creative computing

March 1980
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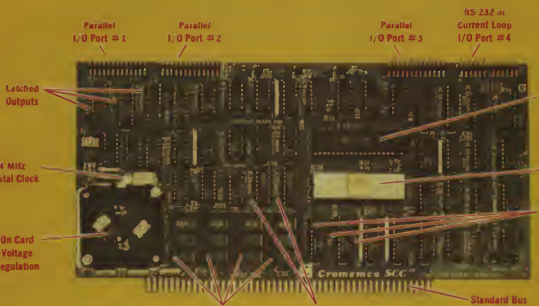

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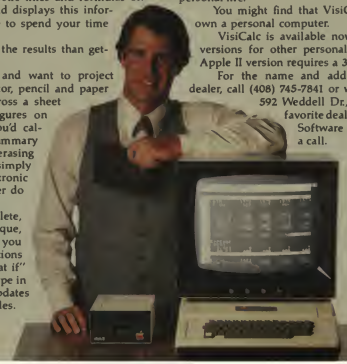

PERSONAL SOFTWARE

CIRCLE 178 ON READER SERVICE C

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In This Issue

articles

8 **John Mauchly. 1907-1980** ..... Nelson

66 **How to Make a Basic Tree** ..... Garson
Examine your family tree

68 **Cryptographic Treasure** ..... Chesson
Can you solve the Beale Papers?

72 **Why Computers Can't Be Intelligent** ..... Dreyfus
It'll be "artificial" intelligence for some time

80 **Terminal Trauma** ..... Ingram

82 **Interview with Joel Birnbaum** ..... Staples

84 **Attention Russian Embassy!** ..... Ahl

86 **Inside the TRS-80** ..... Gerald
Where and how variables are stored

evaluations & profiles

17 **Texas Instruments 99/4 Home Computer** ..... North

20 **COBOL: Microsoft vs. Micro Focus** ..... McClure

30 **Sharpening Your Pencil** ..... Lutz
Pencil Sharpener and Replacement Taker

36 **Mailroom Plus** ..... Hallen
A mailing list program from The Peripheral People

38 **Three Mile Island Game** ..... Fricke

40 **Five Software Packages** ..... North
Tiny C, Basic 5.0, Algol, SP80 Macros, MP/M

Personal Computer Communications

46 **Two Communications Modems** ..... Craig
For personal computing networks

50 **New Tools for a New Era** ..... Craig
The Source and MicroNet

58 **The Computer Connection** ..... Mecca
D.C. Hayes Micromodem and The Computer Connection

60 **Pet as a Remote Terminal** ..... Cox
The Network's communications interface

140 **The Temple of Apshai** ..... Baker

fiction & foolishness

64 **Computer Myths Explained** ..... Wolverton

80 **Keeping Bugs Away** ..... Kilban

188 **Leo's Electronic Lesson** ..... Adams

THE COVER

The cover depicts man's quest to communicate from the earliest days up through time to today and beyond, reaching for the stars. This issue deals with the aspect of communication related to personal computers and data bases. See pages 46-64. The airbrush illustration is by Roger J. Lane who has been involved in art and design for 15 years. He is currently advertising manager for Soroc Technology, Inc.

applications - games

94 **Extended Precision Computation** ..... Rogowski
16-place accuracy from any computer

98 **Photographing Your Computer System** ..... Skiff
Sharpness, background, reflections, detail, light

104 **Domino Game: Reader Challenge** ..... Weiss

106 **Basketball Stats** ..... Green & Hering
Put them on your school computer

112 **Keyword Access System** ..... Hughes

120 **'Rolodex' Data Base Program** ..... Armstrong

124 **Lost & Forgotten Island** ..... Hicks
A survival game based on cooperation

132 **Chess Clock** ..... Howerton

136 **Programs for Small Children** ..... Lucas

144 **Puzzles & Problems** ..... Townsend

166 **Triple Trip** ..... Thiagarajan & Stolovitch
A game for the pocket calculator

168 **Rebus** ..... Ahl, Staples & Galanti

departments

6 **Effective Writing: Possessive case** ..... Ahl

10 **Et Cetera** ..... et al

12 **Input/Output** ..... Readers

146 **Intelligent Computer Games** ..... Levy
Game trees, 2-ply search and minimax search

150 **Apple Cart** ..... Carpenter
Pokes, Reading data, parsing, text typer, new book

154 **TRS-80 Strings** ..... Gray
Three light pens

160 **Personal Electronic Transactions** ..... Yob
Logical statements, two's complement, light pen

164 **Software Legal Forum** ..... Novick
Patents for software?

169 **Dealer List** .....

170 **Compleat Computer Catalogue** ..... Staples

180 **Compendium** ..... Duval

182 **Book Reviews** ..... Gray

MARCH 1980
VOLUME 6, NUMBER 3

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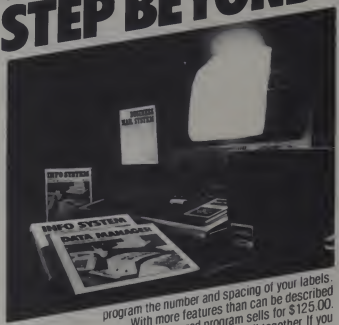

If you thought the TRS-80™ microcomputer was just a toy, think again. These **TBS-80** software systems will turn that computer into a **powerful data processor.**

INFORMATION SYSTEM by Dale Kubler is simply the best in-memory data base manager on the market. It allows you to create files with up to ten fields per record, up to 40 characters per field and 200 characters total per record. Data from the keyboard is entered directly onto a screen display of one entire file.

Once entered, you can sort or search your entire data base by any category and have the information desired displayed on the screen. **INFORMATION SYSTEM** provides a thorough editing mode allowing changes by line without rewriting an entire file. This program allows you to program your own printouts to almost any form you desire for line or serial printers. Screen prints from anywhere in the program are also available **INFORMATION SYSTEM** creates either disk or cassette files depending upon the version you use. From mail lists to recipes, this program is the ideal small system information manager. The price for this program, 32K up disk is $34.50. For systems 16K up tape it's $24.50.

DATA MANAGER by Dale Kubler starts out where INFORMATION SYSTEM leaves off. Requiring 32K and one disk, it accepts up to ten user-defined fields with up to forty characters per field and 255 characters per record. As with all TBS software, data entry and editing is professional and simple to use. What makes this program stand apart from "in-mem" data managers is that it uses up to four disks on line as memory, or as much as 320K of memory storage. Because disk sorts take more time than in-mem sorts, **DATA MANAGER** enables the user to create and maintain up to 5 "key" sort files for quick access of data. A utility program is provided to calculate the number of records possible since the amount of records you can maintain is dependent on a number of variables. This program also supports the upper/lower case modification, and printouts can be programmed to almost any format and sent to line or serial printer. Background printing is provided enabling the computer to search and print at the same time. If you already have INFORMATION SYSTEM, **DATA MANAGER** will accept those files. A necessity for organized people, this program sells for $49.50.

BUSINESS MAIL SYSTEM by Dale Kubler is designed for large-scale business users. Requiring 32K, two disks and printer, this program will store up to 150,000 names in a single file spread out over multiple disks. Each data disk holds 500 names. After data entry, BMS automatically sorts the data by zip code and alphabetical order within the zip code. The program tells you when and which data disk to insert, expanding your files automatically until you've reached 300 disks. Data is input directly onto formatted screen display with the option to use Company Name/Attention instead of Last Name/First Name. Three numeric and one alpha code fields are provided to help you use the search and printout mode. **BUSINESS MAIL SYSTEM** allows you to program the number and spacing of your labels.

With more features than can be described here, this high-powered program sells for $125.00.

TEXT MERGE is the program that puts it all together. If you have the ELECTRIC PENCIL from Michael Shrayer, 32K and one disk drive, then this program is a must. It will merge your data base from any of the above programs with an Electric Pencil file. For example, when you write a letter that is going to several hundred people, you can "code" it by entering a field name from the above programs in place of the actual information. Then, when **TEXT MERGE** is run, it will print out your Pencil file and substitute the "code" with the actual data. In other words, you can print out 1,000 personalized letters without stopping the computer. This program will also enable you to selectively search out only the records from your data base that you wish to use. Also included is the ability to set left, right, top and bottom margins, set page numbers anywhere on the page, and print out right justified if you so choose. **TEXT MERGE** will turn your computer into a powerful data processor and it sells on disk for $49.50.

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CIRCLE 117 ON READER SERVICE CARD

David H. Ahl

Possessive Case

In my January '80 column, I referred briefly to the use of an apostrophe to form the plural of numbers, letters and symbols (X's, 6's, etc.). More often the apostrophe is used to form a possessive, such as Wood's plan or Jones's office. However if the additional "s" would cause unpleasant sibilance (a hissing sound) either in the word itself or between it and the word that follows, only the apostrophe is added, for example, Archimedes' principle, Jones' suggestion, H.G. Wells' books, or for appearance' sake.

The possessive case of plural nouns is also formed by adding only the apostrophe as in the Woods' plan or the Jones' office. Note the additional "the" for clarification.

Joint ownership is shown by the ending of the last word; separate ownership by the ending of each word. Harry and Betsy's new cars indicates that Harry and Betsy have more than one new car jointly owned; Harry's and Betsy's new cars means two cars, one owned by each person. The managers and assistant managers' duties indicates duties common to both groups. Separate duties would be indicated by two possessives and an extra "the": the managers' and the assistant managers' duties.

A rule frequently violated in manuscripts received here is that, in general, nouns designating objects without animal life should show possession by an "of" or "in" phrase rather than by the apostrophe. For example:

the accuracy of the data — not: the data's accuracy
the memory in the computer or the computer memory — not: the computer's memory
the baud rate of the modem — not: the modem's baud rate

Certain exceptions are common such as time expressions (30 days' notice), monetary expressions (five dollars' worth) and distance phrases (three blocks' drive). Also, things made up of people may be excepted (the company's payroll, New Jersey's income tax or Creative Computing's expansion) although the "of" or "in" phrasing is preferred. Another exception is the proper name of manufactured objects (the Qume's speed or the PDP-11's front panel). Again, the "of" or "in" phrasing is preferable.

Another common mistake is using an apostrophe to form the possessive case of personal pronouns. This is wrong. The possessive is formed by simply adding an "s" as in hers or its (not her's or it's which are contractions).

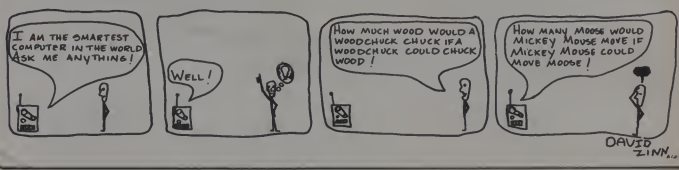
Series of possessives are always to be avoided even if "properly" formed. "Joe's partner's cousin's firm" is bungled and confusing. Instead it should be stated, "the firm of the cousin of Joe's partner."

Certain possessives are invariably ambiguous and must be explained by context. For example, "Arthur's painting" could mean a painting owned by Arthur, one that he made, one of him, one that he is carrying or one that he is hanging temporarily in his office. It could even be the contracted form meaning Arthur is painting. Such ambiguity must be eliminated by context and/or by recasting the phrase.

On that note, I shall hang up my grammatical foil for another month. □

More on K

Referring to the January column, Leo Scanlon of Rockwell International points out that, "Indeed, K does mean 1000 in electronics (as in 2K ohms), but if you're referring to computer memory locations (as in 8K memory), K means 1024. Therefore, an 8K memory contains 8192 locations, not 8000." Quite right.



North Star Horizon–
COMPUTER WITH CLASS

The North Star Horizon computer can be found everywhere computers are used: business, engineering, home — even the classroom. Low cost, performance, reliability and software availability are the obvious reasons for Horizon's popularity. But, when a college bookstore orders our BASIC manuals, we know we have done the job from A to Z.

Don't take our word for it. Read what these instructors have to say about the North Star Horizon:

"We bought a Horizon not only for its reliability record, but also because the North Star diskette format is the industry standard for software exchange. The Horizon is the first computer we have bought that came on-line as soon as we plugged it in, and it has been running ever since!"
— Melvin Davidson, Western Washington University, Bellingham, Washington

"After I gave a ½ hour demonstration of the Horizon to our students, the sign-ups for next term's class in BASIC jumped from 18 to 72."
— Harold Nay, Pleasant Hill HS, Pleasant Hill, California

"With our Horizon we brought 130 kids from knowing nothing about computers to the point of writing their own Pascal programs. I also use it to keep track of over 900 student files, including a weekly updated report card and attendance figures."
— Armonda Picciatta, Kennedy HS, Richmond, California

"The Horizon is the best computer I could find for my class. It has an almost unlimited amount of software to choose from. And the dual diskette drives mean that we don't have to waste valuable classroom time loading programs, as with computers using cassette drives."
— Gary Mantante, Ygnacia Valley HS, Walnut Creek, Calif.

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CIRCLE 172 ON READER SERVICE CARD

NorthStar

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John Mauchly 1907-1980

This is a personal reminiscence. We had an appointment for Thursday. He died Monday night.

He was sly and gentle and bright-eyed and smart as a whip, over six feet tall with an easy slouch and an Uncle Sam chin-beard, and a big big smile. He was always bursting with talk, and he had a wonderful sense of humor. But he didn't guffaw. He would sit back and look very, very pleased, and beam.

I had only met him a year before, at the 1978 Personal Computer Conference. He was terrific. He would launch into reminiscence at the drop of a name. The tales were good, and I began to see, apprehensively, that someone should be writing them for him and getting them in order.

So last summer I started sitting down with him to try to get the whole story down in the way he wanted it told. My friends would come, too, we who were working on our own long-term computer project, and we loved sitting at his feet, tape recorder rolling, as he went on about his boyhood and the scientific principles that fascinated him.

It was very moving: we were in his project, and he was in ours. We listened to the reminiscences, he lent us the lineprinter from his TRS-80 for our hypertext system. We interfaced across the years.

He would not be hurried. He would explain a thing sideways, in a sometimes perplexing order, and when at last you were able to repeat it back correctly, he would merrily say "Yah!" and lean back, and beam. His stories wove: he was tutoring us in all subjects, physics and trigonometry and meteorology amongst the history. Did you know he wanted to plot the effects of the sun and planets on the weather, and that is why he wanted to build a computer?

The history of the first computer is casually familiar. It's a great story, like the Manhattan Project, only nicer. How Mauchly, the physicist, and Eckert, the engineer, led a team at the University of Pennsylvania to build an automatic electronic computer with a changeable electronic program. That was the ENIAC, and it ran in 1945. Then they broke away to found the Eckert and Mauchly Computer Company. IBM wasn't interested, so they became Univac.

J. Presper Eckert, the younger of the two, stayed on at Univac, and is building there still, a vice-president; but John Mauchly, following the American Dream, kept going. He wanted computers to be used for science; one of his triumphs was a machine in a suitcase that did real-time analog linear programming. But business success was elusive, and when he retired his greater success was his big happy family in a house surrounded by trees.

He was bitter about John von Neumann. Folklore has it that von Neumann came up with the idea of putting the program and data in one consolidated space, a single memory for both purposes. "As if we hadn't thought of that!" scoffed Mauchly. "But we were under security, and they told us to tell this von Neumann fellow everything, and so we did; but when he went and published it, nobody said a word about security."

In our taped interviews we never got to that part of the story. We got to about 1940. And then he was gone.

I called another computing pioneer to tell him Mauchly had died, and he summed it up. "John had a remarkable ability to inspire and gather together talented people."

After the funeral there was a gathering at his house. Executives and cronies from all John's projects and companies were there, the keen-eyed people he had brought together long before. It actually got to be quite a party, after a while, with vigorous reminiscences on every side.

Kay Mauchly said to me, "If only John could have been here! He would have loved it so!"

But that's the whole point. He was. Here they were, the wonderfully bright men and women, full of spark and imagination, that had figured out the first memories and the first registers and the first programs. White-haired now, some of them, but full of youth and humor, all brought together by John Mauchly. And some younger ones, too.

The dear old fox had worked his magic to the end.

Ted Nelson

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CIRCLE 120 ON READER SERVICE CARD

A Potpourri of Computer Art and Music — At a 31% Discount!

Creative Computing is pleased to extend a special offer to subscribers. We've put together a special package of material that gives an excellent overview of computer art and music today. The components are:

1. "Artist and Computer" by Ruth Leavitt is a 120-page book in which 35 artists each describe the way in which he or she uses the computer to make artistic vision a reality. Lavishly illustrated in color and B&W, the book contains works of artists involved in graphics, weaving, film, sculpture, video and kinetics. (Reg. $4.95).

2. Philadelphia Computer Music Festival. This 12" LP record contains music played on seven different computer synthesizers ranging from huge multi-channel units to small homebrew circuits. The music includes Bach, the Beatles, Pachelbel's well-known Canon and many other folk and popular melodies. (Reg. $6.00)

3. **Creative Computing**, September 1977 and June 1979, and **ROM**, October 1977. These three magazines contain 19 articles on computer art and animation along with numerous examples of computer graphics done on both large and small computers. (Reg. $6.00)

The price of the separate elements in this package is normally $16.95 plus $2.00 shipping ($18.95 total), however, to subscribers it is available for only $13.00 postpaid in U.S.A. or $15.00 elsewhere — a 31% discount off the regular price.

Order from **Creative Computing**, P.O. Box 789-M, Morristown, NJ 07960, USA.

Computer Camp

This summer youngsters can sign up for an overnight camp in Moodus, Connecticut where the main activity will be . . . COMPUTERS. This unique recreational and educational experience is directed by Dr. Michael Sabinski, Professor at Fairfield University. It is believed to be the only computer summer overnight camp currently offered in the USA.

An action packed week is planned from June 29 to July 4. The campers, ages 10-17, will enjoy small group instruction and mini and micro computers for ample "hands-on." Dr. Zabinski will be assisted by high school teachers.

For further information contact Michael Zabinski, Ph.D., at 203-795-9069 or write Computer Camp; Grand View Lodge; Box 22; Moodus, Conn., 06469.

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APPLE TRS-80

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Equipment and Software Evaluations

Looking to buy a computer, peripheral, software package or electronic game? Creative's in-depth evaluations can probably help you make a better decision. Presented here is a list of the products reviewed by Creative over the last three years. Back issues, when available ("Yes" in last column), cost $2.00 each, three for $5.00, or ten for $15.00. Postage is $1.00 for up to 3 issues or $2.00 for 4 or more. Order from Back Issues, Creative Computing, P.O. Box 789-M, Morristown, NJ 07960.

"Our Face is Red"

Contrary to the belief of our production department and many of our readers, AARDVARK TECHNICAL SERVICES and AARDVARK SOFTWARE are distinct and independent companies. In the advertisers index of the January 1980 issue of Creative Computing, both were listed under the same name, and both received the same reader service number. This error caused great confusion and rendered reader service card inquiries to both companies invalid. Our sincerest apologies to Aardvark Software, Aardvark Technical Services and all our readers for the inconvenience.

★★★★★

There is an error in the first part of the two part series on genealogy (Feb 80 CC, p. 38). When we type FATHER the second time we should get:

MOTHER = GREATGRANDMA
FATHER = GREATGRANDPA
I SEE DAD'S MOM

If we type F again we see:

MOTHER = UNKNOWN
FATHER = UNKNOWN
I SEE GREATGRANDPA.

★★★★★

On page 142 (Feb 80), In David Levy's Intelligent Computer Games column, the line reading "The new P_2 is the old P_{12}" should read "The new P_2 is the old P_{112}."

★★★★★

In our January issue we incorrectly stated that Apple User Bank programs are available for free. They are available from Apple dealers for $40 (Vols. 1, 2) and $32 (Vols. 3-5) per disk. Sorry for any confusion.

★★★★★

Neil Rowe's article "Sine POLY's: Some Geometrical Explorations" in the Dec 1979 issue had a serious typographical error in the description of Part 3, HSQUARE. The plus sign should be an asterisk, I.e. multiplication, not addition.

