

creative computing

August 1980
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the #1 magazine of computer applications and software



Summer Fun and Games Issue:

- Computer Blismarck • Knight's Tour
- Guess My Animal • Turnablock Game
- Fifteen and Hot • Mind Exerciser

Evaluations: Magic Wand, VisiCalc,
Beta-80, Asteroids in Space

Insertion Sort

Stocks and Listed Options

The Creative Process

Columns: Apple, Atari, TRS-80,
Puzzles, Legal Forum, Reviews,
Effective Writing, Intelligent Games



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Special Education Issue

"Educational Software: A Comparative Evaluation" by David Lubar. Comparisons of software from eight companies for Apple, TRS-80, PET, and Atari.

"Complements & Supplements" by Richard Carlson. For secondary math and science teachers to demonstrate algebraic concepts.

"The Mechanical Mouse" by Mike Tyborski. A flowchart solution with program in PILOT for the classical problem first presented in Creative Computing in May 1978.

"An Elementary School Problem Solving Curriculum In CAI" by Nel Noddings. For teachers at the elementary level.

"A Challenge for the Language Arts CAI Developer" by John Allee and Robert Williams. How computers can aid in teaching English, usage and grammar.

"Logic Problem Solver" by Tom Pratt. Solving logic problems with examples from various sports.

"Budget Maintenance Program" by John Webster. Program for managing an institutional budget.

"Point of View" by Isaac Asimov. (Yes, the Isaac Asimov!) A story about a 13-year-old meeting Multivac for the first time.

"Showing Off" by Edmond Weiss. Tenth Column in our extremely popular "Effective Writing" series.

"Stocks and Listed Options" by Alfred Adler. Part 5 discussing portfolio records concludes this acclaimed series.

Columns on Atari, Apple, PET, TRS-80, Software Legal Forum, Book Reviews, and New Products will appear; evaluations of several new peripherals; and coverage of the summer Consumer Electronics Show round out the issue.

*First Philadelphia
Computer Music
Festival*



Computer Music Record

A recording was made of the First Philadelphia Music Festival which is now available on a 12" LP record. It features eight different computer music synthesizers programmed to play the music of J.S. Bach, J. Pachelbel, Rimsky-Korsakov, Scott Joplin, Neil Diamond, Lennon & McCartney and seven others. The music ranges from baroque to rock, traditional to rag and even includes an historic 1983 computerized singing demonstration by Bell Labs. \$8.00 [CR101].

The Impact of Computers on Society and Ethics: A Bibliography

REFERENCE

Gary M. Abshire.

Where is the computer leading us? Is it a menace or a messiah? What are its benefits? What are the risks? What is needed to manage the computer for society's greatest good? Will we become masters or slaves of the evolving computer technology? This bibliography was created to help answer questions like these. It contains 1920 alphabetical entries of books, magazine articles, news items, scholarly papers and other works dealing with the impact of computers on society and ethics. Covers 1948 through 1979. 128 pp hardbound. \$17.95. [12E].

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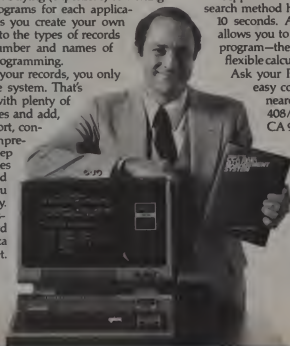
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The Cover

The cover is an acrylic painting in the "Machine Landscape" series done by Charlotte Porson, 969 Park Ave., New York, NY 10028. Charlotte does paintings and collages, mostly about machines from small (12" x 16") to wall-filling (4' x 6').

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Managing Editor Burchenal Green

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Rance Christman
Creative Computing
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\$100,000 Prize Established For Computer World Chess Champion

Carnegie-Mellon University is establishing a \$100,000 prize for the first computer program to become World Chess Champion and the beginning of annual computer-versus-human competition. Called The Fredkin Prize, it has been established by the Fredkin Foundation of Cambridge, Mass.

The competition will be monitored by the International Joint Conference on Artificial Intelligence (IJCAI) of Menlo Park, California. CMU will act as a trustee for the prize until it is awarded.

Dr. Hans Berliner of the CMU Computer Science Department, himself a former World Correspondence Chess Champion and author of the computer backgammon program that last year defeated the World Backgammon Champion in Monte Carlo, will head a committee to formulate the precise rules under which the competition will be held.

Winning the championship is a long process that takes four years for a human, and the computer likewise will have to work its way up the ladder in tournament play.

In the interim, a set of incentive prizes will be offered each year for computer-versus-human competition. In each succeeding year, the skill level of the human players will be increased as will the amount of the prize. The first competition will be held this November at CMU and the prizes will be \$1,500 and \$1,000 respectively.

BCCC Artmobile

The Bucks County Community College ARTMOBILE, a mobile gallery that services the residents and school districts in Bucks County, Pa. is planning an exhibition on Computer Art and Music for the Fall Season of 1980. The exhibit will include hands-on interactive experience with computer terminals inside our van as well as an exhibition of state-of-the-art work in graphics and music via films, tapes and demos. We are still in need of graphic terminals, graphic peripherals such as digitizing pads, light pens, etc. and graphics related software at varying degrees of sophistication for our broad based audience. The ARTMOBILE is a non-profit organization and any hardware and/or software donated or loaned would be tax-exempt. The exhibit will tour the country for approximately four months, reaching an audience of 20,000 people. This is a very good opportunity to publicize all computer products to the school districts and business community in our county. We would also appreciate your support in our efforts to present computers as an accessible and comprehensible tool for artistic and imaginative expression. For further information please contact Martha Lubow, B.C.C.C. ARTMOBILE, Bucks County Community College, Swamp Road, Newtown, PA 18940 (215) 968-5861.



Computer Seminars

H. W. Computers is forming two new and instructive seminars dealing with the age of personal computing. Both seminars will be held regularly and are presented at no cost or obligation to the public.

The purpose is to provide a better understanding of personal computing by explaining how computers have developed over the years and the many ways they are used in everyday life today. The seminars include: a brief history of computers, how they operate, an explanation of computer terms, how we instruct computers to perform various tasks and a demonstration of applications and capabilities.

One seminar is dedicated to young people 12 to 18 years of age who have an interest in computers and who may, or may not, have access to computer courses in their local schools. The remaining seminar is for adults who intend to purchase a personal computer, or adults who wish to determine how personal computers can be of interest and benefit to them.

To register, stop by the retail store at 19511 Business Center Drive, Northridge, CA or phone (213) 886-9200 for registration information.

National Computer Association Formed

The National Computer Association (NCA) was formed by a steering committee of users from across the nation on April 25, 1980. The proliferation of computing products and associated applications has made it impossible to gain information about all the available products. System houses as well as end users need to communicate about such products through some central organization. As computing products become more numerous, this need for information exchange grows. The NCA will provide a quarterly publication to promote the exchange of ideas; an indexed catalogue of products available from other members to promote member-to-member communication about such products; and a forum for the presentation of information and exhibits in an annual meeting.

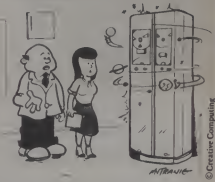
Membership is available at a cost of \$35.00 on an annual basis. The first NCA News, available in July, will introduce some of the members and contain the finalized by-laws. The first indexed catalogue of available products will be published in the third quarter. The NCA 1980 meeting is scheduled to be held at Stouffer's Denver Inn on December 4 & 5, 1980. For more information, contact Floyd L. Burton, Director, NCA, 1485 E. Fremont Cir. S., Littleton, CO 80122 (303) 797-3559.

Computer Show

The Mid-Atlantic Business & Home Computer Show will be held at the D.C. Armory Starplex, Washington, D.C., Thursday, September 18 to Sunday, September 21, 1980. Show hours are: Thurs.-Saturday, 11 a.m. to 9 p.m., Sunday, 11 a.m. to 6 p.m. General adult admission is \$5. An end-user public exposition featuring small and medium-sized business systems, scientific and engineering computers, micro-computers and electrotechnology, produced by National Computer Shows, P.O. Box 678, Brookline, MA 02147. Tel: (617) 524-4547.



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CP-184

CIRCLE 146 ON READER SERVICE CARD

I felt compelled to write after reading James McClure's article "Shoplift: The Latest Kitchen Utensil" in your May 1980 issue. The benefits of a system such as Mr. McClure's can be appreciated by many of us who suddenly find we've been handed the responsibility of doing the weekly shopping, without any idea of what is needed.

I would suggest the next logical step in this system would be assigning each item on the file a location code corresponding to the item and location in the store. This presumes most shopping occurs at one favorite shopping center. By sorting the items on this code (think of it as a "bin location" in a warehousing operation) before printing, the list the trip up and down the aisles can be facilitated to a faster conclusion. Such codes could be based only on aisle number; or side (left or right); or tier; or a grid pattern. After all, a grocery store is very much a public warehouse operation in which we are the bin-pickers. And I for one don't want to spend any more time than necessary winding my cart through the aisles.

Keep up the good, and interesting, work!

Dave Kennebeck
1103 Morningside
Round Lake Beach, IL 60073

Computer Criminals Exonerated

Dear Editor:

This letter pertains to certain gross inaccuracies in "How Safe Is Your Computer?" May '80, page 32. The inaccuracies pertain to that portion of the article referring to the loss by Penn Central Railroad of 217 boxcars.

For the past three years I have personally investigated the allegations set forth in your article and have found no evidence to support them. It is true that in 1971 newspaper articles appeared, indicating that the Penn Central Railroad had lost certain boxcars, possibly as a result of computer error. Subsequent investigation demonstrates, however, that the newspaper articles had no foundation in fact. To repeat these allegations nine years later constitutes a gross libel of the "tiny railroad" as well as the individuals connected with its operation at that time. While your article does not mention the names of those persons, or the name of the "tiny railroad," people in the railroad industry are well aware of the reference.

The true facts surrounding this matter reveal that the Penn Central computers were not to blame at all and, as a matter of fact, nobody had even modified any computer input. Transcripts of the testimony taken in the Penn Central bankruptcy hearing as well as other documents reveal the following:

a. Equitable Life Assurance Society had leased 4000 boxcars to Penn Central. These boxcars were manufactured by Pullman Standard and all were of the same type and vintage.

b. In 1971, Equitable sold 466 boxcars to an individual in New Jersey who then entered into an agreement with a short line railroad in LaSalle, Illinois to recondition the boxcars and eventually place them into service.

c. The boxcars in question, however, were spread throughout the country because many of them were in service in the U.S. railroad complex, and many months went by without Penn Central's delivering the boxcars to the rightful owner. In addition, even though Penn Central was not the rightful owner of the boxcars, it continued to collect fees from other railroads for their utilization.

d. Due to the negligence of Penn Central employees, boxcars of the same vintage as purchased, but bearing different serial numbers, were shipped to the Illinois railroad.

e. The owner immediately notified Penn Central that it was sending the wrong boxcars; Penn Central replied that the owner should accept those boxcars since they were of the same manufacture and vintage, even though the serial numbers were different.

f. There was no computer error. No computer input was ever modified but instead, officials of Penn Central Railroad directed that the boxcars be sent to the short line railroad in Illinois.

g. Most of the boxcars were not classified as scrap; to the contrary, most had a minimum of five to six years of useful life left and, if reconditioned, could continue to be utilized for an additional twenty-five to forty years.

h. None of the boxcars shipped to Illinois had any product in it and

therefore could not be emptied. There were no contents to dispose of.

i. Many of the boxcars were reconditioned and since their ownership had changed, Penn Central's name was deleted and the name of the new railroad was affixed.

j. None of the individuals involved had any connection with organized crime, contrary to the allegation in your article.

As can be seen from these facts, all of which are supported by transcripts of testimony and documents, no boxcars were ever scrapped, none was ever emptied and its contents disposed of, and none of the individuals had any connection with organized crime. As previously stated, the individuals connected with this transaction are well known in the railroad industry. Anyone reading this article would immediately associate the situation with those individuals. Thus, the failure to name them in the article does not excuse the libel. This article, nine years after the fact, falsely accuses these persons of being related to organized crime and committing the theft of 217 Penn Central boxcars. It is a shame that you have had to use this regrettable situation as an example of alleged computer crime. I am sure that you can come up with much better examples without blaming the computers.

I urge that in your next issue, you print a retraction of the allegations so that the reputation of the individuals will not be further harmed.

Warren J. Kaps
Court House Towers
39 Hudson Street
Hackensack, NJ 07601

We are deeply grateful for this chance to rectify any error that may have appeared, and sincerely hope that those concerned readers who have, by their letters, phone calls and telegrams, expressed dismay and distress on these matters, will at last rest easier.

Information On Sharing For All, Please

Dear Editor:

In the Input/Output section of the June 1980 issue there is a letter about sharing a disk and printer with a dozen Pets. I would like to find out if such an arrangement is possible with other small computers, for instance Apples, or TRS-80's. Perhaps some of your other readers have such knowledge they could share.

Nat Mann
St. Williams Public School
1391 Main Street
Tewksbury, MA 01876

Accurate Accuracy

Dear Editor:

After having had some trouble converting Bruce Barnett's "Accuracy Plus: Multiprecision Multiplication" (*Creative Computing*, August, 1979) — the product on page 82, 1st column, top, is incorrect from place 22 to 45 — I took up the suggestion of your reader Doug Jones ("Accuracy [?] Plus," Input/Output, *Creative Computing*, December, 1979) to check by dividing the product.

For the benefit of those of your readers who have had the same trouble working it out with Pencil and Paper, I'm enclosing the checked results of the multiplications on pages 82 (top) and 83 (bottom). They are correct unless bugs in two independent programs have formed a conspiracy.

152415878754577847238093 = 962680728375106822735947 +
1467548783383632239378725142953284155326118131

1467548783383632239378725142953284155326118131 + 962680728375106822735947 =
152415878754577847238093
(EMDT RICH B DEZIMSTELLER,)

29812338964552676341 = 736371808668728935487 +
1812161007876151987839546873444906678356387
3812161007876151987839546873444906678356387 + 736371808668728935487 =
19812338964552676341
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CIRCLE 121 ON READER SERVICE CARD

T. J. Ward, with support from the "A. J. and Susan R. Ward" Foundation, White, and Texas. I have been using a course program on CARS-80 for some time. My research focuses on the use of CARS-80 in various language programs. A new generation of students is currently using the CARS-80 program to learn the first language of a second language. I hope to publish research on the use of CARS-80 in the future, such as the latter in the future.

My first great love was a girl, a tall, beautiful, blue-eyed, young, Irish woman that happened along my way, young man, I was about 16, I was in school and she was 17. I would, would I, would I love? When I was about 18 or 19 years old? Was there a girl, a beautiful woman? What kind of girl was she? What kind of girl was she? Was there a girl, a beautiful woman? What kind of girl was she? What kind of girl was she?

[illegible]

Makes the authors of the article — "Compensated Access: Improving" have developed a certain degree of success in making the value of their program (it was primarily designed to be a model to confirm the value of the program, though it is not the final outcome, information, since it has been submitted to the public domain).

Dear Sirs,

First, a comment: I've noticed a steady upgrade in the quality of your on-line full courses, please keep it up.

Sound, a question. With more computer stores appearing on the scene, buyers and users find that knowledgeable people are always available to answer questions. I, and probably others of you, have been in if we had some "vest-pocket book" that could be used as a reference in display so that we have much information in the current were "Z80," "Z80A," "8088," "68000," "68010" for which we based. Can your capable staff, one of your knowledgeable people, help in their research.

Richard A. Carr
6115 Lindberg Avenue
Allentown, PA 18104

It is hard to tell whether the *Chamaeleo* is a new marine form, or a land form, or even a new form from the unknown RCM.

[illegible]

Dear Editor:

Ran. Gao's poem by his article "Anyu's Dream" and "Jiaozi / Dumplings" is not only a statement that we have become the same country, but also a declaration that we will be the same.

When a subunit such as X^a or X^b is exported, the two polypeptide chains are changed from XS to a valid representation of that gene and appear as SP^a and SP^b following a direct copy of their Amino Acid sequence (see below).

The high-quality water here is not used at the ANOVA Plant. In fact, the water is used for the first time in the world. The water is used for the first time in the world. The water is used for the first time in the world.

* If you prefer, you can also use the *atan2* function to find the angle. When a number is passed, *atan2* will return the angle in radians. The *atan2* function will also return the angle in degrees if you pass a second argument of 180.

London: B. Vowles
18,52 pence per page (plus 6% charge)
Page 81: £ 0.74 10

[illegible]

One of my main suggestions for the problem was very similar to (62) & (63). We have shown that Aggravation along the basis of the three-dimensional space of parameters between W3 and W2. In this, growth in the same sense to extend up the triangle in Aggravation results in a similar (dis)advantage. Work is encouraging the small, *disadvantage* of *W3* is growing in the direction of the same as between W3 and W4. This growth in the direction of the triangle of the triangle is the same as the growth in the direction of the triangle of the triangle.

A NEW WORLD OF SMALL COMPUTERS IS AT YOUR FINGERTIPS THIS FALL



4th Annual

NATIONAL SMALL COMPUTER SHOW

New York Coliseum, October 30 to Nov. 1, 1980

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Introduction to Small Systems for Business, Stan Velt, Associated Computer Ind., noon, Oct. 30 & 31.
Marketing Lists: Several Directions, Dr. Norman Agin, Mathrich, Inc., noon, Oct. 30 & 2 pm, Oct. 31.
Selecting a Small Computer for Business, David Benveny, Computer Mart of N.J., 1 pm, Oct. 30 & 31.
Evaluating and Improving Your Computer's Performance, Philip Grossman, Raytheon Co., 1 pm, Oct. 30.
Law Office Systems Aspects of Word Processing, Bernard Sternin, 2 pm, Oct. 30.
Future Smart Machines: 2000 A.D. and Beyond, Dr. Earl Joseph, Sperry Univac, 2 pm, Oct. 30.
Computer Contracts - Facing the Issues, Alan C. Verbit, Verbit & Co., 3 pm, Oct. 30.
Acc 'n Receivable/Acc 'n Payable/Jan 'n Ledger, 3 pm, Oct. 30.
Advantages of Distributed Processing & Multi-Processing, John Steifel, Q Corp., 4 pm, Oct. 31.
Investment Analysis of Stocks & Commodities on a Microcomputer, Fred Cohen, Shearson Loeb Rhoads, Inc., 4 pm, Oct. 30, 3 pm, Oct. 31.
BASIC Programming, Michael Mulachy, Worcester State College, noon, Oct. 31.
VideoPrint: Full-Color, Low-Cost, Hard-Copy Computer Graphics, Warren Sullivan, Image Resource Corp., 1 pm, Oct. 31.
Business Applications Software Development Via Data Base Management, Dr. Andrew Whinston, Micro Data Base Systems, 2 pm, Oct. 31.

Application of PASCAL to Small Systems for Business, Panel, Stan Velt, Associated Computer Ind., Moderator, 3 pm, Oct. 31.
Educational Software: the Good, the Bad, the Ugly, Jo Ann Conliffe, S.U.N.Y. at Stony Brook, noon, Nov. 1.
Introduction to Personal Computing, noon, Nov. 1.
Computer-Assisted Mathematics Courses, Dr. Frank Scialzo, Queensborough Community College, 1 pm, Nov. 1.
Artificial Intelligence Update, Prof. Peter Kugel, Boston College, 1 pm, Nov. 1.
Compiling and Retrieving Personal Medical Data with a Microcomputer, Derek Entander, MD, St. Luke's Hospital, 2 pm, Nov. 1.
The Present State of CP/M Compatible Software, Tony Gold, Littleton Associates, 2 pm, Nov. 1.
High Volume Data Handling: Intro. to File Processing, Prof. Peter Kugel, Boston College, 3 pm, Nov. 1.
Connecting the Computer to the Outside World, Prof. James Glips, Boston College, 3 pm, Nov. 1.
Educational Applications in the Home, David Ahl, Creative Computing Magazine, 4 pm, Nov. 1.
Household Applications - Some of Them Here, Dr. Dennis J. McDermott, 4 pm, Nov. 1.
(Additional lectures to be announced)

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- 22 ☐ Lawyer/Law Office Mgr.
- 23 ☐ Manufacturer
- 24 ☐ Marketing
- 25 ☐ Medical Doctor
- 26 ☐ Medical Technician
- 27 ☐ Military
- 28 ☐ Office Manager

- 29 ☐ Public Servant
- 30 ☐ Real Estate
- 31 ☐ Religious
- 32 ☐ Research/Development
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National Small Computer Show

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I/O, cont'd...

(the length byte).

Using this pointer has several advantages. It is immediately available for use with the 6502's indexed-by-addressing mode. The pointer will be correct even if it is the Basic program's first reference to that variable. The pointer is also valid for use with array elements, using the following call sequence: `BS(0)=BS(0) : CALL (routine address)`. With this example the \$83-\$84 pointer will point at the descriptor to `BS(0)`. Descriptors for `BS(1)`, `BS(2)`, etc., will follow immediately after.

The one major restriction to this technique is that only one pointer to a parameter can be passed per call. Multiple parameters would require multiple calls, each of which would store a pointer to a parameter. This is further complicated by the fact that the array variable table moves upwards in memory as new simple variables are added to the simple variable table. Pointers to array elements may not be valid during later calls from Basic!

In cases requiring multiple parameter passing, I have often preferred the "first-defined" technique. This technique does not restrict us to using just one parameter variable, as Rick suggests. Indeed, we can access any number of variables within the variable tables, as long as we know their exact order and position within the tables. This is managed by having Basic refer to the parameter variables in the order they are expected to be seen in the variable table, before any access, use, or definition of any other variables. One program I have written uses the following to define three integer type and one string type variable: `V1%:=0 : V2%:=0 : V3%:=0 : V4$=""`. The Applesoft simple variable table pointer at \$69 and \$6A points to the very beginning of the variable table. Entries for each variable are seven bytes apart, a fact which Rick used in his GET ADDRESS routine. One may simply use indexed-Y addressing to look up the values of any of the variables (or pointers in the case of string variables). A word of caution: integer values are stored by Applesoft high-byte first as opposed to the normal low-byte first 6502 convention.

I have not found the sign (#7) bits on variable names which designate variable types to be unreliable, as Rick has. This may be explained by an error in the Applesoft II Reference Manual. String variable names are denoted by a positive first byte and a negative second byte. This is described in reverse within the manual.

One area of variable passing which should not be overlooked is Applesoft's ampersand (&) instruction. The "&" instruction is equivalent to a call to location \$3F5. Its nice feature is that it may pass variable names, string data, constants, or any other information to the assembly language subroutine (usually, \$3F5 contains a JMP to the actual routine). I have recently used "&" to create a "wildcard" string compare function. A Basic statement which might use the function would look like: `&AS,NAS(X),M%.` The first variable contains a string with possible imbedded wildcards ("*") and the second contains a string for comparison (note the ability to use array elements). The last variable, an integer, returns a value of '0' if the match did not succeed, and '1' if it did succeed. Applesoft's own internal subroutines were used by my subroutine to look up the pointers to the variable tables.

This is getting rather long. I will stop here and thank you and your submitters for the excellent work you are doing. Keep it up.

Guy A. Lyle
500 Andrew Lane
Lake Zurich, IL 60047

Correction on TMI

Dear Editor:

I was gratified to see my review article in print in your March 1980 issue, but a correction is in order.

In the article I stated that the color convention used in the MUSE Three Mile Island program for valve and equipment status was the same as that used in a real power plant. Actually, the program has it exactly reversed. A red status light represents a running pump or an open valve. The rationale is that green means a safe condition (closed valve, idle pump), and red represents potential trouble if something is not lined up correctly.

Victor R. Fricke
325 Ramapo Valley Road
Mahwah, NJ 07430

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Missionary Position

Ted Nelson

The 1980 NCC

The 1980 National Computer Conference, in Anaheim next to Disneyland, was only moderately interesting. Five major exhibit arenas (one officially deemed to be "personal") held rather little that was new.

The Bombshell

The most important event of the National Computer conference was the Great Ethernet Announcement. You will recall (see "Random Ramblings" in our June 1980 issue — hereinafter cited as June RR—) that Ethernet is a system of coaxial-cable interconnection intended for computers and other office equipment. A single Ethernet cable, running through a maze of offices, will permit documents and data to zitch back and forth instantly between all the typewriters and printers and keyscopes and computers and wall-projectors and copiers and document storage boxes, all faster than you can say "Xerox Palo Alto Research Center," where it was invented.

The Great Ethernet Announcement was the joint disclosure by Digital Equipment Corporation and Intel that they would join Xerox in this venture; and Xerox's complaisant disclosure that it would welcome them in.

KABOOM!

Ladies and gentlemen, it is now established that the Office of the Future — or OOF, as I like to call it — will have one standardized system of interconnection. And we now know its name. Ethernet.

In the computer industry, things have a funny way of becoming standard. They become standard because they develop momentum. Some events contribute importantly — like an IBM announcement or a Standards Committee definition — but these *contribute* to momentum, they don't guarantee it. So when a particular company brings out a product, like the Altair computer or 3M's Data Cartridge, there is a big question whether it will become standard. (The Altair's system of



Prateep Amornvittikivecha next to his first place project, a Thai-English CRT and Printer (TTY45), in the Personal Computing Festival.

interconnection, now called the S-100 bus, did become standard; the data cartridge did not, though it's still around and decent. And if you think IBM's stuff automatically becomes standard, just think of the sprocketed 16mm magnetic tape that came on IBM's old MT/ST typewriter. Where is it now?

Xerox knew they were taking a chance going it alone with the Ethernet; however, that meant if it caught on they'd have it all to themselves. But then they were approached by DEC and Intel, separately, and saw the wisdom of sharing the system — for less than all of a much bigger pie.

This also probably means that the field will be open up for other companies who want to supply special boxes to the Ethernet — because three big corporations make a coalition, and there are some very specific laws about that sort of thing, heh heh. So the Ethernet will probably be a very good thing for everyone — other vendors, users, and the whole wide world.

Speaking of coaxial, Zilog showed at its booth a very nifty new set of boxes — a complete office communication setup based on their Z80 chip, all interconnected by a video cable and set up to toss messages and data back and forth. Looked great. However, given the importance of the Ethernet coalition, Zilog is placed in a very difficult position. Should they go on pushing their own cable setup, just announced, or retrench to join the Ethernet crowd, even alongside their rival Intel? I predict they'll have to give in and join Ethernet — but they won't like it, and it could take six months or more of corporate infighting.

"Personal" vs "Industry" Shows At NCC

Originally, when Portia Isaacson managed to get personal computing accepted as a section of the National Computer Conference, it looked like a big breakthrough. Now it's settled down, though, and the outcome can be seen in negative ways as well.

The personal computing conference is a way of taking the heat off — keeping low-priced competition away from the main exhibit area. Furthermore, not opening it till Tuesday of the show ensures that conferees see all the high-priced goods first.

(Just consider the Exidy Sorcerer as an example: at about \$1300, it's an excellent terminal that can also be used as a computer; thus it competes with IBM's ASCII terminal, or should. But it was very far from the IBM booth.)

There's no real point in distinguishing the two exhibits. A computer is a computer. So here goes:

Apple The Third

Apple was not in the personal arena, but the Professional. Though they were tucked away in the farthest corner of the most obscure basement area, the free Disneyland tickets they were giving away assured their attention from many conference-goers.

And the Apple III was there. Yes, it's out. And trying to figure out what it means is fascinating.

In appearance the Apple III strikes me as unbeautiful — rather like an Apple II that has bumped its head. And the cost of the Apple III will turn your hair: \$4000 plus. But that includes upper and lower case, 80 column display, a single mini-floppy drive and a clock/calendar accessories that would raise an Apple II to the Apple III price anyhow.

The ever-growing success of the Apple II makes it a tough act to follow; and Apple did so many things right on the Two, breaths are being held to see if they can possibly be as right on this one.

Surprisingly, they chose the 6502 chip, an eight-bit unit that is scarcely state-of-the-art. And they say, straightfaced, that this machine can address up to 128 K bytes. Yeah, but how many can it address *really*?

Part of the fun of the computer world is this kind of an announcement. Back in the 1940s, the strategy boys at RAND

Position, cont'd...

used to call this a Minsk-Pinsk, based on the following story: Two Russians meet on a train. First Russian: "Where are you going?" Second Russian: "To Minsk." First Russian: "Aha. Now I know that when you say you are going to Minsk, you want me to think you are really going to Pinsk. But I happen to know that you are going to Minsk. Why are you lying to me?"

So when the Apple fellas say, with a big grin, Yup, the Apple III can address up to 128K of memory, you think, Aha, it can *really* probably address a jillion megabytes, but they won't reveal that until later. And the Apple guys grin. What if it turned out that it only can address 128 K? Did they say different?

Anyhow, we know this machine has serious muscle, because they tell us that separate 6502 programs can be brought in in any order and automatically readdressed. Now let's think together on this.



Relaxing outside Anaheim Convention Center.

That would seem to mean a separate hardwired relocation register for each program, which is a very serious facility. Because that means you can really scramble those old addresses around something fierce, and the hardware will take care of it all. Rather like the DAT box (Direct Address Translation) that lets programs live together in the *big* machines.

Now, they don't seriously expect us to believe that these relocation registers are only eight bits long, do they? (Well, the infuriating thing is, they *might* be eight bits, but then we don't ordinarily expect Apple to do things wrong, and it only stands to reason that these registers oughta be sixteen bits each.)

Now, I'm not saying that's how it is, I'm just saying that's what *stands to reason*.

Of course, it is conceivable that Apple decided, instead of putting their logic smarts into the big address space, to put them into a dinky little relocation capability, and organize their software around that. Then later on the Apple IV, for thousands of dollars yet *again*, could expand the address space.

But what the relocation hardware would also strongly suggest is a whole new line of interlocking binary software modules. (How this will relate to their considerable Pascal commitment is not

clear.) And a big question is of course: will they cooperate with outside vendors, or try to go it alone?

Now here we'd better look at history. Apple has always had an elegant strategy with respect to cooperating vendors. It has been Apple's practice since the beginning to watch and work with cooperating vendors, and embrace high-class products into their own official line, with dealership access and all that.

This has happened with Microsoft Basic, which was rechristened "Applesoft," with Mountain Hardware products, with the D.C. Hayes modem, and so on and on.

Now we begin again. Here with the Apple III comes VisiCalc from Personal Software, all embraced into the official product. Does that suggest Apple will try to keep other software vendors out? No. They're much too smart. So I think that given Apple's historic posture, it is almost certain they will be cooperative about their grand software plan and the interface specifications. Thus small software vendors will probably be able to get into this market, given keen attention to Apple's signals and software releases.

Of course, this also means that the Apple III now creates a clear-cut Umbrella for independent software offerings for the Apple II.

For those of you who tuned in late, an important feature of the nineteen-sixties was the so-called IBM Price Umbrella — which has now largely folded.

This was the excessive price charged by IBM for a given type of product, above and beyond what other companies might happily make and sell that product for.

It was a fair bargain. In return for the legendary reliability of IBM's hardware, and their johnny-on-the-spot repairman armies, and just that IBM label that some people go for, you were paying extra. But this also was a gift situation for the other manufacturers, folks like Control Data and Univac and Memorex, who could do nicely selling compatible products for less, cowbirds around the behemoth.

And this also protected IBM, somewhat, against the charges of Monopoly, since it kept a menagerie of competitors essentially as pets.

So now here is Apple Computer. Originally (Year 2 Anno Altair) it was a struggling company like all our other struggling companies.

Now we see it more clearly as the jolly tan giant of personal computing, rising head and shoulders above the others, with a true personal computer, not just a box of boards with an unforgiving operating system.

And now Apple has the nerve to issue its new model at about twice the price of the old, with what looks so far like *moderately* more capability: the price umbrella again.

So, heh, heh, this means that for those of you who want to do software and acces-

sories that crank up the Apple II to compete with the Apple III, it's open season.

And Apple will only smile.

I am personally tempted to do a word processor.

Now we see why, incidentally, lower case has not been adopted into the Apple II line, though there are several independent vendor accessories that do it.

But Apple chose to hold it all till the Model III.

That, to me, is the one naughtily ibomlogical thing they've done — holding back the capacity of the small machine to push you onto the big one, just the way IBM always has. Tut, tut, tut.

The Other Exhibits

Everywhere was the screech of new dot-matrix printers: from the top-of-the-line Facit, which offered two colors and considerable speed, down to the Base 2 in the personal exhibit area, which at \$700 with graphics looks like a real winner — if it's reliable, etc. etc.

The most important event of the National Computer Conference was the Great Ethernet Announcement.

General Electric's new Terminate printing terminal is a beauty: physically, it is the best-looking teletypewriter anybody's made. The color is also a surprise: refrigerator white. It's Option City, with keyboards, speeds and buffers to your liking: in the \$1500 range and up, they are obviously zeroing in on the range occupied by the Teletype Model 43 ("bulletproof" reliable) and the DEC LA34.

Yes, Virginia, you *can* get a functioning 68000-based computer. (The chip-monks all know that if it's CPU design you care about, the 68000 processor-on-a-chip is the best.) The boxed version is from Motorola, and you'll pay for it — \$2000 and up.

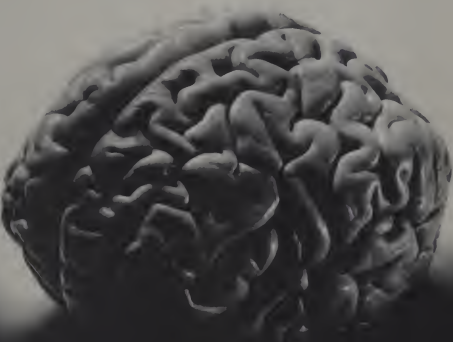
The Onyx Z8000 was there, and running Unix!

Yes, friends, the legendary UNIX time-sharing system may now be had, the whole ball of wax, for under \$20,000 and serving eight users! Heaven and earth have met. And it was running, of all places, in the Microsoft booth in the Personal exhibit area. (Microsoft's Z80 card for The Apple, however, was not. Yet.)

The Findex computer, at \$6000 and up, offers good news and bad. The good news is its portability (30-odd pounds with a handle), and up to two megabytes of on-board bubble memory. The bad news is that you access this through CPM, so that it can't all be treated as a big data space.

Winchester Backup was an important undercurrent of the exhibits.

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Position, cont'd...

The question is, now that people are getting hard (Winchester) disks that hold millions and millions of bytes, *what if they crash?* Where to copy the information just in case?

Well, Konan Corporation — no kin to the barbarian — says it should be 3M data cartridges, and they'll hook 'em up to your S-100 under CPM. And others say it should be industry-standard 3/4" mag tape, offering "streaming" tape drives for the purpose — that is, the tape keeps going in one direction, not jiggling back and forth in vacuum columns. Some say floppy disks will bridge the gap. Corvus offers their videotape-cartridge system, the Mirror (see RR, June). But it really doesn't matter. The important thing to note is that the Winchesters really are getting out there. And that is a beautiful and happy development.

The Corvus Constellation (See RR, June), was running, too. The software seemed to be a little rocky, and Software Pipes were not up yet, but at least we saw it do stuff.

Pascal Boards for both the S-100 bus and Q-bus were seen. (This may standardize Western Digital's P-code.)

Aydin Controls showed just enough computer animation at their booth to suggest that they might be offering animation packages in the future.

(As yet, no commercial digital computer animation packages exist — except scattered pieces of software and a few TV services. COME ON, you guys!)

The Sandwich Boys from American Used Computer, a merry fixture for a decade with signs on their backs, were gone, banished inside by the stuffy and pompous Convention Fathers. Boo.

International Big Mother showed again their Document Box (see June RR). Of special interest to personal-computer fans was an ASCII terminal, portable, looking good and coming in at the rather threatening price of \$1300. That's heavy. ASCII is the code of the personal computer field, and \$1300 is only 40% more, say, than most. Also at the IBM booth were very nice color terminals. IBM terminal for your S-100 anyone? ASCII? No way, said the product mangleer soothingly. They only work with the weird 370 protocol (in an optional complicated update, natch), and the price is given in dollars per month. Now that's the old IBM.

Most impressive exhibit among the personal amateur exhibits was a printed and CRT display of the Thai language — a lovely-looking loopy notation. Its developers actually had a teletype 43 handling the Thai characters under graphic control of a character generator. When I asked if they'd sell the Teletype graphics adapter, they only sighed modestly and said it was nothing.

A color-camera box for a reasonable price — \$2000 — is out: "Videocprint"

from Image Resource (Westlake Village, CA).

This is essentially a setup for shooting sharp color pictures of what would otherwise be fuzzy color displays. The reason is this: your color picture tube beams through a metal mesh, or, in the Trinitron, frizzes into a gridwork of tiny color-phosphor strips. While to the on-line user it's okay, this introduces by its very nature considerably more blur than you want to look at in a photograph.

The solution is to use the black-and-white monitor, whose phosphor is creamy smooth and untextured, to make three separate images for the primary colors, and then recombine these sharper images. (This is what is done in the big-screen TVs — Advent, Panasonic, and others.) For making photographs, however, all you need is a single black-and-white monitor, sauced with your primary colored filters. You put a camera in this box, see, with color film, and open the shutter. Now the



The Creative Computing booth at NCC was shut down briefly due to a row with AFIPS management. For details, keep tuned.

monitor shows the red part of the picture through a red filter. After which darkness descends, and the color-wheel turns, and the monitor shows the blue part of the image through the blue filter. And once more the wheel turns, and the green part of the image appears on the monitor, and this view is appropriately tinted through the green filter. (I remind you that when you are combining images optically, the primary colors are red-blue-green — unlike what it was like in art class, where you mixed poster paints and the primary colors were red-blue-yellow.) Now develop the film, and — whamarama! a beautiful color image, far sharper than you'd see off the color picture tube. I am presuming that this box also performs the electronic separations and controls the framing.

Now all we need is a decent-priced 16mm movie camera to go with it, and a nice movie-editing system done around videotape. Then we can go to our local Fotomat in the parking lot, get a videotape transfer, and make synthesized movies without workprints — dammit, it's all coming together so slowly!

Xerox Palo Alto Research Center, from which Ethernet was cast, figured by implication in another byplay — small, though symbolically important. Rosetta's version of the Smalltalk language (see review of Hypercon 4, this section) was on

view in the personal exhibits. A few people seemed to think that the original Smalltalk developers at Xerox PARC might be distressed by this development. But this would seem unlikely. After all, Kemeny and Kurtz, Iverson and Backus don't mind when independent vendors bring out versions of their languages — Basic, APL and Fortran — and Smalltalk is likely to achieve the same recognized greatness.

A different question is whether Xerox is going to assert trademark over the name "Smalltalk" — and opinions seem to vary on this matter. So far there is no published indication of such an intention.

So the Rosetta fellows aren't violating anything. Yet.

American Used Computer was banished inside by the stuffy and pompous Convention Fathers. Boo.

The Sessions

At the big conferences you have to pace yourself. Fifteen years ago, I used to scuttle from ballroom to ballroom, hungry and out of breath, scribbling down everything I heard. But it was all new then, and subfields were being invented every month. Now most of the topics are old — at least the ones that make it to the NCC schedule — and many session chairmen treat it as a chore. I hit only a few.

The session on computer animation was a nice summary and retrospective of high resolution stuff, especially of the work from New York Tech (crowned by Emshwiller's "Sunstone"), and the beautiful graphics of Demos and Whitney from Information International.

The session on computer-controlled special effects was really crowded. I passed it up, to my regret, for an un-crowded session on "libraries of the future" — which seemed to stress the hypothesis that trained librarians should design the electronic libraries of the future, which they say may or may not be something like card catalogs or the *New York Times* data bank. Hmm. (See Hypercon review.)

Fred Gruenberger's "plenary session" at the Personal Conference turned out to be a number of heavies from the straight computer industry pontificating to a scattering of people in a mostly-empty ballroom on why personal computing "hasn't taken off yet." (What hasn't it taken off? From the way they were talking, the field will be swallowed up by corporate giants as soon as it becomes worth taking over. If this can be taken as representing the attitude in the conventional industry, I'd say the surprises are not over yet, and we'll see who is going to swallow whom. (By 1990, personal computing will be bigger than the rest of the industry. Mark that down.) The industry straights don't yet see the computer as an interactive movie-machine,

which will by then be its central function; and the talented creators of interactive software will not be coming out of the Cobol mills. They're in the cottages and basements with their Apples and PETs and TRS-80s and Ataris.

Another, utterly different "plenary session" — this one rather full — heard from the chairman of the Walt Disney organization about EPCOT. Now, if you are a Disney fan, you know that EPCOT was Walt's crowning dream — the Experimental Prototype Community of Tomorrow — a new kind of residential suburb in Disney World, whose design only Walt could imagine or understand. Now, this was really interesting, because if Disney World was actually going to house an ongoing community of citizens, what would it be like? Would there be slums? No. Churches? Of course. Adultery? Teenage naughtiness? Bubblegum? Minorities? Well ...

Surely here was a problem to tax even the greatness of Walt Disney's spirit and imagination (and I am not being facetious). Because all of the Kansas City values and gumdrop euphemism that Disney's work expressed would have been hard-pressed



The new PMC-80, a TRS-80 look-alike from Personal Micro Computers Inc., Mountain View, CA.

to deal with the smarmy reality of a breathing, unsalaried, human population. I think he would've done it, and I think it would have been a damned interesting synthesis.

But we'll never know. The great man is gone, and committees oversee the accumulation of the wealth, and put out movies like *The Black Hole*. And the Disney chairman came to tell us all about how EPCOT was going to have pavilions and a convention center and rides and attractions. In other words — another amusement park.

He would entertain questions. I leaped up and asked, very politely, about Walt's Dream, as I thought I'd understood it, of a real Experimental Prototype Community of Tomorrow, like with people actually you know Living In It.

No, said the chairman gently, that could not be, that could not have been Walt's Dream. Because if people lived there it wouldn't be Tomorrow any more, would it, it would be Today. And besides, the instantaneous overnight visitor population of Disney World is already in the

tens of thousands anyhow, so there's your EPCOT right there.

He said it nicely, and I suppose the organization has done the right thing. And this way there won't be demonstrations and town meetings and local kids going wrong. Because the only man who could have made such a thing work is gone now. But gosh, golly, gee whiz, shucks, see here — I sure was hoping to live there.

The Fourth Hypertext Conference

Hypercon 4, in Swarthmore, Pa., in April, was the first of the Hypertext conferences not advertised to the public.

I and my co-workers on the Xanadu™ Hypertext System hold these shindigs about every six months to keep our spirits up and propagate the faith.

First, about hypertext: it simply means "non-sequential writing." There are lots of places that writing might be better off in non-sequential structures. And others are working on hypertext of one sort or another, notably Engelbart (now at Tym-Share, where his system is being marketed under the name "Augment"), and van Dam at Brown University. So that "Xanadu" is our trademark for our kind of hypertext, soon to be a commercial offering.

Xanadu hypertext is built around windowing and linked documents. A windowing document simply has a window to another document; that is, Document A may quote a part of Document B. We hope to make this practical, however, and make it also our solution to the copyright problem: the author of Document A gets a continuous royalty while Document A is being fed out to a user, but when the part that's windowed from Document B is fed out, now the author of B gets the royalty. (I say "author" for simplicity's sake; it might be the publisher, or some other owner.) Any document stored anywhere in the Xanadu network — if we manage to get a network going — can window to any other document. The same for links: you can put your own private footnotes, marginalia or underlinings on anything — or publish a document with public links to any others.

The whole point is to build an overall system whose ground rules are fair, and powerful and sweepingly simple — and whose software is efficient, that is to say, feasible. We hope to demonstrate the system this calendar year, and even dream of franchising it nationally — so that where you see the big golden X on the highway, you'll know where to plug in for your local entry to the net.

Now, a little thought will disclose that if any author can window to any document stored in an expanding network, there are certain questions of storage, data structure

and indexing techniques that get fairly serious fairly fast. Which is why the project has taken so long (twenty years). But we're still working hard on it — six to eight active people, depending on who you count — and operability is in sight.

Well and good. The first three of our semi-annual conferences were open to the public, but not many people came, apparently because civilians have a bit of difficulty figuring out what in the world we're talking about — if you have no experience at a keyscope, have never heard of time-sharing or word processing, and have only the haziest idea of what a computer might be, face it, you may not enjoy the conversation very much.

Also, we've been talking about this system a long time, and laymen get a little impatient. They can't quite see what's holding things up — why isn't it ready? After all, computers store information, don't they? Never mind this algorithm and debugging business.

So this Hypercon we decided to hold as a private party. But we managed to bring in a nice group, very highly qualified.

There were guests from Yourdon and Humrto and Capital Children's Museum, National Science Foundation, *The Washington Post*, Western Printing, and the Beck Corporation, to name a few; also the Church of the Holy Starship.

Language freaks came aplenty: Scott Guthery was there (the developer of Tiny C), Leon Zolman (creator of BDS C) and, from Texas, Scott Warren and Dennis Abbe (inventors of Rosetta Smalltalk).

In the morning we covered the Xanadu system's design, again, as must be done for any new group. Then in the afternoon, under a balmy sun, we hammered on such questions as corporate financing, how we relate to video cable as a delivery system, and the body of law that makes a printer a co-defendant in cases of libel — which holds sinister portent for electronic publishing. It means The Bad Guys can shut down anything they don't like just with highly-financed libel suits. Or can they?

After a bounteous Chinese dinner, catered by a Swarthmore student, the group turned to festivity and bibulation and unstructured deprogramming.

The Becksters unpacked their Beck-1, a Z80 machine with CPM and a TV input that does nifty real-time picture conversion, and snapped our pictures on the diningroom table.

The Rosetta folk unpacked their Sorcerer and disk drive and showed us their Smalltalk.

Lawsy, what a demo that was, as Scott Warren showed us the magic of Smalltalk on the Sorcerer screen. He created windows with text in them, rifled and shuffled them on the Sorcerer screen like a card-sharp.

Some thirty very high-level software



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Original Adventure is an undisputed classic. The treasures you seek are hidden in underground caverns. All you have to do is find them. It's easy — just overcome a giant clam, nasty little dwarves and other deathly perils. This game is bi-lingual so, to make it really a cinch, just type in "GO FRANCE" and the characters will speak and understand only French (CS-9004) \$24.95.

The Basic Games Library features 190 top-notch simulations, battles and strategy games from the celebrated Basic Computer Games Book and its sequel. More Basic Computer Games *Volume I* (CS-9001) and *Volume II* (CS-9006) include Super Star Trek, Slalom, and Checkers. Each disk is \$24.95. Both disks and the Basic Computer Games Book are available for only \$50.00 (CS-9000).

Volume III (CS-9005) and *Volume IV* (CS-9006) feature Yahtzee, Tennis Wumpus and Grand Prix. The disks are \$24.95 each. Both disks and the More Basic Computer Games Book are \$50.00 (CS-9007). The entire four disk collection also includes both big games books, edited by David Ahl, and is \$95.00 (CS-9008). All are on 8" disks, require 48K and Microsoft Basic.

Your local computer store should carry Creative Computing Software. If your favorite retailer does not carry the software you need, have him call in your order to 800-631-8112. Or, you can order directly from Creative Computing. Write to Creative Computing Software, Dept. AHHG, P.O. Box 769-M, Morristown, NJ 07960. Include \$1.00 for postage and handling. For faster service, call in your bank order toll free to 800-631-8112.

sensational software

CIRCLE 300 ON READER SERVICE CARD

Position, cont'd...

types stood chin-to-chin in my study for an hour transfixed by Scott's razzle-dazzle.

Some remarks on the Smalltalk family of languages are in order about here, as well as about their place of origin, Xerox Palo Alto Research Center (PARC).

If IBM is like the Soviet Union — millions marching in lockstep, *Ve Know Vot Is Good for De Pipple* — Then Xerox PARC is like Versailles. Its inhabitants frolic in palaces and gardens — that is, with unceasing access to breathtaking delights that we commoners would give an eye for. In particular, the Learning Research Group has its Smalltalk language, running principally on computers called Altos, which are all over the building.

Smalltalk is totally inside-out and upside-down compared to any other computer language, and we will be expounding it more fully in later issues. Suffice it to say, however, that the language's power for graphics and interaction is unrivalled;

**Xanadu hypertext is built
around windowing and
linked documents. A win-
dowing document simply
has a window to another
document.**

and that no version of it has been available anywhere, until this implementation by Rosetta. And while in many ways the Rosetta implementation does not use the more advanced concepts of the later PARC Smalltalks — it does not compile, for instance, and disallows "classes of classes" (watch future issues) — nevertheless, it is the first language of this family to escape the walls.

The Rosetta gents said they weren't sure whether they should bring this product to market yet, because it was so slow. Unanimously the Hypercon multitude said yes, they should, we wanted it, and so on. Thus was Rosetta led down the path to the NCC.

A good time was had by all. The tape recorder didn't work, but posterity needn't worry; most of what was covered was old ground.

Still, people had enough good vibes and good thoughts, and were sufficiently glad just to meet each other, to make it a bang-up day.

The next Hypercon is tentatively scheduled for December, and will be open to the public. But drastic measures will be needed to correct one problem: the small percentage of women (less than ten). We are considering including a Costume Ball, couples only, as incentive to bring in women. Other suggestions are welcome.

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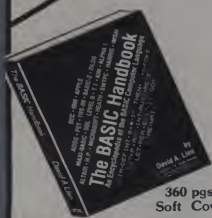
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Beta-80 from MECA

Eric VanHorn

Despite the numerous changes in computer technology, many peoples' everlasting impression of computers is large, spinning reel-to-reel tape drives in old science fiction movies. And despite many predictions of their demise, tape drives are alive and well, even in the small computer industry. MECA makes a number of tape drives, for small computers, among them the BETA-80 for the TRS-80.

The BETA-80 has little resemblance to the slow and unreliable cassettes that most people have used at one time or another. Its shell is an unobtrusive gray, sheetmetal box that measures about 8" on a side and 4" high. The only control is a rear-mounted on/off toggle switch with a front-mounted on/off LED. The BETA-80 uses digital cassettes that load in the top of the box.

Like the TRS-80 disk system, the operating system automatically boots when the keyboard is turned on.

Interfacing depends on how the BETA-80 is to be used. The simplest configuration is to use the tape drive with a 16K Level II TRS-80, in which case a ribbon cable is plugged in to the edge connector at the left rear of the keyboard. Like the TRS-80 disk system, the operating system automatically boots when the keyboard is turned on.

The BETA-80 can also be used with an expansion interface as either a stand-alone bulk storage device or in conjunction with a disk drive as disk back-up. This does, however, require a minor jumper modification in the expansion box. If you are squeamish about making any hardware modifications, MECA will make the change for you. As a stand alone device, the BETA-80 automatically loads and

executes the same way it does with the basic TRS-80. As a backup device, a port must be addressed using the OUT x,y command in Basic.

Because of its high speed operation, the BETA-80 requires digital cassettes. In a pinch it will work with regular audio cassettes, but they will not be reliable. The cassettes must be formatted, and contain two tracks with up to 999 256-byte blocks on each track. This gives a tape capacity of 512K per tape, although tapes can be formatted for a shorter number of blocks. Anyone who has had to work with the 56K capacity of TRS-80 disks can imagine what a luxury this kind of storage is.

The primary commands in Basic are:

SAVE (filename) (track)
KILL (filename) (track)
NAMES (track)
LOAD (filename) (.R)
MERGE (filename) (track)

Filenames are up to 5 characters long. The track numbers, 0 and 1, are indicated the same way drive numbers are in disk systems. Save "TEST:1" would save the file test on track 1.

NAMES is the directory command. Up to 66 filenames can be saved on each track, so 132 files can be saved on a tape without running out of directory space. Because the directory is stored in RAM, the directory need not be read every time a NAMES command is issued. The Directory is automatically read in on start up and must only be reread if the tape or logged-in track is changed.

The BETA-80 operating system also allows for automatically loading and executing programs. Load "TEST.R" will load the program TEST and Run it. This, among other things, makes it possible to have menu driven tapes.

The SAVE command also can be used for file handling. All files are saved as arrays. The information to be saved is stored in an array, then simply saved using the array variable. Even though Level II Basic only recognizes 2 byte variable names, the BETA can still use a five byte file name by only looking at the variable name and the first 2 bytes of the specified file name. The OS is "smart enough" to automatically convert from one to the



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other. File array names are all followed by an asterisk (*). Despite the fact the tape hardware is slower than a disk system, this simplified file handling process can actually make the overall speed faster.

Finally, file merges can be performed to concatenate Basic programs. This is not only useful for development work, but data statements can be merged during program execution to provide a different means of doing file handling.

For Basic programmers, this is as far as you will probably go, but for machine language programmers, the BETA-80 really shines. By getting out of Basic and into the operating system, a variety of versatile and simple instructions allow you to load, save, merge, and move machine language instructions. An OS command is also provided to dump memory. All these commands can also be used in Basic. The syntax is similar to that used in Newdos for accessing utility programs in the operating system. EX 4000 will execute a machine language program starting at a memory location 4000H. In Basic, CMD "EX 4000" will perform the same function.

Generally, the BETA-80 has been very reliable. Occasionally there will be a boot failure, but the system has always booted on the second try. I have been using MAXELL Digital Data Tape (about \$8

For machine language programmers, the BETA-80 really shines.

each) and have never had a media problem. My only real complaint about the hardware is that the tapes can be hard to mount in the drive.

The software is extremely good — much better than I expected. Formatting tapes is slow — it takes about 20 minutes — but since the storage capacity is so great this is only a minor inconvenience. The software includes the OS, a debugger, Star Trek, and a mailing list program to demonstrate file handling. I also understand Electric Pencil is available on tape.

My only other complaint is the speed. The BETA-80 works at 4800 baud, which is certainly better than 600 baud cassettes, but I did wonder why they didn't go ahead and set it up for 9600 baud. That extra speed would make a big difference, particularly when compared to disks.

MECA tape decks are currently available for TRS-80, Apple, Sorcerer and S-100 computers, and can be ordered with an optional printer port. Anyone with one of the above computers should certainly consider tape as an alternative or complement to disk systems.

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VisiCalc: Reason Enough For Owning A Computer

Doug Green

Ideally your computer should be able to act like a cross between an electronic piece of paper and a pocket calculator. That seems to be just what the people at Personal Software, Inc. had in mind when they developed VisiCalc. VisiCalc is not merely a piece of interactive software, but in some respects is more like a separate programming language. It is extremely powerful, and handles many varied jobs with aplomb. When used properly it can save a great deal of time that would ordinarily be spent programming or using several pieces of software. VisiCalc cannot do some of the things that high level languages can do, but what it can do, it does very well indeed.

It takes much less time to learn virtually everything there is to know about the VisiCalc system than it takes for any other programming language you can think of. In my case it took about seven days averaging about one and one-half hours a day to become conversant with all that VisiCalc has to offer. This is in sharp contrast to the various high level programming languages that demand much more of the learner in exchange for their greater flexibility.

Not only does it take only a short period of time to understand the entire VisiCalc system, but it takes almost no time to begin getting results from this remarkable piece of software. This is

Doug Green, Cortland Jr.-Sr. High School, Valley View Dr., Cortland, NY 13045.

an opinion that I share with everyone that I have demonstrated this system to, as well as several people in the computer business who already use VisiCalc or supply it to other users.

A Window Into The Computer's Memory

After you load in the VisiCalc disk you will have the basic electronic sheet of paper on your screen. As you can see from Photo 1, it has 20 rows and four columns. Each location in this grid is identified by the number of the row and the letter-code at the top of the column, for example, A1. The cursor in VisiCalc is much wider than the usual single-character cursor; it takes up the entire entry that it occupies on the grid.

The amount you can store is limited more by the size of your com- puter's memory than it is by the VisiCalc sheet.

Any entry on the sheet can either be a number, a word, or a function of the contents of other locations. This is one of the reasons that VisiCalc is so powerful. Whenever a location is changed by the user, *all of the locations that depend on it are automatically recalculated.* It is this aspect of VisiCalc that is so striking and so useful.

Let us say you have told the VisiCalc sheet to derive column C in some way from columns A and B. Then if, for some reason, you change any of the values in columns A or B, new



Photo 1

results in column C will be displayed automatically. This is like using FOR . . . NEXT commands in immediate mode without ever having the contents of your memory leave the screen.

Although what you see is limited by the number of spaces that can be displayed on your screen at once, the electronic sheet is actually much larger. There are 254 rows and 63 columns where information can be stored, and the amount you can store is limited more by the size of your computer's memory than it is by the VisiCalc sheet.

Keeping track of the remaining memory is very simple since it is constantly displayed in the upper right hand corner of the screen.

You may only see 20 rows of data at one time, but the number of columns can be varied by changing the width of the columns. You can also store more information in one of the grid locations than it appears able to hold. The system will remember exactly what was entered regardless of how narrow you choose to make the visible col-

umns. The screen will display as many characters as you allow for, beginning from the left of your input.

In addition to the grid, there is space at the top of the screen where other important information is displayed.

The white bar displays the contents of the location where the cursor is currently residing. This can either be a value (V) or a label (L). These terms are analogous to numeric and alphanumeric variables that one deals with when using Basic; except just a value can be an expression referring other locations in the table.

The Clear command requires three keystrokes, a fact that saved me from clearing the VisiCalc sheet at a time when I was really trying to do something else.

Two Independently Scrollable Windows

If you are not satisfied with the information that you can see on the screen at one time, you can split the screen in either the horizontal or vertical direction and look at whatever portion of the sheet you like in either window. A common use of this feature is to display the upper left corner of your sheet in the left window while the lower right portion of your work is displayed in the right window. That way you can change your initial entries and watch your totals change at the same time. Photo 2 shows an example of how this might be put to use while analyzing the family budget for the upcoming year. Instead of wondering idly what would happen to your savings for the year if the electric bill goes up five dollars a month, you can find out just by typing over the information that you would like to see changed. As you might guess, this will change the entire row that lies beyond the changed data, along with all of the column totals that depend on these figures.

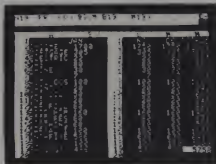


Photo 2

The Replication Feature

Another impressive feature of this system is the ability to replicate similar functions down a row, across a column, or in both directions at once. For example, if you wish to have VisiCalc derive values for column C by subtracting those in column B from the corresponding values in column A, all you need do is type in the directions for the first location in column C along with directions for replication. This will cause column C to be completed in an instant.

If you are trying to complete a table of entries that depends on the values stored in the top row and the left hand column, all you need do is supply the directions for the entry located at row two, column two along with the replication commands and the screen will fill before your eyes, much faster than most users could type in the specific formulas to perform such a task.

Cursor Control

The — and — keys are used to move the cursor from side to side and up and down, while the space bar is used to change the direction of cursor movement from horizontal to vertical and back. For rapid movement you can hold down the repeat key. There is also a GOTO command that allows you to move the cursor to any location on the sheet with just a few keystrokes.

The little dash in the upper right hand corner of the sheet tells you which way the cursor is currently prepared to move. The letter next to this dash, either a C or an R, lets you know the current direction that the recalculation will occur in. You can instruct VisiCalc to recalculate down the columns (C) or across the rows (R). This will depend on how you have set up the entries in your table.

The ESC key is used to recover from simple typing mistakes. If you press it often enough it will erase all

VisiCalc Functions

SUM	Calculates the sum of the values in a list
MIN	Calculates the minimum value in a list
MAX	Calculates the maximum value in a list
COUNT	Results in the number of non-blank entries in a list
AVE	Calculates the average of the non-blank values in a list. The maximum number of values in the list is 255.
NPV	Calculates the net present value of the cash flows in a list, discounted at the rate specified. The first entry in the list is the cash flow at the end of the first period, the second entry is the cash flow at the end of the second period, etc.
LOOKUP	Used with a list of items that are ranked in ascending order. This function returns the value from the list that is less than or equal to the value referenced in the command given.
PI	Returns the value of 3.1415926536
ABS	Returns the absolute value of the value given
INT	Returns the integer portion of the value given
EXP SQRT	Calculates the appropriate function. The trigonometric calculations are done in radians
LN LOG10	
SIN ASIN	
COS ACOS	
TAN ATAN	
NA	Results of a calculation are not available. This makes all expressions using the value display as NA.
ERROR	Results in an "Error" value that makes all expressions using the value display as ERROR.
>>>>	This means that there is not enough room to display the calculated value in the room available. Making the columns wider will often allow the value to be displayed.
Scientific Notation	VisiCalc will automatically shift to scientific notation if necessary in order to display a value in the space allotted.

Table 1.

VisiCalc, cont'd...

that you have typed in since you last hit the return key. As you enter data for a given location it appears on the so-called prompt line, the line between the white box at the top of the sheet and the grid. When you close an entry by hitting return, or moving the cursor to another location on the page, the contents of the prompt line are calculated (if necessary) and placed in the location on the grid that you have just dealt with.

More Functions And Commands

There are a number of other functions that are available to VisiCalc users. These are all listed in Table 1, but a few deserve special mention. The sum function is especially useful to anyone dealing with columns of numbers that must be added. (Think of all the time operators of small businesses can save by not having to bang number after number into a calculator. With VisiCalc they only need to be written once.) You can also ask for the average of a range of values along with other common functions used in business, science, and mathematics.

The list of commands is also impressive. With a few key strokes you can blank out any location, add or delete a row or column, move a row or column to a new location on the page, or repeat a number or letter across any location in the grid. This last command is especially useful for drawing lines across the page like those in Photo 1. There are a number of commands that can change the format of a given location or the entire window that the cursor is located in. The choices for these format commands include: general, integer, dollars and cents, left- or right-justified columns, and graphing. This final command can be used to construct simple bargraphs for information displayed in a range of entries selected by the user. This is shown in Photo 3.

Other commands couple or uncouple the movements of pairs of windows, fix the titles on the screen

as the cursor moves down or to the right, and replicate formatting across a whole column or row, or the entire contents of the current window. These commands require between two and five keystrokes each depending on what is being accomplished. (The Clear command requires three keystrokes, a fact that saved me from clearing the VisiCalc sheet at a time when I was really trying to do something else.)

VisiCalc manages its own storage in its own format. It provides storage commands allowing you to save files on disks or cassette tapes, load files from a disk or a cassette, delete a file from a disk, or initialize a blank disk so that it will be ready to receive VisiCalc files for storage. It is easy to ask for a list of the file names on a given disk. You can also print the contents of your sheet on a disk as a "text file." This file can be read by other programs in Basic, for example, and the information can be further processed in this manner. (This feature permits you to perform whatever other functions you may feel are missing.)

Similar commands will result in the printing of your electronic sheet by your printer. The output will be what is actually on the sheet, as opposed to what appears in the window, so be sure to pay attention to the line width of your printer. In any case you can specify the portion of the page that will be printed with the issuance of the proper print command.

Stay Tuned

Your purchase of the VisiCalc package includes an instruction book that contains an introduction and four lessons. As I read through the book and carried out the examples I found the text to be easy to understand. The explanations were certainly clearer and better than those I have seen in most systems programming manuals. Along with the book, which is in a handsome 10 x 7 1/2 inch three-ring binder, you receive the VisiCalc reference card. This contains a summary of all of the VisiCalc commands and functions and is extremely useful for users who are new to the system. It would also be invaluable to infrequent users. When you send in your warranty card you will receive the first copy of the VisiCalc Newsletter free. Original owners are also protected from any defect in the disk for 90 days, and replacement thereafter for \$15.00.

The people at Personal Software, Inc. are planning to improve the system and offer the updated versions to original owners at a reduced price. They also encourage users to suggest changes and additions to improve the system. As a VisiCalc user I would suggest that they add some of the more

commonly used statistical functions to those listed on Table 1. The ones that I would suggest would be: standard deviation, one or more correlation coefficients, and perhaps the ability to do a t-test and a least-squares linear regression; but new functions, must use up too much memory.

Whenever a location is changed by the user, all of the locations that depend on it are automatically recalculated.

Machines And Memory Requirements

Although the version I used was designed for an Apple system, it will soon be available for other makes of small computers including Pet and Atari. It is only available on disk and requires a minimum of 32K of RAM. Additional memory will allow for the storage of a much larger electronic sheet but all of the systems' features are available for users of 32K systems.

The version that I used (version 35) requires 23K for the resident program. This means that for a 32K system there remains only 9K for storage of the electronic sheet. This still allows for a reasonable amount of storage, but for most business applications it would be a good idea to have 48K available.

Worth The Money?

If you are in business, the chances are that the cost of a VisiCalc disk will be one business expense you will gladly bear. The current suggested retail price is \$150.00. This may be a bit steep for someone who only needs to do his check book and the family budget, but for almost anyone in business, education, or any science-related field it is not only worth the initial expense, but reason enough to purchase a small computer system in the first place. □

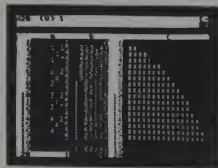
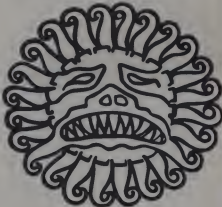


Photo 3





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Asteroids in Space

Chris Vogeli

Have you ever been in a game arcade and watched as some poor soul dumped megabucks worth of quarters into a game? Many have turned into game addicts, spending \$10 and more each night in order to become the 'best' at one game of skill. At present, the most popular games are Space Invaders, Galaxian and Asteroids.

Predictably, the hottest software packages on the market are adaptations of these arcade games. Super Invasion for the Apple II is currently the most popular computer game, largely owing its success to exact adherence to the arcade format. A new program, Asteroids in Space, is in the same vein as Invader. Asteroids for the Apple II duplicates the fun and excitement as well as the superior graphics and strategy of the arcade version of the game.

Asteroids is written in machine language and can be run on either the



Apple II or the Apple II Plus (requires 32K and disk). The game offers the options of a demo or 'attract' mode plus selection of fast/slow missile and asteroids speeds. The rotation, thrust and missile cannons of the players ship are controlled through the Apple game paddles. In the game, the ship starts at the center of the screen and asteroids bombard it from all directions. The player must move and/or rotate the

ship to avoid asteroids and destroy them with missile cannons. A missile hit on a large asteroid sends up to 4 small chunks reeling through space which must also be destroyed with the cannon. As the game progresses, increasing speeds and more asteroids make winning no easy task. To compound problems, a small alien flying saucer, bent on destroying your ship, is randomly released. Warning: The alien is loaded with torpedoes and very rarely misses.

All in all, Asteroids in Space makes for an exciting game and certainly is worth \$19.95, and probably a substantial savings in the long run compared to 25 cents a play in the arcades.

