Duchamp once described painting as choosing different color tubes, combining so called “ready-mades.”¹³ Csuri stresses in his analysis the act of choice and decision:

In making a landscape painting from nature, the artist responds primarily to visual cues in the landscape and makes decisions about color, texture, line and so forth. Then he records these decisions on a canvas to make his painting or transformation.¹⁴

In his quest for these decision procedures, Csuri developed a great interest in using different devices and strategies for the production of imagery, which would redirect the normal drafting procedures. In the drawing *She's Watching Superman* (1963–1964), Csuri creates an elderly woman with a pensive gaze by simulating a mechanical process and composing the image with countless little black dots (Catalogue 1). Between 1963 and 1964, shortly before Csuri started to work with computers, he deepened the idea of systematic quasimechanical image production. He modified a pantograph, a mechanical device for reproducing a drawing on a different scale, which consists of a framework of jointed rods in a roughly parallelogram form. One end of the pantograph device traces the drawing; the other end simultaneously plots a distorted copy. The image coordinates are relocated analogously. Csuri, therefore, called the device for this systematic procedure

an “analogue computer.” He generated several transformations with drawings copied from images by Paul Cézanne, Albrecht Dürer, Francisco de Goya, Paul Klee, Piet Mondrian, and Pablo Picasso, for example (Catalogue 3–11). One key inspiration for this method was not an artist, but biologist and mathematician D’Arcy Thompson. In his 1917 book, *On Growth and Form*, Thompson applied grids and distortions on animals, plants, bones, and human heads. Thompson sought a tool to deduce from a particular animal the ideal form, similar to the Aristotelian genus, as well as the laws of evolution.¹⁵ Csuri reversed Thompson’s enterprise. Rather than seeking the laws of transformation, he created them. He did not seek to reduce variety, but to produce it. Later, he transferred these experiments with his analogue computer to the digital computer and realized the beautiful distortion of Leonardo da Vinci’s *Vitruvian Man* (1966), the Renaissance symbol for the harmonic body (Catalogue 15).

Within the process of image creation, the artist can delegate to the computer decisions that are at a lower level of the control hierarchy. He defines the elements and rules, which the computer has to follow. The elements might be flies and the rule chosen might be an equation that deals with conformal mapping. In one of his early works, *Flies on the Miller Transformation* (1967), Csuri had the computer generate a large number of flies (See Catalogue 25 for a related work). With a pseudorandom number generator, they were distributed and positioned in the region of a triangle. The flies then were mapped into the region of a half-circle. Another example is the morphing of a young woman

into an elderly woman in the *Aging Process* (1967). The drawings were broken down into line pieces, representing the elements to be manipulated. The rule then defined certain parameters of the dissolution of the young woman and the emergence of the old woman (Figure 3; Catalogue 20). All these procedures contained a certain aspect of surprise, although all events in the computer are strictly deterministic. Today, Charles Csuri says that these procedures have changed his “conception of control” and creativity.

When I did a traditional painting, I was thinking in terms of start, beginning, and some end point—a painting, a drawing. Today I don’t have the expectation in the same way. I explore the computer as a search engine for art. I am hoping that when I set up that environment, there will be something I cannot think of.

Already, while he was using the pantograph, Csuri started playing with the notion that he could not anticipate or imagine the result of the rules he had set up. In one of his first articles on computers and art, he stresses that the computer can help to overcome certain “set producing tendencies,” certain patterns of thinking. The artist “usually gets only slight variations on a basic structural theme. A mathematical orientation toward visual problem solving can enable the artist both to break down his biases and to express another range of solutions.”¹⁶

Artists used mathematics as a point of orientation and to enlarge their formal repertoire before the advent of the computer; however, the possibilities of electronic calculations and peripheral equipment, such as plotters, microfilm plotters, and cathode-ray-tube monitors, have shifted this rapport.¹⁷



Figure 3.

Aging Process.
1967.
Ink on paper.
IBM 7094 and
drum plotter.
38 x 94 cm
(15 x 37 in).

In the past, mathematics has been given limited application as a tool for the discovery of aesthetic form because the techniques employed were slow and extremely time-consuming.... As a consequence, the artist's concept of structure was limited by what he was able to design or draw by hand.

The digital computer now suggested "different approaches to problems involving the repetition of data and iterative procedures which can take advantage of the computer's speed of operation."¹⁸ The electronic calculating machine became an "amplifier of human imagination," as Kenneth Knowlton, one of the pioneers of computer-generated animation, formulated it.¹⁹ This vision, however, did not always correspond to the experiences of the first visual experiments with the computer.

It was time consuming to write a single program, and then you had to do an overnight run, so to speak, to get feedback, and then wait for the plotter. And you thought, "Oh no, I should have done that." It really took a lot of time. It limited your productivity in terms of the number of images and ideas you could actually explore or express.²⁰

The Internal Reality of Representation

The difficulties of the beginning did not limit Csuri's imagination. He was conscious of the potential of the new technology. Already, in 1967, he conceptualized a complex example for an artwork containing the potential of variability. He saw "a new approach to problem solving in the arts. With the computer, the artist can now deal with different variables in his decision making process." Csuri also suggested putting into the memory of the computer a color representation of a landscape that was visualized on a graphic console.

Then with a computer which implements mathematical functions, the artist can watch the effects of wind velocity, temperature and factors which involve the amount of daylight upon his landscape. He can also observe data, which are generally unavailable such as the effects of molecular structure, weight, mass, and time upon the landscape. In this decision making process, the artist can rely on non-visual cues as well as visual cues. He can modify many more parameters in the total landscape environment to create a work of art than by conventional methods.²¹

Such a simulation could not be realized in those days. *Tangent Landscape* (1967), a distorted drawing, could only allude to such an enterprise (Figure 4). Within the computer art scene of the

1960s, even the idea of simulation of that kind was not to be found; Csuri's contribution to the discourse was therefore very precious. The simulation he envisioned contained the element of surprise, but it offered another interesting aspect. Designing a simulation, the artist does not act only on the level of visual mimesis, but also constructs a model generating the visible. The hills and clouds are one possible "sensualization" of a set of algorithms and data. The gaze of the artist glided from the surface to the system. "It was very important for me to learn an internal reality about the representation of nature and objects.... The mathematics and algorithmic modes of thinking and how to deal with information was crucial in my development as an artist."²² Csuri's reflection reads like a page out of a book by Paul Klee, one of the artists he highly appreciates. Indeed, Klee, writing on art and mathematics remarked:

Beneficial here is the constraint to get involved with the functions first and then with the



accomplished form.... You learn to look behind the facade, to catch a thing at its roots. One learns to perceive, what streams beneath, learns the prehistory of the visible.²³

For his explorations in the universe of mathematically constructed images, it was important that Charles Csuri early on found open-minded companions with whom to explore the new artistic territory. In 1965, he met programmer James Shaffer and Professor of Mathematics Dr. Leslie Miller. Between 1965 and 1972, Csuri wrote programs and set the parameters for the special functions, and with Shaffer and Miller discussed different mathematical possibilities that would allow him to realize his artistic ideas and help him to implement them. "Both of them wrote special functions for me. I specified the kind of function I needed, and they wrote the code for them."²⁴ Csuri gratefully worked with these programmers and mathematicians, because, after an initial fascination with the secrets of programming, the artist wished to limit the amount of time spent in that arena, and he was looking impatiently for ways to realize as much of his imaginations as possible. Csuri's vision was brought ever-closer through the process of interdisciplinary discussion and collaborative realization.

Figure 4.

Tangent Landscape.
1967.
IBM 7094 and
drum plotter.
Original dimensions
unknown.

The Computer as a Tool for Aesthetic Analysis

Csuri's interest in the creative process led him to develop in his 1967 research proposal the idea of the computer as a tool not only of image synthesis, but also of analysis. Scanned images should be used to

construct a mathematical description or profile on an artist's work. It might be a kind of mathematical handwriting. His style could be analyzed. It might be interesting to compare these mathematical patterns in authenticated works by an artist and the works which are in question as to their authorship.²⁵

The idea of defining an artist's style or the structure of an artwork or text mathematically and statistically with the help of a computer had been in the air since the late 1950s. In 1965, A. Michael Noll, for instance, analyzed Piet Mondrian's 1917 *Composition with Lines* in order to regenerate a similar picture on the computer. Another example is a student at the Massachusetts Institute of Technology trying to formulate mathematically the style of Rembrandt's and Seurat's brushstrokes.²⁶ The most important author with reference to Csuri's ideas here is German philosopher Max Bense, a key figure for the European computer art scene, who sought to detect within the framework of his "information aesthetics" the elements and rules of artworks. Since the mid-1950s, Bense had developed, in his *Aesthetica* series, the

idea of "analytic aesthetics," applying methods of semiotics and Claude Shannon's information theory.²⁷ While Bense was analyzing completed artworks, paintings and texts, Csuri sought to observe and analyze the procedure of creating them. He imagined using a graphic console to automatically record the single steps of image creation: the inputs of the light pen as well as the programs used and the parameters chosen. "Using an 'on line' system, one could also keep track of the time required for decisions between each step."²⁸ Csuri even thought of a "comparative analysis of decision making by people." With German mathematician and artist Frieder Nake, Csuri was a theoretical companion, although Nake and Csuri were unfamiliar with each other's writings. Nake formulated conceptually what Csuri planned to realize practically—profiting from the computer's "traceability." In 1968, Nake published "The Art Production as a Decision Process," segmenting theoretically the creative process in points in time, attributing to every point a set of possible decisions.²⁹ He thereby put an emphasis on the temporal dimension of creation, an aspect that was already contained in Bense's information aesthetics through Claude Shannon's mathematical theory of communication.³⁰

Nake suggested, following Bense, that if the process of image generation could be formalized mathematically, it could be mechanized. That is, an image could be composed and drawn automatically by a computer. Yet he emphasized that certain aspects of the creative process are beyond this kind of formalization. This point was central to Charles Csuri's concept of computer art: decisions of a certain level can be delegated to the computer. The

quest to formalize and mechanize certain processes had revealed to Csuri a level of control and decision-making that escapes this grasp: the artist's intention, the all-embracing aesthetic aim.

Interactive Systems

The question of artistic control emerged once again, when Csuri examined interactive systems within the research for real-time film animation beginning in 1969. Different objects, such as origami swallows, goldfish, butterflies, turtles, violins, and helicopters



could be generated, turned and moved via a three-dimensional data table, a light pen, dials, a joystick, function switches, and the alphanumeric display terminal (Figure 5).³¹ In a major exhibition project, Csuri again transcended different media in order to promote an idea. In cooperation with fourteen departments,³² he organized the show *Interactive Systems: Computer Animated Film. Electronic Sound. Video. Light. Electromyogram. Environmental Collage* at OSU (Figure 6). The exhibition opened April 1, 1970, the same year that Jack Burnham curated the now famous *Software. Information Technology: Its New Meaning for Art* at the Jewish Museum in New York, pleading for “responsive systems” in art. In the introduction to the catalogue of *Interactive Systems*, Csuri wrote:

The spectator will be permitted to participate in esthetic decision making. An effort has been made to create esthetic situations or environments in which the spectator can become involved. This is expected to be accomplished through a controlled electronic environment, in which a user can make decisions by electronic means to invent or modify images or sound systems.³³

The catalogue bears witness to an impressive exhibition showing not only a selection of the films produced by Csuri and his students, but also, several interactive installations realized in the diverse media indicated in the exhibition's subtitle. Csuri even managed to install a complete computer graphics system, a PDP

Figure 5.

Origami Swallows.
1971.
Real-time art object.
PDP 11/45 and Vector
General graphics
display.

COMPUTER FILMS – CHARLES CSURI

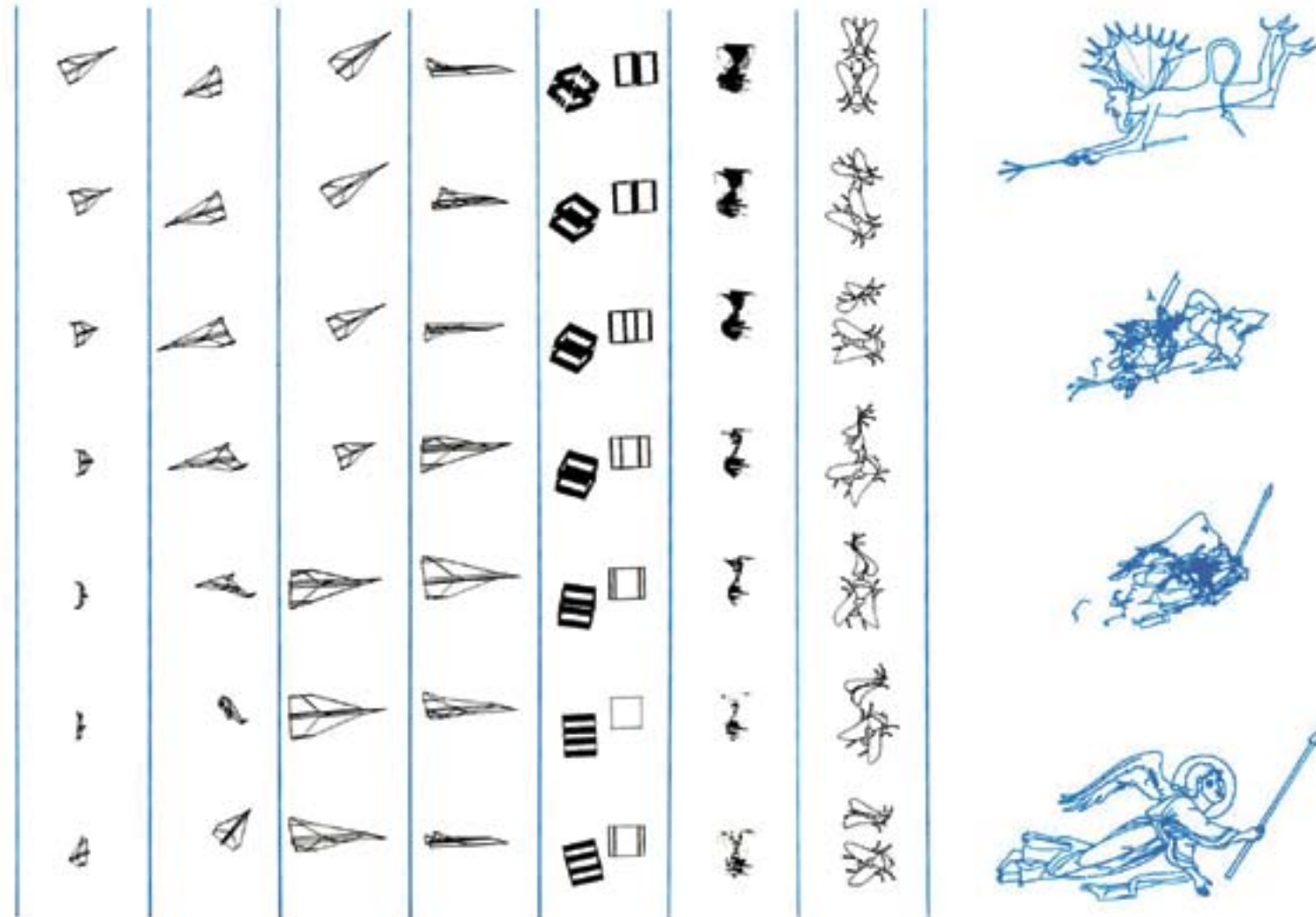


Figure 6.

Computer Films.
1970.
From Interactive
Sound and
Visual Systems.
For complete ISVS
catalogue, see wmc.ohio-state.edu/csuri/.

11/45 computer line drawing display, to demonstrate the interactive process for animated film. Art students were scheduled to demonstrate to the public techniques for art graphics and film animation.³⁴ There is no documentation of the exhibition besides the catalogue, because after only five days, the entire campus was shut down when serious conflicts emerged in connection with the civil rights movement.

Computer Art Between Hype and Rejection

Charles Csuri is one of the outstanding figures in the computer art scene of the 1960s. Deciding not to follow his friend Roy Lichtenstein to New York, he stayed in Ohio, independently developing his concept of computer art and having no regular contact with other artists in the same search. It was only in 1968, after Csuri had already defined his early work, that computer art won a broader audience. This led to an intensive information exchange between its protagonists working in America, Europe, and Japan. Although the journal *Computers and Automation* announced a computer art competition in 1963, and although the first exhibitions with computer drawings took place in 1965,³⁵ it was only in 1968–69 that the exhibition activities reached their climax. Csuri's drawings and his film *Hummingbird* (1967) were among the most propagated works (See Catalogue 19 for a still image). He was acknowledged internationally, with exhibitions in the United States, Great Britain, Germany, Czechoslovakia, Yugoslavia, and Israel.

Before all of this hype, in August of 1967, *Sine-Curve Man*—the oscillating portrait of a bearded man—won the computer contest of *Computers and Automation* (Catalogue 17). The same year, *Hummingbird* received an award at the fourth *International Experimental Film Competition* in Brussels.³⁶ Thereupon, the Museum of Modern Art in New York purchased the film for its permanent collection.

Despite all these activities, the art audience was at a loss with computer-generated art. Ken Knowlton described this perplexity: “The machinery which intervenes between artist and viewer precludes a great deal of normal communication. Even at the first stage—the punched card—one cannot tell whether the card was punched tenderly or in fury.” For those who had no insight into the computing process, computer art remained largely inaccessible.³⁷ In addition to this helplessness resulting from a lack of knowledge on a technical level, the aesthetic theories of computer art did not enter the contemporary art discourse beyond a more general discussion of art and technology. No cultural authority tried to challenge computer art's aesthetic, to develop it and to spread a certain understanding. The traditional art world of galleries and art journals rejected art related to the computer.³⁸ The reasons were manifold and must be sought on theoretical and social levels. One was caused by the fact that the images, films, and sculptures were produced, in large part, by persons neither having an academic art education nor belonging to art circles. This was just one of many reasons why the projects realized and the theoretical statements formulated within

the framework of the computer art scene were not perceived as interesting, challenging provocations of and inspirations for the contemporary art context. They did, however, have the potential to actually scrutinize certain artistic values. A. Michael Noll, for instance, had the computer generate a Mondrian-like picture and described the difficulties of his colleagues to identify whether the original Mondrian or the computer-generated picture was composed by a machine. In doing so, he seemed to undermine the human domain of artistic creativity. In a manner similar to that of German Herbert W. Franke, Hiroshi Kawano, one of the pioneers of Japanese computer art, sought “the algorithm of art in order to simulate human art.”³⁹ The emphasis of rationality, of the traceability of the creative process, of an art that can be measured objectively, communicated without loss, formalized and mechanized, seemed to attack the idea of the genius and the ineffable core of art. When Matthew Baigell, assistant professor at the Art History Department of The Ohio State University, in 1967, sent an article to the journal *Artforum*, he received a two-sentence answer from Philip Leider, one of the editors, which illustrates the atmosphere in those days. The letter read, “Thanks for the enclosed manuscript on Chuck Csuri. I can’t imagine *Artforum* ever doing a special issue on electronics or computers in art, but one never knows.”⁴⁰ (Figure 7)

The Artist’s Personal Fiction

Charles Csuri’s concept of art only *seemed* to resemble the militant ideas of “the computer as artist.” Csuri never called into question the authority of the human artist. He did not cultivate the rhetoric of the extinction of the subject, of a transhuman art. As much as he explored the computer, the machine itself as a symbol of rationality and discipline never stood in the center of his reflection. The computer was a tool, which he tried to master and enhance. Foremost in his mind was that the relationship between man and machine was always, to a certain degree, reciprocal, and that in the process of taming, so to speak, the one who tames is transformed as well.⁴¹

Along with Otto Beckmann, the Computer Technique Group Japan, William Fetter, Peter Foldes, Leon Harmon, Ken Knowlton, Leslie Mezei, and others, Csuri explored the depiction of the visible world with new technical means. Most of the artists and scientists producing images and movies with the computer in the 1960s designed abstract imagery. They enquired in a nonfigurative way about variability, randomness, and complexity—aspects that represented the potential of the new medium. Csuri never focused his imagination on the visualization of the structure of the computer itself. Neither did he entertain a mythical relation to the eternal world of mathematics. Rather, Csuri used mathematics as a means of representation. He did not seek to represent the idea of mathematics itself. He applied trigonometric modifications, geometry (which is described in his papers as *n*-dimen-

ARTFORUM

667 MADISON AVENUE • NEW YORK, NEW YORK 10021

MESSAGE

TO

Mr Matthew Baigell
Assoc Prof., Art History
Ohio State University
College of Ed; School of Art
126 N Oval Dr
Columbus, Ohio, 43210

DATE

Dear Mr Baigell,

Thanks for the ~~manuscript~~ enclosed manuscript on Chuck Csuri; I ~~am~~ cant imagine ARTFORUM
~~xxxx~~ ever doing a special issue on electronics or computers in art, but one never knows.

In any event, thank you for letting us see the manuscript,

REPLY

DATE

10/30/67


Philip Leider
EDITOR

SIGNED

Figure 7.

Artforum Letter.
1967.

sional) projective transformations, and conformal mapping in order to construct a new spatiality. The result would be a linking of the mimetic depiction of the world with geometrical space. In one colored sketch from 1965, he drafted a portrait floating in n -dimensional space; in another, the movement of an imaginary camera turning around a drawing, which became an object (Catalogue 16). Watching the eight sequences of the movie *Hummingbird*,⁴² which was composed of 14,000 pictures, one witnesses how the movements of a simple hand drawing generate an unimagined deep space. The hummingbird dissolves, recomposes, and floats along imaginary waves.

Next to the drawings and films, the potential of the new combination of art and electronic calculation is visible in *Numeric Milling*, a sculpture from 1968 that was produced with a numerically controlled milling machine⁴³ (Catalogue 22). Only a few artists, such as Georg Nees and Robert Mallary, explored the field of computer-generated sculpture. Csuri developed new drafting procedures, creating surprising three-dimensional surfaces using the Bessel function, which is applied for many problems involving wave propagation.⁴⁴ To virtually build an object with different surfaces without any physical resistance and, in a later phase of his work, to look at it in three dimensions before its materialization and play through hundreds of variations would shift the habits and results of the sculpting process. Csuri's special position in the field of computer art lies also in his ability to champion a new tool and to make use of new scientific ideas, something Leslie Mezei postulated early on.⁴⁵ Csuri envisioned the integration

of scientific methods, linked to the new tool, into computer art:

The computer which handles fantastic amounts of data for processing brings the artist close to the scientist. Both can now use the same disciplines and knowledge in different ways. For the first time, the artist is in a position to deal more directly with the basic scientific concepts of the twentieth century.⁴⁶

He imagined simulating the distorting effects of the Lorentz transformation, a theory of special relativity, with a representation of a turtle moving at the speed of light. But he went one step further:

The artist need not necessarily stop at the parameters defined by a transformation in relativity. He can arbitrarily declare that objects will move at a speed which is five times that of light....In fact, he can, with the computer, take a broad variety of well-known equations which describe our physical universe and change the parameters. He can create his own personal fiction.⁴⁷

With his work *Random War*, Csuri adapted the idea of scientific simulation to reflect on processes that do not appear in physics books but are expressed in aphorisms and haiku (Catalogue 24). He told about randomness, which is not caught in terms of

stochastics but is experienced as destiny. The drawing *Random War* (1967) shows the result of a simulation: a picture with 400 soldiers and a written list. The drawing of a toy soldier had been put into the computer. With a pseudorandom number generator, the computer determined the distribution and position of 400 soldiers on a battlefield. One Army was called Red and the other one Black, and the names of members of his department and of some well-known national figures, such as Ronald Reagan, were given to the program. Another program assigned military ranks and army serial numbers, also at random. In addition, the random number generator decided the following information: (1) Dead (2) Wounded (3) Missing (4) Survivors (5) One Hero for Each Side (6) Medals for Valor (7) Good Conduct and (8) Efficiency.⁴⁸

Csuri, who had survived a dangerous voluntary mission during the Ardennes Offensive in Belgium at the end of World War II, confronted the calculated pseudorandom numbers of mathematics with the randomness of human experience. The computer simulation, one of the great visions of the 1960s that was hoped to be able to predict the future in order to change the path of history,⁴⁹ here produces the microcosm of the battlefield. Using the potential of computer simulation, Csuri expressed one of the eternal subjects of mankind, while at the same time reflecting the role of this technology for twentieth-century warfare.

Random War is a paradigmatic example of Csuri's conception of computer art. In his essays and articles, Csuri always stressed that art transcends technology, that for him it is a medium to express

human experiences, thoughts, and emotions. "The challenge is to use computer technology to serve our human spirituality."⁵⁰ Robert Zend once described a scene, which I paraphrase here. The messenger arrived out of breath at the king's court. For a moment, the hubbub at the banquet table died down. And the king, rising from his chair, asked, "Who sent you? What is the news?" Still short of breath, the messenger pulled himself together, looked the king in the eye and gasped, "Your Majesty, there is no message, because no one sent me. I just like running."⁵¹ If Charles Csuri had sent the messenger, he would have answered "Your Majesty, there is no message because no one sent me. I just like running," and in the confused silence he would have started to tell a long story embracing "myth, magic, humor, and at times, even the brutal reality of suffering, pain, and fear."⁵²

¹ Paul Trachtman, "Charles Csuri Is an 'Old Master' in a New Medium," *Smithsonian* (February, 1995): 60.

² Paul Valéry, "Einführung in die Methode des Leonardo da Vinci," *Werke* 6, Frankfurt on the Main: Insel 1995, 15f. Translated by the author.

³ Charles Csuri and John Staudhammer, "An Interview with Charles Csuri," *IEEE Computer Graphics & Applications* (January, 1990): 7.

⁴ J. G. Raudseps, *Picture Regeneration from Quantized Data*. The Antenna Laboratory, Department of Electrical Engineering. The Ohio State University Research Foundation: 31. July 1963.

- ⁵ Janice M. Glowski and Su-hsing Lin, "The Journey to An Artist's Signature," *Charles A. Csuri: In Search of Meaning, 1948–2000*. Columbus College of Art and Design (9 March–1 April 2000): 3.
- ⁶ Csuri left the Department of Fine Arts and took up teaching and research in the Department of Art Education.
- ⁷ *Proposal to the National Science Foundation. A Software Requirement for Research and Education in the Visual Arts*. Principal Investigator Charles A. Csuri, Department of Art Education. Proposed Starting Date: 1 November 1968. Proposed Duration: 2. Months. Total Funds Requested from NSF: \$99,199. NSF Grant No. GJ-204-A01.
- ⁸ Charles A. Csuri. Conversation with the author, Columbus, Ohio, 11–13 October 2005.
- ⁹ See *Experiments in Art and Technology*, Billy Klüver (Ed.). E.A.T. bibliography: 1966–1977, New York: 1977. See also *Art and technology; a report on the Art and Technology Program of the Los Angeles County Museum of Art, 1967–1971*. Maurice Tuchman (Ed.). New York: Viking Press, 1971.
- ¹⁰ Charles Csuri, "Real-Time Film Animation," *Proceedings of the Meeting of UAIDE*, San Diego, Cal., no. 9, (1970): 292.
- ¹¹ From 1969 through 1971, Csuri used a 32 K IBM 1130 computer interfaced to an IBM 2250 model IV graphics display. In 1971, he established the Computer Graphics Research Group (CGRG) at The Ohio State University. The university provided major support for hardware with a 48K word PDP-11/45 computer and a Vector General graphics display with three-dimensional rotation hardware and other features. See Charles Csuri, "Real-Time Film Animation." *Annual Report to the National Science Foundation*. Office of Computing Activities. Grant Number GJ-204. January 1, 1972 to January 1, 1973. The Ohio State University Research Center, 5–116.
- ¹² Csuri. Conversation with the author, Columbus, Ohio, 11–13 October 2005.
- ¹³ Marcel Duchamp, quoted in Katharine Kuh, *The Artist's Voice: Talks with Seventeen Artists*. New York: 1960, 90.
- ¹⁴ Charles A. Csuri, *Proposal to the National Science Foundation*, The Ohio State University Research Foundation. Proposal Reference No. 68-466, 3.
- ¹⁵ D'Arcy Thompson, "On the Theory of Transformations," *On Growth and Form*. Cambridge: Cambridge University Press, 1997, 268–325.
- ¹⁶ Charles Csuri and James Shaffer, "Arts, Computers and Mathematics," *AFIPS Conference Proceedings*, Vol. 33, 1968, p. 1293–1298, p. 1295
- ¹⁷ Charles Csuri and James Shaffer, "Arts, Computers and Mathematics," in: *AFIPS Conference Proceedings*, Volume 33, 1968, 1294.
- ¹⁸ Arthur Efland, "An Interview with Charles Csuri." In *Cybernetic Serendipity: The Computer and the Arts*, edited by Jasia Reichardt. A Studio International special issue, 1968, 81.
- ¹⁹ Ken Knowlton, quoted in Janet Vrchota, "Stan Vanderbeek. Technology's Migrant Fruitpicker." In *Experimental Animation: An Illustrated Anthology*, edited by Robert Russett and Celice Starr. New York and London: Van Nostrand Reinhold, 1976, 201. (Reprint from *Print Magazine*, March/April 1973.)
- ²⁰ Csuri, conversation with the author, Columbus, Ohio, 11–13 October 2005.
- ²¹ Charles A. Csuri, *Proposal to the National Science Foundation*, The Ohio State University Research Foundation. Proposal Reference No. 68-466, 2; and Charles A. Csuri and James Shaffer, "Arts, Computers and Mathematics," *AFIPS Conference Proceedings*, Vol. 33, 1293.