Product and Manufacturer	Type Review	Volume/Page	Available
COMPUTER SYSTEMS			
2K Single Board Computers	Corr. Chart	5:11/25	Yes
A Personal Computers	Corr. Chart	5:11/30	Yes
Altair 8800	Feature	2:1/13	No
"	Follow-up	2:6/25	Yes
APF Before One	Feature	5:7/26	Yes
Apple II	Feature	5:8/29	Yes
Faith Home Computer	Feature	5:6/24	Yes
Commodore 17	Feature	5:9/25	No
"	Feature	5:10/30	Yes
Heathkit H-8	Feature	5:1/18	Yes
"	Fulltime	5:2/17	Yes
Heath (Key products)	Short	5:12/25	Yes
Hewlett Packard 9 MP	Feature	2:6/18	Yes
IMSAI 8080	Feature	3:1/30	Yes
Intercept Model One	Short	5:8/24	Yes
"	Feature	5:11/36	Yes
Nuevue Classmate 80	Feature	5:10/30	No
North Star Horizon	Feature	5:6/44	Yes
Ohio Scientific C2P	Feature	4:3/62	No
Ohio Scientific C8P "	Short	5:8/22	Yes
Ohio Scientific Superboard	Feature	5:1/20	Yes
Pet 2001 (Commodore)	Feature	5:8/24	Yes
Polymorphic 8813	Feature	5:6/48	Yes
Sol-20 (Processor Technology)	Feature	3:3/32	No
Sorcerer (Exidy)	Feature	5:5/33	Yes
"	Feature	5:1/28	Yes
Southwest Technical Prod 6800	Feature	3:1/33	Yes
Radio Shack TRS-80, Level 1	Feature	5:1/35	Yes
"	Manuals, Software	5:3/22	No
Radio Shack TRS-80, Level II	Feature	5:5/40	Yes
Radio Shack TRS-80, Model II	Feature	5:8/20	Yes
Systemaker 8051	Feature	5:6/20	Yes
"	Manuals	5:2/103	No
Texas Instruments 99/4	Feature	5:8/29	Yes
Video Brain (Unitech)	Feature	5:1/42	No
"	Software	5:3/34	Yes
Wave Mate Jupiter II	Feature	3:3/26	No
Xitan Zenba 2 (TRS)	Feature	5:6/46	Yes
TAPE DRIVES, PRINTERS AND I/O			
Anadex DP-8120 Line Printer	Feature	5:10/34	Yes
Anadex WP-6000 Video Terminal	Feature	5:2/37	Yes
Internal Data Printer Writer	Feature	5:7/17	Yes
Malibu 160 Line Printer	Feature	5:5/52	Yes
Optim Video Interface	Feature	5:5/50	Yes
SOTEC CT-80 Graphics Terminal	Feature	5:7/20	Yes
SOTEC PR-80 Printer	Feature	5:6/32	Yes
Teletype 43	Feature	5:1/20	Yes
Texas Instruments 810 Line Printer	Feature	5:6/38	No
TRS-80 Quiet Printer II	Feature	5:11/32	Yes
PERIPHERALS			
#1 1000 Speech Synthesizer	Feature	4:3/36	No
ALF 10-Key Music Board	Corrective	4:3/28	Yes
ALF Parks Music Board	Feature	5:6/102	Yes
Apple Fish II	Feature	5:3/124	Yes
Bit Pad (Communiplex)	Feature	4:4/43	Yes
CSP/Sears Tape Controller	Feature	5:11/60	Yes
Computalker Speech Synthesizer	Feature	4:5/62	No
Exatr D-17 Disk System	Feature	5:6/42	No
Heuristics Speechlab	Feature	5:7/30	Yes
Hi-Res Plotter (Houston Inst)	Feature	5:6/27	Yes
Intrul D-10 Floppy Controller	Feature	5:11/54	Yes
Midwest Scientific Floppy Disk	Feature	5:3/44	No
Western 6/60 Music Board	Feature	5:3/28	Yes
Peripheral 511 Tape Digitizer	Feature	5:10/26	Yes
Pet-Trucker Cassette Interface	Short	5:6/124	Yes
Software Technology Music System	Feature	5:5/46	Yes
Solid State Music SS-1	Corrective	4:2/25	Yes
Sunterliker (SL Hardware)	Feature	5:11/42	Yes
Terrapin Turtle	Feature	5:3/105	Yes
Thinker Toys Floppy Disk	Feature	5:2/24	Yes
TRS-80 Floppy Disk	Corrective	5:3/22	Yes
TRS-80 Speech Synthesizer	Feature	5:6/46	Yes
SOFTWARE - LANGUAGES & SYSTEMS			
Basicville	Corrective	5:6/60	Yes
Cassie (Software Systems, Inc)	Feature	5:9/40	No
CP/M Operating System	Feature	5:5/62	Yes
Cromemco 3K Control Basic	Short Corr	5:5/23	Yes
Dynamic Debugger (DDT)	Feature	5:5/26	Yes
"Full Ottawa" ANSI	Feature	5:2/35	Yes
Microsoft Basic 1.0	Corrective	5:6/45	Yes
Microsoft Basic 4.0	Corrective	5:6/48	Yes
Microsoft Basic 4.0 Extended	Corrective	5:7/24	Yes
Microsoft Fortran 80	Feature	5:5/62	Yes
MICROS vs TRSDOS	Corrective	5:11/18	Yes
Palo Alto Tiny Basic	Short Corr	5:5/23	Yes
Pet Monitor (Pome Commuter Center)	Feature	5:3/40	Yes
Processor Tech 4K Basic	Short Corr	5:6/23	Yes
SPACE - TRS-80 Version	Short	5:7/18	Yes
SUPER/80	Short	5:5/18	Yes
SUPER 80 Basic 2.0	Corrective	5:2/27	Yes
Sprint (for the 8080)	Feature	5:12/24	Yes
Terbell Basic	Feature	5:1/23	Yes
Tiny B	Feature	5:1/26	Yes
TRS-80 Level III Basic	Feature	5:11/42	Yes
UCSD Pascal (Five)	Corrective	5:1/26	Yes
SOFTWARE - APPLICATIONS			
Channel Rate Book (for Pet)	Feature	5:3/26	Yes
Checkbook Maintenance (Commodore)	Feature	5:2/135	Yes
CLOAD Magazine	Feature	5:6/26	Yes
Creative Software (for Pet)	Feature	5:11/26	Yes
Data Base Management (Cromemco)	Feature	5:3/12"	Yes
Data Management (DM)	Feature	5:3/29	Yes
Electric Paintbrush - TRS-80	Short	5:6/124	No
File Handler - TRS-80 (Circle)	Short	5:7/118	Yes
Financial Trio-80 (Practical Pet)	Feature	5:11/42	Yes
Instant Software (for Pet)	Corrective	5:1/106	Yes
Interactive Structure	Short	5:5/26	Yes
Library 1 (The Future Itself)	Feature	5:6/28	Yes
Microchess 1.5	Feature	5:1/75	Yes
"	Short	5:2/102	Yes
"	Corrective	5:11/64	Yes
Micro Purple (For TRS-80)	Feature	5:1/38	Yes
Micro Pro Super Sort	Feature	5:7/48	Yes
Misc Software (for Apple)	Corrective	5:1/108	Yes
Name & Phone Index (Structured)	Feature	5:6/71	Yes
Pet Bibliofiler	Feature	5:5/70	Yes
Pet Diagnostics (Commodore)	Feature	5:7/52	Yes
Pet Educational Cassettes (Peninsula School)	Feature	5:5/85	Yes
Pointer (Christianson & Pague)	Feature	5:1/36	Yes
Search Games (Lawson)	Corrective	5:10/62	Yes
Satellite Graphics (Practical)	Feature	5:12/32	Yes
Software Software (for TRS-80)	Short	5:1/28	Yes
Software Software (for Apple)	Corrective	5:1/108	Yes
Starfitter (TRS-80 Creative Corp)	Feature	5:12/86	Yes
TRS-80 Income Info System	Feature	5:3/107	Yes
TRS-80 Pilot Pilotes Package	Feature	5:3/61	Yes
TRS-80 Personal Finance	Short	5:2/103	Yes
Word-Wizard Character Generator (for Pet)	Corrective	5:11/34	Yes
Video Checkers (Commodore)	Feature	5:8/137	Yes
WHISIT Data Base System	Feature	5:8/109	Yes
WORD PROCESSING SYSTEMS AND SOFTWARE			
Auto Scribe	Feature	5:1/28	Yes
Digital Research WP, Inc	Corrective	5:10/60, 5:11/81	Yes
Electric Pencil	Feature	5:2/39	Yes
"	Corrective	5:10/60, 5:11/81	Yes
IFS Word	Feature	5:6/63	Yes
Ohio Scientific WP-1	Feature	5:8/131	Yes
Peachtree Software	Feature	5:8/133	Yes
Peripherals Unlimited	Feature	5:6/86	Yes
Smoke Signal TP-1	Feature	5:1/76	Yes
Technical Systems Consultants WPII, PT	Corrective	5:10/60, 5:11/81	Yes
Text 2000 (Info 2000 Corp)	Feature	5:8/129	Yes
Wordmaster (Micro Mus)	Feature	5:6/60	Yes
Word Master (Polymorphic 8813)	Feature	5:6/36	Yes
Wordsize (TRS)	Feature	5:6/36	Yes
Word Processing Printers	Corrective	5:12/28	Yes
PLOTTERS AND VIDEO GAMES			
Crown Review - Christmas 1977	Short	5:6/38	Yes
- Christmas 1978	Short	5:6/20	Yes
- New Year 1979	Short	5:6/16	Yes
- Christmas 1978	Short	5:11/12	Yes
- New Year 1979 (pt 2)	Short	5:12/17	Yes
Games-Person (Colcew)	Short	5:6/71	Yes
APF M1000 Video Game System	Feature	5:12/28	Yes
Atari Video Pinball	Feature	5:8/35	Yes
Atari Video Computer System	Feature	5:9/37	Yes
1978 Corrective	Feature	5:10/34	Yes
Bomb Chess	Corrective	5:10/61	Yes
Chess Challenger	Feature	5:4/20	Yes
Chess Challenger Level 7	Short	5:6/35	Yes
Code Name: Sector (Sorcerer Prod)	Short	5:6/72	Yes
Core IV (Villar Preview)	Feature	5:6/37	Yes
Computer Backgammon	Corrective	5:5/31	Yes
Electronic Battleship (APF)	Feature	5:3/87	No
Gamemaster II	Corrective	5:6/33	Yes
Mathematician (APF)	Feature	5:2/30	Yes
Pattel Auto Race, Football, Basketball, Soccer (Mattel)	Feature	5:1/27	Yes
Odyssey 200, 300, 400	Feature	5:1/28	Yes
Stock (Villar Preview)	Short	5:6/71	Yes
Speak & Spell, Spelling Bee (TI)	Corrective	5:6/40	Yes
Wizard/Dragon (Curtis)	Short	5:1/73	Yes
Zuzz 119 (Colcew)	Short	5:6/71	Yes
MISCELLANEOUS			
"	Feature	5:1/26	Yes
Bruder Lucie Trainer	Feature	5:9/66	Yes
Cosmic Computer Portrait Series	Feature	5:8/136	Yes
CompuCreate Auto Tutorial	Feature	5:8/132	Yes
Crain 4130 Language Translator	Corrective	5:12/20	Yes
Microsoft Language Translator	Corrective	5:12/20	Yes

Input/ Output

More on Math I-Q

Dear Editor:

I would like to take issue with Howard Berenbon's "What's Your Math IQ?" in the December **Creative Computing.**

First, since the numbers and the patterns are fixed within the program, I wonder why a computer is necessary at all. The same numbers and patterns show up each time; why not just use pencil and paper?

Second, the answers to several problems are questionable:

9) 6 7 9 13 ?

Why is the next number 20 and not 21? It looks as if we're adding powers of 2.

16) 2 6 38 ?

1446, he says, obviously thinking of the equation $x^2 + 2$. Another correct answer is 294, derived from the equation $8x - 10$. Set the equations equal to each other and you'll see why 2 and 6 behave that way. The gaffe could have been avoided by providing another number in the series.

17) 5 9 4 6 8 ?

Why 2?

19) 1 6 41 ?

286 is as legitimate as 1686. Just use $7x - 1$ instead of $x^2 + 5$. See comments for 16).

I won't go into detail about all the mathematically valid answers that can be invented for the problems involving arrays. But please explain why 20 and not 27 is considered correct for:

11) 2 10 4
3 17 5
3 ? 6

Top row totals 16; middle row, 25; bottom row, 36?

"What's Your Math IQ?" is at best naive, for it tests neither mathematics nor IQ. What you're doing, as David Page used to say, is mindreading, not mathematics.

Phyllis Klein
117 Church Street
Watertown, MA 02172

In retrospect, I have to agree with your analysis of the article. I would also opt for an answer of 21 to (9), although Mr. Berenbon is apparently using the formula 2X – 5. The solution to problem 11 is derived from the formula: Col. 2 = Col. 1 × Col. 3 + 2. *Normally, a good array problem should have mathematical relationships in two directions. This one could but does not and, hence, is a very poor problem.*

A much better and reasonably valid IQ test with math, verbal and spatial items which does take full advantage of the computer is the one offered by **Creative Computing Software.** *It's for the Level II TRS-80 and costs $24.95. The timer and scoring for different ages are built in. Also the correct answers are buried deep in machine code so the user can't cheat by looking at a listing of the program. —DHA*

Noticeable Discontinuity

Dear Editor:

One of the many features of **Creative Computing** that I enjoy is the short articles describing user's experience with various programs or products. Several programs I own (or don't own!) were acquired or rejected as a result of reading these.

Typical of these articles is the one in the January issue describing 'Micro Music,' the Radio Shack music program. Like Mr. Wright, I have wasted many happy hours with this when I really ought to have been doing other things (like writing my own programs).

For Mr. Wright's benefit, or for anyone else who has had his problems with trying to play only part of a composition, there is a way to do this. The program contains a "repeat" feature, whereby a passage may be repeated n times by enclosing it in parentheses, with the number 'n' immediately after the left parenthesis. Further, there is a feature for skipping over the last part of the last repetition, to provide an alternative ending. Combining these two features, one encloses the passage one does not want to hear in parentheses, with the repeat count at 1, and use the 'skip' feature applied to the whole passage.

My pet annoyance with this program is its inability to sustain notes for periods other than those expressible by normal musical notes. I seem to be beset by nine beat notes; the program documentation claims that this can be done by writing successively 2 four beat notes and a single beat note, but there is a noticeable discontinuity between them. Any answers to this problem will be gratefully accepted.

R. J. Lighton
475 Columbia Blvd.
Wood-Ridge, NJ 07075

More Heath Surprises

Dear Editor:

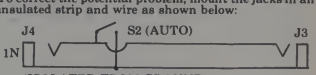
Regarding the articles on Heath Surprises, Dec 1979 **Creative Computing:** all 55 Heathkit Electronics Centers, *DO* sell and service the WH-89 & WHS-11-A. We sell and service all Heath Kit and Assembled Computer products, as well as Heath Recommended computer accessories and printers.

William C. Halpin, Manager
Heathkit Electronic Center
10133 Springfield Pike
Woodlawn, OH 45215

TRS-80 Data Monitor Fix

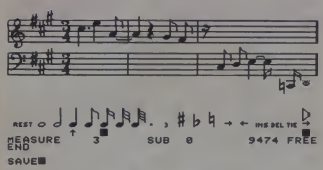
Dear Editor:

I think I should point out a potential problem in the TRS-80 data monitor featured in your September 1979 issue (p. 112). If your readers design that hardware as shown they will blow the power supply diodes out of their tape recorders. At least as far as the CTR-80 recorder goes, the remote jack interrupts the battery side of the motor. The schematic shown in your issue shows connecting to ground — shorting out the 6-volt supply. To correct the potential problem, mount the jacks in an insulated strip and wire as shown below:

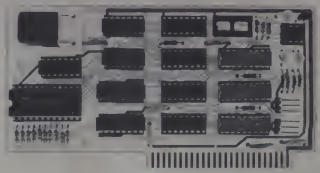


Roger P. Wells
1008 Kehoe Drive
St. Charles, IL 60174

APPLE MUSIC



MUSIC ENTRY SCREEN



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ADVANCED FEATURES

With ALF's Entry program, you can quickly and easily insert, change, and delete notes; add new parts (up to nine); change time and key signatures; repeat sections or make "rounds"; and change sound parameters at any point in the song.

QUALITY

ALF has been selling personal computer synthesizers longer than anyone else. We won't settle for anything less than top quality.

HARDWARE

Our three-voice (model 10-5-16) synthesizer was the first Apple-compatible music product and is still the most advanced music synthesizer available for the Apple II computer. It simply plugs into your Apple and your home stereo system—complete Integer BASIC software is provided (Applesoft versions available at slight extra cost).

Suggested list price: **$265.00**

SEE IT AT YOUR LOCAL APPLE DEALER.

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the leader in computer music

In the Same Boat

Dear Editor:

A letter of thanks for presenting the super well done article on buying printers by Ahl and North. The satire, unsinkable spirit and byte your tongue style was very enjoyable.

I'm sure that I can speak for all of your subscribers in my reaction to the gutsiness of the report. Surely you are going to pay a high price in hostile advertisers for performing this very valuable service for your readers.

We, the printer-to-be buyers, thank you from the very bottom of our well worn wallets! The treatment you received was really incredible! All along we thought it only happened to private individuals, now we know that Creative Computing is REAL PEOPLE.

A. Douglas Werbeck
Maywood Fish Farms
P.O. Box 787
Ruskin, FL 33570

Indeed the article did cost us two advertisers. We hope that eventually they'll return to these pages.

About a week after the article was typeset and laid out, the Selectraterm (Selectra-Print) again failed and we sent it back to Micro Computer Devices in Anaheim for repair. Their service was reasonably prompt (two weeks turnaround) and courteous.

Interestingly, the two printers which gave us the most trouble, the Qume and Selectraterm, now tend to be the printers of choice for correspondence and reports. Once finally fixed, they are quite reliable. Had our original units been in good adjustment when they arrived our story would have been quite different.

—DHA

Tick Tock for the TRS-80 Clock

Dear Editor:

As an avid investigator of my TRS-80's special features I have found a neat addition to the TRS-80 graphics clock (CC Oct 1979).

A short bleep — buzz can be heard through the computer keyboard with these four new lines and one small change.

The sound is a result of the special out port command (PORT 255).

Here are the changes to be made:

Line #	Statement
1	U1=1
281	IF U1=1 THEN OUT 255, 3
282	IF U1=(-1) THEN OUT 255, 4
283	U1=U1*(-1)
one small change 30	DEFFINT A-T: DEFFINT V-Z:T=10:?

Although these sounds are not extremely loud it does make the clock a little more realistic. Another idea would be to use these two ports to create a personal alarm clock. All you do is record your wake up call on cassette, add these two out ports in the program and the computer does the rest. Make sure a timing loop is placed around the first port so the machine plays the tape long enough for the whole message. The two out ports are:

OUT 255,1 (TURNS CASSETTE ON)
OUT 255,2 (TURNS CASSETTE OFF)

The main flaw is leaving the machine on throughout the night resulting in an electric bill that will surely open your eyes.

Mark Spindel
39 Wynmor Road
Scarsdale, NY 10483

WP Printers Review

Dear Editor:

I was very interested by your article on purchasing word processing printers. I have also had some unpleasant relationships with the Qume people, but not as bad as yours. I recommended to the department that we buy a good quality printer to use in conjunction with our DEC 2050 system, and Qume was a little cheaper than Xerox and Diablo, so we ordered one from an Eastern distributor. It was highly recommended, but when it arrived it wouldn't work, and we didn't feel like trying to fix it ourselves. We called the distributor and he informed us there was no local service available. We called the manufacturer and they said the same thing. To make a long story short we sent it to the manufacturer and told them to keep it.

Then we started looking around to find a printer *with local service!* Xerox guaranteed local service *if and only if* we bought the unit from their distributor, not a cut-price mailorder outfit. So we bought from them; $3,500 for a Xerox 1720 Communications Terminal. It has had heavy service for over 6 months now and has given us quality output with a minimum of problems. The only service call was handled the same day, to replace a broken plastic clip which holds the ribbon cassette in place. I have been running it at 300 baud over an acoustic coupler so I haven't pushed to its maximum print rate (50 cps) but I can't complain about performance at 30 cps.