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Computer Bismarck

Randy Heuer

It is difficult to determine just what features make a computer simulation enjoyable. Using very vague terms, a computer simulation should be challenging but not impossible, and of course should be something that would ordinarily be difficult to do without the aid of the computer.

Perhaps one of the first "good" computer simulations was the classic "Star Trek" game. The commander of the *Enterprise* was faced with two separate challenges in each game. One was the strategic problem of the overall destruction of the entire Klingon fleet in a given amount of time. The other was the tactical challenge of handling the combat situation in each quadrant.

Admittedly, most "Star Trek" type games are generally not difficult to win after several sessions, but the length of time "Star Trek" has endured attests to its popularity. Some more recent good computer simulations that come to mind — although not all conflict simulations — are *Galactic Empire* (Softside), *Three Mile Island* (Muse) and *Air Traffic Controller* (Creative Computing). All of these simulations feature an overall problem that is overcome by solving many small problems. It is this two-step thought process that makes these games interesting.

Now there is a new simulation on the market which again confronts the player with an overall problem that can only be solved through the solution of many small problems. *Computer Bismarck* is perhaps one of the most complex home computer simulations produced to date. Its level of complexity may be too much for some; however, for those who find most computer games dull after a few sessions, *Computer Bismarck* may provide the challenge they've been seeking.

The Historical Perspective

For those not familiar with World War II naval history, I'll briefly outline the situation that *Computer Bismarck* attempts to simulate.

At the beginning of the war, the

German battleship *Bismarck* was probably the finest battleship afloat. Although the British possessed a greater number of capital ships, none of her battleships could match the *Bismarck*.

In late May 1941, the *Bismarck* and the cruiser *Prinz Eugen* left port from Bergen, Norway. Their mission: to intercept Allied merchant convoys supplying England with vital war supplies. The U-boats had already deeply hurt the British war effort, and these immensely powerful German surface ships loose in the Atlantic could completely disrupt this tenuous link.

The next few days would prove to be fateful for both sides. In the first engagement between the German duo and the British battleships *Hood* and *Prince of Wales*, an early salvo from the *Bismarck*

The diversification of the German player's possible strategy also makes it difficult to determine whether the computer is really playing a good game or randomly wandering about the map.

penetrated the *Hood's* deck, exploding the ship's main ammunition magazine. In a matter of seconds, the *Hood* sank and over 1400 men died. The *Bismarck* then escaped the shadowing British cruisers.

However, fate soon turned against the *Bismarck*: a lucky hit from a British Swordfish torpedo plane disabled the *Bismarck's* steering while she was steaming toward France. With the *Bismarck* practically helpless, the British engaged the German ship with a sizable force of ships, and after a few hours the *Bismarck* went down with over 2200 men.

The Simulation

So much for what really happened. The computer simulation, though, lets us explore the many things that *might* have happened. In *Computer Bismarck*, players take the role of the commander of either the British or German fleets. Or a lone

player may command the British fleet while the computer controls the German forces.

Two versions of the program are presently available. The one reviewed here is the 48K Apple version (for ROM Applesoft). This package requires a disk drive and retails for \$59.95. (A less sophisticated cassette version for a 16K TRS-80 is also available, but since I have not seen it I cannot say what the similarities and differences are from the Apple version. The TRS-80 version sells for \$49.95.)

The Apple version comes packaged in a rather oversized box about the size of many of those "bookcase" games from Avalon Hill and others. Rattling around inside are an instruction booklet, two sets of playing charts, a pair of very nice maps laminated in plastic, two grease pencils and the diskette. The multi-colored maps are coated with plastic so players may make notations on the maps with the grease pencils and then later erase them.

The rules are long and fairly complex; however, it is important that the players become totally familiar with the rules before attempting to play *Computer Bismarck*. I know that many people reach right for the diskette after buying a software package, but this is one of those games where not having a very clear understanding of the rules and their implications will be disastrous. In fact, I think I can safely say that most people will find this simulation impossible to play without reading the rules and having them nearby the first few games. The separate playing charts are also very helpful; indeed, unless you memorize all the necessary values, it's imperative that these also be on hand while playing the game.

For those people unfamiliar with conflict simulations (such as any of several published in board-game form by companies such as Avalon Hill, Simulation Publications, etc.), a grid is placed over a map of the field of play to facilitate movement. In *Computer Bismarck* a 20 x 18 grid is superimposed on a map of the North Atlantic. Each of the ships and planes involved is assigned a series of numerical ratings to represent characteristics such as speed, endurance, firepower, ability to absorb damage, detectability and search capabilities. On a given

Bismarck, cont'd...

turn, a player may usually move any or all of his units up to their movement limits. Thus the simulation is much more dynamic (and realistic) than games such as chess. Another feature unique to conflict simulations is that the element of chance may effect the outcome of a particular battle, although the player with superior forces will usually win. But nothing is guaranteed.

Perhaps the most unusual feature of *Computer Bismarck* is the fact that neither side is aware of the location of the other's forces except when a sighting occurs. The computer keeps track of the necessary numbers and determines whether opposing units can see and attack each other. Thus the players get the feel of the total blindness that the actual commanders must have experienced. It is this feature that makes *Computer Bismarck* unique among computer games and board games alike. Experienced wargamers will find this element particularly satisfying and frustrating at the same time.

The Program

We now get to the software itself (finally).

The game is played entirely on the

monitor or TV screen. Before each player moves his units, a high-resolution map, with the present locations of the player's units, is displayed on the screen. The map itself is very well done, and the only small complaint I can register is that the movement-grid is not also superimposed; I believe this could have been done without serious program modification.

This is one of those games where not having a very clear understanding of the rules and their implications will be disastrous.

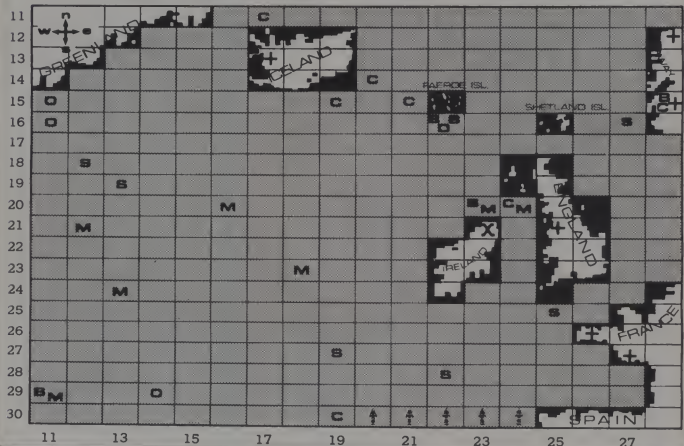
It's also a bit difficult from looking at the screen to determine which unit is which, as all the battleships are represented by B's, all the cruisers (light and heavy) are represented by C's, etc. Given the resolution problem of small computers, I don't know how this problem could be handled effectively. One solution might be to provide the players with cardboard counters like those in board games and let the players move them about on the laminated maps. I suppose people could

make their own. (I should point out that if a player forgets the location of a particular unit, there are a couple of commands that provide either the present position of the unit when given the unit's name, or list the names of the units at a given gridpoint.) Despite these minor complaints, the display is fairly functional after one masters the command lists.

Players control the movement and actions of their units via a two-level command system. The player enters a two-character code for whatever action or display he wishes. To move his units, the player enters the appropriate code and then refers to the second command menu. The ships or planes that may move at this turn are then listed one at a time, and the player may enter the appropriate movement commands. As the player enters the movement commands, the units are moved about the screen — although a player may change any or all of his moves until he enters the DM (done move) command. At this point the other player moves his units via the same process. The actual updating of positions is done simultaneously by the computer after both players are finished.

Neither player is aware of the location of the opposing units unless a sighting occurs. This is accomplished by displaying only the player's own units on the screen

COMPUTER BISMARCK



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Judging by the letters we've received from buyers of Computer Bismarck,™ home computer historical wargaming is a great mind-stretching recreation to uncramp the old synapses after a few hours of trying to cram 54K of code into 48K of memory. But before you read any further, let us warn you that our new game, Computer Ambush,™ is more gut-wrenching than mind-stretching.

Strategy versus Tactics

Computer Bismarck is a "strategic" wargame, casting you in the role of a British or German admiral coolly deploying fleets of ships and planes. Computer Ambush is "tactical"...tough and dirty street fighting in a half-ruined French town.

You're a Sergeant

You command a squad of ten infantrymen (either American or German). Each man has a name, rank, and such individual combat skills as footspeed, strength, intelligence, endurance and marksmanship...all of which affect the success of every move you order. Your squad is armed with grenades, rifles, automatic weapons, plastic explosives, bayonets, and even garottes. You fight with carefully-aimed shots, area bursts, explosions, and hand-to-hand combat. They can result in wounds or deaths, depending on time, distance, the individual skills of each soldier, and your ability as a squad leader.

Battlefield

Street fighting is the most challenging tactical command situation in modern warfare. Using "Higher Text", a character generator, the computer displays a map showing buildings (your plastic explosives can turn them into rubble during the game), walls, hedges, doors, windows (nasty sniper positions), and each of your men by name. The enemy is usually hidden.

Play the Computer

The computer plays the German squad leader (Feldwebel Kurt Reich) to perfection. It defends the town with sniping, machine guns, grenades, and finally, with hand-to-hand combat.

You're Sergeant Buck Padooka. You maneuver your men and fire at revealed and probable German positions. If you kill all the Germans before they get you, the town is yours. But the computer's a tough, experienced squad leader, so don't expect to win very often.

Play a Friend

You take turns examining the



video map display, moving your men, and firing weapons. Your options are limited by casualties, wounds, physical exhaustion, ammo supplies, terrain, and the individual skills of each of your men. The same is true for your opponent. And every action takes precious time, even the flight of a grenade or bullet. (Remember, time is life or death on the battlefield and in Computer Ambush!) After each turn, the computer displays the movements and weapons fire of both squads as tracks on the video map...just once, so watch carefully to figure out where the enemy is, or was.

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The time pressure and complexity of Computer Ambush create the stress of actual combat command. Your palms sweat as you watch PFC Chuck Lawson get blown away by that damned Kraut machine gun you forgot when you ordered him to sneak across the alley. If you can imagine a game that's more complex than chess, requires much faster decision-making, rewards courage and cruelly punishes foolhardiness...that's Computer Ambush!

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Bismarck, cont'd...

during each player's turn. Before the game, each player enters a secret password so that his opponent can't see his map (unless the opponent knows his password). This is a worthwhile feature, although one player must leave the room on the other's turn.

The computer opponent (nicknamed "Otto Von Computer, Simulated Admiral") is also worth commenting on. Perhaps the biggest problem most wargamers face is finding an equally fanatical opponent to play against. *Computer Bismarck* solves this problem by providing a series of subroutines to play the role of the German commander.

"Otto" appears to play a fairly respectable game. I say *appears to*, since with the hidden-movement rule (and the fact that the program is LIST protected), I can judge "Otto's" ability only from the limited experience of a few games. The diversification of the German player's possible strategy also makes it difficult to determine whether the computer is really playing a good game or randomly wandering about the map. Generally speaking, "Otto" makes particularly good use of his U-boats and seems to use good judgment as to when to attempt to break his surface ships out into the Atlantic.

The typical game of *Computer Bismarck* lasts from two to five hours.

Fortunately for those of us who rarely have a continuous block of time like that, a game may be saved on diskette at the end of any turn. Thus a single game can be played over a period of days. This feature is absolutely necessary with computer games of such duration.

Neither side is aware of the location of the other's forces except when a sighting occurs.

The only major complaint I have about *Computer Bismarck* is the missing tactical-warfare element. Although a player may decide whether to attempt to withdraw a ship, which target to fire upon and whether to fire torpedoes, very few other choices are left to the player once a combat situation occurs. Hits and misses just happen and the player has little control over this action.

In some ways this "missing" tactical combat phase may be somewhat of a blessing for many people who find the strategic portion of *Computer Bismarck* enough of a challenge. However, I find it disappointing that players have so little control over this part of the game after the complete control they've had up to this

point. Maneuvering your forces in the decisive battle would add so much to the game.

Final Remarks

I suppose the final question is whether *Computer Bismarck* is worth the rather considerable cost. The answer really depends upon your taste in software. *Computer Bismarck* is probably not for everyone.

The point which I probably cannot emphasize enough is that it is an extremely complex simulation. In most computer games only one piece may move each turn. In this simulation, however, as many as thirty units may move on a turn. Changing weather conditions, fuel supplies, combat damage, and of course the clock, must all be accounted for in determining a player's overall move. Some people may find this extent of sophistication too much to handle.

However, for those ready for a challenging computer simulation, I enthusiastically recommend *Computer Bismarck*. These people will enjoy the complex problems that this game presents, at times frustrating and bewildering.

For more information on *Computer Bismarck*, contact Strategic Simulations, Inc., P.O. Box 5161, Stanford, CA 94305. □

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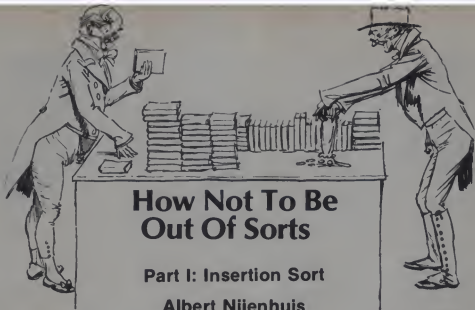
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How Not To Be Out Of Sorts

Part I: Insertion Sort

Albert Nijenhuis

Why sort?

Sooner or later — always sooner than expected — you will have to do some sorting. Your list to be sorted may be a symbol table in a compiler, which has to be alphabetized, or you may want the largest 100 items, in order, in a list of 10,000. Perhaps you are a student who wants to update the mailing list for his school paper. Or, if you have a business, you may want to put in order the recently active accounts before updating the entire file.

Anyhow, computers spend a large amount of their time just sorting one list or another. Finding the right method for each job is therefore of great importance.

A Few Methods.

In this article and in two more parts to follow we will discuss just a few of the many available sorting methods, and indicate situations in which they are particularly useful.

Before you read on, it is useful to ask yourself how you would sort a list of, say, six numbers in increasing order. Chances are you would end up with something similar to the insertion sort which we discuss in this article, or the "bubble sort," which is very similar, and is often used as a programming exercise.

The **Insertion Sort** is extremely simple in concept, and is very easy to program. It is very suitable when, for example, you have to sort lists of length up to about 10. When the lists are longer, the number of comparisons it makes become very large, and the method is definitely not recommended. For short lists it is nevertheless very fast, because there is a minimum of book-keeping involved.

Heapsort is a method which greatly economizes on the number of comparisons that are performed, by using the general principle that if " $a < b$ " and " $b < c$ " have been established, it is no longer necessary to compare a and c . Since the per-step bookkeeping is a bit more involved, it works a bit more slowly on short lists than the insertion sort.

Computers spend a large amount of their time just sorting one list or another. Finding the right method for each job is therefore of great importance.

Both insertion sort and heapsort use no array space except that in which the input data is stored. This feature makes these methods simple to use as a part of bigger programs.

The third method is a **linked merge-sort**, and will be discussed in the third article. It is particularly useful in situations where the items to be sorted are bulky and hard to displace, or where the input data already has so much of the desired order that not using this order would be wasteful. This sorting method does require some working storage, and its program is longer than the other two.

Insertion Sort.

We shall assume that the numbers to be sorted are stored in an array with n locations $a(1), \dots, a(n)$, and the

sorting consists of switching the contents of these locations so these contents are listed in increasing order.

The following way of looking at the problem is extremely important in understanding algorithms: we assume that the first j elements $a(1) \dots a(j)$ are already in order. On first sight this may seem like magic — it may suggest that we have already solved the problem that we wanted to solve. In fact, it does nothing of the kind: whatever magic there is, is in the replacement of the fixed given subscript n by the subscript j which, in principle, take any of the values $1, \dots, n$. The statement " $a(1), \dots, a(j)$ are already in increasing order" will be true for certain values of j and not for others. If it is indeed true for $j=n$, then we are finished, but that is only seldom the case. All we are allowed to assume is its truth for $j=1$, because any list with only one member is automatically sorted. What we shall do is design a method which, assuming the statement is true for any particular j , will cause it to be true for the next value of j . This method will thus lead us, step by step, from $j=1$ to $j=n$.

For example, suppose we had the list consisting of 1, 2, 6, 8, 12, 5. Then the statement is true for $j=5$, but not for $j=6$. To make it true for $j=6$, we compare 5 and 12, and interchange the two because they are out of order. This yields the list 1, 2, 6, 8, 5, 12. Still focusing on 5, we now compare it with 8, and interchange. Next is the comparison with 6 in the new list 1, 2, 6, 5, 8, 12, which again leads to an interchange. The next comparison, with 2, does not lead to an interchange, and we have just achieved the truth of the statement for $j=6$.

The story with general values of j is remarkably the same, though we rephrase it slightly. We first store $a(j+1)$ in b to simplify the procedure. (So, in



Magic Wand Word Processor

Glenn A. Hart

Tastes vary in word processors. Some like the simple, others go for baroque. Here's one with every feature — virtually guaranteed to require a trained programmer for its fancier operations. —TN

The Magic Wand is a complete word-processing package with a distinct approach to providing a complete spectrum of word-processing facilities. Its developers have succeeded to a remarkable degree in implementing their design philosophies, since the finished product is effective and desirable. The Magic Wand is produced by Small Business Associates, 3220 Louisiana, Suite 205, Houston, Texas 77006, (713) 528-5158. Although no 'list price' is specified, the program is available for around \$400.

Design Philosophy

Unlike most complete word processors, the Magic Wand consists of two separate programs, EDIT and PRINT, which must be loaded repeatedly to perform their respective functions. In this sense, the Magic Wand system is similar to separate editor and text output processor programs, but with a degree of integration not usually available from separate programs. One advantage of this approach is that the modules are reasonably sized (EDIT is 13K and PRINT is 20K), and only one must be resident in memory at a time. This leaves more memory room for text and also allows the programs to operate correctly in systems with smaller memory. With the upcoming multi-user operating systems which permit limited memory space for each user, Magic Wand's frugal use of memory may be a major factor in its behalf.

Magic Wand was designed to be as user-oriented as possible within a business context. Since the primary interface with the user is the editing function, the editor was deliberately kept rather simple. There is a definite tradeoff operating here: a

simple editor is easy to learn and easy to use, but does not offer the 'power' of a more complex editor. An analogy to high-level languages is appropriate; there is little that a complex Basic interpreter can do that can't be done with a simpler interpreter, but it may take a few more program steps to accomplish the objective.

Magic Wand's designers also strove to emulate the high-price dedicated word-processing systems as much as possible. A definite attempt was made to limit the number of keystrokes necessary to accomplish each task and to use any available

The Magic Wand system is similar to separate editor and text output processor programs, but with a degree of integration not usually available.

function keys. Each copy is supplied with a customized Reference Card, which shows the specific assignments for the terminal to be used. With my IMSAI VDP-80, the cursor control and many of the special function keys are accurately mapped to the Magic Wand program as the machine designer intended. This is the only commercial program I own which makes use of these special keys, which reduces the amount of memorization required. Of course, use of special function keys does mean using a part of the keyboard not

normally accessed, and it can take some typists a while to become accustomed to these keys.

Since the VDP-80 has a limited number of special function keys, several other editor commands are implemented with single control characters (which are also well chosen). Presumably a terminal with more function keys would have an even more customized layout, while a terminal without any special keys could use standard control characters.

This customization must be a time-consuming and difficult job for the program suppliers, and is indicative of the care and attention to detail that has gone into the program design. Obviously the Magic Wand is sold customized for a specific terminal and printer (Diablo, Qume and NEC Spinwriter versions are available), and no user modification of these parameters is possible. Local dealers are supplied with modules to adapt the program to different configurations when the program is first purchased, or if equipment changes are made later.

The documentation deserves special mention. It is truly first-rate in many respects, and obviously took a great deal of time and thought. Completely typeset for maximum legibility, it is structured as a lesson-by-lesson tutorial for totally inexperienced users. Amusingly, the student is presumed to be Abraham Lincoln's secretary, and early drafts of the Gettysburg Address and various letters are supplied as sample text. The step-by-step approach, and a refreshing sense of humor,

TABLE ONE

Edit System Status			
Reading	Finished	SAMPLE.LET	
Writing	Active	ACTUAL.LET	
Workspace contains 17 Lines/Paragraphs			
Characters	34052-Total	229-In Use	33824-Remaining
Mode: Text			
Line Width: 60			
Tab Columns: 1 9 17 25 33 41 49 57			
•			

Glenn A. Hart, 51 Church Road, Monsey, NY 10952.

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Wand, cont'd...

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Using The Editor

The editor is invoked by typing EDIT with either one or two filename parameters. Using one filename causes this file to be loaded, edited and saved under the same name. Specifying two filenames allows editing an old file and saving it under a new name. A sign-on screen appears, which asks the user to "Mount disks and press return." This procedure allows the text and data files to be stored on a different disk from that holding the programs. Since the programs are reasonably short and don't take up much disk space, this is rarely necessary, and the user usually just hits the return key.

EDIT uses two basic screens: the command screen and the text screen itself. The command screen (a sample is shown in Table 1) displays the files being manipulated, the total memory in the system, how much is being used and how much is available, the current mode, the line width for the display, and the columns currently used for tab stops. The Mode is usually "Text" for normal editing, but special modes are available for editing special files with default parameters different from normal text such as programs.

Various editor commands can be entered when the command screen is displayed, but we will come back to these after examining the editor itself.

The editor is simple and to the point, but behind this simplicity lies some careful design work. Editing is done on a full-screen basis. This sounds obvious, but the Magic Wand allows the cursor to move

anywhere on the screen, even including areas where there is no text. Most word processors store text as a continuous stream of characters, and therefore do not allow the cursor to move into screen areas which appear available but in which no text is stored. The first-time user may not appreciate the difference, but Magic Wand's approach makes editing easier and more natural. (The popular "Electric Pencil" shares this trait. —Ed.)

The editing control keys are shown in Table 2. Note that the commands shown are customized for my system, and will vary from version to version. The cursor can be moved in any direction a character at a time, to the right by tab stops, back to

With any of these commands, the imbedded character which turns the feature on and off can be changed by the user.

the beginning of a line, the upper left screen position with the HOME key, or to the beginning or end of the text. The display can be scrolled in either direction either a line or a screen at a time. (The screen has to be re-written for negative scrolling, which can be a bit slow. This is unavoidable with serial terminals but is a bit surprising with memory-mapped video.)

Text is normally entered without carriage returns, and Magic Wand employs word wrap to move words which won't fit on a line down to the next line automatically. Carriage returns are used only at the end of paragraphs or for blank lines, and are indicated on the screen by a tilde (~). Overwrite mode is standard, which means that a character entered

simply replaces the one under the cursor.

Two methods of inserting text are available. The INSERT key inserts text at the cursor position, pushing characters to the right to make room. Insertion continues until some non-text key like a backspace, scroll, etc. is pressed. There is no indication that the program is in insert mode other than the behavior of the text on display; either a change in the cursor appearance or some flag might have been nice. Insertion of more than a few characters is generally handled better by use of the FULL INSERT key. In the full insert mode, the screen is cleared from the cursor position to the bottom of the screen except for one line of text. The new text can then be entered without movement on the screen which can be confusing. After all the new material is added, END INSERT fills in the rest of the screen with the subsequent text.

Character deletion is straightforward, with following characters moving to the left as deletions are made. The LINE DELETE key removes all text to the right of the cursor on a line; if the cursor is on the left edge of the screen, the entire line will be removed. As a thoughtful safety measure, the LINE DELETE key must be pressed twice to take effect, so an accidental depression of this key will not result in a lost line.

The program permits single or multiple searches or searches with replacement. When the SEARCH key is depressed, the cursor moves to the bottom line of the screen and the search and replacement string, if any, are entered, separated by a colon. The number of repetitions can be indicated by another colon followed by a number or a return to indicate replacement of all occurrences. After the operation is performed, the

TABLE TWO

REFERENCE CARD IMSAI VDP-80 EDIT CONTROL KEYS STANDARD FORMAT

Up Cursor	Up arrow
Down Cursor	Down arrow
Left Cursor	Left arrow
Right Cursor	Right arrow
Tab	TAB
Home	HOME
Backspace	BACKSPACE
Forward Line Scroll	Control X
Backward Line Scroll	Control E
Forward Page Scroll	Control C
Backward Page Scroll	Control R
Top of Text	Control V
Bottom of Text	Control B
Character Delete	DELETE
Line Delete	Control N
Character Insert	INSERT
Full Insert	Control O
End Insert	Control Y
Search/Replace	Control G
Repeat Search	Control F
Block Marker	Control U
Page Feed	Control P
Visible Line Feed	Control Z

TABLE THREE

EDIT COMMANDS

R	Read file into memory
R n	Read n lines into memory
W	Write entire file in memory to disk
W n	Write n lines to disk
WC	Write to cursor to disk
L n	Set line length at n characters
T n	Set tab markers n spaces apart
T n1,n2,...	Set tab markers at specific columns
BC	Copy block to cursor position
BM	Move block to cursor position
BD	Delete block
BK	Kill all block markers
P	Print text in memory
PB	Print block of text
P n or PB n	Print with left margin of n characters
O filename	Display file
I filename	Establish file as include file
I	Begin include sequence
I#	Reset include file to beginning
S filename	Establish file as Print file
S	Begin printing file in background
SX	Stop printing file in background
MT	Change to Text Mode
MP	Change to Program Mode
MA Y/N	Automatic wordwrapping, yes/no
MB Y/N	Blank padding, yes/no
MC Y/N	Display carriage return, yes/no
END	End EDIT, save edited file
QUIT	Quit EDIT, kill edited file
QUITX	Quit EDIT, save file as \$\$\$ file type



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Wand, cont'd...

system indicates the number of replacements done.

If no search string is specified, the program looks for the next occurrence of an exclamation point. This doesn't sound like much, but the manual demonstrates how to set up template letters (in which, for example, only the date and addresses have to be changed) by placing exclamation points where the insertions are to be made. Searching for the next one automatically positions the cursor to the point of the next insertion. Simple, easy and powerful!

Searching is done from the cursor forward only, so global replacements require the cursor to be moved to the beginning of the text. To selectively replace only certain occurrences, a single replacement can be made and the REPEAT SEARCH key used to move to the next occurrence. No provision is made for wildcard or special matching characters, case-independent replacements, or whole word only replacements (although this can sometimes be simulated by surrounding the desired word with spaces when specifying the search or replacement string).

Amazingly, the student is presumed to be Abraham Lincoln's secretary, and early drafts of the Gettysburg Address and various letters are supplied as sample text.

Line feeds can be inserted into the text; this is rarely if ever used in normal material but is handy for formatting Microsoft Basic lines. A page feed character (which appears on the screen as a caret (^)) can also be inserted, and serves as a form-feed indication during printing, and also in the special INCLUDE feature described below.

Blocks of text are delineated with the BLOCK MARKER key. An underline character appears on the screen to indicate the marker, but this is *not* actually an underline. As with most word processors, blocks can be moved, copied to other locations in the text or deleted.

Other editing commands (listed in Table 3) are entered from the command screen described earlier. Hitting the ESCAPE key shifts between the normal text screen and the command screen. Provision is made to read or write either entire files or a specified number of lines, changing the number of characters in a line when printing it on the screen or printer. (Note that word wrap is not operative when displaying or printing from EDIT, so this feature is only useful for checking files; the PRINT module must be used for actual

LISTING ONE

Sample Form Letter

```
\NLS,RN55,COPY0"
\SET ADDR1=" "
\SET ADDR2=" "
\SET ADDR3=" "
\SET ADDR4=" "
\SET ADDR5=" "
\GET ADDR1,GET ADDR2,GET ADDR3,GET ADDR4,GET ADDR5"
\GET COPIES="Enter Copy recipients:"
\GET SALUT="Enter SALUTATION (including ending punctuation):"
\TEXT"
Dear \:SALUT,TAB35\February 22, 1980"

This is the actual text of the sample letter. Note that the
inside address and copy recipients line follow the signature
in the format used.

This version requires the operator to enter the necessary
address, salutation and copy recipient information before
each letter is printed.

Sincerely,"
-
Glenn A. Hart"
-
\:ADDR1"
\:ADDR2"
\:ADDR3"
\:ADDR4"
\:ADDR5"

cc: \:COPIES"
GAH/new"
\NP"
```

finished printing.) For the command screen you may also display a directory of files on any active drive, change mode for entering programs or special material, rather than normal text, change the default tab settings, initiate block moves, copies or deletions, or exit the EDIT program.

Note that files can be printed while editing is in progress. This *background printing* is a form of multi-tasking, and can be a real time saver. (As mentioned above, the file will not be formatted correctly unless it was printed to disk in a formatted version.) As with most such spooling schemes, keyboard response is somewhat degraded, although a patch can be made to the BIOS of many CP/M systems to improve performance in the background printing mode.

Many word processors allow reading text from disk to the location of the cursor. This allows preparation of stock paragraphs which can be inserted into letters, reports, etc. While Magic Wand can handle such 'boilerplate' in the same way, it also has an extremely powerful and simple-to-use special method. A file can be specified as the "Include File," and pre-defined segments of the file can be examined and incorporated into the main file on a selective basis. Alternatively, each segment can be labeled when the file is constructed, and any segment can be added directly to the main file without intermediate steps. This mechanism can also be used to construct 'Help Files' to be used for reference instead of text generation. Such files can provide clerical staff with information on computer procedures,

sales policies, etc.

All in all, the basic editor is straightforward, easy to use and easy to learn, but with deceptive power and flexibility. Obviously there are several enhancements which would be helpful, such as on-screen formatting, the ability to move around a word at a time, deletions of words in either direction, use of reverse video or dual intensity, pattern matching, whole word only, wildcard characters and case conversion in the search and replace mechanism, etc., but these might come at a high cost in both simplicity of use and memory requirements.

Imbedded Commands

The real power of Magic Wand comes from a very extensive set of commands which can be imbedded in the text or issued when the file is printed. The normal procedure is to place the commands at appropriate points in the text, very much like a free-standing text output processor program.

A complete listing of the available commands is shown in Table 4. These commands can be placed *anywhere* in the text, not just in the leftmost column. The normal command indicator is the backslash (\), but this can be changed with the CMD command.

Several of the commands perform straightforward formatting of the page layout to be used. Many such commands take either a character or a numeric parameter which represents a column number or the number of lines involved. A numeric parameter can sometimes be either a positive or negative number to show increments or decrements in the parameter value. Some commands have default parameters which will do a good job on standard text, even if no specific command is given. Left, right, top and bottom margins can be set, line spacing varied (or momentarily disabled for special functions), temporary indentations established, paragraph indentation set (auto-

matic indentation by a specified number of columns of the first line of copy following a carriage return), insertion of 'ghost hyphens' used to split words if they happen to print at the end of lines, etc.

Both flush-left (as in normal typing) and flush-right formats are available. Flush right is useful to line up text on the right margin for headings and special purposes. A literal mode is also provided to disable formatting features for charts and tables. Magic Wand is one of the few word processors to allow multiple line headings and footings in any user-defined format, an important advantage in many business environments. Pagination is flexible, individual lines or groups of lines can be centered, formfeeds can be inserted (either a formfeed character if the printer supports this feature or a series of line feeds if it does not), an 'ignore character' which the printer will disregard can be specified for skipping around in the text, sending special control codes to the printer, etc.

Several forms of justification are possible. With a standard printer, Magic Wand will insert blanks to right justify the line, but with specialty daisywheel or thimble printers other options are available. JUST inserts microspaces between

words, while JUSTC uses a character spreading algorithm. Proportional spacing is also possible with appropriate print wheels, although this feature is not extensively documented in the first release.

Specialty printers are capable of various precision printing modes, and Magic Wand supports them all. CPI determines the number of characters per inch, and defaults to 10 for normal pica-sized printing. The H command can also be used for this function to directly specify the

The editor is simple and to the point, but behind this simplicity lies some careful design work.

number of 1/20" increments to be used between characters.

Magic Wand is also the only program I have seen to incorporate a feature known as 'kerning,' which is evidently a typographer's term for altering the spacing between given letters to improve the appearance of unusual words. Spacing between lines can also be modified to precise values other than the normal six lines per inch with the LPI command, by setting a half-line value with the SP

command, or by directly specifying the vertical increment with the V command.

Underlining (both solid and only under characters) is provided, as are boldface, with variable intensity (number of repeated overstrikes) and superscripting and subscripting. With any of these commands, the imbedded character which turns the feature on and off can be changed by the user. These specialty printer functions can be disabled for printing with a standard printer by the DRAFT command. This is convenient if you have, as I do, both a high-speed and a daisy-wheel printer.

High-Level Language Features

Perhaps the most powerful and unique aspect of the Magic Wand is its inclusion of many commands which are similar to high-level language statements. Display of messages, input of data from the operator, numeric, string, and system variables, conditional commands, comparison operators and variable-length disk data files are all supported. This is very much like having the Basic statements PRINT, INPUT, LINE INPUT, LET, GOTO, IF THEN, TAB, LEN, GET, PUT and others built into the word processor!

TABLE FOUR

PRINT COMMANDS	
LM n	Left margin of n characters
RL n	Right margin n characters from Left Margin
IN n	Indent n characters
PI n	Paragraph indentation of n characters
PL n	Page length of n lines
TM n	Top margin of n lines
BN n	Bottom margin of n lines
LEFT	Flush left format
RIGHT	Flush right format
LIT	Literal format
JUST	Justify using blank insertion
JUSTC	Justify using character spreading
PROF	Proportional spacing
CENTER	Centering format
CTR	Center current line
CPI n	Pitch of n characters per inch
H n	Horizontal movement of n increments per character
K n or -n	Add or subtract n increments to next character
LPI n	n lines per inch
SP n	n spaces between lines
SP+ n	n and a half spaces between lines
SP 0	Inactivate line feed
V n	Vertical movement of n increments per line
CND c	Set c as command marker
HY c	Set c as ghost hyphen symbol
UN c	Set c as underline symbol
UNB	Broken underlining
UNS	Solid underlining
BF c	Set c as boldface symbol
BF n	Set n (1-9) as boldface intensity
BOF 0	Turn off boldface
SSA c	Set c as superscripting symbol
SSB c	Set c as subscripting symbol
IGNORE c	Establish c as Ignore Character
OUT n1,n2...	Output series of numbers to printer
FORMC	Continuous form paper
FORMS	Single sheet paper
DRAFT	Inactivate specialty printer features
COPY n	Process n copies of file
COPY 0	Process indefinite number of copies
PG n	Set current page at n
LINE n	Move down to line n
LINE -n	Move up to line n
TAB n	Move to column n
SETUP	Indicates start of initial setup section
TEXT	Indicates end of initial setup section and beginning of text
NP	New page
NL	New line
FF	Form feed
FORMFEED ON/OFF	Turn on/off mechanical formfeed
START n	Start processing at nth record/page
STOP n	Stop processing at nth record/page
END	End current pass
QUIT	End job
GET var	Go to keyboard for value of variable
SET var="Prompt"	Print prompt on screen
SET var="String"	Set value of var as String
SET #var = n	Set numeric value of var as n
FILE Tn,filename	Set file as Text File with n elements
DATA v1,v2,...	Assign elements to variables
FILE Fn,filename	Set file as Fixed File n characters long
DATA V1(n1),...	Assign n characters to variables
=var	Print full length variable
!var	Print variable truncated to last non-blank character
\$var	Print variable in dollar (decimal) format
DECIMAL P/C	Change to American/International decimal format
#var	Print variable in numeric format
%var	Print truncated length of variable
IF	Beginning of conditional statement
IF NOT	Alternate conditional statement
SKIP	Skip one line of text file
SKIP n	Skip n lines of text file
SKIP TO c	Skip to next occurrence of c
HEAD n	Define next n lines as heading
FOOT n	Define next n lines as footing
PRINT ON/OFF	Turn printer on/off
DISK ON/OFF	Start/stop saving output on disk
DISK filename	Start saving output on disk under filename
VSIZE n	Set n as maximum number of variables
HSIZE n	Reserve n characters in memory for heading
FSIZE n	Reserve n characters in memory for footing
*	Internal note - not printed on screen
NOTE	Note printed on screen
WAIT	Go to keyboard for command
SHOW	Show on screen value of specific variable
DS	Display Status
DV	Display value of all variable
DF	Display value of file variables
DB	Display size of buffers
CLS	Clear screen

LISTING TWO

```

More Complex Form Letter"

\SETUP"
\CLS"
\NOTE This program prepares form letters using the CLIENT.DAT file."
\RM55,COPY0"
\GET DATE="Enter today's date:"
\FILE \10,CLIENT.DAT"
\DATA ,NAME,ADDR1,ADDR2,CITY,STATE,ZIP,SALUT,COPIES"
\TEXT"
\IF EOF=0,SKIP 7"
\MP"
\CTR\Form Letters Sent"

\CTR,DATE"

\=#COUNT\ letters were sent to clients stored in the CLIENT.DAT file."
\FF,QUIT"
\SHOW "Pass ",IPASS," Name: ",NAME "

Dear \SALUT,TAB35,DATE,NL"

This is the actual text of the sample letter. Note that the
inside address and copy recipients line follow the signature in
the format used."

This version runs without operator intervention, printing a
letter for each record in the data file and displaying the pass
number and recipient as each letter is printed. At the end of the
job, a summary is displayed showing the total number of letters
printed."

It would be easy to send letters only to specified classes of
clients by including a code field in the data file and using a
conditional statement to print letters only to recipients with
certain codes."

Sincerely,"
-
Glenn A. Hart"
-
\NAME,NL"
\ADDR1,NL"
\IF ADDR2<" " ,ADDR2,NL"
\CITY, \STATE \ZIP"
-
cc: \COPIES"
-
GAW/nes"
\SET #COUNT=#COUNT+1"
\MP"

```

The uses of these commands vary from rather-simple-but-useful up to extremely-complex-and-powerful. For example, I recently had to send identical letters to clients, with each letter varying only in the salutation, inside address and copy recipients. As an illustration of Magic Wand's power, two examples of a similar hypothetical letter follow.

The simpler text file is shown in Listing 1. The general approach is to have the operator supply the variable information before each letter is printed. The salutation, address lines and copy line are set up as string variables (which are preceded by a colon). The COPY 0 command causes repetitive execution, asking the operator after each letter if he or she wishes to proceed to doing another one. The salutation and date appear on the first line of the letter. CLS clears the display screen, NL forces a new line. The NOTE command displays text on the operator console, while GET VAR = "Prompt" prints a prompting message and then receives the value of the specified variable from the keyboard, much like

LINE INPUT "Prompt." VAR in Basic. Flush-left printing is specified, since justification tends to make a letter look computer generated and is not generally desirable in business use.

Note that the date in this version was actually in the text itself. If the same letter would have to be sent some other time, the SETUP/TEXT commands could be used to establish a body of commands preceding any text which would be used only during the preparation of the first letter. The date could be requested in this section and would not have to be asked for again. In Listing 2, this method is used.

If no search string is specified, the program looks for the next occurrence of an exclamation point.

Listing 2 also demonstrates the use of data files. Magic Wand allows definition of variable or fixed length data files with any number of data items in each record. The FILE command specifies the name of the data file (which must have been prepared previously) and how many data items are included in each record. DATA assigns a variable name to each item which can then be used in the text file. Note that not all elements of each record must be used in any given application; commas are used to skip over unused items. This allows a comprehensive data file to be established with complete information on all clients. It

LISTING THREE

Sample Data File

```

RECORD #1"
Mr. John Bigshot"
Amalgamated Industries"
123 Broadway"
Anywhere"
N.Y."
10000"
Mr. Bigshot:"
Harry Flack, George Associate"

RECORD #2"
Mr. Thomas Smith"
Smith Associates"

Suffern"
N.Y."
10901"
Tom,"
Mary Smith"

```

is easy to write a Magic Wand file to help in this process; the file which is created is simply printed to disk (with the DISK ON command) rather than to the printer. A sample of the data file for this job is shown in Listing 3.

Version 2 introduces the use of system variables. Seven such variables are maintained by the program, including the current page number, pass number, record number, line number, and column number. The number of lines from the bottom of the page is available, as is an end-of-file flag to test for the end of data files. Combining these variables with various conditional tests can result in quite sophisticated controls. A conditional statement is used to test for an empty third address line; if the line is empty the program skips to the city/state/zip line without printing a blank line.

This version also adds a management report at the conclusion of the job showing the number of letters printed. The Magic Wand manual shows a much more complicated example, which keeps track of the size of contributions, the number of different types of responses produced, etc. All this can be done through use of system variables, user-defined counter variables and conditional branching.

With this version, operation is totally automatic once the date is supplied. Single sheet letterhead was used, but with either continuous forms or letterhead typed onto computer forms the entire job would be completed without operator intervention. Envelopes can also be typed onto forms, usually over the printed letterhead area, and the Magic Wand text file can easily print the envelopes in the same pass.

The Print Program

When PRINT is invoked, the user is given a chance to mount different disks, as in EDIT. The program then prompts with a backslash. At this point, hitting RETURN will start printing, using either default settings for page layout or the values imbedded in the text itself. Any imbedded commands will be executed, including all the prompting, operator

input requests, data file accesses, etc. described above.

When the backslash prompt is displayed, valid formatting commands can be given to change the value of a formatting parameter. The new value will be used unless a command imbedded in the text overrides it. If the user enters DS for

Design of more complex jobs is far less simple, and I feel that some experience in programming is a definite plus if not a requirement in extracting the maximum benefit from the program.

Display Status, the screen shown in Table 5 appears. The current values for all important formatting variables, the current position in the file, the current values of the various recognition characters, etc. are displayed in an excellent format. Commands can be entered continuously to change these values, until a simple RETURN starts printing. Since printing can be interrupted at any time by hitting the space bar on the console, printing parameters can be modified

TABLE FIVE

Print System Status		Pass 1
Input File DEMO.TXT		
Format Left Flush	Printer: Diablo 1650	
PL - Page Length 66	Diskout:	# Variables 0
TM - Top Margin 0	Forma	Ignore Char
BM - Bottom Marg 6	Line/In 6	Cond. Hyphen &
LM - Left Margin 10	Chars/In 10	Underscore Solid
RM - Right Marg 60	Page 1	Boldface Intensity 1
IN - Indentation 0	Line 0	SSA (Above) (
PI - Para Indent 0	Column 1	SSB (Below))
SP - Spacing 1	Source Text	Command Mark \

during mid-run if desired.

Other print-time commands can display the value of various variables and the size of various buffers, start or stop printing at specified page numbers, end processing, etc. Formatted output can be sent to either/or both the printer or to a disk file for later printing in the background mode. If the text file includes commands to SHOW the value of variables, the screen can be made to display the pass number or other useful data while the file is printing.

Summary And User Evaluation

Even with the lengthy explanations and examples I have provided, I have not covered all the possible uses of the Magic Wand. The high-level language features make it possible to perform almost any conceivable word processing job.

Preparation of day-to-day business

correspondence and reports is simple and easy to learn, due to the basic simplicity of the editor and the well-chosen default settings for the PRINT program. Personal experience has shown that secretarial staff take to the system quite readily and can begin to use the program quickly and efficiently.

Design of more complex jobs is far less simple, and I feel that some experience in programming is a definite plus if not a requirement in extracting the maximum benefit from the program. The ability to structure extremely powerful programs that are easy to use by clerical personnel well repays the effort expended, especially for legal offices and other business environments where repetitive but variable letters and contracts are commonplace. The Magic Wand is one of the most flexible word processing packages available, and should be considered by any potential word processing purchaser. □

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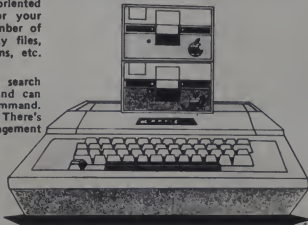
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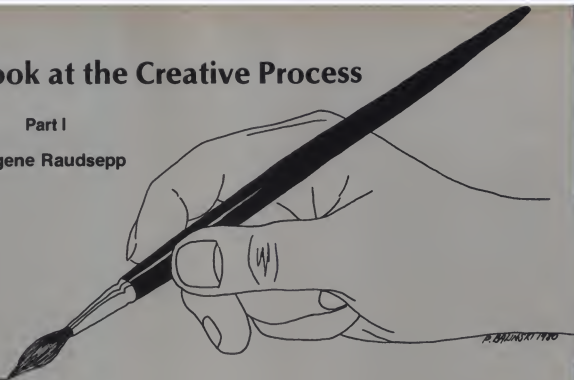
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A New Look at the Creative Process

Part I

Eugene Raudsepp



If you would intuit, get intuit. — Ed.

One of the most persistent notions about creative ideas is that they come in a flash-like and spontaneous fashion. Perhaps one of the best metaphorical descriptions of the sudden, flash-like birth of the creative idea comes from the contemporary composer, Paul Hindemith. Although written about musical composition, his apt metaphor describes equally well how *some* creative conceptions occur in science, engineering, and invention.

We all know the impression of a very heavy flash of lightning in the night.

Behind the genius there is always a vortex-like intensity, a forceful plan pushing his creative endeavors.

Within a second's time we see a broad landscape, not only in its general outline but with every detail. Although we could never describe each single component of the picture, we feel that not even the smallest leaf of grass escapes our attention. We experience a view, immensely comprehensive and at the same time immensely detailed, that we never

could have under normal daylight conditions, and perhaps not during the night either, if our senses were not strained by the extraordinary suddenness of the event. . . . Compositions must be conceived in the same way. If we cannot, in the flash of a single moment, see a composition in its absolute entirety, with every pertinent detail in its proper place, we are not genuine creators.

Psychologist L. L. Thurstone also regarded the dramatic and sudden moment of insight or illumination as characteristic and critical in creative conception. He considered insight to be the main key to the entire problem of invention:

The moment of insight is the critical moment. The thinking that precedes the moment of insight is different from the thinking that follows that moment. We might define the moment of insight as the main characteristic of work that is called creative. . . . The act is creative if the thinker reaches the solution in a *sudden closure* which necessarily implies some novelty for him.

Although it is true that some creative ideas, solutions to problems and inventions, undoubtedly owe their existence to spontaneous insight, a closer study of the creative process indicates that most ideas do not issue from a full-blown, precisely delineated and firmly structured insight. Neither is the subsequent process of forming and developing the idea always a spontaneous flow of suggestions from the unconscious, reducing the creative indi-

vidual to a passive transcriber of dictated ideas.

The dramatic instance of a sudden illumination that enables the creative engineer to perceive the entire novel idea, process or device is in reality a rare and over-publicized phenomenon, grossly exaggerated in the accounts creative individuals themselves have left behind. It is even more unfortunate that this romanticized exaggeration about the

The individual often loses respect for the person initiating the attack. He soon refrains from suggesting anything at all.

sudden complete vision of a new invention, product or idea has become a firmly rooted notion among our own contemporary investigators and writers on creativity. The perpetuation of this notion can only convince those who fail to experience such apocalyptic visions that they really do not have creative talent, when, in fact, they may have it to a considerable degree. There is also little doubt that this notion has dissuaded many budding and promising creative engineers from whole-hearted application of their talents. It would, perhaps, be encouraging for them to know that the ideas that have been developed into completed forms are seldom conceived minutely and clearly right in the beginning of the creative process. The

Eugene Raudsepp, Princeton Creative Research, 10 Nassau St., Box 122, Princeton, NJ 08540.

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New Look, cont'd...

creative idea, with only rare exceptions, is initially anything but sharp and sustained, issuing effortlessly into expression. If it really were so, it would reduce the creative process to a noncreative mechanical copying of all the elements that were presented to the creative person at the moment of a single, comprehensive insight. As will become apparent, the process of creating is anything but mechanical or passive copying.

He cannot view the finished product with the same ardor or feeling as the act of creation. The felt value of the idea usually abandons the creative individual at the completion of his work.

Close scrutiny of the creative process shows that what occurs during the act is a slow, selective structuring of an idea that is initially only imperfectly intuited, and which follows the dictates of an intuitive feeling of what belongs and what does not belong, what is proper and what is not. It is a gradual, frequently elusive and groping clarification of a dim and vaguely perceived idea. Perhaps the best way to illustrate this process is through a metaphor.

Let us imagine that we stand at a shore on a foggy day and see a ship sailing in the distance, shrouded by a low, shifting, overhanging fog. Fixing our eyes on the probable course of the ship, we may alternately catch a glimpse of a piece of the white sail, or the top of the mast, or the surging prow. The whole thing is never in full view, yet we know that it is there, and eventually we can construct an image of the entire ship. In a similar fashion, an individual in the beginning of the creative process senses the total structure of his idea when only a limited number of details of the new emerging configuration are clearly perceived and delineated. He starts elaborating on the single detail or piece of an overall idea he perceives, and this process of elaboration and shaping of the detail helps other details to emerge. Provided critical judgment is held in abeyance, these details often fall into their proper places spontaneously. Thus the initial idea, rather than being a comprehensive survey of the whole new conception, is often merely a fragmentary particle of the total new idea still to emerge. Although some intuitive anticipation of the original total concept has to occur in the beginning, it is the process of shaping the elusive, fragmentary insights that actually brings it into being. However, the shaping of a new creative product may

proceed with unflinching orientation and discrimination even if an awareness of the total meaning of the new idea is not conscious or is only imperfectly so. Nevertheless, the implicit total idea or concept controls the entire creative process — so much so, in fact, that it is impossible for the creative engineer to impart elements into the evolving idea that do not jibe with the commanding *gestalt* of the original conception.

It is the *intuitive sensing* that serves as the all-important measure of the elements to be incorporated into the creative product, and not an all-embracing insight. William J. J. Gordon of Synectics, Inc. has empirically observed intuition *in vivo* with his invention design group. According to him, "intuition is an inner judgment made by the individual about a concept relative to a problem on which he is working. . . . The individual with good intuition is the one who, beyond what could be expected from mere probability alone, repeatedly selects the viewpoint which turns out to lead, for instance, to a great painting or an important invention."

In a vital sense, the creative process can be considered as a movement: from the amorphous, dimly and vaguely perceived idea toward a more intelligible structure as the work progresses; from obscure, incommensurable inwardness toward resolved and tangible clarity; from the implicit toward the explicit; from the vaguely intuited toward the known; from the dimly intuited and chaotic toward the reasoned and organized; from the vague meaning toward the clear meaning; from the separate existing paradoxes and contradictory components toward a resolved, unified and logical structure. The emergence of the idea is gradual, and it is only by virtue of the creative exercise during forming that the individual finally succeeds in securing the elusive idea.

Suspending Critical Judgment

The acceptance of proposals as they emerge from the unconscious while one is actually working on an idea is a delicate thing. One has to resist the increasing

pressure of criticism and judgment that the progressively articulated portions of the idea inevitably elicit. For nothing can inhibit and stifle the creative process more — and on this there is unanimous agreement among all creative individuals and investigators of creativity — than critical judgment applied to the emerging idea at the beginning stages of the creative process. Critical judgment early in the process will inhibit, if it does not completely shut off, the forward propulsions of the emerging idea.

A total loss of consciousness of what is going on, or the unconsciousness of the act of creation occurs only during a trance-like absorption of the whole personality in the inspirational flow of ideas.

This does not mean that criticism, judgment and evaluation have no place in the production of new ideas. On the contrary, these functions serve a very useful purpose. But they serve their purpose at the conclusion of the process, when an open and objective assessment of the idea should be attempted and any pride of paternity suppressed. During the heat of the creative shaping and forming of the idea, however, criticism and judgment must be suspended. The individual should only be aware of the suggestions that emerge from his unconscious. No single item that occurs should be pinpointed in the center of attention, for this might inhibit further development of the idea. In a sense, the creative person first feels his idea, rather than *thinks* or *conceptualizes* it. As Brewster Ghiselin has pointed out, "one must learn to seize and hold them (the initial ideas) without insistence, letting them agitate the mind when and as they may and make their own development, relinquishing them as they fade or fail of effect and taking up others to be cherished without attachment in the same way, shaping the expression of the growing insight critically — that is, consciously and rationally, drawing upon all resources of craft and understanding — insofar as that may be done without arresting spontaneous development, always preserving the stir of the excited mind out of which the development issues."

Many creative individuals have indicated how very important it is to be self-consciously absorbed during the creative process. For example, composer Aaron Copland offers the following advice, which, in principle, applies to creativity in almost every other field: "Inspiration may be a form of supercon-



"John! Your scatter plot is scattering!"

consciousness, or perhaps of subconsciousness—I would not know; but I am sure that it is the antithesis of self-consciousness. The inspired moment may sometimes be described as a kind of hallucinatory state of mind: one half of the personality emotes and dictates while the other half listens and notates. The half that listens had better look the other way, had better simulate a half attention only, for the half that dictates is easily disgruntled and avenges itself for too close inspection by fading entirely away."

The contemporary poet Richard Wilbur reminds us of Baudelaire's notion that the creator must be "hypnotist and subject at the same time." "This is ticklish business," says Wilbur. "You have to give the unconscious free play, and at the same time shape the proposals of the unconscious into something that makes daylight sense."

The idea arrives brimming with positive feeling, which gives the creative thinker a poignant sense of certainty concerning its relevance to the problem he is tackling.

Similarly, the great poet-philosopher Frederick Schiller in 1788 warned, in an historic letter to a friend who complained of a lack of creative power, that the intellect should give a wide berth to the incipient ideas in the beginning of the process: "Apparently it is not good—and indeed it hinders the creative work of the mind—if the intellect examines too closely the ideas already pouring in, as it were, at the gates. Regarded in isolation, an idea may be quite insignificant and venturesome in the extreme, but it may acquire importance from an idea which follows it; perhaps in a certain collocation with other ideas, which may seem equally absurd, it may be capable of furnishing a very serviceable link. The intellect cannot judge all these ideas unless it can retain them, until it has considered them in connection with the other ideas. In the case of a creative mind... the intellect has withdrawn its watchers from the gates, and the ideas rush in pell-mell, and only then does it review and inspect the multitude." And James Thurber declared: "Be a guardian not an usher at the portal of your thought."

Many engineers fail to maximize their creative performance because it is hard for them to entertain the elusive and vague thoughts present during the early stages of the creative process. The indefinite, shapeless and disorderly state of mind and the incipient confused excitement that

creative activity engenders are something from which they ordinarily flee. Because of the concrete and practical background of their education and experience, they need a well-defined and clearly blue-printed purpose in view to move with concentration, energy and courage toward a goal.

Critical attitude, according to several psychologists, seems to be the engineer's most notable personality trait, and it colors almost all of his perceptions. The noted industrial psychiatrist Dr. Charles E. Goshen, feels that the hyper-critical attitude, the trigger-ready tendency to judge, stems from the engineer's head to 'always be right' and his extreme sensitivity to criticism. Dr. Goshen believes that the engineer's self-esteem, his self-image and pride hinge largely on his success in avoiding criticism. Consequently, as a defense mechanism, he criticizes approaches to technical problems, as well as people, with equal fervor. This tendency to be overly critical is usually also directed inward, toward the engineer's own thought processes. Consequently, it may well be one of the most negative factors in thwarting creative problem solving.

One of the primary reasons why judicial thinking and creativity make uncomfortable bedfellows is that criticism is based on what is already established, accepted or proved. Critical judgment must have recourse to past experience, precedent and facts—everything that is in the past tense. Being a past-oriented way of thinking, it is essentially opposed to the novel, the untried and the original. Where creative advance is concerned, the past serves only to a limited degree as a guidepost. Of itself, however, it is incapable of either bringing the new idea about or predicting what would happen if it were developed. The knowledge of what already exists also involves a stereotyped orientation. None of the unexpected new combinations, contrasts, balances and configurations of the elements in a creative idea in its formative stage meet the requirements of established laws, facts or logic. A new creative idea is, of course, based on available knowledge, but it does not issue from it by any direct rational or logical process.

We have elevated logic and reason to a level where they stifle creative thinking. This has been pointed out by consultant Dr. A. R. Wight. He states: "Perhaps one of the chief forces that inhibit creativity is the emphasis on logic and reason and the lack of respect for intuition. Logic can destroy creativity if demanded or applied too soon, because a creative idea very often is a product of intuition, and the logic supporting it must be developed. Unfortunately, many people in industry have come up through schools where 'rule and reason' prevail. They thus feel that nothing is worth consideration that cannot be defended by logic."

Failure to suspend judgment and consider a range of alternatives frequently

results in early commitment to an approach that may contain a 'restrictive error' or an 'incurable strategy.' In the perceptual laboratory, for example, subjects who make an early, incorrect interpretation of a picture in an 'ambigu-meter' (a device that gradually brings a blurred picture into focus), tend to retain the wrong perception. They fail to 'see'—even when the picture has been fully and clearly exposed.

The most creative engineers engage in undisdisciplined, open-minded, and uncritical thinking in the initial stages of the problem-solving process. This has been reported by Gary A. Steiner of the University of Chicago. He states: "Highly (highly creative engineers) often spend more time in the initial stages of problem formulation, in broad scanning of alternatives. Lows (less creative engineers) are more apt to 'get on with it.'... For example, in problems divisible into analytic and synthetic stages, highs spend more time on the former—in absolute as well as relative terms. As a result, they may leapfrog lows in the later stages of the solution process. Having disposed of more blind alleys, they are able to make more comprehensive integrations."

The intuitive moment is also frequently accompanied by a sense of compulsion that urges the creative individual to do something right away about the idea.

"Creativity is characterized by a willingness to seek and accept relevant information from any and all sources, to suspend judgment, defer commitment, remain aloof in the face of pressure to take a stand."

Professor Steiner points out, however, that after the initial, open-minded, idea-getting phase, and the examination of many alternatives, the creative engineer exercises critical judgment. He selects the alternative he feels is potentially the best. In the developmental stage a bull-headed conviction about the idea's merit takes over. In professor Steiner's words: "Initially there is an open-minded willingness to pursue leads in any direction, a relaxed and perhaps playful attitude that allows a disorganized, undisciplined approach, to the point of putting the problem aside entirely. But at the point of development and execution, where the selected alternative is pursued, tested, and applied, there is great conviction, even perseverance, perhaps strong personal involvement and dogmatic support of the new way."

Other increasing experimental evi-

New Look, cont'd...

dence also indicates that a constructive, rather than a critical or negative, approach to ideas produces more creative solutions. Dr. Ray Hyman conducted several experiments at General Electric and at the University of Oregon. He compared a positive (or constructive) set and a negative (or critical) set toward both common and uncommon ideas for solutions of a problem. According to him, when subjects review ideas with a constructive set (what are the good points of these ideas?), they come up with more creative solutions to the problem than does either a control group (with no instructions) or the group which has been instructed to use a critical set (what are the weak points?).

The more creative engineers engage in undisciplined, open-minded, and uncritical thinking in the initial stages of the problem-solving process.

Another significant finding of his experiments: those ideas that were reviewed constructively were often incorporated in the final solution. But ideas reviewed with a critical set were almost always rejected.

Another reason why critical weighing during the creative process should be avoided is that it robs the idea of the value and validity with which it is viewed when it first occurs. More ideas have been prematurely rejected by a stringent evaluative attitude than would be warranted by any inherent weakness or absurdity in them. The longer one can linger with the idea with judgment held in abeyance, the better the chances of capturing all its details and ramifications. Overelaboration is no problem, since there is always plenty of time later to prune the idea of the unnecessary details and redundancies that inevitably slip into the new product during the process.

During the heat of creative forming, the creative individual has to abandon himself entirely to his experience and be keenly aware of only the suggestions that emerge from the unconscious. Consciousness of the familiar sort has to be blotted out and he has to be implicated with his unconscious activity only. As in the procreative embrace self-consciousness and self-awareness detract from the intensity and fullness of the lovers' communion, so also in the creative process a lack of total abandon prevents the maintenance of open avenues to the unconscious source of ideas. (Apropos this I would like to mention that the creative urge is just as strong as the procreative

urge, and sometimes creative activity takes precedence — if only because it lasts longer.)

Intrusion of self-consciousness, or a full and explicit awareness of what one is doing, robs the individual of the necessary ardor and excitement that should attend the process, with the consequence that the idea's development may become arrested. Deliberation that is self-conscious can be harmful even when the creative individual is occupied with the more conscious and rational development of his idea, when he is working on already secured insights. Even here a complete absorption in the business at hand is an absolute necessity. Of course, a total loss of consciousness of what is going on, or the consciousness of the act of creation occurs only during a trance-like absorption of the whole personality in the inspirational flow of ideas. The creative act in this case is so intense that the individual creates without knowing that he is creating. But this sort of oblivion to everything, except the suggestions arising from the unconscious matrix, is not the most common experience in creativity. An effortless, unforced spontaneity seldom spans the entire process.

In a sense, criticism and evaluation are at work already during the unconscious gestative or formative process of an idea. And they become more conscious with the progressive structuring of the idea. But as long as they do not hinder spontaneity or break the rapport with the unconscious, their function contributes to the implementation and development of the growing idea. It is often advisable that these cognitive functions remain submerged and secondary even when the polishing stage of the idea is reached and the pruning of redundant matter becomes the primary concern. For even while polishing, the creative individual has to maintain the grasp of the dominant idea and permit further insights connected with it to emerge into his awareness.

Critical Attitudes Kill Ideas in Others

That critical and evaluative attitude can stifle creativity in others has been



"Henri's into creative computing."

noted by many researchers in the field. Dr. A. R. Wight points out that "a person will submit ideas with increasing reluctance if they are pounced upon immediately and subjected to critical and often merciless evaluation. It is difficult for a new idea to survive this kind of treatment. The effect on the individual suggesting the idea is equally devastating."

"Attacking this idea is felt to be, and often is, an attack on him personally. The individual feels hostility toward and often loses respect for the person initiating the attack. He soon refrains from suggesting anything at all. Or, he resorts to second-guessing, in an attempt to suggest something that will be accepted and approved."

Ideas that have been developed into completed forms are seldom conceived minutely and clearly right in the beginning of the creative process.

One way engineers can lessen the harmful effects of negative criticism is through learning to apply tact and diplomacy when they have to criticize. They should be open-minded and receptive toward ideas and suggestions offered them, and be good, understanding listeners. They should develop an ability to evaluate ideas without using external evaluation — that is, they should react to ideas rather than judge them.

The ability to be coolly objective about criticism comes only in time. It is based on a series of solid successes in creative problem solving. No matter how tough the engineer, over-critical attitudes, cynicism, ridicule, or even plain indifference on the part of others toward ideas he comes up with are tremendously destructive of idea-producing ability.

Fear of disappointment and anxiety about disapproval or censorship have prevented many engineers from coming up with original suggestions. What can be even worse, however, is that cumulative experiences of rebuff and criticism can result in a complete paralysis of idea-producing ability. No new ideas emerge, even in the privacy of the engineer's own mind.

Dr. Carl Rogers, one of our foremost psychologists, has advanced some suggestions on how we could establish a climate in which external evaluation is absent. Although utopian in terms of our present organizational set-ups, his notions are worth heeding. He explains it in this way: "When we cease to form judgments of the other individual from our own locus of evaluation, we are fostering creativity. For the individual to find himself in an

atmosphere where he is not being evaluated, not being measured by some external standard, is enormously freeing. Evaluation is always a threat. It creates a need for defensiveness. It means that some portion of experience must be denied to awareness.

"If this product is evaluated as good by external standards, then I must not admit my own dislike of it. If what I am doing is bad by external standards, then I must not be aware of the fact that it seems to be me, to be part of myself. But if judgments based on external standards are not being made, then I can be more open to my experience. I can recognize my own likings and dislikings, the nature of the materials and of my reaction to them, more sharply and more sensitively. I can begin to recognize the locus of evaluation within myself. Hence I am moving toward creativity."

The creative process is a slow, selective structuring of an idea that is only imperfectly intimated, and which follows the dictates of an intuitive feeling of what belongs and what does not belong.

It should be also pointed out that one of the chief values of *brainstorming* lies in its encouragement of a non-evaluative atmosphere. It is a technique for creating a climate in which the participants are free to express any idea — even a wild or far-fetched one — without fear of trigger-ready negative reactions. In experienced brainstorming groups, no-holds-barred thinking, deviant or divergent ideas are consciously encouraged, and there is a supportive atmosphere that encourages the elaboration of these ideas. The non-evaluative atmosphere also enhances the imaginative exploration of their implications, merits, feasibility of implementation and range of applications.

The Emotional Concomitants Of The Creative Process

Among the observable and introspectively reportable characteristics of the arrival of a new idea is the keen *sense of value* that adheres to it. The idea arrives brimming with positive feeling, which gives the creative thinker a poignant sense of certainty concerning its relevance to the problem he is tackling. At times this pleasant shock of surprise and the sense of profound well-being that the idea induces approach the feeling of rapture.

The positive feeling that infuses the

idea undoubtedly lies at the root of many great achievements; still, it is not everything, for the painful process of shaping and forming it into a workable thing still lies ahead. Too often it is believed that the idea is, in and of itself, all there is to the creative process. Yet almost everyone has known idea-men who literally shook ideas from their sleeves, but who never amounted to much because they failed to work them out into something concrete and tangible.

Nevertheless, with most creative people, this emphatic sense of conviction as to the idea's vital import, the joy and exaltation it instills in them, are to a large degree responsible for starting the entire creative process moving. In addition, this positive feeling provides the creative individual with a reservoir of staying power to conquer every technical deficiency or temporary blockage that may occur. It also fills him with a sense of urgency to understand and penetrate to the minutest vestiges of his exalted new idea. That the creative individual feels overwhelming pride about his own ideas is further demonstrated by the fact that when the finished idea, product of device does not meet his approval, he invariably blames his incomplete technical skill or knowledge for his failure and sees no imperfection in his original concept.

It should also be pointed out that the subjective sense of certainty and conviction that the germinal idea induces is as hard and real as the perception of a concrete object. The individual is sure, at the moment the idea occurs to him, that he has seen or grasped the central core or essence of his crucial problem, or that he now has the insight for a vital new invention. At the time the idea occurs to him he needs no proof that such is the case, although doubt and uncertainty about the validity of the idea or new insight may occur later. Nevertheless, the click of recognition that an idea represents something significant is seldom betrayed by a true creative individual because of later doubts, or because of the overwhelming technical demands of the idea's translation into a tangible thing.

The intuitive moment is also frequently accompanied by a *sense of compulsion* that urges the creative individual to do something right away about the idea. The idea demands resolution through explicit overt action and often grows into a full-fledged compulsion if action on it is delayed or postponed. It recurrently invades his consciousness, no matter what he is doing or thinking, and charges his thoughts and perceptions, frequently against his own volition and judgment, in the direction of finding complementary elements or supporting data for the further development of the idea. It may even, at times, obstruct the emergence of other new ideas if it is not worked out.