- ²²Charles Csuri, “In the Search of Meaning,” *Charles A. Csuri: In Search of Meaning*, 1948–2000, 9 March–1 April 2000, Columbus College of Art and Design, 12.
- ²³Paul Klee, “Exakte Versuche im Bereich der Kunst,” 1928, and Hans M. Wingler, *Das Bauhaus: 1919–1933*, Cologne: Rasch, 1962, 156. Translated by the author.
- ²⁴Csuri, e-mail to the author, 8 May 2006.
- ²⁵Charles A. Csuri, *Proposal to the National Science Foundation*, The Ohio State University Research Foundation. Proposal Reference No. 68–466, 5.
- ²⁶Leon D. Harmon, “Still Images,” lecture at Experiments in Art and Technology (EAT), 3.3.68. Records 1966–1993, Getty Research Institute, Research Library, Accession no. 940003, Box 28/11.
- ²⁷*Einführung in die neue Ästhetik* (Baden-Baden: Agis), a compendium of the four books between 1954 and 1960, revised and extended by six chapters.
- ²⁸Charles A. Csuri, *Proposal to the National Science Foundation*, The Ohio State University Research Foundation. Proposal Reference No. 68–466, 13.
- ²⁹Frieder Nake, “Die Kunstproduktion als Entscheidungsprozess,” Boris Kelemen, Radoslav Putar, (eds.). *Bit International*, No. 2. *Computers and Visual Research*, Zagreb: Galerija Grada Zagreba 1968, 47.
- ³⁰Claude Elwood Shannon, “A Mathematical Theory of Communication,” *Bell System Technical Journal* 27, July and October 1948, 379–423 and 623–656.
- ³¹Tom DeFanti, “The Graphics Symbiosis System.” In Charles Csuri, *Real-Time Film Animation. Annual Report to the National Science Foundation*. Office of Computing Activities. Grant Number GJ-204. 1 January 1972 to 1 January 1973. The Ohio State University Research Center, 5–116.
- ³²Jasia Reichardt, *The Computer in Art*. London and New York: Studio Vista/Van Nostrand Reinhold, 1971, 34.
- ³³Charles Csuri, “Introduction,” *Interactive Systems*. College of the Arts, The Ohio State University. 25 April–12 May 1970, 1.
- ³⁴Charles Csuri, “Computer Animated Film,” *Interactive Systems*. College of the Arts, The Ohio State University. 25 April–12 May 1970, 4.
- ³⁵The first exhibition known so far was initiated by philosopher Max Bense at the Studiengalerie of the Technical University in Stuttgart, Germany, showing computer-generated drawings by Georg Nees (5.2.–19.2, 1965). The second exhibition was organized by Howard Wise in his New York gallery, presenting works by Bela Julesz and A. Michael Noll (6.–23.3, 1965).
- ³⁶Herbert W. Franke, *Computer Graphics, Computer Art*. Translated from the German by Gustav Metzger. London: Phaidon, 1971, 131.
- ³⁷Kenneth Knowlton, “Computer Films” (based on a lecture at EAT in 1968). In *Experimental Animation: An Illustrated Anthology*, edited by Robert Russett and Celice Starr. New York and London: Van Nostrand Reinhold, 1976, 195.
- ³⁸Taylor Grant, *The Machine That Made Science Art: The Troubled History of Computer Art*. 1963–1989, Ph.D. diss., The Faculty of Architecture, Landscape and Visual Arts, University of Western Australia, October 2004.

³⁹Hiroshi Kawano, manuscript. Archive, Muzej Suvremene Umjetnosti (Museum for Contemporary Art). Zagreb, Croatia, 1971.

⁴⁰Letter of Philip Leider to Matthew Baigell, 30.10., 1967, in the collection of Charles Csuri.

⁴¹Bruno Latour, "Mixing Humans with Non-Humans: Sociology of a Door-Closer." In *Social Problems* 35, 1988, 298–310.

⁴²Charles Csuri and James Shaffer, *Hummingbird*. Programming Assistance: Samuel J. Cardman, and J. Carroll Notestine. Charles Csuri wanted the film "to begin as if an artist was making a drawing." Shaffer developed the technique to bring in short segments of the plotter drawings. Csuri conceived the ideas of morphing, randomness and fragmentation, which were implemented by Shaffer, Cardman, and Notestine. Charles Csuri, e-mail to the author, 8 May 2006.

⁴³Charles Csuri discussed the idea of three-dimensional surfaces with Leslie Miller and told him about the possibility of creating sculpture with a three-axis milling machine. "He then devised a scheme using quadratic equations. He explained how the code worked and I experimented with parameters to see what was possible." Charles Csuri, e-mail to the author, 8 May 2006.

⁴⁴Charles Csuri and James Shaffer, "Arts, Computers and Mathematics." *AFIPS Conference Proceedings*, Vol. 33, 1968, 1298.

⁴⁵Leslie Mezei, "Science in Art in Science in Art in Science," *Arts Canada*. Toronto: June 1968, 38.

⁴⁶Charles A. Csuri, *Proposal to the National Science Foundation*. The Ohio State University Research Foundation. Proposal Reference No. 68-466, 3.

⁴⁷Charles Csuri and James Shaffer, "Arts, Computers and Mathematics." *AFIPS Conference Proceedings*, Vol. 33, 1294. See also, Charles A. Csuri, *Proposal to the National Science Foundation*. The Ohio State University Research Foundation. Proposal Reference No. 68-466, 4.

⁴⁸See Arthur Efland, "An Interview with Charles Csuri." *Cybernetic Serendipity: The Computer and the Arts*, edited by Jasia Reichardt. A Studio International special issue. London: Studio International 1968, 81–84.

⁴⁹See Martin Caidin, *The God Machine. A Novel*. New York: Dutton, 1968 or Jones, D. F., *Dennis Feltham Jones*, Colossus, London: Hart-Davis 1966.

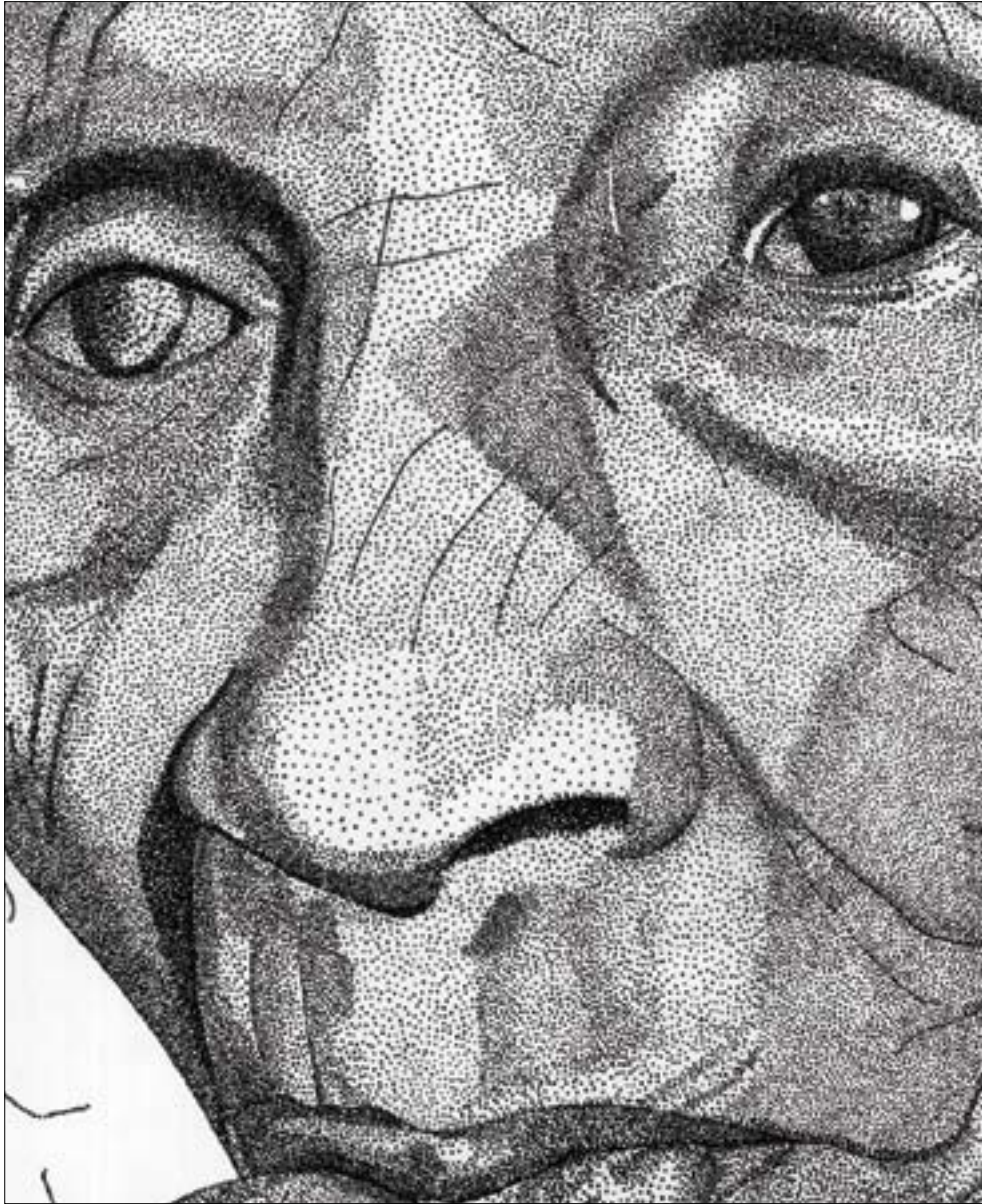
⁵⁰Charles Csuri and John Staudhammer, "An Interview with Charles Csuri," *IEEE Computer Graphics & Applications*, January 1990, 3.

⁵¹Robert Zend, "The Message." In Robert Zend, *From Zero To One*. Victoria, British Columbia: The Sono Nis Press, 1973.

⁵²Charles Csuri and John Staudhammer, "An Interview with Charles Csuri," *IEEE Computer Graphics & Applications*, January 1990, 3.

When I began working with the computer,
I had to look closely at how it could be
used within an artistic context.

– Charles A. Csurí



“I began questioning the role of a tactile-kinesthetic approach to painting and drawing. What is the relationship between the mind and the hand? As an experiment, I made this drawing, one dot at a time, with a pen. It was a procedural approach in which I worked mechanically like a machine. I also wondered if words and comments could contribute to and become part of an art object. I was curious to see if, in the end, there would still be an aesthetic quality.” — Charles A. Csuri



1. ***She's Watching Superman.***
1963–1964.
Ink on paper.
Procedural drawing.
147 x 104 cm
(58 x 41 in.).

Contemplation

Created in 1964, *Contemplation* acknowledges Csuri's dual sources of artistic inspiration and experimentation, his fine arts training and the potential of technology. During the advent of applied computer science, there was only one computer available for the entire Ohio State University campus. As a result, Csuri found himself in dialogue with scientists more frequently than with fellow artists. Part of a series of works experimenting with imagery and technology, *Contemplation* delineates Csuri's break from art constrained by paint and canvas.

Contemplation's skewed lines were inspired, rather than created, by the pantograph device's capabilities and denote the incursion of the computer into the realm of Csuri's artistic sensibilities. What follows this experimentation was decidedly different. In essence, the dramatic shift in artistic tool sets, furnished by science, acted as the impetus for a new understanding of surface representation.

In *Contemplation*, Csuri first sketched a pencil line drawing on the stretched and gessoed canvas. Next, he used oil paint and created the defining lines by hand. The proportions of the man are subjected to transformations inconceivable in nature. A depiction of the same male figure, to the right of transformed renderings, is

also rendered in Csuri's original media of paint. In stark contrast to the pantograph-derived figures in the *After the Artist* series, however, Csuri's thickly applied pigments give the male figure depth and form, allowing it to penetrate the third dimension.

This work, made concurrently with the *After the Artist* series, marks a significant transitional period in Csuri's artistic career. It demonstrates that he was beginning to conceive of the transformative possibilities that the computer offered. Although they are similar in their formal properties, *Contemplation* is distinct from the works contained in the *After the Artist* series, insofar as the subject matter does not allude to master works in the history of art. Rather, we see a seemingly ordinary man situated in the modern era, as indicated by his collared shirt and tie. Here, Csuri does not invoke the works of past masters, or the limitations of brush and palette. With *Contemplation*, Csuri shifts into a new phase of artistic development. Although he continues to be influenced by the history of art, from this point forward, Csuri will use the computer to revolutionize the ways in which artists negotiate representation of their world. [AM]

-
2. **Contemplation.**
1964.
Oil paint on canvas.
76 x 127 cm
(30 x 50 in.).



After the Artist Series

“This [technology] allowed me to systematically alter the original geometry of my drawing. One end of the pantograph device traced the drawing and the other end was simultaneously making transformations. I was intrigued with the idea of using devices and strategies to create art. I questioned the notion there had to be a tactile kinesthetic process to create a drawing or painting.” — Charles A. Csuri

Over the centuries, many artists have sought to believably translate our three-dimensional world onto a two-dimensional surface. Csuri, like his early contemporaries who also worked as painters, defies a concern for strict realism and instead embraces the two-dimensional surface, challenging its limitations in his earliest endeavors with computer art. There were no mass-produced operating systems when Csuri began creating art in the early 1960s, necessitating that he create his own computer programs to challenge the limits of this new technology. Further, computers at this time were unable to assign values to account for mass, although the perception of spaces and their relatedness to mass will become a hallmark of Csuri's art created in a three-dimensional world space.

In his *After the Artist* series, the first analogue computer art created by Charles Csuri from 1963 to 1964, Csuri recalls and recreates classic works by historically significant and personally compelling artists. In all, he created nine analogue drawings, referencing works by Paul Cézanne, André Derain, and Albrecht Dürer, among others. In this series, Csuri creatively distills selected masterpieces into their vital components, thus placing the works by these artists into a new role he has assigned to

them. Then, using his analogue process, Csuri masterfully repeats, stretches, skews, and inverts the elements. These works translate traditional art by harnessing a vehicle originally created for the scientific applications. The result is a new artistic paradigm, in which Csuri appropriates scientific elements and injects unpredictability, dynamism and controlled artistic chaos. By stripping the works of Cézanne, Derain and Dürer of their z-axis, Csuri removes that aspect which confers depth and volume, working instead with “relationships between objects as transformations involving position, rotation and scale.”¹ These ‘transformations’ result from the distillation of well-known works into their simplified forms, and their subsequent manipulation results in tension between dimensions.

Albrecht Dürer (1471–1528), the patriarch of portraitists, dominated Germany in the late fifteenth century. Prior to him, artists generally did not paint independent self-portraits, which expressed the personality behind the canvas's production. In *After Albrecht Dürer*, Csuri recalls Dürer's *Self-Portrait with a Bandage* of 1491–92, a pen on paper sketch in which Dürer emphasizes the agency of his own hand (Catalogue 3). Csuri eliminates references to depth and space by removing shading, reducing Dürer's sketch to its most basic elements. The adjacent pantograph is flipped and slightly compressed as Csuri considers it from another perspective. He returns to the original orientation for the final replication, skewing the drawing along both its x and y axes, further emphasizing the presence of Dürer's hand and, by extension, reminding the viewer of the latent capabilities within it.

The intellectual climate of early twentieth century Paris generated schools of art such as Cubism and Fauvism, movements that sought to rebuke the photographic, mechanical reproduction of the tangible world. Their investigations into essential expressions of color and line drove artistic innovation. Here, Csuri reevaluates two of the artists who played significant roles in this milieu, Paul Cézanne (1839–1906) and André Derain (1880–1954).

While not as well known as many others of his time, André Derain painted captivating portraits in the company of Cézanne, Pablo Picasso and Henri Matisse, among others. Derain was noted for his infusion of Mannerism, recalling the famous Spaniard El Greco of the late 16th-early 17th century. In *After André Derain*, Csuri has condensed Derain's bold brushwork, reducing it to only the most expressive elements (Catalogue 4). One of the two figures has been elongated along its x-axis, forming the visual base to support a more conventionally proportioned figure in the center.

In *After Paul Cézanne*, Csuri pays homage to Cézanne's significant contributions to the art world, particularly his innovations as the forefather of Cubism, a style in which space is broken into planes outside traditional modes of representation (Catalogue 5). Csuri was well aware of Cézanne's prominent role in art history and had a personal affinity for his work, having spent long hours in museums and galleries closely studying the works of Cézanne and other master artists. In a personal symbolism of geometric forms, Csuri uses concentric circles and progressively larger

squares that emanate from the center of Cézanne's eyes. Read from left to right, the circles and squares express Cézanne's unique vision and the modes through which he translated physical space onto two-dimensional canvas. When asked about the symbolism, Csuri stated, simply and with a smile, "He was the father of modern art, having the vision for Cubism...I couldn't resist playing with it."² [AM]

¹ Charles Csuri, *Tactile-Kinesthesia*, 1998.

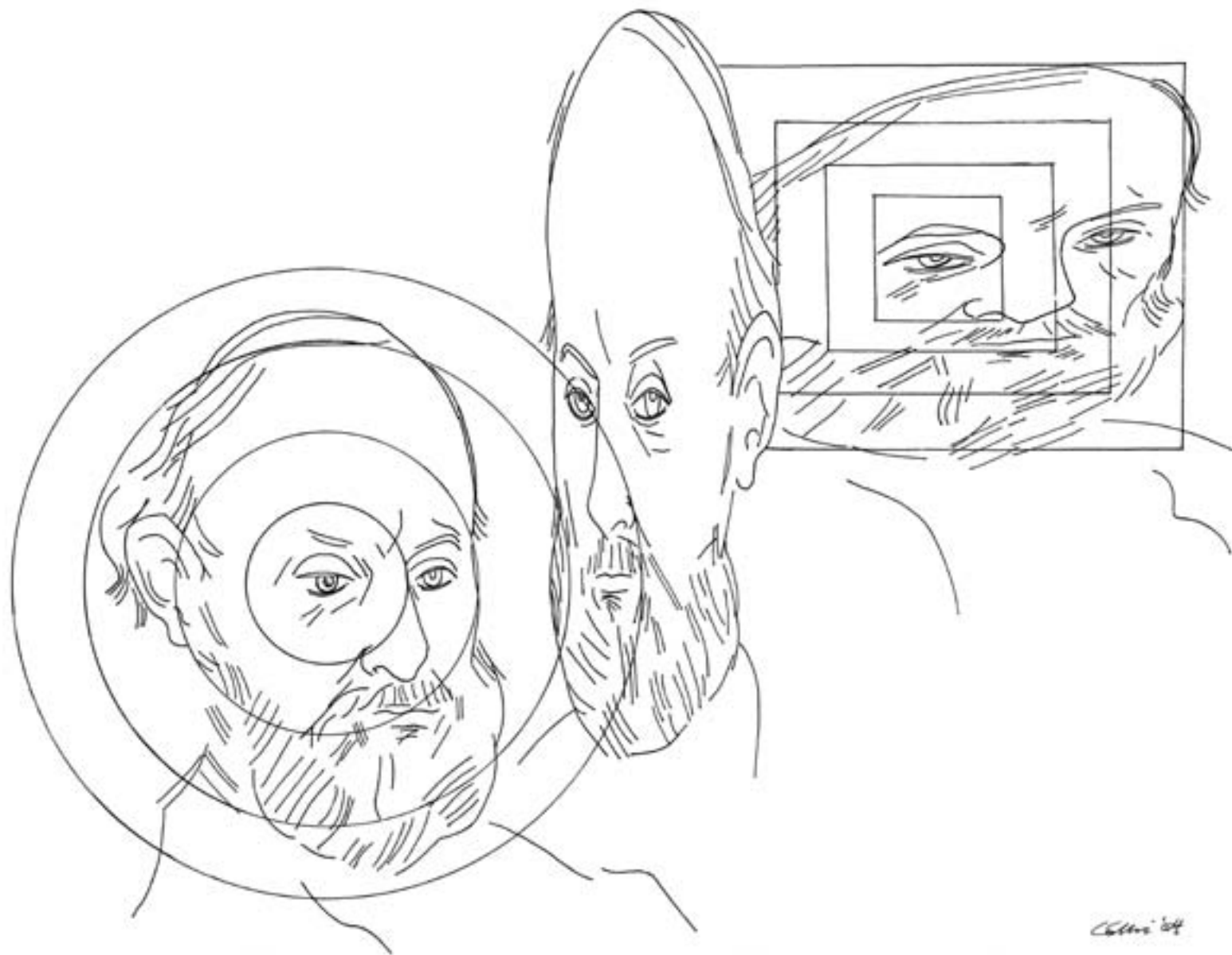
² Personal communication, March 2006.



3. **After**
Albrecht Dürer.
1964.
Ink on paper.
Analogue Computer.
61 x 81 cm
(24 x 32 in.).

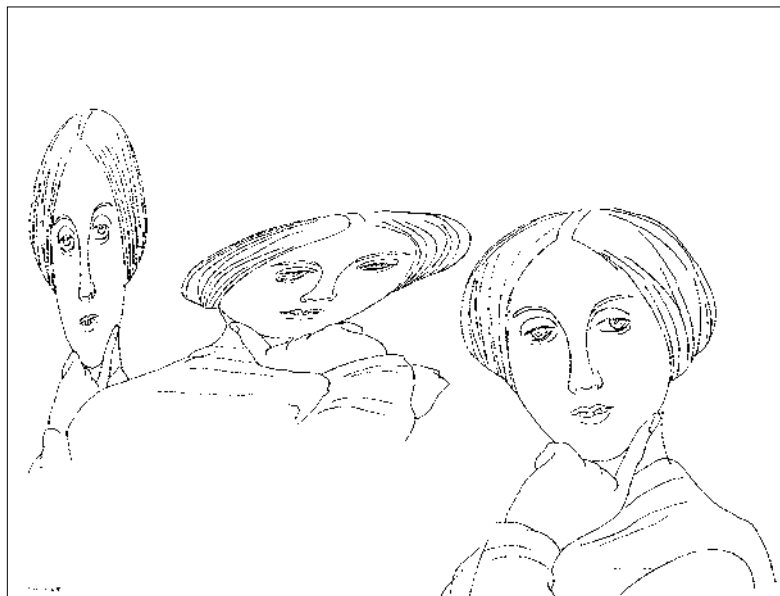


4. **After**
André Derain.
1964.
Ink on paper.
Analogue Computer.
61 x 81 cm
(24 x 32 in.).

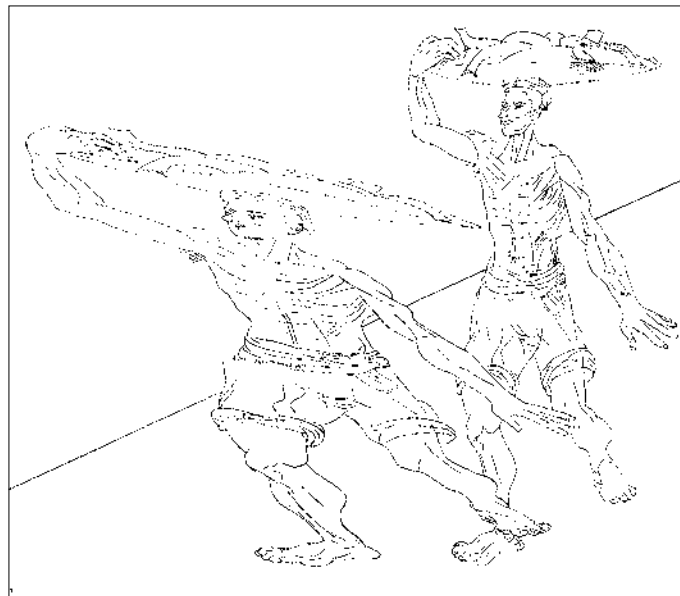


5. *After*
Paul Cézanne.
1964.

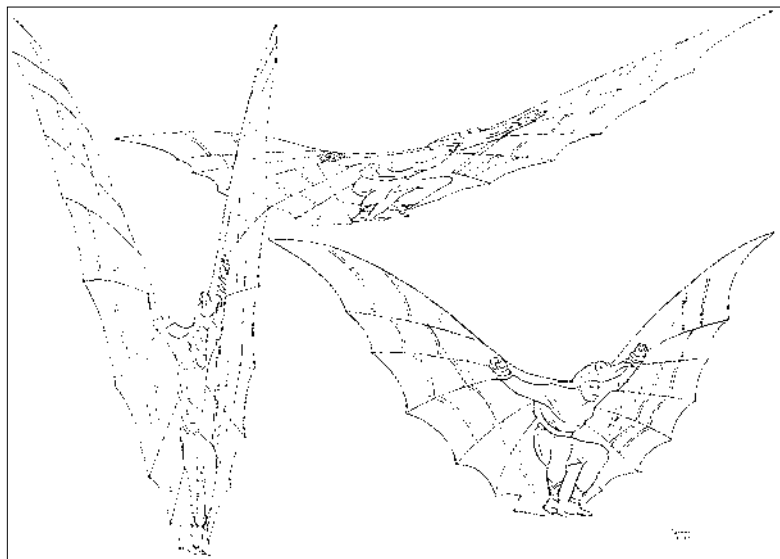
Ink on paper.
Analogue Computer.
64 x 81 cm
(25 x 32 in.).



6. **After**
Jean-Auguste Ingres.
1964.
Ink on paper.
Analogue Computer.
66 x 51 cm
(26 x 20 in.).



7. **After**
Pablo Picasso.
1964.
Ink on paper.
Analogue Computer.
66 x 51 cm
(26 x 20 in.).

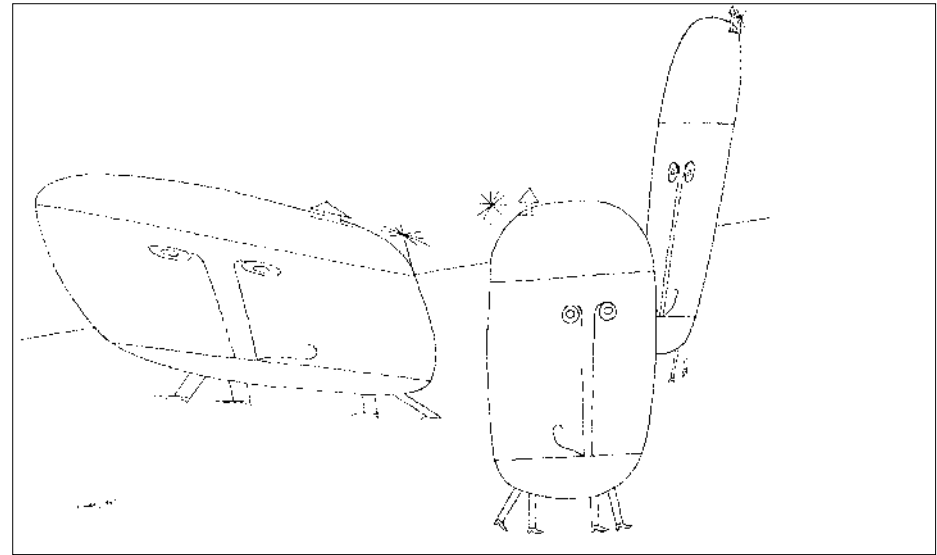


8. **After**
Francisco Goya.
1964.
Ink on paper.
Analogue Computer.
66 x 51 cm
(26 x 20 in.).