I do have one comment about *quality*, however, and you may notice the same thing with your Qume. It is that the plastic daisywheels seem to deteriorate rapidly. At first, when the characters began to have blank spots I thought the wheel was dirty and cleaned it. This had no effect on print quality so I took a look at the wheel with a loupe and noticed that portions of the letters were just gone. My only solution to date is to buy a couple of spare wheels and keep one hidden for use when I want highest quality output. Xerox brochures illustrate metal daisywheels, but so far none are available for my printer.

Jay Hansche
Tulane University
Dept. of Psychology
New Orleans, LA 70118

Donate a Computer

Dear Editor:

I am a Presbyterian minister, currently serving my second small rural congregation. Although I took a few programming courses in high school and college, and have kept up with developments through the years, I have not had the opportunity for any hands-on experience in years. Having decided to make a career of serving small churches I have despaired of ever having the use of a computer in my ministry. It's a pity, too, because there are so many things a computer could do in a church: lift some of the burden from volunteer treasurers, make sense of a chaotic but valuable library of tapes, notes and papers; prepare newsletters — from composing to sorting by zip-code — in an afternoon; and just think of the educational games, especially with graphics and sound!

It finally struck me that whenever the church has needed something she couldn't afford, she has always begged. I hope that as your readers upgrade their systems they will consider donating the unwanted hardware to a church instead of selling it. The clergy of most main line churches are highly educated and would be able to put a suitable system to good use. Donations to churches are, of course, deductible. Thank you for your help, and for your fascinating magazine.

Dr. Mark C. Russell
Williamson Memorial Presbyterian Church
Rt. 1, Box 371
Ringgold, VA 24586

Help in Digging Out Password?

Dear Editor:

I recently purchased an expensive business software package from Software 80 in Fountain Valley, CA for my TRS-80. I received it with promises of free programming adjustments and a protection guarantee was required to be signed prior to release of the password for backup usage. Upon returning the signed protection, it was found the company had folded its tents and stolen away with no forwarding address. Is there any way that I can debug the program to find the password, so I can use the program? Do you have any knowledge of the company's present location?

Wm. J. Duxbury, MD
1401 Washington Street
Kingsburg, CA 93631

We don't know of their whereabouts and were under the impression the postal authorities would be hot on their trail by now. Perhaps you should check with your local postal inspector and see if an investigation is under way. —JC

More on the Battle

Dear Editor:

With regard to "Battle of the Assemblers" by Rod Hallen (Dec 79), one glaring error should be corrected: ASM from Digital Research will indeed page through large files!

Actually, most disk-based assemblers page through files, symbol table space is normally the limiting factor in large programs. I have personally used ASM to assemble 50K source files containing 6 or 7 hundred labels, doing so in a 32K CP/M system.

Not having used the other assemblers, I cannot make comparisons, but some features of ASM which I particularly appreciate are:

1) Multiple instructions per line using ! as a delimiter;

```
PUSH B! PUSH D! PUSH H or RRC! RRC! RRC! RRC
```

can be used to group trivial operations and shorten listings.

2) Labels may be as long as 16 characters; OUTPUTBUFFER is a legitimate label (this does, of course, consume additional symbol table space).

3) Arithmetic expressions such as:

```
NEWNUMBER EQU -((PAGEWIDTH-1)/
NWORDS)*2*(START-3))
```

can be evaluated, assuming the internal labels are defined; 2 & 3 are of considerable value in making a program "self documenting."

4) TAB (control I) is accepted through most CP/M software to establish 8 column increments formatting source listings and effectively "space compressing" the files.

5) ASM uses hashing for symbol searches and binary searches on reserve words making this a very fast running assembler.

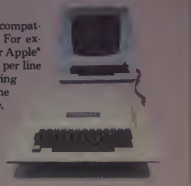
Admittedly, the ASM manual is strictly for computer freaks — Digital Research seems to have put much more effort into the documentation of MAC, their 8080 Macroassembler (which relieves some of the shortcomings of ASM). One should note also that "PIP," the Peripheral Interchange Program in the CP/M operating system allows specification of lines per page and truncation of lines to a specified width when directing output to a printer.

David W. Thomas
P.O. Box 235
Lederach, PA 19450

Why not kill two birds with one stone?

If you have an Apple* and you want to interface it with parallel and serial devices, we have a board for you that will do both. It's the AIO.™

Serial Interface.



The RS-232 standard assures maximum compatibility with a variety of serial devices. For example, with the AIO you can connect your Apple* to a video terminal to get 80 characters per line instead of 40, a modem to use time-sharing services, or a printer for hard copy. The serial interface is software programmable, features three handshaking lines, and includes a rotary switch to select from 7 standard baud rates. On-board firmware provides a powerful driver routine so you won't need to write any software to utilize the interface.

Parallel Interface.

This interface can be used to connect your Apple* to a variety of parallel printers. The programmable I/O ports have enough lines to handle two printers simultaneously with handshaking control. The users manual includes a software listing for controlling parallel printers or, if you prefer, a parallel driver routine is available in firmware as an option. And printing is only one application for this general purpose parallel interface.

Two boards in one.

The AIO is the only board on the market that can interface the Apple to both serial and parallel devices. It can even do both at the same time. That's the kind of innovative design and solid value that's been going into SSM products since the beginning of personal computing. The price, including PROMs and cables, is $135 in kit form, or $175 assembled and tested. See the AIO at your local computer store or contact us for more information.

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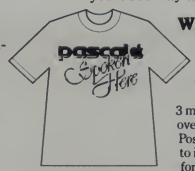
Like Pascal.

Apple II is one of the few personal computers that has it. And when you turn this page and feast your eyes on the many advantages this high level, general-purpose language has to offer, you'll see why that's very good news indeed.



When you've got it, flaunt it.

If you'd like to let the world know who speaks Pascal, here's how:

Follow the dotted line and cut out the transfer image above.

Preheat iron (dry-wool setting) for 3 minutes. Slip garment on ironing board over scrap material. Remove wrinkles. Position transfer face down and pin edges to ironing board cover. Iron transfer slowly for one minute. If paper browns, iron is too hot. Let transfer cool for one minute, then unpin and slowly pull transfer straight up. Results are best when t-shirt is at least 50% polyester.

Pascal by the package.

Our high-level, full feature Language System consists of a plug-in 16K RAM language card, five diskettes containing Pascal as well as Integer BASIC and Applesoft extended BASIC, plus seven manuals documenting the three languages.

The beauty of this Language System is that it speeds up execution and helps cut unwieldy software development jobs down to size. Also, because the languages are on diskette, loaded into RAM, you can quickly and economically take advantage of upgrades and new languages as they're introduced.

Apple's Pascal language takes full advantage of Apple high resolution and color graphics, analog input and sound generation capabilities. It turns the Apple into the lowest priced, highest powered Pascal system on the market. With Pascal, programs can be written, debugged and executed in just one-third the time required for equivalent BASIC programs. With just one-third the memory.

On top of that, Pascal is easy to understand, elegant and able to handle advanced applications. It allows one programmer to pick up where another left off with minimal chance of foul up.

Because Apple uses UCSD Pascal,™ you get a complete software system: Editor, Assembler, Compiler, and File Handler. And because we adhere to the standard, your programs run on any UCSD Pascal system with minimum conversion. Which is really something an enthusiast can get enthusiastic about.

To be more specific.

The Apple II's specs are tempting enough without the Language System and Pascal. With them, they're downright irresistible.

The text screen, a 24 x 40-line window, can display an entire 80-column Pascal line, thanks to Apple's unique horizontal scrolling feature.

Characters are normal, inverse or flashing, 5 x 7, upper case. Full cursor control is standard.

Since Pascal runs on an Apple computer with 48K bytes of on-board RAM, the additional 16K bytes on the language card bring the total to a full 64K bytes.

And, Pascal runs on the new Apple II Plus. It features an Auto-Start ROM that boots the Disk II at power-on for turn-key operation. Applesoft extended BASIC is resident in ROM.

Standard color graphics (in the BASIC environment) offer 40h x 48v resolution, or 40h x 40v with 4 lines text, in fifteen colors.

Black/white high resolution, bit-mapped graphics display 8K bytes of memory as a 280h x 192v image (140h x 192v in six colors).

Fully buffered peripheral connectors provide access to all system buses, for complete interface freedom.

And finally, since it weighs a mere 11 lbs. and has its own travel case, as an option, not only is it easy to get carried away with an Apple, it's easy to carry one away.

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800-538-9696. (In California, 800-662-9238.) Or write us at 10260 Bandley Drive, Cupertino, California 95014. When you contact us, we'll give you the name, address and telephone number of the Apple computer dealer nearest you.

If you'd like more information on the advantages of owning an Apple personal computer, he can fill you in. Personally.

apple computer

Texas Instruments 99/4 Home Computer

Steve North

After more than the usual amount of hoopla, the new Texas Instruments home computer finally arrived. Naturally, the appearance of a leading consumer electronics manufacturer's first home computer is somewhat of a Happening, and another sign that the personal computer field is no longer in its infancy. However in this case "industry analysts" got a bit carried away with outrageous predictions. The TI 99/4 does **not** have a tiny IBM 370/168 inside it (would anyone really want one?) It does **not** run MVS and a PL/I language compiler (translation: very big computer software), or even Pascal, but just regular Basic like most other home computers. It does not even use TI's bubble memory technology. Still, the TI 99/4 is one of the most easy-to-use systems we've tested, and seems like another progressive step in making home computers more civilized.

Are PEEK, POKE and CALL not included in TI Basic to protect the user from potentially dangerous stuff or to help sell solid state software modules?

The 99/4 consists of a keyboard/computer unit, and a color video monitor which displays very sharp and bright graphics, better than a connection to a household TV set could provide. It is well known that Texas Instruments was unable to obtain permission to manufacture a computer with a built-in RF modulator for TV hookup when the 99/4 was designed, and so it was necessary to incorporate a separate color monitor which pushes the price over $1000. (Although one can understand why this price was necessary, it is still beyond the grasp of Middle America.) Now that the necessary waiver has been obtained T.I. is expected to introduce a less expensive version of the 99/4 without a monitor. The discriminating buyer may still prefer the higher quality graphics which the color monitor provides.

The 99/4 has a full-sized keyboard in almost-standard layout. Unfortunately the keys are calculator-style buttons which are OK for hunt-and-peck typists but not for touch typists. It is difficult to understand why people who design home computers think that

the keyboard is the best place to economize. Have you ever seen an electric typewriter or CRT terminal with an el cheapo keyboard?

To the right of the keyboard, the 99/4 has a slot for plugging in "Solid State Software" modules, which contain prewritten non-erasable programs. These allow the user to run canned software without the time and aggravation spent loading cassettes. There are connections for joysticks and a cassette recorder, as well as an expansion connector, presumably for floppy disk storage units. None of these were tested with the unit. The 99/4 has polyphonic sound capabilities and has 16K of internal random-access memory.

The 99/4 belongs to the very exclusive class of computers which we were able to get up and running without a single adjustment. (In this case we did not even read the documentation until we were about to turn the system on, and then had second thoughts.) When the computer is turned on, it displays a menu listing three programs: T.I. Basic, an Equation Calculator, and the program in the Solid State Software module presently plugged in, given by name (such as Football or Early Learning Fun).

The Equation Calculator allows one to do simple calculator-style

TI 99/4, cont'd . . .

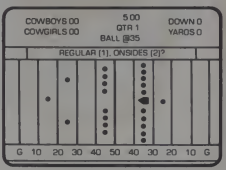
computations without knowing any programming. In addition to finding the value of simple expressions (like 2 + 3* 4/5) it can also save intermediate results in variables, shown graphically in a box so you can know the contents of all the variables all the time. This makes the Equation Calculator somewhat more powerful than a handheld calculator. It's a nice feature for someone who doesn't want to get involved with Basic but it doesn't justify the price of the system.

The 99/4 belongs to the very exclusive class of computers which we were able to get up and running without a single adjustment.

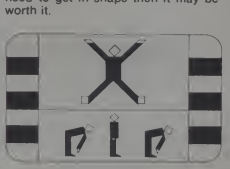
T.I. Basic was written by the microcomputer system software house *par excellence*, Microsoft. It was apparently written to T.I.'s specs and is not compatible with the many other Microsoft Basic implementations, such as TRS-80 Level II, Applesoft, OSI Basic, Commodore PET Basic and many others. In contrast, T.I. Basic is nice for learning and generally does not sacrifice much of the power other versions have. For example, it has user-defined functions, character string handling, string arrays, data files, a trace mode and breakpointing. However, T.I. has obviously designed this Basic to prevent the user from getting at machine level functions, so the friendly PEEK, POKE and machine language CALL functions are conspicuous by their absence. It's hard to say exactly why this was done (to protect the user from complicated and potentially dangerous stuff? To help sell Solid State Software modules by making that the only way to get fast-running machine language programs into the machine?). T.I. Basic also does not allow access to the full power of the color graphics point-plotting hardware, with its 192x256 resolution. However, the user is allowed to define his own character fonts by means of an intrinsic function, and can use these indirectly to control individual pixels on the screen. Basic also has intrinsics for controlling the display color, examining what's on the screen, creating musical tones and testing the keyboard status. In general, this looks like a very nice Basic to learn with, and is very complete except in these two areas (machine level interface and graphics).

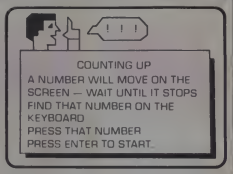
The documentation which comes with the 99/4 includes **Beginner's BASIC, Programming BASIC with the TI Home Computer,** and a User's Reference Guide which is also mostly about Basic though it does explain the Equation Calculator and how to look up the computer.

The Solid State Software modules we tried represent a wide range of possible applications for the 99/4. The software staph (yes, it is a disease) seemed to prefer Football. This is a two-player game in which each player enters a play secretly and then the offensive and defensive plays are executed graphically by the computer and the result shown. Although it was remarked that the game seemed to work by using a table of probabilities and the same thing could be done with a $2.98 plastic spinner, this did not seem to dampen interest in the game too much.

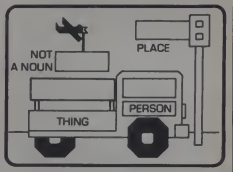


The Physical Fitness cartridge is designed to lead you in an exercise program customized somewhat to your own ability and needs. (The program tries to make sure that you have read the accompanying documentation, presumably to prevent too many lawsuits over heart attacks and that kind of undesirable thing.) Again, the reviewers began to wonder why anyone would spend $1150 (computer) and $30 (cartridge) to see a little man jump up and down on the screen, but if that's the kind of motivation you need to get in shape then it may be worth it.





The two CAI packages tested (Early Learning Fun and Beginning Grammar) were both well-designed and seemed able to hold a child's attention unusually well. These programs incorporate very nice graphics, sound effects and error trapping. For instance, one lesson asks the student which word in a sentence is a pronoun. The program simply will not let the student type in a word which isn't in the sentence. Unlike many CAI programs, a correct answer is rewarded by graphics and sound whereas an incorrect answer receives no reward. The programs are well-designed to reinforce learning and keep the child from getting bored quickly.



The computer jocks who have seen the 99/4 are almost invariably unimpressed. "Why, it doesn't run CP/M or UNIX or have a macro-assembler!" But they forget that the 99/4 is designed as a consumer product and as such it is perhaps the only machine of its type. If you know a great deal about computers and want to have one that is best described as a scale model of the one you have at work or school, then this isn't for you. If you are new to computing and want something you can plug in and use right away, with the intent of learning more, then this computer is worth your consideration. Some T.I. 99/4 users will outgrow the capabilities of the present system, but we expect T.I. to introduce new peripherals and software for the unit to match the increasing sophistication of its owners. □

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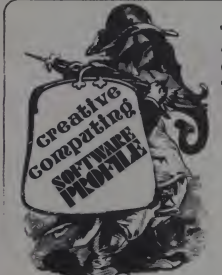

A comprehensive review of two new COBOL compilers for microcomputer systems.

Microsoft vs. Micro Focus Cobol

James McClure

With each passing day, more high quality software is becoming available to the microcomputer owner. Languages which were previously available only on large mainframes or on expensive minicomputers are now appearing in the micro-marketplace. Cobol is an example of one of the new languages available for small machines and two new significant entries in the market are: Cobol-80, from Microsoft, and CIS Cobol from Micro Focus, a British company. Both of these languages will run on any 8080/Z-80 microcomputer with the CP/M operating system, provided that adequate storage resources are available.

Requirements of resident and mass storage are stringent. The CIS Compact Cobol compiler can compile and run programs in 32K, but both Microsoft and Micro Focus standard compilers require at least 48K. In addition, Micro Focus recommends the use of dual full sized disks, ideally double density types. If speed is critical, or if programs requiring large resident storage are being run, fully expanded memory (64k) is also desirable. Programs can be segmented (in CIS Cobol) to run in minimal core, but doing so decreases the speed of execution, since segments must be continually loaded from disk. Furthermore, two useful Micro Focus utility programs, FORMS and INDEX both require 64K for operation.

Introduction to Cobol

Cobol stands for the COmmon Business Oriented Language and its development was initiated by the US Government in the 1950's when it decided that some standard language for its various installations should be developed. Since that time Cobol has become the universal business computer language and is now used on almost every major computer in the country which performs business processing. In 1974, the American National Standards Institute defined a standard for the implementation of Cobol and this standard has been followed by Microsoft and Micro Focus in developing their language systems.

Languages which were previously available only on large mainframes or on expensive minicomputers are now appearing in the micro-marketplace.

Although most microcomputer owners are probably not well versed in Cobol, this language has many features which are perfect for personal computing. Databases are becoming more popular among microcomputer users and most are complex programs (usually in Basic or assembly code) which allow the quick storage and recall of information. Cobol has many of these data storage/retrieval capabilities built-in, in addition to extensive formatting features, which most other languages can only imitate. It is also the most English-like of the major computer languages (Basic, Fortran, Pascal, etc). Due to this, it is often easier to learn than more scientifically oriented languages which may require large numbers of confusing symbols and inconsistent syntax.

One of the major disadvantages of the industry emphasis on Basic is that many people have become content with its often limited capabilities. One must keep in mind that the primary reason Basic has been installed on so many micro systems is that it is a relatively easy language to implement in the microprocessor environment. Now that more attention is being paid to software, particularly software for the average person's use, other, more powerful, language systems are being created. The Cobol compilers that will be considered in this article are examples of such systems.

One of the potential drawbacks of Cobol has always been its requirement of large memory and mass storage space. In today's market, however, memory and disk prices have dropped significantly and adequate storage should not be too difficult to obtain; furthermore, the cost of this extra storage is offset by the time and money saved by being able to use a much more powerful programming system.

In short, Cobol is an excellent language for the business which owns a microcomputer, since it is the unchallenged standard in business programming. Cobol programmers are plentiful, and applications programs written in Cobol will be simpler to develop and modify. Cobol is also a good choice for the average personal computer owner because of its power. Limiting factors will be the amount of available storage and the amount of money the computer owner is willing to spend for the language.

Language Features

The American National Standards

STRING	SEARCH	Condition Names	COMPUTE
UNSTRING	SEARCH ALL	(Level 88)	PERFORM/VARYING

FIGURE 1. Microsoft Level 2 Nucleus features

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Cobol, cont'd . . . .

Institute broke the Cobol language up into 12 programming areas, called modules. These modules comprise file I/O, debugging, etc. Each module was defined at two levels: Level 1 and Level 2. If a module of Cobol was to be implemented to conform to Level 1, it had to allow a certain set of features. A Level 2 implementation of the same module would allow even more features. Thus, a standard was devised so software manufacturers would have some guidelines for implementing their versions of Cobol.

1. Nucleus Module

This module contains the central command set of Cobol. Both Microsoft and Micro Focus compilers implement the nucleus module to Level 1. However, Microsoft has also implemented several advanced Level 2 nucleus features, such as COMPUTE and

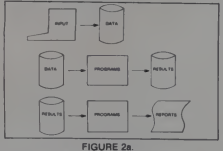

FIGURE 2a.
Mainframe data processing cycle.

SEARCH. A complete list is shown in Figure 1.

One disappointing limitation of Micro Focus Cobol is that condition names (level 88) are not supported. These generally make for more readable programs, and some difficulty may be encountered in adapting mainframe Cobol programs to run in CIS Cobol if condition names are used frequently.