Many sterile days and possibly weeks

may pass as the result of failure to heed the urgency of certain compelling ideas. They seem at times to have mobilized most of the available psychic energy the individual has, so that, even while he is engaged in some other activity, he often gets distracted in whatever he is doing and feels compelled to return to the original idea, even though the time or occasion for considering it is not propitious. The new idea thus sometimes has the earmarks of obsessiveness or compulsion about it. Indeed, if one observes the creative process at the highest level — at the genius level — this aspect of compulsive urgency is one of the most striking phenomena that occurs.

Critical attitude, according to several psychologists, seems to be the engineer's most notable personality trait, and it colors almost all of his perceptions.

Perhaps the genius should be described not so much in terms of talent or skill as by the intensity of the conceptions he formulates, by the overwhelming and overpowering urgency with which these conceptions surge up into his consciousness, compelling him to form and develop them into a tangible thing. Behind the genius there is always a vortex-like intensity, a forceful plan pushing his creative endeavors.

At the time the creative individual feels the compulsion to do something with his idea he may also be overwhelmed by a *sense of possession*. He may be possessed by his idea in the sense that he feels it comes from some external source rather than from within himself, and that his own consciousness is reduced to acting merely as a passive instrument. These ideas frequently amaze him after he has committed them to paper. After he is through working and can take stock of the entire result, he finds that there are many elements completely different from those he might have been consciously entertaining before starting to work. Often the finished product appears alien or incomprehensible to him, in the sense that he does not feel responsible for it. Try as he may, and irrespective of the pleasure and pride that it produces, he cannot view the finished product with the same ardor or feeling that had attended his experience during the act of creation. The felt value of the idea usually abandons the creative individual at the completion of his work. In case of longer creative problem solving activities, where interruptions become necessary, it is fascinating to note that the initial idea and the enveloping mood can be reintroduced and suffer little or no change in the meantime. □



I bought the last Apple in Paradise, or so I was told. At any rate, it was the last one in Honolulu's Computerland during last fall's hectic Christmas rush. The dream of owning my own computer had been fermenting in my brain for years. I had fantasies of unloading k's of data such as tax and investment records, address lists, checking and savings account records, charge accounts, daily appointments and such, from my over-burdened mind, freeing it for higher order social pursuits. With a new tax year starting and after a thorough evaluation of available computers, I felt the time was opportune to pick up my Apple. I hoped to learn how to operate and program it before the new tax year began.

Dying though I was to get the system up and running, a holiday party prevented me from unpacking it that night. By sunrise the next morning, I had my Apple out of the carton and connected, though a garbled test pattern of question marks and flashing semi-colons was as far as I could get without resorting to the Basic manual. As soon as I got past the section on loading programs, I was off and running with the Star Wars shooting game which entertained my 6 year old daughter, Alexis, and her friend, Tony, for an hour. After they tired of shooting, I attempted to load the High Resolution Graphics program but the complex double load (and a typo in the manual) only got me an hour of frustrating "err's." I managed to load Star Trek but, without instructions, found the game useless.

By noon, the free programs had lost their challenge and I had settled down to learning programming via Apple's well-written Basic Manual. This endeavor was also short-lived, however, when I discovered that my Apple had a worm, or some kind of a bug, in it. After half an hour of operation, any key depressed would

Bill Pumphrey

result in a series of letters as if the repeat key was being held down. A frantic call to Computerland advised me that it could be a defective chip overheating. Sure enough, a fan blowing on the memory board stopped the problem. My wife had been skeptical enough about my \$1200 purchase without her having to see a fan blowing on my fantastic new toy, so I rushed the Apple back to the store, where it was eventually discovered to have a defective keyboard. Luckily, Computerland had a spare one to lend me while mine went back to California for repair.

In the following weeks, I discovered that I must have a binary mind; I took to programming like a bee to honey. By January I had modified an income tax

Worst, while I recalled the colorful Apple ads in Playboy which showed a television screen crowded with colorful graph bars, yet I failed to locate a program which would create such graphs.

program to meet my requirements for numerous supplemental forms and I was making good use of Apple's checkbook program. Some of my dream applications were becoming realities even though several had realistically been dropped. The Apple people had provided many games and other programs free for the taping, so my software collection was growing.

Color graphics was one of the reasons I had chosen Apple. Some games utilized

this capability, but most business applications had no need for it. Worst, while I recalled the colorful Apple ads in *Playboy* which showed a television screen crowded with colorful graph bars, yet I failed to locate a program which would create such graphs.

One afternoon while sitting floor duty at Luke & Luke Realty, where I work, I decided to write a program which would plot color bar graphs. The basic program which I developed that afternoon did indeed plot a color vertical bar on the screen. Next, I had to develop equations to space the bars equally, draw the graph grid and frame, code the bars (months, letters or numbers), center the title in the text area, and compensate for any unusual rounding-off errors by Applesoft. Because my background is marketing, I wrote easy-to-understand input statements and added error messages to guide neophytes such as I.

My first rough graph program and the final edition, which I copyrighted, are vastly different. As I constantly improved the program, I discovered subroutines which saved both memory and time. In February I decided to market my programs by direct mail. *Creative Computing* seemed the most logical place to advertise. Unfortunately, nearly two months lead time was required from receipt of my ad to the issue in which it would be published.

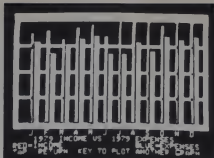
Ad costs for software publishers were extremely reasonable, considering the magazine's circulation. I prepared a projection of my order requirements to pay for different size ads and settled on a 3 inch, one column classified ad captioned "New Apple Software." I always went through each issue with a red pen, circling all Apple software ads and I hoped other Apple owners did the same. I wrote the ad copy myself and, after numerous revisions, had it typeset in Honolulu (\$12.50) to avoid the possibility of a typographical error and the time delay required for approval of ad proofs.

By the time I decided to market my

Bill M. Pumphrey, 469 Ena Road #1310, Honolulu, HI 96815.

graph program, I had developed it into four different programs (Basic Color Bar Graph, Double Bar Graph, High Resolution Line Graph and a Deluxe Color Bar Graph which required greater RAM than the basic due to additional features). I had located a source of 5 minute cassette tapes which cost about 65¢ each when purchased in bulk lots. I had rubber stamps made to label the tapes and I wrote and printed a page of instructions for each program. Sundry other items were needed to get me into business: receipt book, ledger, heavy duty mail envelopes, fragile and first class mail labels, address labels, etc.). Unless I became snowed under in orders, I planned to record each tape on my Panasonic recorder. I cleaned the recording head frequently and tested each tape for loading. Because I had had some programs on beginnings of tape which loaded poorly, I recorded each program twice for my customers.

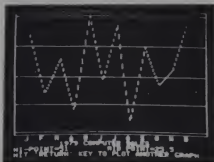
In late March, my first order arrived. Throughout the next three months, orders and inquiries came in from across America with a few from Europe, Canada and South America. Nearly every order was for all four programs. Some technical inquiries involving adapting the programs for other computers, but program modifications were beyond my knowledge. Only one order came back (the tape had been damaged in the mail), and several customers wrote that they were very



Double Bar Graph

pleased with the program.

Creative Computing has a reader's inquiry card in each issue and more than 300 readers wrote requesting additional information. I designed a self-mailer flyer



Hi Res Line Graph

which I sent to the first 180 respondents. Printing and postage charges ran about 22¢ per flyer; I insisted on first class mail so inquiries would be handled quickly. Free addressed gummed labels had been provided for each inquiry. Monitoring the results of these flyers, I determined that the resulting sales did not justify the cost of sending flyers. To double-check this finding, I sent out a second mailing a month later. It too drew minimal response. As something of an advertising expert, I will concede that the flyer could have been a factor in the low response. Nonetheless, I did not mail any more flyers to inquirers.

To date, my profit (not reflecting in my costs the time spent developing the programs and processing orders) is negligible. Personally, however, I do not consider it a loss. My experience gave me a greater understanding of my Apple, provided me a personal case history of direct mail to use in the advertising course which I teach at Hawaii Pacific College and introduced me to fellow Apple owners across the country. I would urge any small-computer owner to develop new programs for his equipment; the challenge is certainly more fulfilling than simply running programs written by others. But, if it is marketing your program that interests you, I would advise you to let some established software publisher handle it. Your time can be better spent developing yet other programs. □

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Wim Klein, a well-known "human computer" performed amazing feats involving complex calculations at the Brown symposium in September 1979.

A question which has perplexed scientific men for several centuries is the strange ability of a few phenomenally-gifted human beings to perform mental feats of calculation which are utterly beyond the powers of the average man. Even a trained mathematician could perform these tricks — if he could do them at all — only with the help of computers and a generous allowance of time.

Generally, this power shows itself in early youth. It sometimes disappears as the child grows up, but more often it persists and develops throughout life. Usually it perishes with its possessor — though in one or two cases it has passed on from one generation to another.

But the most significant thing is that it is extremely rare. In all, there are not more than 30 genuine and authenticated cases of this kind.

The first case of which any truly authentic record exists is that of Jedediah Buxton, a farm laborer in Derbyshire, England, and this only dates from the middle of the 18th century.

Buxton, whose amazing powers were tested and applauded in 1754 by the world's foremost scientific body at that time — the Royal Society — was a dull-witted yokel who never learned to read, write or use written figures. Nor did he even learn the use of ordinary terms such as "thousand," "million," "billion," and so on. When dealing mentally with high numbers — and some of them were colossal — he gave them names of his own such as a "tribe," a "covey," or a "cramp."

Numbers fascinated him. He seems to have spent much of his life, while laboring in the fields, in abstruse mental calculations. And while his results took a long time to arrive at because he was a slow thinker, they were always right.

In 1750 he was asked to work out, to the nearest pound, what sum a farthing would come to if doubled 140 times. Several days later he gave the correct answer, which contains 39 figures.

Paul Brock, 15 Anderson Cove Rd., R.R. 1, Sooke, B.C., Canada V0S 1N0.

The Riddle of the Human Computers

Paul Brock

He was then asked if he could multiply this huge number by itself, mentally, and he said he thought he could. He kept his word two and a half months later, and explained that he had carried out the calculation "just now and then" whenever he felt like it! His answer was 100 percent correct.

A much more typical specimen of the "calculating boy" was Zerah Colburn, of Vermont, U.S., who was touring the country as a "lightning calculator" at the age of six. When aged eight, he was quite unable to give any explanation of how he worked. Once, in reply to a persistent enquirer, he burst out with "God put it into my head and I can put it into yours!"

He could answer all the stock questions about the number of seconds in

A typical specimen of the "calculating boy" was Zerah Colburn, of Vermont, U.S., who toured the country as a "lightning calculator" at the age of six.

so many centuries, the number of grains in so many bushels of corn, and so on. Also he could *instantly* multiply together any two numbers of four figures each, and — which was much more remarkable and has puzzled mathematicians ever since — he could "factorize" at sight any number up to a million.

For instance, on being asked for the factors of 171,395 he at once said that it was the product of 5,7,59, and 83. For those of 247,483, similarly, he gave 941 and 263, while on being asked for the factors of 36,083 he said, "There aren't any." That number is what mathematicians call a "prime" and has no factors at all, except 1.

Now if the average mathematician, given pencil and paper, were asked to find the factors, if any, of 247,483 it would take him a very long time. He would know that one such factor, if the number were not a prime, must be less than 497 (the approxi-

mate square root of 247,483) and he could rule out even numbers and those ending in 5, and so on. But he might have to try, say, 100 divisors before he hit on 263 — a number which Colburn gave immediately and almost absent-mindedly.

It is practically inconceivable that the boy could have memorized the factors of all numbers up to one million — although the thing has been done on a much smaller scale. For example, a later calculator, Carl Ruckle, certainly knew by heart the factors of all the numbers from 1 to 1000 — and it used to be said of the mathematician Srinavasa Ramanujan that he was as well acquainted with the first 2,000 numbers as if he had been their intimate companion since boyhood.

On one occasion when the Indian wizard at figures was sick in London, a friend called to see him. Knowing that the Indian took little or no interest in anything except numbers, he began by remarking, "The number of the taxi which brought me here was 1729, but I suppose there's nothing particularly interesting about that."

"There certainly is," was the eager reply. "That's a most interesting number. It's the smallest which can be expressed as the sum of two cubes in more than one way!" (1729 equals 12 cubed plus 1 cubed, and also 10 cubed plus 9 cubed.)

Zerah Colburn lost his powers as he grew up, and his later career was not very successful. He wrote an autobiography in which he gave a hint as to his method of



Wim Klein asks the audience for a suitable large (9-digit) seed number to multiply by itself.

factorizing, in the shape of a table, was Jacques Inaudi, Italian. His calculating powers showed themselves at the early age of six.

One feat of his was to stand with his back to a gigantic blackboard on which assistants worked out the sums dictated by the audience and with which Inaudi was dealing mentally. He concluded his performance by repeating in a prearranged order, and without turning around, every figure on the board including those used in the calculations — and by that time the board was absolutely crowded with them.

Among other feats, he could always give, generally in a second or less, the day of the week corresponding to any specified date. One mathematician gave him "September 9, 1752, but he knew the answer at once and shouted "No day." It was one of the 11 omitted when the Gregorian Calendar was adopted.

Like both Colburn and Dase, Inaudi had one special feat peculiar, or almost so, to himself — this being the expression of any number less than 100,000 as the sum of four squares. Any mathematician knows that any number can be so expressed, but the problem of finding the components is generally a difficult and laborious business. Yet Inaudi could always do it, mentally and in less than a minute.

He retained and developed his amazing powers during his long life, and while working as a railway engineer often found them invaluable. He used to be spoken of as "the best witness who ever entered a committee room," and he thought nothing of working out off-hand, and on data just supplied by his opponent, the exact cubic content, and cost of digging, of a railway cutting varying in slope and from one to five miles long!

J.M.Z. Dase, a German, was a calculator of the Buxton type — remarkable not so much for the speed of his work but for the enormous size of the numbers he could handle mentally. On one occasion, when being tested by the Berlin Academy of Sciences, he was asked whether there was any limit to what he could tackle in this direction, and he said he knew of none and would welcome a severe test.

So he was given two prime numbers each of one hundred figures, and invited to multiply them together. He did this mentally, correctly, and while under continuous observation, the problem taking him eight hours. On another occasion he extracted the square root of a 100-figure number, mentally, in 52 minutes!

He also had the remarkable gift of being able to count a large number of similar objects (sheep in a flock or the letters on a page of a book) at a glance.

Yet he was no mathematician. He could never manage to understand the simplest rule in geometry or algebra, and his work was purely arithmetic and elementary.

One of the best known modern calculators who gave public performances

was Jacques Inaudi, Italian. His calculating powers showed themselves at the early age of six.

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Bidder could grasp a number better after hearing it once read out than after reading it on paper a dozen times.

We are still very much in the dark about how these extraordinary mental feats are performed. The ones who perform them have no clues either. But clearly, one of the first essentials is a profound and phenomenal memory.

It seems fairly certain, too, that most mental calculators, in addition to having exceptional memories for figures (they generally find difficulty in memorizing a long string of letters) have a great gift of mental imagery, or what is called the "mind's eye." They work out their calculations on a sort of mental blackboard.

In fact, Bidder's son, J.P. Bidder, who became a brilliant lawyer, and who inherited much of his father's ability, said he couldn't imagine any other way of doing mental arithmetic. Yet Bidder himself made no use at all of this plan, but worked entirely by sound. He could grasp a number better after hearing it once read out than after reading it on paper a dozen times.

But the fact still remains that the great majority of well-attested feats of mental calculation are completely baffling, even in the present state of advanced scientific knowledge. □

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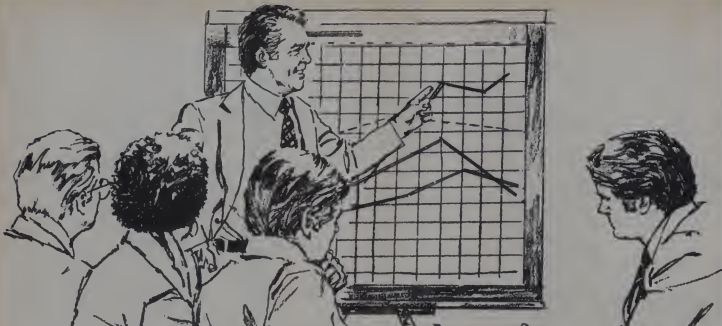
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Stocks and Listed Options

Part 4-The Price of an Option and Program NEWPREM.

Alfred A. Adler, Ph. D.

Review

In the first article of this series the stock market was presented as a place where buyer and seller, or their representatives, meet and engage in an auction. Brokers were discussed as the usual form of representative, and the necessity for including the ever present commissions in all calculations was discussed at some length. Some of the possible varieties of investment attitudes were touched on briefly. This was followed by a discussion of puts and calls, the listed option markets, and one or two of the more obvious option strategies.

The second article continued the discussion of option strategies with a brief presentation of the six basic maneuvers. Program OPGRAPH was then presented and discussed, followed by sample runs illustrating combination strategies, with covered and uncovered calls, and covered and uncovered straddles receiving fairly detailed treatment.

Part 3 continued with more details on call writing followed by a fairly detailed discussion of opening versus closing option transactions. Program OPTION was presented along with

sample runs covering hedging with calls, out-of-the-money hedges, and in-the-money hedges.

From this point on it will be assumed that the reader has read the previous articles in the series, and can refer to them as necessary.

The price of an option, the premium, is composed of two parts: the intrinsic value, and the time value.

The Future Of The Position

In Part 2 of this series covered and uncovered calls, and covered and uncovered straddles, were discussed. In Part 3 hedging with calls was discussed in considerable detail. The emphasis in all of these discussions was on establishing the position. The future maintenance or disposition of the position was given little thought.

Obviously, establishing a position is only the beginning of the game. As stock prices and option prices fluctuate, the position must constantly be reevaluated to determine whether or not it should be maintained, modified, or terminated, and, if either of the last

two, in what way. As an aid to answering the questions which inevitably arise, a means of predicting the way in which the future option premium is likely to track the stock price and the passage of time would be of great help.

It is the purpose of this article to address the problem of predicting the future course of option premiums and presenting a program designed to project option premiums from a user chosen data base into the future.

Intrinsic Value And Time Value Of An Option

It is well known that option premiums move up and down with stock price and decrease nonlinearly as expiration approaches. It is equally well known that option premiums are highly volatile and can change drastically as investor confidence waxes and wanes, even in the absence of significant changes in stock price or time. For this reason it is virtually impossible to accurately predict future option premiums. It is possible, however, to predict, based on a stable reference period, what an option premium should be, assuming continuity of investor attitudes. This future premium is of course dependent on the assumed future time and stock price at that time.



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Cunard International Hotel,
London, 4 — 6 September.

Stocks, cont'd...

The price of an option, the premium, is composed of two parts: the intrinsic value, and the time value. The intrinsic value may easily be determined exactly. If a call has an exercise price of \$25 per share, whereas the underlying stock is selling at \$27 per share, obviously anyone owning the call can buy the stock at \$25 and sell it for \$27, making a \$2 profit. The call is therefore certainly worth at least \$2. That is its intrinsic value. Note that commissions are not considered since certain people, notably stock exchange members, can trade without paying commissions. Since these people can move into the market and make a profit anytime the

price of the call in the previous example falls below \$2, their demand puts a floor on the call premium.

Thus the intrinsic value of a call equals the stock price minus the exercise price of the call. If the stock price is equal to or less than the exercise price of the call, the intrinsic value is, of course, zero.

If a put has an exercise price of \$25 per share and the stock is selling for \$23 a share, anyone owning the put can buy the stock at \$23 and force a sale at \$25, making \$2 per share. The intrinsic value of a put is therefore equal to the exercise price of the put minus the stock price. If the stock price is equal to or greater than the exercise price, the intrinsic value of the put is zero.

The time value of an option is the

value investors place on its potential for appreciation. It is essentially the price of hope, the ante to get into the crap game. The time value, in contrast to the intrinsic value, is totally unsecured. It is, again in contrast to the intrinsic value, a wasting asset. This is why, and this statement will blow many a mind, the option buyer is more likely to be a gambler, whereas the more conservative types lean toward option selling.

If the stock price is equal to or less than the exercise price of the call, the intrinsic value is zero.

The time value of an option is not easy to assess. It is a strong function of the volatility of the stock, a weaker function of the trading volume, and depends on the spread between the stock price and the exercise price. This latter point will be discussed later. Above all, the time value depends on investor expectations. Obviously, if the

Figure 1

```
<<<< Program MEMPREN - by Alfred A. Adler Ph.D. >>>>
```

```
Do you want to see the normalized premiums? YES
```

```
***** INTRODUCTORY DATA *****
```

```
Stock Symbol, Remarks : NWA
```

```
Do you want predictions of puts or calls? CALLS
```

```
Can you state the time function constants? NO
```

```
How many days will you use for your data base? 2
```

```
And how many exercise prices per day? 2
```

```
Choose exercise price No. 1 : 25
```

```
Choose exercise price No. 2 : 30
```

```
***** THE DATA BASE WILL NOW BE INPUT *****
```

```
FOR DAY 1 OF DATA BASE.
```

```
Give day no. : 255; and stock price : 29
```

```
List the 3 expiration day nos. (in chronological order) for
```

```
options available on this day : 321,40,139
```

```
Give the 3 premiums corresponding to these expiration day nos.
```

```
for an exercise price of 25 : 4.375,5.125,7.125
```

```
Give the 3 premiums corresponding to these expiration day nos.
```

```
for an exercise price of 30 : 1.75,2.8125,3.875
```

TABLE OF NORMALIZED OPTION PREMIUMS

EXERCISE PRICE	66	DAYS TO EXPIRATION	158	249
25	1.2808689	2.4011716	4.7186465	
30	2.1937411	3.2745467	4.3463346	

```
FOR DAY 2 OF DATA BASE.
```

```
Give day no. : 248; and stock price : 25.5
```

```
List the 3 expiration day nos. (in chronological order) for
```

```
options available on this day : 321,48,139
```

```
Give the 3 premiums corresponding to these expiration day nos.
```

```
for an exercise price of 25 : 2.25,2.9375,3.625
```

```
Give the 3 premiums corresponding to these expiration day nos.
```

```
for an exercise price of 30 : -.8875,1.1875,1.875
```

TABLE OF NORMALIZED OPTION PREMIUMS

EXERCISE PRICE	73	DAYS TO EXPIRATION	165	250
25	1.9843135	2.6758468	3.365728	
30	1.8884932	2.5988278	3.4573291	

```
***** THE DATA BASE IS NOW COMPLETE *****
```

```
THE TIME FUNCTION CONSTANTS ARE :
```

```
A = 51.893012
```

```
B = 1.6790825
```

DAYS TO EXPIRATION

ADJUSTED NORMALIZED PREMIUMS

5	9.6053648E-02
10	.19151739
15	.28640225
20	.38071634
25	.47447609
30	.56522057
100	1.8198781
150	2.4413823
200	3.465492
250	4.2367903
300	4.9789927
350	5.695163



```
***** ENTER PARAMETERS FOR PREDICTED OPTION PREMIUMS *****
```

```
*** Do you want a table of premiums for 9 options on a ***
chosen day for a chosen stock price, or do you want
a graph of the premium for 1 option on a chosen day
over a range of stock prices : 7 or 07 ?
```

```
Choose the 3 exercise prices desired : 25,30,35
```

```
Choose the 3 expiration months :
```

```
(3 letters each, without commas) : FEBMAYJUG
```

```
List the 3 expiration day nos. corresponding to these
```

```
expiration months : 48,139,230
```

```
For prediction day : Give day no. : 21
and assumed stock price on that day : 31.5
```

```
***** PREDICTED OPTION PREMIUMS *****
```

EXPIRATION MONTH	1	FEB	MAY	AUG
DAYS TO EXPIRATION	1	27	118	209
EXERCISE PRICE	25	1	6.54	7.13
	30	1	1.66	3.01
	35	1	.67	1.00

```
For prediction day : Give day no. : 21
and assumed stock price on that day : 28.5
```

```
***** PREDICTED OPTION PREMIUMS *****
```

EXPIRATION MONTH	1	FEB	MAY	AUG
DAYS TO EXPIRATION	1	27	118	209
EXERCISE PRICE	25	3.57	4.50	5.76
	30	.16	1.51	2.93
	35	.04	.63	1.60

```
For prediction day : Give day no. : 41
and assumed stock price on that day : 31.5
```

```
***** PREDICTED OPTION PREMIUMS *****
```

EXPIRATION MONTH	1	FEB	MAY	AUG	
DAYS TO EXPIRATION	1	7	98	189	

EXERCISE PRICE	25	1	6.50	6.96	7.88
	30	1	1.51	2.69	4.13
	35	1	.01	.75	1.98

```
For prediction day : Give day no. :
LOOP IN LINE 1070
READY
RUN
```



Pursuit Games, CS-3004 (16K)

• Stock Car Race \$7.95

Stock Car Race is a real time racing game on a road race circuit. Your high speed racer is controlled by the "arrow" keys, as you shift up and down through four gears. Take the turns slowly, "floor it" on the straights, but don't blow your engine!

• Maze

Maze for the Level II 16K machine is a high speed pursuit game. You are timed throughout your run and rated on the basis of elapsed time and the number of moves required to escape. A different maze every time. Nine skill levels.

• Indy Racer

Indy Racer is a real time racing game for the TRS-80. You're in the driver's seat of a red-hot Indy car, changing gears and weaving around the track as you pass your competitors. Indy Racer is similar to the popular arcade-style driving games.

• Depth Charge

As commander of a destroyer, your mission is to destroy as many enemy subs as possible. Move your ship back and forth on the water, positioning yourself over enemy subs as they cruise into range. Depth charges sink slowly, so timing and position are important in this re-creation of the Battle of the Atlantic.

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This graphics demonstration program turns your TRS-80 into a computer age kaleidoscope. You enter the number of lines and size of the display to produce changing patterns on the video monitor. Truly hypnotizing, Kaleidoscope runs continuously to brighten up your home or office.

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• Star Wars

If you hate Darth Vader, you'll love Star Wars. This real time game is fun for aliens of all ages. May the Force be with you!

• Romulan

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Count Cristo has had a fiendish curse put on him by his enemies. Will you be able to rescue him or is he forever doomed?
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You'll love this Adventure; in fact, you might say it's LOVE AT FIRST BITE
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Stocks, cont'd...

market is expected to rise, the time values on calls will be high and those on puts will be low. On the other hand, if gloom and doom prevail, time values on calls will be low, while those on puts will be high.

The option premium is the sum of the intrinsic value plus the time value, no more, no less, always.

Algorithms For Valuation Of Option Premium

As time passes, the time value of an option decreases, slowly at first, and then with increasing rapidity. Finally, on expiration day, the time value has decreased to zero. The option either expires worthless or at its intrinsic value, depending on the relationship between the stock price and the exercise price, as discussed earlier. Clearly the time value is a monotonically (which means moving always in the same direction) decreasing function of time. This means that the shorter the time to expiration, the less the time value. Further, as the time to expiration decreases, the rate at which the time value decreases becomes greater and greater. Theoretically, there should be no deviation from these rules.

As it turns out, the time value also depends on the relationship between the stock price and the exercise price. The time value tends to be greatest when the two are very close and drops off to near zero when the discrepancy is very large. The reason for this is obvious. When the price discrepancy is very large, either there is no game, or there is little incentive to play. In the case of calls, if the exercise price is far above the stock price, there is little hope, and if the exercise price is far below the stock price, the option premium is so high (the intrinsic value is high) that few are interested in playing. In the case of puts, these statements reverse.

The variation of option premium versus time and versus stock price was examined over an extended period of time for a large number of stocks. Very definite patterns were obvious, in close conformance to the above theoretical principles. From this effort it was possible to define the general form of the analytical function which the data were following. Having this, it is only necessary to determine the constants of the equation. These, of course, will be different not only for each stock but for each class of option (put or call) based on that stock. This is because option premiums are affected, on a very stable basis, by the volatility of the stock, the average trading volume, etc. These factors cause differences from one stock to another and require that

the constants be determined independently for each stock. World and national politics, the ebb and flow of the world of finance, the business cycle, etc. all affect investor sentiment and this causes the constants for a given option class, and based on a given stock, to change from time to time. When major changes in investor outlook become apparent, the old constants become invalid and new constants must be established from more recent option premium data.

Specifically, a function has been found that represents the variation of option premium with stock price at an arbitrary fixed time. Another function has been found that represents the variation of option premium with time for an arbitrary fixed stock price. Given option premium data over some chosen reference period, the constants for any option may be determined and the algorithms used jointly to project the future option premium at any time corresponding to any stock price.

The secret of laying a good data base is to select data that is 'typical' as opposed to 'far out.'

Program NEWPREM

Program NEWPREM is designed to accept historical option premium data, determine the function constants, report them for future use, and present the desired predictions of future option premiums in either tabular or graphical form, as the user chooses. No personalization is required.

Instructions for use are not included in NEWPREM, as they are in all the other programs, as both the program and the instructions are lengthy. Since it is desirable that the program be usable with either a North Star Horizon with 32K of RAM or a TRS-80 16K Level II, the instructions are available in Program INSTRUCT, furnished with NEWPREM.

Following the run command, the program will ask whether or not the user desires to see the normalized premiums. The answer to this question will be discussed later. The program will prompt the user to furnish the INTRODUCTORY DATA: the stock symbol and remarks, whether predictions of puts or calls are desired, and whether or not the time function constants can be stated. Obviously, on the first run they cannot be. In that

case, the prompts will continue with a request for the number of days to be used for the data base, the number of exercise prices per day, and a statement of these exercise prices.

Following the entry of the INTRODUCTORY DATA, the DATA BASE is input. For each day of the DATA BASE, the day number and stock price on that day are requested. The 'day number' refers to the number of days since the beginning of the year. This was discussed in the third article of the series in conjunction with Program OPTION and a table of day numbers was presented in Figure 1 of that article. The prompts continue with a request for the three expiration day numbers for options available on this day, and the option premiums corresponding to those expiration day numbers for each exercise price in the DATA BASE.

When the data for DAY 1 has been entered, the program reports back with a TABLE OF NORMALIZED PREMIUMS. This table gives values of option premiums in three columns. Each column corresponds to a different number of DAYS TO EXPIRATION, and each row corresponds to a different EXERCISE PRICE. The values of all these premiums have been normalized for the exercise price, which means that the theoretical effect of exercise price has been removed from the premiums. Therefore, all of the values in any column should be the same. Any differences in the premiums in a given column are due to inconsistencies in the real world premiums. Over or under priced options may be spotted in this manner, where under or over priced means with respect to the other options in the group, not in an absolute sense. The numbers will of course vary greatly from column to column because the effect of DAYS TO EXPIRATION has not been normalized out.

Following each DAY of the DATA BASE, such a TABLE OF NORMALIZED PREMIUMS is presented. Each table uses only the data from that day. When the DATA BASE for all of the DAYS has been entered, the TIME FUNCTION CONSTANTS are presented followed by a table of ADJUSTED NORMALIZED PREMIUMS. The adjustment in this case means that a curve, of the correct theoretical form, has been fitted to all of the normalized premiums in the DATA BASE in such a way as to determine the value best representing the combined data as a function of DAYS TO EXPIRATION. The table therefore represents the premium, normalized with respect to exercise price, versus DAYS TO EXPIRATION. The effects of the differences in DAYS and STOCK PRICE have obviously also been removed.

The inclusion of these normalized premiums is to allow the user to check on the consistency of his input data, which is, after all, the basis of his data base. Printing or not printing these values does not affect the run in any way. It is suggested that the NORMALIZED PREMIUMS be looked at when loading a DATA BASE but not when the TIME FUNCTION CONSTANTS can be furnished. Obviously, once a DATA BASE has been loaded and the TIME FUNCTION CONSTANTS obtained, no more data need be loaded for that particular option class (put or call) for that particular stock as long as no major change in the market situation or investor attitude occurs.

The option premium is the sum of the intrinsic value plus the time value, no more, no less, always.

When the DATA BASE has been entered and the TIME FUNCTION CONSTANTS determined, the program will ask whether tabular or graphical predictions are desired. If premiums are desired in tabular form, the user will be asked to choose three exercise prices and three expiration day numbers. He will then have to furnish the day number for prediction day and the assumed stock price on that day. Nine PREDICTED OPTION PREMIUMS will then be furnished in a form similar to the way option premium data is presented in the Wall St. Journal and other newspapers; that is, in matrix form with expiration months across and exercise prices down.

If predicted premiums are desired in graphical form, the user will be asked to choose one exercise price and one expiration month, that is, a single option. The day number for prediction day will then be requested along with the price range of the underlying stock over which premiums are to be predicted. The program automatically computes the premium scale for the graph, making sure it is an easily read scale such as one, two, five, or ten to the unit, and plots the graph vertically, premium versus stock price for a single option.

Whether a table or a graph is presented, the program recycles back to the request for the prediction day, thereby preserving the effort that has already been expended in loading data.

Sample Runs

In order to demonstrate the operation of Program NEWPREM a number

```
<<<< Program NEWPREM - by Alfred A. Adler Ph.D. >>>>
```

```
Do you want to see the normalized premiums? NO
```

```
***** INTRODUCTORY DATA *****
```

```
Stock Symbol, Remarks : NWA
```

```
Do you want predictions of puts or calls? CALLS
```

```
Can you state the time function constants? YES
```

```
A = $1.993012
```

```
B = 1.6790825
```

```
***** ENTER PARAMETERS FOR PREDICTED OPTION PREMIUMS *****
```

```
*** Do you want a table of premiums for 9 options on a ***
chosen day for a chosen stock price, or do you want
a graph of the premium for 1 option on a chosen day
over a range of stock prices : T or O? G
```

```
Choose the exercise price desired : 30
```

```
Choose the expiration month : MAY
```

```
What is the expiration day no. for this month? 139
```

```
What is the day no. for which premiums are to be predicted? 21
```

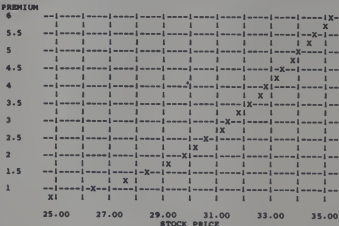
```
Readability of graph is best when difference between
starting and ending stock price is evenly divisible by 5.
```

```
At what stock price should the graph start? 25
```

```
At what stock price should the graph end? 35
```

```
How many lines would you like to skip so that the graph can
start at the beginning of the next page? 0
```

```
***** GRAPH FOR MAY 30 CALLS ON DAY NO. 21 *****
```



```
What is the day no. for which premiums are to be predicted? 41
```

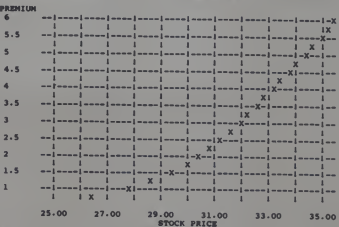
```
Readability of graph is best when difference between
starting and ending stock price is evenly divisible by 5.
```

```
At what stock price should the graph start? 25
```

```
At what stock price should the graph end? 35
```

```
How many lines would you like to skip so that the graph can
start at the beginning of the next page? 0
```

```
***** GRAPH FOR MAY 30 CALLS ON DAY NO. 41 *****
```



```
What is the day no. for which premiums are to be predicted?
```

```
STOP IN LINE 935
```

```
READY
```

```
BYE
```

```
*
```

Figure 2

Stocks, cont'd...

of rather comprehensive sample runs are presented. The first of these is shown in Figure 1 where the program is used to predict future premiums for call options based on the stock of Northwest Airlines. It is assumed that the time function constants are unknown. A data base must therefore be loaded and since, in this case, the market has been rather quiet, it has been decided that premiums for three expiration months, at two exercise prices each, on two different days, would provide a satisfactory base. Incidentally, the reader should be aware that the data used in these sample runs is historically correct. These are real-world runs, not invented data.

Referring to the TABLE of NORMALIZED OPTION PREMIUMS for DAY 1, note that the normalized premium for the NOV 30 option is very different from that of the NOV 25, and similarly for the FEB's. From this it is concluded that either the NOV 30's and the FEB 30's are overpriced or else the corresponding 25's are underpriced. Referring to the TABLE for DAY 2, we note, since the premiums in each column are very close to each other, that the option premiums on that day were unusually self-consistent.

A tabular prediction format has been selected for this run and premiums have been requested for February, May, and August calls with exercise prices of 25, 30, and 35. For the first table, a prediction day approximately four weeks prior to the expiration of the FEB's has been chosen, along with an assumed stock price on that day of \$31.5. Note that a time value of only \$.07 has been assigned to the FEB 35 by the program, rising to \$.16 for the FEB 30, and then dropping to \$.04 for the FEB 25. These latter figures are obtained by observing that the intrinsic value of the 30's is \$1.50 and that of the 25's is \$.50. Note that the time value assigned to the options with more distant expiration dates is considerably higher, but rises more and more slowly (nonlinearly) as the time to expiration increases.

The second table presents premiums for the same day, but with the somewhat less optimistic assumption that the stock price on that day will be only \$28.5 per share. Note that the time values of the 30's are the same as before and those of the 35's and 25's have reversed themselves. This is due to the fact that the second chosen stock price, \$28.5, is as far below the exercise price, \$30, as the first stock price, \$31.5, is above it.

The third table is based on a prediction day only one week prior to the expiration of the FEB's and an

assumed stock price on that day of \$31.5, the same as was assumed in the first table. The time values for the FEB options are now down to \$.01 or less, again rising nonlinearly as the time to expiration increases.

The second run, presented in Figure 2, is as similar as possible to the first run except for the change from a tabular to a graphical display. Since the first run has provided the time function constants, there is no need to either reload a data base nor to reexamine the normalized premiums.

The first graph presents premiums for the MAY 30 call approximately four weeks prior to the expiration of the FEB options (same day as Table 1 of Figure 1), over an assumed stock price range on that day of \$25 to \$35. Note that the time value of the option decreases as the stock price departs in either direction from the exercise price of the option. This point was discussed previously in some detail.

The time value tends to be greatest when the two are very close and drops off to near zero when the discrepancy is very large.

The second graph shows premiums for the same conditions except that the prediction day is now one week prior to the expiration of the FEB's (as it was in Table 3 of Figure 1). Note that the time value of the option has decreased across the board due to the decreased time to expiration, and that the decrease tends to be greater where the stock price is close to the exercise price of the option than where they are far apart.

Predicted premiums for puts are presented graphically in Figure 3. Since the laying of a data base has already been demonstrated there does not seem to be much point in repeating the process. For this reason, arbitrary (but not unreasonable) values of the time function constants were chosen. The first graph of Figure 3 shows put premiums for the same day as the second graph of Figure 2 over an assumed stock price range on that day of \$25 to \$35. Note again that the time values decrease as the assumed stock price departs in either direction from the exercise price of the put.

The second graph is simply a magnification of that part of the first graph that lies between assumed stock prices of \$29 and \$31.

Selection of A Data Base

As was pointed out in the begin-

ning of this article, option premiums are highly volatile and often change drastically as investor optimism changes, even in the absence of significant changes in stock price or time. That being the case, the secret of laying a good data base is first of all to try to select data that is 'typical' as opposed to 'far out', and second of all to use enough data so that the effects of any aberrant values that do creep in will be drowned out. The definitions of 'typical' and 'far out' will be left to the user, which explains why the selection of a data base is an art and not a science. Certain caveats are in order, however, as discussed below.

The user must engrave upon his mind the fact that the results, that is, the predicted option premiums, will depend on the choices made in creating the data base.

A data base consisting of premiums for one exercise price, for three expiration months, on one day, is an absolute minimum. This serves to establish the effect of time and the price level. If the user is fortunate enough to have chosen a very typical and self-consistent day, he may in fact have a reasonably valid data base. The use of premiums for three exercise prices straddling the stock price, for three expiration dates, and on four days a week apart, usually gives excellent results. Note that this data base covers a month of trading which tends to smooth out daily fluctuations in investor sentiment. If, however, during that month there has been a recognizable change in market sentiment, such a data base would not be valid.

There are many periods, most of the time in fact, when investor sentiment remains virtually the same for many months. Data bases formed during that period remain valid until a change occurs. When a change does occur, however, it often comes with a bang. Option premiums relative to stock price may double or halve within a few days. Obviously, when this occurs a new data base is needed and the future must be replanned. There are other periods, a small minority of the time, when investor sentiment is continually on the move. It is difficult to form meaningful data bases during such a period, since a change may be needed before the strategy matures. Thus, it is crucial that the data base be laid during a market period wherein investor sentiment is similar to that expected to prevail during the period for which predictions are required.

As the user becomes more experienced he will find that his proficiency at making the right choices improves with startling rapidity. One of the best ways of learning proper choices is to select a group of data for a

base and determine the time function constants and the predicted option premiums. Then either double the amount of data used or cut it in half and observe the effect of the change on the results. This should be done with a number of different stocks as the results will vary widely. A bit of experimentation along these lines will bring on the smarts rapidly.

Conclusions

The price of an option, the premium, is the sum of the intrinsic value and the time value. The former is secured by the spread between the stock price and the exercise price of the option (if in the right direction). The latter is simply the value, if any, that investors put on the potential for appreciation.

Algorithms have been developed for the variation of option and premium with time, at a fixed arbitrary value of stock price, and for the variation of option premium with stock price at a

Selection of the data base is an art, not a science.

fixed arbitrary time. The constants in these algorithms may be determined from consideration of a data base consisting of historical values of pertinent option premiums. The algorithms may then be combined to predict future option premiums as a function of time and stock price. Program NEWPREM accepts such historical data as the user chooses, sets up the algorithms, and presents predictions of option premiums under user selected conditions, in either tabular or graphical form.

Selection of the data base is an art, not a science. It is necessary that the data used in the base be derived during market periods wherein investor optimism (or pessimism) is at the same level as that expected during the period for which predictions are desired. It must be realized that the predicted option premiums will depend very much on the choices made in creating the data base.

Program NEWPREM, along with OPGRAPH and OPTION already presented, and PORTAL to be presented next month, is available in several forms. A TRS-80 version on cassette for 16K Level II is available from *Creative Computing Software*. A disk version in North Star Basic, single or double density, as well as an Applesoft version, cassette or disk, is available from the author. □

```

<<<<< Program NEWPREM - by Alfred A. Adler Ph.D. >>>>>

Do you want to see the Normalized premiums? : NO

##### INTRODUCTORY DATA #####

Stock Symbol, Remarks : MWA
Do you want predictions of puts or calls? PUTS
Can you state the time function constants? YES
A = 50
B = 5

##### ENTER PARAMETERS FOR PREDICTED OPTION PREMIUMS #####

*** Do you want a table of premiums for 9 options on a ***
chosen day for a chosen stock price, or do you want
a graph of the premium for 1 option on a chosen day
over a range of stock prices : T or G G

Choose the exercise price desired : 30
Choose the expiration month : MAY
What is the expiration day no. for this month? 139

What is the day no. for which premiums are to be predicted? 41

Readability of graph is best when difference between
starting and ending stock price is evenly divisible by 5.
At what stock price should the graph start? 25
At what stock price should the graph end? 35
How many lines would you like to skip so that the graph can
start at the beginning of the next page? : 0

##### GRAPH FOR MAY 30 PUTS ON DAY NO. 41 #####

PREMIUM
5.5  --X| | | | | | | | | | | | | | | | | | | | | |
5    --|X| | | | | | | | | | | | | | | | | | | | | |
4.5  --| |X| | | | | | | | | | | | | | | | | | | | | |
4    --| | |X| | | | | | | | | | | | | | | | | | | | | |
3.5  --| | | |X| | | | | | | | | | | | | | | | | | | | | |
3    --| | | | |X| | | | | | | | | | | | | | | | | | | | | |
2.5  --| | | | | |X| | | | | | | | | | | | | | | | | | | | | |
2    --| | | | | | |X| | | | | | | | | | | | | | | | | | | | |
1.5  --| | | | | | | |X| | | | | | | | | | | | | | | | | | |
1    --| | | | | | | | |X| | | | | | | | | | | | | | | | | |
.5   --| | | | | | | | | |X| | | | | | | | | | | | | | | | |
      25.00  27.00  29.00  31.00  33.00  35.00
                STOCK PRICE

What is the day no. for which premiums are to be predicted? 41

Readability of graph is best when difference between
starting and ending stock price is evenly divisible by 5.
At what stock price should the graph start? 29
At what stock price should the graph end? 31
How many lines would you like to skip so that the graph can
start at the beginning of the next page? : 0

##### GRAPH FOR MAY 30 PUTS ON DAY NO. 41 #####

PREMIUM
2.2  --|X| | | | | | | | | | | | | | | | | | | | | |
2    --| |X| | | | | | | | | | | | | | | | | | | | | |
1.8  --| | |X| | | | | | | | | | | | | | | | | | | | | |
1.6  --| | | |X| | | | | | | | | | | | | | | | | | | | | |
1.4  --| | | | |X| | | | | | | | | | | | | | | | | | | | | |
      29.00  29.40  29.80  30.20  30.60  31.00
                STOCK PRICE

What is the day no. for which premiums are to be predicted?
STOP IN LINE 935
READY
BYE
  
```

Figure 3

Don't Write That Program!!

Stephen Kimmel



A controversial piece, this: it assumes that a computer program exactly replaces something we do already, and that programs are written for practical reasons. Rebutals are invited.

There is a limited number of programmers out there and a limited amount of time to be spent. So why are we wasting so much time writing worthless programs? Despite millions of words on how to write programs, there doesn't seem to be anything on what to program. How can you begin to write a computer program without first picking something to computerize?

The answer to this lack of guidance is simple. You can write good programs about an unlimited number of things. Well, not quite unlimited. The guidelines are negative rather than positive. They are "Don't writes" rather than "Write abouts." My students and I have formulated the following rules to serve as a guide.

1. *Don't write that program unless the task is something you do frequently.*

By frequently we mean more than twice a year. The reasoning is twofold. First, unless you know what you are doing, you won't be able to teach a computer to do it. Can you really know your subject if you only use that knowledge once a year? Second, it will take you at *least* (and that's if you are very fast and very good) three times as long to program a computer to do something as it would take you to do it yourself. If you only use the program once or twice a year then you haven't done yourself much good.

For every computer program you write, you *must* have a correct example to use to check the computer against. Nobody, I repeat, nobody writes programs that are free from errors every time. Every program must be checked and tested. Some of the errors will appear obvious like

the program that told you to add negative eggs to your soufflé. Other errors will be more insidious, parading as reasonable answers.

It bears repeating. You must have a correct example to check the program.

The classic example of a bad program to write under this rule is an Income Tax program. You would have to work your income tax by hand to have the correct example to test the program. In the final analysis, doing your income tax using a program that you wrote would take you from three to six times as long. And you would have to rewrite the program every year since that's how often they change the laws.

If the computer is to free minds for more important things, it must enable them to do the mundane tasks in less time.

The exception, of course, is if you are planning to sell the program or a tax service. But then you are doing income taxes more than once a year. I don't even recommend buying an income tax program. Unless the manufacturer is prepared to guarantee the answers, and they aren't, you still have to check the answers. That means working it by hand.

The second exception is the second rule.

2. *Don't write that program unless the task is something you would do more often if it were easier to do.*

In its simplest terms this is what computer power means.

3. *Don't write that program if a human could do the same thing in less than five minutes.*

All of the first three rules can be reduced to a single variable — time. If the

computer is to enrich the lives of humans, if the computer is to free minds for more important things, it must enable them to do the mundane tasks in less time. If it fails that test, if perchance it actually takes longer to do the task with a computer, then the computer becomes a hindrance rather than an aid.

Consider an example from a commercially available program. The idea is to convert recipes. You are in the kitchen preparing a meal for 46 of your most intimate friends. However, your recipe only makes enough for twelve. You can:

Take the cookbook to the computer (spare bedroom)	30 seconds
Turn computer on (two buttons)	2 seconds
Enter Interpreter, Utility, etc.	1 minute
Enter Recipe	30 seconds
Conversion Program	
Run program (and write down answers)	1 minute
Turn computer off	2 seconds
Return to kitchen	30 seconds
Total time	3:34

Or you can:

Go to den and get calculator	20 seconds
Turn on calculator (one button)	1 second
Perform operation (and write down answers)	3 minutes
Turn off calculator	1 second
Return to kitchen	20 seconds
Total time	3:42

Or you can use man's traditional solution
Fake conversion mentally 10 seconds

Or you can use man's other traditional solution
Make enough for 48 portions
and serve slightly larger portions
Net savings through computerization

Stephen Kimmel, 4756 S. Irvington Place, Tulsa, OK 74135.

is less than 8 seconds. Even if you have a disk, so the program loads instantly, you have still saved less than two minutes, and lost a couple of minutes compared to normal operation. And assuming you did save some time, what would you do with those extra two minutes you bought? You sit there and watch your four-foot diameter cake fall — or perhaps spend it walking back to your computer to save some more time.

The five-minute figure is strictly arbitrary, but it is a good guideline. The less your time is worth the shorter it will be.

4. Don't write that program to do something that could be done better with a:
a. \$10 calculator — such as balance your checkbook.

b. \$2 file box and some 3x5 cards — such as your Christmas Card list... unless you plan on having the computer print address labels... which is inconceivably gauche.

c. \$5 calendar and a 5¢ pencil — such as your appointment book.

Not only can you balance your checkbook, update your mailing list and make a note of a future date faster by hand than you can by computer, but you can do it a lot cheaper. The physical acts are about the same. The computer has all that overhead (such as walk to the computer, load the program, etc.), and it has other

constraints such as limited memory, restricted data forms. And you spent four hours programming it to do each of those things. The computer in those applications is a waste of time and money.

Why does anybody use a computer for these things? Easy. They bought it and they have to do something with it.

Finally:
5. Don't write a computer program if accuracy doesn't matter.

People have survived for centuries by balancing their budgets only approximately.

The computer may be able to tell you that you need to buy 12.76 pizzas when you would have guessed 13. The problem is that it doesn't make any difference. You still have to buy 13 pizzas. There are no savings in either time or money. There is only the vague increased assurance that you are a good guesser and the vague creeping doubt that you wasted your money buying that computer in the first place.

The applications of this are myriad. People have survived for centuries by balancing their budgets only approxi-

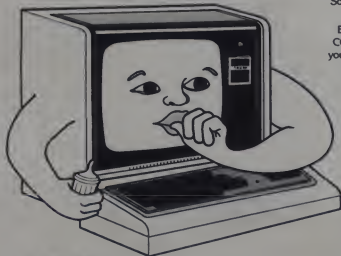
mately. It is possible that the savings on decreased leftovers will eventually pay for the computer, but I doubt it.

There are too many worthwhile things to program for all this effort to be spent writing programs that stifle and hinder the human rather than doing what the computer is supposed to do: release the human for bigger and better things. All you have to do is to use a little imagination to get past the worthless and into the worthwhile. □



"Right now it's counting the calories I consumed last week."

GOO-GOO, GAA-GAA, REA-DEE...



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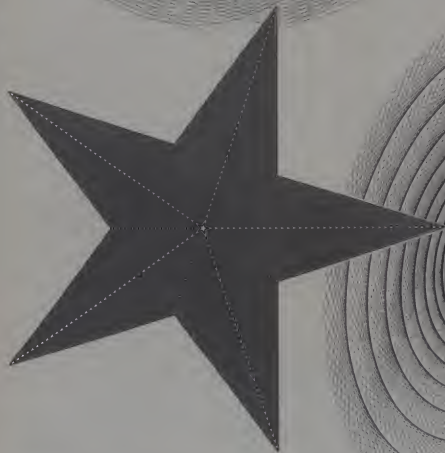
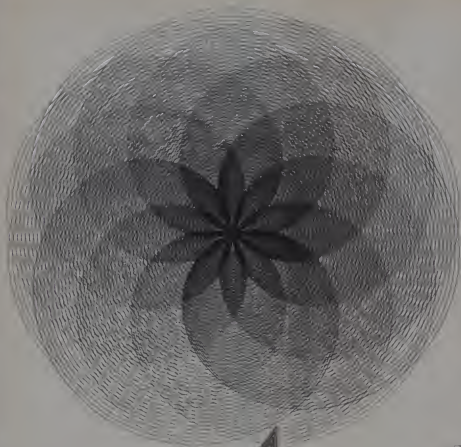
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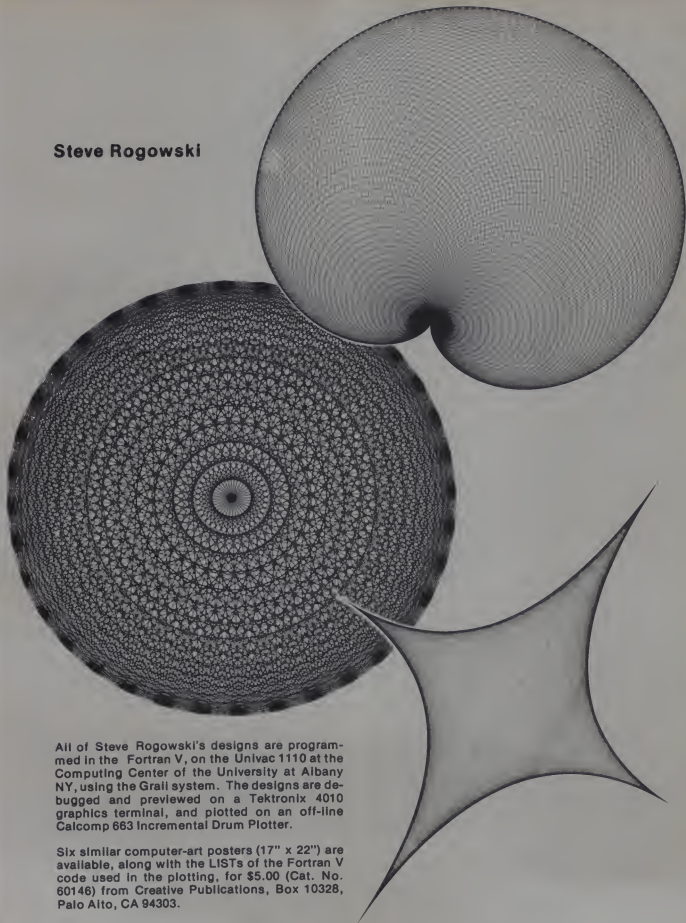


Computer Art



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Steve Rogowski

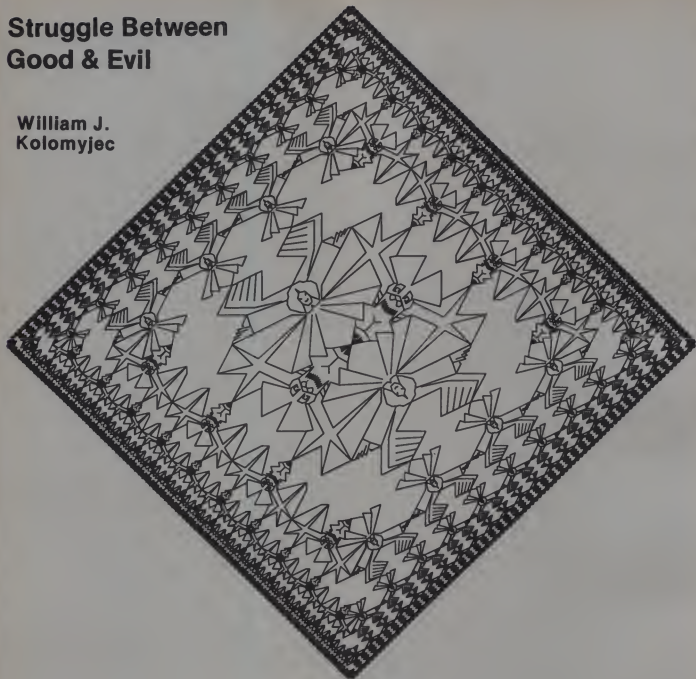


All of Steve Rogowski's designs are programmed in the Fortran V, on the Univac 1110 at the Computing Center of the University at Albany NY, using the Grail system. The designs are debugged and previewed on a Tektronix 4010 graphics terminal, and plotted on an off-line Calcomp 663 Incremental Drum Plotter.

Six similar computer-art posters (17" x 22") are available, along with the LISTs of the Fortran V code used in the plotting, for \$5.00 (Cat. No. 60146) from Creative Publications, Box 10328, Palo Alto, CA 94303.

Struggle Between Good & Evil

William J.
Kolomyjec



As long as I can attain access to a computer I will continue to use it. It is my medium! Here at Michigan State University I have taught computer graphics as a form of expression for the past two years and the response has been overwhelming. Many art students, after an involvement with the computer, discover that there are objective methods to problem solving and any preconceived notions about the 'ominous' computer are dispelled, it becomes a tool in their hands. Many non-art students, when they become acquainted with visual phenomena, learn to 'see' their world under a different light. I encourage my students to work together in debugging programs and evaluating

imagery. All take part in classroom critiques. Here the collaboration reaches a maximum when artist and non-artist explain what thoughts underlie a particular work. The effort in making computer graphics is great but then so is the reward. I encourage anyone to spend the time and effort necessary in one's involvement with this medium. Perhaps the greatest return comes from the works themselves when the neophyte computer artists discover that embedded in their imagery is a little of themselves.

William J. Kolomyjec, College of Engineering, Michigan State University, East Lansing, MI 48824.

Text excerpted from "Artist and Computer." Ten of William Kolomyjec's are reproduced in the book showing a wide diversity of styles. Thirty-four other artists are also represented in "Artist and Computer." It is available for \$10.00 postpaid from Creative Computing, P.O. Box 789-M, Morristown, NJ 07960.

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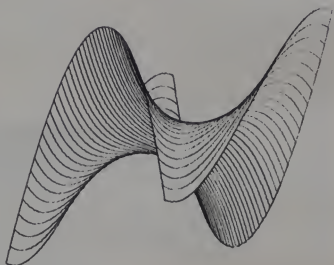
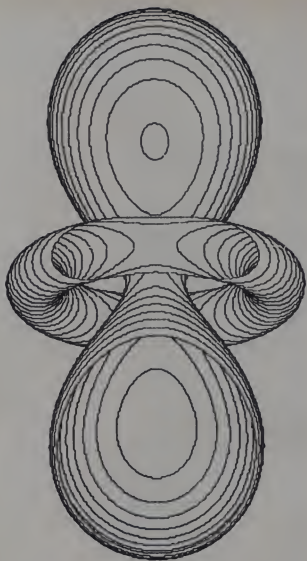
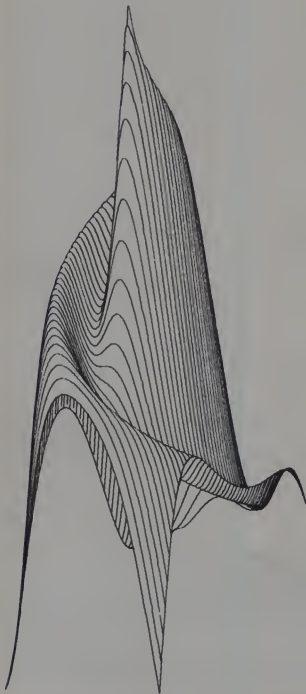


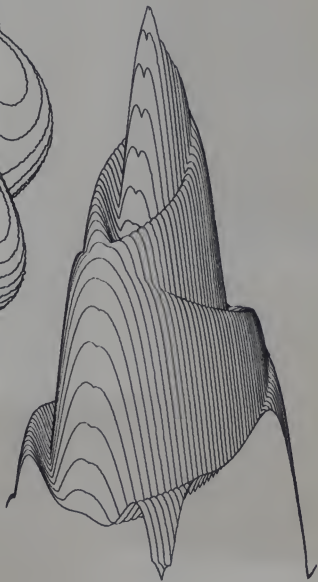
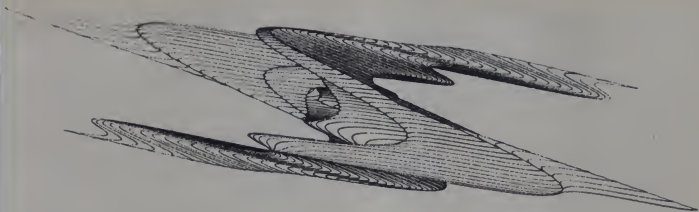
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Robot Conference Reviewed

Abby Gelles

Even though there are no real robots and may never be, for some reason the longing for robots (slaves' companions?) fires many people. Here's the latest word from the robot nostalgia front
—TN



Dr. Isaac Asimov on robots.

The brochure promised adventure. Aha, I thought, take the subway to the future.

There was, admittedly, more on my mind than just an opportunity to experience some novel magic. There was the nagging necessity to sponsor my forthcoming books—a set of teacher's manual and student hobbyist workbook for junior/senior high school students entitled *Robotics Curriculum*. I called my publisher, "We've got to go!" I cajoled. He called and got us an exhibition spot at the first International Conference on Robotic Futures. My first stab at the promotional circuit promised a weekend of hobnobbing with droids and superstars.

The conference assumed the subtitle "Towards a Creative Human/Machine Relationship," and offered as participants in this creative relationship such notable humans as Isaac Asimov and machines such as Quasar's Klatu (introduced as the star robot) and R2D2. The dates: April 25-27, 1980; the place: Long Island

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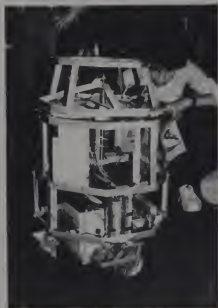
University, Brooklyn Campus. Sponsorship was shared by the World Future Society, represented by Edward Cornish, president and editor of *The Futurist*, and L.I.U.'s Institute of Continuing Education, represented by Dean Victor Marrow. The proposed program offered workshops in robotics, AI, education, cybernetics and much more, as well as movies—first-run entertainment and the more seriously intellectual variety—plenary sessions for future work in robotics, mime and dance presentations, vendor exhibits, and a rousing robot parade.

I bought a new outfit. I was excited.

We arrived the first evening to find a disappointing smattering of exhibitors and press. The quiet atmosphere of what should have been a celebration portended the disorganization that was to permeate

In the viewpoint of some observers, no amount of professional conference organizing will confer upon Klatu the advertised status of robot.

the rest of the weekend. Over the days that followed, tables loomed gloomily empty, or simply laden with handouts, lacking either human or machine proprietor; many workshop leaders failed to appear, as did keynote speaker Dr. Marvin Minsky, noted director of MIT's AI Lab. Others were incorrectly described in the literature, or late in arriving. Even Dr. Asimov was several hours late, dependent on a lift from the sponsors, who themselves arrived for their precious cargo well after the time he was due to speak. An attendance of 11,000 at the gate was projected, but perhaps 10 to 20 percent of this figure would more accurately describe the actual "crowd," and most of these were L.I.U. students or curious passersby. The conference obviously suffered from lack of followup beforehand and the need of stronger managerial leadership. We were advised by the organizers that next year's effort will be taken over by a professional conference



Herb, with his creator Holden Caine.

setup team, alleviating the bedlam.

In the viewpoint of some observers, no amount of professional conference organizing will confer upon Klatu the advertised status of robot. Perhaps one of the highlights of the experience for me was a firsthand feel of the competition, politics and rumor-mongering that transpires between those who dabble with droids. I know from my research, and from my junior high students' class reports, that there is a chasm between three classes: those who consider themselves serious proponents of AI, manufacturers of dedicated industrial manipulator systems, and those who produce promotional or entertainment devices with interesting shells. This pecking order causes each of these groups in turn to discredit the output of the next in line as real robots. Outfits such as Quasar make good copy, as articles appear whispering that microphones imbedded in the body of Quasar droids substitute for brain power. Klatu is an entertainer. He bleeped and joked and rapped with the folks all weekend, generally creating a momentum where there might have been disappointing quietude.



"Mobot", a homebrew robot, with creator Peter Quinn.

If he houses remote control or micro-phonous conversational facilities, then credit lies with his masters for their ability to put on a good show. They know their business, and their market. However, I was a bit abashed that the firm had the gall to sell its promotional material to gullible children for 75 cents a copy!

Despite the disorganization evident throughout the conference, there were some excellent and notable high points. Among my own experiences, I watched a very fine filmed record of a conversation between Margaret Mead and other anthropologists, donated by New York's Museum of Natural History, concerning the future of man in a technological society. I wandered among the vendor tables, asking questions of precocious young robot builders, and received some very sound advice for my own students regarding



Some familiar characters.

Another View

Betsy Staples

The lure of Canal Street, with its used clothing, surplus engine parts, second-hand furniture, discount odds and ends and Chinese grocery stores, was strong as we threaded our way through the traffic between the Holland Tunnel and the Brooklyn Bridge, but we dared not stop—we had a date with the future.

It was the last Saturday in April and we had been invited to participate in the Robotics Futures Conference sponsored by Long Island University at its Brooklyn campus. The Conference was scheduled to run from Friday through Sunday, but we had elected to participate only on Saturday. We arrived in plenty of time to set up our booth, only to discover that our booth had been given away—not that there were hordes of would-be exhibitors lusting after booth space. There were only a few exhibitors, but apparently one of those had liked our booth better than his own.

So, we set up our table in a dimly lit corner of the exhibit hall, unplugged the copy machine so we could run our Apple demo, and prepared for a busy day talking with exciting, future-oriented people.

The first thing we learned was that robotics- and future-oriented people are not necessarily computer-oriented people. Most of them approached our software display with curiosity: "Do you use these things with those 'Pong' games?" If we needed any further proof, it came when a quick inventory revealed that we had sold all ten copies of *Be a Computer Literate*, our computer literacy text aimed at junior high students, in the first two hours.

A quick turn around the exhibit hall disclosed some of the apparent interests of the attendees. There were two exhibits featuring large, talking, promotional type robots and one homemade model that looked like something from a 1980's version of an *Our Gang* comedy. There were also several displays of futuristic artwork and tables full of Darth Vader mugs.

Capping off a day of workshops and seminars on robotics and the future was the *piece de resistance*, lectures by Marvin Minsky and Isaac Asimov. At the appointed hour, 4:00 p.m., the attendees filed in to the lecture hall and took their seats, only to be told that there would be a delay—the lecture would begin at 4:15. After a few more such postponements, rumors began to fly: Marvin Minsky had heard that a certain robot had elected not to come and had decided to do the same; Isaac Asimov had never even been invited.

Finally, at about 5:00, Isaac Asimov did appear. He began his talk by announcing that he is "off robots now," but proceeded to provide answers to what were apparently "frequently asked questions," and to describe some of his past involvement with robots.