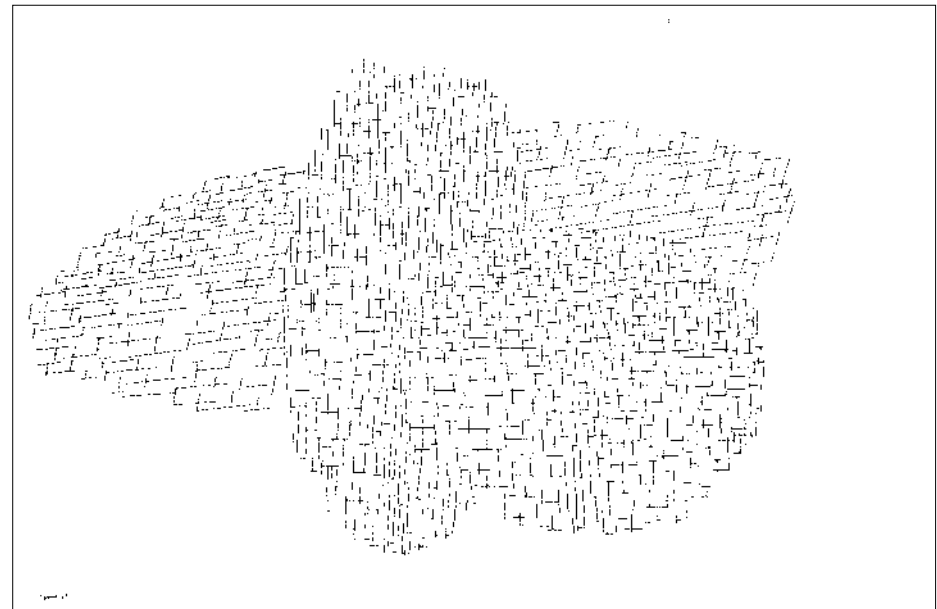


9. **After Albrecht**
Dürer's Study of
Gentile Bellini.
1964.
Ink on paper.
Analogue Computer.
66 x 51 cm
(26 x 20 in.).

10. **After Paul Klee.**
1963.
Ink on paper.
Analogue Computer.
66 x 51 cm
(26 x 20 in.).

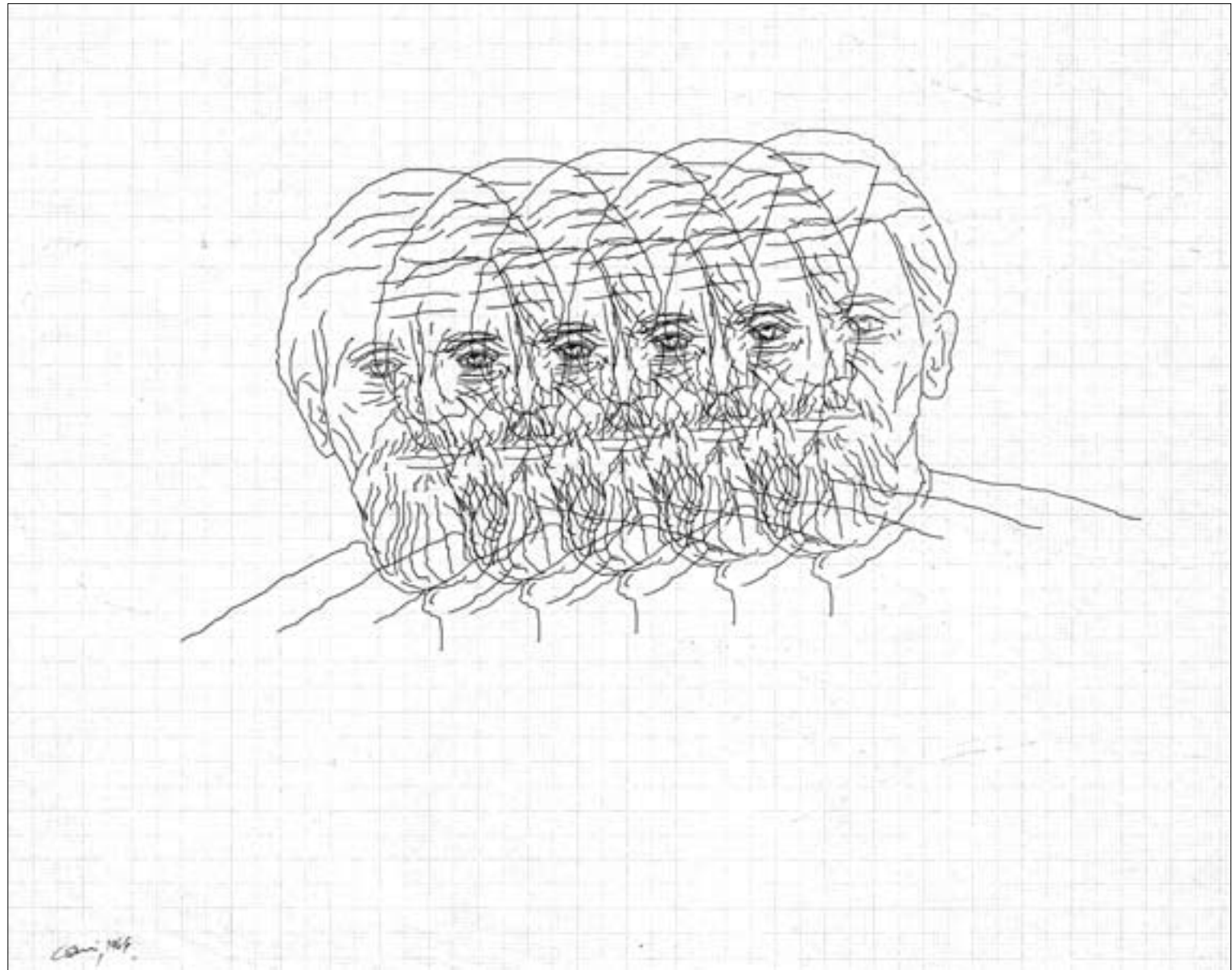


11. **After Piet Mondrian.**
1964.
Ink on paper.
Analogue Computer.
66 x 51 cm
(26 x 20 in.).

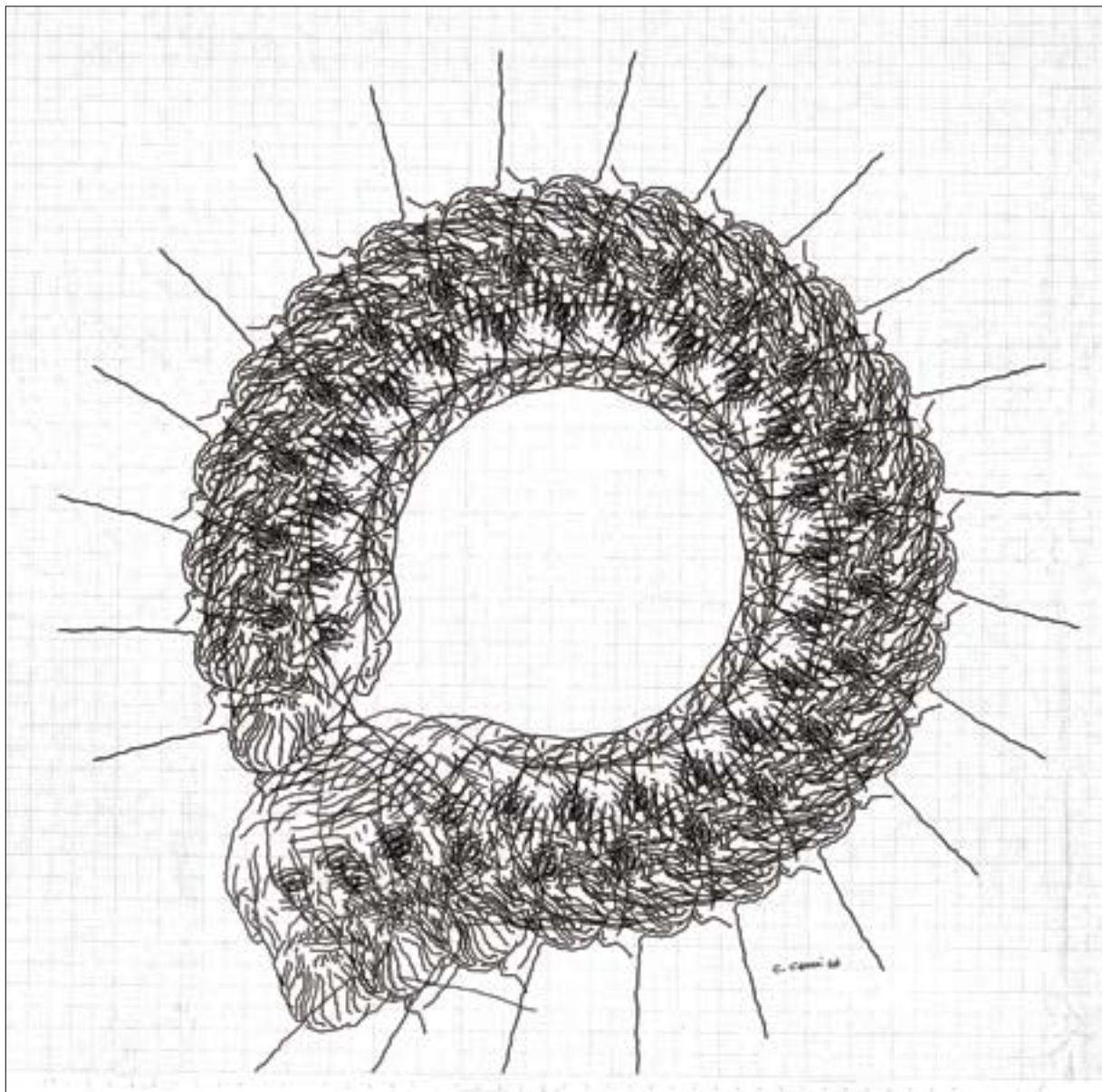




12. ***Dignified Lady.***
1964–1965.
Ink on paper.
IBM 7094 and
drum plotter.
8 x 10 cm
(3.25 x 4 in.).



13. **Five Faces.**
1966.
Ink on paper.
IBM 7094 and
drum plotter.
79 x 91 cm
(31 x 36 in.).



14. ***Bearded Man
in a Circle.***

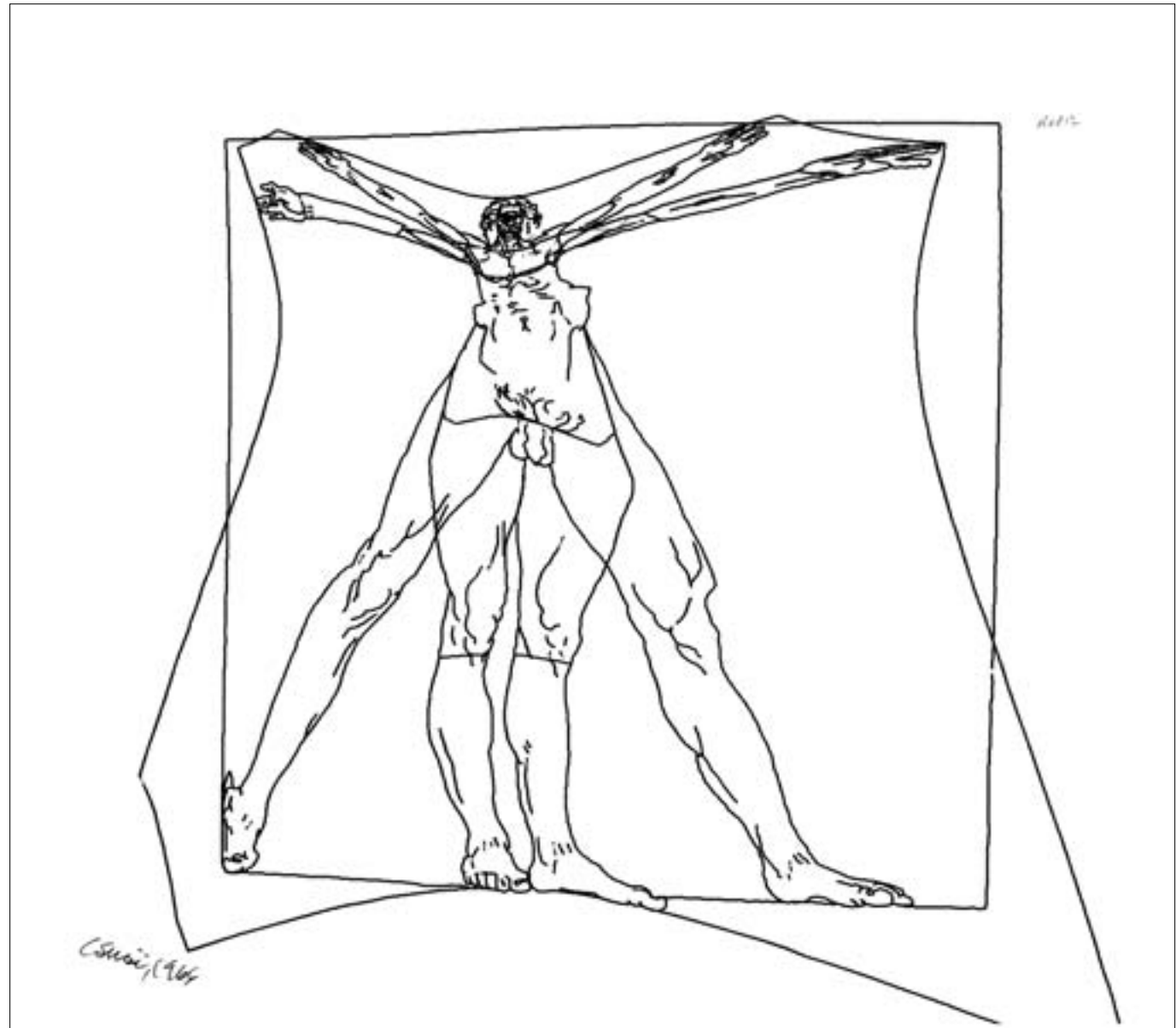
1966.

Ink on paper.
IBM 7094 and
drum plotter.
81 x 81 cm
(32x 32 in.).

15. **Leonardo
da Vinci Series.**

1966.

Ink on paper.
IBM 7094 and
drum plotter.
51 x 152 cm
(20 x 60 in.).





Six Pages from the Artist's Sketchbook

These sketchbook drawings were made when Csuri first started using the computer. They demonstrate ideas and issues that he was struggling with in the context of a drum plotter, a slow computer and punch cards. Csuri asked himself, "What can I do with this process or approach that would be different from my traditional work?" According to Csuri, it was a time of great speculation, and the drawings illustrate that he was thinking in terms of three-dimensional space, with some notion of stereo pairs and flying through a drawing. In the sketchbook, he comments about a three-dimensional path for an object, sine waves, and various transformations. Csuri's comments about the drawings, made in 2006, are noted below the images.

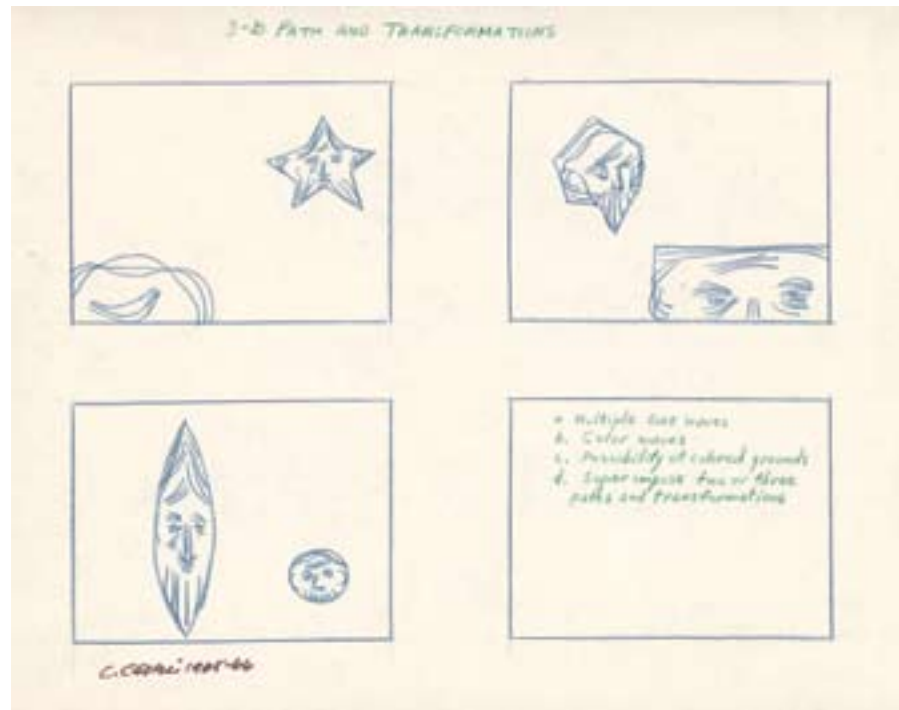
**16. Six Pages
from the Artist's
Sketchbook.**

1965–66.

Color pencil on paper.

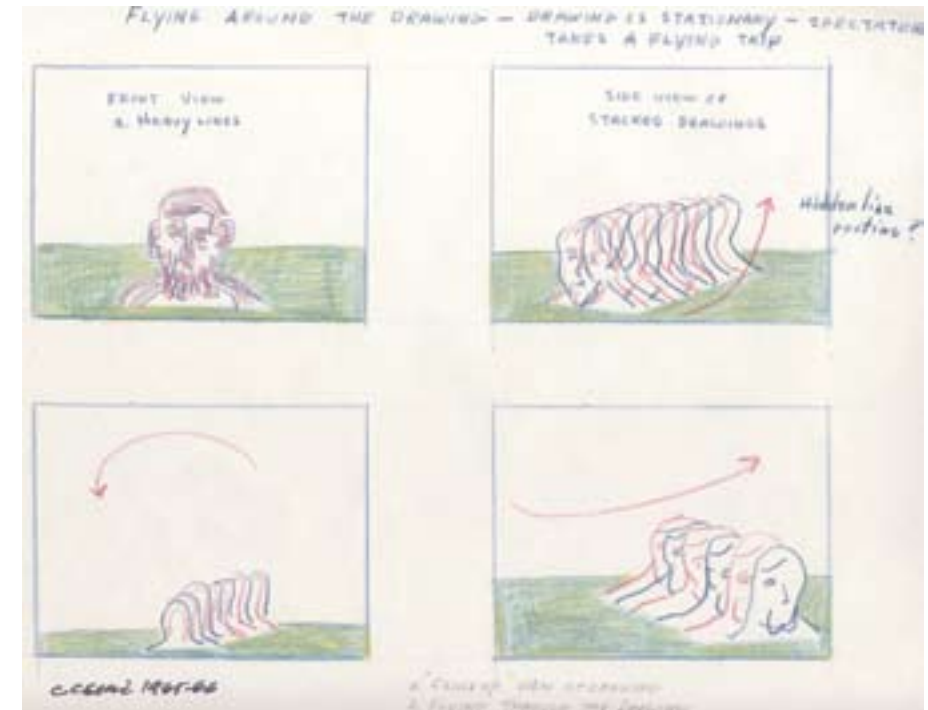
165 x 203 cm

(65 x 80 in.).



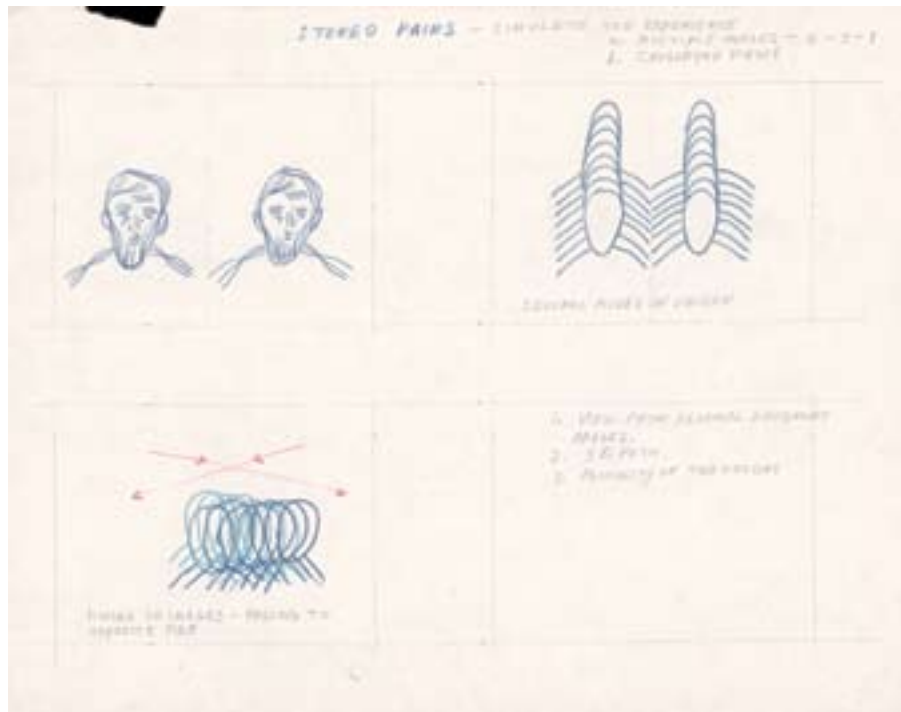
3D Path and Transformations

Here, I explore a drawing in a three-dimensional space and the idea of three-dimensional paths. Leslie Miller, a Professor of Mathematics, introduced me to a broader viewpoint about transformations—transformations on the original drawing that would make the overall shape look abstracted or like a star.



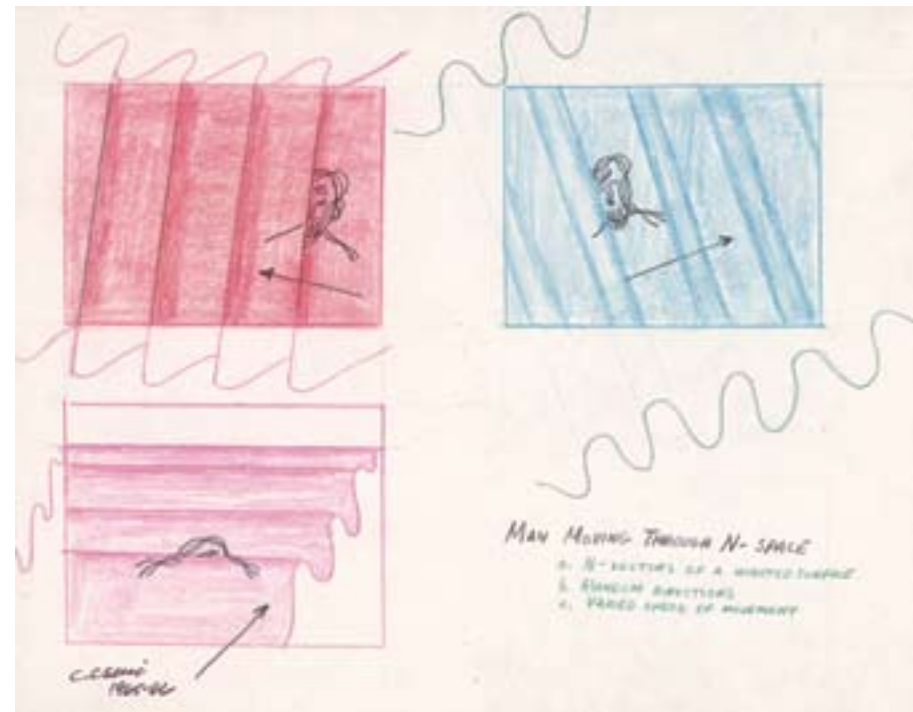
Sketch Flying Around the Drawing

I thought of the drawing as a three-dimensional piece of sculpture. I envisioned the drawings like layers in three-dimensional. My fantasy was to be able to fly around and through my own drawing. Or, the spectator could take a flying trip. I was concerned about a hidden line routine, as I learned more about three-dimensional computer graphics.



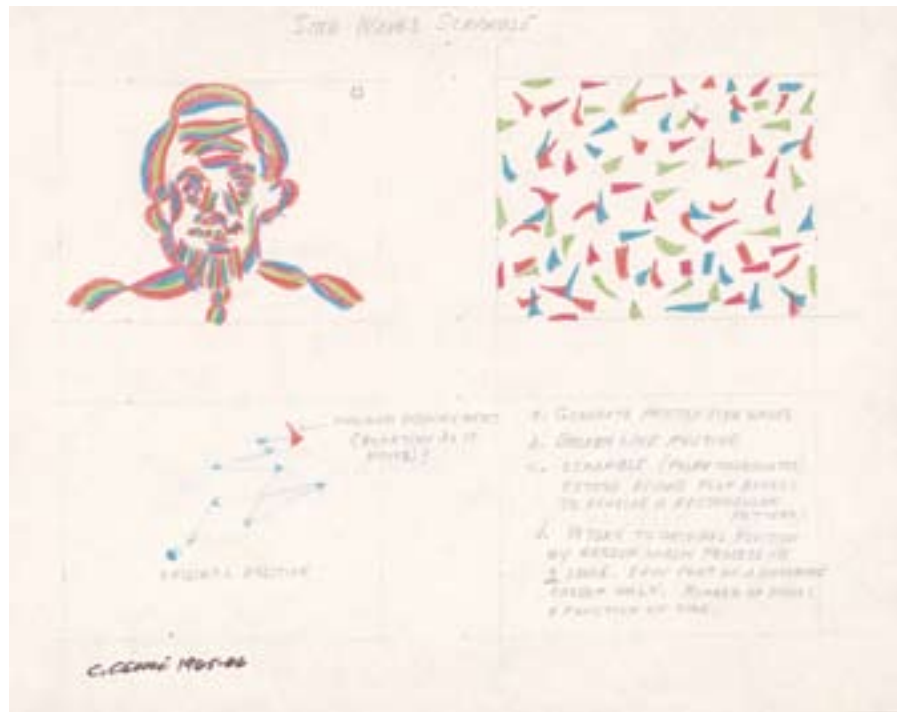
Stereo Pairs

The notion of working in three-dimensional space fascinated me. I thought of art objects as a three-dimensional entity that could be viewed by means of stereo pairs. Also, there could be a three-dimensional path that controlled one's movement in relationship to the drawings. But, there were a number of technical issues that kept me from fully realizing this idea.



Man Moving Through N-Space

Now you see me now you don't. The drawing is moving into and out of various spaces. The decisions about direction and speed were to be made by a random number generator. The camera angle was to be positioned so that it would look like the drawing was sliding over a three-dimensional surface and out of view.



Sine Waves Scramble

Quickly I found that I wanted to find ways to deal with color, even though I was limited to a single plotting pen at a time. The sketch of the bearded man on the left was to be broken into fragments, using what we called "a broken line" routine. The lines would be displaced by means of a random walk process, then brought back together again. Animation was on my mind when I considered this idea.