COMMUNICATION WITH VIDEO TERMINALS

There is one major difference between the Cobol language as implemented on big mainframes, and the Cobol required for efficient use on microcomputers. Large systems generally process their data in batch fashion. Information is stored in massive quantities on cards, tapes and disks. Programs are written to process this data and write the results to disks, tapes and printers. Thus, a typical processing cycle looks like Figure 2a.

On small systems, the situation is quite different. Much smaller amounts of data are processed and cards, magnetic tape and other mass storage devices are not used. Therefore, data is typically processed as it is input and a report is either immediately generated or the information is stored for later use. A typical small-system cycle is shown in Figure 2b.

The difference between these two cycles lies in the form in which the applications programs expect the incoming data: on a large system, it is stored in sequential form on mass storage devices, whereas on a small system, data is usually obtained directly from an operator at an input terminal. Obviously, two different techniques must be used to acquire the data. The terminal operator requires guidance in the form of prompts and messages so that the data is input correctly. In other words, the small computer must interact with its users to a much greater extent. This is made possible in the Microsoft and Micro Focus Cobol compilers by the extension of the nucleus ACCEPT and DISPLAY verbs, two commands that had traditionally been largely ignored on big systems because of their inapplicability. The ACCEPT and DISPLAY verbs allow the transfer of data to/from the console much like the PRINT and INPUT commands of Basic. These Basic commands only transfer data, without any formatting, and this has been a major shortcoming.

Basically, two extensions were made to ACCEPT and DISPLAY. To accommodate the new generation of intelligent video terminals with addressable cursors and other advanced features, both Microsoft and Micro Focus extended the verbs so that a screen position at which the data transfer is to take place can be specified. Thus it is possible to set up forms on the display with different areas of the screen used for different input items. Form-oriented input has been shown to be effective in reducing data entry errors. For an example of a typical form, see Figure 3.

The second extension made to ACCEPT and DISPLAY has to do with the concept of one 'record.' A file is

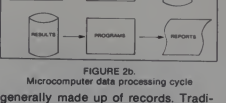

FIGURE 2b.
Microcomputer data processing cycle

generally made up of records. Traditionally, one record has corresponded to one card, or one line on a display device. Since ACCEPT and DISPLAY manipulate one record at a time they could only be used to read or write one line to/from the console. This posed some severe limitations on form-oriented input, since a form for one record could take up many lines on a display. To solve this problem, Micro Focus further extended ACCEPT and DISPLAY to allow the transfer of up to a full screen (24 lines) of data at a time. Thus, the user simply defines display records containing all of the necessary input fields and prompts. This extension makes processing even the most complicated display forms a snap, and is perhaps the best of all the extensions made to microcomputer Cobol.

Although most microcomputer owners are probably not well versed in Cobol, this language has many features which are perfect for personal computing.

PRINTER OPERATION

Both Microsoft and Micro Focus support a line printer, although Microsoft implements a LINAGE clause which allows the programmer to specify how many lines will be printed on each page, as well as the size of top and bottom margins and the location of a footing area. A data item called LINAGE-COUNTER is also automatically created. It contains the number of the next line to be printed. The WRITE statement associated with a printer file may optionally specify action to be taken if the end of the page is reached (such as the printing of heading information on the next page). These features remove much of the burden of report writing from programmers, allowing them to concentrate on data processing.

2. Table Handling Module

The table handling module is second in the list of Cobol language modules. Both compilers implement this module to Level 1, but Microsoft has also implemented several Level 2 features.

The standard Cobol language is equipped with facilities to define and process lists or tables of data. This is very similar to the ARRAY data structure in other languages. According to the ANSI standard, Cobol permits tables to have up to three dimensions. Micro Focus Cobol has removed this restriction and allows a virtually unlimited number of dimensions.

Two commands are useful in processing tables: SEARCH and PERFORM VARYING.

SEARCH is used to locate a particular item in a table, and can take

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one of two forms: SEARCH, and SEARCH ALL. The first form performs a linear search through the table until a specified condition is fulfilled. (Usually, the condition has to do with whether the desired table element has been found or not.) This is useful with tables of randomly ordered data, such as a list of names.

The second form, SEARCH ALL, performs a binary search on a table of ordered data. It is not necessary to understand the mechanics of the search; the important difference is that a binary search takes, on the average, much less time to locate a table element. There is one restriction: the table elements must be arranged in ascending or descending order according to the field that is being searched for. To give an example, SEARCH ALL would work well on a table of alphabetically sorted names.

The second command useful in table processing is PERFORM VARYING. This executes a given procedure while varying a data item from an initial value by a specific increment until a given condition is met. This is convenient for use with tables since the data item can be a subscript. See Figure 4a and 4b for examples.

Of the previously mentioned commands, Microsoft implements all and Micro Focus does not implement SEARCH, SEARCH ALL or PERFORM VARYING. This is unfortunate; however, SEARCH and PERFORM VARYING can be easily simulated using combinations of other commands, albeit inconveniently. The SEARCH ALL form, however, cannot be easily simulated and is useful in processing large tables where a sequential search might be too time-consuming. Fortunately, for the average personal computer owner, large data tables are not terribly common given the small available memory of a microcomputer after allocating space for the operating system and run time package. Therefore, the need for the SEARCH ALL command does not often arise. Nevertheless, it would be appreciated if Micro Focus would give some thought to implementing all of these absent features in future compiler versions.

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3-5. Sequential, Relative and Indexed I/O Modules

One of the most powerful features of Cobol, besides its formatting capabilities, is its file handling system and both the Microsoft and Micro Focus compilers are good implementations in this area. Both compilers support the full Level 1 specifications for file processing, and both include some Level 2 features. Basically, three methods of file storage are available: Sequential, Relative and Indexed Sequential.

Two types of sequential files are available on both compilers: standard sequential and line-oriented files. Normal sequential files consist of records of fixed length. Line oriented files consist of records of variable length, each terminated by a carriage return and line feed (such files are generally produced by text editors). Since both Cobols can read and write line oriented files, it is possible to use a text editor to prepare and alter data operated on by Cobol programs. This adds extra flexibility in the case where only a small amount of data is to be processed and it would be easier to use existing text editing facilities to enter the information into a file rather than to write a Cobol program to perform the data-input process. Also, reports can be directed to a file for later printing whereas, previously, such a file could not be directly listed.

```
School enrollment record:

Student name        <                        >
Address             <                    >
City, State, Zip    <                 ,      >
Telephone           <        >
Menu selections:

Recall record               < >
Edit record                 < >
Delete record               < >
Append record               < >
Stop                        < >
```

FIGURE 3.
A typical CRT form for use with CIS COBOL.

One of the major disadvantages of the industry emphasis on Basic is that many people have become content with its often limited capabilities.

The second type of file mode available is relative. This corresponds closely to the 'random-access' file capability of many Basics. Relative files consist of fixed length records which may be read or written by specifying the position of the desired record. Thus it is possible for a program to retrieve, modify and rewrite the fourth record in a file without reading through any other records.

The final and most powerful file mode is the Indexed Sequential mode. Indexed sequential files consist of fixed length records which may be read or written by specifying the contents of one of the fields on the record. The field which is specified is called the key field. The computer stores records so that if the value of the key field is known the record can be retrieved. On big systems it is possible to have several key fields; however, both Microsoft and Micro Focus require that only one field in a record be declared as the key field.

6. Interprogram Communication Module & Segmentation Module

A valuable feature of CIS Cobol is the fact that it supports full Level 2 interprogram communication and program segmentation. In essence, this provides the user with complete mechanisms for breaking up programs so they can run in limited memory, a feature obviously desirable on microcomputers whose processors can address a maximum of 64K. The fact that programs can be segmented and/or chained together permits execution of routines with virtually no restrictions on size. These features do not exist in standard Microsoft Cobol, although the Reference Manual states that other versions are available with Level 1 implementation of Segmentation.

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7. Library Module

Both the Microsoft and Micro Focus compilers support the Level 1 specifications for the Library Module. No Level 2 features are included in either language system. Basically, the Library Module allows Cobol program text stored in disk files to be copied into another program as it is being compiled.

8. Communication Module

Neither Cobol-80 nor CIS Cobol supports the communications module, as it is not feasible in the microcomputer environment.

9. Debug Module

Special debugging commands are available in both CIS and Microsoft Cobol, in place of the standard Cobol debugging module.

Both compilers implement 'debugging lines' with the letter 'D' in column 7. These lines are compiled only if the phrase 'WITH DEBUGGING' is included in the program; otherwise, they are ignored.

Microsoft has also implemented two new commands: READY TRACE and RESET TRACE. When the first is executed, all subsequently executed paragraph-names are printed at the console, to allow program flow to be monitored. Upon execution of RESET TRACE the trace mode is switched off and program execution continues normally.

Micro Focus has taken a different approach including a fully interactive debugging package. This package can be loaded with the desired program at run time and allows single stepping, memory display and alteration, as well as a host of other convenient features too numerous to be discussed here. This is the missing link in most high level language systems, since the programmer must be able to dissect a program as it is running.

There are two disadvantages to the CIS interactive debugger. Some extra memory (not much) is consumed by the debug program, and this may limit its effectiveness with very large Cobol programs. Also, the debugger is not symbolic; all references to data items and statement/paragraph locations are in the form of hexadecimal values. These values must be obtained from a compiler listing of the program under test.

Despite these two inconveniences, the CIS Cobol debugging package represents an extremely significant advantage over the Microsoft Cobol debugging mechanisms, and this fact should be considered when choosing between the compilers.

10. Report-Writer Module

The Report-Writer module provides for quick and easy generation of all forms of printed reports. However, both Microsoft and Micro Focus have chosen not to implement this module so that other more valuable features could be included. Needless to say, with a little extra work professional-looking reports can be generated without this module.

12. Sort/Merge Module

Neither Microsoft or Micro Focus Cobol implement the SORT/MERGE module, although Microsoft does claim to have this feature available in some special versions. The Micro Focus Manual suggests an interesting way to circumvent the lack of SORT/MERGE in CIS Cobol. The information may be entered in scrambled order into an indexed sequential file and read back out in sorted order. While not an ideal solution, this procedure works well and should take care of many smaller sort jobs. For larger needs, powerful stand-alone sort programs are available from many vendors.

Operation of the Compilers

Both of the Cobol systems are implemented as compilers. Basically, this means that programs are prepared beforehand using a text editor, translated into an intermediate code by the Cobol compiler, and executed by a run time system which interprets the intermediate code and performs the necessary operations at the machine level. It would seem, then, that running a Cobol program requires only three steps: write, compile and execute. With Micro Focus Cobol this is true. However, the Microsoft system requires an additional step before the program can be executed. This comes from the fact that the output of the compiler is not in 'ready to run' format; rather, the compiler produces a relocatable binary file which is missing the run time monitor and other system subroutines. The monitor and subroutines are supplied by another program called a linker, which reads the relocatable file and fills in the necessary pieces. This adds a certain amount of flexibility at the machine level, since the programmer has more control over the location and arrangement of the parts of the compiled program; however, a fairly steep price is paid in terms of speed and convenience since the linking process is rather slow. Admittedly, the ability to rearrange program code and to easily combine programs written in other languages with ones written in Cobol can be helpful at times particularly for unusual applications or for situations where memory must be carefully allocated. However, in my opinion, the Micro Focus approach is preferable for the average micro system since programmers will be mainly interested in applying the computer to general problems and less interested in the operation of the programs at the machine level.

The small computer must interact with its users to a much greater extent.

```
PERFORM GET-ITEM
    VARYING ITEM-SELECT FROM 1 BY 1
    UNTIL ITEM-SELECT > 10.
GET-ITEM.
    ACCEPT NAME (ITEM-SELECT).
        .
        .
        .
```

FIGURE 4a.
Microsoft PERFORM/VARYING verb

ERROR REPORTING

One feature that figures prominently in the ease with which a program can be executed is the ability of the computer to detect, accurately report and possibly correct programming errors.

With regard to the Microsoft and Micro Focus Cobol implementations, the error trapping and reporting features of both compilers are somewhat disappointing and need more work.

First, it is important to divide error messages into their two respective categories: compile time errors and run time errors.

The first category encompasses all forms of syntax and format errors which can be detected while the program is being compiled. Micro Focus reports these errors as they are encountered by printing (at the console) the line of the source program which contains the error, an asterisk pointer to the location in the line where the error was discovered and an error number.

It seems highly inconsistent with the tenet of the Cobol language, i.e., that communication with the computer be made in a language similar to English, that a programmer must still look up the message corresponding to a given error number. At no great cost, a file of the messages could be maintained on disk so that when the compiler determined the number of the message to be output, it could retrieve the text of the message from the file and display it, rather than forcing the

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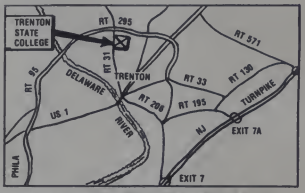

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programmer to go through a similar look-up procedure. The days when obscure letter/number combinations could provide adequate error reporting are long past; today's language systems can and must interact with the user, if we desire that that user need no longer be a data processing professional.

Unlike the Micro Focus compiler, which always outputs error messages at the console, the Microsoft version of Cobol provides only a count of the errors found. In order to determine what errors were actually found, a listing of the program must be requested. This appears to be a calculated way of increasing a programmer's frustration. First, a complete listing of the program during every compilation is usually not desirable since it is both time-consuming and largely unnecessary if only a few changes have been made. Second, since most errors are listed after the program text a (quicker) listing at the console is practically useless. By the time the error appears, the program code has long since vanished off the screen. On the positive side, Microsoft does not use error numbers; the text of each message is self-explanatory.

It would be really worthwhile if someone could combine the immediate, at-the-console error reporting of Micro Focus Cobol with the English message feature of the Microsoft version. Until this happens, however, compile time error reporting on both systems will be annoying and inadequate.

The other major category of errors, run time or execution faults, includes all possible conditions which cause the running program to abort or to function improperly. Many of these errors occur as a result of incorrect program logic. For instance, it is quite possible for a program to compile and execute without a single error being issued, and yet produce incorrect results. The correction of these errors is the responsibility of the programmer, since he or she (and not the machine) understands what the proper results of the program should be.

However, other run time errors include illegal operations, missing or malformed data and other errors. These errors are detected by the run time system, and are reported to the console. Once again, Micro Focus uses numbers instead of textual messages. The error number, as well as the machine code address at which the error occurred, are output to the console. The machine address is of limited use, since a compiler listed of the program must be close at hand to determine what sequence of instructions at the address caused the error. I have already mentioned that the probability of having an up-to-the-minute listing is low, and so the user is left more or less in the dark as to the location in the source code of the error. If the compiler provided an abbreviated listing of paragraph names, along with their associated addresses, this would be a great help since the programmer would at least be able to determine in which paragraph the error occurred.

```
GET-ITEM.
    ACCEPT NAME (ITEM-SELECT).
      .
      .
      .
SET ITEM-SELECT UP BY 1.
MOVE 1 TO ITEM-SELECT.
PERFORM GET-ITEM
    UNTIL ITEM-SELECT > 10.
```

FIGURE 4b.
CIS COBOL simulation of PERFORM/VARYING

Microsoft's run time error messages include the reason for the error (in English), the number of the line in the source program at which the error occurred, and the name of the aborted program (in case the error occurred in a called subprogram). Thus, a listing of the program is not needed to trace the error, since either of the CP/M utilities PIP or ED can be used to locate the offending source line if the line number is known.

Other Software

Both Microsoft and Micro Focus provide software in addition to the Cobol compilers.

For the cursor-addressing and screen clear features to function properly both compilers need to be customized to work with the user's particular brand of CRT. Micro Focus provides a special program, called CONFIG which, when run asks a series of questions about the user's terminal. From this information, CONFIG is able to modify the run time monitor so that it will function properly with the desired terminal.

Microsoft provides a set of assembly language routines which will work for several different terminals. Unfortunately, if your terminal is not among those listed in Figure 5, you must write an assembly program to interface Cobol-80 to your CRT. Obviously, if personal computer owners purchase Cobol because of its simplicity, they will probably not be well versed in assembly code and, as a result, will have to seek outside help. In my opinion, the Micro Focus interactive approach is preferable, mainly because it does not require any special knowledge of the internal workings of the terminal or machine code.

Besides the terminal interface programs, Cobol-80 comes standard with a macro assembler (for reasons mentioned in the above paragraph, among others), a linker and a librarian. Before Cobol-80 programs can be executed, they must be run through the linker, which fills in any necessary machine code routines from a system library file. To make additions and alterations to the library file, the librarian is provided.

Since Micro Focus programs are self-linking, no linker, library file, or librarian is provided. However, two other programs can be purchased for use with CIS Cobol. The FORMS program is a powerful interactive utility which allows the creation of input forms on screen; after the form has been specified, FORMS generates the necessary Cobol data declarations to implement it.

The second available program, called INDEX, is an expanded version of FORMS. INDEX will generate a complete Cobol program to accept, store and retrieve data entered in any desired form.

It is impossible to say much more about these two programs, since entire articles could be devoted to each. In any case, they are a big help in speeding up applications program development.

Documentation

Documentation for both systems is plentiful, but the Micro Focus literature is slightly better organized and a bit more in-depth. Several manuals are provided with each language system. Microsoft provides an update notice, a Cobol-80 Reference Manual, Cobol-80 User's Manual, and Microsoft Utility Software Manual. The update notice is particularly useful in that it provides quick information on improvements and changes. The Reference Manual provides general information on the Cobol language as implemented by Microsoft. The User's Manual provides descriptions of Cobol features that pertain to specific operating systems. (Cobol-80 is available for the CP/M, ISIS-II, DTC, and ALTAIR DOS.) The Utility Software Manual provides information on the linker, librarian, assembler utilities and their operation.

Form-oriented input has been shown to be effective in reducing data entry errors.

Cobol, cont'd. . . .

Micro Focus provides a Language Reference Manual and an Operating Guide. The Reference Manual contains a complete description of the CIS Cobol language in easy-to-read format. Highlighting is used throughout to draw attention to critical information, and a completely expanded Cobol program skeleton is available in Appendix F for handy reference. The Operating Guide provides information on CIS Cobol features that pertain to specific operating systems.

Price

Obviously, the cost of the Cobol systems will be an important factor in the to-buy-or-not-to-buy decision of

ANSI Standard (no cursor features)
Lear-Siegler ADM3-A
beehive 100 and 150
Microbee 2
Cromemco 3101 and 3102
SORIC IQ 12w
Hazeltine 1500
Heath H19
DEC VT52
ADDS Regent 100

FIGURE 5.
Terminals for which Microsoft supplies I/O drivers

The days when obscure letter/number combinations could provide adequate error reporting are long past; today's language systems can and must interact with the user.

many prospective purchasers. It is important to keep in mind, however, that professional software commands professional prices. The cost of Microsoft Cobol, including the macro assembler, linker and librarian is $750.00. The cost of CIS Cobol from Micro Focus is $850.00 ($650.00 for the Compact Compiler). This price includes the compiler, run time system and configuration program. The FORMS and INDEX programs are available for an additional $125.00 and $200.00, respectively. All prices include documentation. The literature is available separately at $25.00 for Microsoft documentation and $50 for the Micro Focus documentation.

Summary

In conclusion, the Microsoft and Micro Focus compilers are both powerful pieces of software. Each has its advantages and disadvantages. It is up to the individual user to determine which package best suits himself, by closely examining the features and facilities of the languages as they pertain to desired applications. For more information on either Cobol system, please write to the manufacturers. And, feel free to write me with any comments and/or personal observations you may have on either of the software systems. □

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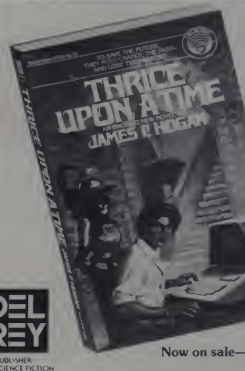
Telex 328945

Micro Focus Ltd.
58, Acacia Road,
St. Johns Wood,
London NW8 6AG
01-722-8843
Telex 28536 MICROF G



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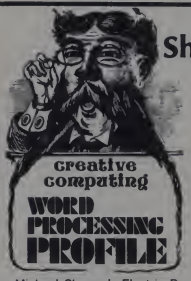


Sharpening Your Pencil

Dick Lutz

Michael Shrayer's Electric Pencil has become something of a de facto standard in microcomputer-based word processing. In a sense, its success is a perfect example of entrepreneurial timing.