He explained that at the time, he was unaware that he was inventing the word "robotics." "Robot," the Czech word for "worker," was already in common use. Since all physics words end in "ics," he assumed that "robotics" was a legitimate word and began to use it in his writing.

After asking himself "How did you come to know so much about robots and computers?" he answered, "I don't know a damn thing—never did," and added that he didn't know one had to know anything to write about them.

When he was a child Asimov enjoyed science fiction, particularly stories about sympathetic robots that were designed to be nice. His Laws of Robotics reflect this early preference.

"How come you never mentioned computers in your early robot stories," he asked himself. The answer: robots have existed in human thought almost from creation—they were created in man's image—but nobody thought of computers. In his own writing, he never really distinguished between them, he explained. A computer was an immobile robot and vice versa.

Regarding the Laws of Robotics—they are deliberately ambiguous. "My intention was to write stories and become rich and famous. If the laws were perfect, there would never be any stories." All of his stories, he said, have robots going wrong violating one or more of the laws.

Asimov feels that just as humans have a driving force to survive, computers have a drive to solve problems. Humans have certain strengths and computers have certain strengths. Why not allow them to evolve as parallel intelligences in a symbiotic relationship? We face a "glorious, boundless, horizonless future, if we can only solve the problems which threaten to destroy us." Presumably computers can help us do that.

Following the lecture, the participants were invited to a much-touted reception for Asimov and the absent Minsky. Asimov arrived late and didn't stay long, which was just as well, since the left-over-from-lunch cold cuts, fruit, cake and wine which passed for refreshments didn't encourage us to lengthen our stay. □

While Asimov's Laws allude to robots as something potentially human-like in nature, Clapp's laws obviously treat them as purely subservient to human goals.

Asimov's Three Laws of Robotics:

1. A robot may not injure a human being, or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

—Handbook of Robotics, 58th edition
2058 A.D.

Clapp's Three Laws of Robotics:

1. Organizations may not install robots to the economic, social or physical detriment of workers or management.
2. Organizations may not install robots through devious or "closed" strategies which reflect distrust or disregard for the work force, for surely they will fulfill their own prophecy.
3. Organizations may only install robots on those tasks which, while currently performed by men, are tasks where the man is like a robot, not the robot like a man.



Help! I'm lost!

The major highlight, of course, was the anticipated appearance of Isaac Asimov. Perhaps his late arrival served a purpose in heightening the tension of that anticipation. I was particularly anxious to hear his address, as over the years I have found him extremely accessible by telephone and letter, and was curious to find out, if I could from a short speech, a little about what makes this prolific, rollicking Renaissance author tick. What the audience witnessed was a straightforward, kindly, smiling bit of joy from the man who coined the term "robotics." ("How do I know I coined the word," he queried. "I looked it up in the dictionary when I first tried to use it, and found it nonexistent. Years later, I looked it up again, only to find the definition contained a quotation by myself claiming I coined the term!")

My class had written to Dr. Asimov a while back challenging him to alter the Three Rules of Robotics which he first presented in *I, Robot*, and which now form one of the foundations of modern robotics principles. They suggested some consideration be given to the necessity for robots to protect other robots, as well as man, since robots can have intelligence and feelings. They also inquired about his credentials in the field. Apparently the credential challenge is one Isaac Asimov often receives, for he addressed it in his speech, saying simply that he lacked any. When asked how he could have written so many books about computers and robots without any background in either technology, he regularly responds, "I didn't know I needed any!" Thus, one of the world's noted authorities in technological science fiction (and some serious technology, too) rests his opinion on intuition and wit, with some optimism for the future. What a nice thought with which to close the first International Conference on Robotic Futures: Towards a Creative Human-Machine Relationship. □

simple or affordable mechanisms for adding rather sophisticated feedback or computerized features to our class robot. I picked up a brochure describing a project being conducted at NYIT called ADAM II, which led to a delightful acquaintance with the project's professorial head, and promise of future exchange of information and participation in standards work. The one dance I attended was interesting in its multimedia approach.

It was impossible to attend as many workshops as one would like, since, even with some of them cancelled, the concurrent offerings contended for level of interest. I was forced to skip a much desired refamiliarization with the thoughts of James Albus, author of *People's Capitalism* and NASA roboticist, Todd Loofbourrow (prodigious developer of homebrew robot), and Dave Ahl (*Creative Computing*). Also, following the charismatic plenary introduction by Moshe

Davidowitz, Rabbi, Humanist Psychologist, and Policy Analyst for the Prometheus Group, I sadly forfeited attending his workshop on "New Mythos for a Mechanized World" in favor of other offerings.

The Three Rules of Robotics first presented in *I, Robot* now form one of the foundations of modern robotics principles.

However, I did find myself involved in some fascinating discussions. Among them were the discovery of two individuals with whom I was previously unfamiliar. One, Neale Clapp, an independent industrial consultant, is a social scientist who advises management regarding industrial relations with workers. As a result of a contract with GE, Mr. Clapp found himself heavily involved in the introduction of robotic technology among human workers. He has developed his own Three Rules of Robotics, which lay the groundwork for industry in smoothing the industrialization of their currently human labor-intensive tasks.

A second speaker I enjoyed was Ms. Minna Hilton, an expert in the area of "media ecology," who explained, with the aid of a film, how differently each of us hears and perceives reality, due to the fact that our internal models for information decoding vary so greatly in structure. The revelation that while I may think logically, the person to whom I am trying to communicate a concept may possess a more fluid conception process, will greatly influence my teaching, writing and even systems-analysis documenting techniques in the future.

For those interested in games playing, science fiction, robot construction and government objectives in robotics, there were many more workshops available.



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The "Knight's-Tour" Problem

Bhairav Joshi

There is an elegant old problem, called the "Knight's Tour," which has attracted the attention of puzzle enthusiasts, mathematicians, and computer programmers. The object here is to discover the itinerary of the Knight (K) through each one of the 64 cells of a Chess-Board (CB) beginning at any one cell. The K is allowed to visit each cell only once as it tours the entire CB.

Motivated by Andy Pauker's recent article describing an algorithm for the solution of this problem (*Computerworld*: July 2, 1979, p. 17), I decided to study it with the ultimate goal of developing an efficient algorithm for solving the problem using a digital computer. This article presents the results of my study.

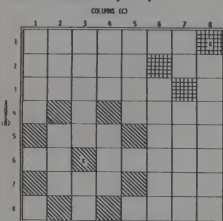


Figure 1

Long before the era of computers, the problem was tackled by great mathematicians like De Moivre, Euler, Legendre, Roget, Warnsdorff, and others. It is now well known that the number of solutions to this problem is greater than 31 million! No one seems to know the maximum number of possible solutions. An interesting discussion of some of the elegant solutions of

this problem can be found in W. W. R. Ball's book on *Mathematical Recreations and Essays*, 4th edition, Macmillan and Company, Ltd., New York (1905).

One of the earliest ideas suggested for developing solutions to this problem, that is well suited for computer implementation, is that due to a German mathematician, J. C. Warnsdorff (1823), now known as Warnsdorff's rule. This heuristic rule, dubbed by mathematicians as 'double-look-ahead,' states that the K will move to that cell from which the number of cells available during each of the next two moves is smallest. A detailed description of this rule can be found in volume II of C. F. de Jaenisch's book on *Applications de l'Analyse Mathématique au Jeu des Echecs* (1862).

The Knight is allowed to visit each cell only once as it tours the entire Chess-board.

Here I will explore and modify Warnsdorff's rule, and show how the modified rule leads to an efficient algorithm for obtaining 64 solutions — each with a different starting cell. I will show that each cell of the CB has a characteristic place-value which alone needs to be invoked in deciding the next move of the K. I will also prove that there are only ten unique cells in a CB where the K can start. Finally, I will present an APL implementation of my algorithm illustrated by typical results.

Knight's Moves on a Chess Board

A chess board (CB) is shown in Figure 1. It consists of 8 rows and 8 columns of squares called cells. The row-number (R) and the column-number (C) of a given cell determine its location on the CB. Each cell on the CB has unique values of (R, C) — its coordinates, associated with it. For example, in Figure 1 the knight (K) is located in two different cells. The co-

ordinates of the first cell, shaded by diagonal lines, are (6, 3), i.e., it is located in the 6th row and 3rd column; and the coordinates of the second cell, shaded by vertical and horizontal lines, are (1, 8).

In any single move the K travels among the cells of a CB in a L-shaped path, i.e., 1 (or 2) cell(s) in one direction followed by 2 (or 1) cell(s) in a direction perpendicular to the initial direction. If we let $\Delta R, \Delta C$ denote the changes in the coordinates of the K during a move, then the allowed values of ΔR and ΔC are those shown below:



In other words, there are eight different values of $\Delta R, \Delta C$, shown in the first two rows of Table I, corresponding to the 8 different possible moves of the K. Given the initial location of the K it is fairly simple to find the new coordinates for all of the 8 different moves. This is demonstrated in the middle two rows of Table I where the initial location of the K is assumed to be (6, 3). The resulting 8 moves are shown in Figure 1 by cells shaded by diagonal lines.

It must, of course, be realized that for certain initial coordinates of the K not all of the 8 moves will be allowed. As an example of this type, consider the K at (1, 8) in Figure 1. The coordinates for 8 possible moves from this initial position are calculated in the last two rows of Table I. Since all values of coordinates less than 1 or larger than 8 will push the K off the CB, the moves 1, 3, 4, 5, 7 and 8 are not allowed when the initial coordinates of the K are (1, 8). The two allowed moves for this starting position are shown by cells shaded with horizontal and vertical lines in Figure 1.

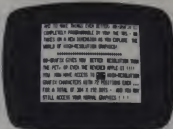
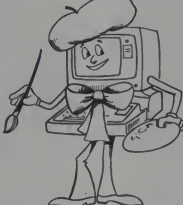
First-Order Moves Associated With a Given Initial Position of the Knight

For each cell on the CB as the start-

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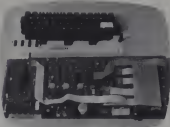
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Problem, cont'd...

ing position of the K, the number of allowed moves can be determined using the procedure explained above. These are called the allowed *first order moves* (FOM's). The FOM's for some of the cells of the CB are shown in Figure 2. Note that, as anticipated, the number of FOM's for the cells near the center of the CB is larger than that for the cells near the edge of the CB.

Symmetry of the CB: Before proceeding further it is useful to analyze the symmetry properties of the CB and the ways these properties can be used to simplify various aspects of this problem. The entire

UV simply interchanges the upper and lower halves of the CB.

(3) Finally, the cells to the left and the right of the line XY are also equivalent. Here the reflection occurs in a vertical plane passing through the line XY and interchanges the left and the right halves of the CB.

What this means is that there are really only 10 unique cells in the CB, lying (fully or partially) in the shaded area of Figure 2. Each one of the remaining 54 cells of the CB is equivalent to one of these 10 cells. To show this equivalence let θ (circle-bar), ϕ (circle-stile), α (circle-slope), and σ (circle-slash) represent the reflection operations in vertical planes

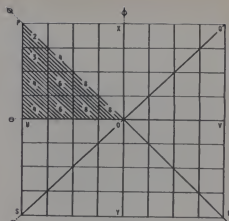


Figure 2

(1, 8), $\theta(1, 1)$ gives (8, 1), and $\theta\theta(1, 1)$ gives (8, 8).

Table II shows how each one of the non-shaded cells of Figure 2 can be obtained from one of the 10 shaded cells. In this Table all of the cells with coordinates occurring in a given column are equivalent.

One immediate consequence of the analysis presented in Table II is that the FOM's associated with any one of the 64 possible initial positions of the K can now be written down from those given for the 10 unique cells in Figure 2. These are shown in Figure 3.

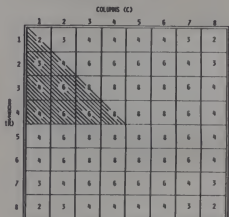


Figure 3

The Second Order Moves (SOM's) and Place-Values (PV's) Associated with a Given Initial Position of the Knight

Having discussed the symmetry properties of the CB and the method of calculating FOM's for the K, it is now a simple task to find the SOM's for the K for each one of the 64 possible starting positions. To find the total number of SOM's for a given starting position, add the FOM's associated with each cell which belongs to a FOM of the K. For example, the SOM's associated with the cell (6, 3) can be calculated as shown in Table III. The information contained in FOM's and SOM's can be conveniently summarized by a decimal number — hereafter referred to as the *place value* (PV). The integer part of PV represents FOM's and the digits

No. of Possible Moves	1	2	3	4	5	6	7	8
ΔR	1	1	-1	-1	2	2	-2	-2
ΔC	2	-2	2	-2	1	-1	1	-1
$(5+R) + \Delta R$	7	7	5	5	8	8	4	4
$(3+C) + \Delta C$	5	1	5	1	4	2	4	2
$(1+R) + \Delta R$	2	2	0	0	3	3	-1	-1
$(8+C) + \Delta C$	10	6	10	6	9	7	9	7

Table I.

A Scheme for Computing the FOM's of the K

CB itself is a big square, labelled as PQRS in Figure 2, with the following three important symmetry properties:

(1) The cells above and below the diagonal lines PR (or QS) are equivalent. This is true because a reflection in a vertical plane passing through PR (or QS) simply interchanges the two diagonal halves of the CB without physically altering it in any way.

(2) The cells above and below the line UV are also equivalent. Here again a reflection in a vertical plane passing through

passing through lines UV, XY, PR, and QS, respectively, of the CB in Figure 2. Thus starting with ΔOPU of Figure 2, the entire square representing the CB can be generated, because a moment's reflection would show that $\theta(\Delta OPU)$ generates ΔOUS , $\theta(\Delta OPS)$ generates ΔOPQ , and $\theta(\Delta QSP)$ generates ΔQSR . The cells in Figure 2 which are equivalent to one of the shaded cells can be determined in a similar fashion. For example the (1, 1) cell is equivalent to the cells with coordinates (1, 8), (8, 1) and (8, 8) because $\phi(1, 1)$ gives

	(1,1)	(2,1)	(2,2)	(3,1)	(3,2)	(3,3)	(4,1)	(4,2)	(4,3)	(4,4)
ϕ	(1,8)	(2,8)	(2,7)	(3,8)	(3,7)	(3,6)	(4,8)	(4,7)	(4,6)	(4,5)
θ	(8,1)	(7,1)	(7,2)	(6,1)	(6,2)	(6,3)	(5,1)	(5,2)	(5,3)	(5,4)
$\theta\phi$	(8,8)	(7,8)	(7,7)	(6,8)	(6,7)	(6,6)	(5,8)	(5,7)	(5,6)	(5,5)
α	-	(1,2)	-	(1,3)	(2,3)	-	(1,4)	(2,4)	(3,4)	-
$\theta\alpha$	-	(1,7)	-	(1,6)	(2,6)	-	(1,5)	(2,5)	(3,5)	-
$\theta\phi$	-	(8,2)	-	(8,3)	(7,3)	-	(8,4)	(7,4)	(6,4)	-
$\sigma(\theta\theta\phi)$	-	(8,7)	-	(8,6)	(7,6)	-	(8,5)	(7,8)	(6,5)	-

Table II.

Each row contains the coordinates of the K obtained by applying the symmetry operation, shown on the left, to the set of coordinates shown in the top row.

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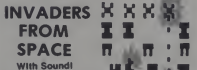
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Initial Coordinates	(6,3)							
Coordinates for allowed FOM's	(7,5)	(7,1)	(5,5)	(5,1)	(8,4)	(8,2)	(4,4)	(4,2)
FOM's for the new positions (from Figure 3)	6	4	8	4	4	8	5	6
SOM'S	Sum of the above FOM'S = 42							

Table III.
Calculation of Second Order Moves (SOM's) for a
Given Initial Position of the K.

after the decimal point represent SOM's. For example, for the cell (4, 4) there are 8 FOM's and 56 SOM's; the PV associated with this cell is 8.56. The PV's associated with the 10 unique cells of CB are shown in Figure 4.

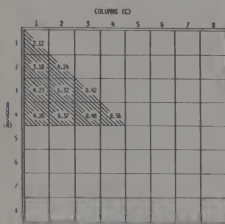


Figure 4

The concept of PV used here is very useful in locating the next move of the K which involves: (1) searching for a cell with *minimum* number of FOM's; (2) if there is more than one cell with the same number of FOM's, then the one with *minimum* number of SOM's is selected. In other words, given an initial position of the K, the next move of the K will be to the allowed cell with the smallest PV. If more than one of the allowed cells have the same PV, the choice becomes arbitrary, and can be defined by choosing the cell with the smallest value of the R-coordinate. This arbitrary choice is *not* a restriction for finding a complete itinerary of the K starting from any cell on a CB.

To determine K's itinerary through the CB in the most efficient fashion, starting with any initial position, the following procedure can now be used.

Step 1: Initialize an itinerary counter to 1. Create an 8 by 8 matrix, representing the Chess Board. The elements of this matrix, at the beginning, represent the PV's corresponding to each cell of the CB. This matrix can be created by using the data given in Figure 4 and by using

the symmetry properties discussed in Section II above.

Step 2: Calculate the new allowed coordinates of the cells of the CB accessible to the K. Find the cell(s) with the lowest PV. If more than one allowed cells with the same PV exist, pick one with the smallest value of the R-coordinate.

Step 3: Decrease the number of FOM's, and hence the PV's, by 1 from all locations of the CB from where the current location will become *unavailable* in all future moves. Note that for the successful determination of the K's itinerary it is *not* necessary to modify the SOM's.

Step 4: Mark the current location of the K on the CB as having already visited. This can be done by replacing the PV in

the current location by 1-N, where 1 is itinerary counter (goes from 1 to 64), and N is any number such that (1-N)-8 will be larger than any PV in the matrix CB. Since each time a location becomes unavailable 1 is subtracted from *all* locations to which the given location becomes unavailable, it is necessary that the factor of 8 be kept in mind (since 1 could be subtracted 8 times from a given element of CB) while selecting the value of N. In practice N equal to 100 or 1000 is most convenient (see Step 7).

Step 5: Move the K to the new position determined in Step 2 above, i.e., replace the old coordinates of the K on the CB with the new ones. Increase the itinerary counter by 1.

Step 6: Repeat Steps (1) through (5) until the K has completed its tour of the Chess Board, i.e., I becomes greater than 64.

Step 7: Replace the elements of the matrix CB by integers showing the sequential-visit-numbers of the K. At the end of Step 6 the matrix CB will contain PV's of the order of (slightly less than) N, 2N, 3N, ..., 64N showing the cells visited by the K in the order 1, 2, 3, ..., 64. The PV's in the CB can be replaced by the sequential-visit-numbers by dividing each PV by N and *rounding up* the result to get an integer.

Step 8: Print the resulting matrix of integers from 1 to 64 showing the K's tour.

<pre> V Z=KATOUR X:A;B;I;AX:Y;I/O [1] I=I/O+1 [2] B=A*20.12 3.18 4.23 4.26 3.18 4.24 6.32 6.37 4.23 6.32 8.42 8.48 4.26 6.37 8.48 8.56 [3] B=A,B,[1]0B=B,0B [4] AX=Z,[1]0-Z=4 2p 2 1 2 1 2 1 2 1 2 [5] L1:Y=(A/(9+Y))>0.01/Y=AX*8 2pX [6] Z=Z+1/Z=B(A=8+Y/Y=(9+Y)0B 1] [7] B(A)=B(A)-1 [8] B[8+Y/X*8 1]=I+100 [9] X=X[Z,1] [10] =L=10+Z=I-1+1 [11] Z=8 0p 0.01*B V </pre>		PROGRAM # 1
<pre> V KATOUR I R [1] 3 0 KATOUR R V </pre>		PROGRAM # 2
<pre> V KATOUR I0;C;R;Z;I/O [1] Z=8 0p R=I/O+1 [2] L10:C=1 [3] L20:Z=Z,(3 0 KATOUR R,C),8 2p ' [4] =L20+1R2C+C+1 [5] =L10+142R+R+1 [6] (R+2),[1] ',[1](R+10+0Z),[1] ',[1](R+8 10+)+20BZ V </pre>		PROGRAM # 3
<pre> V KATOUR ALL;B;C;L;R;Z [1] R=I/O+1 [2] B=8 2p ' [3] L10:C=1 [4] L20:0p L=4+1+B=C [5] 0p 0=HERE ARE '(VL),' EQUIVALENT ITINERARIES CORRESPONDING TO STARTING COORDINATES: ',R,C [6] (3 0+2),B,(3 0+0Z),B,(3 0+0Z),B,(3 0+0Z)=KATOUR R,C [7] =L30+1L+4 [8] ',[1](3 0+0Z),B,(3 0+0Z),B,(3 0+0Z),B,(3 0+0Z) [9] L30:=L20+1R2C+C+1 [10] =L10+142R+R+1 V </pre>		PROGRAM # 4

Figure 5

Ten Iterineraries of the Knight

As indicated earlier, there are only 10 unique starting positions of the K, and for each of these a different itinerary can be found by using the above algorithm. All of the remaining 54 itineraries, each with a different starting cell, can be generated from these 10 by the use of symmetry operations presented.

		COLUMNS (C)															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1	16	5	20	17	26	15	18									
2	6	21	2	16	16	19	16	13									
3	17	4	16	14	12	18	17	14									
4	22	7	12	1	16	13	12	15									
5	15	16	17	10	19	14	13	16									
6	8	25	12	15	16	19	12	13									
7	11	14	25	10	11	10	17	12									
8	24	9	10	15	26	11	10	14									

Figure 6

APL Programs for the Knight's Tours

Four APL programs have been developed to generate the K's tours (see Figure 5). Here is what these programs do:

- **KATOUR** carries out the calculations involved in Steps (1) through (7) described above.

- **KATOUR1** prints one possible tour of the K for any given set of starting coordinates. It is invoked by typing: **KATOUR1 R,C**. Here R and C are the row and column indices of the initial position of the K.

- **KATOUR10** generates and prints 10 tours — one for each one of the 10 unique starting positions of the K. It is used by simply typing its name.

- **KATOURALL** generates and prints 64 itineraries of the K corresponding to 64 different starting positions.

Examples

Figure 6 shows a typical tour of the K starting at the cell (4, 4). Notice that the K stops for the last time at the cell (3, 4). Since the K cannot go from cell (3, 4) to cell (4, 4) in one move, such a tour is called a *non re-entrant*. Of the 64 tours generated by my algorithm, 44 of them are non re-entrant tours. An example of a *re-entrant* tour is shown in Figure 7 with a starting position of (4, 3). At the end of this tour the K stops at the cell (5, 5) from where it can jump to the starting location in one move. My algorithm generates a total of 20 such tours. Seven of the re-entrant tours are related to the tour (4, 3), seven to the tour (3, 2) and three to the tour (3, 3) by symmetry operations described earlier.

Using the APL program #3 of Figure 5, on an ITEL AS/6 under OS/VS1,

		COLUMNS (C)															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1	16	4	24	4	16	5	16	21								
2	12	18	7	4	16	16	16	16	5								
3	13	18	11	17	17	17	12	15									
4	13	13	1	16	16	16	7	16									
5	16	13	16	17	17	17	17	17									
6	13	13	16	17	17	17	17	17									
7	12	18	11	17	17	17	12	15									
8	15	10	11	12	15	16	9	12									

Figure 7

it takes 4.946 seconds to generate 20 tours beginning at 10 unique starting cells of the CB. A. Pauker's Basic program takes 30 minutes to do the same job (what computer?); his Fortran program would do it in about 47 seconds. The beauty of my algorithm lies in the fact that it will produce all 64 itineraries in about 6 seconds, whereas an algorithm, such as Pauker's, that does not take advantage of the symmetry of the CB would take a very long time (Pauker's Fortran program will take about 300 seconds to generate all 64 tours). □

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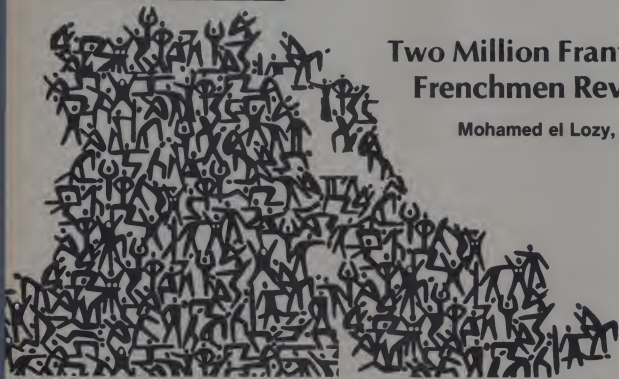
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Two Million Frantic Frenchmen Revisited

Mohamed el Lozy, M.D.

The speed of even the slowest computer often allows the use of crude mathematical methods ("brute force" is a term often used) which may be inefficient in terms of computer time but which, by saving human time, may well be efficient in an overall way. Thus, if a computation to be done once can be carried out crudely in one minute, it makes no sense to invest an hour of human time to produce an algorithm that runs in five seconds. On the other hand, there are problems which cannot be solved by brute force and which respond well to brainpower. A good example is the coin-tossing problem recently discussed in this magazine.

N. B. Winkless, Jr. (*Creative Computing*, June '79) has given an entertaining account of what probabilists call the "Problem of long leads." Briefly, the question posed was: Supposing that the two million residents of Paris all started flipping coins at the rate of one flip per second, and that each stopped as soon as the cumulated totals of heads and tails he had obtained were equal, how many would still be at it (or would "survive") at various levels? Winkless obtained the correct formula, but the method of computation he used breaks down completely if one wants to find the number of "survivors" after a large number of flips. Thus, H. R. Hollandar

(*Creative Computing*, Oct. '79, Input/Output) calculated that to go to the ten year mark on his computer would

require six days of computing, at 24 hours a day! Using a very simple approximation, the number of sur-

```
1 print "table 1: relative errors of approximations to n!"
2 print
3 print
4 print " n", " n!", "rel err 1", " rel err 2"
5 print
6 e=exp(1)
7 f=1
8 for n=1 to 10
9 f=f*n
10 a1=sqr(2*pi*n)*(n/e)^n
11 a2=a1*exp(1/(12*n))
12 e1=abs(f-a1)/f
13 e2=abs(a2-f)/f
14 print n,f,e1,e2
15 next n
16 stop
```

ready
runnh

n	n!	rel err 1	rel err 2
1	1	.077863	2.27427e-03
2	2	.0404979	3.26037e-04
3	6	.0272985	9.96590e-05
4	24	.0205763	4.23590e-05
5	120	.0165072	2.16166e-05
6	720	.0137086	1.24613e-05
7	5040	.0118265	7.75050e-06
8	40320	.0103578	5.03782e-06
9	362880	9.21344e-03	3.10020e-06
10	3.62880e+06	8.29661e-03	1.99791e-06

stop at line 100

ready

Mohamed el Lozy, M.D., Department of Nutrition, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115.

Table 1: Relative errors of approximations to n!

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CIRCLE 178 ON READER SERVICE CARD

Frenchmen, cont'd...

vivors at any time after the first few flips can be accurately computed in seconds with a hand held calculator.

In this problem, as in many problems in probability, results can be obtained very quickly using Stirling's approximation to the factorial function. As many will remember, factorial n , written $n!$, is simply the product of all the integers from 1 to n . Thus: $n! = 1 \cdot 2 \cdot 3 \cdot \dots \cdot (n-1) \cdot n$.

For small n this is easy to evaluate by repeated multiplication, but for large n it becomes more and more time consuming. Stirling's approximation,

in its crudest form, states that, approximately, $n! = \sqrt{2\pi n} \cdot (n/e)^n$.

where $e (=2.71828 \dots)$ is the base of the natural logarithms. A better approximation is given by

$$n! = \sqrt{2\pi n} \cdot (n/e)^n \cdot e^{1/2n}$$

In both cases the ratio of the approximate to the true value approaches unity as n increases. The first program compares these two approximations.

It will be seen that in both cases the relative error decreases with increasing n , and that the second approximation is very much better than the first. Indeed, for $n = 10$ the second approximation gives results accurate almost to the precision of the

arithmetic, while first still has an error of 0.8%.

The method followed by Winkless can be formalized by saying that the probability of surviving after n pairs of flips is

$$P_n = (1/2) \cdot (3/4) \cdot (5/6) \dots (2n-1)/2n \\ = \frac{1 \cdot 3 \cdot 5 \dots (2n-1)}{2 \cdot 4 \cdot 6 \dots 2n}$$

At first sight it may not be clear where $n!$ enters into this formula. On more careful observation it should be clear that the denominator consists of the factors of $n!$, each multiplied by 2, so since there are n factors, we have $2 \cdot 4 \cdot 6 \dots 2n = 2^n \cdot n!$

As for the numerator, a simple (once you know it!) trick will transform it into a quotient of factorials. The numerator consists of the odd factors of $(2n)!$, and

The number of survivors at any time after the first few flips can be accurately computed in seconds with a hand-held calculator.

its value will not be changed if we multiply and divide it by the even factors $2 \cdot 4 \cdot 6 \dots 2n$. Hence, we get

$$1 \cdot 3 \cdot 5 \dots (2n-1) = \frac{(1 \cdot 3 \cdot 5 \dots (2n-1)) \cdot (2 \cdot 4 \cdot 6 \dots 2n)}{2 \cdot 4 \cdot 6 \dots 2n}$$

The numerator of this is clearly $(2n)!$, while we have already seen that the denominator is $2^n \cdot n!$. Hence, we have

$$P_n = \frac{(2n)!}{2^n \cdot n!^2}$$

a form in which we can readily use Stirling's approximation. Using the simple approximation we get

$$P_n = \frac{1}{\sqrt{n}}$$

while using the more accurate approximation we get

$$P_n = \frac{e^{-1/8n}}{\sqrt{\pi n}}$$

An ever better approximation can be obtained by the use of the gamma function. Those familiar with that function will readily see that

$$P_n = \frac{\Gamma(n+0.5)}{\sqrt{\pi} \cdot n!}$$

Using an excellent approximation given by Raff (*American Statistician*, April 1970, pp 22-24) we get:

$$P_n = \frac{1}{\{(n+0.25)^2 + 1/16\}^{1/4} \sqrt{\pi}}$$

```
1 print "table 2: comparison of approximations to numbers of
  survivors"
2 print
3 print
4 print " n," true," app 1," app 2," app 3"
5 print
10 f=2.000000e+06
15 p1=f
20 for n=1 to 30
25 p1=p1*(2*n-1)/(2*n)
30 p2=f/(sqrt(p1*n))
35 p3=p2*exp(-1/(8*n))
40 p4=f/((n+.25)^2+.0625)^.25
45 p4=p4/sqr(p1)
50 print n,p1,p2,p3,p4
55 next n
60 stop
```

ready
run

n	true	app 1	app 2	app 3
1	1.000000e+06	1.12838e+06	995791	999405
2	758000	797885	749543	749949
3	625000	651478	624883	624989
4	546875	564198	546831	546872
5	492188	504626	492167	492186
6	451172	460655	451161	451171
7	418945	426487	418939	418945
8	392761	398942	392757	392761
9	370941	376126	370939	370941
10	352394	356825	352392	352394
11	336376	340219	336375	336376
12	322360	325735	322360	322361
13	309962	312956	309961	309962
14	298892	301572	298891	298892
15	288929	291346	288928	288929
16	279908	282095	279908	279908
17	271667	273672	271667	271668
18	264121	265962	264121	264121
19	257171	258868	257170	257171
20	250741	252313	250741	250741
21	244771	246233	244771	244771
22	239208	240571	239208	239208
23	234008	235283	234008	234008
24	229133	230329	229133	229133
25	224558	225676	224558	224558
26	220232	221293	220232	220232
27	216154	217157	216154	216154
28	212294	213244	212294	212294
29	208634	209535	208634	208634
30	205156	206013	205156	205156

stop at line 60
ready

Table 2: Comparison of approximations to numbers of survivors.

The second program compares the performance of three approximations given over the first minute (30 pairs of flips). While approximation 1 does give a rough idea of the true values, it is much less accurate than the other two, with the last one being marginally better than the second.

The third program uses the last approximation to obtain the expected numbers of survivors after selected

time periods. This computation confirms the result, obtained by H. R. Hollander by brute force computing, that at the end of one year we should expect to have 284 survivors. It also shows that at the end of one century there would be 28 survivors, a result beyond the research of any brute force approach. Finally, we see that after 4 millennia there would still be 4 solitary survivors. □

```
10 print "table 3: numbers of survivors after"
15 print "        different periods of time"
20 print \ print
40 u=1
50 for i=1 to 7
60 read i$,f
70 u=u*f \ print i$
100 for j=1 to 4
105 n=j*u
110 p=2.00000e+06/(((n+.25)^2+.0625)^.25)*sqr(p1)
115 p=int(p+.5)
120 print j,p \ next j \ next i
150 stop
160 data "minutes",30
170 data "hours",60
180 data "days",24
190 data "years",365
200 data "decades",10
210 data "centuries",10
220 data "millennia",10
```

READY

minutes	
1	285156
2	145370
3	118777
4	102899
hours	
1	26594
2	18806
3	15355
4	13298
days	
1	5429
2	3839
3	3134
4	2714
years	
1	284
2	281
3	164
4	142
decades	
1	90
2	64
3	52
4	45
centuries	
1	28
2	20
3	16
4	14
millennia	
1	9
2	6
3	5
4	4
Stop at line 150	
READY	

Table 3: Numbers of survivors after different periods of time.

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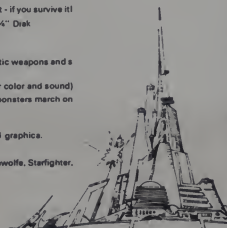
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CIRCLE 102 ON READER SERVICE CARD

A Computerized Identikit for Alien Beings

Ralph Roberts



It ain't easy for a science fiction writer to keep coming up with a bunch of different aliens for each story. Nope, we don't run across all that many in real life, you know. Oh, a few, maybe, but not enough.

So I developed this program to help me and you create our very own aliens. Naturally, space in magazines being limited, this is only a framework. You can add a lot more descriptive phrases to fill up your memory. Or create disk files of the various alien attributes rather than using DATA lines as I have. Also change the paragraph to other settings and so forth. In addition, this program is a great idea generator. It may give you that little spark out of which a story grows.

The program itself is simple. It's written in Smoke Signal Basic for my Chieftain. A few notes of explanation: 'CHRS(12)' clears my CRT, 'STRING=39' sets the length of string variables, 'P.' is the same as 'PRINT.'

Again, let me stress that this program is a skeleton. Elaborate. Have fun. Create them aliens, hear?

Ralph Roberts, P.O. Box 8549, Asheville, NC 28804

```

0001 PRINT CHR$(12)
0002 REM ALIEN DESCRIPTION PROGRAM
0003 REM :iby Ralph Roberts:
0004 STRING= 39
0005 LINE= 72
0010 FOR X=1 TO 10:READ A$(X):NEXT X
0011 FOR X=1 TO 10:READ B$(X):NEXT X
0012 FOR X=1 TO 10:READ C$(X):NEXT X
0013 FOR X=1 TO 10:READ D$(X):NEXT X
0014 FOR X=1 TO 10:READ E$(X):NEXT X
0015 FOR X=1 TO 10:READ F$(X):NEXT X
0016 FOR X=1 TO 10:READ G$(X):NEXT X
0017 FOR X=1 TO 10:READ H$(X):NEXT X
0018 FOR X=1 TO 10:READ I$(X):NEXT X
0050 PRINT "      When I turned the corner in that long corridor
traversing the ";
0052 PRINT "ancient starship, I found myself face to face with
the alien ";
0054 PRINT "creature. I skidded to a halt and nervously looked
it over. The alien was ";
0056 PRINT "quite a sight. Its head was ";GOSUB 9000:P.A$(A);"
";
0058 PRINT "and the eyes were ";GOSUB 9000:P.B$(B);" ";
0060 PRINT "Obviously, its hearing organs were ";GOSUB
9000:P.C$(C);" ";
0062 PRINT "and I found myself repelled by the mouth which was
";
0064 GOSUB 9000:P.D$(D);" ";
0066 PRINT "On the front of that awful face, the nose was
";GOSUB 9000:P.E$(E);" ";
0068 PRINT "and I couldn't help noticing that the creature's
body was ";GOSUB 9000
0069 PRINT "F$(F);" ";
0070 PRINT "The alien was wearing ";GOSUB 9000:P.G$(G);"
";and carrying ";
0072 GOSUB 9000:P.H$(H);" ". Then it spoke with a voice like
";GOSUB 9000
0074 PRINT I$(I);" ". Only by heroic effort did I regain control
of myself."
0900 END
1000 REM -- HEAD --
1001 DATA soft and round,kind of squishy,like a block of rusty
steel,bullet-shaped,glowing and pulsing
1002 DATA a dark yellow sphere,pitted like an airless
moon,oblong,partially transparent
1003 DATA like a flattened basketball
2000 REM -- EYES --
2001 DATA three pulsating black circles,like two clusters of
orange grapes,a band of light emitting holes
2002 DATA five little rotating balls,constantly blinking blue
lights,like a spider's
2003 DATA piercing gray squares,shooting out beams of yellow
heat,unblinking green orbs,two floppy purple stalks
2500 REM -- EARS --
2501 DATA just two small holes,large and floppy like a
dog's,twitching constantly
2502 DATA tiny trumpet-like organs,more like tall yellow
horns,always moving purple tendrils
2503 DATA scaly membranes atop its head,on the tip of its ugly
nose,yellow and purple spotted fans,irregular shaped openings
3000 REM -- MOUTH --
3001 DATA a simple slit,constantly opening and snapping
shut,emitting a foul odor
3002 DATA filled with sharp red teeth,barely discernable,like a
miser's purselip
3003 DATA a perfect dark green square,slobbering drops of purple
drool,hidiously open,like a hungry look
3500 REM -- NOSE --
3501 DATA flopped forward like a green elephant's,a tiny orange
dot,wigwagging with a life of its own
3502 DATA jutted out like an orange banana,bobbling
obscenely,pert for such a monster
3503 DATA seemed to have a life of its own,crinkling at my
smell,unbelievably huge,a single yellow hemisphere
4000 REM -- GENERAL BODY DESCRIPTION --
4001 DATA short and squat,massively fat,a great blocklike mass,a
slim sticklike affair,like a lake of jelly
4002 DATA sprouting appendages all over,vaguely humanoid,like a
wrinkled gray leather bag
4003 DATA graced with four legs and an arm,seemingly made up of
small spheres

```

Program Listing

```

5000 REM -- CLOTHES --
5001 DATA gaudy plastic coveralls,a very short orange
cobe,strings of multicolored beads
5002 DATA just a wide purple and gold belt,nothing at
all,shimmering strips of greenish light
5003 DATA something very like Bermuda shorts,leather cowboy
boots and chaps,bits and pieces of odious rags
5004 DATA a mostly transparent pressure suit
5005 REM -- WEAPONS AND DEVICES
5501 DATA a huge broadsword,some sort of raygun,a device
consisting of red lights
5502 DATA a recording device,a girly magazine,a wicked cutting
instrument
5503 DATA a much smaller replica of itself,an efficient
appearing lasergun
5504 DATA a really weird machine,an evil looking throwing weapon
6000 REM -- SPEECH --
6001 DATA the roaring of an angry sea,bees buzzing hungrily,a
cold wind whistling
6002 DATA a buzz saw hitting rusty nails,birds singing offkey,a
stuck doorbuzzer
6003 DATA rapidly popping champagne corks,fingernails scraping a
blackboard
6004 DATA the sound of boiling water,the tinkle of shattering
glass
9000 LET A=INT(RND*10)+1:RETURN

```

Sample Runs

When I turned the corner in that long corridor traversing the ancient starship, I found myself face to face with the alien creature. I skidded to a halt and nervously looked it over. The alien was quite a sight. Its head was partially transparent and the eyes were a band of light emitting holes. Obviously, its hearing organs were yellow and purple spotted fans and I found myself repelled by the mouth which was slobbering drops of purple drool. On the front of that awful face, the nose was flopped forward like a green elephant's and I couldn't help noticing that the creature's body was graced with four legs and an arm. The alien was wearing gaudy plastic coveralls and carrying a wicked cutting instrument. Then it spoke with a voice like the roaring of champagne corks. Only by heroic effort did I regain control of myself.

When I turned the corner in that long corridor traversing the ancient starship, I found myself face to face with the alien creature. I skidded to a halt and nervously looked it over. The alien was quite a sight. Its head was bullet-shaped and the eyes were unblinking green orbs. Obviously, its hearing organs were tiny trumpet-like organs and I found myself repelled by the mouth which was hideously open. On the front of that awful face, the nose was unbelievably huge and I couldn't help noticing that the creature's body was sprouting appendages all over. The alien was wearing shimmering strips of greenish light and carrying a huge broadsword. Then it spoke with a voice like the roaring of an angry sea. Only by heroic effort did I regain control of myself.

When I turned the corner in that long corridor traversing the ancient starship, I found myself face to face with the alien creature. I skidded to a halt and nervously looked it over. The alien was quite a sight. Its head was kind of squishy and the eyes were like two clusters of orange grapes. Obviously, its hearing organs were more like tall yellow horns and I found myself repelled by the mouth which was filled with sharp red teeth. On the front of that awful face, the nose was jutted out like an orange banana and I couldn't help noticing that the creature's body was like a wrinkled gray leather bag. The alien was wearing nothing at all and carrying an evil looking throwing weapon. Then it spoke with a voice like birds singing offkey. Only by heroic effort did I regain control of myself.

When I turned the corner in that long corridor traversing the ancient starship, I found myself face to face with the alien creature. I skidded to a halt and nervously looked it over. The alien was quite a sight. Its head was bullet-shaped and the eyes were like a spider's. Obviously, its hearing organs were on the tip of its ugly nose and I found myself repelled by the mouth which was constantly opening and snapping shut. On the front of that awful face, the nose was a single yellow hemisphere and I couldn't help noticing that the creature's body was sprouting appendages all over. The alien was wearing bits and pieces of odious rags and carrying an efficient appearing lasergun. Then it spoke with a voice like the roaring of an angry sea. Only by heroic effort did I regain control of myself.

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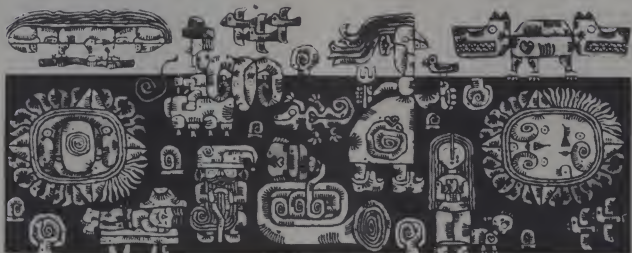
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LAP — Will You Accept The Challenge?

Bruce D. Barnett



Here is an exciting game that will not only test your powers of deduction, but will provide you with much entertainment while you try to figure out a hidden pattern on an 8 x 8 grid—if you can—with the least number of queries. The game called LAP, is a thought provoking mixture of BATTLESHIP, MASTERMIND and ZONE-X.

LAP was invented by Lech Pijanowski of Warsaw, Poland and first caught my eye in a book entitled "A GAMUT OF GAMES" by Sid Sackson.

I usually get discouraged if I have to perform an extensive amount of typing to place a game on my home computer.

This article presents a program that enables you to play this challenging game on your computer. I've purposely made the program as short as reasonably possible, since I usually get discouraged if I have to perform an extensive amount of typing to place a game on my home computer, and I've assumed that you might too. Thus this program con-

tains only 20 lines and has no frills. For example, the rules are explained in this article—not in the program—and if you make a mistake, you will simply have to start over. However, this does not present a problem, since the inputs are quite modest anyway. I later mention a number of suggestions and an especially difficult problem should you care to enhance your program.

The rules of LAP are quite simple. Imagine an 8 x 8 square grid divided into four regions marked R1, R2, R3 and R4 such that each region contains exactly 16 cells and each region is continuous. This means that any two squares within a given region can be reached simply by

moving horizontally or vertically a square at a time without entering any other region. Figure 1 shows one possible such segmentation. The letters and numbers around the grid serve simply to allow one to name each square.

The object of LAP is to determine the exact location of each of the four regions of a pattern that is hidden from you. As clues, you may ask for the number of cells that are contained within each region for any of four adjacent cells you desire that are in the shape of a square. Thus, referring to Figure 1, if you asked about cells B2, B3, C2 and C3 which obviously form a square, you would receive the response that three of

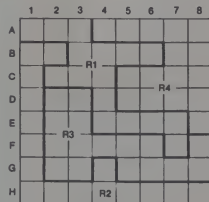


Figure 1



Figure 2

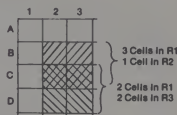


Figure 3

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these cells were in region R1 and one cell was in region R2. The challenge is to determine the hidden pattern with as few queries as you need—the fewer you require the better you must be. Thus, not only should you derive the most information from each response, but the queries themselves should be carefully selected.

To get you started, suppose you first asked about G1, G2, H1 and H2, (Query #1 or Q1 for short) and that you received the response that 3 cells were in R2 and that one cell was in R3. Clearly the corner cell must be in R2, for otherwise region R3 could not be continuous as shown in Figure 2. Suppose, further, that a second query (Q2), resulted in 3 cells in R1 and 1 cell in R2 for the square of cells B2, B3, C2 and C3. Similarly, let two cells be in R1 and two cells be in R3 for a third query asking about C2, C3, D2 and D3. See Figure 3. You can immediately deduce that cells C2 and C3 are contained in R1 and D2, D3 are contained in R3. This follows from the fact that the single cell in R2 (from Q2) cannot lie in cells C2 or C3 (referring to Q3), and thus these cells (C2 and C3) are R1 cells since you

know from Q2 that three cells lie in R1. A moment's reflection will tell you that D2 and D3 are contained in R3. So far we have the picture of Figure 4, where one of B2 or B3 lies in region R2 with the other cell in region R1. Let Q4 ask about the corner, A1, A2, B1 and B2. Suppose the response was 2 cells in R1 and 2 in R2. Armed with this extra information we can surprisingly arrive at Figure 5. The reasoning is a bit complex—but here goes! Suppose we assume that B3 is in R2. Some reflection shows that A1 must be in R2 and now for the three 2s we've established, (see Figure 6), to be connected the 2s must form a pattern somewhat like Figure 7A or 7B. In either case it is impossible to have 16 continuous cells in all regions. Thus our initial assumption about B3 must be incorrect and thus B3 must be in region R1. A bit more straightforward deduction was applied to finally arrive at Figure 5. This is only a sample of some of the reasoning you can apply to this game, which hopefully has whetted your appetite for more!

In playing this game on your computer, the computer naturally will be the one to respond to your

queries. You can make as many queries as you wish by keying in a 1 to the following question that you should see at your terminal when you run the program.

ENTER COORDINATES, (1) OR SEE ANSWER, (2) 1 or 2? In specifying coordinates you need only input the top left cell—the program will figure out the remaining cells that form a square for you. When you think you have the pattern or have simply given up, key in a 2 to the aforementioned question to see the answer. All this is illustrated in the sample run.

The object is to determine the exact location of each of the four regions of a pattern that is hidden from you.

Program Description

This program was written in Northstar Basic. To get started, each square of the grid was individually numbered as shown in Figure 8. Function FNC(Q\$) simply converts an inputted cell description such as B5 to the corresponding cell number—13 in this case. Function FNC(N) is the inverse function and will convert 13 back to B5. You will note that once the top left square is specified such as B5, the four cells that form the larger square of your query always follows the same number pattern. This is illustrated for a specific square in Figure 9A and shown in general in Figure 9B. Statements 80 to 100 calculate and record the region that each of the four cells lie within. The polynomial expression in statement 90, $1*(8*1-2*1*1-6)$, has the property of equalling the 0, 1, 8 and 9 of Figure 9B as I takes on consecutive integers from 0 to 3, and thus identifies the

	1	2	3
A			
B		2?	2?
C		1	1
D		3	3
E			
F			
G			
H	2		

Figure 4

	1	2	3
A	1	1	1
B	2	2	1
C	2	1	1
D	2	3	3
E	2		
F	2		
G	2		
H	2		

Figure 5

	1	2	3
A	2		
B		1	2
C		1	1
D		3	3
E			
F			
G			
H	2		

Figure 6

	1	2	3	4
A	2	1		
B	2	1	2	2
C	2	1	1	2
D	2	3	3	2
E	2			2
F	2	2	2	2
G	2			
H	2			

Figure 7A

	1	2	3	4	5
A	2	2	2		
B	1	1	2	2	2
C		1	1		2
D		3	3		2
E					2
F					2
G					2
H	2	2	2	2	2

Figure 7B

	1	2	3	4	5	6	7	8
A	1	2	3	4	5	6	7	8
B	9	10	11	12	13	14	15	16
C	17	18	19	20	21	22	23	24
D	25	26	27	28	29	30	31	32
E	33	34	35	36	37	38	39	40
F	41	42	43	44	45	46	47	48
G	49	50	51	52	53	54	55	56
H	57	58	59	60	61	62	63	64

Figure 8

To change the pattern one need only change statement 20. Five different patterns are provided you at the end of this paragraph for you to

<u>SQUARE</u>	<u>SQUARE NO.</u>	<u>FORM</u>
B5	13	$13 + 0$
B6	14	$13 + 1$
C5	21	$13 + 8$
C6	22	$13 + 9$

Figure 9A

<u>SQUARE</u>	<u>SQUARE NO.</u>	<u>FORM</u>
TOP LEFT	X	$X + 0$
TOP RIGHT		$X + 1$
BOTTOM LEFT		$X + 8$
BOTTOM RIGHT		$X + 9$

Figure 9B

```

0010 IIN K$(64),Q$(2)
0020 I=I+1:DO UNTIL Q$(1)=1:444440:331444:40:33111:40:33331:33333:3332222222
0030 I=I+1:DO UNTIL Q$(1)=1:444440:331444:40:33111:40:33331:33333:3332222222
0040 DEF FNCS(I)=CHRS(INT(I/7)+65)+CHRS(8-INT(I/7)+65)
0050 IF INPUT$(1) NOT IN "0123456789",GOTO 1
0060 IF I=0 GOTO 70
0070 INPUT "ENTER TOP LEFT COORDINATE ",Q$
0080 FOR I=0 TO 3
0090 I=I+1:FNCS(I)=I*(9-I+1)*"1-6"
0100 FN VAL(I,K$(1,M(1)))=FN VAL(K$(1,M(1)))
0110 NEXT I
0120 PRINT "POINTS",TAB(14),"REGION",TAB(29),"NO. CELLS IN REGION"
0130 FOR I=1 TO 4
0140 PRINT FNCS(I-1),TAB(15),1,TAB(30),M(1)
0150 NEXT I
0160 GOTO 50
0170 FOR J=0 TO 7
0180 FOR I=1 TO 8
0190 PRINT TAB(25),K$(8*J+1,8*J+1)*" ",NEXT I
0200 NEXT J

```

Listing Of Basic Program

```

REPLY
RUN

ENTER COORDINATES, (1), OR SEE ANSWER, (2) 1 OR 2 ? 1
ENTER TOP LEFT COORDINATE A1

POINTS      REGION      NO. CELLS IN REGION
A1          1           2
A2          2           7
B1          3           0
B2          4           0

ENTER COORDINATES, (1), OR SEE ANSWER, (2) 1 OR 2 ? 2
ENTER TOP LEFT COORDINATE B2

POINTS      REGION      NO. CELLS IN REGION
B2          1           3
C2          2           1
C3          3           0
C4          4           0

ENTER COORDINATES, (1), OR SEE ANSWER, (2) 1 OR 2 ? 1
ENTER TOP LEFT COORDINATE C2

POINTS      REGION      NO. CELLS IN REGION
C2          1           2
C3          2           8
C4          3           0
C5          4           0

ENTER COORDINATES, (1), OR SEE ANSWER, (2) 1 OR 2 ? 2

```

Sample Run

try one at a time. However, you need not be limited to just these; a friend can just as easily make up new patterns for you. If you compare Figure 1 with statement 20, you will note that the position of each number corresponds to the cell number and the entry itself is the region that the cell occupies.

Five Additional Patterns

Finally, as promised earlier, some enhancements you may want to add to your program are:

1) Coding that will automatically count the number of cells in each region specified by K\$. If they all total up to 16, this will have been a nice check for you.

2) Allow yourself additional tries should you enter an incorrect coordinate.

3) Count and print the number of queries you made before asking for the answer.

4) And now the most challenging of all: have the computer randomly generate the four continuous regions. It should be theoretically possible to generate every possible segmentation by a proper choice of random numbers! Should you accomplish this difficult task you can call yourself a programming genius.

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Mind Exerciser

Jason Woolf
Charles Hemminger

Have you an agile memory? Are you sober? Try this one on your friends. It's a simple game to measure your powers of recall.

Mind Exerciser displays words at random points on the screen. After a short time you are asked to remember as many of the words as possible.

This program should be adaptable to any Basic which allows positioning of the cursor. This is the version we have worked out for a TRS-80.

The first section of the program initializes everything and reads the words to be used from the DATA statements at the bottom of the program. You can choose up to 199 words up to 12 letters long, but be sure to conclude with "1".

In Lines 410-520 the cursor positions are chosen. The object is to place them below the title message and so they do not overlap each other or wrap around the screen.

The next seven Lines shuffle the order of the words in the data set. The rest of this simple program is quite straightforward. If you can display upper and lower case then Lines 850-900 can be omitted. The typical TRS-80 enters the ASCII value when an upper-case letter is typed and displays it accordingly. Lower-case entries are taken into the buffer as ASCII lower case but displayed as upper case. This can make for confusing errors by whomever is trying to remember the words. Therefore the program assumes that all DATA is entered with no capitals. This routine can match the stored words with any entries.

Jason Woolf, Charles Hemminger, 20 North Harrison Ave., Northampton, MA 01060.

```

10 REM MIND EXERCISER
20 REM VERSION 1.0
30 REM BY JASON WOLF & CHARLES HEMMINGER
40 CLS
50 CLEAR2000
60 DIM A$(200), S(200), BS(25), B(25)
70 N=0
80 N=N+1
90 READ A$(N)
100 IF A$(N)=""-1 THEN 130
110 S(N)=N
120 GOTO 80
130 N=N+1
140 REM INSTRUCTIONS
150 PRINT @20,"MEMORY EXERCISE"
160 PRINT
170 PRINT "DO YOU NEED INSTRUCTIONS (YES OR NO) "
180 INPUT Q$
190 IF LEFT$(Q$,1)=""Y" THEN 310
200 PRINT
210 PRINT "THIS IS AN EXERCISE OF YOUR ABILITY TO CONCENTRATE."
220 PRINT "YOU WILL BE REQUESTED TO CHOOSE THE DENSITY OF WORDS TO"
230 PRINT "BE DISPLAYED ON THE SCREEN. THEY WILL BE SHOWN FOR A SHORT"
240 PRINT "PERIOD OF TIME WHICH YOU HAVE ALSO CHOSEN. YOU MUST THEN"
250 PRINT "TRY AND REMEMBER AS MANY AS POSSIBLE."
260 PRINT
270 PRINT "YOU SHOULD TRY AT LEAST 3 EXERCISES TO OBTAIN AN AVERAGE."
280 PRINT
290 PRINT "GOOD LUCK !"
300 PRINT
310 REM SET DENSITY
320 PRINT "DENSITY (1-5) "
330 INPUT D
340 D=INT(D)
350 IF D<1 OR D>5 THEN 320
360 ON D=5

```

```

370 PRINT "SPEED (1-30) "J
380 INPUT J
390 S=INT(S)
400 IF S<1 OR S>30 THEN 370
410 REM RANDOMIZE PRINTING
420 C=0
430 FOR I=1 TO D
440 R=120+RND(883) : REM WANT A NUMBER FROM 120 TO 1023 - 12
450 IF R=INT(R/64)*64+51 THEN 440
460 IF I=1 THEN 500
470 FOR J=1 TO C
480 IF R=B(J)-12 AND R=B(J)+12 THEN 440
490 NEXT J
500 B(I)=R
510 C=C+1
520 NEXT I
530 REM RANDOMIZE DATA WORDS
540 FOR I=N TO 2 STEP -1
550 K=INT(RND(883)*N+1)
560 T=S(I)
570 S(I)=S(K)
580 S(K)=T
590 NEXT I
600 REM DISPLAY TEST
610 CLS
620 PRINT 020,"MEMORY EXERCISER"
630 FOR I=1 TO 0
640 PRINT 030,I,AS(S(I))
650 NEXT I
660 REM DELAY
670 FOR I=1 TO 5
680 FOR J=1 TO 600
690 NEXT J
700 NEXT I
710 REM ANSWER SHEET
720 C=0
730 CLS
740 FOR I=1 TO D
750 IF I/11=>INT(I/11) THEN 790
760 FOR J=1 TO 600
770 NEXT J
780 CLS
790 PRINT 020,"MEMORY EXERCISER"
800 PRINT 010,"HOW MANY OBJECTS CAN YOU RECALL"
810 M=1-INT(I/11)+1
820 PRINT 0256+M*64,"OBJECT # "J"J" "J"
830 INPUT TS
840 PRINT 0306+M*64,""J"
850 REM MAKE SURE NO UPPER CASE CHARACTERS
860 T=LEN(TS)
870 FOR J=1 TO T
880 K=ASC(MID$(TS,J,1))
890 IF K>96 THEN TS=LEFT$(TS,J-1)+CHR$(K-32)+RIGHT$(TS,T-J)
900 NEXT J
910 REM DID HE GET IT RIGHT
920 FOR L=1 TO D
930 IF AS$(L)<>TS THEN 1010
940 IF L=1 THEN 1040
950 FOR K=1 TO C
960 IF B$(K)<>TS THEN 990
970 PRINT "REPEAT"
980 GOTO 1070
990 NEXT K
1000 GOTO 1040
1010 NEXT L
1020 PRINT "SORRY"
1030 GOTO 1070
1040 PRINT "CORRECT"
1050 C=C+1
1060 B$(C)=TS
1070 NEXT I
1080 PRINT "YOU HAD "J"C" OUT OF "J"D" CORRECT."
1090 U=U+C
1100 V=V+D
1110 PRINT "WOULD YOU LIKE TO TRY AGAIN (YES OR NO) "J"
1120 INPUT US
1130 IF LEFT$(US,1)="" THEN 400
1140 IF LEFT$(US,1)="" THEN 1110
1150 PRINT "YOUR FINAL SCORE WAS"J"INT(U/V*100)J"% CORRECT."
1160 END
1170 REM STORE DATA WORDS OF YOUR CHOISING
1180 DATA DOG,CAT,ELEPHANT,ZEBRA,COW,PIG,SHEEP,DUCK,CHICKEN,RAT
1190 DATA HOUSE,TREE,ROSE,DAFFOIL,BIRD,ROBIN,BLUEJAY,CAR,GARAGE
1200 DATA PICTURE,PENCIL,PEN,PAPER,TYPEWRITER,DIPLOMA,WRENCH,NAIL
1210 DATA LIGHT,THIMBLE,SPOOL,WIRE,SLAKE,BUSH,FLOWER,CHAIN
1220 REM LAST DATA WORD MUST BE -1
1230 DATA -1

```

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(kōrs'wār).n.

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Computers in fiction; Survey of Educator's Attitudes; K-State: How to Hide Your Basic Program; World Chess Championship Computer; Computer Catalog; Microchess for the TRS-80; Exidy Sorcerer; Ohio Scientific superboard II; Robots in Fiction; Help for the Weary Taxpayer; A counterfactual Cursor for your PET; Medical Audit Time.

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Word processing systems — buying a system and 5 evaluations; Writing 2 user-oriented programs; Tutorial on PILOT; 3 new games; Amortization schedules, reading and comprehension tests.

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Two Ecology Simulations, Creativity Test, World Power Systems, Files and Data Bases — 4 Articles; Evaluations of Six Peripherals and Software Systems; Personal finance Model, 2 logic games.

Vol. 5, No. 8 August 1979

Adventure, Computers and Dance, Can Computers Think? The Law and Your Computer, muMath, Image Processing, Manipulating Pencil Files, Structured Programming Techniques, Evaluation of TI99/4, TRS-80 Model II, SWTPC PR-40, IMSAIVIO Games: HVOLT and Fort.

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Comparison Chart of Six Popular Personal Computers, Comparison of Single Board Computers, Electronic Toys and Games, Quick Printer II, Interact Computer, TRS-80 Level III Basic, Battle of the Word Processors, Introlx-10 Home Control System, Adventure: Complete Listing in Basic, Build Your Own Telephone Dialer and Joysticks.

Vol. 5, No. 12 December 1979
More Electronic Games, Language Translators, APFMP1000 Video Game System, Buying a Word Processor printer, Satellite Tracking Software, Syskit for the 8080, Assemblers: CP/M vs. TSC, Statistics for the TRS-80, Part 2: Controlling Household Devices, Computerized Biofeedback, Applications: The Microcomputer as an Investment Tool, "Turnkey" CP/M systems, Animation for the Apple, Digitized Video Images.

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Vol. 6, No. 2 February 1980
Six articles on Investment Analysis; David Levy: Intelligent Computer Games; Programs: Geneology, Graphing, Genetics; Evaluations of Word Star vs Electric Pencil; Pascal

for the TRS-80; Micro Processor, Data Debugger; Sorcerer Word Processing Pac; Trivia Contest Results.

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Evaluations: TI 99/4; Cobol: Micro-soft vs Micro Focus; Pencil Sharpener; Mailroom Plus; Tan software packages; Networks for Personal Computers; Threes Milla Island Game; Interview with Joel Blinbaum; How to Make a Basic Tree.

Vol. 6, No. 7 April 1980
Dr. KiloBYTE's Creative Popular Personal Recreational Micro Computer Data Interface World Journal—the Famous 73 page April Fool parody, 8 Articles on Reading and Language; Interview with Gordon Ball; Evaluations of Heath WH-89, Atari 800 vs PET; Chateworth Mark Senza Card Reader, Adventura.

Vol. 6, No. 8 May 1980
7 Features on Saving Money with your Computer: Analysis of Stock Options, Budgeting Modal, Shopping Lists, Home Inventory, Home Purchase, Retirement Planning, Computer-Aided Modal Rocket Design; Two Natural Language Systems; Evaluations of PET 2022 Line Printer, APF Imagination Machine, Personal Software's Desktop/Plan, Universal Data Entry System.

Vol. 6, No. 9 June 1980
14 Graphics Articles: Polar Plots, 3-D Graphics, Animation, Graphic Mazes, Motion Simulation, Inada Spaca Invaders. 7 Music Articles: Digital Audio, Computer-Aided Sight Reading, Design of a Synthesizer, Digital Enhancement of Old Recordings, Comparison of printers; Evaluations of The Atari Machine, Nealeco's Music Box for the PET, HeathKit-Thomas Electronic Organ Kit.

Music Board: Flowcharting; Payroll Program.

November 1977
Solar Energy Measurement; A Beginners Introduction to BASIC; The Kit and I, Part III; More Music to Play on Your Computer; Micro Maintenance, Solomon and Viet: Putting Together a Personal Computing System; Time Sharing on the Family MICRO.

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ROM
COMPUTER APPLICATIONS FOR US



ROM

July 1977

SOL: The Inside Story; Braille and the Computer Video newspaper; A Chip is Born; The Cara and Feeding of Your Home Computer; Digital Foam — the peripheral of the future.

August 1977

The Kit and I, Part I, by someone who's never soldered before; Introduction to the fundamentals of Computer Memory; Tips for the do-it-yourself hardware beginner; Binary clocks; APLomania.

September 1977

Xeroxes and other hard copy off your CRT; Payroll Program; How Computers Work; The Kit and I, Part II; or Power to the Computer; CCD's How They Work and How They're Made; A look at PLATO, an Educational Computer System; IBM 5100.

October 1977

Binary Arithmetic for the Beginner; Microprocessor Aid for the Deaf and Blind; The KiloByte Card; Scott Joplin on Your Sci-Fi Hi-Fi; Building a Basic

What to Name the Baby?

Paul Rayner

I had just finished several hours at my two computers, watching the Apple and the TRS-80 battle out a series of Tic-Tac-Toe games, with pretty much the usual results. The Apple was far superior in play because of its high resolution graphics and color, but the TRS-80 won its games by cheating, using the old keyboard bounce glimlick.

Then I realized that I had really not done any creative computing since my two best-selling programs, "Adventure in the Sin Palace" and "Universe Reversed."

You may recall my version of "Adventure," with its series of 101 erotic rooms, how you experienced the delights of each room, and its varied occupants, before dying of exhaustion with a smile on your face; and "Universe" where the entire solar system is reversed in its orbit, and one must determine the resulting action upon the tides and ocean currents, the Los Angeles Dodgers and the Snail Darters.

Then the brilliant idea came to me—"What to name the Baby?"

The idea evolved into a simple program to find all the possible names for a baby, using four letters, names which would work for boys or girls or whatever.

The idea evolved into a simple program to find all the possible names for a baby, using four letters, names which would work for boys or girls or whatever.

Then, after running, testing, debugging and listing the program, a sudden and frightening realization came upon me. First, I realized that the program was actually producing four-letter words that would not only not be suitable for a child's name but hardly suitable for a truck driver, Marine sergeant or computer programmer—names not normally used in mixed company, and, in fact, used only in current best-selling movies and books. And second, I realized that we were not expecting a child in the near future.

This program, dear reader, is

Paul Rayner, 3464 Townhouse Dr., Las Vegas, NV 89121

therefore dedicated to you for your use, amusement and modification and/or destruction. The program listing is for Applesoft Basic. It can easily be adapted for other Basics, TRS-80 Level II or merely discarded.

Explanation Of Listing

Lines 100-250 are preliminary introduction information. Mostly this "dresses up" the listing, but primarily it makes the writer of the program feel quite important. Most people who run programs never see this stuff at all anyhow. Line 250 is the most important line in the program. It contains every element used in the printout and is instrumental to the success of the program. The author fondly refers to this line as a "string"

and claims that when properly used this "string" could print out all of William Shakespeare's plays. Lines 260-310 do all the manipulation of the "string" and form the actual printout. The tough part follows... Lines 340-370 do the tricky stuff. Makes each column do its thing, then starts the next column. Line 370 just prints the total number of words. Not necessary, but informative if you quit in the middle of the program you may want to PRINT T and see how close you got to the possible total of 456,976 names (words). Lines 410-680 are gingerbread put into the program because the author found out that magazines pay by the word. Actually they are not required for running the program, but make it look more impressive than it really is.