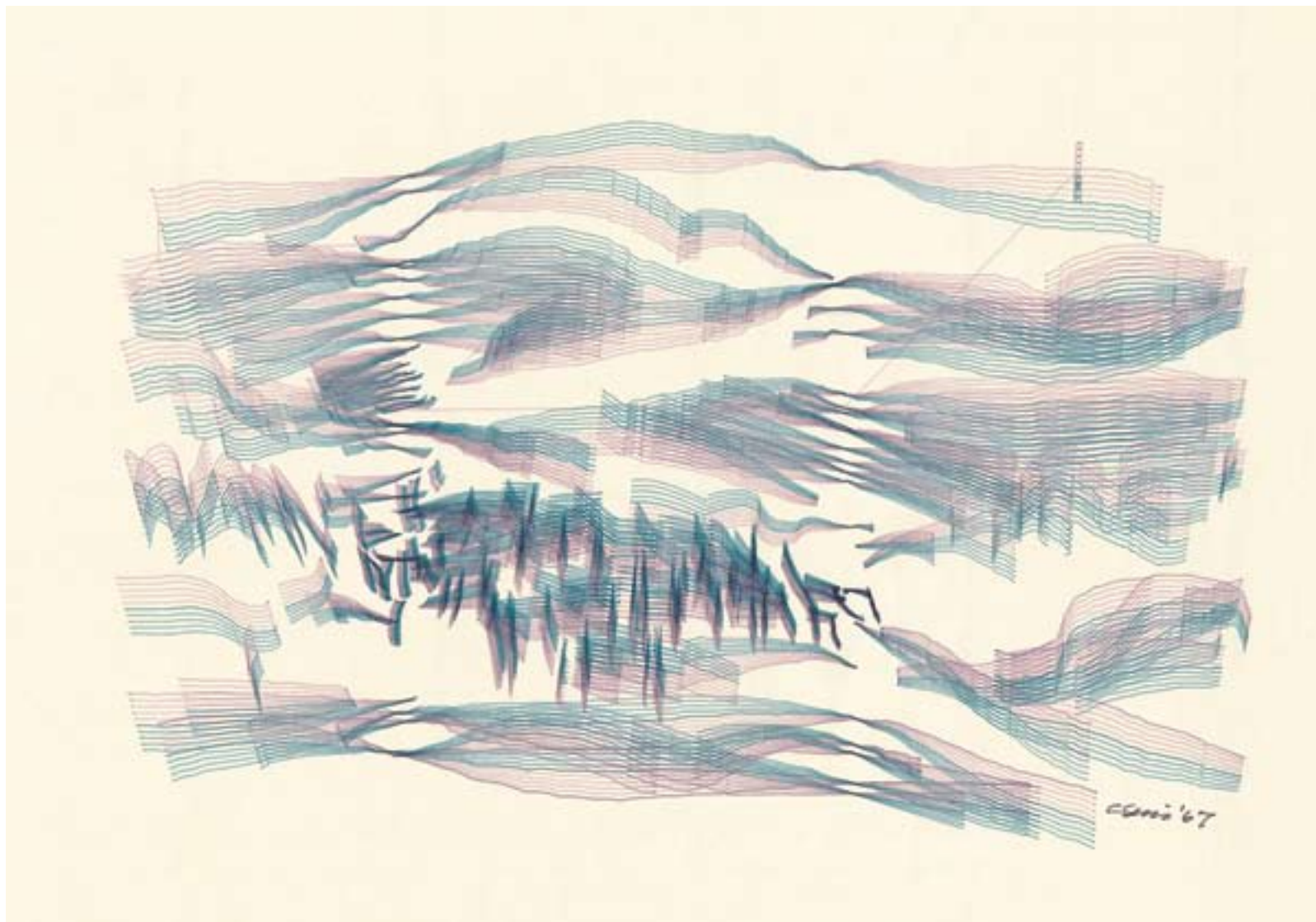
Sine Curve Man

In this sketch, I was looking at how frequency and phase changes might effect my original drawing. A more graphic quality might be achieved by repetition and a slight shift in the drawing. Also, I considered how I might use colored ink.

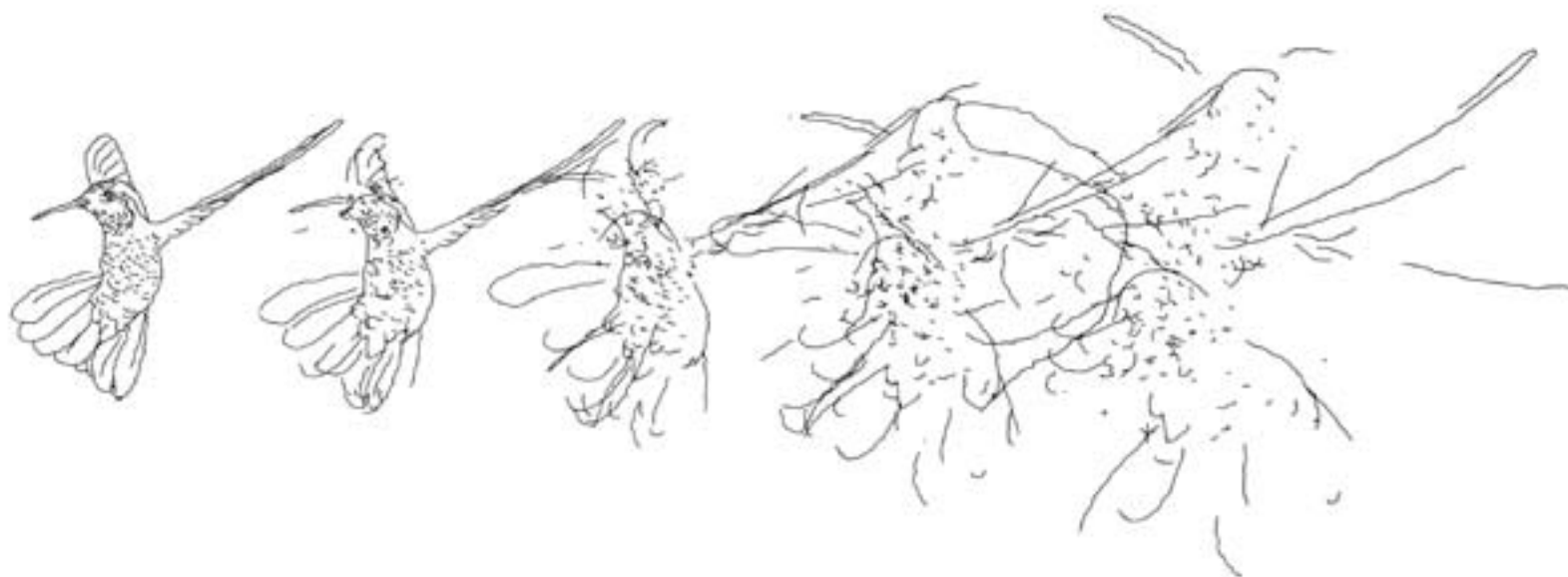


CSM, 1967

17. ***Sine Curve Man.***
1967.
Ink on paper.
IBM 7094 and
drum plotter.
104 x 104 cm
(41 x 41 in.).



18. **Sinescape.**
1967.
Color ink on paper.
IBM 7094 and
drum plotter.
61 x 76 cm
(24 x 30 in.).
Collection of Mr. and
Mrs. Kevin Reagh.



19. ***Hummingbird II.***

1969.

Photo screen
on Plexiglas.

IBM1130 and
drum plotter.

46 x 76 cm
(18 x 30 in.).



20. ***Aging Process.***

1967.

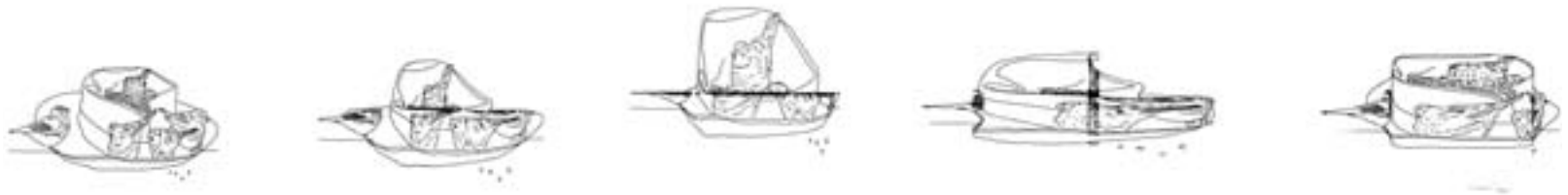
Ink on paper.

IBM 7094 and

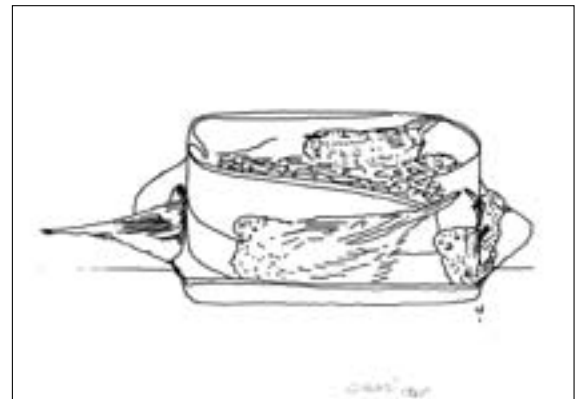
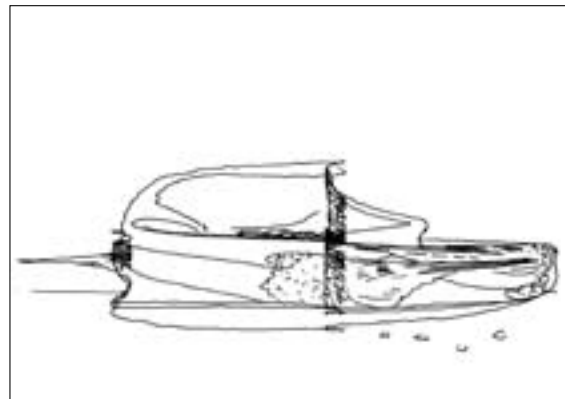
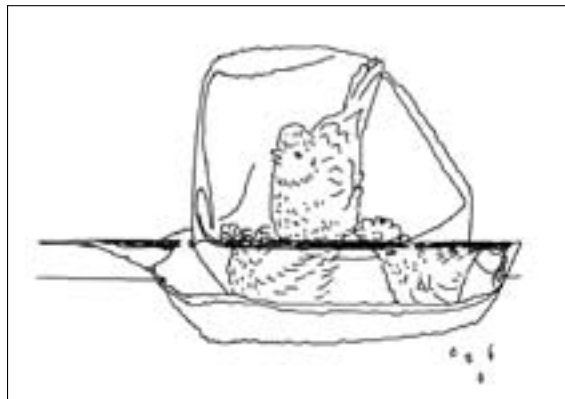
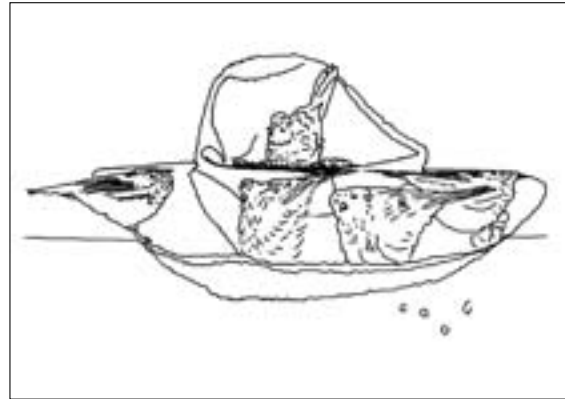
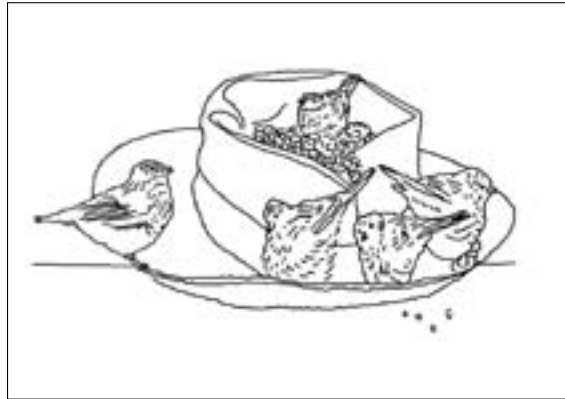
drum plotter.

64 x 140 cm

(25 x 55 in.).



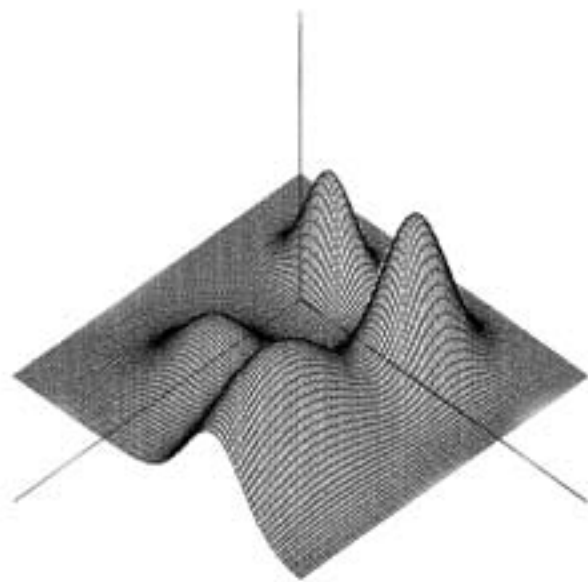
21. ***Birds in a Hat.***
1968.
Ink on paper.
IBM 7094 and
drum plotter.
38 x 155 cm
(15 x 61 in.).
Collection of Mr. and
Mrs. Kevin Reagh.



Birds in a Hat (details)

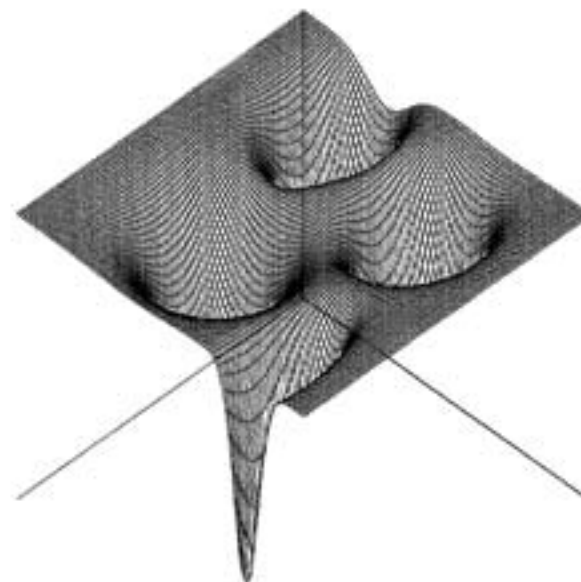
22. ***Numeric Milling.***
1968.
Wood.
3-Axis Milling
Machine.
33 x 56 x 22 cm
(13 x 22 x 8.5 in.).
Collection of Mr. and
Mrs. Kevin Reagh.





```

AMAX# 114
VIEWING ANGLE
THETA #45.00
PHI # 45.00
      ARRAY SIZE
      NATURAL DIMENSION REGION PLOTTED
MODE # 1      X 100      1 THRU 100
PLOT3D      Y 100      1 THRU 100
  
```



```

AMAX# 50
VIEWING ANGLE
THETA #45.00
PHI # 45.00
      ARRAY SIZE
      NATURAL DIMENSION REGION PLOTTED
MODE # 3      X 100      1 THRU 100
PLOT3D      Y 100      1 THRU 100
  
```

23. **Plotter Drawing
of Numeric Milling.**
 1968.
 Ink on paper.
 IBM 7094 and
 drum plotter.
 64 x 38 cm
 (25 x 15 in.).

Random War

Scattered randomly across an expansive white ground, identically formed soldiers coded in red and black diminish into a continuous vertical ground plane. In places, figures stand upright in vacuous isolation. Elsewhere, they crowd together, the falling toppled onto clusters of the fallen. Two lists of serial numbers and names, one for each army, stretch across the upper register. The lists indicate which soldiers have died, which were wounded, which remain missing, and which survive. One hero is recognized on each side and is listed above the medals awarded for valor, good conduct, and efficiency.

Random War, arguably one of the most important works of the twentieth century, stands at the convergence of Csuri's life experiences and the American social upheaval that predominated at the time of its creation. While the Vietnam War raged in Southeast Asia, antiwar sentiments divided the country. Generations of Americans struggled against each other at unprecedented levels. Technology was enthusiastically embraced in suburban households and touted by many as the savior of countless social and medical ills. Simultaneously, many perceived it as a demonic force that introduced chaos, depersonalizing and degrading human beings. To many in the art community, creating art with a computer was an act of evil in itself.

Csuri was uniquely poised to conceive and render an aesthetic object of this scale and significance. A soldier and decorated veteran of World War II's Battle of the Bulge, Csuri knew the battlefield and the horrors of war. As a fine artist, he understood

the power of visual communication and the aesthetic object. As one naturally skilled in discourse and interdisciplinary collaboration, he could harness the computer's potential and use it to advance the world of art.

The "little green army man"—the model for Csuri's drawing of a soldier—has iconic status in the American psyche of those born before the mid-1970s. These two-inch-tall, green plastic figurines, shown wearing army fatigues and helmets and poised to shoot their enemies, were an integral part of most boys' toy sets until the late 1970s (Figure 1). Childhood memories of games played are permeated by adult sensibilities of the greater victories and losses that the figurines represent. Csuri heightens this social tension and captures the chaos of the battlefield, where one often cannot differentiate between friend and foe, by using a random number generator to place the forms on battlefield coordinates and to rotate the absurdly rigid bodies in two-dimensional space. The soldiers' names, recorded in lists across a horizontal space, personalize the realities and randomness of war. A work brilliantly conceived, Csuri entered into the random number generator the names of the living, many of whom would view the work in its final form. Ohio State University administrators, faculty, and staff, as well as famous people of the time, such as Ronald Reagan and Gerald Ford, become soldiers in Csuri's *Random War*, clearly suggesting war's indiscriminate nature. Csuri even entered his own name into the random number generator, and it was ultimately assigned to the list of the wounded. *Random War* predates Maya Lin's Vietnam War Memorial, *The Wall* (1982),

which honors Vietnam War veterans with carvings into granite of the names of those lost in battle. Csuri's use of names underscores and personalizes the randomness and chaos of all wars, while Lin's work shows the grim outcome and historical reality of Csuri's predictions. Lin never met Csuri, and it is unlikely that



Random War (detail of soldiers)

she saw the original *Random War*, the whereabouts of which are unknown today. Nevertheless, the two works create a powerful juxtaposition, demonstrating both the historical evolution of conceptual art that incorporates language and the historical and sociological realities of cause and effect. [JMG]

MEDALS AWARDED			
HEAD			
RA18570898	PETNOLDS HOWARD	PVT	SURVIVING
MEDAL FOR VALOR			
RA11440841	GRVIN JOHN	PFC	WOUNDED
RA10090186	WINTERS HARRY F	PVT	SURVIVING
RA18111924	MEILING RICHARD L	PFC	WOUNDED
RA10525982	BRUS ROBERT	PVT	SURVIVING
GOOD CONDUCT AWARD			
RA18430042	KRIMMEL GARY W	PVT	SURVIVING
RA15899759	OGILBY RAGUS	PFC	MISSING
RA17906185	MAHARIS GEORGE	PVT	SURVIVING
RA11600079	HYLER JOSEPH	PVT	WOUNDED
RA17455605	STROUD JAMES	PVT	MISSING
RA19761996	THOMSON ALEX	PVT	MISSING
RA17282705	SEALY JA ALBERT H	PVT	SURVIVING
RA13971338	STERNBERGER JOSEPH	PVT	WOUNDED
RA17266211	IRVINE JOHN	PVT	WOUNDED
RA11141642	NATILE MICHAEL A	PVT	WOUNDED
RA18161522	LEACH CLARENCE D	PVT	SURVIVING
RA15497705	BARNETT WILLIAM	PVT	SURVIVING
RA19422493	BAER ROBERT	PVT	MISSING
RA12932700	SAVARESE JAMES	PVT	SURVIVING
RA16351998	PATZER ANTON C	PVT	SURVIVING

Random War (detail of names)

A large number of small, stylized human figures in black and red, scattered across a white background, representing a large crowd or population. The figures are simple line drawings with some red highlights, appearing to be in various poses, suggesting movement or a diverse group. They are densely packed in some areas and more sparse in others, covering most of the frame.

Early Works to the mi

DEAD

NO127047 FINE JOHN G. PVT
NO128040 HARRIS GEORGE PVT
NO128122 HARRIS ROBERT PVT
NO128176 SARTWELL JAMES PVT
NO128278 L. CHRISTOPHER ROY PVT
NO128322 LATHAM ROBERT A. CPL
NO128427 WERNER DONALD E. PVT
NO128528 COPE HARVEY E. PVT
NO128529 W. A. JAMES HARRIS PVT
NO128621 GILMAN DONALD E. PVT
NO128622 HARRIS JAMES C. PVT
NO128727 HARRIS JOHN W. PVT
NO128824 F. JAMES GILF PVT
NO128924 STEPHENS ROBERT PVT
NO129024 HARRIS DONALD E. PVT
NO129127 HARRIS JAMES C. PVT
NO129270 HARRIS JAMES C. PVT
NO129324 HARRIS JAMES C. PVT
NO129427 HARRIS JAMES C. PVT
NO129527 HARRIS JAMES C. PVT
NO129627 HARRIS JAMES C. PVT
NO129727 HARRIS JAMES C. PVT
NO129827 HARRIS JAMES C. PVT
NO129927 HARRIS JAMES C. PVT

WOUNDED

NO127047 FINE JOHN G. PVT
NO128040 HARRIS GEORGE PVT
NO128122 HARRIS ROBERT PVT
NO128176 SARTWELL JAMES PVT
NO128278 L. CHRISTOPHER ROY PVT
NO128322 LATHAM ROBERT A. CPL
NO128427 WERNER DONALD E. PVT
NO128528 COPE HARVEY E. PVT
NO128529 W. A. JAMES HARRIS PVT
NO128621 GILMAN DONALD E. PVT
NO128622 HARRIS JAMES C. PVT
NO128727 HARRIS JOHN W. PVT
NO128824 F. JAMES GILF PVT
NO128924 STEPHENS ROBERT PVT
NO129024 HARRIS DONALD E. PVT
NO129127 HARRIS JAMES C. PVT
NO129270 HARRIS JAMES C. PVT
NO129324 HARRIS JAMES C. PVT
NO129427 HARRIS JAMES C. PVT
NO129527 HARRIS JAMES C. PVT
NO129627 HARRIS JAMES C. PVT
NO129727 HARRIS JAMES C. PVT
NO129827 HARRIS JAMES C. PVT
NO129927 HARRIS JAMES C. PVT

MISSING

NO127047 FINE JOHN G. PVT
NO128040 HARRIS GEORGE PVT
NO128122 HARRIS ROBERT PVT
NO128176 SARTWELL JAMES PVT
NO128278 L. CHRISTOPHER ROY PVT
NO128322 LATHAM ROBERT A. CPL
NO128427 WERNER DONALD E. PVT
NO128528 COPE HARVEY E. PVT
NO128529 W. A. JAMES HARRIS PVT
NO128621 GILMAN DONALD E. PVT
NO128622 HARRIS JAMES C. PVT
NO128727 HARRIS JOHN W. PVT
NO128824 F. JAMES GILF PVT
NO128924 STEPHENS ROBERT PVT
NO129024 HARRIS DONALD E. PVT
NO129127 HARRIS JAMES C. PVT
NO129270 HARRIS JAMES C. PVT
NO129324 HARRIS JAMES C. PVT
NO129427 HARRIS JAMES C. PVT
NO129527 HARRIS JAMES C. PVT
NO129627 HARRIS JAMES C. PVT
NO129727 HARRIS JAMES C. PVT
NO129827 HARRIS JAMES C. PVT
NO129927 HARRIS JAMES C. PVT

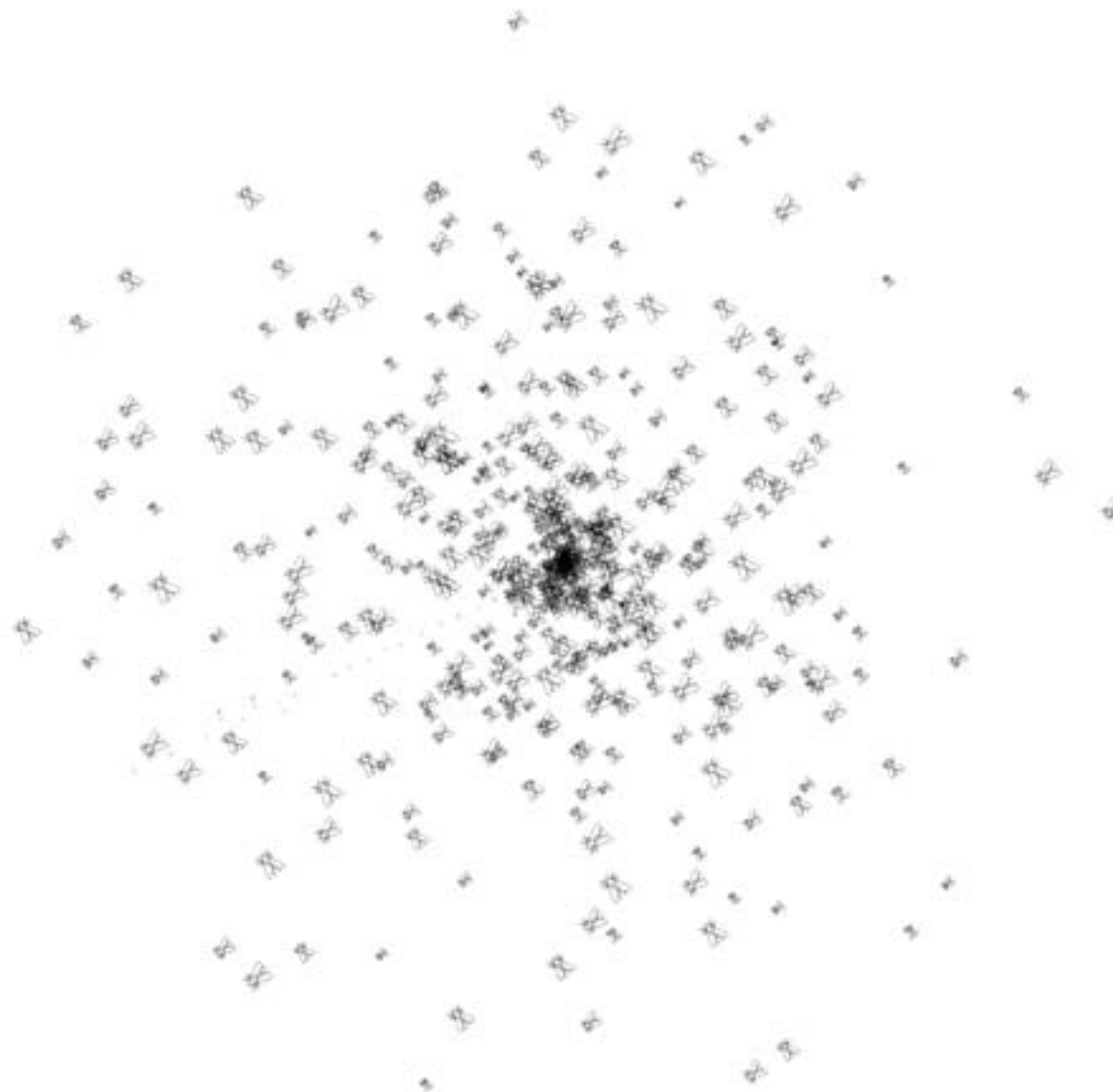
SURVIVING

NO127047 FINE JOHN G. PVT
NO128040 HARRIS GEORGE PVT
NO128122 HARRIS ROBERT PVT
NO128176 SARTWELL JAMES PVT
NO128278 L. CHRISTOPHER ROY PVT
NO128322 LATHAM ROBERT A. CPL
NO128427 WERNER DONALD E. PVT
NO128528 COPE HARVEY E. PVT
NO128529 W. A. JAMES HARRIS PVT
NO128621 GILMAN DONALD E. PVT
NO128622 HARRIS JAMES C. PVT
NO128727 HARRIS JOHN W. PVT
NO128824 F. JAMES GILF PVT
NO128924 STEPHENS ROBERT PVT
NO129024 HARRIS DONALD E. PVT
NO129127 HARRIS JAMES C. PVT
NO129270 HARRIS JAMES C. PVT
NO129324 HARRIS JAMES C. PVT
NO129427 HARRIS JAMES C. PVT
NO129527 HARRIS JAMES C. PVT
NO129627 HARRIS JAMES C. PVT
NO129727 HARRIS JAMES C. PVT
NO129827 HARRIS JAMES C. PVT
NO129927 HARRIS JAMES C. PVT

MEDALS AWARDED

NO127047 FINE JOHN G. PVT
NO128040 HARRIS GEORGE PVT
NO128122 HARRIS ROBERT PVT
NO128176 SARTWELL JAMES PVT
NO128278 L. CHRISTOPHER ROY PVT
NO128322 LATHAM ROBERT A. CPL
NO128427 WERNER DONALD E. PVT
NO128528 COPE HARVEY E. PVT
NO128529 W. A. JAMES HARRIS PVT
NO128621 GILMAN DONALD E. PVT
NO128622 HARRIS JAMES C. PVT
NO128727 HARRIS JOHN W. PVT
NO128824 F. JAMES GILF PVT
NO128924 STEPHENS ROBERT PVT
NO129024 HARRIS DONALD E. PVT
NO129127 HARRIS JAMES C. PVT
NO129270 HARRIS JAMES C. PVT
NO129324 HARRIS JAMES C. PVT
NO129427 HARRIS JAMES C. PVT
NO129527 HARRIS JAMES C. PVT
NO129627 HARRIS JAMES C. PVT
NO129727 HARRIS JAMES C. PVT
NO129827 HARRIS JAMES C. PVT
NO129927 HARRIS JAMES C. PVT





25. ***Feeding Time.***

1966.