At the time it became available, the market for it was about right. It required about the right size memory, represented a level of effort in programming that provided a solid set of capabilities for a good, but affordable price, and it answered a growing need. But few microcomputer users are ever completely satisfied. That's one reason why there's a growing market for software of greater sophistication (see last month's **Creative**), but a solid market for Pencil-enhancing products: hardware (like the TRS-80 lower-case conversion) and software — like MicroDaSys' Pencil Sharpener. If you have Pencil, Sharpener opens new worlds.

Few microcomputer users are ever completely satisfied. That's one reason why there's a growing market for software of greater sophistication

If you don't have Pencil, Pencil Sharpener may add just the capabilities you need to make purchase of both very attractive. The combination is stronger than the sum of the parts.

First, what does Pencil do?

The Electric Pencil converts a standard microcomputer into a highly capable professional-level input-oriented word processing system. It accepts your high-speed (or low-speed) typed input, allows on-screen editing (insertions, deletions, text movements, "strikeover" corrections) and stores the result under a file name of your choice. Further, it facilitates "global" (whole-file) search-and-find or search-and-replace activity, thereby giving you highly-efficient revision capability.

Dick Lutz, 4802 Fifth Ave., Pittsburgh, PA 15213.

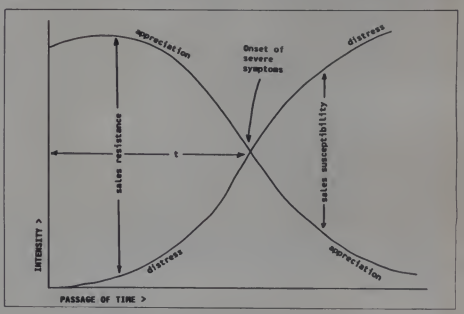
Then, Pencil becomes an output formatter, pumping text out to your printer and formatting it as it goes: line lengths, margins, character spacing (with an incremental printer), single-double spacing, automatic or forced paging and so on.

All by itself, Pencil is marvelous. For example, it even allows a kind of shorthand typing, within limits. If I have occasion to turn an audio cassette into a transcript, for example, I can avoid constantly retyping specialized vocabulary ("microcomputer," "microcomputer-based," "software-implemented") by typing shortform substitutes ("mC," "mCb," "sI") and often keep up with the taped dialogue. Later, one quick search-and-replace turns each substitute into the real thing throughout the textfile.

Pencil allows creation of topical paragraph files which can then be integrated into other files simply by loading them. Personal letter-writing becomes a snap when one carefully-composed paragraph can be included in several letters (and you can include non-printing notes on who has received what).

Yet, after you fully explore all of Pencil's capabilities, you are eventually overtaken by the disease common to microcomputerists and text-processor users, known in the medical community as *Satisfactus Expiratus*. (See chart.) Loosely translated, this name denotes a falling curve of appreciation for the capability of any software package and an intensification of distress with its shortcomings. It's sometimes known as the "Aren't you ever satisfied?" syndrome. (Answer: No.)

Pencil can't handle superscripts, for example. And it can't sound the printer bell, and it can't do overstrikes



Typical patient's chart in a case of *satisfactus expiratus*. Lutz's first law of software holds that the less money you have to spend on software, the shorter the time (t) between acquisition and the appearance of symptoms. (The second law holds that symptoms tend to appear about the time you've figured out the instruction manual.)

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It's through a lot of hard work that we are able to offer you a product that is "almost perfect," but we aren't about to stop working until we can say that the MAGIC WAND *is* perfect.

Full screen text editing

The MAGIC WAND has probably the most responsive and easy-to-use editor available for either a serial or DMA terminal. It uses only single stroke control keys to give command and takes advantage of the special function keys on your terminal whenever possible. In addition, you can set up library files with coded sections that you can merge by section name.

Full text formatting commands

The MAGIC WAND allows you to set the left, right, top and bottom margins, page length, indentation, paragraph indentation, (incuding "hanging" paragraphs), text left flush, right flush, justified (two ways), literal or centered, variable line and pitch settings, variable spacing (including half lines), bold face, underlining (solid or broken), conditional hyphenation, sub- and superscripting. You may change any of these commands at run-time *without reformatting the file.*

Merging with external data files

You may access any external data file, with either fixed length or sequential records. The MAGIC WAND converts the record into variables that you define and can use like any other variable. Of course, you may use the data for automatic form letter generation. But you can also use it for report generation.

Variables

You may define up to 128 variables with names of up to seven characters. The current value of a variable may be up to 55 characters, and you may print it at any point in the text without affecting the current format. Although the MAGIC WAND stores the variables as strings, you may also treat them as integer numbers or format them with commas and a decimal point. You may increment or decrement numeric variables or use them in formatting commands.

Conditional commands

You may give any print command based on a run-time test of a pre-defined condition. The conditional test uses a straightforward IF statement, which allows you to test any logical condition of a variable. You may skip over unneeded portions of the file, select specific records to print, store more than one document in a single file, etc.

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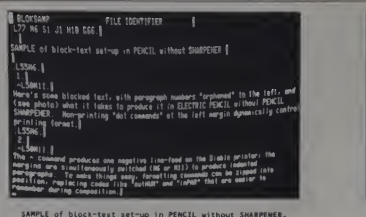
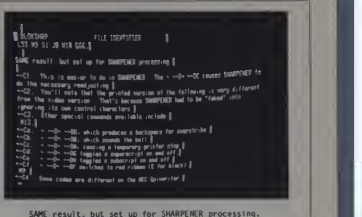


SAMPLE of block-text set-up in PENCIL without SHARPENER.

1. Here's some blocked text, with paragraph numbers "orphaned" to the left, and (see photo) what it takes to produce it in ELECTRIC PENCIL without PENCIL SHARPENER. Non-printing "dot commands" at the left margin dynamically control printing format.
2. The ^ command produces one negative line-feed on the Diablo printer; the margins are simultaneously switched (M6 or M11) to produce indented paragraphs. To make things easy, formatting commands can be zipped into position, replacing codes like "outNUM" and "inPAR" that are easier to remember during composition.



SAME result, but set up for SHARPENER processing.

1. This is easier to do in SHARPENER. The "^C causes SHARPENER to do the necessary readjusting.
2. You'll note that the printed version of the following is very different from the video version. That's because SHARPENER had to be "faked" into ignoring its own control characters.
3. Other special commands available include:
   a. "^D, which produces a backspace for overstrike.
   b. "^G, which sounds the bell.
   c. "^A, causing a temporary printer stop.
   d. "^G toggles a superscript on and off.
   e. "^H toggles a subscript on and off.
   f. "^F switches to red ribbon (E for black).
4. Some codes are different on the NEC Spinwriter.

Many kinds of format control are possible with Pencil alone, such as the "blocked text" (the printed version) produced by inserting format changers in the text as composed (photo of video). But more is possible, often more easily, with Pencil Sharpener in the act. Note the photo and print as handled by Sharpener.

(such as overstriking 0 with / to produce Ø for clarity, or adding those little grimplinkies that crop up in foreign languages). It can't easily do a negative indentation to place paragraph numbers in a margin next to blocked text (see illustration), and it won't easily pause in mid-document for a typewheel change and a smooth resumption.

But Pencil Sharpener can.

What's more, Sharpener can *merge*. (Small fanfare, please.)

What's "merge," you ask? Suppose you have a letter that must go to three dozen people, but all 36 should really get a personalized letter, meaning you might want to refer to a spouse by name, a business by name, or a last order by order number, amount and date. With Pencil alone, you might create the letter with replaceable "variables" in it: SPOUSENAME, BIZNAME, LASTORDNUM, LASTORD$, and so on, along with the appropriate space for address and other "blanks." Then you'd use search-and-replace to snap the necessary information into position (Pencil automatically adjusts the spacing) and print it, customizing one letter at a time.

Now, by itself, that's a powerful time-saving capability, but it still requires you to constantly attend to the process, doing one letter at a time, and so on. Quite soon, you are asking: "Why can't this be automated?"

Enter MicroDaSys and Pencil Sharpener, which does just that. You prepare a master letter, and separately (using Pencil or other software), a file of replacements. "Push the button," as they say in the stores, and Sharpener will produce *merged* output — continuously or with built-in pauses for changing paper.

In a separate (or the same) run, using a separate (or appended) "master document" that's really only an envelope-printing utility, you can use the same file of replacements to do names and addresses. (Sharpener discards the replacements for which it cannot find a satisfying variable in the master.)

Once running (and using continuous forms), Sharpener+Pencil will just keep plugging away 'til it's done several days of typing work or made lint of your best ribbon.

It's sometimes known as the "Aren't you ever satisfied?" syndrome. [Answer: No.]

But it's even more flexible.

You can, for example, use automated search/replace to bury a bell-sounder in letters with which you'd like to send one brochure, and two where you want to insert another (where they carry different price lists). Quite soon, the worker receiving the output will be responding automatically.

But that's only the beginning. Once you get used to the way Sharpener "slaves in" Pencil's search-and-replace capability you can even arrange "conditional" search-and-replace.

Imagine, for example, that you're the distributor of a line of automatic garage-door openers, and you also sell to the general public. Responding to inquiries, you want to quote retail to the public, wholesale to prospective dealers. Can one master letter take care of both? With Sharpener, the answer is a firm yes.

You write the master letter to contain a price list like this:

Standard motor	CategStMoPrice
Special motor	CategSpclPrice
Deluxe motor	CategDelxPrice

(Here, the variables are chosen for clarity of illustration; because these same combinations of letters might occur otherwise in the text, these wouldn't be good ones to use normally.)

You'd then create, perhaps in Pencil, a price structure like this:

DealrStMoPrice/$38.00, suggested retail		$58.00
DealrSpclPrice/	42.00	62.00
DealrDelxPrice/	53.00	73.00
IndivStMoPrice/	$58.00	
IndivDelxPrice/	73.00	
IndivSpclPrice/	62.00	

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". . . but the really impressive stuff is in the back room."

CIRCLE 126 ON READER SERVICE CARD

Sharpening, cont'd . . .

Then you block move that material into every replacement set, at its end. At the head of each replacement set, accompanying the name and address of each person inquiring, you insert a variable,

```
Categ/Dealr   . if the inquiry is from a dealer,
   or
Categ/Indiv   . if an individual's inquiry.
```

Sharpener commands Pencil to look at the first "Categ" variable, and change CategStMoPrice into either DealrStMoPrice or IndivStMoPrice. Continuing, then, through the list of variables and replacements, it finds either DealrStMoPrice or IndivStMoPrice, but not both. If the inquiry is from a prospective dealer, upon encountering DealrStMoPrice it makes the substitution using DealrStMoPrice/$38.00 (etc.). Upon reaching the replacement file entry IndivStMoPrice/58.00, Sharpener is unable to find the required variable, and discards the unwanted replacement.

Alternately, if the Categ/Indiv entry is encountered first, changing CategStMoPrice into IndivStMoPrice, Sharpener fails to locate DealrStMoPrice but finds IndivStMoPrice, and only the appropriate substitution occurs.

To recap, the master letter variable CategStMoPrice goes through an automatic

Categ/Dealer or Categ/Indiv

search-replace (only one is entered) to become the new variable

DealrStMoPrice or IndivStMoPrice

which subsequently goes through a further automatic

DealrStMoPrice/$38.00 . . . or
IndivStMoPrice/$58.00

replacement (only one succeeds) to yield a final letter containing

Standard Motor $38.00, suggested retail $58.00
or
Standard motor $58.00

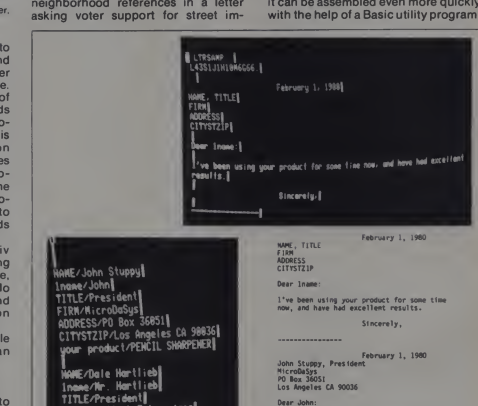
Imagination suggests unlimited variations.

Of course, the other double-searched variables are similiarly revised.

These (and similar) uses of Sharpener's automatic merging, with the other options like subscripts, superscripts and printer strikeover, open the door to multiplication of operator effort. Suddenly, one unit of input labor becomes not one unit of output reward, but 5 or 35 or 350.

Imagination suggests unlimited variations. You can dun club members for the specific amount of past dues, or tailor requests for charitable donations so they remind a giver (with thanks) of his past generosity by exact amount (a thoughtful and welcome document as tax time approaches), maybe even referring to the specific use made of the donation. Or include specific neighborhood references in a letter asking voter support for street improvement bonds. I'm tempted to suggest a contest for the most imaginative use.

Fortunately, the file of data to be merged into your master letter need not be created in Pencil, though that's handy for many applications. Instead, it can be assembled even more quickly with the help of a Basic utility program.



A letter with replaceable variables and a file of satisfying replacement information produces "merged output." Note that specific names replaced "your product" in the letter except in the case of the Hartlieb letter where, there being no satisfying replacement in the data file, no substitution occurred. Similarly, in the case of the Shrayer letter, there being only a space entered in the replacement file for TITLE, the word TITLE was deleted from the master letter and the empty space substituted. Thus, "survivable" variables may be included and sometimes replaced, and "non-survivable" variables can be removed even though there's no satisfying replacement information for them.

Sharpening, cont'd . . .

LAST ORDER: 1/21/76

Basic can either query an operator for insertion data, or rummage through an existing diskfile and pull out names, addresses and the like, even conditionally. (You might solicit only donors who last gave more than 11 months ago, for example, ignoring the vast numbers who gave more recently.) And with some programming time, the Basic program can even reconvert information like

into "We hope you were pleased with our service four years ago in January."

Assembling such a file in Basic is relatively easy, as long as Sharpener sees the necessary command characters. The listing reproduced here shows a core file sector assembly subroutine that puts them in. This subroutine is part of a longer operator-querying program that's too long to reproduce here but is available otherwise. (See box.)

Note: Before arrival at this subroutine, the following have been established: L$=carriage return (CHR$(13)), N$=nul(CHR$(0)); TV=Total Variables in group; AL$ is the 128-byte fielding of file 1; <> is operator signal to terminate entry of replacement information. R$(T) is the current variable/replacement being accepted (T is a loop-control variable); A$ is the 128-byte sector being assembled. The Basic variant is Microsoft Disk Basic version 4.51 or 5.0.

```
8000 'SUBROOO assembles complete sectors for storage.
8005 IF R$(T)="<>" THEN R$(T)=R$+R$:GOTO 8005  'If end-signal given, substitute end-of-file nuls.
8010 R$(T)=R$(T)+"/"+R$(T+1):R$(T+1)=""  'Otherwise, assemble variable name, slash, replacement, & carriage return.
8020 IF T<TV+1 THEN R$(T)=R$(T+2):R$(T+2)="":  If this is last variable for a replacement group, add another return.
8030 IF LEN(A$)+LEN(R$(T))<=128 THEN A$=A$+R$(T):R$(T)="":  If new part fits current work sector, add it & return for more.
8050 LO = LEN(A$)+1:HI=128:A$=A$+N$(HI-LO):  But if the new string won't fit, compute what will be left over.
8060 AS = A$ + LEFT$(R$(T),(128-LEN(A$))):  And what will fit is complete & 128 byte sector for storage.
8070 LSET AL$=A$:PUT #2, LOF(2)+1  Store it on disk as AL$ (previously fielded.)
8080 A$=R$(T)(MID$(T),LO):LO=0  Then start a new sector with what was left over.
8090 RETURN
8999 '
```

Further notes: Pencil's search-&-replace function takes variable and replacement with slash between: Variable/Replacement. This subroutine places a carriage return at the end as required by Pencil Sharpener; it functions as the operator's press of carriage return would, activating the search-replace function built into Pencil. Two carriage returns (see line 8020) signal, "print now" (all variables have been replaced) to Sharpener.

If you're suffering from creeping satisfactus expiratus, Pencil Sharpener may be just the prescription. □

The software referred to in this article is available from the following sources:

The Electric Pencil: $150+ (price depends on version)
Michael Shrayer Software
1253 Vista Superba Drive
Glendale, CA 91205

The Pencil Sharpener: $195 (requires Electric Pencil)
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CIRCLE 104 ON READER SERVICE CARD

A TRS-80 Mailing List Program

Mailroom Plus

Rod Hallen

I have come across many problems that were designed to maintain mailing lists, but none as easy to use as Mailroom Plus from The Peripheral People. In addition, Mailroom Plus, which was originally written for the National Rifle Association, has some features that greatly enhance its utility.

MRPLUS is written in Basic and requires at least 32K of RAM and one disk drive. All lists are maintained on the disk, but file manipulation takes place in memory which is a much faster method of operation. Similar programs use random access disk files but this takes time. The difference is particularly noticeable when sorting lists.

Application

MRPLUS is set up to accept Name, Address, Telephone number, Info and Category. Info can be anything that you'd like to add to the file and Category can be a membership number, Ham call sign, equipment bought or sold, or anything else you would like to use for identification.

On entry to MRPLUS the following Menu is displayed:

1. Create new list
2. Add to list
3. Edit list
4. Search & display
5. Search & print
6. Sort
10. Safe on disk
11. Input from disk

The documentation is quite well done and a sample name list is provided to give you some practice in using MRPLUS. The manual takes you briefly through the various options that are available and you quickly become used to the method of operation. Prompt messages in all of the right places help to keep things straight.

The manual then describes each of the following options in great detail.

1. Create new list — asks for a name for this list and then prompts with Name, Street, City, etc. and waits for an entry for each. Names are entered and stored in reverse order, i.e., Smith John but they are displayed and printed in the normal way (John Smith). You can null any entry with the Enter key. After each record is entered it is displayed and you are asked if it is correct. You can then make corrections or go on to the next record. Entering END for the name will terminate the list.

The fields (name, street, city, etc.) are not limited to size as long as the length of the entire record does not exceed 255 characters. This means that long entries will not have to be unnecessarily abbreviated and should be adequate for most situations.

2. Add to list — This selection allows you to add more records to an existing list. They are added to the end of the file and can then be integrated using the Sort feature.

3. Edit list — If it is necessary to go back into a list to review it or make corrections, this selection is made. You step through a record with the enter key until the line requiring correction is reached. That line is then retyped.

4. Search & Display — This is one of the outstanding features of MRPLUS. It will search and display any record which contains a stated string. If you give "John" as the search string, every record that contains the word John will be displayed one at a time under your control. If the search string was given as CA 92, then all California entries with ZIPs starting with 92 would be displayed.

The power of this feature really shines when you have entered pertinent information into the Category line. If you are a computer store owner and want to keep track of the equipment your customers have purchased, you might enter the following for one of your customers:

Category? .12345.L2.32K.DISK2.

This would be serial number, Level II, 32K RAM and two disk drives. Using Search & Display you could come up with a list of all of your customers who have disks, Level II or any other information you enter here.

Maintaining a club list would work in the same way. If Category contained membership class, number, interests, etc., you could search for any desired group within the club. Businessmen could keep track of backorders, customer interest, or any other desired category.

5. Search & Print — works the same as 4 except that the output goes to the printer instead of the video screen. In addition, you may output the entire record or just the information required to print address labels. These can be selected as one or four labels across. If you want to print the entire file instead of just selected parts, a separate program called "AUTO-PRINT" will do that for you.

6. Sort — Choose Name, ZIP, or Category and this will sort a file in alpha-numerical order. Since the sort takes place in memory, it is quite fast. Much faster than a disk sort using random access disk files. After the sort is finished, you are given the option of eliminating duplicates from the list. Record numbers of duplicate records are displayed and you can erase the appropriate one. Once the file has been sorted you can use option 5 to print, or option 10 to save on disk.

10. Save on disk — A file in memory can be saved on disk at any time and each file has a name. If you bring in a file from the disk, make some additions or changes, and then save to

Rod Hallen, PO Box 73, Tombstone, AZ 85638.

Mailroom, cont'd . . .

the disk with the same file name, the new file will replace the old one. If the old file was called "NAMES" and you name the new file "NAMES1," then both files will be on the disk. The capacity of the disk is the only limitation to the numbers of files you can save.