LIST

```

100 HOME
110 UTAB 12: HTAB 12: PRINT "FOU
    R LETTER WORDS": FOR H = 1 TO
    26000: NEXT H
120 HOME: GOTO 400
130 TEXT: HOME: CLEAR
140 REM
150 REM *****
160 REM *
170 REM * FOUR LETTER WORDS *
180 REM *
190 REM * PAUL RAYNER *
200 REM * BOX 42831 *
210 REM * LAS VEGAS NV 89104 *
220 REM *
230 REM *****
240 REM
250 AS = "ABCDEFGHIJKLMNOPQRSTUVWXYZ
    XYZ"
260 H = 1: X = 1: Y = 1: Z = 1
270 T = T + 1
280 H$ = MID$(AS,H,1)
290 X$ = MID$(AS,X,1)
300 Y$ = MID$(AS,Y,1)
310 Z$ = MID$(AS,Z,1)
320 PRINT H$;X$;Y$;Z$: CHR$(32)
    "
330 H = H + 1
340 IF H > 26 THEN X = X + 1: H =
    1
350 IF X > 26 THEN Y = Y + 1: X =
    1
360 IF Y > 26 THEN Z = Z + 1: Y =
    1
370 IF Z > 26 THEN PRINT: PRINT
    "TOTAL WORDS: ";T
380 GOTO 270
390 END
400 FOR P = 1 TO 10: PRINT CHR$(
    7):; NEXT P
410 CALL - 394
420 UTAB 10: HTAB 16: PRINT "NA
    RING!"
430 CALL - 390
440 UTAB 20: PRINT "THIS PROGRAM
    TAKES MORE THAN FIVE HOURS"
450 PRINT "TO COMPLETE!"
460 PRINT: PRINT "ARE YOU UP TO
    IT? (YES/NO)"
470 SET DS
480 IF LEFT$(DS,1) = "N" THEN
    670
490 CALL - 936: CALL - 394
500 PRINT "
    "
510 PRINT "SOME OF THESE WORDS
    ARE JUST RAFL"

```

```

520 PRINT "AND SHOULD NOT BE SE
    EN BY KIDS OR "
530 PRINT "NICE PEOPLE OR ANYON
    E SINCE THEY ARE "
540 PRINT "REALLY X-RATED WORDS"
550 PRINT "
    "
560 PRINT "ONE OF THE WORDS IS
    ACTUALLY 'XXXX'!"
570 PRINT "
    "
580 PRINT "IF IT GETS TOO DIRTY
    FOR YOU WHILE "
590 PRINT "THE PROGRAM IS RUNN
    ING -- JUST PRESS "
600 PRINT "RESET OR 'CONTROL/C'
    -- OR PULL THE "
610 PRINT "PLUG OUT OF THE WALL
    SOCKET TO SHUT "
620 PRINT "OFF THE COMPUTER!"
630 PRINT "
    "
640 CALL - 380
650 UTAB 22: PRINT "STILL WISH T
    O CONTINUE? (YES/NO)": GET D$
660 IF LEFT$(D$,1) = "Y" THEN
    GOTO 130
670 HOME: PRINT "I DON'T BLAME
    YOU!"
680 FOR H = 1 TO 26000: NEXT H: HOME
    : END
3700
    FOUR LETTER WORDS
    HAVING!
    THIS PROGRAM TAKES MORE THAN FIVE HOURS
    TO COMPLETE!
    ARE YOU UP TO IT? (YES/NO)
    SOME OF THESE WORDS ARE JUST RAFL
    AND SHOULD NOT BE SEEN BY KIDS OR
    NICE PEOPLE OR ANYONE SINCE THEY ARE
    REALLY X-RATED WORDS.
    ONE OF THE WORDS IS ACTUALLY 'XXXX'!
    IF IT GETS TOO DIRTY FOR YOU WHILE
    THE PROGRAM IS RUNNING -- JUST PRESS
    RESET OR 'CONTROL/C' -- OR PULL THE
    PLUG OUT OF THE WALL SOCKET TO SHUT
    OFF THE COMPUTER!
    STILL WISH TO CONTINUE? (YES/NO)
    AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA
    AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA
    AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA
    AAAA AAAA AAAA AAAA AAAA AAAA AAAA AAAA

```

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Guess My Animal

Mike Orlove



This program plays "Guess My Animal" similar to the program in *Basic Computer Games*. Its internal method of storing questions and answers is somewhat different from the original version. The original stored the questions and possible answers in a linked list simulated with a character string array. This version, by Michael Orlove, stores the information in a tree or program-like form in a string array. The animal-guessing clues are stored as a set of nested IF... THEN... ELSE structures with the appropriate questions and animal name answers embedded.

At the start of the program run, the computer asks if you are writing the program. If you answer YES, the computer allows you to enter the animal-guessing tree expressed in its simple language. If you answer NO, then it will load a previously saved data tape. Once the game is running, it will recognize a set of commands as given below:

SAVE Save animal-guessing information on data tape.
READ Loads in previously saved data tape.
PRINT Prints out the animal-guessing data tree.
MORE Continues printing tree after stopping at end of screen.
FINISH Stops printing tree as an alternate to MORE.
REPLACE Replaces one string with another throughout the tree.

Note that the tape I/O routines are not implemented in this program but are indicated by remark statements and may be filled in by the user. In entering the program, please enter the words THEN, ELSE, and IF in lines 730, 770, and 810 as *lower case*. On the TRS-80 this must be done by holding down the shift key. The purpose of this subterfuge is to prevent the user from bombing the system by entering an animal named IF, THEN, or ELSE by converting the case. □

ARE YOU WRITING THIS PROGRAM? YES

? IF

? DOES IT FLY?

? THEN

? PIGEON

? ELSE

? PIG

? OK

LET US PLAY 20 QUESTIONS. I GUESS AN ANIMAL AND YOU SAY YES OR NO.

DOES IT FLY?

? NO

IT MUST BE A PIG

RIGHT?

? YES

LET US PLAY 20 QUESTIONS. I GUESS AN ANIMAL AND YOU SAY YES OR NO.

DOES IT FLY?

? YES

IT MUST BE A PIGEON

RIGHT?

? NO

OK I LOSE THIS TIME. WHAT IS THE NAME OF YOUR ANIMAL? BEE

WHAT IS THE DIFFERENCE BETWEEN A PIGEON AND A BEE? THE BEE HAS SIX LEGS

TYPE IN AN APPROPRIATE QUESTION. WHICH WHEN ANSWERED YES WILL INDICATE YOU ARE THINKING OF THE BEE

WHEN YOU ARE FINISHED TYPE OK ON A LINE TO ITSELF.

? IS IT AN INSECT

? DOES IT HAVE SIX LEGS?

? OK

LET US PLAY 20 QUESTIONS. I GUESS AN ANIMAL AND YOU SAY YES OR NO.

DOES IT FLY?

? PRINT

IF

DOES IT FLY?

THEN

IF

IS IT AN INSECT

(DOES IT HAVE SIX LEGS?)

THEN

BEE

ELSE

PIGEON

ELSE

PIG

OK

? _

5 CLS

9 CLEAR 3000

10 DIM V\$(200)

12 X=200

20 INPUT "ARE YOU WRITING THIS PROGRAM" ;A\$

30 IF A\$="NO" THEN 830

40 V\$(1)="THEM" :FOR I=2 TO 7

50 INPUT V\$(I)

60 IF V\$(I)="" THEN 830

70 NEXT I

80 PRINT "LET US PLAY 20 QUESTIONS.

I GUESS AN ANIMAL AND YOU SAY YES OR NO."

90 PRINT "PRINT, PRINT

100 T=0 :E=0

110 I=1

120 I=1

130 IF V\$(1)="" THEN 70

140 IF V\$(1)="" THEN 120

150 IF V\$(1)="" THEN 120

160 OUT 120

170 L=1 :FOR I=L TO 7

180 J=1 :FOR V\$(I)="" THEN 200

190 PRINT V\$(I) :NEXT I

200 INPUT A\$:IF A\$="YES" THEN 20

201 IF A\$="PRINT" THEN 600

202 IF A\$="REPLACE" THEN 800

203 REM HAVE IF A\$=SAVE REMIND TAPE THEN RECORD

VECTOR V\$

204 REM HAVE IF V\$=LOAD REMIND TAPE THEN READ

VECTOR V\$

210 IF A\$="SHOW" THEN 830

220 FOR I=1 TO 7

230 IF V\$(I)="" THEN 250

240 OUT 120

250 T=T+1

260 OUT 120

270 IF V\$(I)="" THEN 250

280 OUT 120

290 E=E+1

300 IF T=E THEN 120

310 NEXT I

320 PRINT "IT MUST BE A ", V\$(I), " RIGHT?"

330 INPUT A\$:IF A\$="YES" THEN 80

340 INPUT "OK I LOSE THIS TIME. WHAT IS THE NAME OF YOUR ANIMAL?" ;A\$

350 GOSUB 710

360 PRINT "WHAT IS THE DIFFERENCE BETWEEN A ' ' :PRINT

V\$(I), " :PRINT " AND A ' ' :PRINT A\$:

370 INPUT D\$

380 PRINT "TYPE IN AN APPROPRIATE QUESTION. WHICH WHEN ANSWERED YES"

390 PRINT "WILL INDICATE YOU ARE THINKING OF THE ' ' :

PRINT A\$

400 PRINT "WHEN YOU ARE FINISHED TYPE OK ON A LINE TO ITSELF."

420 I\$="IF" :I\$=1

430 GOSUB 620

440 S\$="B"

450 L=1

460 L=L+1

460 INPUT A\$

470 GOSUB 610

480 I\$="B"

490 IF I\$="OK" THEN 530

500 I\$="L"

510 GOSUB 620

520 OUT 120

530 L=L+1 :I\$=1

540 I\$="THEN"

550 GOSUB 620

560 A\$="B"

630 IF N\$ THEN 600

660 FOR N\$=1 TO 1957 :P=1 :V\$(N)=V\$(N-1) :NEXT N

670 V\$(19)=19 :RETURN

680 REM USE TELETYPE

690 N\$=1

695 FOR N\$=20 TO 1957 :PRINT V\$(N) :NEXT N

695 N\$=N+1

695 INPUT D\$

695 IF D\$="FINISH" THEN 695

695 OUT 120

700 REM BACK TO SCREEN

710 IF A\$="THEN" THEN 730

720 OUT 120

730 A\$="THEN"

740 RETURN

750 IF A\$="ELSE" THEN 770

760 OUT 120

770 A\$="ELSE"

780 RETURN

790 IF A\$="IF" THEN 810

800 RETURN

810 A\$="IF"

820 RETURN

830 REM READ V\$ FROM TAPE

840 OUT 120

850 REM BACKSPACE 1

860 REM SAVE V\$ ON TAPE

870 OUT 120

900 INPUT A\$.B\$

910 I=0

920 I=1

930 IF V\$(I)="" THEN 80

940 IF A\$="V\$(I) THEN 80

950 V\$(I)=B\$

960 OUT 120

570 I\$="L" :I\$=1
 580 GOSUB 620
 590 I\$="L" :I\$=1
 600 GOSUB 620
 610 OUT 120
 620 N\$=1
 621 N\$=1
 630 IF V\$(N)="" THEN 630
 640 OUT 120

Lines 730, 770 and 810:
 THEN, ELSE and IF should be entered as lower case in the TRS-80 by holding down the shift key while typing them!

We have acquired the rights to all TDL software (& hardware). TDL software has long had the reputation of being the best in the industry. Computer Design Labs will continue to maintain, evolve and add to this superior line of quality software.

— Carl Gallatti and Roger Amidon, owners.

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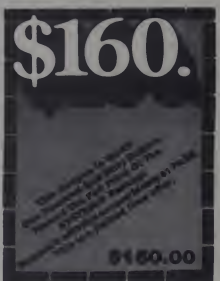
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X	1	0
3	X	7
X	9	2

Fifteen and Hot are two games which appeared in Martin Gardner's column in *Scientific American* more than 10 years ago and were described again recently in the games section of *Omni* Magazine. It is surprising that they have not appeared in program form in any of today's personal computing magazines, especially since both share a playing strategy with a very popular pencil and paper game.

The Game of Fifteen

It is a 2-player game where 9 cards (Ace through 9, any suit) are laid face up on the table and the players take turns picking cards from the table. The first player who gets any three cards in his hand that add up to 15 is the winner. The game could also result in a draw. Consider this play:

Move	Player A	Player B
1	4	3
2	5	6
3	2	8
4	9	
	(wins with 2, 4, 9)	

Note that if player B blocked player A at the third move with a 9 in order to prevent the winner 2-4-9 combination, player A would have countered with 8 at his fourth move to win the game anyway.

If you write the possible combinations of 3 digits which add to 15 you get this list:

1 + 5 + 9 = 15
1 + 6 + 8 = 15
2 + 4 + 9 = 15
2 + 5 + 8 = 15
2 + 6 + 7 = 15
3 + 4 + 8 = 15
3 + 5 + 7 = 15
4 + 5 + 6 = 15

These triads are exactly the number of rows, columns and diagonals in a 3 by 3 magic square whose magic sum is 15, as shown below:

8 1 6
3 5 7
4 9 2

If you replay the game described above on this board putting an 'X' where player A picks a number and an 'O' for player B, you will see that it is a disguised game of Tic-Tac-Toe! In this sense, the game of Fifteen is said to be isomorphic (mathematically equivalent) to Tic-Tac-Toe.

The Game of Hot

In this game, the two players alternately cross out words from a list and mark the words they cross with their initials. The winner is the person who has crossed out any three words which share a common letter. The

game could also end in a draw. Here is the list of words:

FORM SHIP TANK TIED
HEAR WOES WASP HOT
BRIM

Again this game is a disguised version of Tic-Tac-Toe and this is especially evident if the words are arranged into a "magic square" as shown below:

HOT FORM WOES
TANK HEAR WASP
TIED BRIM SHIP

You will notice that each row, column and diagonal forms a winning combination for this game; which also makes it isomorphic to Tic-Tac-Toe.

The game can also be played in the manner of the game of Fifteen by writing the words on cards and players pick up cards alternately.

For both games then, the player who holds a hidden pattern square has

DATE: 79-243; TIME: 12:55:05.4

Sample Run

RUN PER SOURCE.MOLIST
WHAT GAME DO YOU WANT TO PLAY?
1=TRADITIONAL TIK-TACK-TOE
2=GET 3 WORDS WITH A COMMON LETTER TO WIN
3=PICK 3 NUMBERS WHICH ADD TO 15 TO WIN
0=QUIT.

00210000

GAME 1
123
456
789

X
O
O

YOUR MOVE?

GAME 2

1	2	3	4	5	6	7	8	9
FORM	SHIP	TANK	TIED	HEAR	WOES	WASP	HOT	BRIM
O	.	.	.	.	O	X	.	.

YOUR MOVE

GAME 3

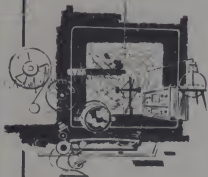
1	2	3	4	5	6	7	8	9
.	.	O	X	.	.	.	O	.

YOUR MOVE

DATE: 79-243; TIME: 12:55:06.1; CPU TIME: 0000.1 SEC

NEW

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This is a bibliography of works dealing with the ways in which computers are being used in our society, the beneficial changes that are taking place in our lives as a re-

sult of computer technology, the social and ethical problems intensified by the improper use of computers, the dangers of a computerized society, the safeguards and defenses against those dangers, the attempts to indicate what a computerized direction the future will take, and the responsibilities of computer professionals. It contains 1920 alphabetical entries of books, magazine articles, news items, scholarly papers and other works dealing with the impact of computers on society and ethics. Covers 1948 through 1979.

Compiled by Gary M. Abshire. Hard-bound, 128 pages, \$17.95. (12E).

NEW The Best of Creative Computing Volume 3

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A sample of the diverse contents is listed.

Edited by David Ahl and Burchenal Green. Large format. 336 pages. \$9.95 (12C).

To order use hand postcard order from inside back cover.

Fifteen, cont'd...

the advantage and can always lead the game to a win or a draw by playing Tic-Tac-Toe on this square intelligently and transforming the moves accordingly.

The Program

By utilizing this concept of isomorphism, I have written a program which plays all three games — Tic-Tac-Toe, Fifteen and Hot — by having separate paths in the printing of the playing board and translating the players' moves for each game but sharing the same logic in the playing strategy.

The strategy used by the program can be expressed in these rules:

1. If the computer plays first, it selects a random first move. For succeeding moves, the rules below are applied.

2. If it finds a winning move, it makes it.

3. If it finds a blocking move, it makes it.

4. It picks an empty square with the most number of paths through it (hence, the order of selection is center, corner, then side squares). Where there is more than one possible move to make (for example, four empty corners to choose from), it makes a random selection.

This strategy is not perfect but it is smart enough to lead most games to draw and some to a win. In some games where the human moves first, the computer may lose.

Other Games

Tic-Tac-Toe is not the only game with disguised versions. The popular game of Nim with the winning binary notation strategy can also be played in another form which does not immediately suggest the isomorphism. The usual game of Nim starts with three rows of 3, 4 and 5 stones where the two players alternate to remove one, some or all stones from one row and the winner is the one who takes the last stone. Imagine four 5 by 6 checkerboards stacked one on top of another. A counter (or coin, or chip) placed on the upper right corner of the uppermost level is the starting position of the game. The object of the game is to arrive at the lower left corner of the lowest level by moving the counter in one of three directions which brings it closer to the target corner. In other words, if you are sitting in front of this "playing board," the only moves allowable are to your left, towards you, or down to a lower level. No diagonal moves are permissible.

If you designate the target corner as the origin with coordinates (0,0,0),

```
00010 DIM P(6,3)
00020 DIM S(8)
00030 DIM T(8)
00040 DIM X(9,4)
00050 DIM Y(9,4)
00060 DIM W(9,4)
00070 DIM V(9)
00080 DIM S(9)
00090 DIM W(9)
00100 DIM V(9)
00110 REM LOAD P WITH WINNING COMBINATIONS
00120 FOR I=1 TO 8
00130 FOR J=1 TO 3
00140 READ P(I,J)
00150 NEXT J
00160 NEXT I
00170 DATA 1,5,9
00180 DATA 1,6,8
00190 DATA 2,4,9
00200 DATA 2,5,8
00210 DATA 2,6,7
00220 DATA 3,4,6
00230 DATA 3,5,7
00240 DATA 4,5,6
00250 REM LOAD M AND V ARRAYS
00260 FOR K=1 TO 9
00270 READ V(K)
00280 LET M(V(K))=K
00290 NEXT K
00300 DATA 1,6,3,5,7,4,9,2
00310 REM LOAD X AND T ARRAYS
00320 FOR I=1 TO 8
00330 FOR J=1 TO 3
00340 LET X(I,J)=I
00350 LET T(I,J)=J
00360 LET X(K,L)=I
00370 LET Y(K,L)=J
00380 LET S(K,L)=1
00390 NEXT J
00400 NEXT I
00410 GOTO 1480
00420 REM UPDATE BOARD(H,D) -----
00430 LET M=V(H)
00440 IF G=1 THEN 460
00450 LET M=H
00460 FOR L=1 TO X(M)
00470 LET Y(L,H)=L
00480 LET J=T(H,L)
00490 LET S(J,H)=J
00500 LET S(I)=S(I)+D
00510 LET T(I)=T(I)+1
00520 LET S(H)=D
00530 NEXT L
00540 REM COUNT MOVES
00550 LET C=C+1
00560 RETURN
00570 REM SHOWBOARD -----
00580 IF G=1 THEN 790
00590 PRINT "123"
00600 PRINT "456"
00610 PRINT "789"
00620 PRINT
00630 FOR I=1 TO 3
00640 PRINT " "
00650 FOR J=1 TO 3
00660 LET E=X(I)+J*(X(I)-1)+J
00670 IF E=10 THEN 730
00680 LET C=C+1 THEN 710
00690 PRINT " "
00700 FOR I=1 TO 3
00710 PRINT H$; " "
00720 GOTO 740
00730 PRINT C$; " "
00740 NEXT J
00750 PRINT
00760 NEXT I
00770 PRINT
00780 RETURN
00790 REM "1 2 3 4 5 6 7 8 9"
00800 IF C>2 THEN 820
00810 PRINT "FORM SHIP TANK TIED HEAR NOES WASP HOT BRIM"
00820 FOR K=1 TO 9
00830 IF R(K)=1 THEN 890
00840 IF R(K)>0 THEN 870
00850 PRINT " "
00860 GOTO 900
00870 PRINT H$; " "
00880 GOTO 900
00890 PRINT C$; " "
00900 NEXT K
00910 PRINT
00920 RETURN
00930 REM "123456789"
00940 REM ISXTM(X,D) -----
00950 LET F=1
00960 FOR I=1 TO 8
00970 REM IF SUM IS +3 OR -3 RETURN F=1 MEANS WIN
00980 LET S(I)=S(I)+D THEN 1010
00990 NEXT I
01000 LET F=0
01010 RETURN
01020 REM FIND NEXT MOVE -----
01030 FOR I=1 TO 8
01040 REM IGNORE IF THERE ARE 3 PIECES IN THE ROW
01050 IF X(I)>3 THEN 1120
01060 REM IF SUM OF ROW IS 2 OR -2, LOOK AT THAT ROW
01070 IF SUM OF ROW IS 2 OR -2, LOOK AT THAT ROW
01080 IF SUM OF ROW IS 2 OR -2, LOOK AT THAT ROW
01090 REM IF SUM IS POSITIVE, MOVE TO WIN ELSE MOVE TO BLOCK
01100 LET S(I)=2 THEN 1160
01110 LET X=I
01120 NEXT I
01130 REM A ROW OF 2 OR -2 WAS FOUND
01140 IF I=9 THEN 1250
01150 LET I=I-9
01160 FOR J=1 TO 3
01170 LET M=M+(I,J)
01180 REM SELECT EMPTY SQUARE IN THAT ROW
01190 IF S(I,J)=0 THEN 1400
01200 NEXT J
01210 REM SHOULD NEVER HAPPEN
01220 PRINT "ERROR"
01230 STOP
01240 REM AT THIS POINT NO WINNING, BLOCKING MOVE FOUND
```



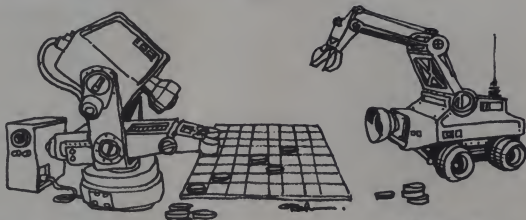
```

01760  IF I=0 THEN 1800
01770  PRINT "YOU WIN"
01780  GOTO 1870
01790  REM IS IT A DRAM?
01800  IF C<= THEN 1840
01810  PRINT "A DRAM"
01820  GOTO 2170
01830  REM LOOK FOR BEST MOVE
01840  GOSUB 1030
01850  REM UPDATE BOARD WITH COMPUTERS MOVE
01860  GOTO 1870
01870  GOSUB 430
01880  PRINT "MY MOVE IS",M
01890  REM SHOW BOARD
01900  GOSUB 570
01910  REM DID I WIN?
01920  LET D=1
01930  GOSUB 950
01940  IF I=0 THEN 1980
01950  PRINT "WIN"
01960  GOTO 2170
01970  REM DID MY MOVE RESULT IN A DRAM?
01980  LET D=1
01990  GOTO 2170
02000  GOTO 1870
02010  PRINT "YOUR MOVE (ENTER 0 TO SEE BOARD)"
02020  INPUT M
02030  IF M<1 THEN 2050
02040  IF M<10 THEN 2070
02050  GOSUB 570
02060  GOTO 2010
02070  REM
02080  IF B(N)=0 THEN 2120
02090  PRINT "SORRY, THAT PLACE HAS BEEN TAKEN"
02100  GOTO 2010
02110  REM UPDATE BOARD WITH HUMANS MOVE
02120  GOTO 2170
02130  GOSUB 430
02140  REM SHOW BOARD
02150  GOSUB 570
02160  GOTO 1740
02170  PRINT "MORE GAMES - Y OR N?"
02180  INPUT AS
02190  REM CLEAR ALL WORK AREAS
02200  MAT 0=0
02210  MAT S=0
02220  MAT T=0
02230  MAT B=0
02240  LET 0=0
02250  IF AS<>"Y" THEN 1980
02260  GOTO 1820
02270  PRINT "THANKS FOR PLAYING"
02280  STOP
02290  END

```

I leave it to the interested reader to write a program which takes advantage of this equivalence. $\square$

TURNABLOCK



Manny Juan

Are you a master of Nim? Do you know its winning strategy by heart? Do you cancel like powers of 2's by mind? Then this game is for you!

The game of Turnablock combines the flavor of Othello and the winning strategy of Nim. It was described in Martin Gardner's column in the February 1979 issue of *Scientific American* and its winning strategy was later revealed in the following issue. The game described here differs slightly from the one in the article in the way moves are made.

Turnablock is played on a board (in this case, 3 x 3 board) with Othello pieces. Initially the board is filled with the pieces in a checkerboard pattern (i.e., alternating black and white). Both players sit on the same side of the board unlike most board games.

Players take turns flipping the pieces bounded by a rectangle within the playing board. The rectangle may be any size (1 x 1, 1 x 2, 1 x 3, 2 x 2, 2 x 3, or 3 x 3) but the left upper corner of the rectangle chosen must contain a black piece. The last player whose move makes the board show all white pieces is the winner.

Refer to the sample game to see how Turnablock is played.

For convenience and for this discussion, the cells of the board are numbered 1 to 9 from left to right and top to bottom as in Figure 1.

The first player can always win with the initial pattern as played in this version. The winning strategy involves the use of a strategy chart that corresponds to the playing board. The cells are weighted as in Figure 2.

1	2	3
4	5	6
7	8	9

Figure 1
Numbering Scheme

1	2	1
2	3	2
1	2	1

Figure 2
Strategy Chart

Program List

```

00010 DIM V(3,3),B(3,3)      REM V FOR WEIGHTS, B FOR BOARD
00020 FOR I=1 TO 3
00030 FOR J=1 TO 3
00040 READ V(I,J)            REM INITIALIZE V(3,3)
00050 NEXT J
00060 NEXT I
00070 DATA 1,2,1,2,3,2,1,2,1
00080 PRINT"WELCOME TO TURNABLOCK!"
00090 LET M=0                 REM HUMAN WINS COUNTER
00100 LET C=0                 REM COMPUTER WINS COUNTER
00110 REM INITIALIZE BOARD
00120 FOR I=1 TO 3
00130 FOR J=1 TO 3
00140 IF V(I,J)=2 THEN 170    REM SKIP EVEN NUMBERED (1-9) CELLS
00150 LET B(I,J)=1           REM PUT BLACK PIECE ON ODD CELLS
00160 GOTO 180
00170 LET B(I,J)=0
00180 NEXT J
00190 NEXT I
00200 GOSUB 670
00210 PRINT"DO YOU WANT TO MOVE FIRST (Y/N). TYPE N FOR HELP"
00220 INPUT AS
00230 IF AS="Y" THEN 420
00240 IF AS="N" THEN 290
00250 IF AS<>"N" THEN 200
00260 GOSUB 1600              REM PRINT INSTRUCTIONS
00270 GOSUB 1740              REM MOVE INSTRUCTIONS
00280 GOTO 200
00290 GOSUB 460
00300 IF S=0 THEN 330
00310 GOSUB 1000              REM EVALUATE WIN SUM
00320 GOTO 340               REM IF MINISUM NOT ZERO,
                                REM FIND WINNING MOVE
00330 GOSUB 1330              REM MAKE RANDOM MOVE IF MINISUM ZERO
00340 PRINT"MY MOVE IS":M

```

Manny Juan, 61 Oakmont Dr., Daly City, CA 94015

```

00350 GOSUB 1450      REM CONVERT MOVE TO COORDINATES
00360 GOSUB 1530      REM MAKE MOVE
00370 GOSUB 670       REM SHOW BOARD
00380 IF P<0 THEN *20
00390 PRINT "I WIN"
00400 LET C=C+1
00410 GOTO 610
00420 PRINT "YOUR MOVE"
00430 INPUT M
00440 IF M=0 THEN 370
00450 IF M>0 THEN 480
00460 PRINT "YOU LOSE"
00470 GOTO 350
00480 GOSUB 1450      REM CONVERT MOVE NOTATION
00490 IF I9<I1 THEN 520
00500 IF J9<J1 THEN 520
00510 GOTO 550
00520 PRINT "INVALID MOVE"
00530 GOSUB 1740      REM SHOW MOVE INSTRUCTIONS
00540 GOTO 420
00550 IF B(I1,J1)=0 THEN 520
00560 GOSUB 1530      REM CHECK BLACK LEFT UPPER CORNER
00570 GOSUB 670       REM MAKE MOVE
00580 IF P<0 THEN 290
00590 PRINT "YOU WIN"
00600 LET H=H+1
00610 PRINT "ANOTHER GAME (Y/N)"
00620 INPUT A$
00630 IF A$="Y" THEN 110
00640 IF A$<<"N" THEN 610
00650 PRINT "YOU WON 'N'; GAMES. I WON 'I'; GAMES"
00660 STOP
00670 REM SHOW BOARD
00680 LET P=0
00690 FOR I=1 TO 3
00700 FOR J=1 TO 3
00710 IF B(I,J)=1 THEN 740
00720 PRINT " "
00730 GOTO 760
00740 LET P=P+1
00750 PRINT " X "
00760 NEXT J
00770 PRINT
00780 NEXT I
00790 RETURN
00800 REM EVALUATE NIM SUM OF BOARD
00810 LET B1=0
00820 LET B2=0
00830 FOR I=1 TO 3
00840 FOR J=1 TO 3
00850 IF B(I,J)=0 THEN 960
00860 LET V1=V(I,J)
00870 IF V1=1 THEN 900
00880 IF V1=2 THEN 920
00890 IF V1=3 THEN 940
00900 LET B1=B1-B1
00910 GOTO 960
00920 LET B2=B1-B2
00930 GOTO 960
00940 LET B1=B1-B1
00950 LET B2=B1-B2
00960 NEXT J
00970 NEXT I
00980 LET S=B1+B2
00990 RETURN
01000 REM FIND WINNING MOVE
01010 LET H=0
01020 FOR I1=1 TO 3
01030 FOR J1=1 TO 3
01040 IF B(I1,J1)=0 THEN 1300
01050 FOR I2=1 TO 3
01060 FOR J2=1 TO 3
01070 LET M1=B1
01080 LET M2=B2
01090 FOR I=1 TO I9
01100 FOR J=1 TO J9
01110 LET V1=V(I,J)
01120 IF V1=1 THEN 1150
01130 IF V1=2 THEN 1170
01140 IF V1=3 THEN 1190
01150 LET M1=M1-M1
01160 GOTO 1210
01170 LET M2=M1-M2
01180 GOTO 1210
01190 LET M1=M1-M1
01200 LET M2=M1-M2
01210 NEXT J
01220 NEXT I
01230 LET S=M1+M2

```

```

REM CONVERT MOVE TO COORDINATES
REM MAKE MOVE
REM SHOW BOARD

```

```

REM UPDATE COMPUTERS WIN

```

```

REM CONVERT MOVE NOTATION

```

```

REM SHOW MOVE INSTRUCTIONS

```

```

REM CHECK BLACK LEFT UPPER CORNER
REM MAKE MOVE
REM SHOW BOARD

```

```

REM UPDATE HUMANS WIN

```

```

REM NUMBER OF PIECES

```

```

REM EXCLUSIVE OR ON B1

```

```

REM EXCLUSIVE OR ON B2

```

```

REM INITIALIZE MOVE
REM (I1,J1) STARTING CORNER OF BLOCK
REM LOOK FOR BLACK PIECE
REM (I2,J2) ENDING CORNER OF BLOCK

```

```

REM SAVE B1
REM SAVE B2

```

```

01240 IF S<>0 THEN 1280      REM CHECK FOR WINNING MOVE FOUND
01250 IF M=0 THEN 1270      REM SAVE FIRST MOVE FOUND
01260 IF RND(0)<0.5 THEN 1280 REM TAKE RANDOM CHOICE OF WINNING MOVES
01270 LET M=10*(3*(I1-J1)+3*(I2-J2))
01280 NEXT J9
01290 NEXT I9
01300 NEXT J1
01310 NEXT I1
01320 RETURN
01330 LET M=0      REM MAKE RANDOM MOVE
01340 FOR I1=1 TO 3
01350 FOR J1=1 TO 3
01360 IF B(I1,J1)=0 THEN 1240
01370 IF M=0 THEN 1390

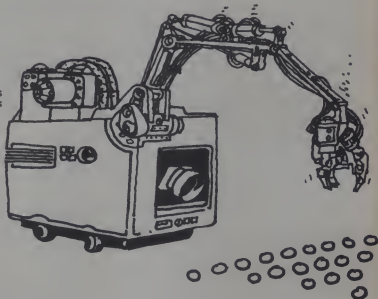
```

The first player must move so that the values under the black pieces after his move have a "Nim-sum" of zero. To compute the Nim-sum of the board convert the values in the strategy chart corresponding to the black pieces into binary notation and cancel pairs of like powers of 2.

For instance if black pieces occupy cells 5, 6, 8 and 9 in the middle of a game, the respective weights would be 3, 2, 2 and 1 or 1-2, 2, 2 and 1. Cancelling like powers of 2's would leave 2 which is the Nim-sum of the board. The only moves which could turn the Nim-sum to zero would be by flipping the black piece in cell 6 or cell 8.

After playing a few rounds of the game you will soon find the symmetry of the strategy chart helpful in determining the move which achieves a zero Nim-sum.

The program computes the Nim-sum before it moves and if the value is zero, it makes a random move. Otherwise, it looks for all safe moves and selects one of them randomly. The program always wins if it is allowed to move first. □

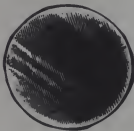


Turnablock, cont'd...

```
01380 IF RND(0)<.5 THEN 1420
01390 LET I9=I+INT((3-I+1)*RND(0))
01400 LET J9=J+INT((3-J+1)*RND(0))
01410 LET M=10*(3*(I1-1)+J1)+3*(I9-1)+J9
01420 NEXT J1
01430 NEXT I1
01440 RETURN
01450 REM CONVERT MOVE TO COORDINATE POINTS
01460 LET M1=INT(M/10)
01470 LET I1=INT((M1-1)/3)+1
01480 LET J1=M1-3*(I1-1)
01490 LET M9=M-10*M1
01500 LET I9=INT((M9-1)/3)+1
01510 LET J9=M9-3*(I9-1)
01520 RETURN
01530 REM MAKE MOVE ON BOARD
01540 FOR I=1 TO I9
01550 FOR J=1 TO J9
```

```
01560 LET B(I,J)=B(I,J) REM FLIP PIECES INSIDE BLOCK
01570 NEXT J
01580 NEXT I
01590 RETURN
01600 REM INSTRUCTIONS
01610 PRINT'TURNABLOCK IS PLAYED ON A 3 BY 3 BOARD'
01620 PRINT'WITH 9 "OTHELLO" PIECES (2-COLOR CHIPS).'

```



RUN PGM SOURCE,NOLIST
WELCOME TO TURNABLOCK!

X O X
O X O
X O X

DO YOU WANT TO MOVE FIRST (Y/N). TYPE H FOR HELP
H

TURNABLOCK IS PLAYED ON A 3 BY 3 BOARD
WITH 9 "OTHELLO" PIECES (2-COLOR CHIPS).
BLACK IS SHOWN AS "X" AND WHITE AS "O".
WE TAKE TURNS FLIPPING A BLOCK OF PIECES
WHERE THE BLOCK MAY BE ANY SIZE RECTANGLE
(1X1 THROUGH 3X3) WITHIN THE BOARD
BUT THE LEFT UPPER CORNER OF THE BLOCK
MUST BE A BLACK PIECE.
THE LAST PERSON WHOSE MOVE MAKES A BOARD
WITH ALL WHITE PIECES IS THE WINNER.
GOOD LUCK!

ENTER YOUR MOVE AS A 2-DIGIT NUMBER.
THE FIRST DIGIT POINTS TO THE LEFT UPPER CORNER OF THE
BLOCK YOU WISH TO FLIP (THAT SQUARE MUST HAVE A BLACK PIECE)
THE SECOND DIGIT POINTS TO THE OPPOSITE CORNER OF THE BLOCK.
THE BOARD IS NUMBERED THIS WAY:

1 2 3
4 5 6
7 8 9

FOR EXAMPLE: MOVE 11 WOULD FLIP CELL 1
MOVE 46 WOULD FLIP CELLS 456789
MOVE 26 WOULD FLIP CELLS 2356

ENTER 0 TO SEE BOARD AGAIN.
ENTER A NEGATIVE NUMBER TO GIVE UP IN THE MIDDLE OF A GAME.

X O X
O X O
X O X

DO YOU WANT TO MOVE FIRST (Y/N). TYPE H FOR HELP
H

MY MOVE IS 36

X O O
O X X
X O X

YOUR MOVE

66
X O O
X O X
X O X

MY MOVE IS 59

X O O
O X X
X O X

YOUR MOVE

89
X O O
O X X
X O X

MY MOVE IS 78

X O O
O O X
O X X

YOUR MOVE

66
X O O
O O O
O X X

MY MOVE IS 13

O X X
O O O
O X X

YOUR MOVE

99
O X X
O O O
O X O

MY MOVE IS 33

O X O
O O O
O X O

YOUR MOVE

89
O X O
O O O
O X X

MY MOVE IS 28

O O O
O X O
O X O

YOUR MOVE

99
O O O
O X O
O X O

MY MOVE IS 58

O O O
O O O
O O O

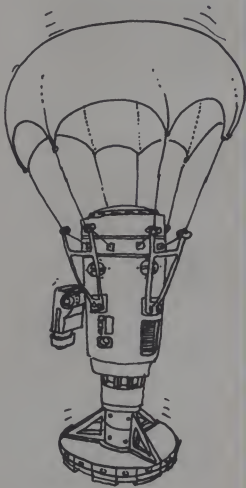
I WIN

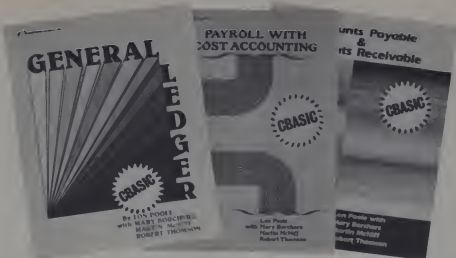
ANOTHER GAME (Y/N)

N

YOU WON 0

GAMES. I WON 1 GAMES





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APPLE PIE

N. B. McBurney II

Exploit the high resolution graphics capability of your Apple to display easy-to-understand pie charts.

One of several reasons that I purchased an Apple as a personal computer, over the others on the market, was Apple's high-resolution color graphics capability. An excellent use for this capability is the generation of pie charts.

Pie charts, sometimes called circle or sector charts, are used to illustrate component parts in relation to their total by the use of radial sections of circular areas. Pie charts are a very effective graphic illustration technique for:

1. Illustrating percentage data.
2. Displays with a smaller number of plotted values.
3. Displays of data relationships that must be quickly and easily grasped by potentially unsophisticated audiences.
4. Illustrations where relative amounts are to be emphasized, as opposed to data trends.

Pie charts also have the distinct advantage of being much easier to program than grid-based routines (while the accompanying listing may look intimidating at first glance, the bulk of it is comment statements — for which I have no apologies). The key to pie charts is in the use of the trigonometric functions SIN and COS coupled with a little polar and cartesian geometry. In polar geometry a circle centered at the polar coordinate system origin is achieved by holding the radius (r) constant and varying the angle through 360 degrees (i.e., $r=c$). To convert to the cartesian coordinate system, that we need to use the Apple's HIRES screen:

$$x = r \cos \theta$$
$$y = r \sin \theta$$

N. R. McBurney II, 2561 Stockbridge Rd., Marietta, GA 30062.

Finally, by adding constants to x and y we can move the center of the circle to any valid coordinates on the HIRES screen. This is exactly what happens in lines 1700-1780 and 1860. In fact, once the requisite variables are initialized the instructions in lines 1700-1780 and 1860 are all that are required to generate the pie chart. The rest of the program is concerned with input, labeling, error detection and general beautification of the display.

The program allows up to ten input values to be specified along with two title lines of up to forty characters each. The titles are entered in the DATA statements in lines 2690 and 2700. Titles will be automatically centered by the program. The title lines are followed by up to ten more DATA statements (lines 2720-2760 in the

accompanying listing) contain three fields each. The first field is the amount the sector is to represent. The second field is a short description of the sector that will be used to label the graph. The third and final field is the color for the sector. Colors will vary depending on your TV display and how it is adjusted. On my set the following values for the color field results in the associated sector color:

- 1 = Green
- 2 = Blue
- 3 = White
- 4 = Black
- 5 = Orange

You will want to experiment with the color field. I've found that some color combinations give strange results when drawn next to each other (e.g., orange next to green). My local

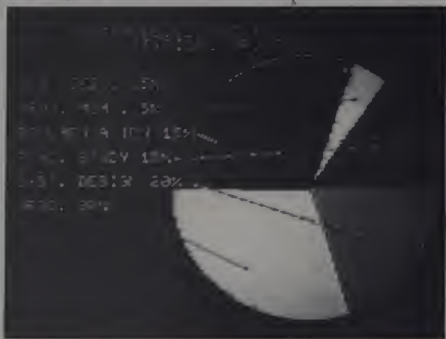


FIGURE 1

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NINE SIMULTANEOUS VOICES

How many voices do you need to really get into computer music? With our Apple Music II you could play two 4-part harmony songs at the same time — and still have one voice left over for percussion.

MUSIC — RIGHT AWAY

The Apple Music II is supplied with 7 programmed songs. Just type RUN DISCO and these songs will play in glorious stereo. And our "Album Series" disks (with 12 or more songs per disk) are available for just \$14.95* each.

YOU'VE GOT TO HEAR IT TO BELIEVE IT

See your local Apple dealer for a demonstration today. Or order our demo record for just 75¢* (plus 25¢ postage per order). Just ask for the Apple Music II record.

*Suggested U.S. price.



 A L F Products Inc.

1448 Estes

Denver, CO 80215



FIGURE 2

computer shop explained it away as 'color flip' but I wasn't about to show my ignorance and ask what that was.

The DATA statement at line number 2680 specifies rotation and labeling mode. The first field will rotate the pie chart in a clockwise (or counter-clockwise if negative) direction. The second field specifies the labeling mode. If the second field equals one then the labels are printed to the left of the display with a line drawn to each corresponding sector. The program attempts to order the display of the labels such that none of these lines will cross. This is done in lines 2060-2170. The program is not always completely successful at this, but by rotating the graph (field-1) and adjusting the length of the sector labels, crossed lines can be avoided. The display shown in Figure 1 was generated by the data statements in the attached listing and uses this mode of labeling.

If the second field of the first DATA statement is two, then each sector is labeled with a character from A to J, and the same character plus a '=' is prepended to the label when it is displayed. This mode of labeling is illustrated in the display shown in Figure 2. Figure 2 was generated with the following DATA statements:

```
DATA 15.2
DATA PROJECTED U.S. POPULATION AGE DISTRIBUTION
DATA 1990
DATA 52005, < 14 YRS., 1
DATA 12771, 14 - 17.2
DATA 25148, 18 - 24.3
DATA 41086, 25 - 34.4
DATA 36592, 35 - 44.5
```

```
DATA 25311, 45 - 54.1
DATA 20776, 55 - 64.4
DATA 17804, 65 - 74.3
DATA 12021, > 74 YRS., 2
```

The program was written in ROM Applesoft on a 48K RAM system but should run on a smaller system.

Labeling is done with the High Resolution Character Generator and Table by Christopher Espinosa in the *Apple Software Bank Contributed Volumes 3-5*. This software has the distinct advantage of price — it's free from your local Apple dealer! You just provide the blank disk or cassette (the manual did cost me \$2.00). These software routines are read into RAM from disk by the statements in lines 1870-1940. If you are using a cassette simply load the character generator at \$6000 and the character table at \$6800 or wherever you have room. There are limitations on the starting addresses of this software so be sure to check Apple's documentation (mentioned above) before rearranging things. Once the routines are loaded, delete lines 1870-1940 and run the program.

Other than the above comments, the program is fairly simple and the liberal comments should prove adequate to walk you way through the program.

Some enhancements the reader may want to consider are:

1. Displaying the percent in each sector.
2. Writing logic so that lines from labels to sectors would only be drawn for sectors too small to label with a character key.
3. Detaching a specified sector to

highlight it (as below).



4. Automatic sector color assignment (i.e., work out what color combinations work).

5. Draw the pie as a coin seen from an oblique angle.

6. Forget the whole color thing and do it in black and white with lines instead of shading.

7. Modify the input section to select graph data from disk, cassette or enter interactively.

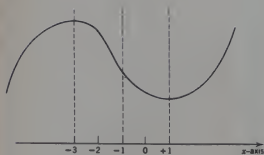
While you're considering all this I'll give you a piece of pie — Apple pie at that!

```
000 REM
010 REM : PIE CHART GENERATOR
020 REM :
030 REM : P.D. REINHART
040 REM : FEBRUARY 1980
050 REM :
060 REM : DATA FORMAT:
070 REM : LINE# DATA LABEL,MODE,MODE
080 REM : ANGLE
090 REM : ANGLE=ANGLE OF ROTATION
100 REM : (NEGATIVE COUNTERCLOCKWISE)
110 REM : LABEL,MODE=1, DATA PRINTED TO
120 REM : EACH SECTOR
130 REM : 2, LETTER CODE
140 REM : EACH SECTOR
150 REM : LINE# DATA FIRST LINE OF TITLE
160 REM : LINE# DATA SECOND LINE OF TITLE
170 REM : LINE# DATA LABEL,COLOR
180 REM : ANGLE
190 REM : VALUE OF PORTION OF TOTAL FOR PIE SECTOR
200 REM : LINE# SECTOR COLOR (1-5)
210 REM :
220 REM :
230 REM :
240 REM :
250 REM :
260 REM :
270 REM :
280 REM :
290 REM :
300 REM :
310 REM :
320 REM :
330 REM :
340 REM :
350 REM :
360 REM :
370 REM :
380 REM :
390 REM :
400 REM :
410 REM :
420 REM :
430 REM :
440 REM :
450 REM :
460 REM :
470 REM :
480 REM :
490 REM :
500 REM :
510 REM :
520 REM :
530 REM :
540 REM :
550 REM :
560 REM :
570 REM :
580 REM :
590 REM :
600 REM :
610 REM :
620 REM :
630 REM :
640 REM :
650 REM :
660 REM :
670 REM :
680 REM :
690 REM :
700 REM :
710 REM :
720 REM :
730 REM :
740 REM :
750 REM :
760 REM :
770 REM :
780 REM :
790 REM :
800 REM :
810 REM :
820 REM :
830 REM :
840 REM :
850 REM :
860 REM :
870 REM :
880 REM :
890 REM :
900 REM :
910 REM :
920 REM :
930 REM :
940 REM :
950 REM :
960 REM :
970 REM :
980 REM :
990 REM :
```

```

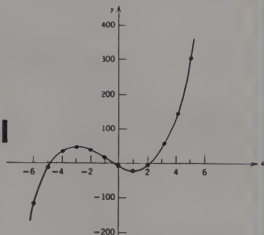
3770 VT
2860 WP
1690 RS
2564 RB
2511 RE
2528 RF
2390 IF
2148 FU
2320 PA
1540 L3
2519 EW
2566 RE
2594 RE
1860 SJ
2010 OE
2720 AJ
1630 G3
2640 OF
2935 OF
2400 RL
2678 RE
2900 JF
2990 JF
2700 JF
2714 JF
2720 JF
2720 JF
2700 JF
2754 JF
2745 JF
a
ALPHA
BETA
C
CV
W
BAMBA
I
J
J
LABEL
PODE
DECT
P1
a
01
TITLE
a
9
87
02
1
12
12
1C
12
1

```



Individual Graphing of Mathematical Functions

Doug Schiffer
&
Sarah Brooks, Ph.D.



A problem that frequently appears in mathematics courses is the individual graphing of a handful of different mathematical functions. ($y = \sin(x)$, $y = \log(4.2^x)$, $y = 2^x + 3$ etc.). One way to have the computer do this is to write a program that has as many DEF statements as you have functions. You

The computer rewrites the function definition by itself; the program literally rewrites itself.

then have a separate graphing loop for each graph. The program would look something like this:

```
10 DEF FNA(x) = SIN(x)
20 DEF FNB(x) = LOG(4.2^x)
30 DEF FNC(x) =
  .
  .
  .
500 FOR I = A TO B STEP C
510 Y = FNA(I)
520 GOSUB 1000 I GRAPHING
530 NEXT I
  .
  .
  .
600 FOR I = A TO B STEP C
610 Y = FNB(I)
620 GOSUB 1000
630 NEXT I
```

The resulting program is very large and not at all elegant, especially if you have a large number of functions. Of course you can write a program with only one "DEF" statement and let the user of the program change the function after every run. The problem

here is that students with no previous computing experience have trouble logging on the system, calling up the program, and operating the programs in general. It is also extremely hard for them to modify the programs. Furthermore, it is very distracting and time consuming to keep starting and stopping the program.

The solution we found uses a variation on the second technique. There is only one DEF statement but the computer rewrites the function definition by itself; the program literally rewrites itself. Two versions are provided. One is for a compiler (Digital PDP 11/40 Basic). The other is designed for an interpreter (Mits 12K Basic).

The two versions go about this "self-modification" in two different ways. For the compiler version, control is transferred to a special editor-like program (SETUP) via the CHAIN instruction. SETUP then reads the source code version of TABFUN into a string matrix (each line of TABFUN is one element of the string matrix). The user is then asked what function he/she would like to graph. (One types $\sin(x^{\pi}) + 3$ if that is the function he/she wants). SETUP then combines the element of a DEF statement (line#,"DEF FNA(x) = " and the user supplied string) to make a legal Basic statement. This string replaces the element of the string matrix that contained the old function definition. At this point the old TABFUN on the disk is erased and the string matrix is written onto the disk in its place. Control returns to TABFUN via the CHAIN command.

The same technique could have been used in TABFN1, the interpreter diversion. But since most smaller

computers don't have a disk-based language with the CHAIN command, an alternative approach is in order. Here the program searches the core memory for a 'D' followed by an 'E' followed by 'F'... When it finds this spot it stops and asks for a new function like the compiler version. The new string is then POKed into successive locations following the '=' sign. A carriage return plus an END statement are added for proper execution.

Self-modifying programs can wipe themselves out (for example, the program is the same after the run, only minus a mere 57 lines).

Control then returns to the main graphing and tabulating routines.

Of course, aspects of a program other than mathematics functions could be modified in the same way. Definitions, string functions, DIM statements, setting of constants, or even program logic could also be changed with equal ease. The replace statements could come from the user or a special data file.

A final comment on self-modifying programs: BE CAREFUL. Ordinary programs, when they "bomb," just produce extraneous outputs. Self-modifying programs can do that and/or wipe themselves out (for example, the program is the same after the run, only minus a mere 57 lines). It's a good idea to save the program on paper tape, cassette, or somewhere safe on the disk before you run it on experimental or first time basis. □

Doug Schiffer & Sarah Brooks, Ph.D., Mathematics Dept., Mohawk Valley Community College, 1101 Sherman Drive, Utica, NY 13501.

LISTING OF 'TABFUN.BAS' ON 25-Oct-78 AT 11:30 AM

```

10 INPUT X RANGE AND # OF SUBDIVISIONS: A,B,N
20 IF A=0 AND B=0 THEN 100
30 S=X:Y=1
40 FOR X=A TO B STEP (B-A)/N
50 S=FNA(X)
60 NEXT X
70 INPUT "DO YOU WANT TO CHANGE X RANGE?" A$
80 IF A$="YES" OR A$="Y" THEN 10
90 INPUT "DO YOU WANT A GRAPH OF FUNCTION?" B$
100 IF B$="N" OR B$="NO" THEN 330
110 INPUT X RANGE AND # OF SUBDIVISIONS: A1,B1,N1
120 INPUT Y RANGE AND # OF SUBDIVISIONS: Y1,Y2,N2
130 IF A1<0 OR B1<0 THEN A=A1:B=B1
140 IF N1<0 THEN N=N1
150 IF Y1<0 OR Y2<0 THEN 220
160 Y1=1E38:Y2=-1E38
170 FOR X=A TO B STEP (B-A)/N
180 IF FNA(X)>Y2 THEN Y2=FNA(X)
190 IF FNA(X)<Y1 THEN Y1=FNA(X)
200 NEXT X
210 IF N2=0 THEN N2=70
220 S=GRAPH OF FUNCTION X=A TO B, INCREMENT: (B-A)/N
230 TAB(22):Y=Y1 TO Y2, INCREMENT: (Y2-Y1)/N
240 FOR X=A TO B STEP (B-A)/N
250 Y=FNA(X)-Y1
260 P=INT(Y/(Y2-Y1)*N2+.5)
270 SCHR(10)
280 IF POS(0)>P THEN SCHR(8):GOTO 280
290 IF POS(0)<P THEN TAB(P)
300 S=S:Y=Y1
310 NEXT X
320 S=1
330 INPUT "DO YOU WANT TO CHANGE FUNCTION?" C$
340 IF C$="Y" OR C$="YES" THEN CHAIN "SETUP"
350 INPUT "DO YOU WANT TO RUN AGAIN?" D$
360 IF D$="G" OR D$="GRAPH" THEN 110
370 IF D$="F" OR D$="FC" THEN CHAIN "SETUP"
380 IF D$="Y" OR D$="YES" THEN 10
390 DEF FNA(X)=LOG(X)
400 END

```

Ready

LISTING OF 'SETUP.BAS' ON 25-Oct-78 AT 11:33 AM

```

10 I SETUP - PUTS FNA IN 'TABFUN' D. SCHIFFER 10/77
20 OPEN "TABFUN.BAS" AS FILE 1
30 DIM A$(40)
40 INPUT LINE $1:A$(1) FOR I=1 TO 40
50 INPUT "FNA(X)=?" IF$
60 KILL "TABFUN.BAS":OPEN "TABFUN.BAS" AS FILE 1
70 A$(39)="390 DEF FNA(X)=F$+CHR$(13)+CHR$(10)
80 S$1:A$(I) FOR I=1 TO 40
90 CLOSE 1
100 S="-":FOR I=1 TO 40
110 CHAIN "TABFUN.BAS"
120 END

```

Ready

LISTING OF 'TABFN1.MIT' ON 25-Oct-78 AT 11:34 AM

```

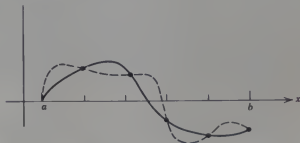
10 REM VARIABLE FUNCTION GRAPHING FOR MITS 12 K BASIC
20 INPUT X RANGE AND # OF SUBDIVISIONS: A,B,N
30 INPUT Y RANGE AND # OF SUBDIVISIONS: Y1,Y2,N1
35 IF N1=0 THEN N1=70
40 IF C=0 OR D=0 THEN 100
50 C=1E37:D=-1E37
60 FOR X=A TO B STEP (B-A)/N
70 IF FNA(X)>D THEN D=FNA(X)
80 IF FNA(X)<C THEN C=FNA(X)
90 NEXT X
100 S=GRAPH OF FUNCTION X=A1 TO B1, STEP: (B-A)/N1
110 TAB(19):Y=Y1 TO Y2, STEP: (Y2-Y1)/N1
120 FOR X=A TO B STEP (B-A)/N
130 P=INT((FNA(X)-C)/(D-C)*N1+.5)
140 TAB(P):S=

```

```

150 NEXT X
160 S=WANT TO CHANGE FUNCTION? A$
170 IF A$="NO" OR A$="N" THEN 360
180 REM NOW FOR FUNCTION CHANGE
190 FOR I=0 TO 12287
200 IF PEEK(II)>68 THEN 300
210 FOR KK=1 TO 6
220 READ JJ
230 DATA 69,70,32,70,78,65
240 IF JJ<PEEK(II+JJ) THEN RESTORE:GOTO 300
250 NEXT KK
260 GOTO 320
300 NEXT II
310 S=ERROR:ISTOP
320 INPUT FNA(X)=? IF$
325 F$=F$+CHR$(10)+CHR$(13)+999 END+CHR$(10)+CHR$(13)
330 FOR LL=1 TO LEN(F$)
340 POKE II+JJ+LL+10,ASC(MID$(F$,LL,1))
350 NEXT LL
360 INPUT RUN AGAIN? B$
370 IF B$="YES" OR B$="Y" THEN 10
380 DEF FNA(X)=SIN(X)

```



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Plot With the Devil

Jay Hansche, Ph.D.

When I accepted delivery on my Xerox 1720 Communications Terminal I skimmed through the manual to determine how to set it up correctly and to see what its special characteristics were. I noticed some sections on plotting but I was very eager to get along into word processing and number crunching, so I stored the information in the back of my head for future reference. Recently, as I was evaluating some complicated research results involving the interrelationships of ellipsoids in three-dimensional space, it occurred to me that the results could be interpreted as ellipses in two-dimensional space. I decided to have another look at the manual.

I was pleasantly surprised to find that my machine follows Diablo instructions very nicely.

The first thing I discovered from this closer look was that my manual had a big *Preliminary* on the cover and it described a Diablo machine called the Hyterm Model 1641. The cover also reported that Diablo was a Xerox company, a relationship I was already aware of through inspection of my terminal. Though the word 'Xerox' is prominent on the outside cover, when the cover is removed all the inner labels say 'Diablo.' The illustrations in the

manual are all of Diablo machines, but they looked very similar to the Xerox, so I decided to give it a try. I was pleasantly surprised to find that my machine follows Diablo instructions very nicely. (I have seen the Radio Shack daisywheel printers, but I could not get access to a technical manual on them so I have no idea of whether or not they can perform this type of operation.)

Plotting, or Graphics, as the manual calls it, turns out to be relatively simple. When given a special instruction (ESC 3) the terminal shifts into Graphics mode. In this mode carriage movement is unrelated to printing: printing a character does not produce carriage movement. Instead, the space and backspace instructions produce $\frac{1}{60}$ " of carriage movement rather than the standard $\frac{1}{10}$ " or $\frac{1}{12}$ ". The line feed and negative line feed instructions produce only $\frac{1}{60}$ " of paper movement, as compared to the standard line of $\frac{1}{6}$ ". The manual provides the proper ASCII codes for these instructions and that was enough to get me started.

My program was written on a DECSYSTEM-2060 in what they call Basic-PLUS-2. I had written a number of plot routines, so this job presented few problems. The one problem that caused me the greatest difficulty was an interaction between the operating system (OS) and the Basic compiler. The program executes a lot of print statements that are not ordinary printing, so I didn't want the OS to generate carriage returns. The system command 'terminal width 0' is sup-

posed to provide infinite line width, but when I tried it 'Infinite' turned out to be 60. I fought with this problem for quite a while before I found some fine print in the back of the Basic manual which suggested that DEC Basic also controls line width at the terminal. What was happening was that Basic checked

The system command 'terminal width 0' is supposed to provide infinite line width, but when I tried it 'Infinite' turned out to be 60.

the system terminal parameters. When Basic saw the 'terminal width 0,' Basic set it back to 60. Thank you, Basic. But the manual also described a MARGIN (right margin) command and, when I included 'MARGIN 100000' in my program, things began dropping in place. I hope that most computer systems won't generate this type of problem.

DECSYSTEM Basic-PLUS-2 is really a fine programming language, combining many of the best features of Fortran and Cobol, as well as some of the error-trapping features of Pascal. However, that wouldn't do for publication. It was with great regret that I went through my finished program and replaced all the fancy string functions, integer mode variables and implicit loops with their more standardized Basic equivalents. The original version, for example, included no NEXT

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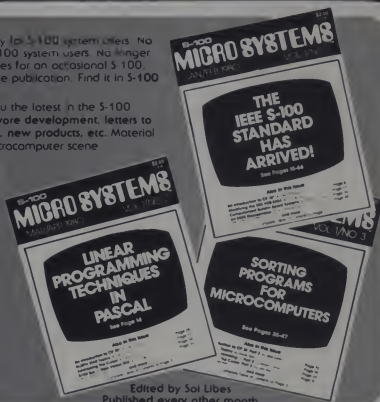
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Plot, cont'd...

statements or INT functions. The program now contains nothing more esoteric than the CHR\$() function to put an ASCII character into a string variable and some string concatenation. I hope I have included enough comments to make the program easy to follow.

Though I was initially motivated to write this program to plot my ellipses, I knew that when the program worked I would be interested in other plots, so I decided to write the program to read any list of X,Y coordinates and plot them. Next I generated a file of the X,Y coordinates for the ellipses and let the program take the values from the file. The program can plot any points, not just ellipses, and of course the set of file reference statements (520-590) can be replaced by an algorithm to generate points. The only requirements to run the program are that you should have a fairly good idea of the highest and lowest values of both X and Y so these ranges can be scaled to fit the printer.

The tractor (mine anyway) is designed to move the paper in only one direction, and negative line feeds do not work well at all.

If you routinely run your machine with a forms tractor that pulls the paper through the machine, as I do, you should remove the tractor and insert the paper in standard typewriter fashion around the platen. The tractor (mine anyway) is designed to move the paper in only one direction, and negative line feeds do not work well at all. Also, my machine has a toggle switch to vary pitch from 10 to 12 characters per inch. I run at 12, and the program was written on that basis. If you are running at 10 characters per inch, go to line numbers 680 and 690 and change the 5's to 6's.

The program plots with asterisks. If you would rather use some other character that should be easy to change. The program also has a system for preventing plot-points from being too close together. If you want to vary the spacing between plot-points, your algorithm should generate more points than you plan to use (I have 300 data points for each ellipse). Line number 660 controls the spacing between points, and this can be varied by changing the value of the constant '20' in that statement. Now all you have to do is look through your back issues of *Creative Computing* for the Lissajous programs and you're in business, plotting with the Diablo. □

```

RUNNNH
ENTER HIGHEST AND LOWEST VALUES ON X.
? 3,-5
ENTER HIGHEST AND LOWEST VALUES ON Y.
? 3,-3

```



```

00100 REM ***THIS PROGRAM WAS WRITTEN TO DEMONSTRATE THE PLOT AND GRAPHIC
00110 REM ***CAPABILITIES OF XEROX AND DIABLO COMMUNICATIONS TERMINALS.
00120 REM *****
00130 REM IF YOU ARE RUNNING ON A TIME-SHARING SYSTEM, REFORM
00140 REM YOU GET INTO 'BASIC' YOU MUST SET SYSTEM TERMINAL
00150 REM PARAMETERS SO THEY DO NOT INTERFERE WITH PAGE WIDTH AND
00160 REM LENGTH VALUES AS NEEDED BY THIS PROGRAM.
00170 REM *****
00180 REM WRITTEN ON DECSTSEM-2060 IN BASIC-PLUS-2 BY
00190 REM JAY HANSCHKE.
00200 REM PSYCHOLOGY DEPARTMENT,
00210 REM TULANE UNIVERSITY,
00220 REM NEW ORLEANS, LOUISIANA.
00230 REM *****
00240 MARGIN 100000 IOPEN RIGHT MARGIN.
00250 REM***DEC BASIC WILL SET RIGHT MARGIN IF THE PROGRAM DOESN'T.
00260 PRINT "ENTER HIGHEST AND LOWEST VALUES ON X."
00270 INPUT XHI,XLO
00280 PRINT "ENTER HIGHEST AND LOWEST VALUES ON Y."
00290 INPUT YHI,YLO
00300 X RANGE=XHI-XLO ISCALE X TO FIT TERMINAL WIDTH.
00310 XSCL=X RANGE/12
00320 X MID=(XLO+X RANGE/2)/XSCL
00330 Y RANGE=YHI-YLO
00340 Y MID=(YLO+Y RANGE/2)/XSCL ISAME TRANSFORM FOR Y.
00350 LF$=CHR$(10) IASCII LOAD FOR LINE FEED. (PAPER UP)
00360 CTR=(Y RANGE/2)*6+3
00370 FOR I=1 TO CTR
00380 PRINT LF$; IFEED UP TO START PLOT.
00390 NEXT I
00400 SP$=CHR$(32) IASCII LOAD FOR SPACE.
00410 BS$=CHR$(8) IASCII LOAD FOR BACKSPACE.
00420 FOR I=1 TO 75
00430 PRINT SP$; ISPACE RIGHT TO CENTER.
00440 NEXT I
00450 REM***STRING CONCATENATION FOR NEXT THREE VARIABLES.
00460 GR$=CHR$(27)+CHR$(51) IASCII FOR SHIFT TO GRAPHICS MODE.
00470 NCR$=CHR$(27)+CHR$(52) IASCII TO SHIFT OUT OF GRAPHICS.
00480 MLF$=CHR$(27)+CHR$(10) IASCII LOAD FOR NEGATIVE LINE FEED.
00490 PRINT GR$; ISHIFT TO GRAPHICS MODE.
00500 XALD=0 (X INCR=1/60", Y INCR=1/48".)
00510 YALD=0 ISTART PLOT FROM X=0,Y=0.
00520 REM***INSERT YOUR ALGORITHM TO GENERATE X,Y COORDINATES HERE.
00530 OPEN "ELP2.DAT" AS #1 IALL FILE REFERENCES MAY BE REPLACED

```

```

00540 LINPUT #1, AS          ITO LINE NUMBER 590.
00550 X$=SEGS(AS,1,7)      IGET A PAIR OF X,Y VALUES FROM FILE.
00560 Y$=SEGS(AS,14,20)
00570 X=VAL(X$)
00580 Y=VAL(Y$)
00590 REM***END OF FILE REFERENCES HERE.
00600 X=(X/XSCL-XMID)/.01667 I SCALED X DIVIDED BY STEP SIZE.
00610 Y=(Y/XSCL-YMID)/.02083 I SCALED Y DIVIDED BY STEP SIZE.
00620 X=INT(X*.5)           IROUND X AND Y.
00630 Y=INT(Y*.5)
00640 XNU=X-XALD            I COMPUTE STEPS FROM LAST PLOT POSITION.
00650 YNU=Y-YALD
00660 IF XNU*2+YNU*2<=20 THEN 1210 I IF MOVE IS LESS THAN 20, FORGET IT.
00670 IF ABS(XNU)<25 THEN 830 I POINTS TOO CLOSE DON'T PLOT SMOOTHLY.
00680 FSP=INT(XNU/5)         I IF LONG MOVE ON X, SHIFT OUT OF GRAPHICS.
00690 XNU=MOD(XNU,5)         I FSP=NUMBER OF FULL SPACES TO MOVE.
00700 IF FSP<0 THEN 770     I XNU=REMAINDER TO MOVE IN GRAPHIC MODE.
00710 PRINT NGR$;           I OUT OF GRAPHICS.
00720 FOR I=1 TO FSP        I FULL SPACES TO X.
00730 PRINT SP$;
00740 NEXT I
00750 PRINT GR$;            I BACK TO GRAPHICS FOR REMAINDER.
00760 IF XNU=0 THEN 920 ELSE 850 I SAME FOR BACKSPACE.
00770 PRINT NGR$;
00780 FOR I=1 TO ABS(FSP)
00790 PRINT BS$;
00800 NEXT I
00810 PRINT GR$;
00820 IF XNU=0 THEN 920 ELSE 890
00830 IF XNU<0 THEN 890     I IF NEGATIVE, GO TO BACKSPACE.
00840 IF XNU=0 THEN 920     I IF ZERO, CHECK Y.
00850 FOR I=1 TO XNU
00860 PRINT SP$;            I SPACE TO LOCATION ON X.
00870 NEXT I
00880 GO TO 920             I AT X LOCATION, GO CHECK Y.
00890 FOR I=1 TO ABS(XNU)
00900 PRINT BS$;
00910 NEXT I
00920 IF ABS(YNU)<23 THEN 1080 I FOR LONG MOVE ON Y, SHIFT OUT OF GRAPHICS.
00930 NLF=INT(YNU/8)         I COMPUTE NUMBER OF FULL LINE FEEDS IN NLF.
00940 YNU=MOD(YNU,8)         I YNU = REMAINDER LESS THAN FULL LINE FEED.
00950 IF NLF<0 THEN 1020    I IF NEGATIVE, GO TO (+) LINE FEED.
00960 PRINT NGR$;           I OUT OF GRAPHICS FOR FULL FEED.
00970 FOR I=1 TO NLF
00980 PRINT NLF$;
00990 NEXT I
01000 PRINT GR$;            I BACK TO GRAPHICS FOR REMAINDER.
01010 IF YNU=0 THEN 1180 ELSE 1110 I SAME FOR NEGATIVE LINE FEED.
01020 PRINT NGR$;
01030 FOR I=1 TO ABS(NLF)
01040 PRINT LF$;
01050 NEXT I
01060 PRINT GR$;
01070 IF YNU=0 THEN 1180 ELSE 1150
01080 IF YNU<0 THEN 1150    I IF NEGATIVE, GO TO (+) LINE FEED.
01090 REM***POSITIVE VALUE OF Y TAKES NEGATIVE LINE FEED.
01100 IF YNU=0 THEN 1180    I IF NO CHANGE ON Y, GO TO PRINT STAR.
01110 FOR I=1 TO YNU
01120 PRINT NLF$;
01130 NEXT I
01140 GO TO 1180            I GO TO PRINT STAR.
01150 FOR I=1 TO ABS(YNU)
01160 PRINT LF$;
01170 NEXT I
01180 PRINT "***";          I PRINT IN GRAPHICS MODE DOES NOT MOVE CARRIAGE.
01190 XALD=X                 I STORE PRESENT X AND Y VALUES.
01200 YALD=Y
01210 IFMORE #1 THEN 540     I LOOP BACK FOR NEXT X,Y PAIR.
01220 PRINT NGR$            I TAKE TERMINAL OUT OF GRAPHICS MODE.
01230 FOR I=1 TO (Y/48-YLO)*6+.3 I LINE FEED OUT OF PLOT.
01240 PRINT LF$;
01250 NEXT I
01260 CLOSE #1
01270 STOP
01280 END

```

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RGLASS

David Gerrold

I don't know why I was thinking about an hourglass at three in the morning, but I was lying awake and thinking that it couldn't be that hard to write an hourglass simulation.