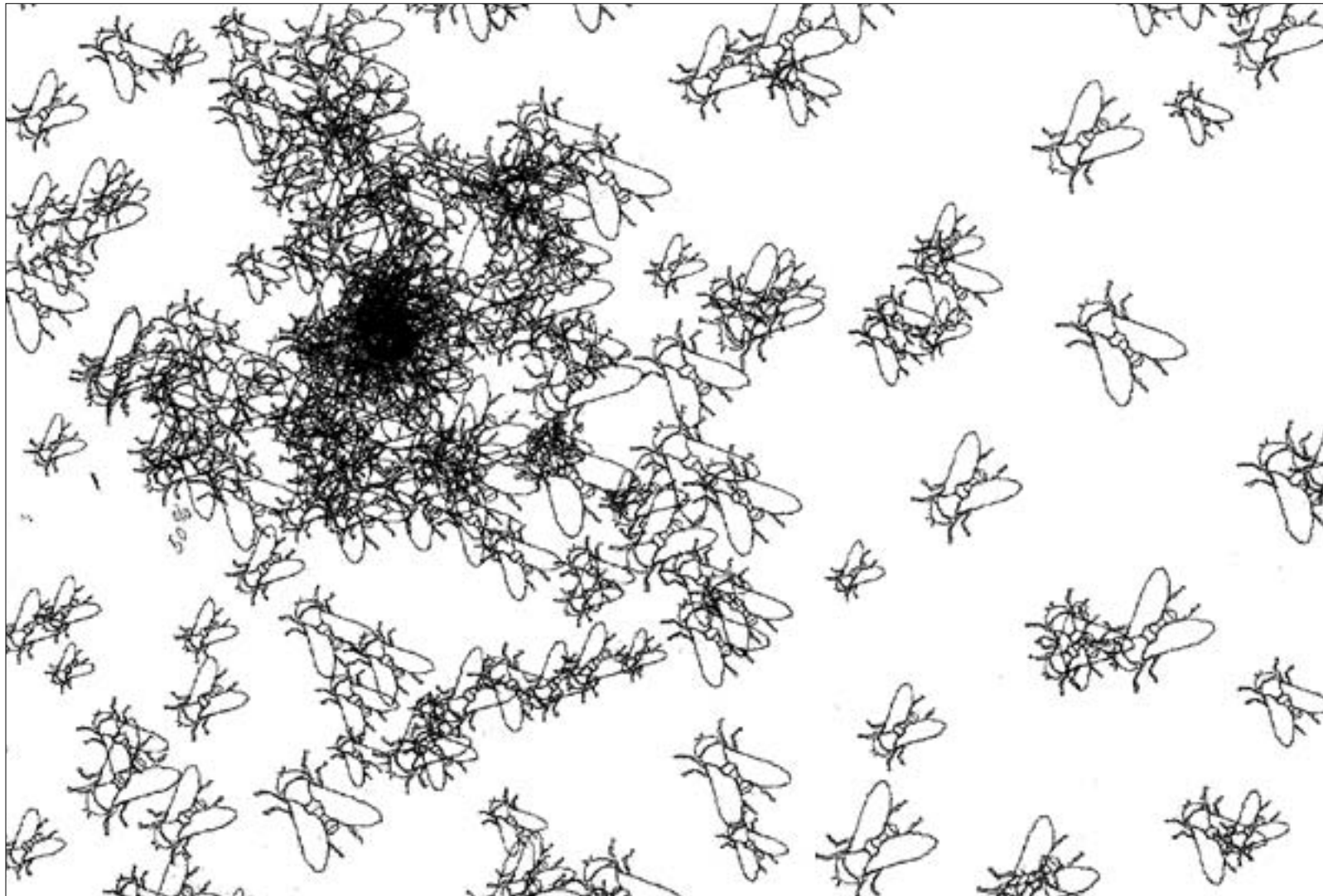
Ink on paper.

IBM 7094 and

drum plotter.

76 x 127 cm

(30 x 50 in.).



Feeding Time (detail)



From Object To Object Transformed

Thomas E. Linehan

While it is often difficult to fully attribute the origins of an idea, the advancement of an idea is more easily identified. Charles Csuri's professional career as an artist and computer scientist parallels the advancement of our understanding of the nature of objects. Csuri's early work implies the transformation of stable, aesthetic objects into virtual objects. These virtual objects now inhabit virtual worlds and are endowed with multidimensional spatial and temporal attributes. These objects are filled with possibility.

Csuri's work has always had this vision. It is concerned with multidimensionality, contingency, temporality, and evolving forms. His work is liberated from the snapshot or decisive moment of early photographic and narrative art. It reaches toward an iterative transparency of the process used in its formation. Looking back on Csuri's work in the mid- to late-1960s, we see his early concern with possibility space as described by Will Wright (developer of *The Sims* strategic life-simulation computer game) (*WIRED*, April 2006, p.112). Csuri's works cultivate and exploit this possibility space. The *Random War* series used a rule-governed, gamelike, generative process to depict possible battlefield outcomes (Cata-

logue 24). The object space becomes a battlefield, and the possible outcomes become the aesthetic objects. This work prefigures in both content and method much of the modeling and simulation so widely used today for after-battle assessment. Csuri surely hoped, when he created the work, that the iterative display of possible battlefield outcomes could have an impact on real-world war decisions at the time.

Csuri's *Feeding Time* presents a more playful view of a new virtual battlefield, one in our environment (Catalogue 25). The viewer sees the virtual space as filled with possible landing targets for the common housefly. A single fly leaves a record of its landing coordinates by causing a plotter to successively redraw the fly in the possibility space. This work prefigures much of the current and future work being done in algorithmic control software used to guide robotic systems. These guidance-control algorithms use mathematical models to describe flocking, herding, and schooling. Csuri's use of the fly prefigures the use of birds, sheep, and fish as behavioral models for controlling large populations of animated or robotic objects.

Csuri anticipated the advances in memory and computation speed that would enable the complex models of today. In 1964, he envisioned a space filled with objects with their own history, predispositions, attributes, and capabilities. These were to become our virtual objects of today. These objects were to be richly related to the theories of aesthetic objects. The implied object attributes of the art of the past became present in Csuri's newer experiments. In these works, objects took on an animated, sculptural form. Repeatedly, Csuri considered replacing the concept of object with that of system. The word *system* could account for the dynamic, evolutionary, and expansive character that better represented his concept of an evolving object. In the end, he maintained his view of the evolving aesthetic object. It was important to maintain a connection to the aesthetic objects of the past in his new work. He admired the artists who came before him and felt that he was working in a well-established, artistic tradition of the object transformed.

Csuri's newer work maintains the possibility space of earlier two-dimensional works, but in a three-dimensional stage. The events of his aesthetic ideas play across and about this stage with the quality of thoughtful experiment.

Csuri created a workshop and a laboratory designed to further the object's transformation and the complex models to be used for its management and control. The Ohio State University's Computer Graphics Research Group (CGRG) and, later, the Advanced Computing Center for the Arts and Design (ACCAD)

became the vehicles for this exploration. He recruited students and professionals to work as a community dedicated to experiment and investigate possibility space and the objects and actors that populate it. The experiments have continued in Csuri's workshop for more than thirty-five years. He continued his own work daily and directed the work of hundreds of computer graphics and animation professionals during that time. The industry is populated with CGRG and ACCAD alumni. Csuri's work and the work of colleagues and students have set the standard for the study of art in the context of advanced technology. His workshop has become the model for both art and computer science education for this century. It is dedicated to the object's transformation and the full immersion of the audience in the mind of both artist and scientist.

Charles Csuri envisioned and helped create the virtual object environment of today. He also created the model environment for its cultivation, study, and innovation. Few artist workshops or science laboratories of the past can match this contribution for relevance and impact on the world of their times.

Dialogue and Creativity: The Faces of Collaboration

Wayne Carlson

Chuck Csuri was a painter. He was a painter with more than a passing interest in computers, and, in particular, in how a computer might be used as a tool to express his artistic message. Jim Shaffer was a mathematician. He was a scientist who was intrigued by the fact that this art professor had a vision for how he could use an electronic device to create and manipulate images. Together, these two started what would turn out to be a legacy of two divergent backgrounds coming together to press the boundaries of their research areas, and to make art with a computer.

When people speak of Csuri's academic career and his art, the term *collaboration* is often used. This isn't surprising, but what is meant by collaboration when referring to Csuri's art? How did the collaborative process function for Csuri and his colleagues? Moreover, how does this process compare with collaboration in the history of art and in academia? While a thorough discussion of this topic is beyond the scope of this essay, it is significant to note that collaboration is an established tradition in the history of art. Further, a brief comparison between traditional artists' workshops and Csuri's work with computers sheds light on the collaborative processes at hand in his work.

During the Italian and Northern Renaissance Periods (the fourteenth through the late-sixteenth centuries), for example, master artists oversaw great workshops that employed numerous apprentices. These novices toiled, sometimes for decades, under great masters, stretching canvases, mixing pigments, cleaning brushes, and hauling stones for sculptures. Apprentices who showed artistic skill and promise eventually helped to create works of art, which were envisioned by the master artist and commissioned by patrons. The specifics of these collaborations varied, as one might expect, with the coming together of individual personalities and particular historical circumstances. In general, however, the early art workshops were populated by individuals working to gain artistic skills. As artists, or aspiring artists, they were trained in a similar fashion and shared comparable historical reference points. The goals and the trajectories of their artistic lives were, therefore, shared to some extent. The workshop of modern glass artist Dale Chihuly resembles this form of collaboration, in which most of the employees are artists creating glassworks under the guidance of a recognized master.

While Csuri, like the great masters of old, is easily recognized as

the senior artist and creative director in his collaborative efforts, the constitution and process in his workshop was significantly different. Csuri's research groups brought together individuals with dramatically different skill sets and redefined the history of collaboration in creating art. Csuri learned the programming language of FORTRAN, was schooled in other technical processes, and, today, continues to write code. However, he recognized early on that bringing together experts from various fields would allow for the greatest creative potential. In short, a closer look at the history and dynamics of Csuri's art and technology groups reveals a significant departure from the traditional, historical collaborative process of art creation.

I arrived at The Ohio State University (OSU) for graduate school in 1974. Like Jim Shaffer, I was trained in mathematics, but I really wanted to learn more about the theories and practice of computer science. One day, I responded to a poster advertising a lecture by a professor of art who was using a computer to make moving images. I was introduced to Csuri's world of magic, which, by this time, included the production of works such as *Sine Curve Man* (Catalogue 17), *Sinescape* (Catalogue 18), and *Random War* (Catalogue 24). I was hooked. He later reeled me in when he asked me to join his research group as a participant in a new project that was awarded by the Air Force Office of Scientific Research. (Imagine...a professor of art attracting federal research grants from agencies such as The National Science Foundation, the Navy Weapons Training Center, and the Air Force!) Csuri's research group included Rick Parent, another

computer scientist, Ron Hackathorn, a glassblower, and several other artistic types who were working together to define what would become the discipline of computer animation. When compared with art studios of the past, within Csuri's Computer Graphics Research Group (CGRG), there was a marked distinction between both the background of the individuals and the collaborative process.

In the case of Csuri's work, one can think of the collaborative process as occurring in spheres of practical experience. Csuri, as an artist, would have an idea about how he wished to represent something. He would approach the scientists and make inquiries. When engaged with requests for computer code that could transform Csuri's mental images into reality, a dialogue between artist and scientist would ensue. Csuri would press on with questions. The scientists would attempt to envision his words and to explain to him the current state of technological capabilities. After numerous discussions, it was time for the scientists to explore the creative boundaries of technology within the realm of their skills and knowledge base. Through such ongoing dialogue, creativity exploded within the different disciplinary spheres, eventually coming together in the form of artistic tools that allowed computer art to be made.

There are numerous examples of this collaborative dialogue between experts from different fields in Csuri's research groups over the years. An excellent representational example can be found in the interaction of Csuri with Dr. Steve May, who was

then a doctoral student in computer science. This collaboration is mentioned frequently, because many of Csuri's artworks draw on tools developed through their dialogue. Their creative collaboration looked something like this: In the early 1990s, Csuri approached May with inquiries into the notion of drawing in three-dimensional space. As a student of art history, Csuri had studied the works of the great Japanese painter, calligrapher and woodblock printer, Kitagawa Utamaro (1753–1806). He was interested in Utamaro's use of bold, flowing, yet elegantly controlled lines to render form. As someone in love with drawing, Csuri wanted to explore the use of calligraphic lines in three-dimensional space. Csuri remembers his conversation with May and recalls how he told May that he wanted to use lines that had depth and width. He also wanted these lines to reflect light and cast shadows. May noted, as any competent computer scientist of the time would, that a line, by definition, is a two-dimensional concept, with no breadth or depth and, therefore, no ability to interact with a light source in three-dimensional space. Csuri pressed on with his inquiries, in his usual fashion, asking "But what if it could? What if line had depth and could be rendered in three-dimensional space?" Then came the familiar request, "I want to be able to do this. Can you help me?" Such dialogue opened a space into which May could engage his creative process with a computer code. Choosing the respected language of Scheme, he embarked on the development of scripts that would create a line in three-dimensional space. Csuri now refers to the code as the "ribbon tool." Csuri can adjust the width, length, and movement of the line by varying the parameters in May's code. Csuri has used this

tool to create some of his most engaging works, such as *Entanglement* (Catalogue 56), *Horse Play* (Catalogue 42) and *texturePerhaps* (Catalogue 54).

Today, we would identify such collaboration as interdisciplinary. Interdisciplinary collaboration has always been difficult; in academia in the 1960s, it was nearly impossible. Professors were taught and encouraged to focus on their individual areas of expertise, and to work tirelessly and alone on a problem that could define them as the expert in that area. Promotion and tenure guidelines often required sole authorship on papers that were published on a given topic, and the rewards structure in universities gave more favor to those who could demonstrate such an individualized effort. Art and technology stood apart from this norm. Maybe it was because of the need for artists to access the esoteric and seemingly magical components of computers and other technological innovations, and maybe it was a desire on the part of the "gear-heads" to express their creative thoughts with the vocabulary of the arts. For whatever reason, there are numerous examples of successful partnerships between an artist and a mathematician or an artist and a computer scientist during this period.^{1,2,3,4,5,6,7,8}

Over the next four or five years, under Csuri's direction, this disparate group of creative people designed and developed new hardware and software, and honed the approach to defining time-based image displays. Federal funding continued, and support from the university followed.

All the while, Csuri envisioned an academic program that embraced this marriage of art and technology, and he also foresaw a commercialization that could take the technology from his lab and apply it to the emerging world of computer-animated motion-picture special effects, television promotions, and advertising. Both of these directions required that unique and successful spirit of collaboration across the vertical boundaries of dramatically different disciplines.

Half of his dream was realized in late 1980 and early 1981, after a mutual friend and business associate introduced Csuri to Robert Kanuth, a serial entrepreneur and financial securities investor. Csuri emphasized to his future business partner the need to continue the interdisciplinary approaches to the problems associated with image making, and a core group of the research staff was recruited to join Kanuth's new company, Cranston/Csuri Productions, Inc. CCP, as it became known, joined an elite group as one of the premier companies of the time that were producing computer-generated imagery for the small and big screens.

I was fortunate enough to join the company and work over the entire life of this pioneering commercial enterprise. As a member of the management team involved with defining and running the company, I experienced firsthand Csuri's commitment to the continuing marriage of art and science, but now with the *ménage à trois* style relationship demanded by the introduction of business to the mix. As such, the business client's role somewhat

echoed the role of the patron, who financially supported a master artist's workshop by commissioning works. Within this dialogue, the customer's often vague vision was to be creatively exceeded, engendering delight and awe in the mastery of production. On the strength of Csuri's reputation and the investment savvy of Kanuth, this privately held company was able to secure Ohio development funds and the backing of several large institutional and private investors. On the strength of the creative team of software developers and artists, the company attracted over 400 international clients representing many different business activities. At its peak, CCP employed over seventy people who were involved in the realization of over 150 creative and innovative products each year.

At the same time, a new kind of collaboration was beginning. While CCP was growing and succeeding, Csuri remained involved with the activities of his research lab and its new penetration into the teaching and learning academic arena. The original Computer Graphics Research Group (CGRG), started as a research collective and was evolving to become the Advanced Computing Center for the Arts and Design (ACCAD). This new venture was designed to bring together undergraduate and graduate students from art, photography and cinema, design, art education and computer science to learn together in an environment that represented the state-of-the-art in this new and emerging field of study. It happened to be co-located in the same campus-area facility as CCP, which provided the opportunity for OSU students and faculty and the professionals from CCP to get

together socially and more formally in the pursuit of knowledge that would eventually advance the computer animation field and cement The Ohio State University and CCP as two of the more important contributing institutions in the history of CGI.

As noted, interdisciplinary collaboration is often difficult. In particular, when one considers the intense demands of taking an intellectual activity from the theoretical to the practical, and add the need to turn a profit to meet the expectations of an increasingly competitive business market, the net that holds this collaboration together can become strained. Such was the case with Csuri's involvement with CCP. He justifiably felt very strongly that a share of the financial success of the company should be reinvested in the experimental pursuit of research; this was what he brought to the venture, after all. Although the leadership of the company agreed that research was necessary to maintain the competitive edge that defined the company in the first place, the financial expectations of the investors coupled with the need to make a growing payroll relegated this desire to a secondary priority, and this put Csuri and the board of CCP at odds. Csuri stepped down from the day-to-day operations of CCP and turned his attention back to making ACCAD a viable entity within the university.

CCP continued to impact the CGI production market for the next two years. However, Csuri's presentiment of the difficulty they would have in the changing market proved to be at least partially accurate. While CCP was directing much of its invest-

ment capital to the mainframe technology that was available at the time, the computer hardware industry was introducing the workstation, and the per-cycle cost was dropping dramatically. In addition, while the conversion from the lab-oriented software base to dependable commercial software was eating its share of the company assets, the computer software industry was introducing licenses for integrated CG software that was designed from the contributions we and other pioneers made, but it was also built on very significant and ongoing research efforts of others. In a sense, we sired the progeny that eventually would portend our demise. At the end of 1987, CCP closed its doors and Csuri's dream of commercial success came to an end.

The circle was completed when ACCAD was established and the goal of a research and teaching center, founded on the concept of interdisciplinary collaboration, became a reality. In my own transition from a narrowly focused mathematician, I marveled at the ability of this polymathic man who had the vision and desire to bring these so different, yet so similar areas of knowledge together in the pursuit of a new art and science. My own circle was completed when I had the opportunity and honor to assume a new role as Csuri's successor as the Director of ACCAD⁹ upon his retirement. I had no choice but to continue the strong commitment to interdisciplinary collaboration that built and still sustains this incredible resource.

-
- ¹ *The Museum As Seen at the End of the Mechanical Age*. New York: Museum of Modern Art, 1968.
- ² “Experiments in Art and Technology, Inc.” *Journal of the Society of Motion Picture and Television Engineers*: 146 (1968).
- ³ “E.A.T., Cogs, Gears, Transistors, and Art.” *The Kingston Daily Freeman*. Kingston: 20 (1969).
- ⁴ Brennan, P.J. “Art Meets Technology in New York: There Is No Winner.” *Engineer* (Jan./Feb.) (1969): 12
- ⁵ Christiansen, R. “Art and Technology.” *The New York Times*: 26 (1966)
- ⁶ Kluver, B., and J. Martin, et al. *Some More Beginnings: An Exhibition of Submitted Works Involving Technical Materials and Processes*. New York, Museum of Modern Art and Technology, 1968.
- ⁷ O’Connor, J.J. “The Gallery: Art Meets Science.” *The Wall Street Journal*. New York: 1966.
- ⁸ Snyderman, N. “Mixing Technology with the Arts.” *Electronic News*: 4 (1966).
- ⁹ <http://accad.osu.edu/>

Middle Period

late 1980s to the early 1990s



Exploration and the Artist's Tools

Maria Palazzi

Csuri's artistic development from the late 1980s to the early 1990s followed significant professional transitions. In 1985, Csuri resigned from Cranston/Csuri Productions to focus his energy completely on the renowned Computer Graphics Research Group (CGRG) at The Ohio State University (OSU). During the next two years, he and Dr. Thomas Linehan oversaw the renaming of CGRG to the Advanced Computing Center for the Arts and Design (ACCAD), which established a home for computer graphics research in the College of the Arts at OSU.

In 1990, with ACCAD functioning under a new support system, Csuri retired from his role as an administrator, grants writer, and teacher. At the urging of his wife, Lee, he returned to his passion for creating art. Few independent artists were using computers as their main medium at this time, due to limited access to advanced technologies and software. By assuming an emeritus professorial position at OSU, Csuri was able to work in a research environment as a full-time artist in residence with the appropriate resources needed to support his work.

Csuri's art during this middle period reveals the same curiosity about the connections between art and technology that drove him to create art with computers in 1963. The middle period works often integrate his traditional drawings and paintings with evolving technological developments in surface manipulation. In addition, and perhaps most significantly, it was during this period that Csuri began working with computer scientists to develop custom software programs that would eventually contribute to many signature elements in his artwork. Works from this and subsequent periods demonstrate increased mastery and subtle use of his core programming scripts, or "tools," as the artist often refers to them. Csuri speaks of gaining a greater sense of freedom as his familiarity with these programs deepened. His openness is evidenced by an ever-blossoming elegance in his art as the application of the tools becomes increasingly invisible.

When Csuri returned to making computer-generated art, he contends that he had to stop trying to be "too damn profound." This realization led to a shift in the style of his work, in which he allowed himself to be more playful and to focus on the beauty

and elegance he saw in his life. Csuri's subjects are permeated by a personal symbolism that, whether derived from mythic or physical sources, emerged from a home life that has imbued and nurtured his spirit and creative drive. His art is joyful, playful in color, and reflective of the same feelings of wonder, loss, and joy shared by all. This makes his work accessible, which cannot always be said for computer-generated works of art.

Csuri describes his work from this period as “organic looking,” suggesting that the use of the traditional media of drawing and painting as the basis for texture generation removed the sterile feeling often associated with work based in mathematics and logic. Using a technique called texture mapping, Csuri was able to wrap virtual models with portions of his oil paintings and drawings—a process similar to placing a label on a bottle of wine. Csuri said with delight, “I texture-mapped everything!”

A Child's Face, for example, uses a painting Csuri created with the thick application of oil paints, a traditional medium that was central to his artistic development (Catalogue 27). The painting was then scanned to create both a texture and a bump map that wraps around a computer-generated bust head and gives the final work surface color, pattern, and three-dimensional texture. Csuri applied this same texture to the background plane, creating an ambiguous play among the foreground, background and the image's spatial quality. This effect greatly interests Csuri, who has long admired the works of Paul Cézanne and his *passagé* technique. By using identical textures on both the child's face and the

background, Csuri breaches the object's boundaries, allowing the foreground to insinuate itself into the background. The results create a dynamic interplay that resolves into the object's three-dimensional form.

Traditional painting concepts, which Csuri taught for nearly two decades as an art professor, are revealed in *A Child's Face* and continue to influence the direction he explores in his approach to digital art. *Mask of Fear* explores texture mapping through the traditional artistic principles of scale and orientation (Catalogue 32). Again, the background elements share qualities of the foreground, in which Csuri repeats the abstracted faces that populate a singular torso. Csuri introduces atmosphere to enhance the spatial qualities of the image and transitioning shapes.

Csuri appropriates textures from photographs, using bricks to wrap mountains, a torso, and a sunlike element in *Brick Landscape* (Catalogue 33). He challenges the viewer's perception of scale and the objects' relationships by maintaining the pattern size across each of the elements. Atmospheric perspective is implied with a computer-generated fog that rises from the brick valley.

As noted, Csuri's art from this period marks the beginning of his partnership with custom software. Following long conversations among Csuri and graduate students studying at ACCAD, his signature procedures, fragmentation, ribbon, and colormix, were created and put to use in a variety of ways. Csuri collaborated on the design of the software and credits John Donkin, Matthew

Lewis, and Steve May, among others, as willing to engage in a dialogue that challenged him to articulate what he was trying to achieve. In the early 1990s Steve May introduced Csuri to AL. Csuri quickly realized the potential of AL and was willing to invest the time to learn it, something he is cautious about with all software. “AL is an environment for procedural computer animation which provides a powerful modeling language, a language interpreter, and a set of interactive animation tools. The AL language is an extension of Scheme. Scheme is a LISP-like language which is powerful and general purpose, but easy to learn and use.”¹ Csuri describes AL, including the subsystems he later developed with Barbara Olsafsky, as providing him with the capabilities of a search engine, in which he “lets the computer work for [him].” He sets conditions that generate unpredictable results; this is Csuri’s way of exploiting the computer for his own means.

Csuri creates his images by arranging or reappropriating pieces of scripts and adjusting the parameters that control the procedures. AL executes the scripts that Csuri has composed, generating images through RenderMan®. Csuri began extensive exploration of these functions during this middle period, mastering the procedures in a way that allowed creative control. He describes his process as art preceding science. His artistic vision is conceptualized, then completed by manipulating the computer code.

Csuri’s interest in degrees of abstraction led to the creation of the fragmentation procedure, giving Csuri the ability to play

with the line between abstraction and representation. *Cosmic Matter*, in which Csuri fragments digital models of classic sculptures by extracting polygonal elements that float in a solar system arrangement, exemplifies this exploration (Catalogue 34). The fragments also exist in a three-dimensional color space, which Csuri creates using his colormix tool. This tool allows Csuri to define the location of specific colors within a prescribed volume. His placement of geometry within the colormix determines which color is mapped to the object’s vertices. In *Surrealist Dream*, Csuri uses colormix to imply spatial qualities for groupings of abstract shapes, which appear fragmented from an unidentifiable source (Catalogue 38). A lone figure remains unaltered atop one of the floating elements, giving definition to an otherwise abstracted environment. Many of the figurative computer models in Csuri’s work came from a very small resource of data that were generated by human figure scanners and given to him by colleagues. These figures, posed by Csuri, appear repeatedly throughout his work.

The body of Csuri’s work from this middle period is comprised entirely of still images, unlike his early and later computer art, which incorporates movement through real-time objects, animation, and Virtual Reality Modeling Language. During this period, he was disenchanted with animation because it took too much time. Consequently, the virtual camera was focused from one point of view, like that of a traditional painter. Unlike a traditional painter, however, Csuri was looking past the picture plane and examining three-dimensional space.

As an artist, Csuri made a conscious decision not to become absorbed in the evolving technical minutiae of the computer graphics discipline. He felt this could easily distract from the essence of image making. Csuri credits his students and his life at a research institution as having broadened his vision and honed his insight into the potential of computer graphics. The field expanded his view of nature and reality as he pursued ways in which he could use the computer to assist in generating art. Maintaining that for his process, “art takes place outside of the machine,” Csuri’s images from this time reflect a growing sense of harmony between the artist and the technology.

¹ <http://www.csuri.com/>

Silent Statues

Elements of still life and landscape, structural diligence, and a looser, more painterly lyricism than that found in his other computer art are present in Csuri's *Silent Statues* and demonstrate the artist's exceptional sensitivity and range. Simulated images of the human body fade to varying degrees away from the viewer's eyes. This play of substantive form creates a rhythmic pattern that ranges in tone from light to dark. Movement of line and texture provides the third dimension, transforming the composition into a spatial reality. They flow over and across the virtual canvas, creating a single, tightly woven chromatic surface. Line and shape enable the viewer to interpret the painting simultaneously as landscape, still life, or both.

The biomorphic forms and the gaps between them become, to some extent, synonymous. What do these figures illustrate? The meaning is not apparent. We can guess at the underlying sense only by imagining a larger whole from which these statues have

been abstracted. Armless human bodies, standing rooted to the ground as columns, generate a vertical symmetry with respect to a horizontal axis. These ghostly silhouettes advance and recede from their surroundings, enduring the eroding pressures of the space around them. The created space does not subvert the substantiality or the integrity of the picture plane.

What was painterly in Csuri's early, traditional art of paint and canvas is still present in this new medium, expressed in the articulated touches of light and shadow, as well as in the palpable brushwork of the background. Using the computer as an artistic partner, Csuri moves freely between constructed figuration on one side and imagery with classic forms and allusions on the other in repeated oscillation. All this he accomplishes without loss of natural flair or aptitude for intense fantasy and expressiveness. [AV]

26. ***Silent Statues.***

1989.

Unix environment.

Lightjet on paper

with laminate.

76 x 102 cm

(30 x 40 in.).





27. ***A Child's Face.***
1989.
Unix environment.
Lightjet on paper
with laminate.
76 x 102 cm
(30 x 40 in.).