11. Input from disk — Brings a file in from the disk for adding, changing, or printing.

In connection with memory and disk capacity, the following information is given: you can get a 150 to 300 name file into memory depending upon how long each record is. In order to protect you from losing a file due to an OUT OF STRING SPACE error, MRPLUS starts to display the amount of memory left after you have exceeded 150 records in a file. If a file is getting too big, you can break it down into one or more parts and save each part as a separate file on the disk. You can also merge two smaller files into one larger one.

The manual recommends keeping MRPLUS on one disk and the name and address files on a separate disk. It also recommends that you record each file twice for backup protection. In connection with this, information is given on doublesiding your disks. This will double your recording capacity. I am using the Wangco 82 disk drive which will read either side of a disk without modifying the disk. (I have heard that Wangco is going out of the disk drive business and that the Model 82 can be purchased at a very reasonable price.)

You can also increase the capacity of your data disks by erasing Basic, BACKUP, FORMAT and any other unnecessary programs. This can be done using the Radio Shack Master Password which is provided.

Conclusion

I guess I've made it clear that I'm sold on Mailroom Plus. It is available from The Peripheral People at P.O. Box 524, Mercer Island, WA 98040 for $30 postage paid. It is supplied on cassette for transfer to your diskette or they will record it on a customer provided disk.

Mailroom Plus makes creating, maintaining and printing mailing lists a very simple chore whether it is a personal list or a group of business or membership lists. I have been using another mailing list program for some time but I am now converting all of my files to Mailroom Plus. □

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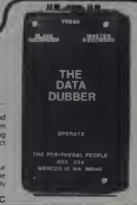

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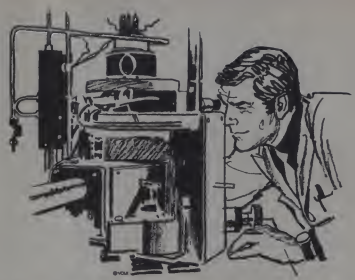
CIRCLE 174 ON READER SERVICE CARD

Three Mile Island



I am sure by now nearly everyone has heard aout what happened at the Three Mile Island nuclear power plant. I am especially familiar with the details of what transpired. I have been at TMI nearly full time since the accident, helping on the recovery effort.

After many weeks away from my family, home, friends and my Apple, I arrived home recently to discover a copy of MUSE NEWS, a publicity blurb from the MUSE Company, among my giant pile of unopened mail. Right across the top was a stylized drawing of the place from which I had just returned, and the frequently heard question, "Could it have been prevented?"

It was an announcement for a new program from MUSE for the Apple-II. The program was described as a realistic simulation of a pressurized nuclear reactor. This got me excited, because this was one of the ideas on my "later list." You know what I mean; program ideas to work on "later," when you have the time to do it. Somehow, "later" is a long time in arriving. Oh, well. . .

Needless to say, I placed an order for the program. I was really surprised at the size of the package when it arrived. It was big enough to hold 10 copies of the Apple DOS manual. When I opened the box, the surprise gave way to admiration. Inside was a diskette, a 36 page instruction booklet, and hundreds of foam excelsior "peanuts." MUSE Company, I am impressed by your care in seeing that the disk arrived undamaged.

The program is truly massive in size. It needs a full 48K system, and uses practically all the available memory. It is written in Integer Basic. A ticking clock is provided, and the simulation proceeds at one minute intervals of sim-time, which occur in about 4 seconds of real time.

When you run the program, you become the operator at the controls of a nuclear power plant. The object is to run the plant in a safe and profitable manner. Naturally, there are hindrances and aids to this objective.

One thing that makes it difficult is that the demand for electricity varies over a wide range on a daily cycle. This forces you to change the operational status of equipment and to open and close valves. You also have to change the temperature of the reactor core by moving control rods.

Another problem is that equipment fails frequently. Consequently, you have to change equipment status to deal with this, too. Valves fail as is; that is, a valve cannot be closed if it fails when it is open, and vice versa.

Another hindrance to successful operation is that the gnomes in Washington at the Nuclear Regulatory Commission are continually issuing safety bulletins. These bulletins tell you that their computer simulations indicate your gauges may be faulty and request you submit them for inspection. If you comply, the gauges are unavailable for a length of time, and you have to "fly it blind."

The aids you have in operating the plant are excellent. They include four graphical views of portions of the plant, an instrument panel, a financial summary and an equipment status and failure log.

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

Victor Fricke

The animation in each of the four graphic views of the plant is excellent. An open valve is represented by a green square, closed is red and out of service is black. Similarly for pumps, a red rectangle represents an idle pump, and green means running. This is the same color convention used on status panels in a real power plant.

When fluid is flowing in pipes, they are shown in appropriate colors; blue for cooling water, yellow for steam, pink for radioactive gas, etc. When there is no flow in the pipe, it changes to grey.

The way you start or stop a piece of equipment is to first call up the graphic display in which it is shown. Then, for example, if you want to close a valve, you press cntl-v, and a display of valve ID tags is shown beneath each valve. Just press the letter which identifies the appropriate valve, and it will flip from open to closed. A similar routine is used for other equipment; cntl-t for turbines, cntl-f for filters, etc.

Another aid is the instrument panel. On it are ten instruments which show the operating parameters of the plant, and several annunciators which warn of trouble.

The equipment status and failure log shows the operational status of each pump, valve, turbine and filter in the plant, and a prediction of when it will fail. Also, for equipment which is out for repairs, it shows when it will become available again.

The financial summary shows the electric output of the plant, the electric demand, and the profits and operating costs up to the present. If the profits become sufficiently nega-

Island, cont'd...

tive, you are allowed to petition the Public Utilities Commission for a rate increase. If the losses are too great, your operating license is terminated for fiscal irresponsibility. When you petition for a rate increase, it is only granted 5% of the time.

As a simulation, Three Mile Island is excellent. As a game it is fascinating to me. Of course, what interests a nuclear engineer may not interest everybody. I am disturbed, however, by the model of plant systems chosen by the author. This game will probably leave a very false impression that it is a touchy thing to be able to operate a nuclear power plant safely.

For example, when experimenting with the program, I found that if the pressure inside containment rises to the point where the containment is automatically sealed, then it becomes impossible to prevent a meltdown. When the program isolates the containment, it does so by closing all the valves. In practice, some of the valves remain open in a real plant. The steam and feedwater flow is not interrupted, because then there is no way to use the steam generator to remove the heat from the reactor.

Another example of departure from reality: the containment isolation in the game occurs at 5000 pounds per square inch pressure. In a real plant it occurs at 3 or 4 psi. There is no way the pressure could ever rise to such a high level. The highest pressure expected in a postulated accident is only 40 to 70 psi, depending on containment volume.

Indeed, the laws of thermodynamics are not followed in this game, since the 5000 psi cloud of steam is supposed to come from the 2400 psi pressurizer when its relief valve opens.

The game also gives the impression that there is only one emergency core cooling system, when in an actual plant there are usually at least three separate systems.

However, those criticisms do not detract from Three Mile Island as a game. As such, it is fascinating and fun to play. Indeed, if reality were modeled, it would be very boring. In routine operaton of nuclear power plants absolutely nothing changes for weeks on end; a computer gamester would soon tire of it and return to Startrek or Hunt The Wumpus. □

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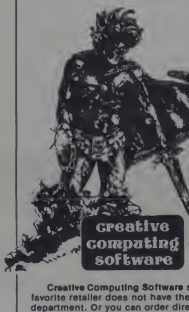

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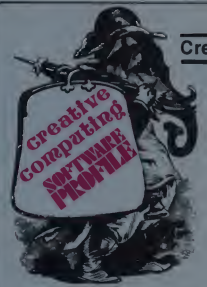

Creative Computing reviews five software packages

Tiny C
Microsoft Basic 5.0
Research Machines Z80 Algol
Structural Analysis SP80 Macros
Digital Research CP/M 2.0 and MP/M

Steve North

Over the past few months we have collected several interesting CP/M programming languages and other tools for review. In general the quality of system software for microcomputers which has come out in the last year is clearly improving and often rivaling what is available on minis and larger computers.

The one negative trend we noted —perhaps it's more of a chronic problem—is that software implementors feel free to bend standards and sometimes leave out major portions of a language just to make life easier for themselves. For example, a C compiler without real values is not a C compiler. True, there are many things one can do without real values but on the other hand, the original C language had real values there are existing programs that use them, and they are often necessary for writing some kinds of applications. Maybe the implementor of the particular compiler thought a floating point package would use too much memory or maybe he didn't want to take a week or more to write them, but that does not justify calling the end result an actual C compiler but on "C minus reals and a few other things I didn't have time to do." Not to rake anyone in particular over the coals, but in too many cases language implementors stopped when they were 90% done, thinking they had finished or at least that the rest of the world might buy it. In the future we expect that the quality of microcomputer based system software will equal that of larger computer versions in almost every respect. (This is a very safe prediction to make, since it will eventually be very hard to tell microprocessors apart from big machines based on instruction sets).

Tiny C

So, we hereby present a set of capsul review of some neat software we've had a chance to try recently.

The C language was designed and implemented several years back by Dennis Ritchie on a PDP-11 in conjunction with the much admired UNIX operating system. (UNIX itself has inspired several microcomputer-based operating systems, which we will try to review in the future.) C is a very powerful language which gives the user enough simple building blocks to construct functions to do nearly anything within reason. C avoids including all the intrinsics anyone could possibly need and so does not share the overwhelming complexity of some languages(notably PL/I) but still retains the structured "flavor" of languages in the Algol-Pascal-PL/I family. (That's a family?) C is not as widely available as other structured languages, but it has brevity and sophistication (major portions of UNIX are written in C) so those who know it usually love it. (Or at least are moderately satisfied with it. Not true of many other programming languages.)

Tiny C, as you would expect, is a stripped down version of C. Roughly, Tiny C is to C as Tiny Basic is to Basic—it retains most of the style of C without implementing the advanced features. Tiny C computes with integers and characters which may be scalars or one-dimensional vectors. The statements in Tiny C are:

```
if(expression) statement
if(expression) statement1 else
        statement2
while(expression) statement
return(expression)
break
```

A statement can consist of a simple statement (like an assignment such as x = x + 1) or a block, which is a group of statements enclosed by brackets. Some feel this is a more natural and understandable approach to specifying a block structure than using special BEGIN and END keywords as in Algol and Pascal. C does not have subprograms per se, but does everything with functions. Your programs will thus consist of a set of functions, and the system further has built-in functions and supports your own user-written library as well. Functions may be written in Tiny C or machine language.

The standard library which comes with Tiny C includes functions for character string and integer I/O (there are no I/O statements in C so these are machine language functions), disk file I/O, conversions for strings and numbers, moving one string to another (necessary because strings are vectors and there are no intrinsics to handle vectors), test if a character is waiting at the console and so on. These functions generally give you what you need to get started and you can then build your own Tiny C or machine language functions to do more complex things.

The Tiny C manual is exceptionally well put together. It includes many helpful examples and explains the language in a way that can be understood by both experienced computer programmers and novices. The manual also documents the interpreter itself with a source listing in both 8080 and PDP-11 assembly language and explanatory text. Since Tiny C is an interpreter and not an entire operating system, a separate loader and Program Preparation System (for writing and debugging Tiny C programs) is also part of the package.

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SYSTEM REQUIREMENTS: the video circuitry of the Electric Crayon™ provides direct drive input to a video monitor or modified tv set. An internal up-modulator for rf antenna input may be constructed by adding inexpensive components to the existing video circuitry.

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Five Packages, cont'd . .

The Program Preparation System (PPS) is itself written in Tiny C and is a line oriented editor similar in some ways to the CP/M editor (said to be inspired by DEC's TECO). The PPS editor commands allow you to look at portions of the program, insert and delete lines and so on, using a "curent line" pointer which gets move to and fro. Initially the PPS seemed a little awkward to use and not especially fast since it is written in Tiny C which has to be interpreted and is not a speed demon. Perhaps with some practice you might like it. As an alternative you can edit programs using the standard system text editor or screen editor, and then convert the program files (to remove embedded linefeeds (AND RUN THEM WITH Tiny C.

Big computer C fanatics will probably be a bit disappointed because Tiny does not preserve all the power, flexibility and brevity of C. However, this also makes it a somewhat better language for learning (its best application) since one does not need to get bogged down in confusing extras and details to write simple programs that work. Once someone has mastered Tiny C he will be much better equipped to tackle full C or another advanced structured language. A TRS-80 cassette version and several other non-CP/M versions are available, and if you own a TRS-80 with no disk, this may be one of the only ways of trying anything besides Basic on your computer. The value of CP/M-Tiny C strictly as a programming tool is questionable since the days of tiny languages are disappearing. However, Tiny C Associates are presently handling a fullblown memory-eating 8080 C compiler for $100. This, and several other high-powered structured language compilers, will be the subject of a future review.

Microsoft Basic Version 5.0

It could be said that Microsoft Basic is bigger and better than ever. "Bigger" is especially true since the interpreter and operating system now reside in 28K of memory, so a 48K system is needed to do any serious work. Version 5.0 is also not completely compatible with previous releases but has been influenced by conformity with the ANSI Minimal Basic standard. Improvements have also been added to make Microsoft Basic more competitive with C Basic (a commercial Basic compiler) and to provide features that users have wanted.

Those who like to write readable programs (if that is possible at all in Basic) will be pleased to know that long variable names of up to 32 characters with embedded keywords are now allowed. Thus, PRINTLINES is a legal variable name and the interpreter won't get upset if you write PRINT PRINTLINES in a program. But as a side effect, keywords must now be delimited with spaces both in commands and program statements. This is a nuisance if you are in the habit of leaving out spaces to conserve memory or typing, and worse if you have old ASCII source files you'd like to use with the new version of Basic. Fortunately programs saved in internal format are for the most part compatible (because spaces are included in the keyword tokens) and a copy of Basic 4.52 is included for those who hurt while they convert.

A WHILE/WEND construct, like that of CBASIC, allows execution of a block of code as long as a given condition is true. Several peculiarities including handling of FOR NEXT statements (the test is now at the beginning of the loop instead of the end), rounding of integer values, and random numbers have been cleaned up. A CHAIN command with COMMON variables allows you to break up programs too large to fit in memory into two parts stored on disk, and programs can be saved in a protected format in case you're paranoid about who can get a list of your code. Random file handling, always a little awkward in Microsoft Basic, has been improved somewhat by the addition of variable length records (only up to 128 bytes) and the ability to use PRINT and INPUT on random files.

Microsoft recently released a Basic Compiler which accepts the same programs that run under the interpreter. This means you can write and debug a program with the interpreter and when you're done, compile it for a significant improvement in execution time and to be a Big Man on Computers.

It would seem that in this product Microsoft has taken microcomputer Basics as far as they can go. (Of course, one can always come up with extra features such as multiline user-defined functions that would be nice to have, but the point of diminishing returns has already been reached.) Microsoft is now developing a high-powered Pascal compiler for a variety of applications including systems programming. In fact, one inspiration for the project was to replace assembly language for Microsoft's own in-house use, which is obviously pretty intense programming. Their Pascal will conform with most of the existing standards but will also have compiler toggles to enable "Extended" and "System" level enhancements to do things that standard Pascal doesn't easily allow (such as machine-level operations that one needs when writing system software). The good news is that it will be a very nifty language, the bad news is that Standard Pascal will have as much meaning as Standard Basic. Anyway, when available, we will do a comparison of this and several other Pascal implementations, such as UCSD and Intersystems. Before you get too interested, remember that the compiler will license for $1000.

Research Machines Ltd. Z80 Algol

Algol is one of the oldest established computer languages and also one of the first to incorporate features such as a block structure with local variables. It is allegedly more popular in Europe than over here, though it can also be of great help if you want to try the algorithms published in the Journal of the ACM to see if the authors made any mistakes.

RML Z80 Algol incorporates all the features of Algol 60 as well as a few extensions and has a subroutine library to make I/O a little easier. The compiler does not make native 8080 code but, like many other compilers (including UCSD Pascal and CBASIC), makes object code for a stack machine which is then simulated on the real (Z80) machine thereby yielding fast-running object programs of a reasonable size. Benchmarked against Microsoft 8080 Fortran, which makes native 8080 code and does some optimization, RML Algol is surprisingly competitive. Naturally RML Algol is somewhat slower when executing control structure such as loops or function calls, but on the other hand it is faster doing certain arithmetic operations.

Algol originally was designed in part as a publication language so it lends to writing well-organized and readable programs. RML Algol sticks very close to the Algol 60 standard, except in a few areas which would have been tricky to implement or have eaten gobs of memory. For instance, since it is a one-pass compiler it is a little more fussy about declarations than the standard

DIGITAL RESEARCH — Software / Manual / Update

CP/M FLOPPY DISKETTE OPERATING SYSTEM — Packages assembler, ed, dsdate, console, and DDT. 8080 assembler, text editor, 8080 debugger and various utilities plus full documentation. CP/M 2.2 version configured for most popular computer disk systems in single density. Specify: Altair 8" IBM, Cromemco 5¼", Altair 8" Micropolis, Heath 11, or H89. TRS 80/I, ICOM 3712 and vCOM Micro Disk plus many other configurations available off the shelf — $145/$25/—

CP/M version 2 per manual if same available immediately — $170/$25/—

MP/M — $480/$50/—

MACRO — 8080 Macro Assembler. Full Intel macro definitions Peadro Ose includes RCP, IRP, REPT, TITLE, PAGE and MACLIB. ZSM library included. Produces Intel absolute hex output plus symbols file for use by SID (see below).

SID — 8080 symbolic debugger. Full trace pass count and conditional breakpoints. Single step, examine, deposit and hex arithmetic. When used with MAC, promotes full symbolic display of memory labels and equated values.

ZSID — As above for Z-80; requires Z-80 CPU. $60/$25/—

TEX — Text formatter. Its create paginated, page-numbered output with imbedded commands. Right margin justification is user or default selectable.

DESPOOL — Program to permit simultaneous printing of data from disk while user executes another program from the console. $45/$5/—

MICROSOFT

BASIC-80 — Disk Extended BASIC. ANSI compatible with long variable names, WHILE/WEND, chaining, variable length records.

BASIC COMPILER — Language compatible with BASIC-80 and 3-10 times faster. Produces 8080 native code. Supports relocatable binary output. Requires BASIC-80 or Adds $350 to RAM 80 or COBOL-80 prices below.

FORTRAN-80 — ANSI 66 (except for COMPLEX) plus many extensions. Includes relocatable binary compiler, linking loader library with manager. Also includes SID and MACRO (see below).

COBOL-80 — Level 1 ANSI 74 standard COBOL plus most of Level 2 Full sequential, relative and indexed file support with variable file names STRING UNSTRING, INSPECT, VARYING, NEXT, COPY, CALL, COPY-SEARCH. Dimensional arrays, compiler directives, conditional compilation, ACCEPT, full interactive screen handling extensions, interactive compatible assembler linking loader and relocatable object file output as described under MACRO-80 — $625/$25/—

MACRO-80 — 8080/Z-80 Macro Assembler Intel and Zilog mnemonics supported Relocatable linkable output. Linking Library Manager and Cross Reference List utilities included — $145/$15/—

XMACRO-80 — 8086 cross assembler All Intel 8086 utility features of MACRO-80 package Intermediate object code output for linker 8086 compatible — $275/$25/—

EDIT-80 — Very fast random access text editor for text with an without line numbers. Global and single line commands supported. File compare utility included — $99/$15/—

MICRO FOCUS

STANDARD OS COBOL — ANSI '74 COBOL standard compiler supported by 1/3 the size of the ANSI level 1 Supports many features to level 2 including dynamic loading of CODEs, segmentation, full IBM file facility. Also program segmentation interactive debug and powerful interactive screen facility to support protected and unprotected CRT screen handling. Over 100KB programs used. Specify hardware for boot — $750/—

FORMS 2 — CRT screen editor Output as COBOL data descriptions or moves into COBOL working storage. Automatically creates query and update programs off indexed files using CRT protected and unprotected screen formats No programming experience needed Output program directly compiled by CIS COBOL — $350/$25/—

HDBS — Hierarchical Data Base System CODASYL one-field set FIELD SETs FIELD SETs may be sorted which are all user defined ADD, DELETE, UPDATE, FIND, and GET verbs supported Automatic locking for ordering is sorted FIFO, not at user option Supports many set relationship supported Read/Write protection at the FIELD level Supports FILE LINKAGE over multiple floppy or hard disk devices

NDBS — Micro Data Base System CODASYL network data base with all features of HDBS plus multi-level Read/Write protection at the RECORD and ITEM level Fastest implementation of one of the most powerful and many to many and many to one SET relationships Supports multiple owner and multiple members for within SETs HDBS files are fully compatible

MDBS-DRS — MDBS with Dynamic Restructuring System option which allows altering MDBS data bases when new ITEMs, RECORDs, or SETs are added without changing existing data — $398/$35

MDBS-DBD — $398/$35

MDBS-DRS-Z80 version — $650/$35

8080 Version available at $75 extra

Z80 version requires 20K RAM 8080 version requires 24K RAM (Memory requirements are additional to CP/M and application program.)