I couldn't think of any particular need for such a program either, but it might be a good way to learn how to handle matrices, an area of Basic I had been tiptoeing around for some time.

The principles of the simulation were easy to work out, and also cured my insomnia. The next morning, though, I figured I'd better sit down and actually write the program, just to prove that the structure I'd worked out in my head was viable.

It almost was. It only took four days to debug.

And—before I was through, I'd found at least one use for it. I added it as a subroutine to a game of WUMPUS. Now, each time the player makes a move, the hourglass prints out and chomps another asterisk into the bottom half of the glass.

If you have the memory to spare, any subroutine that adds a visual element to a game makes it that much more interesting. (And it seems to me that it won't be too much longer before most users will have memory to spare for these extra little touches. It certainly makes the game seem a lot less mechanical.)

The listing here is in North Star Basic. The backslash allows more than one statement per line—and also saves five bytes per usage. (Whoopee!)

Lines 10 through 60 dimension the hourglass. However many moves your game calls for (whether determined randomly, as WUMPUS does when it allocates supplies, or not), the program will generate an hourglass with exactly that number of asterisks in it.

Lines 80 through 220 load the hourglass. When the top row is level,

the number of asterisks is a perfect square, which explains why line 30 computes D1 as a square root (plus two) and then squares it. The plus two is to provide an empty top row in the hourglass itself. Line 210 subtracts as many asterisks as necessary to bring the number down to the actual number of moves.

Lines 130 to 150 generate the sides of the hourglass; 92 and 47 are the ASCII values for the slash and the backslash. In line 160, the value of T5 determines whether there is an asterisk (42) or a space (32) in that position. T5 and T6 are trash variables, used for different functions throughout the program.

LIST

```

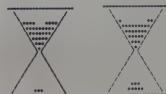
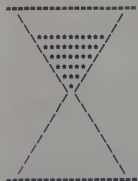
10INPUT"HOW MANY GRAINS IN THE GLASS? ",T7
20IF T7<4 THEN 10
30D1=(INT(SQRT(T7))+2)*2
40DIM T$(D1+5)
50DIM T(D1,D1+1)
60REM--VARIABLES ARE X,Y,D1,D3,T5,T6,T7,Z
70REM-----LOAD HOURGLASS
80T5=-1
90FOR X=1 TO D1
100D3=D3+1
110IF D3<D1+2-D3 THEN 130
120T5=D3-D3+1
130T(X,D3)=-92\T(X,D1+2-D3)=47
140FOR Y=1 TO D1+1
150IF T(X,Y)<92 AND T(X,Y)>47 THEN 170
160T5=T5-1\GOTO180
170IF T5=1 THEN T(X,Y)=42 ELSE T(X,Y)=32
180NEXT Y
190NEXT X
200D3=0\REM-- TOP LEVEL MARKER FOR SIFT CONTROL
210FOR D1=1 TO D1/2*D1/2-T7\GOSUB300\NEXT Z
220GOSUB490
230REM-----RUN HOURGLASS
250GOSUB300\GOSUB380\REM ---- SIFT TOP, SIFT BOTTOM
260IF T(D1/2,D1/2+1)=42 THEN 250\REM - IF EMPTY, THEN STOP
280"HOURLASS IS EMPTY"\END
290REM-----SIFT THE TOP
300X=D3+1\Y=D1/2+1\T5=0\T6=0
310IF T(X,Y+T5)=42 THEN 340\REM - CHECK SIDE SPACES
320T6=T6+ABS(T5)
330IF NOT T6 THEN T5=ABS(T5)+1\T5=T5-1\GOTO310
340IF T(X,Y+T5+1)>42 THEN D3=D3+1\REM-- CHECK FOR SIDE WALL
350Y=Y+T5\T(X,Y)=32
360RETURN
370REM-----SIFT THE BOTTOM
380X=D1/2+1\Y=X\T5=0\T(X,Y)=42
390IF X=D1 THEN 450\REM-- WE ARE FLOORED, WE CAN EXIT
400IF T(X+1,Y)=32 THEN 440\REM-- IF THE SPACE BELOW IS EMPTY, FILL IT
410T5=-1\GOSUB610\IF R THEN T5=T5-1\T6=T5
420IF T(X+1,Y+T5)=32 THEN 440\REM - CHECK SIDE SPACES
430T5=T5-1\IF T5=T6 THEN 450\GOTO420
440T(X,Y)=32\X=X+1\Y=Y+T5\T(X,Y)=42\T5=0\GOTO390\REM-FILL EMPTY SPACE
450GOSUB490
460RETURN
480REM-----PRINTOUT HOURGLASS
490I=1\GOSUB570
500FOR X=1 TO D1
510T5=""
520FOR Y=1TOD1+1
530T5=T5+CHR$(T(X,Y))
540NEXT Y
550GOSUB590
560NEXT X
570T5=""\FORX=1 TO D1+5\T5=T5+" "\NEXT X\GOSUB 590\RETURN
580REM-----PRINT SUBROUTINE
590ITAB(40-LEN(T5)/2),T5\RETURN
600REM-----END SUBROUTINE
610R=INT(2*RND(-1))\RETURN
READY

```

David Gerrold, PO Box 1190, Hollywood, CA 90028

RUN

HOW MANY GRAINS IN THE GLASS? 36



HOURLASS IS EMPTY
READY

Lines 250 to 280 actually run the hourglass. If you use this program as a subroutine (and what else would you use it for?) then you will probably delete these lines and put your control lines in the main program.

Lines 300 to 360 sift the top of the hourglass. In WUMPUS, occasionally rats eat half of your supplies. This subroutine can be used to subtract the appropriate number of asterisks from the top. (If you find supplies, however, adding asterisks is a bit more difficult, and I have to admit that it's a problem that I haven't exactly solved yet. Write me if you find a solution.) This sifting subroutine works from the top down, working from the center of the line to the sides before moving down to the next line of asterisks.

Lines 380 to 460 drop the asterisks into the bottom of the glass. If an asterisk has an empty space below it, it falls into it. If there is no empty space, it looks to both sides to see if it can fall in either of those directions. If it can't, it stops.

It is also possible to animate the actual falling of the asterisk. If you have a CRT terminal, but since I wrote this for use on a printer, I left that particular problem for later.

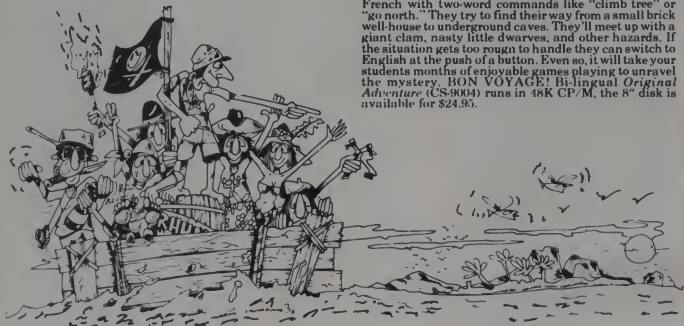
Lines 490 to 570 print out the hourglass. Line 590 is the actual printing subroutine and will center the hourglass on the page. If you want to move it to the left or right, change the value of the TAB command accordingly. Line 610 is a random number subroutine called up by line 410. This is how the asterisk decides whether to look to the right or the left as it topples down the stack. It has to be done randomly or the asterisks won't pile up evenly.

The hourglass certainly adds a lot of visual suspense to a wumpus hunt. In my neighborhood, though, we don't kill our wumpi anymore. We snap their pictures. (Hmmm...I suppose I should add that to the program next—a print out of the wumpus' picture!) □

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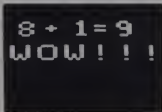
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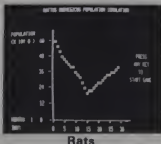
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80 Software Critique on
Ecology Simulations-1
Jan-March 1980

Ecology Simulations-2



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Translating Into Apple Integer Basic

Jordan Mechner



One of the biggest problems faced by Apple owners is how to convert programs found in books and magazines, written in standard Basic, into Apple Integer Basic. This Basic, designed for the Apple and the Apple's color graphics, has many strange quirks that make things very difficult for the beginner who wants to type in his favorite programs from *Basic Computer Games*.

This article describes the differences between Apple Integer Basic and standard Basic, in the hope that it will make things easier for these beginners.

Floating Point

If you ask the Apple for 2/3, it will give you a 0. If you type in 1.7, you will get a ***SYNTAX ERR. Apple Integer Basic has no floating point facility, and nothing can be done about it. This is one of the things the designers gave up in order to increase Integer Basic's efficiency.

Since Integer Basic has no floating point, it also has no SIN(), COS(), TAN(), ATN(), SQR(), LOG(), and EXP() functions. These functions are next to useless without floating point. It also has no INT() function, of course, since all numbers are integers anyway.

There are some programs to whose execution these functions are crucial. MUGWUMP, for example, from *101 Basic Computer Games*, will not work without the SQR() function. So, it's always a good idea to scan the listing of a program before you start to type it in. It would be very frustrating to have typed in half of MUGWUMP before you saw the SQR() function and realized that it wouldn't work in Apple Integer Basic.

One more point: While typing in a program, keep an eye out for occurrences of the INT() function. When you come to one, delete it.

RND

In standard Basic, the RND() function returns a random decimal between 0 and 1, for example, .77961. To get a random integer between, say, 1 and 10, you would use the formula

```
INT(RND(0)*10+1)
```

In Apple Integer Basic, however, the RND() function works differently. RND(10) returns a random integer between 0 and 9. So, to get a random integer between 1 and 10, you would use

```
RND(10)+1
```

In general, INT(RND(0)*N+1), which returns a random integer from 1 to N, can be translated into Integer Basic as RND(N)+1.

One of the most subtle and devilish differences between Apple Integer Basic and most other Basics: If the condition in an Integer Basic IF statement is false, only the first statement following the THEN is ignored and execution proceeds on the same line.

IF... THEN

One of the most subtle and devilish differences between Apple Integer Basic and most other Basics is its use of the IF... THEN statement. If you type in a program without being aware of this difference, the logic will be completely different and the program will not run at all.

Let's look at the statement

```
110 IF H=0 THEN X=X+1:Y=Y+1
```

If H=0, most Basics will execute both statements, X=X+1 and Y=Y+1. If

H=0, the computer will execute neither statement, but skip directly to the next numbered line.

Apple Integer Basic thinks differently. It will execute the second statement, Y=Y+1, no matter what. Only the first statement, X=X+1, depends on whether H=0 or not.

In general: If the condition in an Integer Basic IF... THEN statement is false, only the first statement following the THEN is ignored and execution proceeds as usual on the same line. In standard Basic, all statements following the THEN are ignored and execution jumps to the next line.

What does this mean, practically, to someone typing in a program? It means that you come to

```
110 IF A=B THEN A1=A:B1=B:C=0
120 ...
change it to
110 IF A=B THEN 120:A1=A:B1=B:C=0
120 ...
```

This kind of modification requires thought and understanding. It is probably the most difficult kind of change you will have to make. Be on the lookout for IF... THEN statements, and change the ones with more than one statement following the THEN.

Strings

The Integer Basic string handling facility is very different from that of most Basics. For one thing, strings must be dimensioned with the DIM statement. If N\$ will be 20 characters long, you must type

```
DIM N$(20)
```

at the beginning of the program to avoid a ***RANGE ERR.

Also, the method of substring notation is completely different. There are no MID\$(), LEFT\$() and RIGHT\$() functions. Instead, the following notation is used:

A\$(N) All characters of A\$ starting with the Nth character.

A\$(N,M) All characters of A\$ starting with the Nth character and ending with the Mth character.

What do you do when you come to a MID\$(), LEFT\$() or RIGHT\$() in a standard Basic program? Here are some simple formulas:

MID\$(AS,N,M) = AS(N,M+1)

LEFT\$(AS,N) = AS(1,N)

RIGHT\$(AS,N) = AS(LEN(AS)-N+1,LEN(AS))

The LEN() and ASC() functions are supported as usual. The CHR\$() function, however, is not. It can be simulated, if necessary, by assigning all the ASCII characters to a string:

```
AS=" !"#$%&'()*+,-./0123456789:;<=>?@ABCDE  
FGHIJKLMNOPQRSTUVWXYZ [\]^_`"
```

Now,

```
CHR$(N)=AS(N-31,N-31).
```

Double Subscripts for Arrays

Apple Integer Basic allows only single subscripts, such as A(X). If you try a double subscript, such as A(X,Y), you'll get a "***SYNTAX ERR. How can you get around this seemingly serious deficiency? Very many programs, in fact any game played on a two-dimensional board, use double subscripts.

There's a simple formula. Instead of starting with

```
DIM A(R,C)
```

start with

```
DIM A(R+C)
```

And when you come to a double subscript like A(I,J), type A(C*I+J-C) instead. It will work. What you are really doing is representing a two-dimensional array as an "unraveled" one-dimensional array. (For further explanation, see *Basic Tricks*, September 1979.)

INPUT

Some Basics use the semicolon for input, as in

```
210 INPUT "SPEED";S
```

Apple Integer Basic uses the comma:

```
210 INPUT "SPEED",S
```

This is a minor difference. Otherwise, the INPUT statement is standard. It prints a ? as a prompt character for numeric input, but prints no prompt for string input.

TAB

There is no TAB() function in Apple Integer Basic. Instead, there is a TAB statement. Where a standard Basic says

```
360 PRINT TAB(X/2);""
```

type

```
360 TAB X/2:PRINT""
```

In general, TAB X is equivalent to PRINT TAB(X);.

ON...GOTO

Integer Basic has no ON...GOTO statement. The best thing to do is to "do it the long way." That is, replace

```
600 ON X GOTO 1000,1290,640
```

with

```
600 IF X=1 THEN 1000:IF X=2 THEN 1290:  
IF X=3 THEN 640
```

When the line numbers are incremented evenly, as in

```
20 ON X GOTO 100,110,120,130,140
```

you can take a shortcut:

```
20 GOTO 10*X+90
```

READ...DATA

This is another feature Apple Integer Basic is missing. Again, the only substitute is to do it the long way. Instead of

```
70 FOR I=1 TO 10:READ A(I):NEXT I  
3000 DATA -10,7,310,0,0,-1,6,12,-310,-310  
use
```

```
70 I(1)=-10:I(2)=7:I(3)=310:I(4)=0:I(5)=0:
```

```
I(6)=-1:I(7)=6:I(8)=12:
```

```
I(9)=-310:I(10)=-310
```

□

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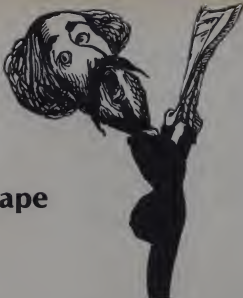
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Apple II: Reading Data From Tape



You have an Integer Basic program which has relatively large arrays of data. For instance, you have financial data to read into an analysis program; or, as I do, a baseball program which needs repeated updating of player records; or a table of department names that needs periodic updating.

Although Integer Basic does not have a DATA statement, there are three other ways to get these data into your program. First, you can assign each element individually. If you have lots of memory and the data will not change, this is not a bad way to do it. Second, you can enter data using the INPUT operator in your program. This is fine if you have a relatively small amount of data to enter each time you want to run the program.

Finally, for large amounts of data or for data that need periodic updating, you can read data into your program using the techniques I will describe.

Follow these steps to create, write, and read the data.

1. Create the data with a separate program.

2. Write the created data to tape from the data creation program.

3. Read the data into your execution program.

That sounds easy, so let's see how to do it using a simple example.

First create the data. Start by setting the write arrays as your first statement.

```
100 DIM A(10),B(10)
```

This act sets up memory location starting at \$800 (hex address 800, decimal 2048) to store the data.

Now let's write a simple input program.

```
110 FOR J = 1 TO 10
120 INPUT "KEY IN DATA ITEM 1",C
```

Bruno B. Wolff, Jr.

We'll add a simple edit step to prevent a 32767 error.

```
130 IF C < 328 THEN 150
140 PRINT "DATA ITEM TOO LARGE":
GO TO 120
150 INPUT "KEY IN DATA ITEM 2",D
160 A(J)=(C*100+5)/D
170 B(J)=J*100
180 NEXT J
```

Now you need to determine two important locations in memory — the starting address of the area of memory you want to write and the ending address of that area. Since Integer Basic starts assigning variables to memory at \$800 (unless you change it by changing LOMEM), you know the starting address right off. You can find

Now you need to determine two important locations in memory — the starting address of the area of memory you want to write and the ending address of that area.

the ending address two ways. One, you can calculate it; or, two, you can read it by looking at the memory location with the monitor.

First let's calculate it. Integer Basic needs one byte for each character in the variable name. (You may want to refer to page 35 and following in the red book.) Then it has a byte for the DISPLAY option. Then two bytes for the next variable address. Then there are two bytes for each element in the array. The number of elements is the dimension number plus 1 since element 0 is the first element. So we have

1+1+2+22 (for A) and 1+1+2+22 (for B) or a total of 52 locations, i.e., 34 hex.

Now we add the number of bytes needed to our starting location minus 1 to get the ending address.

Hexadecimal	Decimal
800	2048
+ 34	+ 52
- 1	- 1
833	2099

A second way to find the starting and ending address is to use the monitor. To do this you have to RUN the program. The program will run to line 120. Then hit the reset key. You'll get the monitor prompt ".*"

Input 800.803 to see the first four bytes of variable memory. The computer will respond:

```
800 C1 00 1A 08
```

"C1" is the hex notation for "A." "00" says the display option is off. "1A 08" says the next variable starts at \$81A.

Next input 81A.81D to display the variable "B" and the location of the next variable. The machine will respond 81A C2 00 34 08. "C2" is the hex notation for "B." "00" shows the display option is off, and "34 08" says the next variable starts at \$834. From that we conclude the last location we want to write is one less than \$834 or \$833.

Now Control C back into Basic.

Now that we know the start and end addresses, we have to put them into the computer.

The starting address is loaded in decimal locations 60 (low order) and 61 (high order). The ending address is loaded into 62 (low order) and 63 (high order).

Take the hex starting address of 800 and separate the low order and high order bytes. Low order = 00, high order = 8. The decimal equivalent of 00 is 0, and 8 is 8. Simple enough.

Then we set up to read in the arrays.

```
150 DIM A$(1)
160 PRINT "POSITION TAPE AN
PLAY MODE"
170 INPUT "WHEN READY START TAPE AND
LET RETURN", AS
180 CALL-259
190 PRINT "READ COMPLETED"
```

Now we'll clear the screen and print the data, adding a delay so you can read the message in 190.

```
200 FOR J=1 TO 300: NEXT J
210 CALL-936
220 PRINT "B A"
230 PRINT
240 FOR J = 1 TO 10
250 PRINT B(J);
260 PRINT " "; A(J)
270 NEXT J
280 END
```

There you have it. A few points to remember: to compute the variable length be sure to add one byte for each letter in your variable name and the number of bytes includes subscript 0. For string variables each variable has one byte for each cell plus a termination byte (set to 1E) which marks the end of the string.

To review, then, for numeric variables the total number of bytes is:
 L letters in a name
 +1 display byte
 +2 address of next variable
 +(N+1) * 2 two bytes for each cell (Dimension N plus 1).

For strings:

L letters in a name
 +1 display byte
 +2 address of next variable
 +(N+1) one byte for each cell (dimension N plus one)
 +1 termination byte

Also remember that both programs must start with the same dimension statements and have the same read and write addresses.

I think you'll find these routines useful. Now you can build your own Integer Basic programs to read and write data. □



"It all began when I saw an ad for a programmer course on a matchbook cover... Then I got lung cancer."

© Creative Computing

Now take the ending location 833. The decimal equivalent of the low order byte 33 is 51(3*16+3). The high order byte 8 converts easily to 8 decimal.

```
190 POKE 60,0
200 POKE 61,8
210 POKE 62,51
220 POKE 63,8
```

Another way to compute the poke address is to take the decimal address and compute the low-order byte by using the MOD function with 256 as modulus and divide the decimal address by 256 to find the high order byte. So an alternative way is to POKE as follows:

```
170 POKE 60,2048 MOD 256
180 POKE 61, 2048/256
190 POKE 62, 2099 MOD 256
200 POKE 63, 2099/256
```

There are two ways of looking at the same thing. One is just as good as the other. If you look at the monitor, the first method is easier. If you count, the second way is easier.

The next thing we have to do is CALL the program that writes to the tape. First let's give ourselves a message to position our tape and put the program on hold until we're ready.

```
230 DIM A$(1)
240 PRINT "POSITION TAPE AND SET IN
RECORD MODE"
250 INPUT "HIT RETURN WHEN READY", AS
260 CALL-307
270 PRINT "WRITE COMPLETED"
280 END
```

Now that wasn't too bad, was it? The final thing we have to do now is write the program that will use the data created in program 1.

These are two ways of looking at the same thing. One is just as good as the other. If you look at the monitor, the first method is easier. If you count, the second way is easier.

We'll do a simple program to read and print the data we read in. The most important thing to remember is that the create-data program and the use-data program must start out with the same dimension statement.

```
100 DIM A(10),B(10)
```

Now we POKE the read addresses we already computed when setting up the write program.

```
110 POKE 60,0
120 POKE 61,8
130 POKE 62,51
140 POKE 63,8
```

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```

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  TO BUILD THE MAJORITY OF THE SINGLE-FAMILY HOMES SEEN
3 REM IN THE USA TODAY. A USER WHO IS CONSIDERING BUILDING
  A HOUSE MAY REPEAT IT WITH DIFFERENT COMBINATIONS OF
4 REM VARIABLES AND VERY QUICKLY DETERMINE IF HIS PLANS WILL
5 REM INSURANCE AGENTS WILL FIND IT USEFUL IN HELPING A CLIENT
  DECIDE HOW MUCH COVERAGE TO BUY ON A GIVEN HOUSE.
6 REM REAL ESTATE AGENTS MAY USE IT TO SHOW PROSPECTS WHAT IT
  WOULD COST TO DUPLICATE A HOUSE THEY ARE CONSIDERING.
7 REM LENDING OFFICERS AND APPRAISERS MAY USE IT TO GET A
  REPLACEMENT BASIS FOR USE IN ESTABLISHING VALUE.
8 REM AUTHOR: J ESSIG, BOX 366, WEBSTER CITY, IA 50595
9 CLS: CLEAR SCREEN
10 PRINT " *** HOME CONSTRUCTION COST ESTIMATOR *** "
11 PRINT " "
12 PRINT " THIS PROGRAM WILL ASK YOU QUESTIONS ABOUT THE "
13 PRINT " HOME TO BE ESTIMATED. ENTER YOUR ANSWERS BY TYPING "
14 PRINT " 0 FOR NO, OR 1 FOR YES, AND THEN PRESS THE 'ENTER' KEY. "
15 PRINT " "
16 PRINT " REMEMBER ** ZERO FOR NO AND 1 FOR YES ** "
17 PRINT " "
18 PRINT " THE PROGRAM ASSUMES THAT THE HOUSE HAS A KITCHEN, A "
19 PRINT " LIVING ROOM, ONE FULL BATH AND TWO BEDROOMS PLUS THE OTHER "
20 PRINT " ROOMS IT WILL ASK YOU ABOUT. IF IT IS SMALLER THAN THIS, "
21 PRINT " THE PROGRAM WILL BE UNABLE TO CALCULATE A COST FOR IT. "
22 PRINT " "
23 INPUT "IF YOU ARE READY TO GO, ENTER 1 ARE YOU READY "; B$
24 IF B$ = "0" PRINT "END OF PROGRAM": END
25 CLS
26 PRINT " 1 = YES 0 = NO "
27 PRINT " "
28 INPUT "DOES THE HOUSE HAVE A THIRD BEDROOM "; C
29 IF C = 0 GOTO 200
30 INPUT "A FOURTH BEDROOM "; D
31 IF D = 0 GOTO 200
32 INPUT "A FIFTH BEDROOM "; E
33 IF E = 0 GOTO 200
34 INPUT "A SIXTH BEDROOM "; F
35 IF F = 0 GOTO 200
36 CLS
37 INPUT "DOES THE HOUSE HAVE A 2ND FULL (3-FIXTURE) BATH "; G
38 IF G = 0 GOTO 220
39 INPUT "A THIRD FULL BATH "; H
40 PRINT " "
41 INPUT "DOES THE HOUSE HAVE A HALF (2-FIXTURE) BATH "; I
42 IF I = 0 GOTO 220
43 INPUT "DOES IT HAVE A SECOND 2-FIXTURE BATH "; J
44 CLS
45 INPUT "IS THERE SPACE IN THE KITCHEN FOR A DINETTE "; V
46 PRINT " "
47 INPUT "DOES THE HOUSE HAVE A DINING ROOM "; L
48 PRINT " "
49 INPUT "DOES IT HAVE A FAMILY ROOM "; M
50 PRINT " "
51 INPUT "A STUDY "; K
52 PRINT " "
53 INPUT "DOES IT HAVE A DEN "; J
54 PRINT " "
55 INPUT "A RECREATION OR RUMPUS ROOM "; N
56 CLS
57 PRINT " "
58 INPUT "IS THERE AN ATTIC (BIG ENOUGH TO STAND UP IN) "; BB
59 IF BB = 0 GOTO 275
60 INPUT "IS THE ATTIC FINISHED "; P
61 PRINT " "
62 INPUT "IS THERE A BASEMENT "; CC
63 IF CC = 0 GOTO 280
64 INPUT "IS THE BASEMENT FINISHED "; O
65 PRINT " "
66 INPUT "IS THERE A MAIN-FLOOR UTILITY ROOM "; S
67 PRINT " "
68 INPUT "IS THERE AN ATTACHED GARAGE "; A
69 IF A = 0 GOTO 300
70 INPUT "IS THE ATTACHED GARAGE A TWO-CAR "; Q
71 CLS
72 INPUT "IS THE HOUSE CENTRALLY AIR-CONDITIONED "; R
73 PRINT " "
74 INPUT "IS THERE A DECK "; W
75 INPUT "IS THERE AN ENCLOSED PORCH "; X
76 PRINT " "
77 INPUT "IS THERE A FIREPLACE "; Y
78 IF Y = 0 GOTO 367
79 INPUT "IS THERE A SECOND FIREPLACE "; Z
80 PRINT " "
81 INPUT "IS THERE ANY BRICK OR STONE-WORK ON THE EXTERIOR "; A
82 DO = (5*A+C+D+E+F+G+H+J+K+L+M+N+R)+ 5*(O+P+Q+S+T+U+V+W+X+Y+Z+A+BB+CC)
83 CLS
84 PRINT "THE AREA OF THE COUNTRY WHERE THE HOUSE IS TO BE CONSTRUCTED IS
  ALSO A FACTOR IN COST ESTIMATION. PRINT "
85 INPUT "WILL THIS HOUSE BE BUILT IN THE MID-WEST? "; O
86 IF O = 0 GOTO 376

```

Home Construction Cost Estimate

John W. Essig

This program, written in TRS-80 Level II Basic, estimates the construction cost of a home based on the number of rooms, quality of construction, geographical area, and other factors. The programming is very straightforward, but you might want to improve it by adding yes/no answers or other factors. The sample run was printed using the screen-print feature of NEWDOS.

John W. Essig, 826 2nd Street, PO Box 366, Webster City, Iowa 50595.



```

375 LL = 96 : OOSUB 405
376 INPUT "WILL IT BE BUILT SOUTH OF THE MASON-DIXON LINE " ; EE
377 IF EE = 0 OOTO 392
378 INPUT "IN EITHER LOUISIANA OR KENTUCKY " ; EE
379 IF EE = 0 OOTO 381
380 LL = 93 : OOSUB 405
381 LL = 83 : OOSUB 405
382 INPUT "IN THE GREAT SOUTHWEST " ; OO
384 IF OO = 0 OOTO 389
385 INPUT "IN CALIFORNIA " ; OO
386 IF OO = 0 OOTO 389
387 LL = 1.11 : OOSUB 405
388 LL = 95 : OOSUB 405
389 INPUT "IN THE NORTHWESTERN U S " ; II
390 IF II = 0 OOTO 392
391 LL = 91 : OOSUB 405
392 INPUT "IN THE NEW ENGLAND STATES " ; JJ
393 IF JJ = 0 OOTO 397
395 LL = 96 : OOSUB 405
397 LL = 93
405 MM=DO+LL : CLS
407 PRINT "NEXT, IT IS NECESSARY TO RATE THE DESIGN"
410 PRINT "AND CONSTRUCTION ON A SCALE OF 1 TO 4."
412 PRINT " "
413 PRINT "GRADE 1: A SIMPLE HOUSE BUILT FROM STOCK PLANS."
412 PRINT " "
413 PRINT "GRADE 2: BUILT FROM STOCK OR DESIGNER PLANS"
410 PRINT "WITH AVERAGE OR BETTER MATERIALS."
412 PRINT " "
413 PRINT "GRADE 3: CUSTOM BUILT FROM DESIGNER PLANS"
410 PRINT "WITH MANY EXTRA FEATURES."
412 PRINT " "
413 PRINT "GRADE 4: ONE OF A KIND. BUILT FOR AN"
410 PRINT "INDIVIDUAL UNDER AN ARCHITECT'S SUPERVISION."
412 PRINT " "
410 INPUT "PLEASE SPECIFY THE GRADE: 1,2,3 OR 4 " ; FF
465 IF FF = 1 OOSUB 520
470 IF FF = 2 OOSUB 540
480 IF FF = 3 OOSUB 560
485 IF FF = 4 OOSUB 580
520 CLS
522 NN = MM * 3970
524 PRINT " "
525 PRINT "USING STOCK PLANS AND ECONOMY MATERIALS, WE "
527 PRINT "ESTIMATE THAT CONSTRUCTION COSTS FOR THIS HOME "
529 PRINT "WOULD TOTAL" USING "#####.##";NN : OOSUB 600
540 CLS
542 NN = MM * 5024
543 PRINT "USING STOCK OR SIMPLE DESIGNER PLANS AND AVERAGE OR"
547 PRINT "BETTER MATERIALS AND WORKMANSHIP, WE ESTIMATE THAT"
551 PRINT "THE COST TO CONSTRUCT THE HOUSE YOU HAVE DESCRIBED"
554 PRINT "WOULD TOTAL" USING "#####.##";NN : OOSUB 600
555 END
560 CLS : PRINT " "
562 NN = MM * 6164
565 PRINT "WE CALCULATE THAT THE CONSTRUCTION COST OF THIS"
567 PRINT "DESIGNER HOME (LOT & LANDSCAPING NOT INCLUDED)"
569 PRINT "WOULD BE" USING "#####.##";NN
570 OOSUB 600
580 CLS : PRINT "PRINT WE ESTIMATE THAT THE CONSTRUCTION COST OF THIS"
582 PRINT "UNIQUE HOME (LOT & LANDSCAPING NOT INCLUDED)"
584 NN = MM * 7356
589 PRINT "WOULD BE" USING "#####.##";NN : OOSUB 600
590 PRINT " "
592 PRINT "USING A CONSERVATIVE 6 % INFLATION FACTOR, THE"
596 PRINT "COST TO BUILD THIS HOUSE IS : "
610 PRINT " "
613 PRINT " "
615 PRINT " "
617 PRINT " "
619 PRINT " "
621 PRINT " "
623 PRINT " "
625 PRINT " "
627 PRINT " "
629 PRINT " "
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687 PRINT " "
689 PRINT " "
691 PRINT " "
693 PRINT " "
695 PRINT " "
697 PRINT " "
699 PRINT " "

```

*** HOME CONSTRUCTION COST ESTIMATOR ***

THIS PROGRAM WILL ASK YOU QUESTIONS ABOUT THE HOME TO BE ESTIMATED. ENTER YOUR ANSWERS BY TYPING 0 FOR NO, OR 1 FOR YES, AND THEN PRESS THE 'ENTER' KEY.

** REMEMBER ** ZERO FOR NO AND 1 FOR YES **

THE PROGRAM ASSUMES THAT THE HOUSE HAS A KITCHEN, A LIVING ROOM, ONE FULL BATH AND TWO BEDROOMS PLUS THE OTHER ROOMS IT WILL ASK YOU ABOUT. IF IT IS SMALLER THAN THIS, THE PROGRAM WILL BE UNABLE TO CALCULATE A COST FOR IT.

IF YOU ARE READY TO GO, ENTER 1. ARE YOU READY ? 1.

1 = YES 0 = NO

DOES THE HOUSE HAVE A THIRD BEDROOM ? 1
A FOURTH BEDROOM ? 1
A FIFTH BEDROOM ? 1
A SIXTH BEDROOM ? 0.

DOES THE HOUSE HAVE A 2ND FULL (3-FIXTURE) BATH ? 1
A THIRD FULL BATH ? 0

DOES THE HOUSE HAVE A HALF (2-FIXTURE) BATH ? 1
DOES IT HAVE A SECOND 2-FIXTURE BATH ? 0.

IS THERE SPACE IN THE KITCHEN FOR A DINETTE ? 0

DOES THE HOUSE HAVE A DINING ROOM ? 1

DOES IT HAVE A FAMILY ROOM ? 0

A STUDY ? 1

DOES IT HAVE A DEN ? 0

A RECREATION OR RUMPUS ROOM ? 0.

IS THERE AN ATTIC (BIG ENOUGH TO STAND UP IN) ? 0

IS THERE A BASEMENT ? 1
IS THE BASEMENT FINISHED ? 1

IS THERE A MAIN-FLOOR UTILITY ROOM ? 1

IS THERE AN ATTACHED GARAGE ? 1
IS THE ATTACHED GARAGE A TWO-CAR ? 1.

IS THE HOUSE CENTRALLY AIR-CONDITIONED ? 0

IS THERE A DECK ? 1
IS THERE AN ENCLOSED PORCH ? 0

IS THERE A FIREPLACE ? 1
IS THERE A SECOND FIREPLACE ? 1

IS THERE ANY BRICK OR STONE-WORK ON THE EXTERIOR ? 0.

THE AREA OF THE COUNTRY WHERE THE HOUSE IS TO BE
CONSTRUCTED IS ALSO A FACTOR IN COST ESTIMATION.

WILL THIS HOUSE BE BUILT IN THE MID-WEST ? 0
WILL IT BE BUILT SOUTH OF THE MASON-DIXON LINE ? 0
IN THE GREAT SOUTHWEST ? 0
IN THE NORTHWESTERN U S ? 0
IN THE NEW ENGLAND STATES ? 0.

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Estimate, cont'd...

NEXT, IT IS NECESSARY TO RATE THE DESIGN AND CONSTRUCTION ON A SCALE OF 1 TO 4.

GRADE 1: A SIMPLE HOUSE BUILT FROM STOCK PLANS.

GRADE 2: BUILT FROM STOCK OR DESIGNER PLANS WITH AVERAGE OR BETTER MATERIALS.

GRADE 3: CUSTOM BUILT FROM DESIGNER PLANS WITH MANY EXTRA FEATURES.

GRADE 4: ONE OF A KIND. BUILT FOR AN INDIVIDUAL UNDER AN ARCHITECT'S SUPERVISION.

PLEASE SPECIFY THE GRADE: 1, 2, 3 OR 4 ? 3.

WE CALCULATE THAT THE CONSTRUCTION COST OF THIS DESIGNER HOME (LOT & LANDSCAPING NOT INCLUDED) WOULD BE \$88,854.10

USING A CONSERVATIVE 6% INFLATION FACTOR, THE COST TO BUILD THIS HOUSE IN :

1981 WOULD BE	\$94,185.38
1982 WOULD BE	\$99,516.68
1983 WOULD BE	\$105,736.08
1984 WOULD BE	\$111,956.08
1985 WOULD BE	\$119,864.08

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All staff members are knowledgeable about the store's products, but their different backgrounds bring new perspectives to the tasks at hand. One employee used the resources of ComputerLand of Cleveland to help two high school students build a robot. Another designed and wrote a program central to a local television station's election coverage. When Cleveland's educational television station held a telethon recently, the staff joined together and donated an Apple Computer to the cause.

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Four Play

Floyd M. Goldstein

SAMPLE RUNS

Recently faced with the problem of making a schedule for a golf club, I wrote a short program to do the job. It creates a five-week schedule for 16 players, grouped in fours, with each playing only once with each other.

This five week schedule is repeated six times for the full 30 week period of the season; each plays with another six times.

The program can be used to make many different schedules (bridge, bowling, etc.) and can be modified to schedule almost any number of players (memory permitting).

The program was written for a TRS80 Level II (4k and up), but can be modified for many other computers. The PET version requires almost no modifications.

□

Golf Schedule (Floyd Goldstein 3-8-80)

```

5 CLS
10 PRINT @ 457 *** PLEASE WAIT WHILE I MAKE THE SCHEDULE ***:
15 REM BY FLOYD GOLDSTEIN

2498 HALIBU ROAD
BELLMORE N.Y. 11710
(516) 431-1616 (HOME 5)
31 FOR I=1 TO 100:RANDOM NEXT I
35 REM DEFSTR A-D SETS A-D AS STRING VARIABLES AND DEFINIT SETS
40 A="ABCDEFGHIJKLMN":FOR I=1 TO 16:DEF I,I=1: NEXT I:G=1
50 FOR J=1 TO 5:BA=
70 FOR J1=1 TO 4:FOR J2=1 TO 4:W=
80 X=INT(RND/LEN(B)):IF X=0 THEN B=SELZ=ASC(MID(B,X,1)):D=CHR$(Z)
90 W=M+1:IF W=100 THEN GOTO 240
95 PRINT @ 857: I,J1,J2
110 FOR L=1 TO LEN(C):IF C="" THEN L40
120 IF (EIZ:(ASC(MID(C,L,1))-64))=0 THEN GOTO 80
130 NEXT L
140 C=C$D
150 IF LEN(C)=4 THEN GOTO 120
160 FOR L=1 TO 4:Z=(ASC(MID(C,L,1))-64
170 FOR M=1 TO 4:Y=(ASC(MID(C,M,1))-64
180 EIZ:Y=SELZ:Y+1
190 EIZ:Y=SELZ:Y+1
200 FOR T=1 TO 4:(A(J1)+A(J2)+A(J3)+A(J4))-MID(C,T,1):" NEXT T:C=""
210 NEXT J1: NEXT J
211 CLS
212 PRINT@B(15):"*** GOLF SCHEDULE FOR 5 WEEKS ***"
213 PRINT@B(15):"*****"
215 FOR I=1 TO 5:PRINT "WEEK #": I: " "
220 NEXT I
231 PRINT:PRINT" PLEASE COPY THE ABOVE DOWN " :PRINT:INPUT"
235 END:PRINT" WISH TO MAKE ANOTHER 5 WEEKS? (A-B: IF LEFTS (A-B)=V: THEN RUN
240 PRINT @ 727: " ** RESTART **":FOR V=1 TO 500: NEXT V:RUN

```

Floyd M. Goldstein, 2498 Halibut Road, Bellmore, NY 11710.

*** GOLF SCHEDULE FOR 5 WEEKS ***

WEEK # 1:	LMHC	EJOD	PBKN	IAOF
WEEK # 2:	MJNO	EBLF	KOIC	AMPD
WEEK # 3:	GPGL	MFDK	HJIB	NECA
WEEK # 4:	GHFN	LKAJ	JBCC	MHEI
WEEK # 5:	OBMA	OKHE	DFCP	LNID

*** GOLF SCHEDULE FOR 5 WEEKS ***

WEEK # 1:	JAWD	KFCB	LNMO	POE1
WEEK # 2:	MKOJ	HEFL	CDNI	APB1
WEEK # 3:	OBHN	F1MA	EJOC	DBL1
WEEK # 4:	ACCL	FJPN	OHMK	DMBE
WEEK # 5:	CPMH	GDFO	KNEA	BLJ

*** GOLF SCHEDULE FOR 5 WEEKS ***

WEEK # 1:	KLAF	PBIT	JCMN	EDDM
WEEK # 2:	ONFB	LMPJ	COAE	HIDK
WEEK # 3:	BMCK	ONDL	EF1J	PHGA
WEEK # 4:	LEBH	FCDP	JK00	AM1N
WEEK # 5:	PNEK	1COL	JBDA	FOMH

*** GOLF SCHEDULE FOR 5 WEEKS ***

WEEK # 1:	NOCU	AKHE	DM1P	K1JP
WEEK # 2:	JMCE	HKDO	OAPB	FINL
WEEK # 3:	DEBL	HMNA	CKNP	100J
WEEK # 4:	JFAD	BHIC	GENP	KMOL

*** GOLF SCHEDULE FOR 5 WEEKS ***

WEEK # 1:	KBOI	IPDF	CONK	AM1J
WEEK # 2:	GOLK	SDNJ	GPHE	PACL
WEEK # 3:	MOIK	BHMC	KDAE	09FJ
WEEK # 4:	NPLI	BHMC	KDAE	09FJ
WEEK # 5:	KPBF	HOLD	C1JE	HN0A

notes:

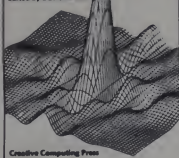
line # 31 is not needed
 line # 212 is for printer. Change the print to Iprint
 on line # 212: 516, 210, 210, 210, 210, 210
 aside from that I think the program speaks for itself

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CIRCLE 137 ON READER SERVICE CARD

MAY PROBLEMS SOLVED

David H. Ahl

P.S.-HEARD THIS ONE?

Of the several solutions received, the one from Joe Martin Free (Howard Industries, Inc., P.O. Box 1588, Laurel, MS 39440) was the most interesting in that he programmed it in the EDX language for an IBM Series/1. Space does not permit us to reproduce the program, however, here is Joe's logical approach.

From P's first statement, it is obvious that both of the integers cannot be prime.

From S's first statement, we know that of all the pairs of integers that can be added together to get this sum, no pair is such that both integers are prime numbers.

From P's last statement, we know that of all the pairs of integers that are factors of the product, one and only one pair of integers exist such that the above conditions are true.

FOR EXAMPLE

Assume that P knew that the product was 92 and that S knew that the sum was 17.

P's 1st statement would be true because the factors could be $2 \times 26 = 52$ or $4 \times 13 = 52$.

Possible integers for the sum could be
 $2 + 15 = 17$ $3 + 14 = 17$ $4 + 13 = 17$
 $5 + 12 = 17$ $6 + 11 = 17$ $7 + 10 = 17$
 $8 + 9 = 17$

Note that of all possible choices above, no pair is such that both integers are prime, so S could state that he knew that P did not know the answer.

From this P knows that if the integers were 2 and 26, S could not have made this statement because the sum would have been 28 which could be the sum of 5 and 23. Both 5 and 23 are prime numbers and S could not have known that P did not know the answer.

So P knows that the integers are 4 and 13.

After checking all of his possible choices that can sum to 17, S knows that only 4 and 13 are the integers such that P can make the deduction that he made.



His program to "prove" this solution follows these steps:

1. Create an array of numbers from 1 to 100 and eliminate the primes.
2. Fill a sum array with numbers (1 to 200) and eliminate any sum that can be the sum of any two primes.
3. For remaining sums, determine all possible sets of two integers that can produce it. For each set of integers, find the product. Then find all sets of two integers that can be a factor of this product. Find the sum of each set of factors. Each sum that is also in the sum array is an answer to the problem.

Moving the limit up to 200, Joe finds that the answers of 4 and 13 are still unique. He suspects it may be unique no matter what the upper limit, but declines the opportunity to prove it.

THE REMAINDERS

Several readers pointed out that there is more than one possible answer to this problem — 5,802,397 answers to be exact. Marathon "REXON" of Fairfield, N.J. wrote that all the answers are of the form:

$$(N \cdot 2520) - 1$$

Where N is any integer from 1 to 5,802,397. Ian MacDonald of Stellarton, Nova Scotia came to the same conclusion and computed 2519 as the smallest answer with 14,622,042,959 as the largest.

HOT DESERT SANDS

It may be easier to solve this problem by visualizing the desert as 800 miles across and our truck as being able to carry 40 gallons of gas which will take it 400 miles. If you draw little pictures, you can see that the truck can go 100 miles, drop 20 gallons and return. The next trip is 200 miles. Continuing this process until 40 gallons are dropped at the halfway point for the final trip across yields a solution of 680 gallons or 17 tankfuls and total mileage of 6800 or the equivalent of $8\frac{1}{2}$ trips across. Perhaps a trailer would be a better solution.



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puzzles & problems

A Remarkable Coincidence



Merlin has reached back to the time of World War II for this month's kickoff puzzle. Around 1944 a remarkable statistical coincidence was noted by some obscure cataloger of trivia. According to the table he compiled, five of the world leaders at that time had a great deal in common. Look at the following table and decide whether it was coincidence, or, a trick with numbers.

	Roosevelt	Churchill	Stalin	Hitler	Mussolini
Born	1882	1874	1879	1889	1883
Age (in 1944)	62	70	65	55	61
Took Office	1933	1940	1922	1933	1922
Years in office	11	4	22	11	22
Total	3888	3888	3888	3888	3888

The Correct Combination



Here's an interesting problem from Mr. L. E. Schander of Yorktown, Virginia. Mr. Schander will receive a copy of "Merlin's Puzzler II" for his contribution. The problem is stated thusly:

"My boss was working late one evening and found he had to get a very important file out of my safe which was sealed by a three-number combination lock. He called me up at home, and since it is against company policy to reveal combination lock numbers over the phone, I gave him only the following hints:"

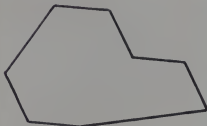
"If you add 1 to the first number, 2 to the second number, and subtract 17 from the third, the product of the new numbers is one larger than the product of the original set. (That is: $A \times B \times C + 1 = (A + 1) \times (B + 2) \times (C - 17)$). If you add 1 more to the first number, and add 2 more to the second, and subtract 7 more from the third, the new product will again increase by 1 and you will know the correct combination."

"Now, what are the combination lock numbers?"

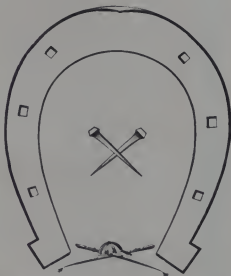
A Problem In Division



According to Merlin the next easy (?) puzzle should take you no more than three minutes to solve. You are to divide the irregular shape depicted here into three equal parts by drawing just two straight lines across it. On your mark, get set, go!



A Betting Proposition



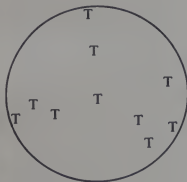
Well, old sport, here's a puzzle you should get a kick out of. Orville Wheelwright, the blacksmith out at the Merlin Downs racecourse, fooled everyone for years with this puzzle. He would hand you a horseshoe which contained six nail holes and ask you to divide it into six pieces, each piece having one of the nail holes in it. You were allowed to make only two straight-line cuts across the horseshoe with a hacksaw to accomplish this feat. Does anyone here care to wager on this one?

(From "Merlin's Puzzler III")

A Touching Problem



rom "The Sometimes Baffled Computer Services Dept." at the Homewood Flossmoor High School in Flossmoor, Illinois, we have a nice little puzzle. All you have to do is arrange the numbers 1 through 8 in the boxes at the right so that no two consecutive numbers are next to each other (up-down, left-right, or diagonally). A copy of "Merlin's Puzzler 1" is on the way to Gail, Ruth, Earnistine, Gary, and Pete.



The Puzzle Of The Ten Tigers

herlock Holmes, Dr. Watson and Inspector Lestrade were returning to London by train. To pass the time they had been swapping puzzles.

"Now gentlemen," said Holmes, "as we have time for one more puzzle I think I will acquaint you with a problem I call 'The Puzzle Of The Ten Tigers.'" The puzzle states that the London Zoo, after having been given ten tigers, had then placed all together in a circular cage. Next, they wished to erect three circular fences within this cage in such a way that each tiger would be isolated from every other tiger. The fences could cross each other at any point. I'll give you both until we arrive at Paddington Station to solve this puzzle."

(From "Merlin's Puzzler 1").

The Bicycle Puzzle



Henry and Harriet decided to bicycle up to Morristown and visit the headquarters of Creative Computing. The distance they had to travel was 20 miles. After they had covered four miles Henry's bike broke down and he had to chain it to a tree. Being in a hurry they decided to push on as quickly as they could. They had the choice of both walking, or, of one walking and one riding the remaining bike. They both can walk at the rate of four miles an hour and ride at eight miles an hour. They decided on a plan of action that would keep their walking to a minimum and yet would get them to Morristown in the shortest amount of time. What combination of walking and riding did they use?



Dropped-Letter Proverbs

Supply the missing letters, and each of the series following will be found to represent a popular proverb. Each dash represents either a dropped letter or the space between two words. In some of the examples one dash stands for two dropped letters.

1. F-i-t-h-a-t-e-c-w-n-a-r-a-y.
2. B-r-s-f-t-r-f-c-t-g-t-f.
3. H-w-o-g-s-b-r-w-g-g-s-s-r-w-g.
4. T-k-c-r-f-h-p-n-n-t-e-p-n-s-w-l-t-k-c-r-f-t-e-s-t-s.

(From "Merlin's Puzzler 2").

A Puzzle With Coins



Required, to arrange twelve coins in such manner that they shall count four in a straight line in seven different directions.

If you have a favorite puzzle that you would like to share with the readers of Creative Computing send it in, and, if Merlin uses it he will send you a copy of one of his "Merlin's Puzzler" books. Until next time, your editor, Charles Barry Townsend.

Charles Barry Townsend

Write With Verbs

Edmond H. Weiss, a communications consultant, teaches effective writing seminars for business, industry, and government. To contact him, call 609-795-5580.

Effective writers use the right verbs. (Notice: I didn't say *utilize*.) With good verbs you can lighten your text, brighten your reports, focus your ideas, engage your readers, push your proposals, command your technicians . . . you get the idea.

But most technical people in general, and computer people in particular, write with extra nouns instead of verbs. (Further, the few verbs they do use are often stiff and dull — like *utilize*.)

Editors have many names for this tendency to write in nouns. Some, as you would expect, call it *nominalization* (a horrible word). Others call it *smothering the verb* (a name more to my taste).

Smothered verbs are good, strong, lively verbs that, unfortunately, are suffocating inside dull, dense nouns. They are harmless enough in your first drafts, when you're still composing your thoughts. But they should not survive the first draft. Look out for them and get rid of them.

Smothered Verbs: Garden Variety

The most typical smothered verbs are in phrases beginning with the words *have*, *make*, *give*, *reach* and *do*. Here are a few examples:

<i>Smothered</i>	<i>Breathing</i>
have an objection	object
have knowledge	know
have reservations	doubt
have a suspicion	suspect
make a distinction	distinguish
make a suggestion	suggest
give an answer	answer
give a justification	justify
reach a conclusion	conclude
reach an end	finish, end
do an inspection	inspect
do a draft	draft

In most — not all — cases, the phrase on the left should be replaced

with the word on the right. Instead of:

We did not have sufficient knowledge of the problem to make a suggestion for improvements.

Write:

We did not know enough about the problem to suggest improvements.

Instead of:

They cannot do a verification of the data until you make a decision about the new password.

Write:

They cannot verify the data until you decide about the new password.

Smothered Verbs: More Exotic Varieties

Technical people, it seems, are endlessly resourceful in inventing new smothered verbs. Among the more curious I've had to edit recently are:

<i>Smothered</i>	<i>Breathing</i>
furnished an explanation	explained
effectuate a system	start up
startup	system
achieve linkage	link
accomplish a separation	separate
realize an improvement	improve
generate a solution	solve
effect a replacement	replace

So, instead of:

The calculations of costs are accomplished by the TREND model.

Write:

The TREND model calculates the costs.

Instead of:

Separation of the personnel and payroll files was achieved.

Write:

The personnel and payroll files were separated.

Instead of:

Rectangle formation can be realized in three ways.

Write:

You can form rectangles three ways.

Verbs Disguised as Nouns

Always be alert to any verbs, smothered or not, disguised as nouns.



Usually, the suspect noun will end with the letters *ion*, or *ing*, or *ment*.

Instead of:

Their decision was to expand, rather than replace.

Write:

They decided to expand rather than replace.

Instead of:

Printing user directories is a capability of the system.

Write:

The system can print user directories.

Instead of:

This plan is an enlargement of our earlier objectives.

Write:

This plan enlarges on our earlier objectives.

Why Do Verbs Matter So Much?

As you can see, finding and using the right verb makes a sentence shorter and "cleaner," without sacrificing information. With fewer and shorter words, the sentences read more easily and invite fewer errors.

The only objection I sometimes hear to writing with verbs is that it makes the sentences too readable. They sound too much like ordinary English and not enough like "documentation." If you find yourself liking the "before" sentences better than the "after" sentences, because they sound more "formal," you may be confusing formality with pomposity.

Writers who are embarrassed or unsure will sometimes hide behind these insufficient knowledge . . . instead of "We don't know." Or they will write, "No decision has been reached as of yet . . ." instead of "We still have not decided."

For the most part, though, writing with too many nouns is just a bad habit of style: something we pick up from the gang at work. To rid yourself of the habit, inspect your first drafts for offending phrases like the examples above. If you correct enough of them, you may one day reach a point where your writing is not only free of errors, but also — dare I say it — fun to read.

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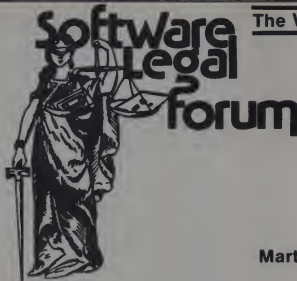
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"When I use a word," Humpty Dumpty said, "... it means just what I choose it to mean — neither more nor less."

Lewis Carroll

Through The Looking Glass

Martha R. Gore

What do the words "copyright" and "copyright infringement" mean to you?

If you have ever written or thought about modifying or developing software using your own or your employer's computer, these could be two of the most important words in your vocabulary. Although the words have been defined in legalese (Software Legal Forum, Jan '80), even lawyers do not always agree as to the application of the legal definitions. Recently, at a software legal seminar sponsored by a university computer center, an attorney opened the discussion by telling his audience, "Please don't quote me or think you can use what I am going to say in your own situation."

His point was that every particular problem has its own elements that must be considered when applying the new Copyright Law. The legal treatment must be tailored to the specific circumstance. And the name of the game is prevention of legal problems before they arise. Once into an after-the-fact controversy, there is going to be a lot of mental anguish and expense.

As the use of small computers becomes more common, the pressure for increased production of software multiplies. The result is that the technology is greatly exceeding the legal system's ability to handle its complexities. Eventually, the courts make the necessary decisions, but until that time, the creators of software have to depend upon lawyers who are still debating what constitutes reproduction limitations and copyright infringements.

The present copyright law equates software with literary work. A person can take a whole group of words and combine them, creating an original work. Where the rub comes in is that in

software, many of the programs have a good number of similarities.

According to some legal opinions, if the work has a spark of originality, it is copyrightable. The combination may be all old stuff, but it has been combined in a new way. Although other elements have plugged into it, it is still something unique. The assumption is that the basic material is out there in the universe, and since the creator packaged it and made the machine do something different, it is a new creation.

On the other hand, some lawyers may consider such a new combination, even though copyrightable, to be a derivation of a prior work and, thus, a copyright infringement. Their argument is that the law defines a derivative work as something which is based upon pre-existing work and includes such things as revisions, annotations, elaborations, modifications, etc.

Is there a way to determine at what point someone else's work has been copied and at what point the program becomes original? It is a very difficult threshold to define. Distinguishing the new from the old is where copyright infringement lawsuits come from.

For this reason, anyone involved with software writing or modification needs a good copyright attorney to lead him or her through the maze. Right from the beginning, it is important to level with your attorney. The attorney's job is to determine whether the work has enough originality to be copyrightable and he or she must know what elements were knowingly taken from the work of others. There must be enough knowledge about the differences and enough expertise using it to show that the work is original. The first line of defense in a lawsuit is documentation availability to

help the lawyer prove his case.

If the lawyer decides that it is copyrightable, there should be no delay registering the copyright claim. The Library of Congress Copyright Office can supply information and the proper forms.

Copyright applications should be keyed to the first time the program ran and worked. The registration is a record of the claim, notice to the world that the claimant created the work and controls the rights to it. The whole purpose of the copyright law is to protect and support the originator's right to earn something from his creative activity.

Under the new law, as soon as the new program is put in some permanent medium, it is automatically copyrighted. The copyright then provides the originator with some legally protectable right which can then be offered to the marketplace.

A lawyer should be the one to either draw up a contract or provide insight if the contract is submitted by the buyer. One attorney should never represent both parties to a contract.

The deal can include the sale of all rights, and the seller can take his money and run. That gives the buyer complete control of the product and its use. Or the creator can market copies of the work himself, either selling or leasing the package.

Actually, in the real world, the fact that the work has been copyrighted is just the beginning of the battle. An original work can quickly become common usage if there is no effort made to protect it. There is a lot of stuff floating around now that was once exclusively owed, but the originator lost control of it. If the creator looks the other way for a long enough time, allowing the material to be used with-

out permission, the rights to it can be lost.

Another pitfall is that on-lookers or minor participants in a project will copyright the work. It is a good idea to have some kind of an agreement with anyone involved at any stage of development.

The plain fact of the matter is that software is very difficult to protect, just because it is in machines and accessible to anyone who sees the output. There are many folks who can look at the output, figure out how to make a few changes and call it something new. It is not unusual for someone to modify a program which has been developed for one machine so that it will run on another. New companies have been started by someone working on a university computer on a weekend, figuring out what was in the computer, modifying it and then going into business for himself.

The course of events can really become complicated when an employee works up a project on his employer's computer or time, or writes a program at home, but gives it a trial run at work. This can be especially sticky if an employee has been hired as a programmer or to make the company's computer do things better. If one is paid to do any kind of creative work, there may be an obligation to share income from outside activity with employers.

The attitude of many employers is that employees are paid to be creative and that outside creativity is a result of their employment. Their thinking is that machines paid for with company money are being used to educate employees, and anything being produced because of that knowledge should be shared with them.

It would appear that unless there is a specific agreement which spells out ownership rights, even if the material is produced elsewhere, employees should get some good advice before tinkering around.

Right now, university computer centers are taking a lot of interest in work that is being created at their expense. Now that there is growing pressure for professors to computerize classroom work, such as problem solving, etc., someone is going to make a lot of money putting this information into machines.

When lessons are composed by the teacher or professor, become a program through the expertise of someone who knows how to make the computer work, and the program is developed in the universities' computer centers, there are going to be some interesting legal questions to resolve regarding legal ownership of the finished product and the relative rights

of those who played a part.

Both business and academia are beginning to assert their rights, insisting that their hard cash is involved in any work which comes out of their shops. If something is invented or created within their facilities, they are demanding part of the action.

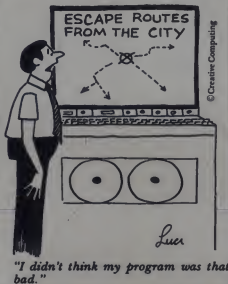
An employee or student needs to know exactly what his or her responsibilities and obligations are to the party who furnishes the machines and materials.

If an employee-employer contract has already been signed, an attorney should read the fine print. There may be some surprises in store for the employee.

When considering employment, discuss any restrictions in order to avoid misunderstandings at a later date. Employers have been known to claim that knowledge gained on the job provided the impetus for personal software creativity or that new programs were created from elements of software that had been paid for by the company.

Often, the employing business institution or university has an attorney who can spell out restrictions on outside activity that are contained in the employment contract. However, an independent lawyer should be consulted if the employee or student has any questions about past or future work in order to avoid a conflict of interests.

The final determination as to the limitations of the copyright law will eventually emerge through court tests. Until that time, anyone involved with small computers and software, in any capacity, will have to depend upon individual attorney's interpretations and hope that he is right. □



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Intelligent Computer Games



David Levy

Correspondence is welcome. Letters with interesting questions and ideas will be used in the column along with a response. No personal replies can be made. Send to: David Levy, 104 Hamilton Terrace, London NW8 9UP, England

Bluffing And Psychology

It may sound strange to suggest that a deterministic animal such as a computer is capable of performing in a psychologically motivated manner, but those of us who believe that Artificial Intelligence is here to stay will argue that if you can do it, so can a computer (or small computer) program. This month's article is devoted to a discussion of the ways in which the 'thought' processes of a game playing program may be modified to perform in a manner that takes advantage of its opponent's psychological makeup.

Michie's Work

I have referred, in an earlier article, to Donald Michie's paper *A Theory of Evaluative Comments in Chess*. In this paper, Michie makes use of the fact that in a two-person game tree, it is not absolutely accurate to assume that the opponent will always make the best move at his disposal. Players are liable to make mistakes, and Michie's paper is centered around this fallibility. A strong player, in chess or any other game, will often encounter a situation in which the best move, based purely on deterministic considerations, is not the move most likely to maximize a player's chance of success. Let us consider a concrete example which I witnessed in an international chess tournament.

The position was something like this. Both players had been very short of time and had been making their moves at great speed. White is clearly losing, and had his opponent not been in time trouble he



would probably have resigned. But White tried one last chance. He played 1 Qa2-h2, giving check. The first thing that I should mention is that these two players were using a very large chess board and set. This had a bearing on White's plan, because he hoped that his opponent's gaze would be attracted to the black king, and that he would not notice the fact that the queen, way over on the other side of the board, was attacked by and attacking the white queen. Had black not noticed this fact, he would have moved his king and allowed White to capture his queen on the next move, whereupon White would have won. In fact Black did notice, and knowing his opponent rather well he had been half expecting this surprising queen check on h2, so, without a moment's pause, Black captured the White queen and our hero resigned. He had not lost anything by trying the ludicrous queen check, because his position was totally lost. He was merely hoping for a one in ten thousand chance.

Moving into the realm of tree searching, we shall now consider a similar example expressed in terms more familiar to the reader.

A player has two moves at his disposal, M_1 and M_2 . He is good enough to see that if he makes move M_1 the result of the game will inevitably be a draw. So the

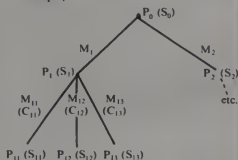
expected result from making move M_1 is 0.5.

If he makes move M_2 the player sees that his opponent can defeat him, but only by finding a 15-ply deep continuation that is very difficult to spot. Otherwise, our player will win. He assesses the probability of his opponent finding this 15-ply win as being 0.1. The expected result from making move M_2 is therefore

$$(0.1 \times 0) + (0.9 \times 1) = 0.9$$

So even though, with correct play, M_1 is theoretically better than M_2 , our player will be better off making move M_2 .

Michie analyzes his tree in the following manner (I am using a simpler example):



Let us assume that we are growing a 2-ply tree, with terminal positions P_{11} , P_{12} and P_{13} ... etc., and terminal scores S_{11} , S_{12} and S_{13} ... etc., respectively. The program considers its possible move from the root position P_0 to P_1 , and notes that its opponent will then have the choice of making the moves M_{11} , M_{12} and M_{13} . Let us say that the program estimates the chance (or probability) of its opponent making move M_{11} to be C_{11} , the chance of its opponent choosing M_{12} to be C_{12} , and the chance of move M_{13} to be C_{13} . Then instead of assigning to position P_1 a score of S_1 , which is the minimum of S_{11} , S_{12} and S_{13} , the program assigns a value of

$$S_1 = (C_{11} \times S_{11}) + (C_{12} \times S_{12}) + (C_{13} \times S_{13})$$

and it is this score which is backed-up to P_0 (remember that the program, which

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Games, cont'd...

"thinks" at even depths, will always make the move with the highest expected score.

This part of Michie's method will work perfectly well for a normal minimax search, but in an alpha-beta search there is the problem that a large number of branches are pruned from the tree so an accurate, backed-up expected score is impossible to achieve. Possibly one could attempt an approximation for alpha-beta searching, but this could lead to extremely unreliable results if the pruning was effective and only a small number of branches examined before a cutoff move found at each (or many) nodes.

Discernability

Consider the plight of an imperfect player trying to decide which move to make in a game. There are three aspects of his situation that may affect his decision:

1. How strong a player is he? If he is very strong then he will nearly always make the best move. If he is very weak then he will often make the wrong one.

2. How obvious is the right move? If you and I are playing chess, and you capture my queen, it is fairly obvious, even to a weak player, that I must recapture your queen unless there is something special about the position. In a "quiet" position, in which neither side has any direct threats or simple captures, the correct move is far more difficult to perceive, because there may be a number of moves of roughly equal merit.

3. What extraneous (psychological?) factors affect the decision? If the correct move is a queen move and our player suffers from some peculiar sexual fantasy that precludes certain types of queen move, it is likely that he will fail to play the correct move.

These three factors combine to affect discernability — the ease of finding the right move. Michie has devised the following model for discernability in chess:

$$d = (M + 1) \frac{3(r+3)}{(r+c)}$$

where M is the player's rating in kilopoints on the international rating scale. (Bobby Fischer's M is roughly 2.8, David Levy's is 2.3, the average of all those who can play chess is 0.8.)

r is the number of ply that a terminal evaluation has been backed up.
c is a small number chosen to avoid the expression becoming infinite for r=0.

Michie's formula is derived from the fact that discernability is directly related to playing strength and inversely related to the number of plausible or possible moves ("plausible" being a function of playing strength). He further argues that the probability of a player whose discernability is d, making a move leading to an

expected score of u, will be given by $p \propto d^u$.

Using these expressions, it would be possible for a strong chess program to plan its play according to the rating of its opponent; taking greater risks against weaker opponents and being cautious against strong ones. At the start of a game it would need to be told its opponent's rating, or if it were extremely sophisticated it could estimate its opponent's strength by performing regression analysis on the moves he made as the game progressed, thereby enabling it to update its estimate of his rating on a move-by-move basis.

How to Psych Your Opponent

A good player will sometimes use psychology to help him win games. He will make moves that are probably not the very best, but which will be difficult or unpleasant for his particular opponent to meet. In chess, for example, a player who is equally at home in quiet, clear positions or in sharp, tactical skirmishes, will himself choose quiet play against a tactical genius but sharp moves against a quiet player. How can this be achieved by a computer program, particularly when employing an alpha-beta search?

Let us assume that the program examines every 1-ply position with a search that analyzes only captures and checks. If the program counts the number of moves examined in each of these capture searches, it can compute a measure for the complexity or "turbulence" of the 1-ply position. This measure might be some fraction of the logarithm of the number of positions in the capture search. The program can then add this turbulence score to the 1-ply position so that when conducting the full tree-search the program assigns greater scores to the moves that lead to more complex positions, which in turn will encourage the program to head for this type of position. If the program's opponent dislikes "quiet" positions, the program should subtract the turbulence measure, thereby encouraging it to play into quiet positions. It would even be possible for the program to psycho-analyze its opponent during a game, by measuring his tendency to head for quiet or complex situations. It could then act accordingly, avoiding positions that suited its opponent's style of play, and aiming for positions that would be less pleasant for the opponent to face.

Bluffing

Anyone who has played cards a lot will know that it is sometimes necessary to bluff. In certain games bluffing is quite rare, in others it is fairly common, in some it is frequently essential. Here we shall discuss two different types of bluffing situation, to show how they might be handled in a computer program.

Most people have played some version or other of rummy. This is a card game in which the object is to make melds, groups of three or more cards of the same denomination (3 sixes; 4 queens, etc.) or three or more cards in succession of the same suit (ace, king, queen of hearts; 5 6 7 8 of spades; etc.). The players take it in turns to pick up a card from the deck (an unseen card) or the discard pile (a visible card) and then discard onto the visible pile. When one of them collects enough melds he wins the hand.

Here is an example of one player's hand in a game of PCW Rummy, in which each player has twelve cards and tries to make three or more melds, or two melds including nine or more cards.

SPADES: 5679
HEARTS: 8K
DIAMONDS: 8K
CLUBS: 23450

Our player has already picked up a card and must now decide how to discard. How will he make his decision?

Clearly some sort of evaluation function is needed. The player can then consider each of the 13 possible discards in turn, evaluate his remaining cards and choose the discard that leaves him with the best hand. But is this enough? The discard itself may help the opponent, either by enabling the opponent to make a meld of his own, or by giving him information about the cards in the hand. It is this second point that is the key to a bluff.

Any good evaluation function will quickly determine that the queen of clubs is the least useful card to keep in the hand. Any other club discard will break up a meld of four, while a spade discard ruins the chance for a meld of five and the discard of an 8 or a king would split up a pair. So the obvious discard is the queen, but is it always the best card to play? It runs the risk that the opponent may have a pair of queens and need this queen for a meld, and it indicates to the opponent, quite truthfully, that a queen is of no use to this hand, so if the opponent is holding a lone queen he may well discard it in the near future, which will not help our player.

Now let us consider the discard of an 8. This has a lesser chance of allowing the opponent to make a meld of eight, and it makes it more likely that the opponent will himself discard the eight of spades, which will give our player a five card run in spades for a winning hand. Thus, the discard of an eight, while perhaps not being the very best play, will sometimes be worthwhile. It is always a good idea to vary one's style of play, and the value of "advertising" is often seen in an "obvious" but incorrect discard from the opponent. Thus, our evaluation function should not only include features to count the melds and part melds, and the safety of the discard, but also a feature to estimate the value of a particular advertisement.

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Games, Cont'd...

The game which is perhaps best known for bluffing is poker. I have played poker for many years and I consider it to be one of the most skillful, if not the most skillful, card game. Without bluff, poker would have no interest of merit, so a good poker playing program must know at least some of the elements of bluffing play. Two of these elements are relatively easy to measure, if you happen to be an expert player or a computer program. We can understand them best by looking at an actual example of a poker hand (do not worry if you do not understand how to play the game — my example can be followed by anyone).

JOE: 7 6 6 J Q (the suits are unimportant)

FRED: 7 5 A J 9 (all diamonds)

This is the final stage of a hand of five card stud poker. In this game each player is dealt one card face down and one face up (left to right in the diagram), and then another card, and another, and another. After each of the four up cards there is a round of betting. We shall assume that the pot currently stands at 100 dollars and that a player may bet anything up to the current size of the pot. It is Fred's turn to bet and his hidden card (the 7) is the king of clubs. Let us first consider the situation from each side.

If Joe's hidden card is a 6, J or Q, then he will win the hand for certain, unless Fred has a hidden diamond, giving him five diamonds (known as a flush). If Fred has a flush then he has the winning hand, irrespective of what Joe has as his hidden card. Joe does not know what has been keeping Fred in the game. If Fred's hidden card is an ace, then he would have had a pair of aces (quite good, but not as good as three sixes) since the second round of betting, so it would have been perfectly reasonable for him to stay in the hand. If it was a diamond then he would also have had some reason for playing the hand rather than dropping out at an early stage. What should Fred do? He has two options, he may "check," putting in no money and waiting to see what Joe will do, or he can bet up to \$100.

If Fred checks then he is almost sure to lose the pot. Joe would be unlikely to bet against a possible flush, and so Joe would also check and the hand would take the money — the highest hand being Joe's pair of sixes (the third six would not even be needed). If Fred bets a lot of money, perhaps the maximum of \$100, he may lose this money but on the other hand he places Joe in a difficult situation. What will Joe think? "Has he got another diamond?" Joe does a quick count of the cards he has seen, realizes that the odds are only 34 to 9 against Fred having a flush, and then he must make up his mind — "Is he bluffing or isn't he?"

How can a computer Fred decide when to bluff? It must first determine whether a situation lends itself to a bluff under any circumstances, and then, if it does so, whether these circumstances are realistically reflected in the particular instance. Here it is clear that the notion of a bluff does have some merit, because there is a finite possibility that Fred may hold the winning hand (unless you know that he has the king of clubs) irrespective of what Joe is holding. So the first thing to determine is the probability that Fred's hidden card will be enough to win him the pot. If this probability is over a certain threshold, Fred may consider a bluff. Whether or not he makes the bluff will depend largely on his estimate of Joe's discernability, which in this case means how often is Joe likely to call a bet of \$100 in a situation of this type. The program would need to monitor Joe's play, and depending on how often he called a bet coming from a hand with four cards showing of the same suit, the program would decide what to do. It would base part of its decision on Joe's discernability, as estimated from his previous play, and part on the knowledge that against a player of very high or very low discernability it is inadvisable to bluff more than rarely (a really good player will not be fooled so easily, a bad one will often not notice what you are trying to pretend!). If the program decides that in this type of situation it should try a bluff against Joe in roughly 20% of hands, it will generate a random number on the range 0-1, and if it lies below 0.2 then it will try a bluff.

To summarize, a bluff should only be made when there is more than a slender chance of it being delivered (odds of 34 to 9 against are quite acceptable — I would suggest 5 to 1 as being a suitable threshold); but it should not be made against a player with very low or very high discernability, and not more often than once in n hands, where n is a function of discernability.

Task for the Month

Those of you who completed the earlier tasks involving noughts and crosses programs, will find this month's exercise somewhat trivial, but nonetheless instructive.

Write a noughts and crosses program to play a perfect game by means of exhaustive tree search. Test this version of the program against a program that moves at random, playing a number of games and noting the percentage score.

Modify the program to use Michie's method of backing up expected values, based on the assumption that the opponent will be moving at random, and play this version of the program against the random version. The results should indicate that slightly imperfect play can result in a better score than perfect play! □

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The machine plays chess?

Alex Bell

Alex Bell, a professional in the computer world and an amateur at chess, traces the development of the attempts to play the game mechanically from the late 18th century when Von Kempelen built the Turk, an automaton in which a man was hidden, until the present time and shows that machines hardly deserve the scorn heaped upon them by most chess players.

... The author tells his story with humour and relish and, by keeping technical jargon to the minimum, makes the book the most readable one I have so far seen on the subject. It should be of interest both to computer men who like chess and to players with a taste for mathematics.

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Disk Drives

Problems of I/O Errors occurring during read/write operations have become more frequent. Experiences of others and my own involvement indicates cost-reduced production may be the problem. With the cost-reduced drives, you have to be very careful to get the diskette centered over the clamp. If the problem seems unduly severe, you may need to have the speed calibrated and the drive mechanism re-aligned. The drive used by Apple is a stripped-down Shugart SA-400. The repair manual for the SA-400 will provide the necessary data for the required adjustments. Realignment is not easy to do. Special diskettes and an oscilloscope are required to make the adjustments.

Head alignment can be part of the problem so make sure it's done by someone who understands the nature of these critical adjustments. Motor speed is easier to do. There is a tach disk attached to the spindle pulley. One bar-track is for 60Hz and one is for 50Hz. By shining a lamp on the tach disk, you can adjust the speed control pot (mounted on the small PCB at the back of the drive) for zero movement of the bars. Make sure this is done with a diskette in the drive. The torque load of the diskette will make a significant difference in motor speed. There is a procedure for making this adjustment with a frequency counter too. And, be sure to check the head load arm and the head load pad for proper operation and wear.

The overall quality of current disk drives is the more likely problem. I have had to insert a diskette several times, on the newer units, to get a proper read. This condition will cause a problem with a write to the diskette too. If the diskette was not centered, the system would not be able to read/write the catalog track correctly. It would be possible to clobber things if you tried to write to an off-center track. One way to check centering is to always read

from the disk first; do a CATALOG, for instance. Also, if you are having problems with reads/writes and getting lots of I/O errors, write to the Manager of Quality Control at Apple. The address is on various manuals you have. Describe the specifics of the problem. Especially describe the details of the conditions when it happens, frequency and so on. Don't try to vent your frustrations, though. You'll get a lot more help if you're rational.

Apple III

Apple's newest entry into integrated personal computer systems has arrived. The systems will be available to dealers by the time you read this, and to customers during the following couple of months. Most all the things Apple II owners pay extra for, are now included as standard. Here's a summary of the functions and features:

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- Video interfaces.
- A new Sophisticated Operating System (SOS).
- Emulation mode which runs Apple II software.

And, all this will be available to you for a cost of about \$4300.00 for the minimum system.

Hardware

Apple III will use a 6502A running at 2 MHz. Included with the 6502 instruc-

tion superset, are a relocatable base register page, a relocatable stack and a 128K byte address range (96K of memory is standard). Peripherals will function with full interrupt capability. A timer derived from the system clock can be programmed for durations up to 18 minutes. The power supply has been beefed-up and will allow 2 disk drives to be operated at the same time. A calendar/clock, integrated into the main circuit board, can be operated over 3 years on its battery. The new audio circuits use a 6 bit D-to-A converter to generate high quality sound to either the built-in speaker or through an external jack.

One drive is built into the Apple III with provisions to support up to 3 additional drives. The new drives will use a 16 sector system providing about 143K bytes of storage — about a 40% increase over DOS 3.2 (the new system is called DOS 3.3). An RS-232 communications interface port is built-in, too. Reference is made to its use with letter-quality printers. There is also a port for the Silentype thermal printer and provisions for an optional parallel printer card are provided too. Another connector on the back panel provides access to the 4 A/D inputs. The traditional joystick will be connected here. Since all connectors are now mounted on the rear panel, there is no longer any need to "lift the cover" to get inside.

The keyboard is detached and greatly expanded. There are 74 keys including a 13-key numeric pad. An alpha-lock key and a shift key are provided. RESET is behind the keyboard. Four cursor control keys are provided for easy cursor movement. And, the keyboard offers sculptured keys with textured surfaces. The keyboard has features obviously intended for such applications as word processing. A variety of video outputs are provided from black and white to high resolution in many colors. All video signals and voltages are available through a DB15 connector. Video display modes include 560 x 192 dot

For your Apple II....

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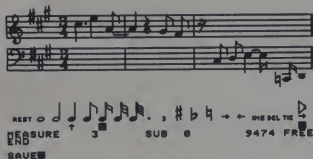
ALF Music Synthesizer

The ALF music synthesizer has three voices on each board which are easily programmed using the Entry program provided. The envelope shape of each voice (or even each note) may be controlled individually thus allowing the synthesis of practically any instrument such as a violin, trumpet, piano, harp or bells. Instrumentation and dynamics may be varied while a song is playing by changing the attack, sustain, release, decay, gap and volume of the notes.

Playback of music is accompanied by a spectacular color display showing a stylized "piano keyboard" for each part with the colors of the notes varying in proportion to their loudness and waveform.

Ease of Music Entry

Music is entered directly using the high-resolution graphics entry program. One paddle is used to select menu items such as note duration, accidentals, dotted notes, triplets, tied notes, etc. while the other paddle moves a note cursor up and down the staff over a 4-octave range. The transpose command extends the range to eight octaves. This form of music entry is considerably faster and more accurate than cryptic note code schemes (like QF53) found with other synthesizers.



MUSIC ENTRY SCREEN

The board plugs into any Apple II or Apple II Plus. Two or three boards are required for stereo. Requires a 16K Apple system and external amplifier and speakers.

*ALF Apple Music II (AM-II) Synthesizer

The AM-II is a new, low cost digital music synthesizer for the Apple II computer. It features 9 voices on a single music card.

The software ENTRY and PLAY systems are the same as on the ALF Apple Music Synthesizer (AMS). The two principle differences between the new AM-II and the original Apple Music Synthesizer are in pitch range, volume range, and parts per board.

The new AM-II has a range of six octaves. The dynamic range is 28 db. (The original AMS has a range of 8 octaves a dynamic range of 78 db and 3 parts per board.)



GRAPHICS

VersaWriter

VersaWriter is a drawing tablet for the creation of full-color, high resolution graphic images on the Apple. Images may be drawn freehand or traced from existing images (cartoons, photos, drawings, etc.) using the simple pivoted two-arm pantograph with magnifying crosshairs.

After an image is drawn, it may be rotated, shrunk, or enlarged. It may be moved across the screen and alternated with other images thus providing high-resolution animation. The image may be colored with varied colors.



Animate other Programs

Graphical images made with VersaWriter and stored on tape or disk may be called from other programs or even imbedded in them. With VersaWriter, you don't have to worry about assembly code, counting pixels or other cumbersome hi-res graphics entry and retrieval techniques.

VersaWriter graphics can be used in all types of programs—games, statistics, engineering, artistic, and educational. Your only limit is your own imagination.

Two Disks of Software

Disk 1 contains the basic plotting, scaling, movement, rotation, color, transfer and recall software. This disk also includes routines which create "shape tables" from your figures to be used in other programs. Disk 2 contains applications software. One program adds five sizes of upper and lower case text to drawings, another adds standard electronic and digital symbols, while a third calculates distances and areas.

VersaWriter requires a 32 or 48K disk system, Applesoft in ROM or an Apple II Plus.

VersaWriter	\$252.00
ALF Music Synthesizer	\$268.00
AM-II Synthesizer	\$198.00

Prices postpaid in USA. NJ residents add 5% sales tax.

To order VersaWriter or the ALF Synthesizer, send your name and address along with a check or chargecard number and expiration date. Visa, MasterCard and American Express are welcome. Units are in stock and orders will be shipped as soon as your check clears or your credit is verified.

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CIRCLE 207 ON READER SERVICE CARD

Apple, cont'd...

black and white, 280 x 192 dot hi-res color, 140 x 192 dot hi-res color, 80 column black and white text, 40 column color on color and all Apple II models. Monitors will be the 12 inch Sanyo, 12 inch Hitachi and eventually Apple's custom 12 inch B&W monitor. An RF modulator can be used for connection to a television set.

Software

Apple's new Sophisticated Operating System is abbreviated SOS and pronounced SAUCE (I know!). The SOS is said to effectively manage these user and system functions:

- Running applications
- Accessing peripherals
- Accessing data
- Developing applications
- Developing languages
- Memory management
- Device management
- CPU scheduling
- File management
- Interrupt control

Features and Benefits of SOS

Apple's new Operating System maximizes system efficiency by controlling resource use and allocation. Software development is easier and program size and complexity is reduced through a powerful system interface for languages and applications. The flexible file system provides efficient system data storage and access, allowing applications to share data and faster access to information. Powerful new utilities provide complete application access to all of the advanced capabilities. To meet your system needs, SOS can be custom configured, even by the inexperienced operator, with the easy-to-use system configuration program. And, the system is designed to be easily expanded allowing you to further enhance the power and flexibility.

Visicalc III

An enhanced version of Visicalc, as sold for the Apple II, will be available exclusively from Apple for the Apple III. The package will take advantage of the 80 column screen, cursor controls and SOS file system. Incidentally, I saw a demonstration of Visicalc II recently. The capabilities of this system are super. If you're doing any financial planning or modeling, you can benefit from Visicalc. I'm getting a copy for my own use so I'll review it in a future column.

Additional Software

There will be a new Business Basic. It is intended to be the Apple standard and will feature formatting capabilities with PRINT USING, longer names for vari-

ables, fast disk access, nineteen-digit integer arithmetic and will support the IF-THEN-ELSE statements for enhanced program structure. (Sounds a lot like Microsoft Basic version 5.0.)

Pascal will be available too. The software will be upgraded for use with SOS. Pascal will feature improved performance and will be compatible with the Pascal file system on Apple II. Fortran, compatible with the Pascal file system, run-time package and program development tools will also be available. This will be an ANSI standard Fortran for compatibility with vast subroutine libraries for math, science, engineering and statistics. A Mail List Manager package will be available too. The program features:

- High speed entry of names, addresses and phone numbers.
- 970 names per diskette.
- Sorting a diskette in 75 seconds by either name or zip code.
- Merge capabilities allowing files to span diskettes.
- Flexible formatting and printing capability.
- Complete menu-driven user interface.

Apple III Packages

The Apple III will be sold as various application packages. These are intended to provide the nucleus of various user solution packages. With a variety of application software and hardware, the package becomes customized for individual customers. The three package groups identified at this time are: Information analyst, Word processor and Software development.

The information analyst includes:

- 96K Apple III
- SOS
- Apple Business Basic
- Visicalc III
- Mail List Manager
- 12 inch B&W monitor

The word processing system includes:

- 96K Apple III
- SOS
- Apple Business Basic
- Word Painter
- Training course to use Word Painter
- 12 inch B&W monitor
- Either a Silenttype or letter quality printer

And, the software development system includes:

- 96K Apple III
- SOS
- Apple Business Basic
- Fortran
- Apple Pascal
- 12 inch B&W monitor
- Expansion drive

One final note. The system is packaged in a metal cabinet. There will be no more problems with radiation interference

from the high-speed microprocessor circuits.

Super-Text Word Processor

This column was developed and written with my new word processor. The package is great. I have been looking for a word processor that would work well with Apple's limited screen capacity. The processor allows free-form entry of text. This means that you don't have to concern yourself with the 40 column limit. Output formatting takes care of putting the text wherever you want it to go. Upper and lower case are easily controlled, and if you have the Paymar Lower Case Adapter, you can see the text on the screen the same as it will be printed. Here's a summary of some of the features:

- Full screen cursor editing.
- Scrolling forward or reverse.
- Line scrolling both directions.
- Paragraph scrolling both directions.
- Add text (also begins text)
- Change text for deleting or correcting.
- Math mode
- Print mode
- Auto link—one program to another.
- Options program.
- Diabolo type printer controls.
- Formatting, tabbing, centering, justifying, etc., etc.

And much more. I've just starting using the processor so I'm not aware of all the features. I know I like what I have been able to do so far. The ease of use is really impressive. I'll provide the details later. The package is about \$100.00 and it's called Super-Text, The Professional Word Processor. It's distributed by Muse Software and should be available at your local computer store.

Readers Input

Here's a neat little program from Randi Rost. The program is called "Puffer" and it moves the characters across the screen in billboard fashion. Randi says this Integer Basic program appears to "puff" a message across the screen. You must put as many characters or spaces in AS as it is dimensioned for. In this example, 40. The program is an endless loop as written. Line 80 could be an escape by testing for a processed key. You can change the delay time by changing line 40. See the listing and sample run of the program.

Rosa Pascal Sez

For those of you who are using Pascal, included are a couple of short utility routines sent in by Ron DeGroat. These routines will let you do a couple of things in Pascal that are in Basic but not in Pascal. Following is the text of Ron's letter essentially as it was written:

**Mountain Hardware makes
more peripherals for
the Apple Computer
than Anybody.**

and ...
a place to put them



DISCUSSION

MusicSystem

 $\Delta/\Sigma + \Sigma/\Delta$

Apple, cont'd...

The assembly language procedures shown in Listing #1 allow the user to display text in FLASHing, INVERSE and NORMAL modes with Apple Pascal in much the same way that Applesoft Basic does.

These procedures may be directly linked to the Pascal host (see example program in Listing #2) or stored in a UNIT in the SYSTEM.LIBRARY along with other useful utilities (such as PEEK and POKE routines, q.v., "The Multi-Lingual Apple" column in the Feb. and Mar./Apr. 1980 issues of Call A.P.P.L.E.). For more information about the control codes (\$C083 and \$C088) see Appendix D of the Apple Language System Installation and Operating Manual.

It should also be noted that since the Apple uses the top two bits of the ASCII character code to select INVERSE and FLASHing modes, lower-case letters cannot be displayed in these modes.

LISTING #1: INVERSE, NORMAL & FLASH PROCEDURES