28. **Caroline.**
1989.
Unix environment.
Lightjet on paper
with laminate.
76 x 102 cm
(30 x 40 in.).



29. ***The Hungarians.***
1989.
Unix environment.
Lightjet on paper
with laminate.
76 x 102 cm
(30 x 40 in.).



30. ***Death of
My Father.***

1989.

Unix environment.

Cibachrome.

76 x 102 cm

(30 x 40 in.).

Collection of

Roy Gottlieb, D.D.S.

Faces

Broad and simple in conception, limited in its range of colors, Csuri's *Faces* is a brilliant synthesis of moving narrative and dynamic visual composition. Rooted in the liberating experience of expressionism, the entire image is a series of faceted surfaces without intervals or gaps. The planes, one over the other, form a rhythm of repetitive patterns, penetrating and partaking of one another. Shapes are created with overlays of luminous color that expand and overlap, recasting the notion of pictorial space. The faces form a single, rocklike mass in so shallow an area that they seem to move outward, towards the viewer, instead of inward to a vanishing point. In particular, the technique of repeatedly placing the same subject out of alignment gives a curious impression of *bas relief*.

The broadly brushed-in background serves as a suitable backdrop to the heads, which suggest the influence of primitive sculpture. However, Csuri's delight in his medium and the simplicity of his forms indicate that the artist is not primarily concerned with representation. The contours are light, lyrical, and emphatically complementary. The substructure of the drawing is marked by a deliberate coarseness, with line used to create an emotive effect independently of color. There is extraordinary coherence, textural unity, and a moment of metamorphosis as the eye travels over the surface following a web of lines from which images begin to emerge. Satirical and abrasive, yet compassionate and whimsical, Csuri creates a universe of his own, marked by tawdry moving faces that grip the imagination and stimulate the fancy. [AV]

31. **Faces.**
1989.

Unix environment.
Lightjet on paper
with laminate.
76 x 102 cm
(30 x 40 in.).



Mask of Fear

To create *Mask of Fear*, Csuri returned to his oil paints and brushes and issues forth an evocative portrait of an unknown woman. As with his paintings from the 1950s, Csuri uses the *impasto* technique, the thick application of oil paint, as well as vigorous and quickly executed brushstrokes to emanate a rich and expressive quality. Stark white faces juxtapose deep red lips and dramatically decorated eyes, giving the figures a ghostly elegance and engaging remoteness.

Csuri fully exploits the use of texture mapping in this work by wrapping four geometries, and, thereby, creating four distinct, three-dimensional heads and a torso. With this work, Csuri's love for Picasso and expressionism is revealed, as he renders null any dichotomy between science and art. [SL]

32. ***Mask of Fear***

1989.

Unix environment.

Lightjet on paper
with laminate.

76 x 102 cm
(30 x 40 in.).





33. **Brick Landscape.**
1989.
Unix environment.
Cibachrome.
122 x 165 cm
(48 x 65 in.).



34. ***Cosmic Matter.***
1990.
Unix environment.
Cibachrome.
76 x 102 cm
(30 x 40 in.).

Gossip

*Wikipedia*¹ refers to gossip as “the act of spreading news from person to person, especially rumors or private information,” and indicates that the news usually “has a personal or trivial nature.” *Gossip* connotes the introduction, perhaps intentionally, of errors and other negative variations into news. Gossip is more often associated with chat than with conversation, and far removed from discourse. What is Csuri’s view of gossip?

Gossip exists: it is a given. Gossip is colorful and glossy. One bit generates more bits. Gossip is magnetic: one piece attracts another piece. Gossip does not repel gossip; it draws more of itself to itself. It swirls, gathering momentum. Some bits fall away; some build in density. Gossip is light, and airy, and it travels. Gossip is made up of individual circular utterances. They are self-contained, allowing some shaping from the outside, but no penetration to their insides: A bit of gossip is self-contained, self-assured, and self-sustaining. The utterances attract other utterances, but none of the originating utterances are transformed by new ones.

Csuri’s floating orbs of gossip are empty in the middle. They originate from personae that are made up of similar orbs, empty in the middle, which, when stacked form towers without centers. The beings that put forth gossip are made up of stacks of gossipy orbs, devoid of cores, made of what they emanate and emanating what they are made of.

Csuri’s *Gossip* is playfully observant. It is accepting, with an implied knowledge of the shallowness of its attraction. It is close to how Saul Steinberg might whimsically treat the subject, and removed from how Jules Feiffer might sardonically castigate it. Csuri’s view is a kind acceptance of human foibles in which he shares. [TB]

¹ *Wikipedia*. <http://en.wikipedia.org/wiki/Gossip>. 5 June 2006.

35. **Gossip.**
1990.
Unix environment.
Cibachrome.
122 x 165 cm
(48 x 65 in.).
Collection of
Dr. Roy Gottlieb, D.D.S.



Wondrous Spring

In *Wondrous Spring*, Csuri confronts the viewer with a visual awareness organically evolved from the belief that harmony underlies the phenomena among which we live. The novelty of his style lies partially in Csuri's creation of the atmospheric in his art. His unique use of this tradition to declare a radical and positive idea of algorithmic painting is extraordinary. Csuri's interpretation of nature is a living harmony of tones, not unlike that of a musical composition, which washes over the viewer and imbues the senses.

He achieves effects of light and space with unparalleled freshness and spontaneity in *Wondrous Spring*. A filmy ambience invites the viewer into a close-up of secret detail, the subtle lines and thin washes of mysterious color melting into each other and into the background. Everything in the work plays a decorative rather than a descriptive role. The forms of the flowers and leaves are

simplified, so that one is more aware of them as shapes than as realistic elements. The painting also reveals Csuri's imaginative power as a colorist; the delicate combinations of pinks, reds, yellows, and blues are unexpected and evoke a lyrical atmosphere.

Tonal recession is deliberately negated, and objects supposedly farthest from the eye are given exactly the same value as those in the foreground. There is no single light source—lights and darks are arbitrarily juxtaposed. *Wondrous Spring* is built of a loose, linear grid of interacting vertical, horizontal, and diagonal lines from which semitransparent, interacting planes and facets are hung. Out of this complex of compositional elements, the subject emerges slowly, only to be lost again in the overall space, so that a dialogue is established between the objects rendered and the spatial continuum in which they are embedded. [AV]

36. ***Wondrous Spring.***
1992.

Unix environment.
PHScologram.
81 x 81 cm
(32 x 32 in.).





37. ***Dance of the Sorcerers.***

1993.

Unix environment
and Frank.

Lightjet on paper
with laminate.

76 x 102 cm
(30 x 40 in.).



38. ***Surrealist Dream.***
1995.
Unix environment and AL.
Lightjet on paper
with laminate.
76 x 102 cm
(30 x 40 in.).

39. **Golden Mask.**
1995.
Unix environment and AL.
Lightjet on paper
with laminate.
102 x76 cm
(40 x 30 in.).



Later and Recent Periods

mid 1990s to 2006



Master of the Digital Renaissance

Karla Loring

In the great tradition of Giotto, Cézanne, and Duchamp, Charles Csuri has become one of the most influential figures in the art of the twenty-first century. Art has evolved and advanced through a variety of tools and techniques with each new generation of artists, but Csuri's work, culminating in his most recent series, is fundamentally revolutionizing the way one *thinks* about art.

The Italian Renaissance was defined by the synthesis of art with science and mathematics, resulting in the mastery of three-dimensional perspective, made possible by Euclid's geometry. The creation of the illusion of three-dimensional depth on a two-dimensional surface plane was a major turning point in art history, which allowed more naturalistic styles to develop.

Csuri recognized that the visual language of mathematics and technology held new possibilities for the creation of art, especially three-dimensional works. The development of n -dimensional geometry, vector graphics, and theoretical spaces enabled Csuri to use the computer much like a creative search engine to produce works that he might never have initially imagined. His most recent works represent a culmination of inventive ideas and

processes that have redefined the way that art is conceived, created, and presented, leading to a digital renaissance in art.

Throughout the history of art, artists have always returned to the common themes of landscape, still life, and portraiture in order to reinvent them. Innovations often begin with a return to the basics of structure, form, color, and space to reconstruct them from the ground up. Like many aspiring artists, Csuri copied the masters at the Cleveland Museum of Art as a student. The artist who perhaps had the greatest influence on his work and philosophy is the renowned post-impressionist Paul Cézanne, considered the father of modern art. Csuri, often referred to as the father of digital art, shares with Cézanne the ability to compose a new order that transforms the visual language of art.

Cézanne is credited with having changed the canon of art by painting objects in the natural world as he saw them, rather than as his mind's translation of what was there. His intellectual constructions synthesized the principle geometric forms of the sphere, cone, and cylinder through light and color. Using brushstrokes consistently across all surface areas, Cézanne simplified the

volumes of these forms and altered linear perspective, paving the way for cubism. Rather than rejecting the traditional modes of representation, such as perspective, *chiaroscuro*, and visual structure, as Cézanne did, Csuri took these ideas to a new level.

Csuri spent decades studying Cézanne's methods of manipulating color and light from conceptual and technical points of view. The geometry of the objects in Cézanne's celebrated still lifes determined the relationship of color and light, and began to show an increasingly abstracted relationship between figures and the ground.

Csuri's introduction of science and experimentation produced works of even greater complexity, layered with meaning and expression. For Csuri, the idea of an object is redefined as a complex model or function. He perceives objects as layers of representation, as instances in time, in a three-dimensional world space in which he creates new forms that truly synthesize realism and abstraction.

In *Venus in the Garden Frame 73*, from the *venus* series, Csuri begins with an image inspired by the famous Greek sculpture of *Venus de Milo*—a symbol of beauty and elegance—which he then re-imagines and creates code to set the rules and conditions that will ultimately control the light, color, camera position, boundaries, and distances, among other variables (Catalogue 59). The representation of an object is replaced by a function in a program, an extremely important development in art.

Each Venus figure is assigned properties based on an ordered set of points given numeric representations. From there, each rendering is unique: one might be created with lines, another with fragments, and another with detailed solid polygons. Others are created with natural forms, such as plants, or combined with historical art references, such as primitive figures, or traditional artistic media, such as glass or marble. In the *venus* series, Csuri treats the surface properties of each of the three-dimensional representations with different textures, in contrast to Cézanne's use of even brushstrokes. Csuri expands this three-dimensional realism, which originated with an object inspiration, to more purely abstract forms in his own imagined world space.

Csuri conceives of his recent abstract work, such as *texturePerhaps* from the *Scribbles* series, in terms of a three-dimensional color field (Catalogue 54). Using algorithms for the color space, Csuri defines the physical structure of the objects, their material properties, and the light spectrum. The color is defined by the parameters he sets for the process, which might not be apparent to the viewer. These conditions determine where the color spaces are and how the color changes as three-dimensional objects move through a space in certain relationships to each other.

This technique is particularly noticeable in Csuri's most recent animations, because, as the object moves in space, it changes its color depending upon its movement and its relationship to the other objects in the three-dimensional color space. Csuri can also control and dynamically change the regions of color, their saturation, and other variables.

Csuri can then generate hundreds of images of his ideas over time with the color space moving and shifting and giving feedback in different situations. His experimental methodology closely resembles a scientist's way of testing for variables that mirrors the obsessive reworking of subjects such as Cézanne with Mont Saint Victoire or Monet's systematic painting of the façade of the Rouen Cathedral to capture the play of light and atmosphere at different times of day and weather conditions.

German-born artist Josef Albers' seminal studies on perception and the theory of color were the result of his labor-intensive *Homage to the Square* color experiments. Using a reduced format of concentric squares, Albers painted dozens of colored canvases to examine the interaction of the colors. With the computer, Csuri is able to create a hundred images literally overnight. It is the selection process that becomes crucial as Csuri's aesthetic judgment from decades of artistic study takes precedence.

Csuri's view is expanded from that of the more conventional artist because he no longer believes that there is a single solution to a problem. Final works in his *venus* series, for example, are the result of running several hundred—or sometimes a thousand—variations, with each unique image rendered from a set of conditions. Csuri continues to reduce the number of images by examining the aesthetic results, until he works it down to a final one or two finished works. Even in this context, Csuri explores continuing levels of control and variation. In the case of *Venus in the Garden Frame 127*, Csuri took Frame 127 as generated by the

venus series and further altered it to reach an aesthetic he wanted (Catalogue 60).

Csuri considers his experimental methodology to be a play between control and discovery that allows works of art to be created without an end goal in mind. He tries various types of representations of an image, some more abstract, some more representational, testing different positions. The *venus* series variations each have a unique texture that picks up the play of light across the color of the texture. The significance of Csuri's technique is that it allows him to search for something—a combination of colors or geometric positions—that he might not have thought of creating. His goal in looking at and sorting through a great variety of combinations is to ultimately find solutions to aesthetic challenges that artists face. Remarkably, Csuri says that he works best when he does not plan or anticipate the outcome.

As is evident in many of his most recent works, Csuri has become more concerned with the expression of beauty in nature than in trying to make a social comment or a statement on the human condition. Although abstract, much of his imagery refers back to images and symbols from art history; even works from his abstract *Scribbles* series and *Entanglement* (Catalogue 56) resemble the pure abstraction of Jackson Pollock or Cy Twombly.

The extraordinary *Scribbles* series, although rendered through computer technology, still has strong energy and expressive passion, with an organic quality based on Csuri's design of the

algorithm. Here, Csuri pursues what a computer can render that is difficult to do by other means. Inspired by his young granddaughter's drawings in her 'preconceptual' phase, Csuri captures a rich spontaneity and fluidity in the pattern of marks that has an animated beauty showing the artist's hand, despite being created by mathematics.

Comparisons will be drawn to the abstract and performative aspects of Jackson Pollock's paintings of the 1950s. Pollock's physical method of pouring, dripping, and splattering paint onto the canvas, built up through layer upon layer, had a strong visceral appeal. Yet, even with his seemingly instinctual and unrestrained technique, Pollock had a planned and controlled course of action in creating his works. His images were shaped by the dynamics of the material's properties with the speed and force of its release, together with specific decisions about color choice, orientation, and canvas size, all determined by Pollock, who, like Csuri, was an astute student of art history.

Pollock's final paintings provided a record of the art performance that took place in the creation process. On a conceptual level, Csuri sets up a situation in which he determines what kind of symbols, objects, colors, and textures he wants to use. Like Pollock, he uses his programmed conditions as a set of controlled choices in order to obtain results that he cannot fully predict. Essentially, his idea is to use the computer much like a creative collaborator.

The end result of Csuri's work *texturePerhaps* gives a three-dimensional impression of layering, but also a sense of space not found in Pollock's work. Pollock did not work from three-point perspective, whereas Csuri's computer graphics have a camera position with a perspective that give it a depth and a quality of light that is hard to achieve by conventional methods.

Artist and former cryptologist Cy Twombly created large, abstract paintings of looping lines that resembled graffiti to blur the line between drawing and painting. Although the titles of his flat, monochrome canvases suggest myths and metaphors, they share none of the intellectual relevance and emotional connection achieved in Csuri's works.

Marshall McLuhan once said that "Art can serve as a beacon, a distant early-warning system that tells the old culture what is beginning to happen, to interpret what scientists are doing." What Csuri has achieved is a true synthesis of the aesthetic and the algorithmic, breaking new ground in three-dimensional computer graphics to create a visual experience that is more advanced than past art forms.

In Csuri's later works, the artist's process of creation has a direct appeal and connection to the viewer's process of interaction and active participation. His developments in digital art have broken from traditional methods of art making to a new level of aesthetic and intellectual engagement with what art means and why it is important. In his most recent series, there is always an underlying

joyfulness and sense of liberation that transmits the beauty, passion, and expression that art is able to capture and convey.

Both scientists and artists are driven by a similar sense of curiosity and experimentation in their desire to solve a problem, whether it is pictorial or pixilated. Csuri's work has forged an artistic pathway for real and virtual art forms, a new context through which future works of digital art can be viewed and understood. His legacy will challenge artists with different ideas about creativity in the decades to come.

British novelist and scientist C. P. Snow once wrote about a division of the thinking world into “two cultures”—the literary intellectual and the scientist—and the breakdown of communication between the two. Recently, American writer John Brockman's idea of a “third culture” seeks to unify the communication between arts and ideas and the sciences through a group of accessible thinkers such as Brian Greene, E. O. Wilson, and Daniel Dennett. Among artists, Charles Csuri exemplifies this new breed of thinker who is fully at home in the arts and sciences, a bridge between art history and art of the future, and scientific history and science of the future. Instead of being marginalized in each world, he has found a way to truly synthesize both sides. Csuri is not just presenting a new direction of art, he is redefining art for the future, leading the digital revolution. All this is from an artist who just wanted to be able to draw in three dimensions.



I try to play at the edge of reason and absurdity.
It is an invitation to something alive.

– Charles A. Csuri

40. *A Happy Time.*
1996.
Unix environment and AL.
Lightjet on paper
with laminate.
76 x 102 cm
(30 x 40 in.).





41. **Garden Lovers.**
1997.
Unix environment and AL.
Cibachrome.
102 x 152 cm
(40 x 60 in.).
Private Collection.

Horse Play

Paired horses stand face to face in a monochromatic field of light and shadow, their faces engaged in close exchange above a vague horizon. Strewn clouds of ribbons float effortlessly overhead, mirroring the animals' elegant constitution with loose bends and greater transparency.

The calligraphic lines drawn through geometric shapes in three-dimensional space create the main forms in *Horse Play*, which give the curious impression of both a drawing and a sculpture. Defined by the artist's ribbon tool, the horses quietly stand as abstracted statues, while the theatrical *chiaroscuro* cast hollow shadows that resolve the work into an air of dignified calm. Horses' familiar strength and thick torsos are playfully rendered in soft hues of reds and pinks; the flowing lines offer graceful movement to the stillness of the geometry. The work seems inspired by the Hindu god Varuna, who, in Csuri's *Ramblings of a Feverish Mind*, suggests that the artist "consider an ethereal purity of space against a background of nothingness." [SL]

42. ***Horse Play***.

1999.

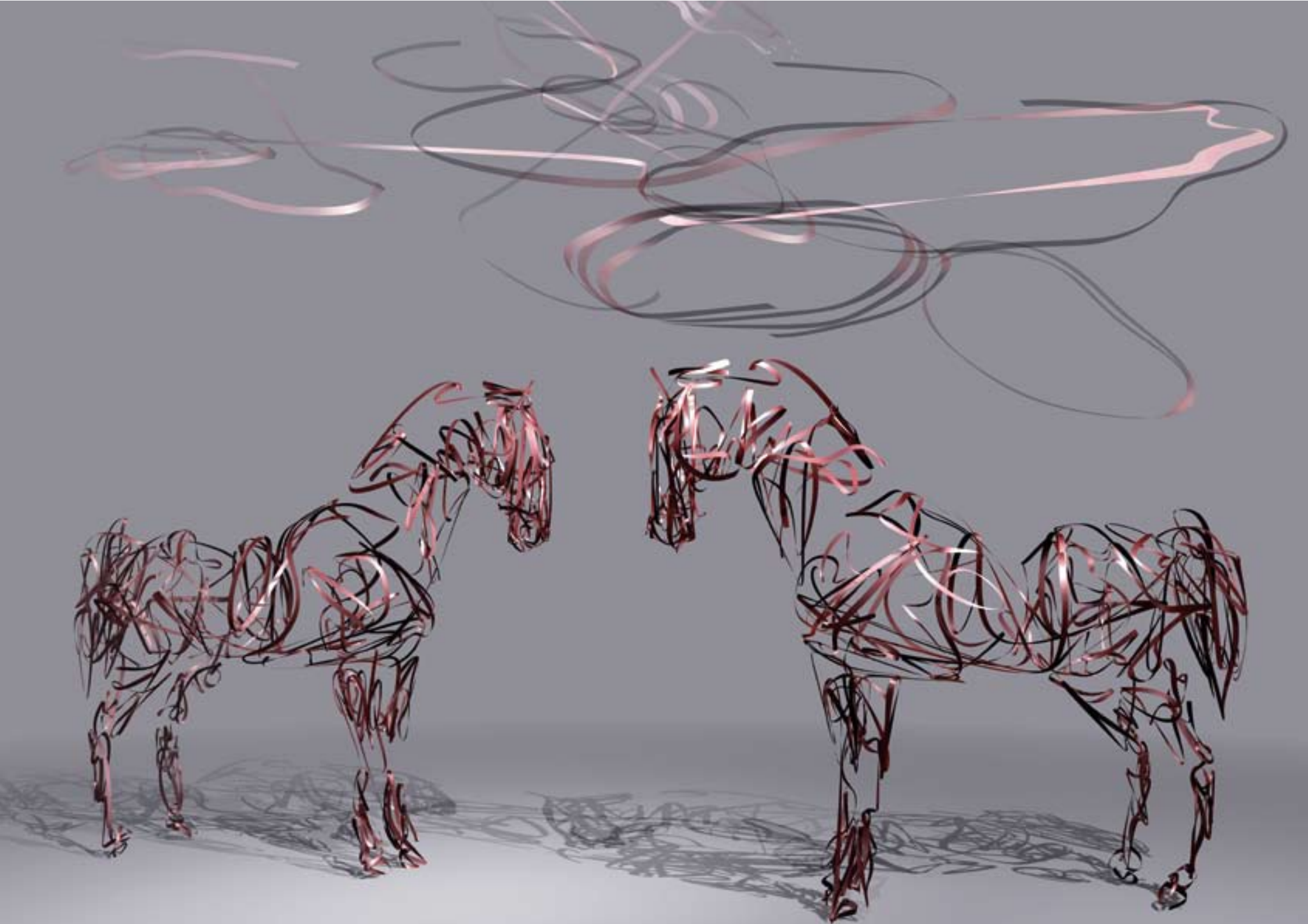
Unix environment and AL.

Lightjet on paper

with laminate.

76 x 102 cm

(30 x 40 in.).



Political Agenda

From any point of view, *Political Agenda* is beautifully composed. Csuri creates two glass spheres that suggest fantasy, magnificence, and grandeur. The spheres' surfaces both reflect light and magnetize the ribbons in the background, creating a swirl of light, color, and line. As with much of Csuri's art, this work wanders between representation and abstraction, transcending these traditional definitions.

The ribboned structure's form, intended to be the Capitol building, is only partly revealed. The ribbons, magnified by the spheres, create a dichotomy of vertical and horizontal lines, suggesting both the similarities of their essence and their differing manifestations. In *Political Agenda*, there is truth behind what is made visible, yet we see only an entrancing, distorted view, made beautiful

by the glass filter through which it is seen. *Political Agenda* was also intended as an oscillating animation that rotates continuously back and forth across the horizontal ground plane in Csuri's *Virtual Glass* CD. In the animation, the mesmerizing quality of the distortion is enhanced as the viewer watches the swirling ribbons twist and swing in a slow and captivating movement that is magnetizing in its beauty and hypnotic in its repetitive distortions. [ZY]

43. ***Political Agenda***.

1999.

Unix environment and AL.

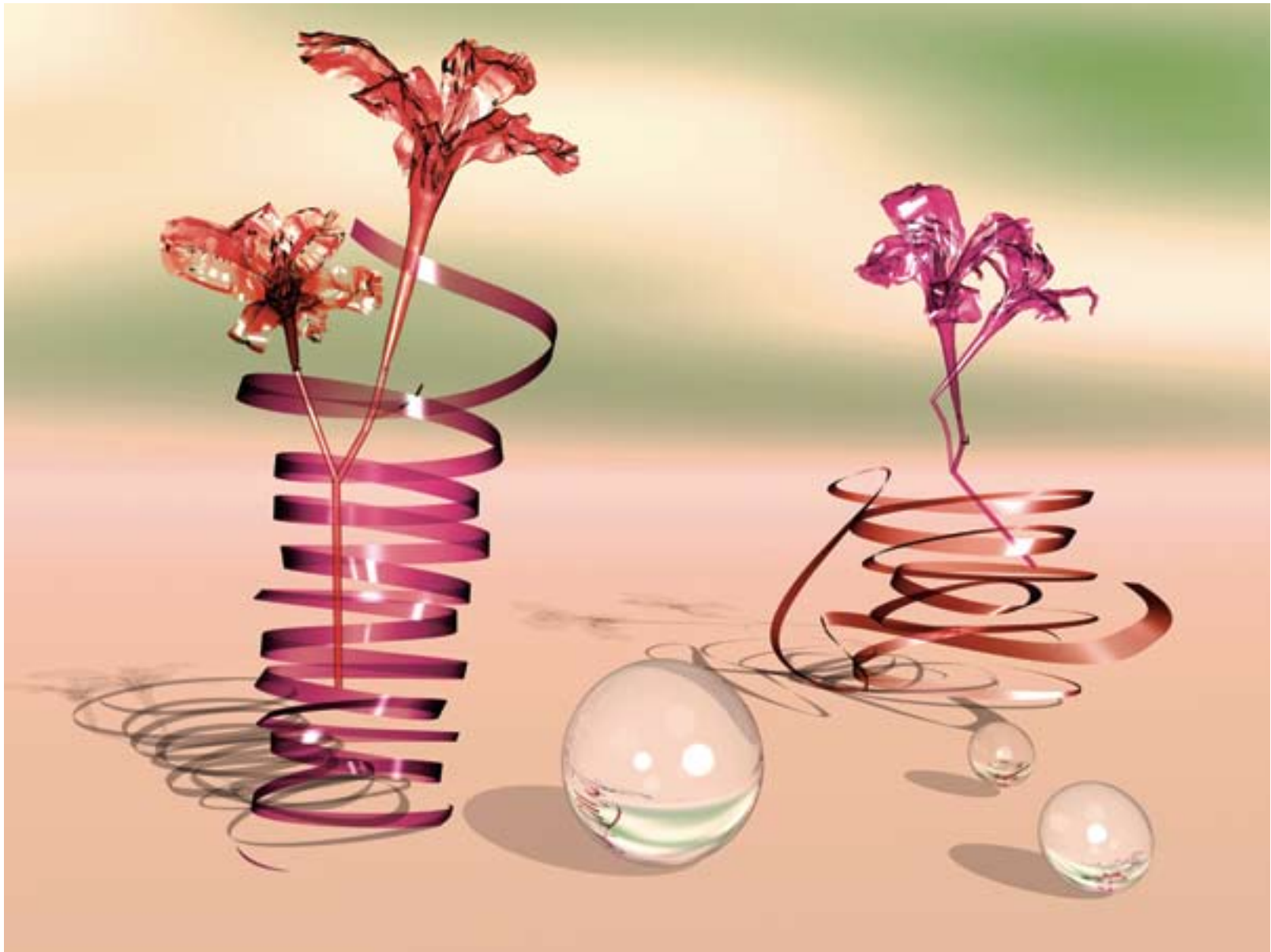
Cibachrome.

122 x 165 cm

(48 x 65 in.).



44. *ribbonVASES*.
1999.
Unix environment and AL.
Cibachrome.
46 x 61 cm
(18 x 24 in).
Collection of
Dr. Roy Gottlieb, D.D.S.





45. ***Horse and Rider.***
2000.
Unix environment and AL.
Cibachrome.
122 x 165 cm
(48 x 65 in.).

A Frozen Moment

Figures in the foreground stand in quiet stasis with their ephemeral counterparts and cast their shadows on the ground, while their alternates slip in and out of our visceral awareness. This work is aptly named *A Frozen Moment*, a still point in time laden with the balance of opposites. The ribboned figures are poised in their relaxed *contrapposto* stances, casting shadows with their hollow bodies. They are grouped with figures caught between materializing and dematerializing, ghostly figures that cast no shadows despite the stark lighting of the scene. The ribbons themselves balance the overarching stillness in the work, introducing the idea of movement in their curvilinear encirclement of the bodies, softly binding the figures as well as reflecting light across their satiny surfaces.

The beauty of the work stems not only from Csuri's choice of elements, such as the graceful classical poses and glass ribbons, but also from the expert harnessing of formal qualities for his artistic purposes: the reflection of light in relation to the light source

and the suggestion of three-dimensionality through the use of *chiaroscuro*. Although the artist almost effortlessly accomplishes the feat of balancing the work's visceral and intellectual qualities, he reminds us that "it takes a great deal of trial and error adjusting parameters before [he] is satisfied with the ribbon-like representation."¹ The quiet simplicity of this work, in comparison with Csuri's other, more dynamic compositions, makes evident the expressive potential of this medium. Algorithms transformed into this visually intriguing space, inhabited by objects that seem to have lives of their own, Csuri's mode of presentation renders another world unto art—one that is vaguely familiar and yet open to still more explorations and interpretations. [YC]

¹ Charles Csuri, *The Scribble Series*, 2000. www.csuri.com/charles-csuri/computer-graphics-2_0.php

46. **A Frozen Moment.**

2000.