When ordering HDBS or MDBS please specify if the version required is for 1) Microsoft L80 i.e. PDR-11RAN-80, 2) BASIC-80/COBOL-80 3) BASIC/G 4. XX, or 3) BASIC-80 5.0

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EIDOS SYSTEMS

KISS — Keyed Index Sequential Search Offers complete Multi-Keyed file system, retrieval and update. Access file management includes built-in utility functions for 16 or 32 bit arithmetic, string concatenation and string compare. Delivered as a relocatable object module. Requires CP/M and ASM or RMAC. FORTRAN and COBOL interfaces available

KSASC — Microsoft Disk Extended BASIC with all KISS features, integrated by implementing BASIC with additional commands or language Package includes KISS file processing features and a sample mailing list program — $85/$45

To licensed users of Microsoft BASIC-80 (8080 only) — $430/$45

MICROPRO

SUPER-SORT I — Sort, merge, extract utility up selects any length program or group of fields/records in any sort format Sorts fixed or variable records with data in binary, BCD, packed BCD, ASCII, EBCDIC, floating, fixed point, exponential, hard justified, etc. Even variable number of fields per record! — $150/$25/—

SUPER-SORT II — Above available as absolute program — $95/$25/—

SUPER-SORT III — As II without SELECT/EXCLUDE — $60/$25/—

WORD-STAR — Menu driven visual word processing system for all users Full cursor control and line editing performed on screen Facilities for text paragraphing, centering, margin setting, and page formatting Can print one document while simultaneously creating a second Edit facilities include global search and replace, find/next, to alter text files. Requires CRT, and etc. Requires CRT terminal with addressable cursor positioning

WORD-STAR MAIL-MERGE — As above with option for printing or merging of data files/records/fields with mail list from Deleter or MAIL — $70/$25/—

SPELL-STAR — Spelling corrector For use by those users who do not have one of the many standard spelling checkers Requires WORD-STAR or equivalent version of WORD-STAR — $150/$25/—

WORD-MASTER Text Editor – in one mode has superset of WORD-STAR commands plus automatic reformatting and replacing, forwards and backwards in file in video mode, plus many user-definable features with serial addressable-cursor terminal — $125/$25/—

DATA-STAR — Customizable data control entry and display system for key-to-disk data capture Menu driven with data validation and verification by operation by length, mask, attribute (i.e. uppercase lowercase, numeric, etc.), and table look-up Also provides customized data entry programs with user defined value 'fixes' feedback for ease of forms design Files compatible with CP/M MP/M supports 32 megabytes Requires 32K CP/M — $300/$25/—

CBASIC-2 Disk Extended BASIC Non-interactive BASIC with powerful commands for file handling and terpreter Supports full file control, chaining integer and scientific arithmetic, string handling — $150/$25/—

PASCAL/M — Compiler generates P code from source Includes assembler, interpreter and runtime library

CAL Supports overlay structure through additional commands to the BDOS Includes assembler source Provides complete interface to CP/M Supports all the added variable type STRING Unlinked files allow memory image of compiler to be saved for faster compiles

PASCAL/Z — Z80 native code PASCAL compiler Produces definable RCMAs re-entrant code which is interfacing to CP/M is through the support library The package also supports the full implementation language and source for the library Requires 56K and Z80 CPU

PASCAL/MT — Multi-tasking extensions to PASCAL/M Supports full file control, chaining integer and scientific arithmetic, string handling — $275/$25/—

Version 3 Upgrade with version records and strings — $295/$25/—

PASCAL/MT+ Subset of standard PASCAL Includes RCMAble 8080 machine code Symbolic debugger Also supports various processors CP/M file I/O and assembly language interface Real-time clock support Full screen handling Requires CP/M 8080 Z80 CPU or North Star Horizon and Floppy Series Environment and Record data types Manual Supports RCMAble PASCAL/Z programs Supports the run time package requires MAC (See under Digital Research) Requires 32K — $250/$30/—

STRUCTURED SYSTEMS GROUP

GENERAL LEDGER — Interactive and flexible system for providing general ledger accounting and reporting Full CCA created interactively Multiple branch accounting centers Unlimited number of accounts Full history for proof CCA correctness etc Journal entries may be made directly to the general ledger or automatically generated from other systems Automatic Elimination of Changes in Financial Position Requires CBASIC-2 — $250/$25/—

ACCOUNTS RECEIVABLE — Open item system with full features for invoicing, credit and customer maintained statement and billing purposes On-Line Entry performance and history reporting Aging of accounts Credit departments interface to General Ledger Requires CBASIC-2 and 2 sixth system used Requires 48K CP/M — $250/$25/—

ACCOUNTS PAYABLE — Provides aged statements of accounts payable Automatic check writing Allows invoices Can be used alone or with General Ledger and/or with Sales Invoicing Requires CBASIC-2 — $250/$25/—

PAYROLL — Flexible payroll system handling weekly, bi-weekly hourly and monthly employees Automatic Tape, bonuses re-imbursements advances sick pay, vacation pay, miscellaneous deductions, and net pay calculations Complete check writing, payroll and employee reports and will post to multiple BSG general ledger accounts Requires CBASIC-2 — $250/$25/—

INVENTORY CONTROL SYSTEM — Performs certain functions of stocking and ordering stock items Stocking item data and deleting old items Tracks quantity on hand and on order Tracks sales Reorder point Reorder lead time Control of stock variable Reports include Master List, Stock Activity, Stock Valuation and Re-order List Requires CBASIC-2 $1250/$25

Everything on Shopping List runs on 64K of TRS-80 Model II

ANALYST — Customized data entry and reporting system. User specifies up to 75 data items per record (real/char) and specifies retrieval and update facility makes information management easy Sophisticated report generator allows user to customize reports Can be used for up to 32 self-contained files Supports file summarization. Requires CBASIC-2 — $250/$15/—

LETTERGEN — Program to create, edit and merge letters or other documents Has facilities to enter, display, delete and save text, with good video support presentation Designed to integrate with MAIL for form letter mailings Requires CBASIC-2 $125/$25/—

MAIL Name and Address selection system – interactive mail list creation and maintenance and report writing output as full reports with reference data or restricted to mailing labels Sorts on any field in any order Extraction and purging of selected records to create new files Requires CBASIC-2 — $150/$25/—

QSORT — Quick merge program for files with fixed or record length variable field length information up to five ascending or descending keys Full sort keys or input files created — $100/$25/—

GRAHAM-DORIAN SOFTWARE SYSTEMS

GENERAL LEDGER — As on time system to switching is required Entries to offer GRAHAM-DORIAN accounting system are automatically posted Data establishes customized C.O.A. Provides transaction register, record of journal entries, trial balance and monthly closings Keeps 14 month history and provides for budgeting and reports with previous year Requires CBASIC-2 Supplied in source — $195/$20

ACCOUNTS RECEIVABLE — Maintains invoices and check register Performs cash flow analysis Flexible aging of accounts Provides customer profiles and records and interfaces with general ledgers Automatically posts to GRAHAM-DORIAN general ledger or runs as stand alone system Requires CBASIC-2 Supplied in source — $195/$20

ACCOUNTS PAYABLE — Creates trial balance reports prepares statements, ages accounts and reconciles bank accounts Provides automatic posting to existing customer payment activity Records can be set up for automatic payment Interfaces with general ledger Automatically posts to GRAHAM-DORIAN general ledger or runs as stand alone system Requires CBASIC-2 Supplied in source — $195/$20

PAYROLL SYSTEM — Maintains employee master file Computes withholding for FICA, Federal and State taxes Prints payroll register checks, quarterly reports, W-2 forms Keeps track of sick pay, vacation and employee benefits Interfaces with general ledger Requires CBASIC-2 Supplied in source — $350/$20

INVENTORY CONTROL — Maintains stock levels, sources, sales ages turnover markup etc Transaction processing Provides for several file updates Salesman type of sale data of sale etc Reports available daily, monthly accounting and decision making Requires CBASIC-2 Supplied in source — $350/$20

JOB COSTING — Designed for the service contractor To be used interactively with other GRAHAM-DORIAN accounting packages for tracking and analyzing expenses User establishes customized cost categories Can be used to track labor, material, overhead and subcontract costs Automatically updates GRAHAM-DORIAN general ledger or runs as stand alone system Requires CBASIC-2 Supplied in source — $350/$20

APARTMENT MANAGEMENT SYSTEM — Financial management system for apartment complexes Keeps records of apartment projects Captures data on vacancies, rentals, leases, rent collection and income Only report system now exists Provides for other functions, income load through vacancy Requires CBASIC-2 Supplied in source — $350/$20

CASH REGISTER — Maintains files on daily sales Files data by salesperson and item Tracks sales overrings refunds payouts and total net deposits Requires CBASIC-2 Supplied in source — $350/$20

Key C — Interactive interpretive system for keying structured programming techniques Manual includes full source code — $75/$25/—

SDS C COMPILER — Supports most major features of the language including Structures, Arrays, Pointers, Recursive function evaluation; linking loader and library manager Supports all standard C library functions data manipulation and static and register class specifiers Supports interface to assembly code Requires 48K CP/M Supplied in source for Ritchie and Kernighan — $150/$25/—

WHITESMITHS C COMPILER — The ultimate in systems software tools. Produces faster code than Pascal, with more features. Conforms to the full UNIX™ Version 7 C language described by Kernighan and Ritchie, and meets many of the functions for performing I/O, strong manipulation and storage allocation described in the appendix. Requires CP/M — $500/$25/—

POLYTYPE 86 — Full screen editor for any CRT with XY cursor addressing Includes macro capability, control sequencing, interactive search and replace, automatic text wrap around for word processing applications for manipulating blocks of text, and comprehensive help facilities — $150/$25/—

POLYTEXT 86 — Text formatter for word processing applications Includes many features found in the Unix nroff command Form letter generation, conditional and conditional processing Support for Diablo Wheel printers Supplied in source code Requires CP/M — $150/$25/—

ALGOL-86 — Powerful block-structured language compiler featuring economical run time dynamic allocation of memory Very compact object code Fully system implementing almost all Algol 60 feature features Includes assembler, linker, and run time library Supports direct hardware I/O and Requires Z80 CPU — $150/$25/—

ZIN DEVELOPMENT PACKAGE — Consists of ZED a file line editor with global inter and intra-line facilities, ZIP Z80 relocating assembler, Zilog Mostek mnemonics conditional assembly and cross reference table capabilities, ZLINK linking loader and ZLIB relocatable trial has disk file. — $90/$20/—

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Z80 is a trademark of Zilog, inc

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TRS-80 is a trademark of Tandy Corp

TCP/M for Heath, TRS-80 Model I and Polydraphix 8813 is a modified and must use specially compiled versions of system and applications software

TCP/M for Heath system configuration of an 64BC CP/M 2 full size disk drives 24 x 80 CRT and 132 column printer

Modified version qualifies for use with CP/M as implemented on Heath and TRS-80 Model I computers.

User license agreement for the product must be signed and returned to Lifeboat Associates before shipment may be made

This product includes/is/includes the language manual recommended in Sundries and Notions above

Shopping List No.10

Software for most popular 8080/Z80 computer disk systems including
NORTH STAR, ICOM, MICROPOLIS, DYNABYTE DB8/2 & DB8/4, EXIDY
SYSTEMASTER, SD SYSTEMS, ALTAIR, VECTOR MZ, MEGA, 8" IBM,
HEATH H17 & H89, HELIOS, IMSAI VDP42 & 44, REX, NYLAC,
INTERTEC, VISTA V80 and V200, TRS-80 MODEL I and MODEL II,
ALTOS, OHIO SCIENTIFIC, DIGI-LOG and IMS 5000 formats.

*The Software Supermarket is a trademark of Lifeboat Associates

ZDT — Z80 Monitor Debugger to break and examine registers with standard Zilog/Mostek mnemonic disassembly display Full screen display Requires CP/M Development Package — $50/$15

DISLOD — Z80 DISTEL to Zilog/Mostek mnemonics Runs on Z80 only — $45/$10

XASM-86 — 8086 macro cross-assembler with nested conditionals and full range of pseudo operations As written it runs on CP/M and MP/M systems and needs a terminal — $250/$25/—

TEST-86 — As XASM-68 for MOS Technology MCS-8650 series microcode — $250/$25/—

WHATSIT — Text formatter to justify and paginate letters and other documents Special features include automatic table of contents, automatic footnotes, dash free or optional dash permitting paragraphs to be created from linked fragments an other files No formatting commands need, lists of paragraphs, footnote insertions listed for contracts, memos etc Has comprehensive manual with many examples — $125/$20/—

WHATSIT+ Interactive Process Control Editor — Full disk BASIC features plus unique commands to help in writing programs Includes all of the features available in WHATSIT and ROM/disk versions Integer Disk or integer ROM/disk — $295/$25

Extended Disk or ROM/disk — $395/$25

SMAL/80 Structured Macro Assembled Language – Extends Intel 8080 assembler to support most macro processor and SMAL structured language compiler Full SMAL implementation with IF-ELSE-ENDIF, DO-WHILE-ENDDO, LOOP-REPEAT-WHILE, DO-END, BEGIN-END, compiler — $150/$25/—

SELECTOR — Disk Data Base Processor to create and maintain multi-keyed data bases with variable length records Automatic summaries on mailing labels Comes with sample applications, including Check Register, Client/Matter Appointments, etc Requires CBASIC-2 — $150/$25/—

GLECTOR — General Ledger option for SELECTOR Includes full interface to SELECTOR and source in CBASIC Unique chart of accounts types invoice proper handling of accounts payable, and financial statements Full statements for all types of financial entries for statement of changes in financial position report accounts, and hyperlink to SELECTOR — $150/$25/— CBASIC-2 and 52K system

CPM2TAS — Adds a range of functions to enable or re-name an IBM 3741 volume, display directory information and a list of the files on a volume Also includes file transfer facilities between 3741 volume data sets and CP/M files — $150/$15/—

BASIC UTILITY QSIS — Consists of (1) CPUNCH-14 Cassette/Disk Interface, which is a tool for increasing the speed of programs in Microsoft BASIC and TRS-80 Model I (2) CPUNCH-15 Disk Interface Utilities for computing Average, Standard Deviation etc including square root, natural log, log base 10, sin, arc sin hyperbolic sin, hyperbolic arc sin Also included in source on diskette and documentation — $50/$30

TIME SHEETS — For CP/M/Plus accounting bookkeeping. Routines to find, fill, pack, move, separate, concatenate, and manipulate character strings. The package consistently diminishes the problems associated with the use of strings in BASIC — $50/$15/— Supplied in source

BSTAM — Utility to see into computer to another site equipped with BSTAM—allows file transfer at high data speed (no overtaxing to two), with CRC block control check data security, automatic operation and automatic retry We are IF it's great! Full wildcard expansion to send a DOS file to CP/M and back with 300 baud with phone connection. Both ends need BSTAM — $50/$15/— Supplied in source Requires Compatible TRSDOS version and modem — $150/$30

SUNDRIES & NOTIONS

HEAD CLEANING DISKETTE — Cleans the drive Head! Write to head in 30 seconds Diskette absorbs loose oxide particles and dirt Use periodically to avoid loss that might destroy the drive Cleans the drive head Lasts at least 3 months with daily use Specify 5" or 8" — $12.95

FLIPPY DISK KIT — Turnstile and instructions to convert single sided drives for use of second side on simple solder drives — $12.95

FLOPPY SAVER Protection for center holes of 8" floppy disks Only 1 needed per diskette Kit contains containing peel pressure seal tape, 100 hole reinforcing rings Installation tools and rings for 25 diskettes — $12.95

Re-orders of rings only — $7.95

PASCAL USER MANUAL AND REPORT — By Jensen and Wirth The standard textbook on Pascal Recommended for use by Pascal/Z, Pascal/M and Pascal/MT

THE C PROGRAMMING LANGUAGE — By Kernighan and Ritchie The standard reference on C Recommended for use by BDS C, Ivy C, and Whitesmith C users — $12.95

Orders must specify disk systems and formats required Add $2.00 for Airmail or Surface Delivery

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Five Packages, cont'd. .

requires. Also, array parameters must be called by name (otherwise an entire new copy of the array would have to be created when a procedure is called). However, in addition to the data types and structures of the standard (Boolean and numeric scalars and multidimensional arrays) standard, RML Algol also has BYTE arrays (for string handling of a kind), a few new logical operators and additional library functions. The wide variety of new functions support console I/O, serial and random access disk files, memory peek and poke, and direct interface with the operating system.

It should be pointed out that a more recent revision of the Algol standard, Algol 68, already exists and has some nice features not included in this implementation (such as a pointer data type and dynamic allocation). But if you're an Algol fan or want a fairly inexpensive, fast and powerful structured language for your system, then you may not need to look any further. There are other languages such as C and Pascal with their own advantages and disadvantages so you'll have to evaluate what's important to you before selecting one.

SP80 Structured Programming Macros

For purists who insist that assembly language is the only correct way to program, Structured Analysis Systems have a set of structured programming macros on disk called SP80. SP 80 comes in several different macro formats for most macroassemblers (Digital Research, Microsoft, TDL (who?) and Cromemco. The macros expand the capabilities of your assembler with three basic functions:

*Conditional execution- IFTHEN, ELSE and ENDIF. These macros control execution of a block of code depending on status flags or the relationship between two registers or literals including signed comparisons.

*Iteration- REPEAT-UNTIL, WHILE-ENDWHILE, DO-ENDDO and LOOP-STAYIF-EXITIF-ENDLOOP. These structures allow you to write loops in assembly language with different ways of exiting the body of the loop.

*Case Analysis-This is the counterpart of Basic's ON...GOTO or Pascal's CASE structure. An index is passed to a subroutine which selects one of several routines to execute.

The documentation is fair (there are several very helpful examples given but some descriptions could have been expanded a little). Overall, this is a very powerful package for those who know how to use it. If you do much large scale assembly language programming, then it's certainly worth your money.

If PRO is the opposite of CON then PROGRESS is the opposite of CONGRESS.

New Products from Digital Research

Digital Research is the company founded by Dr. Gary Kildall, who wrote the CP/M operating system for 8080 family microprocessors. They recently introduced two new operating systems: CP/M 2.0 and MP/M.

CP/M 2.0 is an enhanced version of the older system, primarily to support hard disks and other high-capacity storage devices, and larger files which are made possible. Its major improvement is the addition of a disk parameter block which may be adjusted at installation time to change track and sector sizes, directory sizes, reserved tracks and sector skew factors. The directory and data access algorithms have also apparently been fine-tuned. So if you're interfacing a video disk to your Altair, this is the disk operating system to have.

MP/M is a multiprogramming operating system, also for 8080 family processors. It supports task prioritization, dynamic memory allocation and release, bank select memory, interrupts, hardware generated time/date, multiple consoles and the CP/M 2.0 file structure. For instance, in MP/M, a user can start a task, detach the console and begin another task. MP/M supports system resident processes including a system monitor (which reports the status of all active tasks and other general information), a spooler, and a scheduler that allows you to define in advance at what time and date a program will be loaded and executed. This may be helpful in some environmental and household control applications (if you want to leave the computer on all the time and are convinced that it's not a case of technological overkill).