```

.PROC INVERSE
LDA $C083 ;SELECT 2ND 4K BANK
LDA $C083 ;AND WRITE-ENABLE
LDA #00
STA $D8ED ;CLEAR BITS 6 & 7
LDA $C088 ;SELECT 1ST BANK & WRITE-
RTS ;PROTECT, THEN RETURN
-----
.PROC NORMAL
LDA $C083
LDA $C083
LDA #00
LDA $D8ED ;SET BIT 7 FOR NORMAL MODE
LDA $C088
RTS
-----
.PROC FLASH
LDA $C083
LDA $C083
LDA #00
STA $D8ED ;SET BIT 6 FOR FLASH MODE
LDA $C088
RTS

```

LISTING #2: EXAMPLE PASCAL PROGRAM

PROGRAM TESTSTUFF;

```

PROCEDURE INVERSE; EXTERNAL;
PROCEDURE NORMAL; EXTERNAL;
PROCEDURE FLASH; EXTERNAL;

```

BEGIN

```

GOTOXY(1,0);
WRITE ('THIS SHOULD BE ');
FLASH;
WRITELN ('FLASHING');
NORMAL;
WRITELN;
WRITE ('AND THIS SHOULD BE ');
INVERSE;
WRITE ('INVERSE');
NORMAL;
END.

```

Note: For Pascal newcomers, constants in Apple Pascal assembly language must start with an integer, 0 to 9. If the first digit is greater than 9, i.e., A, B, C, D, E or F, the number must be prefaced with a 0, as shown in Listing #1.)

Listing and sample RUN of "Putt" program.

>LIST

```

10 DIM A$(40): DIM B$(40)
20 A$="ANY 40 CHARACTER STRING AT ALL IN HERE.."
30 CALL -936: UTAB 10: PRINT A$
40 FOR U=1 TO 200: NEXT U
50 B$=A$(2,40)
60 B$(40)=A$(1,1)
70 A$=B$
80 GOTO 30
90 END

```

>RUN

```

ANY 40 CHARACTER STRING AT ALL IN HERE..
NY 40 CHARACTER STRING AT ALL IN HERE..A
Y 40 CHARACTER STRING AT ALL IN HERE..AN
40 CHARACTER STRING AT ALL IN HERE..ANY
40 CHARACTER STRING AT ALL IN HERE..ANY
O CHARACTER STRING AT ALL IN HERE..ANY 4
CHARACTER STRING AT ALL IN HERE..ANY 40
CHARACTER STRING AT ALL IN HERE..ANY 40
STOPPED AT 40
>

```

How the Modification Works:

Listing #3 shows a section of code stored on disc in Block No. 4 of SYSTEM.APPLE file. When loaded into memory, this code resides in the second 4K bank of RAM, which must be selected and write-enabled with the control codes described above before any change can be made.

LISTING #3: CODE EXCERPTS FROM SYSTEM.APPLE

```

D8E8: E9 28 SBC $28 ;CONVERT TO U.C.
D8EA: 29 3F AND $3F ;CHAR. MASK
D8EC: 9 08 ORA $08 ;MODE SELECT:
; 40 = FLASH
; 00 = INVERSE

```

The character mask clears the top 2 bits of the character, and the next instruction sets the bit necessary for the mode selected. Thus, by changing the contents of memory location D8ED, as indicated, we can select either FLASHing, INVERSE or NORMAL modes. □



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Outpost: Atari



Apples, Oranges, TRS-80s and the Atari

The Atari, unlike the Pet, TRS-80, Apple, and Heathkit computers, does not have a Basic by Microsoft. This is a mixed blessing, or mixed curse, as you choose to look at it. The graphics and music handling abilities of Atari Basic are a true joy, while the string handling is difficult. Since most programs published in computer magazines like this one are not in Atari Basic, an understanding of the differences is helpful if you wish to convert the programs for your own use. Here are some of the differences between the Atari and the TRS-80, the most common Microsoft Basic computer.

String Handling

In Atari Basic DIM A\$(50) means reserve 50 bytes of memory for a single variable named A\$. You cannot store a single letter in a string variable unless you dimension it first. One advantage of this is that you can control the length of a string just by the DIM statement, something you cannot do in Microsoft Basic. For example, if you put:

```
10 DIM ANSWER$(1)
```

Then the computer will store only the first letter in the string even if it receives a whole sentence as a reply. This makes it easy to test an answer:

```
20 PRINT "ANSWER?": INPUT  
ANSWER$: IF ANSWER$="N"  
THEN 50
```

In the TRS-80, memory for all string variables is reserved by a single CLEAR statement, with a default value of 50 bytes reserved automatically even without a CLEAR statement. In the TRS-80, DIM A\$(50) means create an array of 51 string variables from A\$(0) through A\$(50).

In the TRS-80, the maximum length of a string ranges from 241 to 256 bytes.

George Blank

depending on circumstances. The Atari is limited only by memory available. This means that the Atari can make up for the lack of string arrays through a process of storing substrings in a very long string. One advantage of the Atari is that string sorting is potentially faster, as the TRS-80 has to pause and reorganize its string space.

Related to the string length is the restriction of a TRS-80 program line to 241 to 255 characters, while the Atari observes a different approach and limits you to 120 characters. Since some TRS-80 programmers like to put a whole subroutine in a single line, you would have to do a bit of reshuffling to translate their programs to an Atari. The lack of an ELSE command (see below) further restricts this approach in the Atari.

Sound

Neither the Atari nor the TRS-80 have a built-in speaker, as does the Apple II. The Atari sends sound effects through a television set speaker. If you are using a monitor that does not have a speaker, you do not have sound. Common practice with the TRS-80 is to connect an amplifier to the cassette output port.

The real difference in sound is that the Atari has a built-in sound capability allowing four completely separate voices at the same time with over 20,000 sound options, including a wide range of musical notes for each voice, while TRS-80 Basic can only alternate voltages at the cassette output port with OUT statements or machine language subroutines. Harmony is very difficult with the TRS-80, but easy in the Atari.

Graphics

It is not really fair to compare TRS-80 graphics to the Atari, as the TRS-80 is strictly medium resolution black and white while the Atari has high resolution color. To fairly represent Microsoft Basic, the Apple should be included in the discussion. One advantage the TRS-80 does enjoy is easy mixing of text and graphics on the screen, which is more difficult with the Apple and the Atari. Also, the TRS-80 has a built-in video memory that does not require user memory, while the Apple and Atari require user memory and, in high resolution, lots of it.

The Atari has 16 different graphics modes, and some of the graphics in the Atari ROM cartridges, including the motion through space in Star Raiders and the ability of the basketball players to overlay each other in Basketball, promise more graphics power than any other popular home computer. Right now, a side-by-side comparison of Apple and Atari graphics seems a standoff because the Atari graphics are not yet documented and explained, but if this kind of graphics ability becomes accessible to the end user, the Atari will be the obvious choice.

A common problem in high resolution graphics is that it requires a lot of memory to store a detailed image. The normal sacrifice limits the number of colors available in hi-res so you need less memory to store color information. The Atari limits you to two colors in high resolution, while the Apple gives you four. However, the Atari allows you to choose your color and tint and even allows you to change the color of an image on the screen instantly by changing a color register that tells the computer what color to make the image. The Apple cannot match this ability.

My personal favorite among the graphics commands of the Atari is the DRAWTO statement, which draws a line

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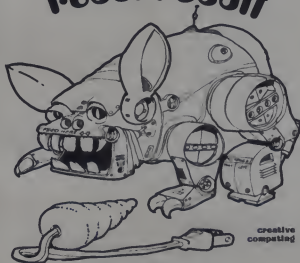
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Atari, cont'd...

from the last plotted point on the screen to any other point. More or less the same ability is present in the HLINE and VLINE commands in the Apple, though not as easily, nor as fast. In the TRS-80, it is necessary to write a subroutine to plot each point individually.

Text Handling

Text handling in the Atari is not as convenient as the Microsoft Basics. The TRS-80 is particularly good at text formatting and printing. Microsoft Basic allows you to include text in an INPUT statement, like this:

```
10 INPUT "What is your answer?";A$
Atari Basic requires a separate print statement:
```

```
10 PRINT "What is your answer?";
PRINT A$
```

The TRS-80 allows you to print directly at any point on the screen with PRINT @:

```
10 PRINT @ 572,"X MARKS THE SPOT"
```

The Atari requires you to position the cursor first, then print your message:

```
10 POSITION 8, 12:PRINT
"X MARKS THE SPOT"
```

Still another difference in text handling is the power of Microsoft Basic's PRINT USING command, allowing you to specify automatic print formatting with a fixed number of decimal points, floating dollar signs, fixed spacing, and other conveniences. These things have to be done by manipulating a string in Atari Basic.

I have begun to experiment with a whole new approach to text in the Atari that may be even more convenient. The Atari allows you to treat the keyboard, the video memory, and any other I/O device as a file. I suspect that once I get used to this, I will not really mind giving up PRINT USING.

There is a more definite limitation to the Atari in one of the key text handling areas, and that is in word processing. Forty columns per line is simply not as convenient as the longer lines on some other computers. The problems here are color and expense. It is much easier and cheaper to give text processing ability and sharp resolution to a computer which does not use a video modulator and does not use color. The Heathkit H-89 with 24 lines of 80 characters has much sharper letters than the Atari, yet the Atari limits you to a mere 38 to 40 characters. A lot of this problem could be overcome by designing the Atari to be used only with a high quality color monitor, but that would price it right out of the consumer market. My own solution is to use a different computer for word processing, including the writing of these columns.

Jumps and Subroutines

One of the areas in which Atari Basic enjoys an advantage over Microsoft Basic is in the ability to transfer control to another line through a variable. This has a lot of potential. Look at these comparisons:

Atari	TRS-80
10 GOSUB TIMEOUT	10 GOSUB 500
20 GOSUB BASKET	20 GOSUB 600
10 RATING = 880 + 4 * BASKET	10 RA = INT(BA/5)
20 GOTO RATING	20 ON RA GOTO 900, 920, 940

The above example illustrates another difference. In Atari Basic, a variable name may be up to 120 characters long, while the TRS-80 allows only 6 and tests only the first two. In the Atari, VALUE1 and VALUE2 are different variables. In the TRS-80, they are the same.

However, the advantage here is not altogether to the Atari. Radio Shack's Level II Basic allows an ELSE statement, while the Atari does not.

Atari	TRS-80
10 IF A=5 THEN 50	10 IF A=5 THEN 50
20 GOTO 100	ELSE 100

Input/Output

A major strength of Atari Basic over Microsoft Basic is in its generalized output routines. This is due to a feature known to mainframe programmers as device orientation. In Atari Basic, PRINT is a generalized output command. While the default device is the video screen, the computer doesn't really care whether it is printing to a line printer, a modem, a cassette tape, a disk file, or the screen. You can even use a variable to shift from one to another in your program, virtually at will. The general format of an OPEN statement hints at the power here:

```
10 OPEN (Reference number), (input/output/both), (extra printer code), (device type), (device number): (file name), (extension)
```

Disk file opening might look like this: `10 OPEN #2,8,0,"D3:LESSON.BAS"` Chapter 5 in the Atari reference manual gives a more detailed explanation.

What do all these differences mean? My answer is: "Not a whole lot!" Nearly anything that can be done in one Basic can be done in any other Basic, even a limited one like IBM Basic. It just takes extra effort, a little understanding of what the other program is trying to accomplish, and a little creative ingenuity.

Basketball

One of the first Atari games is still one of the best. In Atari Basketball, you use the joystick controller to move around the court, dribble, shoot, pass, block shots,

and steal the ball. The exceptional graphics and animation of this game make it a favorite demonstrator at computer stores, so many of you have already seen it.

How well does it play? The answer is that it is relatively easy to beat, but not easy to trounce. The computer is set up to play better when it is behind than it does when it is ahead, so it offers a good challenge until you get really good. However, once you can consistently trounce the computer, you've only begun the real fun!

The best feature of Basketball is that it allows one to four people to play at the same time. There are five options:

1. One player against the computer
2. Two players against the computer
3. Two players against one player and the computer
4. Two players against two players (no computer player)
5. One player against one player (no computer player).

After all, if you let your best friend play Star Raiders, it may be weeks before you get a chance at the computer again! With Basketball, you can both play at the same time. Teams of two are even more fun. This is one of the best computer games available for more than one player.

Basketball requires one joystick controller for each person playing and is available for \$39.95. □

051

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Selecting A Small Computer for Business, David Benveny, Computer Mart of NJ, 1 pm, Oct. 30 & 31.

Evaluating and Improving Your Computer's Performance, Philip Grossman, Raytheon Co., 1 pm, Oct. 30.

Law Office Systems Aspects of Word Processing, Bernard Stearns, 2 pm, Oct. 30.

Future Smart Machines: 2000 A.D. and Beyond, Dr. Earl Joseph, Sperry Univac, 2 pm, Oct. 30.

Computer Contracts - Facing the Issues, Alan C. Verbit, Verbit & Co., 3 pm, Oct. 30.

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Advantages of Distributed Processing & Multi-Processing, John Steffel, GI Corp., 4 pm, Oct. 31.

Investment Analysis of Stocks & Commodities on a Microcomputer, Fred Cohen, Shearson Loeb Rhodes, Inc., 4 pm, Oct. 30, 3 pm, Oct. 31.

BASIC Programming, Michael Matushew, Worcester State College, noon, Oct. 31.

Videospines: Full-Color, Low-Cost, Hard-Copy Computer Graphics, Warren Sullivan, Image Resources Corp., 1 pm, Oct. 31.

Business Applications Software Development Via Data Base Management, Dr. Andrew Whinston, Micro Data Base Systems, 2 pm, Oct. 31.

Application of PASCAL to Small Systems for Business, Panel, Stan Velt, Associated Computer Ind., Moderator, 3 pm, Oct. 31.

Educational Software: The Good, the Bad, the Ugly, Jo Ann Corvito, S.U.N.Y. at Stony Brook, noon, Nov. 1.

Introduction to Personal Computing, noon, Nov. 1.

Computer-Assisted Mathematics Courses, Dr. Frank Scatze, Queensborough Community College, 1 pm, Nov. 1.

Artificial Intelligence Update, Prof. Peter Kugel, Boston College, 1 pm, Nov. 1.

Compiling and Retrieving Personal Medical Data with a Microcomputer, Derek Ender, MD, St. Luke's Hospital, 2 pm, Nov. 1.

The Present State of CP/M Compatible Software, Terry Gold, Lifesoft Associates, 2 pm, Nov. 1.

High Volume Data Handling: Intro. to File Processing, Prof. Peter Kugel, Boston College, 3 pm, Nov. 1.

Connecting the Computer to the Outside World, Prof. James Glaps, Boston College, 3 pm, Nov. 1.

Educational Applications in the Home, David AH, Creative Computing Magazine, 4 pm, Nov. 1.

Household Applications - Some of Them Now, Dr. Dennis J. McQuay, 4 pm, Nov. 1.

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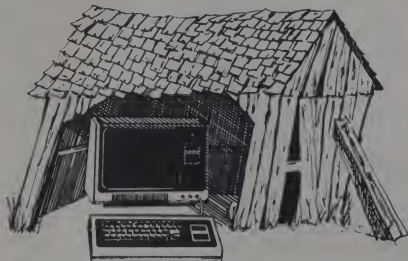
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TRS-80 Strings

Stephen B. Gray



For TRS-80 column number 21, we unravel another CLOAD cover-art program to see what makes it work, take a brief look at Radio Shack's new "TRS-80 Videotex" information retrieval system, look at three machine-language games from The Software Association, take note of a three-day course on TRS-80 interfacing, check out three of Leo Christopherson's games that stress graphics, and end with a short program that displays your keyboard input backwards.

CLOAD Cover Graphics #2

The cover of CLOAD magazine for April 1980 is based on rectangles. The program draws random four-way-symmetrical rectangles, starting near the center of the screen, then (in the top-left quadrant) running up, left, down and right.

After 15 sets of four rectangles are drawn, starting at random locations and with random widths and length, the program shifts to RESET mode, and creates 15 sets of "black" rectangles that blank out parts of the 15 white ones, to

create fascinating designs.

The 74 program lines can be reduced to a hard core of 40 lines containing 43 statements:

```

10 CLS
110 S=0:N=0:F=15
200 A=RND(157)+2
210 B=RND(11)+17
220 L=INT(RND(159-A))+4
230 M=INT(RND(128-B))+2
290 FOR Y=B+1 TO BSTEP-1
300 X=A+L
310 GOSUB 670
320 X=X+1
330 GOSUB 670
340 NEXT Y
370 FOR X=A+L-1 TO A+1 STEP-1
380 GOSUB 670
390 NEXT X
430 FOR Y=B TO B+W
440 X=A
450 GOSUB 670
460 X=X-1
470 GOSUB 670
480 NEXT Y
510 FOR X=A+1 TO A+L-1
520 GOSUB 670
530 NEXT X
570 N=N+1
580 IF N=FTHEMS=1
590 IF N=FTHEMS=2 THEN N=0: S=0
600 GOTO 200
670 REM
700 IF S=0 THEN Y770
710 RESET(X,Y)
720 RESET(127-X,Y)
730 RESET(X,61-Y)
740 RESET(127-X,61-Y)
750 RETURN
770 SET(X,Y)
780 SET(127-X,Y)
790 SET(X,61-Y)
800 SET(127-X,61-Y)
810 RETURN
    
```

In the uncut version of this program, there is a third statement at the end of line 590, GOSUB 870, which jumps to a subroutine that erases the rectangles display by PRINTing a long line of blanks. This is a selective "erase" that clears only

the bottom two-thirds of the screen.

If you leave out GOSUB 870, the bottom two-thirds of the screen will not be cleared at the end of the 30-rectangle cycle, and the new rectangle display will overlay the old one, so that eventually it begins to look like the architectural floorplan of some huge, ancient castle.

If you do add :GOSUB 870 to the end of line 590, the program runs one full cycle, and then you get error message

?UL ERROR IN 590

because "an attempt was made to branch to a non-existent line," as the Level-II Basic Reference Manual puts it.

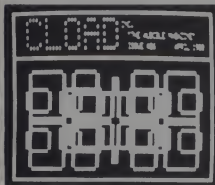
Lines 200-230 provide random values (A and B) as the basis for the starting points and for the horizontal length and vertical width of the rectangles, with L ranging from 4 to 60, and W from 2 to 12.

Lines 290-340 draw the up (right) side (in the top-left quadrant) from B+W to B:



lines 370-390 draw the top side, A+L. 1 to A+1; lines 430-480 draw the left side, from B to B+W; and lines 510-530 draw the bottom side, from A+1 to A+L. 1.

The top and bottom sides of each rectangle are one graphics block high, whereas the left and right sides are two blocks wide, created by lines 320 (right side) and 460 (left side).



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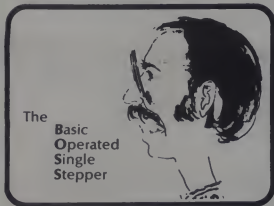
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5. Stacking programs: permits you to stack one or more basic programs in high memory while you work on or run another program. You can call these programs down at any time to merge to the program that you are working, (limited only by the memory size of your machine).

This program sold on cassette for \$29.95 and works in Level II or DOS (works under TRSDOS 2.1, 2.2, 2.3. NEWDOS 2.1 we do not have NEWDOS-80 yet to test) and comes with 13 page manual. Automatically relocates itself to not interfere with other machine language programs that you have in high memory.

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TRS-80, cont'd...

Lines 570-600 keep track of how many times the rectangles have been drawn. In line 580, if N equals the value of 15 at which F was initialized in line 110, the mode shifts to RESET, and the "black" rectangles will be drawn.

In line 590, if N is 30, then it's time to erase the rectangle display, and start over with a jump back to line 200.

Lines 670-750 include the RESET lines that create the four black rectangles. The four side-drawing routines jump to these lines constantly.

In line 700, if S is 0, that means the display is blank, and the program jumps to lines 770-810, which draw the four white rectangles. But if S has been set to 1 in line 580, the 15 white rectangles have already been drawn and it's time to shift to RESET by skipping over the jump in line 700 and going to line 710.

Note how the four SET and four RESET lines create symmetrical rectangles by subtracting the X value from 127 and the Y value from 61, in four different combinations, for the four quadrants. You might want to check this out by running a short program made up of lines 770-800 and various values of X and Y.

This program, called Boxes, was written by Mark Schwenk of Pekin, IL. If you have any trouble figuring out exactly how it works, use TRON and follow the program flow.

Videotex

Jumping the gun on the competition, Radio Shack has started marketing "TRS-80 Videotex," which will turn any home telephone and TV set into an information retrieval system for accessing databanks.

For just under \$400, you get a decoder that connects your TV set and telephone, plus some memory and a keyboard. If you've got a TRS-80, all you need is the decoder, which is about \$200.

The Videotex network will first offer access to newspapers, wire services and stock-and-bond prices, from CompuServe, at \$5 an hour. Plans are to later offer information to subscribers on weather, sports, airline schedules, etc.

Incidentally, the French PTT people are working on a similar system, which they hope to market for much less, designed to eliminate telephone books.

Creative Computing Software

Z-Chess

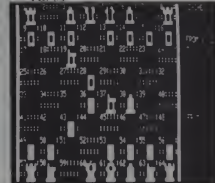
Z-Chess, at \$19.95, can be played at seven levels of difficulty, from 1 with three levels of look-ahead and an average of 10 seconds per computer move, to 7 with six levels of look-ahead and about 30 minutes

per computer move.

Z-Chess plays all moves including casting and en passant, in an aggressive game that wastes no time getting the pieces out there for a fight.

The display takes only a short time to get used to. The king and queen do look a little odd at first, but they're identified with a K or Q. Each square is numbered, from 1 to 64, and moves are indicated quite simply by

FROM: 06
TO: 34



rather than by conventional chess-move notation, which takes longer unless you're familiar with it.

A set-up mode "allows the player to preset the board to any position prior to starting the game, or to change the board at any time during the game. This feature also allows the solving of mate-in-two problems."

Z-Chess is available for the 16K Level II TRS-80 on disk (CS-3513) and cassette (CS-3017) for \$19.95 from Creative Computing Software, P.O. Box 789-M, Morristown, NJ 07960. Or call 800-631-8112.

The Software Association

Two machine-language 16K Level-II games are available from The Software Association (Box 58365, Houston, TX 77058): Back-40 and Dr. Chips.

Back-40

The display for this \$14.95 back-gammon game is very clear, the game is easy to play, and the dice are rolled graphically. A pair of dice at screen right show several faces before settling down.

The computer plays a very good



game, and if you need any instruction in the fine points, just watch its moves. However, no basic instructions are provided for how to play backgammon, so you'll have to get them elsewhere if you don't know how to get off the bar, etc.

Every feature of standard back-gammon is included, such as the doubling cube, and the computer even keeps score.

Dr. Chips

This \$14.95 program is not really a game, as the booklet notes, but is rather a "conversationalist," based on the famous Doctor and Eliza programs, in which the computer plays the part of a pseudo-psychiatrist.

The booklet notes that the "Dr. Chips responses are intended only for fun, and they should not be taken seriously," and says it's a "natural introduction to computers for the family and friends, and a super 'conversationalist' and 'ice breaker' at parties, where everyone will want to have a turn at talking to Dr. Chips."

After loading, the first display is
HELLO, I'M DOCTOR CHIPS -
THE BRILLIANT PSYCHOANALYST.
PLEASE STATE YOUR PROBLEM
AND I WILL TRY TO HELP YOU.

So if you type in

I FEEL DEPRESSED

the computer comes back with

TELL ME MORE ABOUT SUCH FEELINGS

to which you might respond

MY DOG RAN AWAY

and so you get back

YOUR DOG RAN AWAY?

The program is a combination of picking up on your words and turning them back at you, plus a set of responses based on certain key words you might use. So if you reply

YES

to the previous question, you get back another question

WHY

and if you answer

I DON'T KNOW

you get yet another question

WHY DON'T YOU KNOW?

And so it goes, very much like a psychiatrist (but remember, this is "only for fun"), asking questions, some of which may not make much sense, because the program obviously can't respond intelligently to everything you might say. So if you continue the previous 'dialog' with

I WISH I KNEW

you get

DOES THAT RELATE TO THE FACT THAT YOUR DOG RAN AWAY?

Try using vulgarity, and you get
PLEASE THERE IS A COMPUTER
PRESENT.

and if you insist, Dr. Chips asks
WHY DO YOU TRY TO ATTRACT
ATTENTION BY USING FOUL
LANGUAGE?

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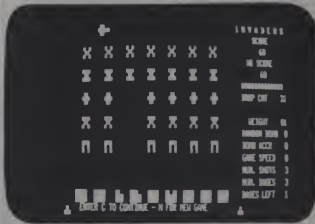
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INVADERS FROM SPACE by Carl Miller



A NEW ATTACK IS LAUNCHED

Just when it seemed to be all over, Acorn introduces a new and faster machine language version of this classic space game. In the game, the aliens are dropping bombs, moving from side to side, and trying to overrun your bases. You try to hold them off by shooting at them and scoring with each hit.

In *INVADERS FROM SPACE* you choose the game speed, the enemy bomb frequency and accuracy, the number of shots on the screen, and the number of your bases. These choices produce a weight scoring factor, and make it fun for all ages.

Move your base and fire at the invaders—both at the same time—which you can not do in most similar games. Full sound effects add excitement to the incredible speed and action of *INVADERS FROM SPACE*.

Acorn produces many game programs for the TRS-80®. These include *PIGSKIN*, the one-or-two player football strategy game; *PINBALL* a graphic arcade game; and *GAMMON CHALLENGER*, the popular backgammon program. Each is available at only \$14.95 on tape and \$20.95 on disk for a 16K Level II TRS-80®. Ask for these and other quality programs at your local computer store.

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CIRCLE 101 ON READER SERVICE CARD

TRS-80, cont'd...

and if you still insist, you get
OK THAT'S ENOUGH OF THAT.

The program recognizes at least four obscene words.

When stuck, the program takes a new tack such as

I DON'T BELIEVE THAT I
FULLY UNDERSTAND YOU

or perhaps

HOW DOES THAT QUESTION
RELATE TO YOUR PROBLEM?

This is a fascinating program, especially to people who've been in analysis, and to analysts. I've heard that psychotic people usually don't believe it's a computer program, but think the display is being generated by a psychiatrist in another room.

The Software Association is off to a very good start with these three programs, and we hope to see more from them.

TRS-80 Interfacing

A five-day course on "TRS-80 Interfacing, Programming and Scientific Instrument Automation" was given by the Dept. of Chemistry and the Extension Div. of Virginia Polytechnic Institute and State Univ., at Blacksburg, VA, on June 23-27.

A three-day workshop on "TRS-80 Interfacing, Applications and Programming" was given by the same organization on July 14-16, at the school's Northern Virginia facility next to Dulles International Airport in Washington, D.C.

The three-day workshop will be repeated later this year, on Dec. 8-10, in Blacksburg. The instructors will be Drs. Jonathan and Christopher Titus, president and vice president, respectively, of the Blacksburg Group, and who publish the famous Bugbooks. Course materials will include the two books on TRS-80 interfacing by Jonathan Titus.

The \$350 workshop "will concentrate on the design and development of TRS-80 interfaces, for use in data acquisition, control, monitoring and other applications. It is recommended for TRS-80 users "who have some experience with Basic programming and digital electronics." You can bring your own TRS-80.

For further information, contact David G. Larsen, Virginia Tech, Blacksburg, VA 24061.

Three By Leo C

One of the brightest TRS-80 programmers in the country is Leo Christopherson, whose Android Nim (*Creative*, June 1979, p 125) from 80-US is a model of how animated graphics can enliven a game, and should be examined closely by anyone interested in creating such graphics.

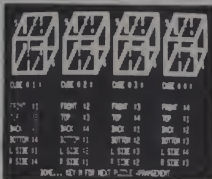
However, there's just so much graphics can do for a game. Two of Leo's

recent games, Cubes and Snake Eggs, are games in point. Both are beautifully programmed, with very clever graphics, yet even the most devoted of games players would probably be interested in no more than a few games. After all, marzipan is used to create some beautiful candies, but how much marzipan can you eat?

Cubes

Cubes is a computer version of the Instant Insanity game, by the Parker Brothers division of General Mills Fun Group.

Perhaps you've seen those four colored plastic cubes, which you're supposed to arrange so that "when placed side by side, each consecutive top (or bottom, or front, or back) is of a different color."



The Cubes program asks you to select four different colors or numerals (it works easier with numbers), and then assign one of the four to each of the 24 cube-sides involved. Then the program "begins rearrangement of the blocks, stopping to display a solution . . . if there is one."

After you've played this \$9.95 game a short while, you may well find yourself wanting to get your hands on the four plastic cubes.

All I can get out of this game is that it teaches you that conformity to a pattern will win, and that totally random activity (in assigning colors to cube-sides) probably won't. Hmmm.

Snake Eggs

There's no animated graphics in Cubes, but some beautiful examples of it are in Snake Eggs, \$14.95 at your neighborhood store or from 80-US (3838 South Warner St., Tacoma, WA 98409).

Snake Eggs is a version of Twenty-One and might be called Forty-One, except that, instead of dice, the game uses snakes. The snakes lay eggs, which are rolled across a striped field. The stripes carry number values, from one on up, and where the egg stops, that's your point. You and the computer continue to roll in competition, and whoever gets closest to 41, without exceeding it, wins. A roll of "snake eggs" automatically wins, and a roll of "scrambled eggs" loses.



The graphics are a work of genius. The snakes, which move even when you're making up your mind how much to bet next, constantly move their heads and tails. And if you plug an amplifier into the AUX of your machine, you hear the snakes "talking," and "snake-language comments will be translated for you."

If you win, the program plays a snappy Sousa motif, and if you lose, you get the theme from Chopin's "March for the Dead."

But somehow Snake Eggs just isn't all that interesting, despite the fantastic graphics and marvelous sound effects. The Controller Snake has to coax the two egg-laying snakes just a little too much to lay eggs, and after a few games of this, you may want to play some cards just for a real 'hands-on' game.

Lifetwo

Here's a third program by Leo, which you may find yourself playing again and again. Lifetwo consists of two versions of the famous Life game, and is \$14.95.

The first version, Game of Life, "allows you to set up a pattern and watch the resulting life patterns unfold according to Conway's standard Life rules," which



unfortunately aren't included. This game has been programmed before, but Leo has managed to make the generations zip along at about 100 per minute!

Even if you know the rules of Life, you may find yourself trying and trying to come up with patterns that will stay dynamic forever.

The second version, Battle of Life, uses sound, mostly of the zap, sploing, and rat-tat-tat type, plus some "talking" by the four life forms (biped, triped, uniped and quadruped) that allow up to four players to

participate. The four life forms are beautifully done, and move every now and then.

Each player chooses a life form and places up to six of them at various positions on a 10-by-5 grid. The game then proceeds according to Life rules, stopping after every five generations to allow each player to add two more lifeforms to the grid.



The instructions say you can hear the sound by plugging the AUX cord into an audio amplifier but, as with Snake Eggs, you can listen in by putting an AM radio near the keyboard.

Short Program #12

Thomas L. Ward, of Pasadena, CA,

sent this.

"Here's another version of Short Program #2 to display name backwards:

```
100 X=15379
110 CLS
120 PRINT "WHAT IS YOUR NAME?"
130 POKE X,95
140 A$=INKEY$
150 IF A$="" THEN 140
160 B$=A$+B$
170 PRINT B$
180 GOTO 140
```

Short Program #2 was in *Creative*, June 1979, p 126."

This program spins the name out of a location two spaces after the question mark, and moves it to the right. If you then press ENTER, the name appears again, flush left, and if you press ENTER repeatedly, moves down the screen.

One problem: the name (or message) is limited to 25 characters. After that, you get