Unix environment and AL.

Cibachrome.

58 x 165 cm

(23 x 65 in.).

Collection of

Roy Gottlieb, D.D.S.



Balancing Act

In a surreal space, three forms balance precariously in a circus-like manner at center stage. The horizontal plane that holds the objects appears realistic because it displays a regular shadow, while the “vertical” surface behind the forms advances through an orange-red illumination. The composition is intriguing, as are the materials of which the objects are made. The context of the work’s creation, the *Virtual Glass* exhibition held at the Riley-Hawke Gallery in Columbus, Ohio, in 2000, belies the forms’ materials. However, Csuri’s expert use of light, shadow, and color creates an ambience of mystery through an unearthly light that pervades the three-dimensional space. In this environment, the ultrasmooth objects appear almost balloonlike, although their obeisance to gravity contradicts this possibility.

While trying to rationalize the ambiguity of the forms, the viewer tends to overlook the tiny acrobat balancing on the top of the object’s middle section. This significant agent offers the mythic object equilibrium, giving stability to the overall composition and resolving the tension created by the precarious balancing of objects. [ZY]

47. ***Balancing Act***

2000.

Unix environment and AL.

Cibachrome.

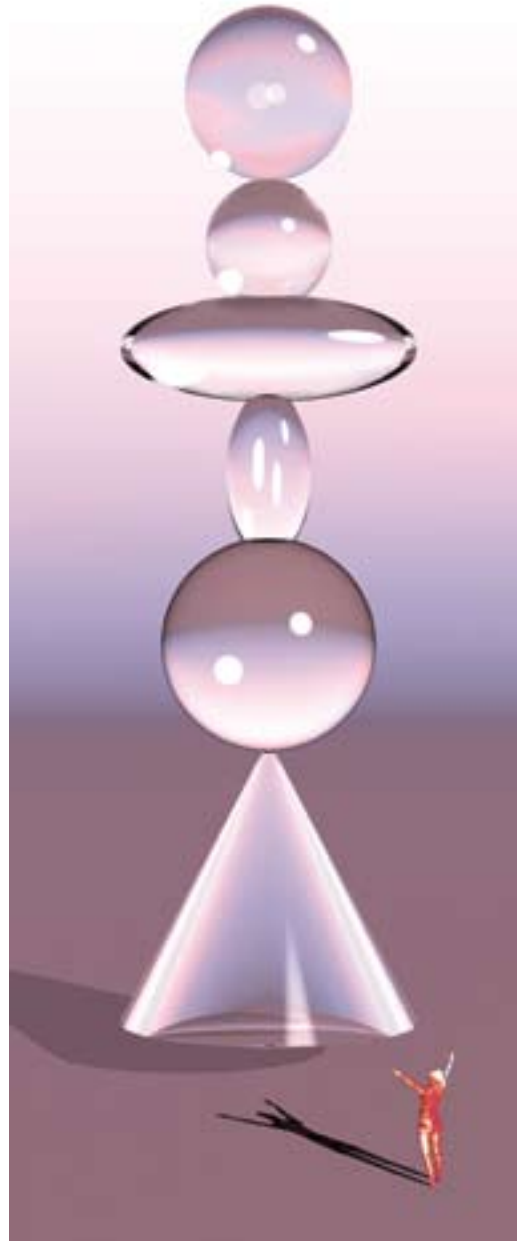
165 x 122 cm

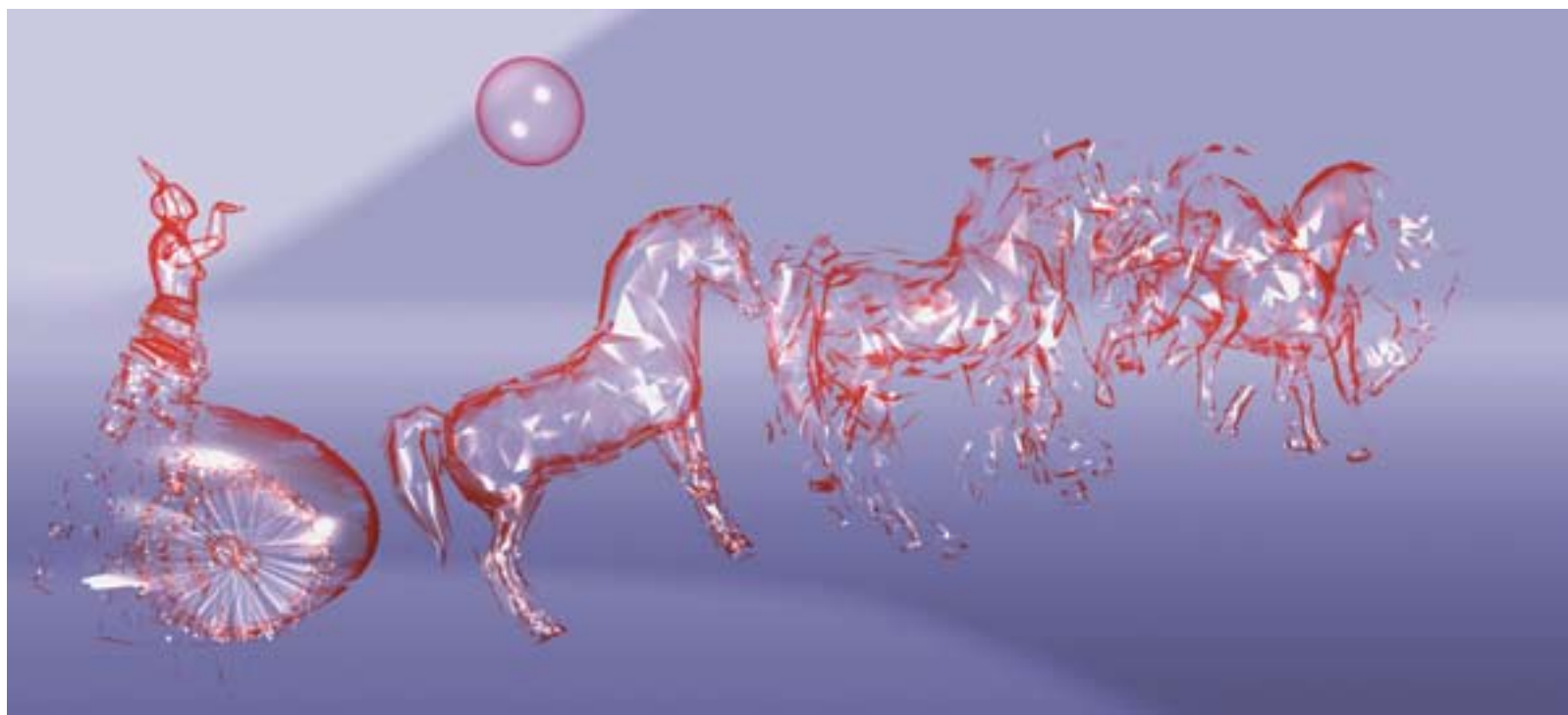
(65 x 48 in.).



48. ***Clearly
Impressive.***
2000.

Unix environment and AL.
Cibachrome.
213 x 84 cm
(84 x 33 in.).





49. **Aurora.**
2000.
Unix environment and AL.
Lightjet on paper
with laminate.
102 x 165 cm
(40 x 65 in.).

Dream Gazing

Set against a backdrop of the evening sky, filled with stars and weightless glass spheres, two masks gaze upward into the night. Both intimacy and the inevitable separation that intimacy implies pervade this work. The masks share an essential form, yet nuance distinguishes them from one another, with one held to a solid shape and the other fragmented into delicate filigree. Their inward turn implies connectedness, although they do not touch, but instead lie in distinct color fields of deep red and soft blue.

The composition echoes a familiar theme of lovers sharing a romantic evening tryst. In the title, *Dream Gazing*, we hear of dreams shared and futures planned as a team of three horses effortlessly pulls the goddess Aurora's chariot across the sky, ushering in a new dawn. There is, at once, all possibility and nothing but this singular moment. The lovers are physically separate, yet bound by shared experience.

Dream Gazing is emotive, pulling the viewer into the private moments of shared love. Masterfully mingling archetypal symbols in grounds of simple colors—the blues and reds of the night just before dawn—Csuri evokes the touching joy and elegance of such inexpressible moments.

Masks are motifs that appear regularly in Csuri's work. Both he and his wife, Lee Csuri, share a love of roughly hewn wooden sculpture and masks, which fill their home. Lee Csuri, whose love of mythology, intellectual curiosity, and keen sense of beauty have nurtured and challenged Csuri's creativity for most of his artistic career, created much of this artwork. [JMG]

50. ***Dream Gazing***.

2000.

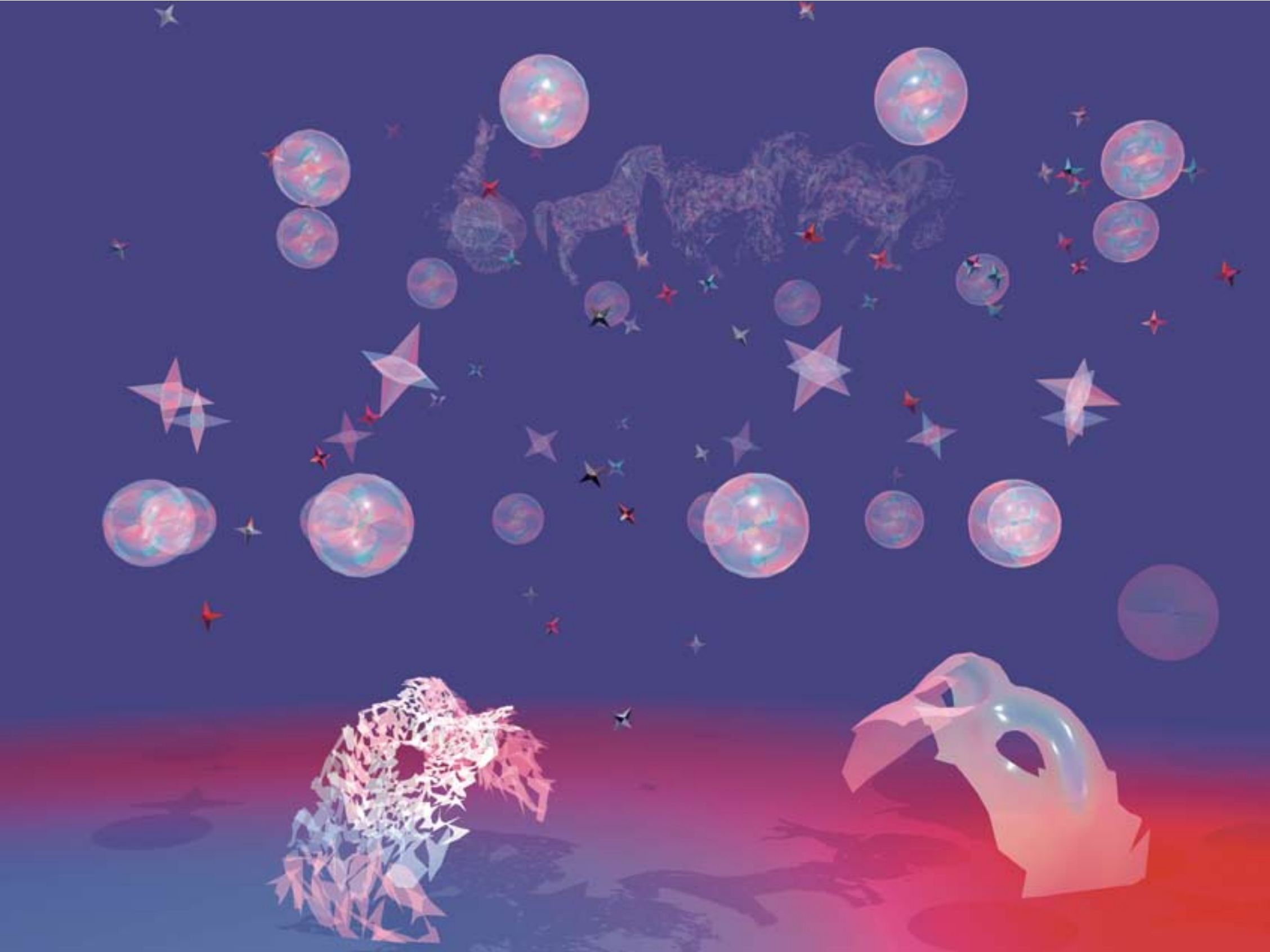
Unix environment and AL.

Lightjet on paper

with laminate.

76 x 102 cm

(30 x 40 in.).



Raphael Voglass

Three rose-tinted glass figures stand in mirrored equipoise against a watery blue background. The internal energy generated by the close placement of the female figures expands through their outstretched hands, generating waves of dynamism that subside into the spacious picture plane. Glass polygons stack precariously to form the figures' hips, further creating movement and a tension that is resolved by feminine grace. After a decade of exploring the limits of his core artistic tools—the fragmentation, colormix and ribbon algorithms—Csuri's intimacy with the apparatus of his trade reaches a delicacy that marks the accomplishment of creative expression guided by fine craftsmanship.

A painting by Renaissance artist Raphael (1483–1520) inspired the creation of *Raphael Voglass*, in which Csuri imaginatively translates the elegance that characterizes Raphael's art. Csuri displaces only parts of the figure and the large sphere, creating a seamless transition between two- and three-dimensional space in those areas.

Csuri masterfully varies the fragmentation function's parameters, modifying the degree, region, and direction of the displacement. Only sections of the figures and the large sphere in the upper-left corner are disarticulated, and, as one of Csuri's signature contributions, results in an innovative transition between two- and three-dimensional space that blends seamlessly within a flow of form and abstraction. [JMG]

51. ***Raphael Voglass***.

2000.

Unix environment and AL.

Lightjet on paper

with laminate.

165 x 114 cm

(65 x 45 in.).





52. **doodleFourteen.**

2001.

Unix environment and AL.

Lightjet on paper
with laminate.

183 x 244 cm
(72 x 96 in.).



53. **19th Century
Space Station Frame
0321**, *stillASTO* series.
2001.

Unix environment and AL.
Lightjet on paper
with laminate.
76 x 102 cm
(30 x 40 in.).



Randomness, Chance, Process: The *Infinity* Series

Matthew Lewis

Charles Csuri speaks of his infinite series as beginning in 1966 with his images *Feeding Time* and *Random War* (Catalogue 25 and 24), both shown in the 1968 Cybernetic Serendipity show in London, making these among the earliest computer-based generative artwork.¹ Experiences working with randomness and chance led to Csuri's increased realization of infinite artistic possibilities with the computer in the role of creative partner. Throughout his career, and particularly in recent years, Csuri has made ever-increasing use of chance operations to explore unexpected combinations of elements, positions, colors, textures, and movement. What Csuri began exploring in the 1960s has become of increasing interest to artists using computers, who can now turn to algorithmic and generative approaches to share the burden of creativity with their machines.²

The term *generative art* has emerged as a way to explain the products of this unique relationship between an artist and his or her artistic tools. It is also used when referring to the creation of processes that run with varying autonomy, producing results for artistic evaluation.^{3,4} The range of algorithms that emerge

from such processes set in motion by generative artists are often discussed with respect to their range of discernible differences, artistic signature, and mark of process, as well as who can make these distinctions. The idea of producing an “infinite number of possibilities” is sometimes discussed, but the nature of these possibilities and even how we can consider the infinite are difficult issues.⁵

The question often arises. If the computer is responsible for generating infinite forms, what, then, is the role of the artist? What often appears, or is described, as completely random operations in generative domains are usually the result of carefully crafted ranges of possibilities, biasing results toward an artist's expectations. Specific limitations on processes, colors, positions, speeds, and forms dictate what the system might choose. The breadth and depth of programmed possibilities mediate the likelihood of discovery and surprise. Cooperative processes of first exploring and then refining design solutions mirror a cycle of evolution: *generate, evaluate, mutate, iterate*. While many generations of individual pictures and choices are saved and modified, most are

discarded and forgotten. From the beginning, Csuri's working process has often made use of *parametric systems* and mathematical functions that produce results within defined ranges for exploring form, structure, and appearance.

The images Csuri creates show three-dimensional computer graphics environments consisting of geometric forms, color fields, lights, and shadows. A single picture might make use of combinations of processes involving fragmentation, instancing, scattering, or simplification, enabled through parametric systems. While most three-dimensional computer graphics images are created by artists using highly interactive commercial computer graphics software packages, Csuri composes his scenes primarily by writing short programs in an environment built upon the old but well-respected computer language Scheme. The code is assembled in an ancient text editor on what was once a very expensive workstation. Csuri rarely sculpts geometry using direct interactive modeling. He creates designs more commonly by intuitive selection from computer-generated options, exploring the results of numerical parameter changes and exchanging procedures.

Generally, running one of Csuri's programs using a fixed set of numbers produces and defines a single image or animation. When these numbers start to be changed experimentally in a source code file, either by the computer or Csuri, a potential space of innumerable images is implicitly created. The text file describing this parametric design space creates an abstract landscape of possibilities, with each degree of freedom in his software

representing an additional dimension, and each point in this space creating a specific artistic result. This conceptual environment cannot be directly viewed, but rather is investigated indirectly using Csuri's accumulated resources.

Each parametric algorithmic technique (whether fragmentation, ribbon, or another process) creates a new territory of solutions to be explored. While final images of the three-dimensional spaces Csuri shows are the usual focus, the abstract, multidimensional image spaces he spends weeks creating are never seen. They are evaluated for their associations, convergences, and areas of interest and irregularity, but what are the formal qualities of these possibility landscapes? Are the regions attracting Csuri's interest solid, with hard edges, or irregular, continuous, potential fields? Do they form blending implicit surfaces, with subspaces of high significance, connected by pathways of nonlinear densities? Are these environments best discussed and evaluated with lexicons of landscape, sculpture, mathematics, or architecture?

Independent of their characteristic qualities, how could the contents of these potentially infinite spaces be determined? Exhaustive search is impossible, but what can be found in practice? Strategic sampling to obtain a sufficient sense of the environs is initially necessary. Trivially homogeneous design spaces are easy to explore but yield few surprises. More heterogeneous image regions prove more challenging, promising (often falsely) potential aesthetic riches, but at the expense of extensive processing time and critical attention.

```
(translate p) (face-along-normal n)
(translate (rnoise -.05 .1 (* p 40.2))
           (rnoise -.05 .1 (* p 30.4)) 0)
(rotate (rnoise -20 20 (* p 25.7)) x-axis)
(rotate (rnoise -80 80 (* p 30.4)) y-axis)
(rotate (rnoise -180 180 (* p 40.7)) z-axis)
(color (vec3 (rrand .4 .7) (rrand .4 .8) (rrand .15 .37)))
(uscale (rnoise .15 2 (* p 5.2)))
(auto-instance "flowers/rose493.obj")
```

Code, such as the preceding, might distribute flowers with a specific range of sizes and colors throughout a general region of an image. Small changes in these individual parameters then constitute careful steps in the virtual environment of possible pictures. By changing a .37 to a .6, Csuri moves to a region of image space in which roses tend to be less red. Navigation between images can occur in straight lines, via minor or more significant changes, random exploratory walks, or the focused pursuit of refinement. Traversal of a path through a space of potential is made easier or more difficult depending on frequencies and densities: the *perceptible gradients* of subjective interest.⁶ Fitness landscapes with cliffs and mountains are particularly challenging to explore, but they are usually preferable to vast planes of creative discouragement.

Csuri roams these spaces during the majority of daylight hours. Despite exponential increases in the power of his image-rendering engines, navigation speed has remained surprisingly con-

stant over many years. As the software and hardware yield quick glimpses from design space points conveyed as images, sequences of settings carve a path into parameter space. Each investigation layers a history of marks, all physically drawn “permanently” on increasingly larger hard drives. This metadrawing is never viewed but only implied by a sequence of images, which are in turn rarely themselves displayed, except for the most favored: sometimes the final destination, but more often an image discovered along the way.

Csuri has described one of his approaches as sending a virtual version of himself to work for him while he sleeps, providing discovered images and animations in the morning for evaluation, then awaiting further instructions.⁷ These overnight runs produce large collections of snapshots, ideally displaying a large number of characteristic regions of image space (Figure 1). With a rapid review of these images (often stepped through as frames of a movie file), Csuri identifies the most interesting, then revisits and investigates them in greater depth. Adjusting parameters can make the results of these runs broader but more superficial, or narrower with increased detail. Csuri’s picture resolutions correspond to velocity in a design space. Reducing resolution increases speed and distance, but the landscape blurs by.

Csuri’s discussions with others about technical possibilities frequently result in the birth (or death) of new possibility spaces. Success is often the product of emergence rather than construction. Paths drawn in probability space mirror his images’ ribbons



frame 0001



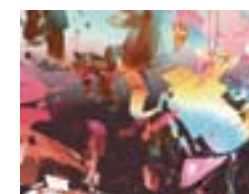
frame 0002



frame 0003



frame 0004



frame 0005



frame 0011



frame 0012



frame 0013



frame 0014



frame 0015



frame 0021



frame 0022



frame 0023



frame 0024



frame 0025



frame 0031



frame 0032



frame 0033



frame 0034



frame 0035



frame 0041



frame 0042



frame 0043



frame 0044



frame 0045

Figure 1

Coral Frames
0001–0050.
afish series.

2005.
Unix environment and AL.



frame 0006



frame 0007



frame 0008



frame 0009



frame 0010



frame 0016



frame 0017



frame 0018



frame 0019



frame 0020



frame 0026



frame 0027



frame 0028



frame 0029



frame 0030



frame 0036



frame 0037



frame 0038



frame 0039



frame 0040



frame 0046



frame 0047



frame 0048



frame 0049



frame 0050

and fragments as well as the continuity of changes in lines of code. How does he choose his next steps? What are the signposts for navigating image space? Initially, pseudorandom walks shift into searching spirals, followed by occasional visits to familiar aesthetic neighborhoods.

A second approach to traversing the virtual spaces of images involves more substantial changes to source files to sculpt the abstract environment into one significantly different (as well as potentially easier to navigate). Reshaping the design solution space can make it more interesting. Csuri is thus not only creating and evaluating images, but also is auditioning *spaces* of images. Adding or subtracting entire procedures from his code modifies the *architecture* of the spaces. Such changes can enable and even encourage traversals between previously unconnected regions.

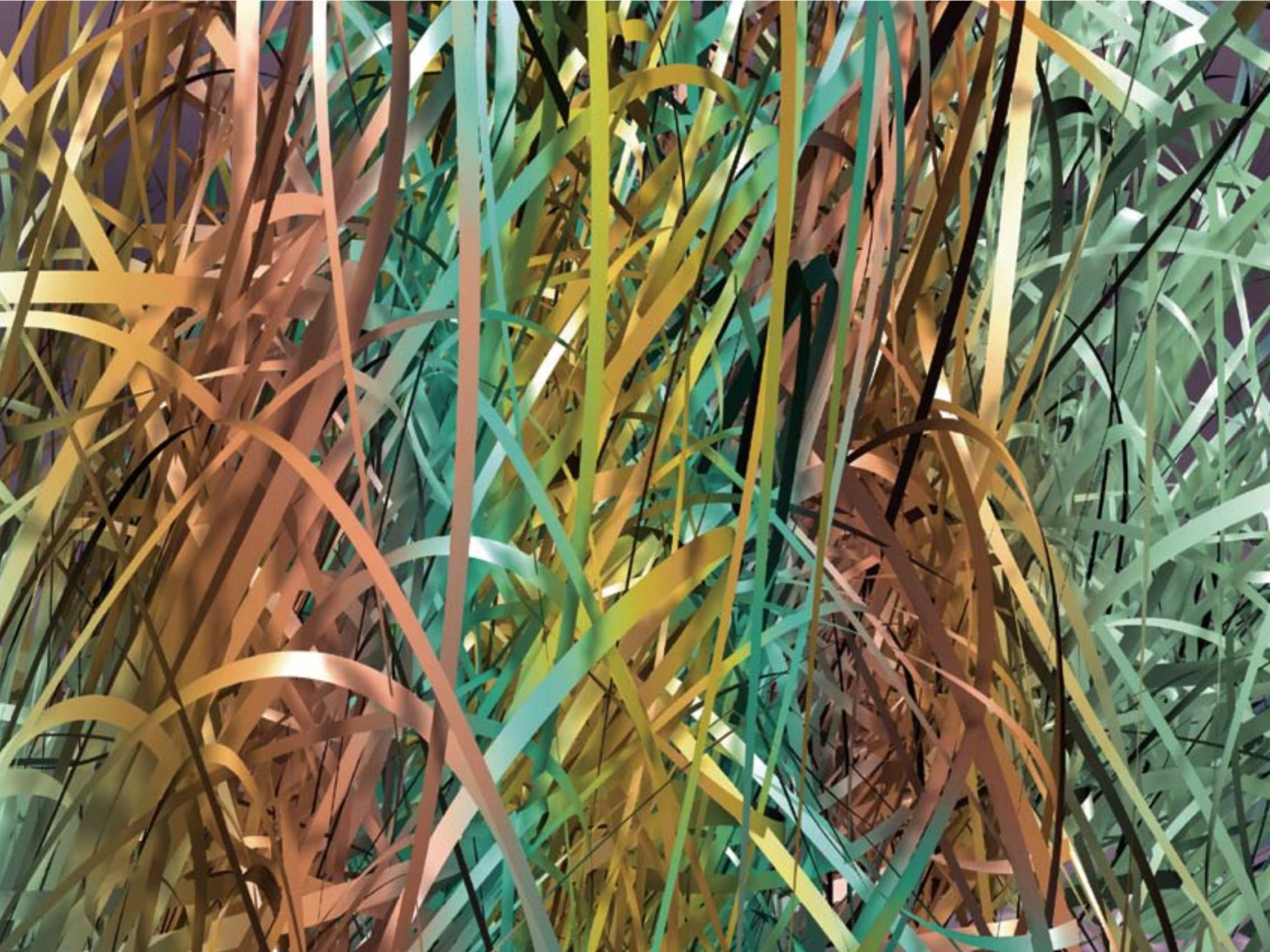
Finally, there are two sets of virtual spaces of possible images being aligned at any given time: the spaces represented by the computer (the product of software and parametric data files) and the spaces of possibility under consideration in Csuri's mind. How do these spaces contrast and interact? There are the roles of the two navigators to consider: Csuri and his machine. Each uses the other as the sole interface to the spaces that they in turn embody. While the forms of the spaces often resemble each other in local regions, they never match. When do the paths that Csuri and the computer trace through these environments emulate each, other and what does it mean when they don't? How do the computer and Csuri communicate their understanding of (and experiences

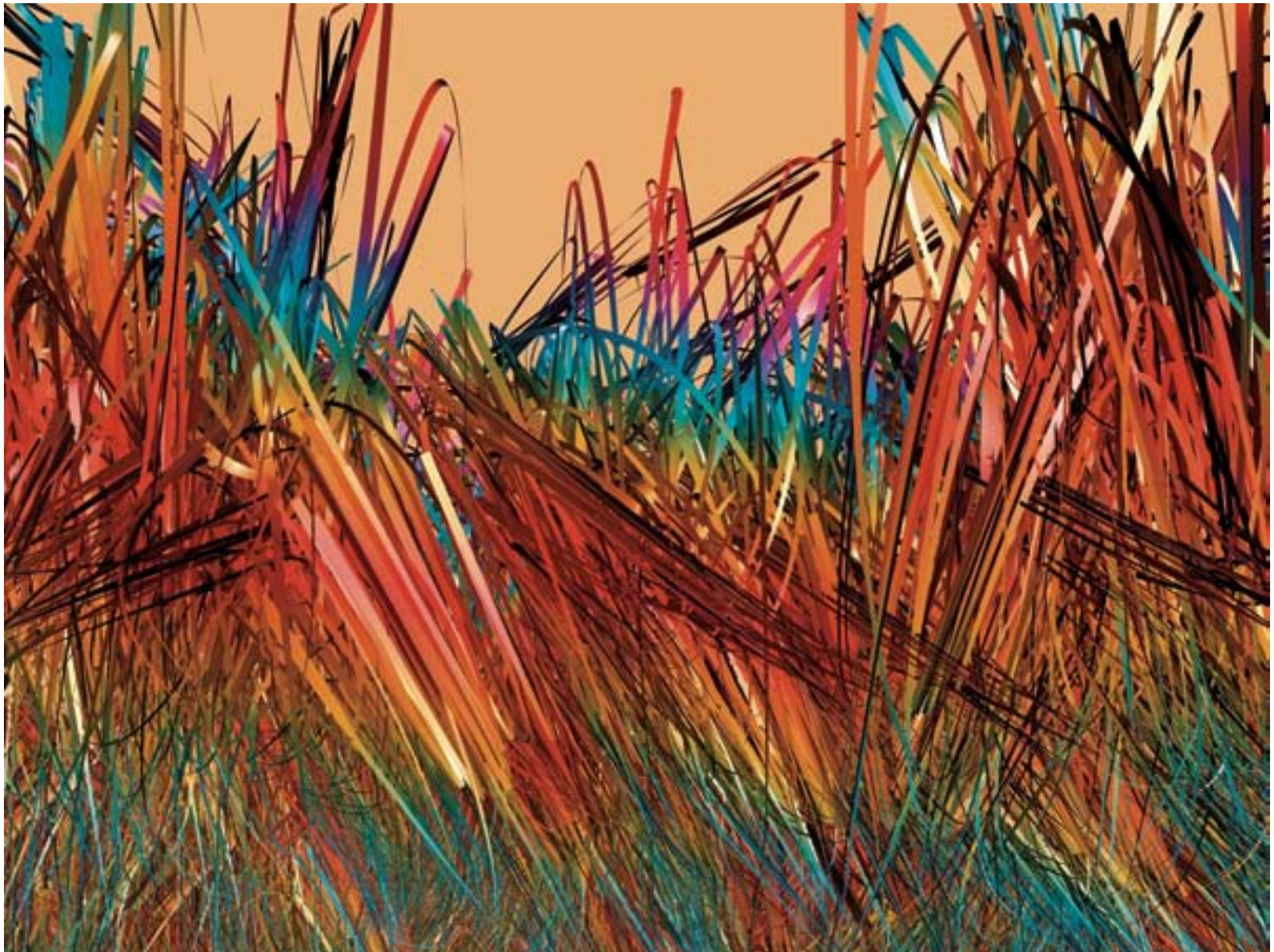
in) these environments? Questions of creativity and authorship with respect to such generative representational issues abound.⁸

Csuri has several options when the computer isn't heading where he wishes: changing the computer's navigational parameters, changing the design landscape itself, or ceasing interaction for the day. The computer in turn modifies Csuri's mental landscape, guiding him into previously unconsidered regions of possibility or significantly reshaping his headspace. It too sometimes "decides" to stop cooperating for the day.

While few would think of Csuri as a landscape artist, he creates many complex virtual image spaces, continuing his explorations, and generously documenting his journeys. These layered, coexisting dependent places shift in purpose and existence with few individuals ever gaining entry. Csuri has always inhabited such heterotopic spaces through interplays of control and chance: academic football and fine art, academia and business, old technology interdependent with new. Code, hardware, data, people, disciplines, and techniques—decades separate the boundaries spanning his daily environment. As an architect of spaces of potential, he continues creating and altering environments instead of merely following existing trails, just as when he first approached computing from the arts, changing both.

-
- ¹ Charles Csuri, “The Infinite Art Object.” http://csuri.com/charles-csuri/computer-graphics-1_0.php, 1998.
- ² Explosive growth in generative practice in computer art has resulted from the increasing accessibility of software such as Flash, Processing, and Jitter, which allow visual and interactive explorations to be controlled and produced by rapidly created code. Each takes a different approach to enabling artists and designers to practically create and distribute work that relies on software capable of surprising the creator as well as the viewer. Web sites such as “Generator.x” and “Processing Blogs” catalogue a growing number of individuals and organizations exploring the interstices of art and procedural design.
- ³ Philip Galanter, “What is Generative Art? Complexity Theory as a Context for Art Theory.” Generative Art 2003 Conference Proceedings, 2003.
- ⁴ Jon McCormack, *Impossible Nature: The Art of Jon McCormack*. Australian Centre for the Moving Image, 2004.
- ⁵ Brian Rotman, *Ad Infinitum... The Ghost in Turing's Machine*. Stanford University Press, 1993.
- ⁶ F. Kenton Musgrave, “Genetic Textures,” in *Texturing and Modeling*, edited by David Ebert, Academic Press, 1998.
- ⁷ Charles Csuri, “The Virtual Me.” http://www.csuri.com/charles-csuri/digital-art-1_0.php, 1998.
- ⁸ Boden, Margaret A. *The Creative Mind: Myths and Mechanisms*. Basic Books, 1991.





54. **texture***PERHAPS.*

2002.

Unix environment and AL.

Color ink on canvas.

97 x 132 cm

(38 x 52 in.).



55. **Strawscape.**
2002.
Unix environment and AL.
Color ink on canvas.
97 x 132 cm
(38 x 52 in.).

Entanglement

A remarkable aspect of Csuri's art is the range of concepts and ideologies that he incorporates into colors, light, space, and the shapes of figures. In *Entanglement*, the artist once again bursts forth, creating an extraordinarily innovative style: a new concept of space that complements his new treatment of form. This work of art displays a tension and complexity of line, a vigorously interwoven movement that is so closely knit as to induce the static quality of perpetual motion. The abstract shape, created entirely of ribbons and kept stable by the base, sets up a sinuous flow of calligraphic line that intertwines in a manner that assigns sculptural qualities to the form. Ignoring likeness to any natural objects, Csuri is alert to the qualities of gesture and interplay that correspond to a feeling of unconstrained freedom.

Two essential details come to mind in describing *Entanglement*: first, the art demonstrates a sense of unity and coherence necessary to the simplicity of its structure, and, second, the chosen lines and colors have a decidedly expressive physiognomy that speaks as a whole to the viewer. Colors occur throughout the work, but in regulated sections, with an appearance that arrests the eye. The effect also gives local intensity to the overall design and accents the intricate layering of line. It is impossible to suggest a firm point of origin.

The work is outrageous, but in the most delightful of ways. The careful preservation of the picture's surface plane linked with an intricately rich interplay upon the canvas produces—momentarily—the feeling that the object could be continued indefinitely in any direction. And, yet, the almost deliberate naivety of *Entanglement's* presentation gives it an astonishing sense of solidity. [AV]

56. *Entanglement*.

2002.

Unix environment and AL.

Lightjet on paper

with laminate.

183 x 244 cm

(72 x 96 in.).





57. ***Brick Figures.***

2003.

Unix environment and AL.

Lightjet on paper

with laminate.

Color ink on canvas.

97 x 132 cm

(38 x 52 in.).



frame 0501



frame 1050



frame 1401



frame 1601



58. **Coral Frames 0501, 1050, 1401, 1601.**
afish series.
 2005.
 Unix environment and AL.
 Color ink on ceramic
 tiles with metal frame.
 81 x 81 x 46 cm
 (32 x 32 x 18 in.).

Venus in the Garden

“Mythology helps me look at how myths affect my beliefs, particularly my perception of reality. I see in them an imaginative tradition about how we look at nature, art, history and destiny of the world, the gods, man and society.” — Charles A. Csuri

The mysteries of ancient myths and the evolution of organic forms are suitably recreated in the two algorithmic paintings *Venus in the Garden Frame 73* and *Venus in the Garden Frame 127* from the *venus* series. Reminiscences of classical sculpture pervade Csuri’s rendering of the goddess of nature, Venus, whose graceful movements are achieved through a disciplined structure of leaves and ribbons. In these works, Csuri introduces a range of sensual experiences associated with the human body and its functions, in a variety that traditional sculpture could not express. Recognizable images of the famous *Venus de Milo* are embedded in repeating and juxtaposed decorative motifs, creating a sensation of ethereal, disembodied space. We see a novel interplay of contrasts: the vertical and the horizontal, the combination of regular and irregular shapes, the qualities of small units and the summated whole. All of these create a tension that is resolved through a rhythmic balance, established among the play of color, texture, and the shifting angularities of the reconfigured shapes.

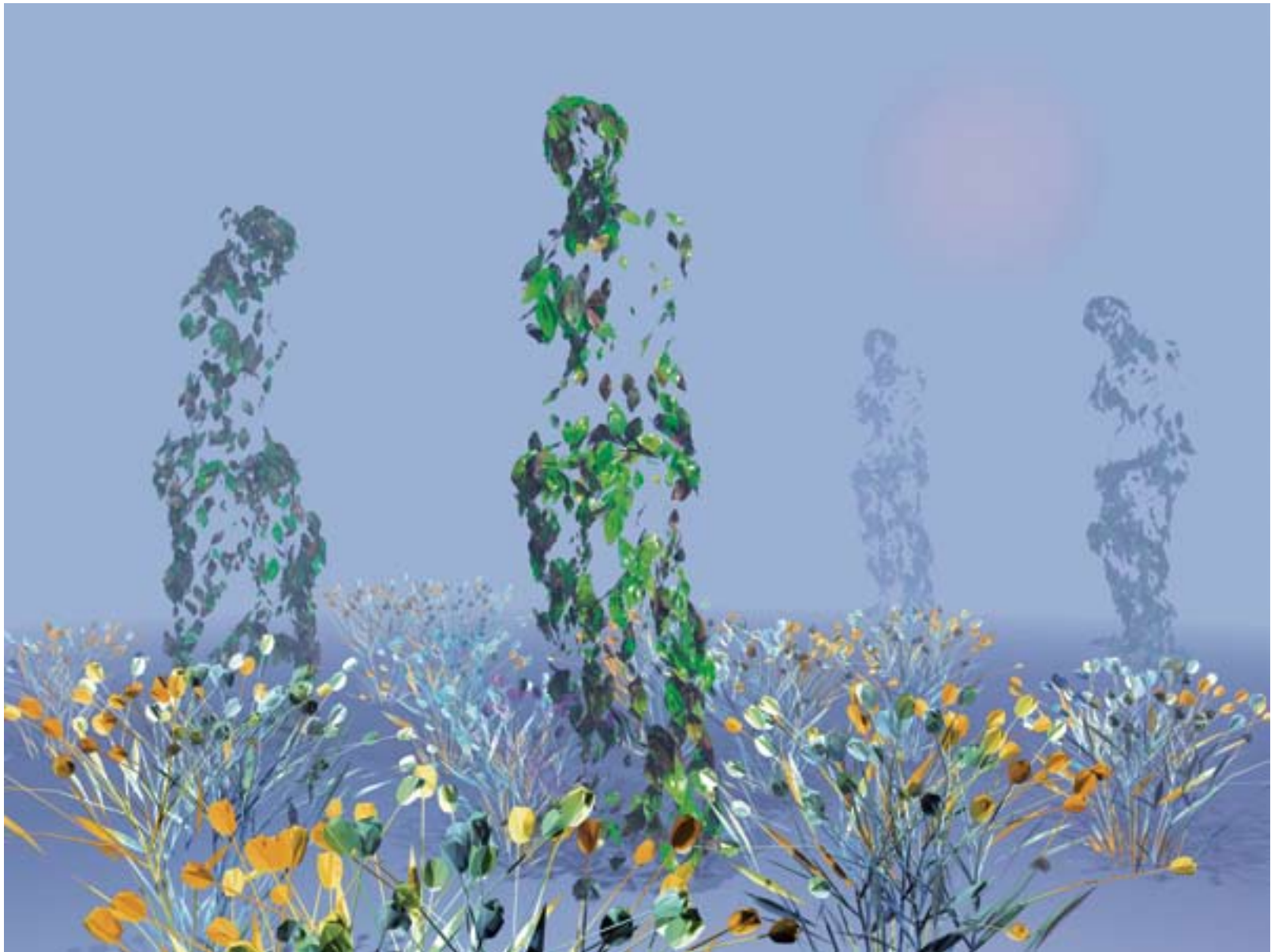
Charles Csuri’s approach to unity is not unlike that of the impressionists and neoimpressionists, achieving the coherence and harmony in countless indistinct strokes of color. The sketching strokes of the greenish-yellow stalks with scattered accents of dark and light leaves and flowers seem to move intermittently, halting or advancing in different directions toward and away from the viewer. Thus, the artist dispenses with conventional perspective and the usual figure-ground depiction of form, creating a pictorial vision that spreads far beyond the confines of the frame.

In *Venus in the Garden Frame 73*, the reference to nature almost disappears in the figures. A staggered succession of chaotically strewn clusters of leaves and ribbons fills the space. Csuri’s expertise is seen in his confidence to produce interesting, even unforeseen, effects. The results constitute a family of forms that contain certain regularities, despite their seemingly random occurrence. All markings appear to belong together. All forms are the same woman, duplicated and multiplied as if by invisible mirrors. The woman’s movements reveal nothing but the fact that each image is passionately alive. [AV]

59. ***Venus in the Garden Frame 73***,
venus series.
2005.

Unix environment and AL.
Color ink on canvas.
97 x 132 cm
(38 x 52 in.).





60. *Venus in the
Garden Frame 127*,
venus series.
2005.

Unix environment and AL.
Color ink on canvas.
97 x 132 cm
(38 x 52 in.).



61. ***Venus in the Garden Frame 64***,
venus series.
2006.

Unix environment and AL.
Lightjet on paper
with laminate.
183 x 244 cm
(72 x 96 in.).

Origami Flowers Frame 89

Not much is simple about *Origami Flowers Frame 89*, from the *simpleFLRS* series. *Origami Flowers* is a three-dimensional mathematical object set within a space with a chosen point of view and a light source placed by the artist. The viewer sees a clump of irises, believable in their grace and elegance, but abstracted, as the title suggests, in their delicate Japanese style. They appear to be made of thin paper, with sharp cuts and intricate folds that have rendered them three-dimensional, and seem to honor Csuri's knowledge of and admiration for Japanese art and culture.

The subject, color, and composition of *Origami Flowers* bring to mind Van Gogh's *Irises* (1889). Van Gogh's flowers, however, look thicker in their structure and feel heavier in their physicality of oil paint on canvas. They are drenched in sunlight. Csuri's flowers are more delicate, swayed by a gentle breeze, and dappled with bright light that leaves shadows. The flowers of *Origami Flowers* and *Irises* are both ephemeral, but in different ways. Van Gogh's flowers are in full, early-summer bloom, but they will fade; their petals will wilt, wither, and fall to the ground; and their unsightliness will be cleaned up by a careful gardener. Csuri's are free from the effects of time and independent of a natural envi-

ronment. Yet what stability they have in their life in a computer is dependent on a tap on a keyboard that could subtly or drastically alter them, or on another tap that could delete them forever.

Origami Flowers seems ultimately a meditative homage to calmness in complexity, and to peace amidst a fragile environment. In Csuri's image, the viewer sees complexity in many shapes and lines, intensities of light and dark colors, thin solidity and some transparency, and spatial depth and density resulting from multiple overlaps of material. The viewer also is somewhat aware that the mathematical complexity of the polygons that actually constitute the image, which are metaphorically parallel to the atoms that make up natural flowers. That polygons or atoms can construct such beauty is sublime.

Irises seem to convey nervousness, perhaps partly because of the facts of Van Gogh's life. *Origami Flowers* reflects the stability of Csuri's personality, and seems to convey calmness. Van Gogh is agitated by the delicacy of life; Csuri embraces it. [TB]

62. ***Origami Flowers***
Frame 89,
simpleFLRS series.
2005.

Unix environment and AL.
Color ink on canvas.
97 x 132 cm
(38 x 52 in.).



Emily's Scribbles Frame 300

As the viewer might infer from the title and its implied gestures, Emily is Charles Csuri's granddaughter. He watched as the two-year-old scribbled with her crayons on paper with intense and carefree abandonment. He wondered what she thought as she marked, whether the drawing had cognitive content for her, and whether she was expressing something. He concluded that she was likely working freely, intently, and with abandon—like a child. He delighted in her involvement; it inspired him. He longed nostalgically for kinetic mark making, for direct involvement with the physicality of materials, for the process of putting crayon to paper. He was once, before all, an artist who pushed and pulled and dragged paint on canvas, with nothing between him and the surface except a brush, if he chose to use one, or his fingers. Csuri remembered when he was joyously lost in the process of creating with abandon, like Emily.

He took Emily's abandon as an inspiration for *Emily's Scribbles Frame 300* from the *fishscrib* series. What the viewer sees here, however, are not the uninhibited hand gestures of an adult artist: *Emily's Scribbles* is a mathematical model of polygons aligned by vectors manipulated by an arithmetic ribbon function, designed by Csuri and Steve May, that allows for infinite manipulations of the same objects. In his method of working, Csuri imagines, but does not actually see, the effects of the logarithmic constraints he is imposing or the configurations he is building until the computer calculates them and eventually renders them visible on a monitor. Through strokes on the keyboard, Csuri can create one, two, or hundreds of versions of the model, wait for them to

materialize as thumbnails, and select the ones he wants as they are or for further manipulation. In further manipulation, however, it is the whole “model” in three-dimensional space that will be altered, not one single line, nor a shade or tint of one particular color. (This is not Photoshop.)

Emily's Scribbles is a three-dimensional image printed on a two-dimensional piece of paper. It is not flat marks on paper, like Emily's crayon drawing. The lines of Csuri's artwork are lit by a light source, highlighting some lines and shadowing others. Lines in the foreground appear larger and closer to the viewer than those in the background do because Csuri's computer programs accept a Renaissance perspective. He chose the place from which the viewer sees this scene from among many others that were available to him.

Csuri let go of the joy of hands-on processes—direct markings on tactile physical materials such as paper and canvas—that give an artist instant visual information upon which to make further visual decisions, such as to stop, make more marks, erase some, tidy some, and smudge others. This is not a Cy Twombly; it is a Chuck Csuri. *Emily's Scribbles* is a beautiful, dynamic, sophisticated image that could only be achieved as it is in the way that Csuri constructed it. In the end, it is gorgeous to look at, triggering an immediate visceral reaction and rewarding close inspection. [TB]

-
63. **Emily's Scribbles
Frame 300**,
fishscrib series.
2005.
Unix environment and AL.
Color ink on canvas.
97 x 132 cm
(38 x 52 in.).



Festive Frame 47

Cézanne sought to suggest nature's essential qualities by invoking the transitions of colors between objects in nature. This use of color, in many cases, allows the foreground and background to merge. The results offer a unique way to deal with two-dimensional color space. After Cézanne's paintings, the strict Renaissance concept of one-point perspective was regularly discarded.

Expressionism moved art in nonrepresentational directions, manifesting versions of reality that served more emotive purposes. Nevertheless, Cézanne's legacy of the picture plane continued. Even the works of Jackson Pollack (1912–1959), one of the foremost influences in abstract expressionism, give emphasis to a two-dimensional visual field. Pollack's eye, as the camera, shifted as he moved back and forth across the canvas, pouring the paint. In Pollack's work, as with some works by Cézanne, there is no fixed camera position. A sense of space, rather than one-point perspective, results from the overlaying of strands of paint.

Cézanne's influence in Csuri's work is readily apparent. However, Csuri has also moved in new directions. With the computer, he is untethered by the constraints of creating perspective. In speaking about *Festive Frame 47*, from the *leo* series, Csuri states:

The computer offers an expanded universe with unique possibilities that enabled me to shift away from a legacy of the picture plane. I find myself generating imagery that depends upon the unique capabilities of computer programming and mathematical procedures. Complexity, as

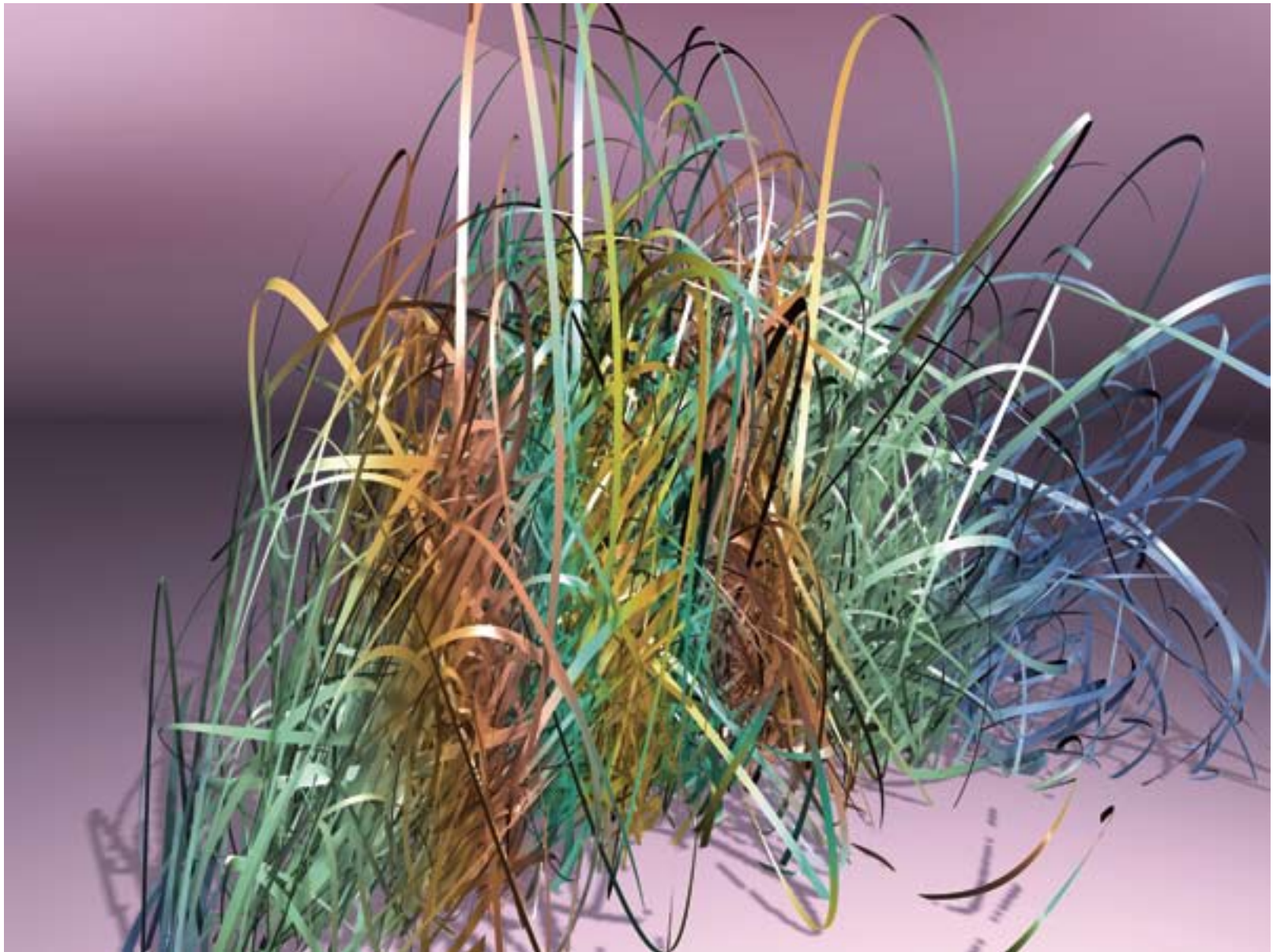
defined by thousands of objects within three-dimensional space, became of great interest to me.

Here, there are about 30,000 objects. It would be overwhelming to manually paint this work from a fixed camera position and yet maintain the three-dimensional perspective of each object. However, because of computer programming, I can forget about this issue. Algorithms as tools handle the problem. Once the parameters are set according to the image in my mind, the scene is generated within a few minutes. Meanwhile, I can enjoy the beauty of three-dimensional space and give my attention to other issues involving the art object, for example, the color of the fragments, which, in this scene, depends upon their location within a world space subdivided into regions of colors.

From a distance, this picture takes on the appearance of a textured rug. However, as one moves closer into the fragments, the texture becomes increasingly three-dimensional. The beauty of three-dimensional perspective reveals the subtle orientations of the structures. As the scale increases, one moves further into the space. Perhaps it becomes a journey into a universe, with the meaning changing, depending upon one's position in space. I often ask myself 'Is the world falling apart or coming together again?' [JMG/CC]

64. ***Festive Frame 47***,
leo series.
2006.
Unix environment and AL.
Lightjet on paper
with laminate.
183 x 244 cm
(72 x 96 in.).





65. **Glorious Grass**
Frame 28, *bush series*.
2006.

Unix environment and AL.
Color ink on canvas.
97 x 132 cm
(38 x 52 in.).

Charles A. Csuri Biographical Sketch

1922	Born Grant Town, West Virginia	1968	Work highlighted in the exhibition <i>Cybernetic Serendipity</i> , held at the Institute for Contemporary Art, London, England
1943–45	Certificate in Engineering, Newark College of Engineering, Newark, New Jersey	1968	<i>Hummingbird</i> animation is purchased by the Museum of Modern Art, New York
1943–46	Military service	1969	Awarded National Science Foundation (NSF) grant; first grant awarded to an artist; grants continue through 1987
1947	B.F.A., Art, The Ohio State University (OSU), 1947	1970	PDP 11/45 with Vector General display
1948	M.A. in Art, OSU	1970	Organized <i>Interactive Sound and Visual Systems</i> , a major exhibition on technology and the arts, OSU.
1949	Joins faculty of the Department of Art, OSU	1971	Founded Computer Graphics Research Group (CGRG), OSU; served as Director through 1986, when CGRG became the Advanced Computing Center for Art and Design (ACCAD)
1955–65	Exhibitions as a professional artist in New York.	1978	Professor of Art Education
1963	Begins creating <i>After the Artist</i> series	1978	VAX 11/780 workstation
1964	Uses IBM 7094 with FORTRAN, IBM 1130 to control plotter	1979	Awarded first United States Navy contract
1966	Begins creating computer animated films		
1967	Awarded prize for animation at the 4th International Experimental Film Festival, Brussels, Belgium for <i>Hummingbird</i>		

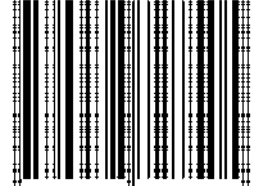
1983	Distinguished Research Award, The Ohio State University	1990	Exhibited at the Smithsonian, Washington, D.C.
1984	Keynote speaker at Nicograph, Tokyo, Japan	1990	Feature article in <i>Art E Dossier</i> by Dr. Maurizio Calvesi
1985	Golden Eagle award, Visual Communications Congress, New York	1991	Ph.D. dissertation on Csuri's art and research completed at the New York University
1986	Professor of Computer and Information Science	1992	Keynote speaker at Nicograph, Tokyo, Japan
1986	Founded ACCAD; served as Director through 1990	1994	Distinguished Alumnus Award, Ohio State University Alumni Club of Franklin County
1986	Exhibited at the 42nd Biennale de Venezia, Venice, Italy	1995	Csuri's work appears on the cover of <i>Smithsonian</i> magazine
1987	ACCAD given the <i>Center of Excellence Award</i> by the Ohio Board of Regents	1995	<i>Csuri Vision</i> , WOSU/PBS one-hour retrospective
1988	Profiled on <i>Portrait of America</i> , CNN television documentary	1996	Professional Achievement Award, Ohio State University Alumni Association
1989	Awarded Distinction <i>Prix Ars Electronica</i> , International Compendium of the Computer Arts, for <i>Mask of Fear</i>	1996	Exhibition at SIGGRAPH, Csuri image as cover of proceedings
1990	Awarded Distinction <i>Prix Ars Electronica</i> , International Compendium of the Computer Arts, for <i>Gossip</i>	1998	Profiled in the <i>New York Times</i>
		1999	Highlighted in History of Computer Graphics at SIGGRAPH conference

- 2000 Named Individual Artist of the Year by the State of Ohio
- 2000 Awarded the Joseph Sullivant Medal, Ohio State University's highest honor
- 2000 *Charles A. Csuri: In Search of Meaning, 1948–2000* exhibition at the Canzani Center of the Columbus College of Art and Design
- 2000 *Virtual Glass* exhibition, Riley Hawk Gallery, Columbus, Ohio
- 2006 Exhibition *Charles Csuri: Beyond Boundaries, 1963–present*

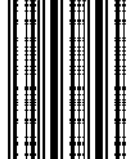
Csuri's art is held in museums and well over 75 private collections worldwide, including those of Walter P. Chrysler, Jose Ferrer, Roy Lichtenstein and George Segal. His work is referenced in dozens of books and magazines, and he has received television interview coverage in England, France, Germany, Holland, Italy, Spain, Sweden, Japan, and the United States. For further biographical information, see <http://csuri.wmc.ohio-state.edu/>.



ISBN 0-9787275-0-9



9 0 0 0 0



9 780978 727505