```
706 ERROR IN 140
```

and the rest of the name appears in normal fashion. In Short Program #2, the name (or message) begins at the right of the screen, halfway down, doesn't move, and keeps on printing the message backwards until it fills all top ten lines completely, a total of 640 characters.

Can you modify this new program so it will print a message longer than 25 characters backwards? ☐

TRS-80™ SOFTWARE

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DISASSEMBLER Read, write, and copy system tapes. Display and modify memory contents. Disassemble ROM, DOS, and system tapes into 2-80 mnemonics. Search for strings in memory. Much more! Includes 32 pages of documentation and information. For 16K Level II. \$19.95

SYSTEM TAPE DUPLICATOR Copy your system format tapes. Includes verify routine. For any Level II. \$14.95

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CASSETTE LABEL MAKER A mini-word processor to print cassette labels on a line printer. Includes manual and 50 seal-and-stick labels on tractor feed paper. For 16K Level II and printer. \$15.95

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CIRCLE 118 ON READER SERVICE CARD

Compleat Computer Catalogue



COMPUTERS

NOBUS-Z COMPUTER SYSTEM



Exo Electronics introduces the NoBUS-Z microcomputer system which features a 4 MHz Z80A CPU, CP/M operating system, 64K dynamic RAM, dual density 8 inch disk drives with 600K bytes/aside, and 6K color text/graphics. It is designed to support both personal and business applications.

Console configurations range from a keyboard and TV set to separate word-processing display terminals. A full line of printers and hard disks is available. A typical complete 70K system with 600K bytes of disk storage costs under \$3000.

Exo Electronics Company, P.O. Box 3571 Culver City, CA 90230. (213) 390-6527.

CIRCLE 251 ON READER SERVICE CARD

VECTOR SYSTEM 2800

Vector Graphic Inc., announces the Vector System 2800, which consists of a Vector 3 terminal with the ZCB single board computer together with 64K of RAM (56K useable) and a disk controller, a Flashwriter II video board featuring an 80 x 24 display.

The second major component in the system is the Dualstor 8" drive unit with

a total capacity of 2 megabyte-formatted. The formatting is IBM compatible. The standard software on the System 2800 is CP/M, Microsoft Basic-80, Raid debugger, Scope editor, the five Peachtree accounting packages and Memorte Word Management are available options.

Options include the Vector Matrix printer, and the Vector letter quality Qume Sprint 3 printer. \$7,295.

Vector Graphic, Inc., 31364 Via Colinas, Westlake Village, CA 91361. (213) 991-2303.

CIRCLE 252 ON READER SERVICE CARD

10MB COMPUTER



Systems Engineering Enterprises has developed a computer system which features a one year transferable warranty. System 6789 includes an intelligent terminal with 48K memory, 80 x 24 high resolution video display, 10 MB 8 inch Winchester Disk and a .5 MB double-sided, IBM 3740 compatible floppy.

A multi-user Basic and operating systems are standard. Available software includes a data base management system, word processor, integrated general business and medical accounts receivable. \$8,500.

Systems Engineering Enterprises, 625 Loftstrand Lane, Rockville, MD 20850. (301) 424-6220.

CIRCLE 253 ON READER SERVICE CARD

TRS-80 EQUIVALENT



Personal Micro Computers, Inc., through an exclusive marketing agreement with a Hong Kong manufacturer, offers a software and hardware compatible equivalent of the Radio Shack Model I, Level II TRS-80. The PMC-80 has a cassette tape recorder, 16K RAM memory, Level II Microsoft Basic interpreter in ROM, power supply, computer and keyboard all in one cabinet.

The PMC-80 will display on either a TV monitor or a standard TV set using a built-in VHF Channel 3 modulator. All software available for the TRS-80 will operate in the PMC-80.

Level II Basic or System cassettes will load in the PMC-80 without volume adjustments. All peripherals designed for the Radio Shack parallel port interface to the PMC-80 60 pin bus through a 40 pin interface adapter.

Disc based programs can be run on the PMC-80 using the Radio Shack Expansion Interface or other commercially available equivalents. With the Expansion Interface, all peripherals designed for the TRS-80 are also compatible with the PMC-80. This includes Winchester disks, speech recognition, printers and RS-232 adapters.

Personal Micro Computer, Inc., 475 Ellis St, Mountain View, CA 94043. (415) 968-1604.

CIRCLE 254 ON READER SERVICE CARD

NEWDOS/80

Powerful Disk Operating System for the TRS-80* designed for the sophisticated user and professional programmer.

NEWDOS/80 is not meant to replace the present version of NEWDOS 2.1 which satisfies most users, but is a carefully planned upward enhancement.

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WP/DP OFFICE COMPUTER



Alpha Professional Systems, Inc. has announced AlphaPrint, a desktop microcomputer incorporating word and data processing capabilities. The system includes 64K of main memory, a 45K display buffer, high resolution 12" video display, and two double density 5 1/4" diskette drives storing over 200 pages of text or 330K of data.

A specially-designed Selectric II-type keyboard incorporates 72 character and function keys, and a full numeric keypad. The optional 660 word-per-minute letter quality printer can be shared by up to three AlphaPrints.

The AlphaPrint's Pegasus Operating System allows optional communications, WP file merge, and data processing capability. Applications software packages are available as are CP/M, Basic, Fortran, Cobol and Pascal. \$4990.

Alpha Professional Systems, Inc., 9465 Wilshire Blvd., Suite 518, Beverly Hills, CA 90212. (213)272-3032.

CIRCLE 255 ON READER SERVICE CARD

SMALL BUSINESS COMPUTER



Information Technology Inc. has designed Superstar a word processor and small business computer. Superstar consists of ITI's Superbrain by Intertec, the NEC Spinwriter, and MicroPro's WordStar word processing software.

Features include: word wrapping, dynamic pagination, two double density 5 1/4" floppy disk drives, 64K bytes of user-programmable RAM, and printing at 55cps. \$7500.

Information Technology Inc., 56 Kearney Rd., Needham, MA 02194. (617) 444-5702.

CIRCLE 256 ON READER SERVICE CARD

MULTI-USER SYSTEM

OSM Computer Corporation has introduced a multi-user, multi-tasking microcomputer system, the OSM Model 6300 computer. Each user has its own CPU, memory and I/O, and shares a common database of disk storage of up to 128 Mbytes, using the industry standard CP/M 2.2 and DPO5/2.

A service processor, consisting of a complete system (Z80A CPU, RAM, I/O) routes all communications from the user processors to the disk database and system printer. The system, which allows up to 128 user terminals is particularly attractive in a word processing environment and for other applications where console speed is critical.

The Model 6300 comes with two 8 inch double density floppy disk drives. Double side is optional. There are several hard disk options available: (1) 32 Mbyte, 64 Mbyte, 96 Mbyte and 128 Mbyte hard disk drive with 16 Mbyte removable on all four sizes and (2) 27 Mbyte fixed drive. The single user mainframe is priced at \$5,195.

OSM Computer Corporation 2364 Walsh Ave., Santa Clara, CA 95051. (408) 496-8910.

CIRCLE 257 ON READER SERVICE CARD

MEMORY

64K BYTE MEMORY FOR S-100 COMPUTERS



Designed specifically for the Sol, Cromemco, North Star, and other S-100 bus microcomputers is Chislun Industries' CI-S100 memory module. The dynamic RAM memory module requires no wait states at 2 or 4 MHz. The new memory is compatible with most S-100 bus microcomputers including the Z80 at 4 MHz and is designed to plug directly into the memory slots. Features include expandability to a half megabyte with a bank select feature which allows user to select up to eight 64K byte memory cards. \$750.

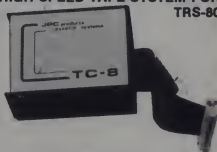
Chislun Industries, Inc., 31352 Via Colinas #102, Westlake Village, CA 91361. (213) 991-2254.

CIRCLE 258 ON READER SERVICE CARD



DISK & TAPE SYSTEMS

HIGH SPEED TAPE SYSTEM FOR TRS-80



JPC Products Company has developed a High Speed Cassette System for the TRS-80 Level II computer. The system allows the TRS-80 user to load programs five times faster and provides better reliability than the TRS-80 system.

The TC-8 supports the saving, loading, and verifying of Basic programs, system programs, and data files. Features include eight-character named files, the ability to list the directory of all files on a tape, verification of saved files, and a data file storage technique which resembles that of a disk system. The TC-80 is available in kit form for \$90 and fully assembled for \$120.

JPC Products Company, 12021 Paisano Ct., Albuquerque, NM 87112. (505) 294-6233.

CIRCLE 259 ON READER SERVICE CARD



FIXED/FLOPPY DISK MEMORY SYSTEM FOR TRS-80, APPLE

Lobo Drives, International, announces the Model 1850 Dual Fixed/Floppy Disk Memory System for Apple and TRS-80 Model computers.

The floppy disk drive is the Model 850 and is available in a choice of single or double density configurations. Maximum capacity is 1.6 megabytes. The 8-inch Winchester technology fixed disk drive is a Lobo Drives Model 1000 and is available in a choice of 5 or 10 megabyte capacity.

The two drives also share the same highly-regulated power supply and unique disk controller. Prices range from \$3495 to \$4695.

Lobo Drives, International, 935 Camino Del Sur, Goleta, CA 93017. (805) 685-4546.

CIRCLE 260 ON READER SERVICE CARD

DATEBOOK for Tue Jan 1 - Not printed since the last change		
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8 AM John Smith/first class		
10		166 Jones/Check up and
12		re-train
14	Thomas Johnson/room	
16	Smith's extract/room	
18		
20	Staffing Wilson/Check up	
22		
24		Jed's last report
26	Mike S. up/restoration	restoration
28		
30	George Kennedy	
32	restoration	
34		
36	Thomas Carter/Check up	
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*SUPER ISOLATOR (ISO-3), similar to ISO-1A except double filtering & Suppression \$85.95

*ISOLATOR (ISO-4), similar to ISO-1A except unit has 6 individually filtered sockets \$96.95

*ISOLATOR (ISO-5), similar to ISO-2 except unit has 3 socket banks, 9 sockets total \$79.95

*CIRCUIT BREAKER, any model (add-CB) Add \$ 7.00

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- GAP-AR** Requires GAP-GL to run, allows adding A/R invoices, printing Sales Journal, detail A/R report, Account Aging, add/update Cash Receipts with register, Cash Receipts Journal, and A/R Billing. Price \$99.95
- GAP-AP** Requires GAP-GL to run, allows adding of A/P invoices, printing Purchase Journal, detail A/P report, Aging of Accounts, Check Writing, Check Printing, Cash Disbursements Journal. Price \$99.95

System requirements are 32K CP/M
CP/M is registered trademark of Digital Research



PROFESSIONAL DATA SYSTEMS

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Bakersfield CA 93305
(805) 323-0891

CIRCLE 181 ON READER SERVICE CARD

BACKUP SYSTEM FOR Z80A/S-100

The CSSN Backup subsystem is a hardware/software package for the protection of disk-stored data. The off-line storage medium is a 13.4 Mbyte capacity magnetic tape cartridge, making Backup ideal for use with high-capacity Winchester disks. Backup also offers the advantages of file-by-file backup.

The system includes a Z80A/S-100 compatible interface board, a DEI cartridge tape drive, and a CP/M-compatible software utility, featuring file-by-file Save and Restore commands.

CSSN, 120 Boylston St., 4th Floor, Boston, MA 02116.

CIRCLE 261 ON READER SERVICE CARD

TERMINALS & I/O

PRECISION MATRIX PRINTER



The Model 460, a desktop matrix printer for commercial applications that combines high-quality printing capabilities at throughput speeds of 160 characters per second has been announced by Integral Data Systems, Inc.

It employs a dot matrix character formation technique in which the placement of dots overlaps both horizontally and vertically to achieve correspondence quality printing.

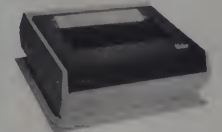
Printing control functions include proportional spacing, enhanced text printing and standard print densities of 10-12 or 16.7 characters per inch. Other selectable print features include automatic text justification, programmable horizontal and vertical tabbing, reverse paper feed, and "fine positioning" of characters to 1/120th of an inch.

The Model 460 has a standard RS-232C serial interface as well as a Centronics-compatible parallel interface. \$1295.

Integral Data Systems, 14 Tech Circle, Natick, MA 01760.

CIRCLE 262 ON READER SERVICE CARD

TWO SPEED/TWO DOT DENSITY GRAPHICS PRINTER



Okidata Corporation has announced a graphics printer, the Slimline SLG. The unit provides a choice of two speed/two dot density printing for alphanumerics in addition to its graphics capability.

High density characters, printed at 120 lpm, are formed using 7 x 9 and 7 x 12 matrices, and low density characters, printed at 400 lpm, with 7 x 5 and 7 x 6 matrices. In graphics mode, it provides a dot density of 100 x 100 dots per inch at a plotting speed of 12 inches per minute. It will reproduce anything that can be displayed on a CRT screen.

The printer is available with Printtronix, Centronics and Dataproducts-compatible parallel interfaces and with a microprocessor-controlled RS232 serial interface.

Okidata Corporation, 111 Gaither Dr., Mount Laurel, NJ 08064. (609) 235-2600.

CIRCLE 263 ON READER SERVICE CARD

MATRIX PRINTER FOR SMALL BUSINESS



A full feature matrix printer, designed for the small business computer and advanced computer hobbyist markets, has been announced by MQI Computer Products.

The MQ1 150 has a speed of 150 cps, bi-directional logic seeking. The unit is a 100 percent duty cycle printer with minimum head life of 200 million characters. The user may select 80, 132 or 136 columns; 6 or 8 lines per inch, and the matrix is 9 x 9, upper and lower case with descenders.

The MQ1 150 will accommodate multi-part forms up to original plus-five copies, from 2" to 15" in width. \$1295.

MQI Computer Products, 18381 Bandlier Circle, Fountain Valley, CA 92708.

CIRCLE 264 ON READER SERVICE CARD

COLOR GRAPHICS TERMINALS

Intelligent Systems Corp. has announced the availability of its Intecolor 8300 and 8900 series product lines which include cost effective, color graphic terminals, desk-top computers and small business systems.

The desk-top computers are available with 5 inch, 8 inch and hard disk units that offer a storage range from 80K bytes to 26 megabytes. Both products feature standard resolution color graphics (160 x 192) with high resolution color graphics (480 x 384) as an available option.

CP/M is available on the desk-top computers along with color word processing capability.

Intelligent Systems Corp., 5965 Peachtree Corners East, Norcross, GA 30071 (404) 449-5961.

CIRCLE 265 ON READER SERVICE CARD

KEYBOARD ACTUATOR



Kogyosha announces the KGS-80 Keyboard Actuator, designed to turn an IBM Selectric typewriter, or its equivalent, into a printer for the TRS-80.

The KGS-80 is positioned on the keyboard, and plugged into the expansion interface, or directly into the CPU using the interface cable. It does not require any software to operate. All memory space is available, making it compatible with Electric Pencil, Scripsit and other word processing programs. \$599.

Kogyosha USA Office, 179 Riveredge Rd., Tenafly, NJ 07670. (201) 569-8769.

CIRCLE 266 ON READER SERVICE CARD

HEAVY-DUTY DOT MATRIX PRINTER

The Model 3431 is a heavy-duty, 150 cps dot matrix printer from TEL, Inc. It offers up to 136-column printing using a 9 x 7 dot format to form 94 ASCII characters, including lowercase letters with descenders, symbols, double-width characters, and bidirectional printing under microprocessing control.

The pin-feed tractor accepts continuous forms from 1.5" to 14". The model 3431 is available with standard parallel interface or optional RS-232C serial interface. \$1,695.

TEL, Inc., 5075 S. LoopE., Houston TX 77033. (713) 738-2300.

CIRCLE 267 ON READER SERVICE CARD

IMPACT PRINTER WITH GRAPHICS



The 80 column DE-800SG dot matrix printer features full dot graphics and complete microprocessor control. The standard version also includes tractor feed, a 2K character buffer, hardware UART, aluminium case, and the ability to store a complete screen display from a standard video terminal.

The unit accepts paper widths from 1.5" to 10" and will print up to 5-part forms. Switch and software selectable option bits control the baud rate and forms length. The interface is RS-232C and 20 MA. Baud rate is programmable from 110 to 9600, 9996.

Data Electronic Devices, Inc., 18 Bridge St., Salem, NH 03079. (603) 893-2047.

CIRCLE 268 ON READER SERVICE CARD

MULTI-FUNCTION S-100 I/O BOARD

New from I/O Technology is a multi-function S-100 I/O board. It has two serial ports Asyn/Sync (RS-232, current loop or TTL) with individual crystal controlled programmable baud rate generators. Four 8-bit parallel ports are available; one is an 8-bit latched input port while the other three 8-bit ports can be programmed in combinations of input, output or bidirectional.



The board is said to be ideal for controller applications and has an 8-level programmable interrupt controller with auto restart (8080/280). An interconnection is available. \$375.

I/O Technology, 29119 Flowerpark Dr., Canyon Country, CA. 91351 (805) 252-7666.

CIRCLE 269 ON READER SERVICE CARD

PERIPHERALS

SPEECH RECOGNITION UNIT



The first low-cost, industry-compatible speech recognition unit, making available speech input capability with virtually every computer terminal, has been introduced by Heuristics, Inc. The Heuristics 7000 will interface with all RS-232-C terminals to provide the advantages of hands-off operation.

The unit can be trained to recognize up to 64 words or phrases, each up to three seconds in length, and is compatible with all common programming languages, such as Fortran, Cobol, Pascal, and Basic. It can be trained or re-trained as often as necessary to accept the voices of the users, and will automatically reject utterances significantly different from the vocabulary set. Rejection levels can be adjusted by the users. \$3000.

Heuristics, Inc. 1285 Hammerwood Ave., Sunnyvale, CA 94086. (408) 734-8532.

CIRCLE 270 ON READER SERVICE CARD

APPLE-SALE! 40 Games for \$85.00

That's a right, 40 games and programs for your apple computer for only \$85.00. You will receive 3 disks-loads of family fun that will entertain you for years. Send \$85.00 to:

Bill Metz

P.O. Box 8628, Oakland, CA 94614

CIRCLE 220 ON READER SERVICE CARD

STARFIGHT...a two-player dogfight.

(machine level, req. 16K) \$9.95

TV TYPER...turns your Apple into a TVT. (Applesoft ROM, req. 48K) \$19.95

Send to: Bill Hindorff

P.O. Box 404

Glen Riddle, PA 19037

CIRCLE 148 ON READER SERVICE CARD

VIDEO DIGITIZER FOR APPLE

The Micro Works DS-65 Digisector, a random access video digitizer for the Apple II, converts a TV camera's output into digital information the Apple can process.



This intelligent Apple peripheral has on-board software in 2708 EPROM, featuring: full screen scans directly to Apple Hi-Res screen; random-access digitizing by Basic programs; line-scan digitizing for reading charts or tracking objects; utility functions for clearing and copying the Hi-Res screen. \$349.95

The Micro Works, P.O. Box 1110, Del Mar, CA 92014, (714) 942-2400.

CIRCLE 271 ON READER SERVICE CARD

FREE! up to \$170 in merchandise

with purchase at PET-C&M demo

PET 15K Large Keyboard	\$ 995 \$130
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PET 282K Printer (req. 16K)	\$ 995 \$ 70
PET 282K Printer (req. 16K)	\$ 795 \$180
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PET 4 Video Head System (HL-48)	34.50
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ATARI - INTRODUCTORY SPECIAL

Atari 1000 Terminal (req. 2nd)	779.00
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PET Word Processor - Machine Language	24.00
3M 5 1/4 & 5 1/8	7.00
2M 5 1/4 & 5 1/8	10.00
Version 1.0, 1.1	1.00
Disk Starter Pages	\$ 1.00

Calculate the prices of your Atari 1000 system. Add up the prices of the items you want. If the total is \$170 or more, you can get the Atari 1000 system for \$170.00. Add \$1.00 per copy for the Atari 1000 system. Add \$1.00 per copy for the Atari 1000 system. Add \$1.00 per copy for the Atari 1000 system.

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CIRCLE 103 ON READER SERVICE CARD

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*TRS-80 is a trademark of Tandy Corporation

CIRCLE 176 ON READER SERVICE CARD

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TARBELL VDS-II

Vector Disk Subsystem

- 8080 or 8085 CPU
- 16 or 32K RAM
- 16 or 32K ROM
- 16 or 32K EPROM
- 16 or 32K EEPROM
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CIRCLE 202 ON READER SERVICE CARD

What you 'C' is what you get!

C Compiler for CP/M

New, and available now! An easily affordable compiler incorporating most of the features of the full C language.

BD SOFTWARE

System requirements: CP/M and at least 24K of RAM

Variable Types: char, int, unsigned

Composite Types: arrays, structures, unions

Pointers: to variables, structures, unions and functions

Features: is a structured language, all functions (Programs) recursive; more powerful expression operators than any other von Neumann type language; allows free-formatted source; close enough to UNIX**C to make conversions feasible.

Speed: On 2 MHz 8080, the statement for (i = 1; i < 30000; i++) x = 5; takes about 4 seconds to execute.

Package contains: compiler, linker, library manager; standard function library; sample source files include games, a terminal emulator with disk I/O plus the source for many standard library functions; BDS C User's Guide; Book—The C Programming Language by Dennis Ritchie and Brian Kernighan of Bell Labs.

Price: \$125

Recipient of the Computer Lib Seal of Approval

*CP/M is a trademark of Digital Research Corp

**UNIX is a trademark of Bell Laboratories

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CIRCLE 190 ON READER SERVICE CARD

INFORMATION EXPLOSION?

GET INFORMATION MASTER!

Are you overwhelmed by your collection of reprints, technical literature, spec. sheets, magazine articles, correspondence, etc.? Get back in control with the INFORMATION MASTER program.

Use combinations of keywords to quickly find exactly what you want. Search a 500 entry data base in 12 to 15 seconds and retrieve essentially unlimited text.

INFORMATION MASTER runs on 8080 or Z-80 microcomputers using a CP/M compatible operating system and having at least two disk drives and 32K of memory. Disk formats available: 8" single density, Vector Graphic 5", Heath H-89 5" (modified CP/M).

INFORMATION MASTER program is shipped ready to run, on disk with demonstration data base and 22 page users manual.

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CIRCLE 143 ON READER SERVICE CARD

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CIRCLE 196 ON READER SERVICE CARD

Xcel Computer Systems announces custom made **Mailing List** programs for the PET, CBM, Apple and TRS-80 computers. The user specifies the type of data to be stored, the format of the record and the information to be printed on the label. The programs use a true random access system and require a printer and floppy disk. Prices start at \$80. Xcel Computer Systems, Box 28, Williamsbridge Station, Bronx, NY 10467.

CIRCLE 283 ON READER SERVICE CARD

Apple Plot is a software package which enables users of Apple computers to create, revise and print detailed charts and graphs. When used with a color television monitor, information being plotted may be displayed in color. It gives the user a choice of six graphic formats: line, multiline, bar, multibar, bar with line overlay and scattergraph. Information can be entered manually through the computer keyboard or from an external program. \$70. Apple Computer Inc., 10260 Bandley Dr., Cupertino, CA 95014.

CIRCLE 277 ON READER SERVICE CARD

Intelligent Systems Corp. has announced two color business programs for the Intelec desk-top computer running under CP/M. **Execograph** is a series of color graphic management information system programs. Also included are statistical tools for forecasting and data analysis. **Color Graphic Accounting** uses color and graphics in the interpretation and display of accounting records generated through the standard accounting functions of general ledger, accounts receivable, accounts payable, payroll, sales analysis and inventory control. Intelligent Systems Corp., 5965 Peachtree Corners East, Norcross, GA 30071. (404) 449-5961.

CIRCLE 284 ON READER SERVICE CARD

Order Entry from Compumax has the ability to generate and print purchase orders and sales orders in mailable format, compute tax on taxable orders, register deliveries against outstanding purchase orders and shipments against outstanding sales orders, and complete purchase and sales order history reports. It is available for Micropolis 1053/II (48K), Apple II, PET (DOS 2.0) and Microsoft under CP/M. Compumax, P.O. Box 1139, Palo Alto, CA 94301. (415) 321-2881.

CIRCLE 286 ON READER SERVICE CARD

Labelmaker for the TRS-80 is designed to allow the user to start a small home business maintaining mailing lists and supplying gummed mailing labels to customers. All names in memory can be sorted alphabetically or by zip code in less than ten seconds. Names can be coded and printed selectively. The

program requires at least one disk drive and a minimum memory of 32K. \$99.50. The Peripheral People, P.O. Box 524, Mercer Island, WA 98040. (206) 232-4506.

CIRCLE 286 ON READER SERVICE CARD

A-T Enterprises has announced an **Income Property Management** software package for the TRS-80 Model II. The interactive system is a full general ledger system that keeps track of all income and expenses providing fully formatted financial statements, management reports and exception reports. Written in CBasic and running under CP/M, it requires 48K of RAM, two 8" disk drives and a printer. \$650. A-T Enterprises, 221 North Lois, La Habra, CA 90631. (213) 947-2762.

CIRCLE 287 ON READER SERVICE CARD

The Buyers/Sellers Analysis Program for TRS-80 Model I and II allows brokers and agents to compute loan payments, closing costs, maximum loans, down payments, amortization schedules, second trust deeds and seller's net proceeds. A terminal feature allows the computer to be used in place of a rented terminal. The Real Estate Systems Group, 484 Lovers Lane, Vacaville, CA 95688. (707) 422-4751.

CIRCLE 288 ON READER SERVICE CARD

EDUCATIONAL

Apple Pilot is a high-level programming language system that facilitates computer-aided instruction for educators and corporate and industrial trainers. In Author mode the instructor creates a lesson using one or more of four editors. In Lesson mode the student runs the lesson diskette, material is presented and student responses are accepted exactly as specified by the teacher/trainer. It will run on Apple II or Apple II Plus with a minimum of 48K bytes of user memory. \$150. Apple Computer Inc., 10260 Bandley Dr., Cupertino, CA 95014.

CIRCLE 277 ON READER SERVICE CARD

Grading System Programs for the Apple II is designed to help school administrators and teaching professionals keep track of grades, cumulative averages and school credits. It allows the orderly input of reporting period grades and the automatic preparation of report cards and honor roll lists for up to 800 students per diskette. The system is written in Applesoft and requires a single disk drive and an 80-column printer. \$199.95. Charles Mann & Associates, Micro Software Division, 7594 San Remo Trail, Yuca Valley, CA 92284. (714) 365-9718.

CIRCLE 289 ON READER SERVICE CARD

T.H.E.S.I.S. has introduced five educational programs on cassette for the

Atari 800. These include **Guessword** for grades 6 and above, **Fishing for Homonyms** for grades 3 to 6, **Wanted** for grades 4 to 8, **Word-mate**, for grades 3 to 6, and **Word Scramble** for grades 1 to 4. T.H.E.S.I.S., P.O. Box 147, Garden City, MI 48141. (313) 596-4722.

CIRCLE 290 ON READER SERVICE CARD

Chemistry Lab Simulation #1 and #2 for the Apple II provide dynamic and colorful simulations of high school and college level chemistry lab experiments. Lab #1 uses high-resolution graphics to simulate introductory level chemistry experiments. Lab #2 visually illustrates the dynamic behavior of gas particles as the user varies the gas environment. High Technology, Inc., Software Department, P.O. Box 14665, Oklahoma City, OK 73113. (405) 840-9900.

CIRCLE 291 ON READER SERVICE CARD

Micro-Ed has announced a series of **educational programs** for the PET designed to raise student scores on the Iowa Tests of Basic Skills. Micro-Ed, Inc., Box 24156, Minneapolis, MN 55424.

CIRCLE 292 ON READER SERVICE CARD

A **K-8 Math Program** designed for use in a classroom environment to supplement regular instruction is now available for use with the TRS-80. It is supplied on five cassettes and three disks in a binder with a teacher's manual containing instructions and sample record keeping forms. It requires a 16K Level II TRS-80 system (disk drive optional). \$199. Available from participating Radio Shack stores and dealers and Radio Shack Computer Centers.

CIRCLE 293 ON READER SERVICE CARD

UTILITIES & MISC.

The Voice gives the Apple II or Apple II Plus the power of speech. Each data disk can store up to 80 words or phrases which can be sorted for quick reference. It allows the user to speak from any Basic program by using Print commands. \$39.95. Muse Software, 330 N. Charles St., Baltimore, MD 21201. (301) 659-7212.

CIRCLE 294 ON READER SERVICE CARD

Quality Software announces the **QS Smart Terminal** program, a Z80 machine language program that permits the user to communicate with other computers and timesharing networks. Incoming data may be stored in any one of nine files in RAM. Files, including programs, may be saved to or loaded from cassette, listed on the video, printed, transmitted out through a modem and created or edited with an onboard text editor. \$49.95. Quality Software, 6660 Reseda Blvd., Suite 105, Reseda, CA 91335. (213) 344-6599.

CIRCLE 295 ON READER SERVICE CARD

MenuBldr, written in North Star Basic permits a user to generate screen menus in 2 to 3 minutes. The program stores the menu control values, menu title and menu text on a disk. \$48. American Planning, 4600 Duke St., Suite 425, Alexandria, VA 22304.

CIRCLE 296 ON READER SERVICE CARD

Datascop Text File Copy augments Apple's DOS 3.2 by providing a way to copy a Basic text file from one disk to another. The program automatically repairs defective records while copying random-access files and notes the record locations for further action by the operator. \$34.95. Datascop, P.O. Drawer AA, Little Rock, AR 72205.

CIRCLE 297 ON READER SERVICE CARD

Programmer by Rational Software is said to provide professional-quality programming tools to users of TRS-80 Level II Basic. After the machine language routine is read once, all five functions—rename, append, pack, delete and move—are available continuously. \$25. Rational Software, 963 East California Blvd., Pasadena, CA 91106.

CIRCLE 298 ON READER SERVICE CARD

Structured Basic Translator is a disk-based programming utility for the TRS-80 Level II. The programmer writes a structured program using a text editor. The program then converts the

file into an executable Basic program. \$29.95. Acorn Software, Inc., 634 North Carolina Ave., SE, Washington, DC 20003. (202) 544-4259.

CIRCLE 299 ON READER SERVICE CARD

Dakin's offers a twelve-program utility package which contains Apple's DOS 3.3. The package requires an Apple II or Apple II Plus with 48K, two disk drives and a printer. \$70. Dakin's Corporation, P.O. Box 21187, Denver, CO 80221.

CIRCLE 301 ON READER SERVICE CARD

Reloc is a Z80 relocation routine that allows users to position utilities at an address of their choosing by selecting either ending or beginning addresses in either hex or decimal. \$29.95. The Alternate Source, 1806 Ada St., Lansing, MI 48910.

CIRCLE 302 ON READER SERVICE CARD

Chat is an intelligent terminal program for the OSI C1-P/Superboard, which allows cassette storage of received data and direct transmissions of data from cassette. \$24.95. Charles A. Shartsis, 9908 Cherry Hill Rd. #812, College Park, MD 20740.

CIRCLE 303 ON READER SERVICE CARD

Hanson House announces **Swiss-Cheese**, a utility for formatting program listings which will automatically produce a page listing, both in the number of lines and the width of line, via user

entry. \$9.95. Hanson House, Dept. 34, 55 Hanson Pl., Stratford, CT 06497.

CIRCLE 304 ON READER SERVICE CARD

A Machine Language Debug Package for the Compucolor II allows the execution of a program to be halted at any point so that the state of the registers and memory can be noted or altered. It can manipulate machine registers, obtain a hex dump of memory, alter memory to a numeric or character value, disassemble memory to mnemonics, enter mnemonics which are immediately assembled and stored in memory and move a memory range. Compucolor Corporation, 225 Technology Park, Atlanta, Norcross, GA 30092.

CIRCLE 305 ON READER SERVICE CARD

Matric, an array handling package for PET/CBM computers is a 5K assembler language program that expands Commodore Basic with fourteen new statements, all of which can be used in Basic programs and entered interactively as direct commands from the keyboard. Versions are available on tape or disk for 8, 16 and 32K machines. \$125. Cognitive Products, P.O. Box 2592, Chapel Hill, NC 27514.

CIRCLE 306 ON READER SERVICE CARD

GE Enterprises announces **Three Sort Routines** for PET, TRS-80 and other small computers. SCN is used for nu-

Games Wanted

Hayden Book Company, Inc., the publisher of SARGON II, is once again accepting sophisticated and interesting new game submissions for ALL home computers.

If you have a game which you would like us to consider for national and international publication, please contact:

Stephen Radosh
Games Editor
Hayden Book Company, Inc.
50 Essex St.
Rochelle Park, NJ 07662

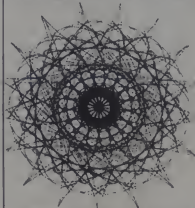
We are also looking for people to add hi-res graphics to existing game programs, on a freelance basis. Please contact Mr. Radosh at the above address.

CIRCLE 141 ON READER SERVICE CARD

INTRODUCTION TO PL/I AND STRUCTURED PROGRAMMING

Want to learn PL/I — Structured PL/I? Know some PL/I and want to learn more? Error-handling? Debugging techniques? Then **INTRODUCTION TO PL/I AND STRUCTURED PROGRAMMING** is for you. Covers an easy-to-learn subset of ANSI PL/I that will enable you to tackle a wide range of computer problems requiring numeric and string processing, plus a selection of the more advanced facilities. The entire syntax of the versatile subset is defined in only 3 pages of syntax diagrams. The book is suitable for self study, and may also be used in a first course in PL/I. Contains ten chapters and six appendices: 311 value-packed pages including 200 exercises and problems, comprehensive index, and bibliographies. An excellent reference document for only \$5.00. (Add \$1.20 postage.)

The interesting problems include mathematical, simulation (mass. city bus), graph plotting, art, games (scrabble, word, snakes and ladders, lists, etc.), puzzle-drawers, cyphers, test analysis and more. Outline of the PL/I features covered: fixed-point, floating-point, iterative DO statements including WHILE, conditional, free format (LIST) and EDIT-directed I/O, declarations, arrays (fixed and variable bounds), procedures and functions, built-in functions, computational error detection and correction, ON units.



NEW SHAPES

by Julius Guest

is a collection of 110 original and fascinating computer-generated designs created by the author over an eight-year period. The designs are satisfying art creations in themselves and may evoke the responses that their titles suggest.

As each art piece is accompanied by a mathematical formulation and program, the reader may thus create his own "New Shapes" and derive as much enjoyment from them as the author obviously did.

The designs are reproduced in color (some in exciting solid reverse) on high quality art paper. Details: 174 pages, 28cm x 27 cm (11" x 10 1/2") (At \$11.99 U.S. that's only 11 cents per diagram!) Add \$2.40 postage.

Order direct from publisher R.A. Vowels, 93 Park Drive, Parkville 3052, Australia. Personal checks accepted (in your currency) or bank Draft Check in Aust. currency. Discounts: 5% for 2 or more books.

CIRCLE 192 ON READER SERVICE CARD

APPLE II Sports Games (16K)



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Take the field. Mix up your pitches to keep the batter off balance. If he hits it, move your fielders to snag the ball before he gets to first. Balls and strikes double plays, force outs and errors. It's the great American computer game.

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CYBORG WARS
for TRS-80 16K L2

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CIRCLE 198 ON READER SERVICE CARD

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CIRCLE 191 ON READER SERVICE CARD

meric classes, dates, etc.; SCA for alphanumeric initials and groups; and SMC for multiple character sorts. \$4.95 each or three for \$7.95. GE Enterprises, 1417 11th St., Manhattan Beach, CA 90266.

CIRCLE 307 ON READER SERVICE CARD

Control of the running and listing of Apple II programs is now available through the Video/Print/List Controller by Howardsoft. The controls are activated by keyboard commands, providing control of running and listing speed, listing format, line printer action and cursor movement. The machine language software is compatible with both Apple II and Apple II Plus computers and will work with Integer Basic, Applesoft and Assembly languages as well as the Apple Monitor. \$39 for disk or tape. Howardsoft Software Services, 7722 Hosford Ave., Dept. C, Los Angeles, CA 90045.

CIRCLE 308 ON READER SERVICE CARD

WORD PROCESSING

Quill Driver is a text processor for the TRS-80 Model I or Model II with at least one disk drive. Features include commands for accessing alternate input files, right justification, tabulation and hanging indents, various forms of pagination and a program to allow the transposition of Pencil, Basic and Edtasm text files to any one of the three file types. \$39.95. The Alternate Source, 1806 Ada St., Lansing, MI 48910.

CIRCLE 309 ON READER SERVICE CARD

Hanson House has announced the release of Easy-Word, a word processor for the TRS-80 Level II. The program, written in Basic, is able by line or word to change, delete, insert and append. \$21.95. Hanson House, Dept. 34, 55 Hanson Pl., Stratford, CT 06497.

CIRCLE 310 ON READER SERVICE CARD

Stylus is a word processing program for use on 6809 computer systems operating under the Flex operating system. It features cursor based editing with on-screen formatting. Versions are available for most terminals and printers. \$150. Sonex Systems, Box 238, Williamsville, NY 14221.

CIRCLE 311 ON READER SERVICE CARD

Magic Window for the Apple is a word processing program that provides for 80-column, upper- and lower-case display and printout without computer modification. It allows the user to do computer-assisted text editing and correction, rearrange copy with simple commands and exercise global search operations. Artsci Inc., 10432 Burbank Blvd., North Hollywood, CA 91601. (213) 985-2922.

CIRCLE 312 ON READER SERVICE CARD



CALIFORNIA

The Computer Store—820 Broadway, Santa Monica 90401; (213)451-0713. 10 am-8 pm Tue-Fri, 10-6 Sat. The Original One! Apple/Vector Graphic.

D.E.S. Data Equipment Supply—8315 Firestone Blvd, Downey 90241; (213) 923-9361. 8AM-9PM 7 days. Complete computer facility—Commodore Pet dealer—"Solid Gold Software" specialists.

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Computerwords—1439 Post Rd. East, Westport 06880; (203) 255-9096. 12-6 Mon-Sat., 12-9 Thurs.

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AMF Electronics—11158 N. 30th St, Tampa 33612; (813)971-4072. 10-6 Mon-Sat. Apple Computer Sales & Service; TRS-80, Apple Software & Peripherals; S-100 boards, computer parts & books.

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The Computer Room—106 E. Oak St, Chicago 60611; (312) 337-6744. 11-7 Mon-Fri, 11-6 Sat.

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ComputerLand of Louisville—10414 Shelbyville Rd, Louisville 40223; (502) 245-8288. 10-5:30.

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Computer Mart, Inc.—1395 Main St, Waltham 02154; (617) 899-4540. 11-6 Tue-Sat. Atari, Heath, NEC, SWTP + S-100 bus systems; Word Processing Specialists.

Neeco—679 Highland Ave, Needham 02194; (617) 449-1760. 9-5:30 Mon-Fri. Commodore, Apple, Superbrain, T1199/4.

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Stonehenge Computer Shop—89 Summit Avenue, Summit 07901; (201) 277-1020. 10 am-6:30 pm Mon-Sat. Apple/Bell 8 Howell/Commodore Authorized Dealer, Sales and Service.

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The Computer Corner Inc—200 Hamilton Ave, White Plains 10601; (914)-WHY DATA. 10-6 Mon-Sat, 10-9 Thu.

OHIO

The Basic Computer Shop—2671 W. Market St, Akron 44313; (216)867-0808. 10-6 Mon-Sat.

Micro Mini Computer World, Inc.—74 Robinwood Ave., Columbus 43213; (614)235-6058, 5813. 11-7 Tue-Sat. Authorized commodore dealer-Sales/Software/Service/Support.

PENNSYLVANIA

Personal Computer Corp.—24-26 W. Lancaster Ave, Paoli 19301; (215)647-8463. 10-6 Mon-Fri, 10-8 Wed, 10-5 Sat.

VIRGINIA

ComputerLand/Tysons Corner—8411 Old Courthouse Rd, Vienna 22180; (703)893-0424. 10-6 MTWF, 10-9 Thu, 10-5 Sat.

Computers Plus, Inc—6120 Franconia Rd, Alexandria 22301; (703) 971-1996. 10-9 Mon-Fri, 10-6 Sat. Micro specialists, books, classes, software, maintenance. "The PLUS makes the difference."

Count = Count - 1

David Lubar

Lenny Potter was half-owner of the firm and only computer shop in the small town of Linchbrook, New Jersey, which meant he spent a lot of time in the company of Klingons, and little time in the presence of customers. Linchbrook just didn't boast a large technical community.

"Mistake, this was a mistake," his partner Abraham Roth moaned, peering out the door as if he could lure in customers through telepathy. "We should move. We should relocate. We should close down and open a food and grain store."

"Take it easy, Abe," Lenny glanced up from the terminal. Having just starved half the population of Sumeria, he didn't want anything more to do with grain. "Things will pick up. Give it a chance."

"An optimist. I've got an optimist for a partner. A thief I could handle. But an optimist, no."

"It'll pick up. It has to," Lenny really believed in the shop. It's a matter of time, he thought as he loaded another game. Little time, he added, reminding himself that the rent was due.

"And this," Abe said, holding up the newspaper. "Crime in the streets. It's not safe anywhere."

Lenny glanced at the headlines. There had been a rash of muggings recently, and none of the victims had been able to identify the criminal. "We can't worry about that."

"The terminology is interesting," the man said after Lenny was done. "Bits, bytes, nibbles — quite interesting."

"You never worry about anything. As long as you can play those games, you're happy."

"Guilty," Lenny said. He was crazy, obsessed, and fanatic when it came to computers. He'd left a decent career in advertising to open the shop. Abe, who had been in the field for years, until he had been forced to retire, showed a bit more restraint. The shop, named "The Quick Byte," drew a fair number of customers, but most left when they discovered the place wasn't a diner.

Looking toward the dark street, Lenny asked, "Shall we call it a night?"

"And disappoint the flood of customers?" Abe shrugged. "Maybe you're right. Maybe business will pick up. But I'm not holding my breath."

As if on cue, a man walked in. "Are you open?" he asked.

"Is uranium heavy?" Lenny crossed the room, taking a good look at the man. He was well dressed in a dark suit of European cut, and appeared to be in his mid-sixties,

though it was difficult to tell for sure. On the second finger of his right hand he wore an expensive ring with a large ruby. I hope he isn't just looking for a magazine, Lenny thought. "Can I help you?" Lenny asked.

"I might be in the market for a computer." The man spoke in the careful manner of one who learned English late in life.

Lenny managed to contain his sigh of relief. "Do you have a specific application in mind?"

"It would be for — I'm not sure of the correct term — to control the home."

"Well, that is easily within the capabilities of the units we carry. You wish to turn on lights and appliances?"

"In part."

"You could get a dedicated system for that," Abe said. "Such devices are available in a number of places."

Hating himself for his honesty, Lenny agreed. "A computer would do the job, but you would be paying for more than you needed, unless you have other uses for it."

"That I do," the man said. "I want to keep track of ... inventory."

"Then you've come to the right place. Let me show you some of the brands we carry," Lenny demonstrated a number of computers, focusing on the ones which were best suited for home control.

"The terminology is interesting," the man said after Lenny was done. "Bits, bytes, nibbles — quite interesting." He selected a rather sophisticated system consisting of a 48K da Vinci computer with dual disks. "I will return tomorrow to pay for my purchase and pick it up. Are you open late?"

"Well, ..." Lenny hesitated. Except for Wednesdays, they closed at five. But he didn't want to lose this sale. "How late?"

The man seemed to be thinking about something. Finally, he said, "After eight."

"We're open till nine."

"Fine."

"We'll see you tomorrow, then, Mr. ..." Lenny realized he didn't know the man's name.

"Vladimir," the man said, smiling slightly.

He should see a dentist, Lenny thought, noticing the long sharp canines that protruded from the man's blood-red gums. "Thanks for doing business with us."

"My pleasure." He turned toward the door, hesitated, then glanced over his shoulder and said, "This should be a great help to me. I am getting old. At times, I forget important things, crucial things. But this should help. Good evening, gentlemen."

Lenny waited until the man was out of sight, then screamed, "YAHOO!" while jumping up and down. After reentry from orbit, he noticed that Abe wasn't particularly excited. "Come on, Abe, rejoice. We made a sale."

"I don't like it," Abe said.

David Lubar, 249 Loring Ave., Apt. 3, Edison, NJ 08817.

"What do you mean?"

"A man named Vladimir, a man who wants to do business after dark — what does that suggest to you?"

Lenny shrugged. It didn't mean anything to him.

"And those teeth. Add it up."

"It's late. Let's call it a day."

The next morning, Lenny kept his distance from Abe. "What have you been eating?" he asked.

"Garlic."

"For breakfast?"

"It's good for the heart, and the blood."

"Maybe you should let me deal with the customers today," Lenny suggested. With a radius of five feet, Abe was unapproachable.

Vladimir, who came that evening, seemed to share Lenny's opinion. He stayed away from Abe, dealing only with Lenny. After he had paid, in cash, for his purchase, he asked, "Will you be able to help me set up the controls?"

"Sure. When?"

"Tomorrow night?"

"My pleasure. Can I help you carry that?" Lenny didn't want to see the man struggle with the boxes.

"I can manage," Vladimir put one carton under each arm and left the store.

"Strong guy," Lenny said.

"Don't go there," Abe told him. "Stay away from his house."

"What?" Lenny wondered if an overdose of garlic could cause brain damage.

"Don't you know who he is? Haven't you ever heard of Vlad the Impaler?"

"Sure, that's the guy who the Dracula legend was based on." The thought settled uncomfortably somewhere in the region of Lenny's stomach. Letting out a hollow laugh, he said, "Come on, that's ridiculous." Abe didn't agree. "If you must go, take a cross."

Lenny knew he would feel silly taking a cross with him. But when he left the shop the next evening, he did bring one extra item, one piece of powerful protection that, according to some people, might even be magic.

"Welcome," Vladimir greeted him at the door. "Come into my home."

Gothic, Lenny thought as he entered the ancient house. He felt as if he had stepped onto the set for some grade-B movie.

"As I said, I forget things at time. The shutters must be closed before sunrise, and the basement must be locked during the day. I have mechanisms attached to them. Can the computer manage the control?"

"No problem," Lenny made the connections, then tested them out. Then he asked, "You also said you needed a data-management system?"

"Yes, I have to keep track of... donations. It would not do to call on any individual too often."

"Here, this should do the trick." He handed Vladimir a disk. "Just load it and it will tell you what to do. It's very user-oriented. You can set up any fields you want." He paused. Vladimir was staring at him. Lenny felt strange, suddenly weak. His will was gone and he was falling into a vortex created by those bloodshot eyes.

Vladimir closed closer. His mouth gaped open, becoming a cave rimmed with razor-sharp stalactites. His breath carried the dried must of a grave.

Drawing on what little strength remained, Lenny managed to say, "These things can have problems at first."

"What do you mean?"

"It takes a while to set up any new system and get out

all the bugs. Remember, you can call on me if you need any help. We like to be valuable to our customers, very valuable. If I may boast, I think our support can be crucial."

"Yes, I see," Vladimir lowered his eyes.

Lenny staggered, almost as if he had been released from a powerful grip. "One more thing," he said, reaching into the small briefcase he carried. He put his fingers on the item, pulling it out slowly, almost reverently. He held it up, trying to control the quivering in his hands. "A little gift."

"Thank you," Vladimir took it from him.

"Call if you have a problem," Lenny said, backing away. The doorknob finally met his hand. Calmly, he stepped to the porch, closing the door behind himself. Then he ran.

"You're still alive," Abe said the next day. He moved closer to Lenny, staring at his neck.

"No wounds," Lenny said, "but it was close."

"Then you believe me?"

"I'm not sure."

"We have to do something about him."

"I already did."

"You mean —" Abe held out an imaginary stake and made a hammering motion with the other hand.

"No, nothing like that," Lenny knew he couldn't do something like that. "I took a safer route. If we're wrong, there's been no harm."

"And if we're right?"

"I'll show you. Let's pay Vladimir a visit."

They went to the edge of town, where the house was. He'll be home, Lenny thought. *He's an old, eccentric person, and nothing more.* There was no answer to his

"It takes a while to set up any new system and get out all the bugs. If I may boast, I think our support can be crucial."

knock. Lenny tried the knob. It turned under his hand. "Come on."

"I don't know if we should."

"It's daytime," Lenny said. "We're safe." He opened the door the rest of the way, feeling slightly disappointed that it didn't emit a rusty creaking sound.

They stepped inside. Sunlight filtered through the shutters, lighting dancing particles of dust. A small red light, like an animal's eye, glowed from the next room.

"He left one of his disks on," Abe said.

It worked, Lenny thought. He walked into the room. The terminal was also on, displaying a page of text.

Abe glanced at the screen, then said, "Adventure?"

"Yup, I gave him a disk. Thought it might interest him. You know how hard it is to stop once you get started. And it used the whole system, overriding the controls on the shutters. So if he really was —"

Abe grabbed Lenny's arm and pointed to the chair. Lenny looked down, and felt a shock that was tinged with just a bit of sadness and regret. The chair was covered with ashes. Lying in the ashes was a ring, a ring set with a large, red ruby.

I am getting old. At times I forget important things, crucial things. The man's words came back to Lenny. "He's got out of here." As they left the room, he glanced back at the computer.

"Leave it be," Abe said.

"All right. But he was so close to the end." Drawing again on his will power, Lenny forced himself to walk away from the unfinished game. □

Reviews



Steve Gray, et al

6502 Assembly Language Programming, by Lance A. Leventhal. Osborne/McGraw-Hill, Berkeley, CA. 632 pages, paperback \$12.50, 1979.

After writing books on assembly-language programming with the 8080A/8085, 6800 and Z80, Leventhal has generated another thick book, packed with all you'll ever want to know about the 6502 microprocessor.

This book is, of course, of interest almost entirely to people writing assembler programs for 6502-based computers such as the Apple-II, or for 6502-based developmental systems, and thus may not have as wide an audience as Dr. Leventhal's three previous books on assembly-language programming.

As usual, the emphasis is on "presenting a large number of fully debugged, practical programming examples," as the back cover puts it.

Features of the book include over 80 programming examples, input/output devices and interfacing methods, and how to program the 6502 interrupt system.

Some of the 15 chapters are on the 6502 instruction set (412 pages), simple programs, simple loops, character-coded data, code conversion, arithmetic problems, tables and lists, subroutines, input/output (129 pages), interrupts, problems definition and program design, debugging and testing, documentation and redesign, and two sample projects.

As usual with Leventhal books, this one is crammed with facts and data, well-written, and meant for the hard-core assembler.

FORTAN 77 For Humans, by Rex Page & Rich Didday. West Publishing Co., 50 West Kellogg Blvd., St. Paul, MN 55165. 486 pages, paperback \$13.95, 1980.

The authors felt there was a need "for a book that provides coordinated introduction to both the rules of Fortran and the creative process of designing algorithms."

The book is patterned after their "Fortran for Humans," and reportedly "provides an alternative for those who have access to a Fortran 77 compiler or any Fortran compiler which supports the CHARACTER data type and list-directed I/O (the WATFIV compiler, for example)."

Each feature of the language is presented with a flowchart and a "plan" that is a words-only version of the flowchart. A great deal of time has been taken to make the text as easy-going as possible, and most of this textbook can be understood by a bright high school student.

Review exercises are included with each section of each chapter, with answers at the back of the book. In an effort to enliven the text, the authors have included some humorous problems, such as writing a program for helping select the winner in the 324th Annual Pumpkin Growing Contest of the Future Farmers of Grand Fenwick; the weight of the pumpkins is measured in ternnotes.

Cartoons are also used to illustrate features such as compile-time errors, and to enliven some of the problems. Very few are funny, and all are wretchedly drawn.

But this is one of the few drawbacks in an otherwise fairly well written textbook that some teachers may find amusing enough to recommend.

PET and the IEEE 488 Bus (GPB), by Eugene Fisher and C.W. Jensen. Osborne/McGraw-Hill, Berkeley, CA. 250 pages, paperback \$15.00, 1980.

A book with a title as cryptic as this is obviously not going to be a best seller, but among instrument designers, programmers and computer hobbyists who want to use the PET computer as an intelligent controller of instruments, this should be a real winner. For one thing, it's the only book available, at this writing, that presents a "how-to-do-it" description of the PET-IEEE interface.

The IEEE Std 488-1978 is said, on page 5, to be generally referred to as the GPB, which stands for General Purpose Interface Bus.

Features of the book include the bus structure (with all control lines and data-bus lines described), the handshake procedure, sample bus transactions, timing diagrams for PET Basic statements that communicate with the bus, how to interface with non-standard bus devices, how to use a logic analyzer for troubleshooting, test programs for use as diagnostic aids, and a nine-page list of IEEE 488-bus-compatible products (including calculators, computers, instruments, and peripherals).

A great many timing diagrams, photographs, drawings and humorous explanatory cartoons go a long way toward making this fairly complex subject as understandable as possible.



Ten Easy Pieces: Creative Programming for Fun and Profit, by Hans Sagan & Carl Meyer, Jr. Hayden Book Co., Rochelle Park, NJ. 190 pages, paperback \$7.95, 1980.

"Here's an introduction to Basic language simulations through computer games," says the back cover of this interesting and worthwhile book.

After a couple of introductory chapters, the authors get into graphics (the hard way, with many DATA lines), RND (random walk), INT (gambling game), LEN (Hangman), math functions (spacecraft landing), and end with a card game and approximating pi. (Many other statements are covered in addition to those cited.)

A dozen or so excellent programming projects are included with each chapter, no answers are given.

The authors, both professors of mathematics at North Carolina State University, provide a fascinating and easily understood introduction to writing games. Some fairly technical information is given very clearly, such as on some complicated nested loops, probability, landing a spacecraft, etc. Two appendices provide details on Archimedes' formula for approximating pi, and on a pseudo-random number generator.

All in all, a nicely written book, of interest to anybody who wants to write games, or who wants to know more about the subtleties of advanced programming in Basic.

The title refers to the authors' belief that "when you run a program, which you have just written, for the first time on the computer, and it actually works, the feeling of exhilaration is the same as it must be when a composer hears his composition performed for the first time and the audience does not belt him with eggs, tomatoes, and other objects with a high rotting potential. In this musical vein, we have divided our book into sections called 'Movements' and have even provided a Prelude and Postlude." (The Prelude is the introduction, the Postlude is the number generator.)



Computers and Social Controversy, by Tom Logsdon. Computer Science Press, 9125 Fall River Lane, Potomac, MD 20854. 410 pages, hardcover \$15.95, 1980.

The author has assembled a baker's dozen of chapters from

a wide variety of sources, added a few obvious comments and produced a book that looks mighty impressive.

The 13 chapters are An Introduction to Computer Technology, The Von Neumann Legacy (binary arithmetic, languages, computer functions), The Care and Feeding of a Digital Computer (cards, tapes, printers, CRTs), The Computer's Memory, Software Engineering, Electronic Privacy Intrusion, Computer Fraud, Machines That Teach, The Era of Intelligent Machines, Computers and Automation, The Scanner Revolution, Computers and Our Monetary System, and The Future.

The book's advantage is that it puts together a great deal of interesting reference material that would take a long time for the average reader to locate in individual bits and pieces.

The book covers such things as "Shaky," the goal-directed robot at Stanford Research Institute, UPC bar-code scanners, the relationship of computers to military power, and on, and on.

However, what Logsdon has written to knit together these many bits and pieces is painfully platitudinous, with many sentences such as "Today — our military establishment is almost completely dependent upon the high-speed digital computer" and "the American educational system is big business."

If you're interested in the social implications of computers, you might buy this book for its large quantity of reference material. If you're interested in finding something to help you go to sleep, you might buy this book for the soporific effect of its writing.

TRS-80 Disk And Other Mysteries, by Harvard C. Pennington, JG Inc., 569 North Mountain Ave., Upland, CA 91786. 133 pages, paperback \$22.50, 1979.

For TRS-80 disk users who've been trying to figure out what's going on inside the software, \$22.50 is a small price to pay to keep from going crazy.

In his introduction, Pennington says, "No doubt you have been told that you cannot do certain things with the TRS-80 like BOOT a Basic program because you need Basic to load a program — or that you cannot lock out the break key without messing up the I/O routines — or that you cannot defeat the LIST and LLIST commands. You have been told wrong. All of these things can be done!"

In the next paragraph he says, "This couldn't have been done without an incredible program called SUPERZAP," a product of Apparatus Inc. of Denver.

After saluting the Tandy Corp. "for the development, production and distribution of this magic machine," Pennington gives them a blast because "The general quality of follow-on support, development and software was abysmal. Information about the workings of the system was (and is) a carefully and jealously guarded secret."

The book discusses how disks are organized, how space is allocated, how files are located on disk, and "the tools that one may use to look at disk files and directories," it also gives clear information how to FIX disk problems such as lost files, Electric Pencil bugs and other snafus.

After a chapter on Reading & Using SUPERZAP 2.0, the book gets into Other Utilities, Operating Systems, Disk Organization, The Directory, Passwords & Other Trivia, Data Recovery, Files, Recovering Electric Pencil Errors, Correcting the GAT and HIT Sectors, and Some Things You Can Do Making Electric Pencil files in Basic, adding commands to SUPERZAP, converting data in ASCII files, etc.

Appendix A provides a glossary. Level II Basic tokens, and hex dumps of TRSDOS 2.2, NEW DOS 2.1 and VIOS 3.0 directories. Appendix B covers disk-drive maintenance, suggested reading, "Murphy's Law and Other Corollaries,"

how to order NEW DOS and SUPERZAP and ends with SEARCH, a Basic program that will search a disk file for any byte combination up to 255 bytes.

All in all, a most welcome book, despite the price. The author has dug deep and gives information you probably won't find anywhere else.

If Pennington gets tired of writing, he might make a living at cartooning. All the illustrations in this book are his, and he is one of the very few fine cartoonists who really understand computers, a rare type.

The book's subtitle is TRS-80 Information Series Volume I. Although this book is a hard act to follow, let's all hope for another winner like this one.

Learn Micro-Computers, by Nat Wadsworth, Scelbi Publications, Box 133 PPSTN, Milford, CT 06460. 328 pages, paperback (plus cassette tape), \$14.95, 1978.

This is a fairly successful attempt to explain computers to the uninitiated, along with a tape that includes a chapter-by-chapter synopsis of the book, review questions, and references to page numbers for further review, in case you didn't know the answers.

The book's six chapters cover basic operation of a small computer, instructions for small computers, machine-language programming, higher-level-language programming, input/output devices, and system considerations. The appendix is a unique combination of glossary and index.

Although "the purpose of this book is to take the mystery out of the operation and practical application of small computers," as the introduction puts it, the programming portions get much more heavily into machine language than some readers may care for. However, they can skip over those parts, which may well be of interest to those who really want to know what it's all about.

Although the writing is sometimes rather stilted, the author more than makes up for it with an earnest desire to explain exactly how everything works, in as simple language as he can, in this book whose title is "Understanding Microcomputers and Small Computer Systems."

Philosophy for Investors by Jason Alexander, Sinalta Press, 1881 Sutter St., San Francisco, CA 94115. 75 pages, paperback \$9.95, 1979.

Many individuals are using their personal computers for investment analysis. However, before leaping into this application it is important for an individual to have consistent investment philosophy and goals. This book is a collection of 12 essays which originally appeared in 1979 in an institutional investment advisory service newsletter.

The content is weighted much more heavily toward philosophy than investment. Indeed, stocks, bonds, price/earnings ratios and other common investment terms are never mentioned. Instead, Mr. Alexander focuses on "Metaphysics: What is; Epistemology — How do we know it; Ethics — So what; Politics — What then; Aesthetics — And?" The layman might sensibly ask, what has all that got to do with me? It is the purpose of the book to answer just that question. Does it?

Yes and no. If you've read Ayn Rand this is a refreshing little review. If you haven't, then this is an insightful start on a consistent philosophy of life. Why the book is called *Philosophy for Investors* escapes me. It's much broader than that. Perhaps it's because investors are used to paying \$10 for a 75-page typewritten book. But that's cynical, which I should not be toward this little volume. On the other hand, I'd feel better recommending this book if it cost \$2 or \$3 since you can get fundamentally the same philosophy in a more comprehensive way from any of Ayn Rand's novels. But as a condensation, this is the best I've seen.

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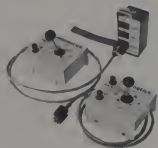
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Personal Computing: Home, Professional, and Small Business Applications, by Daniel R. McGlynn. John Wiley & Sons, New York. 273 pages, paperback \$9.95, 1979.

This handsome and well produced book is only a trifle better than the mass-market paperbacks that have been cobbled together by people who know little or nothing about computers.

These 273 pages contain a great deal of material of little or no interest to the reader interested in the basics of personal computers. Dozens of space-filling tables and illustrations are included, such as photos of the "Tektronix 8000" development system, two pages of Sol Basic commands, three pages of APL, 280 character set and functions, a page on the EBCDIC character set, two pages on the 5x7 dot-matrix character set, and 71 pages of appendices such as a list of "S-100 bus board manufacturers," a list of turnkey systems, and badly out-of-date lists of computer stores and clubs.

The chapter on basic application programs is only three pages long, yet the chapter on interfacing takes up 12 pages with the S-100 bus, complete with six pages of pin definitions and timing diagrams.

The first chapter is liable to turn off a prospective reader, around page 10, the start of a four-page "technical comparison of computers," or page 16, with a section on "benchmarking the 6800, 8080 and Z-80." Both are marvelous examples of too much, too soon.

A determined reader who can wade through all the superfluous material, may find several dozen pages of interest, but they are few and far between in this jumble.

Machines Who Think, by Pamela McCorduck, W. H. Freeman & Company. 375 pages, \$14.95, 1979.

With one humanist foot planted firmly on scientific soil and one scientifically curious foot planted firmly in the soil of the humanities, Pamela McCorduck has written a book that stands astride the wildly diverse histories of the ultimate in computing and the ultimate in human understanding of understanding: artificial intelligence.

Here is a thorough intellectual grasp of what's going on in AI, not for the solder-gunners or the bug hunters, but for the humans to whom it will mean the greatest wrench: the ones who haven't yet heard of it. To deliver the message, McCorduck has called upon the timing and insight of the dramatist. We have here an exciting plot, no less. "To know intelligence well enough to be able to build a working model of it," she writes, "is surely one of the most intellectually exciting and spiritually challenging problems of the human race."

McCorduck delivers on that promise of adventure with a tale elegantly crafted, the more exciting because it is fact, the more suspenseful because there is not yet a neatly tied ending. Put quite simply, this "Personal Inquiry into the History and Prospects of Artificial Intelligence" is a captivation that makes it for us, as readers, our own adventuresome inquiry.

So we stand beside Herbert Simon at a moment of revelation in RAND's Santa Monica air-defense lab, "when I first began to sense that one could look at a computer as a device for processing information, not just numbers." With Allen Newell, we are struck to see Oliver Selfridge and G. P. Dinneen's pattern recognizer exhibiting learning behavior, and there is a sense of now. "I had such a sense of clarity that this was a new path," recalls Newell, "... that we'd entered a new world as far as our ability to conceptualize."

And we are there at Carnegie Tech in 1956 with Edward Feigenbaum and other students when Simon walks into a classroom saying "Over Christmas Allen Newell and I invented a thinking machine." And then on the Dartmouth campus when a diverse bunch of scholars assemble, some not yet sure that

CREATIVE COMPUTING

what they're up to is in fact "scholarly," but drawn together by mutual conviction that machine thought ought to be possible. The players in this drama range from Karel Capek's robot and Mary Shelley's Dr. Frankenstein through Ada Lovelace and Charles Babbage to Norbert Wiener and John von Neumann, to John McCarthy and Marvin Minsky and Raj Reddy and Terry Winograd, and a cast of hundreds still growing. We even pause in the rush of exploration to hear of the discomforts of a Hubert Dreyfus and the moral misgivings of a Joe Weizenbaum.

But it's more than an adventure. McCorduck's book is a catalog of what we all know must be going on out there somewhere, not just assembled between covers but interconnected like a nervous system trying to command a sense of a coordinated activity. With the only notable lapse a slighting of the adaptive-systems realm of AI (though it is there, somewhat disguised), McCorduck has produced a work that will long serve as the text for those who would inquire into the whybither of AI, and as a lodestone drawing young minds into the inquiries that will constitute the future of the field.

The book's magnetism is McCorduck's facility with language and structure, a storytelling tradition that seduces us into a love affair with a most important story. Though fact, it is as commanding as all fiction: the quest for knowledge, and the quest for self.

Dick Lutz

Dr. Dobb's Journal of Computer Callisthenics and Orthodontia, People's Computer Company Series, Hayden Book Company, 50 Essex Street, Rochelle Park, NJ 07662 Vol. 1 (1976), 368 pages, Vol. 2 (1977), 480 pages, Vol. 3 (1978), 480 pages. \$18.95 each.

Dr. Dobb's Journal was originally published in 1976, when People's Computer Company was organizing the backing of the development of Tiny Basic. Their original plan was to do only a few quick issues to document and distribute Tiny Basic, but PCC soon discovered they had a ready-made readership of bit-hackers in search of a forum, a niche which Dr. Dobb's Journal easily filled. These three books contain absolutely everything that appeared in DDJ 1976-78, even the covers.

There's more creativity, wild ideas, and raw enthusiasm here per page than you are likely to find anywhere else in the personal computing press. And how it takes you back to the "old days" of personal computing, tiny languages of unconventional design, computer music on AM radios, debates on software piracy and copyrighting, diddly little machine language video games for the VDM-I, bug fixes for front panels, disassemblers and macroprocessors, TV Dazzler routines, and more. We witness the rise and fall of computer manufacturers like MITS, IMSAI, TDL, Processor Tech, Polymorphic, and see the increasing influence of products like the Apple II and CP/M. Curiously enough, DDJ editors and readers tended to support manufacturers who went out of business (mainly because of catering only to hobbyists) and to ignore developments like the Apple II and TRS-80 as long as possible.

Purely as a nostalgic trip, computer hackers from way back will enjoy browsing through one of these books for an hour or two. But as a helpful reference, most of this stuff is obsolete. No one much needs a Tiny Basic interpreter or a machine language game to toggle in from the front panel. Although some of the articles might prove useful as sources of theory for writing your own programs, this kind of material is better found elsewhere.

It's a little sad to see how personal computing is growing up, with so much exploitation, promising so much and delivering so little sometimes, but it was probably inevitable, and a lot has happened in the last few years which can't be ignored. These books are fun to read as historical references, but their value outside of that is limited.

—S/N

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THE MIGRATION OF DARKNESS

Each evening, shortly after sunset,
darkness covers the land.

Having mystified thinkers for millenia,
the mechanism for this occurrence
has now been identified: migration.

Darkness, it has been found, is composed
of an almost infinite number of particles,
which roost and reproduce up north
where they have fewer natural enemies:

Forest fires, lampposts, lasers, blazing sunlight,
torches, candles, lighthouses, limelight, and electricity
are relatively rare in the polar regions.

These lightweight bits of darkness
flock together and fly south each evening
to more fertile land in a never ending search
for an abundant food supply.

With the coming of the rising sun,
they return to their northern nesting grounds.
However, not all specks of darkness migrate.
Some that are less adventurous

or downright lazy
choose to stay behind.

These covey together, in varying numbers,
seeking shelter from the strong sunlight

by gathering under leafy trees, behind
large rocks, and underneath umbrellas;

Hiding in alleys, between parked cars,
in caves, and inside empty pockets.

These clusters are perceived by us as shadows.
They have a somewhat shorter lifespan
than those which migrate.

RAINBOW BRIDGES

An environmentally enlightened engineer decides
that all riverways, canyons, crevices and valleys
are to be bridged by rainbows.

A rainbow bridge
is a more natural and esthetic way
to connect two separate land masses.

This evanescent design was chosen
because of its imperviousness
to wind, storm, and flying creatures.

The lightweight and immaterial bridges
will be planned to hold seven lanes of traffic:
Red, orange, and yellow will be restricted
to high speed commercial vehicles.

Green, blue, and violet will be designated
for passenger cars.

While Indigo will be reserved for pedestrians,
bicyclists, and runners.

Handrails and flashing lights will be added
to assure the safety
of those on foot.

It is hoped the faint glow of the roadway itself
will ease drivers' eyestrain.

Until engineers can perfect a practical
nighttime model,
the rainbow bridges will be operational
only on sunny days.

Speculative Poetics by Peter Payack

WIDE OPEN SPACES

There are
13 billion
light years
between me
and the edge
of the universe.

And that's
the way I like
it, pardner.

for John Wayne

THE ORIGINS OF THE MATERIAL WORLD

Long before the Earth was formed
it was postulated that the nothingness
which existed everywhere

In the universe
could be condensed and compacted
into a state of fluid equilibrium.
In this way it would form the sub-stratum
of the material world.

With the help of a primitive compression chamber,
small bits of nothingness
were first compacted into Ideas
however fleeting.

A person would get an idea
then immediately forget it.
Much head scratching was in evidence.

Sometime later
though technically
in an eternal world of nothingness
time doesn't exist
the first Idea was captured and stabilized.

The mechanical device to accomplish this feat
resembled a think tank
with a vacuum cleaner attached
to the end of its hose.

One by one these captured Ideas
were transferred into a larger chamber.

Then the unanticipated happened.
The trapped Ideas began mating with one another,
and freak of nature that it was
their offspring were genetically mutated.

These biologically altered ideas
were born into the world as material objects:
*planets, trees, books, animals,
clouds, gothic cathedrals, rocks,
rainbows, etc.*

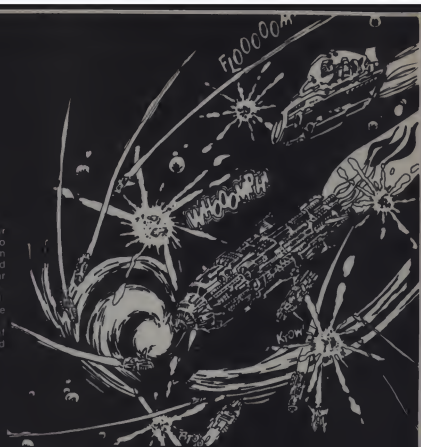
Things rained down from the sky
in a torrential downpour.
The world of nothingness melted away
like snow in a warm spring rain.

SPACE WAR

You're in command in **SPACE WAR!** Destroy your opponent's ship by forcing him to collide with the sun or to explode upon re-entry from hyperspace... or challenge him face to face with missile fire. You're in command of the speed and direction of your ship. You control the timing of your missiles. You select the game mode from five options, including Reverse Gravity and the battle begins! All you have to place your shots, and escape into hyperspace before your opponent times within range. But be wary: he too may "flee out of sight and reap war on the opposite side of the galaxy!" (This is the classic MIT game redesigned especially for the Apple.)

and SUPER INVASION

- **Super Invasion** is the original Invasion game, with the original moon creatures and faster action than any other Invasion game.
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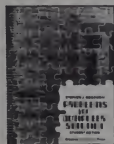
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Computer Music Record

A recording was made of the First Philadelphia Music Festival which is now available on a 12" LP record. It features eight different computer music synthesizers programmed to play the music of J.S. Bach, J. Pachelbel, Rimsky-Korsakov, Scott Joplin, Neil Diamond, Lennon & McCartney and seven others. The music ranges from baroque to rock, traditional to rag and even includes an historic 1963 computerized singing demonstration by Bell Labs. \$6.00 [CR101].



The Best of Byte

This is a blockbuster of a book containing the majority of material from the first 12 issues of *Byte* magazine. The 146 pages devoted to hardware are crammed full of how-to articles on everything from TV displays to joysticks to cassette interfaces and computer kits. But hardware without software might as well be a boat anchor, so there are 125 pages of software and applications ranging from on-line debuggers to games to a complete small business accounting system. A section on theory examines the how and why behind the circuits and programs, and "opinion" looks at where this explosive new hobby is heading. 386 pp softbound. \$11.95 [6F]

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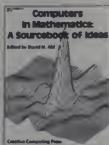
Computer Coin Games

Computer Coin Games by Joe Weisner aids newcomers to the field of computers by simplifying the concepts of computer circuitry through games which can be played with a few pennies and full sized playing boards in the book. Enhanced by outrageous cartoons, teachers, students and self-learners of all ages will enjoy this 96 page softbound book. [10R]\$3.95.



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Computers in Mathematics: A Sourcebook of Ideas

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Much of the material has appeared in Creative Computing but the back issues are no longer available. Hence this is your only source to this practical and valuable material. Edited by David H. Ahl, this mammoth 224-page softbound book costs only \$15.95. (The individual issues, if they were available, would cost over \$60.00.) [12D]



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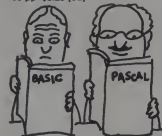


BASIC Programming, 2nd Edition

Kamerny & Kurtz. An introduction to computer programming through the language of BASIC. The authors include in-depth discussions of many applications including files and text processing. 150 pp. \$10.95 [7E]

A Guided Tour of Computer Programming in BASIC

Dwyer and Kaufman. This book tops all introductory texts on BASIC. Filled with detail and examples, it includes sample programs for many simulations, several games, reservations systems and payroll. Aimed at the novice, but of value to everyone. 156 pp. \$5.20 [8L]



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Basic For Home Computers

Albrecht, Finkel, & Brown. This book shows you how to read, write, and understand the BASIC programming language used in the new personal-size microcomputers. Includes detailed descriptions of everything you need to know to make your computer work for you—includes how to get started, numerous applications and games, lists of resources, much more. 332 pp. \$6.95 [7G]

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Peter Grogono. This book is an excellent introduction to one of the fastest growing programming languages today. The text is arranged as a tutorial containing both examples and exercises to increase reader proficiency in PASCAL. Contains sections on procedures, files, and dynamic data structures such as trees and linked lists. 359 pp. \$10.95 [10A]

PASCAL User Manual and Report (2nd Edition)

Jensen & Wirth. This book consists of two parts: the User Manual and the Revised Report. The Manual is directed to those who have some familiarity with computer programming and who wish to get acquainted with the PASCAL language. The Report is a concise reference for both programmers and implementors. It defines Standard PASCAL, which constitutes a common base between various implementations of the language. \$7.90 [10B]

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Daniel McCracken. A thorough first text in Fortran. Covers all basic statements and quickly gets into case studies ranging from simple (printing columns) to challenging (craps games simulation). 278 pp. \$12.95 [7F]

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Wayne Wickelgren. This helpful book analyzes and systematizes some of the basic methods of solving mathematical problems. Illustrative examples include chess problems, logical puzzles, railroad switching problems and ones from science and engineering. For each, the author provides hints for the reader to tackle the problem and then a complete solution is given. Want to solve a complex problem with a computer? Begin here. 262 pp. \$7.50 [7Y]

The Thinking Computer: Mind Inside Matter

Bertram Raphael. Artificial intelligence, or AI, is the branch of computer science concerned with making computers "smarter." With a minimum of technical jargon, this book discusses the capabilities of modern digital computers and how they are being used in contemporary AI research. Discusses the progress of AI, the goals, and the variety of current approaches to making the computer more intelligent. \$6.95 [7X]

The Little Book of BASIC Style: How To Write a Program You Can Read

John M. Neilson. Learn how to write better, easy-to-follow programs with Neilson's rules of style and turn out legible, correct programs. Two hours of BASIC programming is all that is necessary to profit by this book. Concepts of problem-solving and structured programming are included. 160 pp. \$5.95 [9V]

The Art of Computer Programming

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How to Profit From Your Personal Computer: Professional, Business and Home Applications

T.G. Lawis. Put your computer to work for you. This new guide describes the use of personal computers in common business applications, including terms, notations, and techniques used by programmers. 256 pp. \$8.95 [10X]

BASIC With Business Applications

Richard W. Lott. This book focuses on the BASIC language and its application to specific business problems. Part one introduces the BASIC language and the concept of logical flowcharting. Part two presents problems and possible solutions. Topics include: Interest rate calculations, break-even analysis, loan rates, and depreciation. This book is a great aid to the beginner wanting to learn BASIC without having a technical or scientific background. 284 pp. \$11.95 [10Z]

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Computing Milieu

COMPUTER



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Ted Nelson. This book is devoted to the premise that everybody should understand computers in a blithe manner the author covers interactive systems, terminals, computer languages, data structures, binary patterns, computer architecture, mini-computers, big computers, microprocessors, simulation, military uses of computers, computer companies and much, much more. Whole earth catalog size and size. A doozy! 127 pp. \$7.00 [8P]

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Puzzle Answers

A Remarkable Coincidence: The answer will always be twice the year in question. (In the case of this problem twice 1944 comes to 3888). The year of birth plus the age of each individual in 1944 will equal . . . 1944. The same is true with the year that they took office plus the number of years each served. Once again the answer in each case is 1944.

The Correct Combination: The correct combination is: $9 - 3 - 37 - 9 \times 3 \times 37 = 999$, $10 \times 5 \times 20 = 1000$, $11 \times 7 \times 13 = 1001$.

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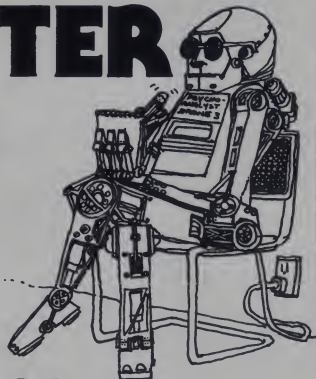
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C8P 1950

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