Although MP/M will run on smaller systems, there's really not much point to it and it appears that it would best live in a system with bank select memory (to prevent one program from unintentionally annoying another and giving everyone a reasonable amount of storage) and with at least an interrupt timer to facilitate task switching. A time date/clock would be nice, too. Naturally you want hard disks (the system monitor very curiously lists tasks "swapped out" though this feature in not implemented in the first release). About now you **should** be wondering why someone would spend $15K on hardware and squeeze all this work through a $15 slice of silicon (otherwise called a microprocessor). Hypothetically, it would seem much more useful to design a microprocessor based multiprocessing system to allow users to have their own processors and memory, which are dirt cheap, and to share the expensive peripherals such as disks and printers. Unfortunately, no hardware standard for multiprocessing on micros has been popularized which severely limits the market for an operating system of that sort. So we're not questioning Digital Research in bringing out this operating system since it's what people seem to want and it's far ahead of the competition. Those with the hardware to run it or computer junkies in search of bigger and better fixes of systems software to stay happy will definitely not be disappointed. □

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CIRCLE 215 ON READER SERVICE CARD

Personal Computing Networks

John Craig

What are the mechanics of actually getting a system hooked up to the phone line so that a computerized bulletin board, information system, or fellow enthusiast can be accessed? Aside from spending a fairly good-sized chunk of money on a data modem the process is quite simple. And, after we evaluated two modems which are closely comparable in the hardware department, it became clear that software is the key ingredient.

It's interesting to note that several manufacturers are now either offering modems as optional accessories or including them as part of a system. The word is out . . . and the personal computing community is getting ready to enter a new era. Telecommunications via personal computers will be a big part of the coming decade.

We're going to examine the features, both hardware and software, of two S-100 data modems. The Micromodem 100 from DC Hayes Associates, Inc. and the MM-103 from Potomac Micro-Magic, Inc. are the two modems. Before we get into the features of these boards a discussion of some of the miscellaneous details, which apply to any modem, should be covered.

What Is A Data Modem?

Quite simply, it's a device for converting the digital signals (square waves) coming out of a computer into audio, or analog, signals which the phone line can accept. A normal voice-grade telephone line can handle frequencies up to 3 kilohertz. As we've discovered from the atrocious radio-frequency interference radiated by personal computers, they're putting out signals in the megahertz range (which can be heard on an FM radio). The modem (derived from MOdulator/DEModulator) takes the ones and zeros coming out of the computer and converts them to audio tones using an encoding technique called frequency-shift keying. Another modem at the other end converts, or demodulates, the tones back into square waves for the receiving computer.

Modems operate in a "direct connect" mode with the phone line and as a result requires Data Access Arrangement (DAA) devicé between the modem and the phone connection (the receptacle in the wall into which the phone plugs). The purpose of the DAA is to provide isolation between the phone line and the modem and, aside from creating additional cost, is included as part of most modems on the market today.

How Does Ma Bell Feel About All This?

AT&T was a little worried in the early days of modem development and didn't care for the idea of people attaching "foreign devices" to the phone system. After a couple of court cases which ruled in favor of such attachments AT&T reluctantly consented. However, in an apparent further attempt to stifle the competition they changed the design, and specifications of the DAA (to which the other companies had to adhere). This resulted in another court action ordering them to get their act together.

Now that the smoke has cleared the only conditions are that the device meet the specifications. The manufacturers recommend that the user notify the phone company . . . but is that really something the user would want to do?

DC Hayes Micromodem 100

DC Hayes & Associates manufacture and market a modem for the Apple II in addition to their Micromodem 100. Most of the features found in the S-100 version are also available in the Apple Micromodem II. Without a doubt, the most desirable feature of this, and most of the modems sold today, is that they're assembled . . . and all the user has to do is plug them in.

The Micromodem 100 has a number of hardware features but, frankly, such features (on any modem) are worth little if they're not supported by the software supplied with the modem. On the other hand, and quite naturally, the software supplied with the modems we evaluated made use of the most or all of the hardware features. There is one main CP/M program (on 8" diskette) supplied, at extra cost, with the Micromodem 100. The program will run on any 8080, 8085, or Z80 system with CP/M. Upon execution the program displays the default status conditions such as baud rate (300), data word length, parity, stop bits and capture buffer status. The program is quite comprehensive and allows the user to change any of those variables. The command often used first is the "dial" function, which allows automatic dialing of phone numbers. If, for example, the user wanted to call a community bulletin board in San Francisco and the local phone system required that a "1" be dialed first to obtain a long-distance tone, the entry would be as follows: D 1*4153482139. The asterisk after the "1" provides a 2-second pause before the dialing of the actual number begins. As soon as the return is hit after entering the phone

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Networks, cont'd . . .

number an "off-hook" indicator on the Microcoupler (DAA) lights up to indicate the phone line is being used by the modem. After the distant number is reached and answered (by the receiving computer) a "connection established" message is sent to the screen. The user/operator responds with two carriage returns which provide synchronization with the remote system. From that point on the software in the remove system determines what happens.

The Terminal Program, as it is called, also has the capability of putting the local system in an "answer" mode and automatically answer calls from a remote computer. When the remote system accesses the local system in this mode the remote user has at his or her disposal the full capabilities of the local CP/M system. Files on the diskettes which are mounted can be accessed, application programs can be run, or language processors used for program development.

There is also a "capture buffer" feature which allows capturing received data into an in-memory buffer for later "typing" to the console or saving on the disk. Unfortunately we didn't have the opportunity to utilize this feature to any great extent because it was desired that most of the information and data obtained from networks and remote systems be printed out on the printer. As a result, we had to get into the CP/M input/output system and modify it to cause the console I/O to also be output to the printer. This provided hard copy when desired and the printer was simply turned off if it wasn't.

The Terminal Program provides the capability of reading a file, or program, off the disk and transmitting it or receiving a file and storing it on the disk. In addition, the user can exit to CP/M (and cause a warm boot), or exit to another program using a jump command, or hang up the phone using the "G" command (for "good-bye"). The modem can be set for full duplex, with no local echo, or half duplex, with local echo. While in the midst of communicating with a remote system the user can type a control Q and return to the Terminal Program for changing one of the parameters or some other function. After the commands are executed the program returns to the communication mode.

The Micromodem 100 sells for $399 (suggested retail) plus $20 for the Terminal Program on diskette. The Apple Micromodem II sells for $379 and includes on-board firmware which plugs right into the Apple. DC Hayes & Associates report that they've received very few calls in recent times from S-100 system owners and somewhat of an increase in calls from Apple owners. This indicates, to them, that the S-100 system owners are more familiar with their systems and that many of the Apples are being bought by less-familiar end users. Both versions of the Micromodem are available through computer stores. If the potential user feels that some help may be needed in getting the system going then the purchase should definitely be made through a store where support is available. DC Hayes also reports that an increasing number of modems are being sold to people interested in accessing The Source and MicroNet.

Potomac Micro-Magic's MM-103 Modem

The MM-103 has a very unique feature in that it is capable of turning on the computer upon receiving a ring on the incoming telephone line. This auxiliary interface can also be used for controlling some other external device with the computer. The auxiliary interface is a 14-pin DIP mounted in the upper right-hand corner of the board, which is rather impressive in appearance. The board was laid out using an automated layout machine and the very thin and closely spaced traces give the impression of a well-engineered board . . . and the performance backs up that impression.

The software for the MM-103 is quite extensive and there's something for everyone. The programs are available on 8" CP/M diskette, 5¼" North Star, or 5¼" North Star CP/M. The software comes with instructions, in the form of "DOC" files, on the diskettes for aiding the user in getting the system up. The North Star DOS version, which is the one we evaluated, incorporates the routines into the DOS and they become "transparent" to the user. The operation is such that the system comes up with the normal plus sign ("+") prompt for the DOS and the user types a Control 0 to initiate the modem program. It then responds with the question, "Manual or Automatic Dial?" We didn't have any success with automatic dial (primarily because the numbers we were calling were long distance and the software didn't provide the 2-second delay for obtaining the long distance tone) but the manual dial worked fine. This simply involved taking the phone off the hook, dialing the number and then hanging up when the distant computer responded with an acknowledge tone. The phone was then hung up, two carriage returns hit for synchronization . . . and communication was established. The software also provides for the capability of changing parameters, such as baud rate, while on line.

We discovered the totally automatic answering capability of the MM-103 by leaving the computer running and noticing that when the phone rang, it only rang once. This happened two or three times and then we answered it, only to discover that the party trying to call us was being greeted by the rather abnoxious acknowledge tone. After turning off the computer we were able to converse with the individual. It's not handy for talking to people . . . but just fine for answering another computer.

There are over 30 programs and documentation files available in the MM-103 software. Users should experience a minimum of trouble and effort in getting the system up and running. The manual is very well done and, like the DC Hayes manual, provides some good introductory material to the field of personal telecommunications.

The MM-103 has a suggested retail price of $359.95 which includes the assembled S-100 board and coupler. Each diskette sells for $15 plus $4.10 to cover shipping and handling.

Pluggin' 'Em in And Makin' 'Em Go

Rather than very carefully reading the directions before plugging a new board in it's sometimes more expedient to simply plug it in and see if it runs. That's what we did . . . and that's what they did (run). In both cases we plugged in the board, inserted the proper diskette, made the proper modifications in the case of the North Star DOS . . . and then executed the program and accessed a distant Computerized Bulletin Board System, The Source, or another personal system. The only thing which might have prevented things from going so smoothly would have been if the device address switches on the modems were set for something other than that which the software was expecting. They weren't.

There's a whole new world of personal computing waiting for you with the addition of a modem to your system. Go buy one, okay? □

Potomac Micro-Magic, Inc.
First Lincolnia Building, Suite B1
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Alexandria, VA 22312

DC Hayes & Associates, Inc.
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The original computer version of Adventure was written by Willie Crowther and Don Woods in Fortran on a PDP-10 at MIT. In this version the player starts near a small wellhouse. Upon entering the house, he finds food, water, a set of keys and a lamp. Armed with only these items, he must set out to explore the countryside in search of treasure and other objects of play. He must also confront dwarfs, snakes, trolls, bears, dragons, birds, and other creatures during his quest. The game accepts one-or two-word commands such as GET LAMP* SOUTH* or KILL DWARF. Of course, If you don't have the proper tool to carry out an action, or if you do something foolish, you may find yourself in big trouble.

In playing the game you wander thru various 'rooms' (locations), manipulating the objects there to try to find 'treasures'. You may have to defeat an exotic wild animal to get one treasure, or figure out how to get another treasure out of a quicksand bog. You communicate thru two-word commands such as 'go west', 'climb tree', 'throw axe', 'look around'.

Adventure

For Apple, TRS-80, Sorcerer, PET, CP/M

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MISSION IMPOSSIBLE ADVENTURE (by Scott Adams) - Good Morning, Your mission is to... and so it starts. Will you be able to complete your mission in time? Or is the world's first automated nuclear reactor doomed? This one's well named, its hard, there is no magic but plenty of **suspense**. Good luck.....

THE COUNT (by Scott Adams) - You wake up in a large brass bed in a castle somewhere in Transylvania. Who are you, what are you doing here, and WHY did the postman deliver a bottle of blood? You'll love this Adventure, in fact, you might say it's LOVE AT FIRST BITE.....

ADVENTURELAND (by Scott Adams) - You wander through an enchanted world trying to recover the 13 lost treasures. You'll encounter WILD ANIMALS, MAGICAL BEINGS, and many other perils and puzzles. Can you rescue the BLUE OX from the quicksand? Or find your way out of the maze of pits? Happy Adventuring.....

VOODOO CASTLE (by Scott Adams) - Count Cristo has had a fiendish curse put on him by his enemies. There he lies, with you his only hope. Will you be able to rescue him or is he forever doomed? Beware the Voodoo Man.....

PIRATE ADVENTURE (by Scott Adams) - "Yo Ho Ho and a bottle of rum..." You'll meet up with the pirate and his daffy bird along with many strange sights as you attempt to go from your London flat to Treasure Island. Can you recover LONG JOHN SILVER's lost treasures? Happy sailing matey.....

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New Tools for a New Era

John Craig

The new telecommunication networks for personal computer users are more than just services. They're a concept becoming a general utility, an information utility. And they're very likely to change our lives.

I received a couple of letters yesterday. Actually, I got a pile of mail but these two letters were special. They were received by my home computer and came by way of an electronic mail system: a system many people have thought about, talked about and probably figured they'd see someday in the far future. One of the letters came from Texas and the other from Illinois, and delivery was **one day** in both cases. Useful and innovative, the electronic mail is only one part of an extraordinary new system called **The Source.**

With this system I also have an "electronic newspaper" available which provides access to up-to-the-minute UPI wire service stories. Each night I read about events current in the Iranian crisis which are broadcast the following day. A major difference between this system and a real newspaper is that the "real" newspaper contains articles which have been selected by its editor, whereas you become the editor when selecting what you'd like to read from the UPI stories. You have the same "raw" news at your disposal from which newspaper editors make their selections.

You can also buy just about anything through this system. The Source has a classified ad section which allows any user to advertise anything for sale or trade. And I mean anything. A small town in New Jersey posted a notice that they were accepting bids on 110,000 gallons of unleaded gasoline; an individual in Arizona was offering a complete movie theater set-up for $16,000. How about renting a condominium at Lake Tahoe for $55 a day for a weekend getaway? Those are just a few of the unusual items. A complete list is shown in Figure A. In addition to the classified ads, which are between individuals, The Source also provides a buyer's service which allows you to select items they're currently offering (at substantial discounts) and simply have it charged to your major credit card. The service offers appliances such as microwave ovens (from $136 to $190 off suggested retail), telephone answering machines, a wide selection of china, sterling silver, luggage, watches & jewelry and more. Sometimes an item being sought may not be listed, in which case a letter of inquiry is sent, via The Source, and the buyer's service will respond with a price quote if it's an item they carry. Aside from being a great convenience—I didn't have to go out shopping for a wedding gift for my sister recently—there's a more significant aspect to this service. While you may read that Electronic Funds Transfer is on the way, through The Source it's already here.

Photo 1 If you left home without this (or your MasterCharge or Visa) then you can forget The Source or MicroNET.

These three services themselves—electronic mail, electronic newspaper and buyer's service using electronic funds transfer—could have an impact on our society in the future. Combined with all the other features of the system, it's almost a certainty that, with widespread use, it will have an impact on our society. The Source has so many features, services and capabilities that it's hard to decide where to begin, even in conversation. In a word, it's overwhelming.

What Is The Source?

Telecomputing Corporation of America (TCA) is the company behind The Source. Its two well-publicized founders are William Von Meister, who was formerly with Western Union and helped establish the Mailgram system, and Robert Ryan, who also founded the company which supplies and maintains the computers for the system. Von Meister has since departed from The Source, leaving Ryan as president.

The heart of the system consists of seven Prime 750 computers. These may be reached by subscribers through two nationwide, independent data traffic networks: Telenet and Tymnet. The Source was originally conceived as an information system for commercial users, but somewhere along the way they realized it would be a waste to let the system sit idle during "off" hours. At the same time it was realized that

ANTIQUE-AND-COLLECTABLES	(4)
APARTMENTS-RENT	(3)
ART	(2)
AUTOMOBILES-DOMESTIC	(28)
AUTOMOBILES-FOREIGN	(28)
BABY-SITTER-AVAILABLE	(1)
BULLETIN-BOARD	(77)
CHATTER	(19)
CLUBS	(23)
COMPUTERS-SALE	(51)
COMPUTERS-WANTED	(10)
DOCUMENTATION	(2)
DRAMA	(2)
GAMES	(4)
HELP-WANTED	(15)
HOBBIES-AND-CRAFTS	(3)
HOME-FURNISHINGS	(2)
MERCHANDISE	(11)
MISCELLANEOUS	(23)
MUSIC	(5)
OFFICE-EQUIPMENT	(1)
OIL/GAS	(2)
PERSONAL	(13)
PERSONAL-SERVICES	(3)
PETS	(3)
PHOTOGRAPHY	(2)
PROPERTY/HOUSES-SALE	(3)
PROPERTY/HOUSES-WANTED	(2)
PUZZLES	(4)
RECREATIONAL-VEHICLES	(3)
SAYINGS	(49)
SOFTWARE	(31)
STEREO/TV	(4)
TERMINALS-SALE	(19)
TERMINALS-WANTED	(3)
WEEKEND-GETAWAY	(6)

Figure A.
The categories found under the Source's classified ads service. The number in the parenthesis indicates the number of entries under that category.

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☐ **Send details on TRS-80 Word Processing and the 24-page TRS-80 Catalog #RSC-3.**

☐ **Have a representative contact me.**

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STATE _____ **ZIP** _____

I Own/Use a TRS-80 ☐ **Yes** ☐ **No**

Model _____

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personal computer users would be ideal customers for those non-prime time hours. They've been very pleased with the decision to go after that market.

There are only a few basic criteria for getting on the system; a personal computer system or terminal with a modem, money and a major credit card. It isn't absolutely necessary to have a computer. For example, an ADM-3, Soroc, or similar terminal can work in conjunction with a data modem to access the system. The most important consideration, whether you use it for a terminal or a complete computer, is to use it at a speed of 300 baud (30 characters per second). It could prove to be a mistake, for the nerves and the pocketbook, to try to use this or any other network with a 110-baud Teletype machine.

Actually, a person doesn't need money to get on the system, just a valid credit card. There's a $100, good-for-life, sign-up fee (which can be charged to the card), after which the only other charge the customer will normally see is $2.75 per hour for using the system. This charge applies to non-prime time usage, which is defined as being from 6PM to 8AM **local time.** The prime time charge is $15 per hour. In most areas around the country, particularly in large cities, toll-free phone numbers have been installed for customers to use the system. Those living in outlying or rural areas will suffer increased phone bills by having to place long-distance calls to the nearest large city to access the system. This problem is resolved when users in a particular area can guarantee 50 hours of usage per month (which is determined by having a certain number of people signed up—e.g.,10 people at an average of 6 hours per month each). TCA will arrange for the installation of a toll-free number when that quota is met.

Best of all, tie-in to the system is free! If you've been accustomed to paying $2.50 an hour for Telenet, for instance - the cost of linkup from a typical metropolitan area - it may just blow your mind to realize that the cost is now included in the $2.75 an hour for The Source.

A Visa, MasterCharge, or American Express credit card is an absolute must for becoming a Source user. The low cost of the system (and $2.75 per hour is low) is possible because there are no monthly billings to the customer. The hourly charges per month are automatically charged to the user's credit card. No checks, no cash, no money orders, just plastic money. In addition to the hourly usage charge, the one-time sign up fee, the phone bill (if there is one), the only other costs a customer can possibly incur are on-line storage charges. This amount to $0.033 per 2K block per day, note that this can add up considerably.

```
*** THE SOURCE ***

ANNOUNCEMENTS (UPDATED FREQUENTLY).....DATA ANNOUN

ADVANCED APPLICATIONS & PROGRAMS.....DATA ADAPPR
ASTROLOGY LIBRARY.....DATA ASTRO-IB
BUSINESS & FINANCE.....BIZDEX
CLASSIFIED ADS & BULLETIN BOARD.....DATA CLASSI
CONSUMER INFORMATION.....DATA CONSUM
DINING OUT.....RESTCD
DISCOUNT SHOPPING SERVICE (MONEY SAVERS).....DATA BUCKS
EDUCATION.....DATA EDUCAT
ENERGY SAVING NEWS & TIPS.....ENERGY
FINANCIAL NEWS.....BIZDEX
GAMES.....DATA GAMES
MAILCALL.....DATA MAILCAL
NEW YORK TIMES - NEWS SUMMARY.....DATA NYTNS
NEW YORK TIMES - CONSUMER DATA BASE.....NYTIMES
PERSONAL CALENDAR & NOTEBOOK.....DATA PERSON
PERSONAL FINANCE.....DATA PERSFI
REAL ESTATE ADVISORY (REAL-SOURCE, INC.).....REALAD
SCIENCE & ENGINEERING.....DATA SCIENC
SELF-PERCEPTION.....DATA ESP, DTA LORE
(PRESS THE RETURN KEY TO CONTINUE, OR "BREAK" TO SELECT A CATEGRY)

SPORTS.....DATA SPORTS
SUGGESTION BOX.....DATA SUGBOX
SYSTEM NEWS.....DATA SYSNEW
TRAVEL CLUB.....DATA TRAVEL
UNITED PRESS INTERNATIONAL (UPI).....DATA DANEWS
USER DIRECTORY.....DATA USEDIR
VOICEGRAM.....DATA VOICEGRAM
WEATHER.....DATA WEATHR
WISDOM OF THE AGES.....WISDOM
```

Figure B.
The features, programs and services available through the Source.

Additional Features & Services of The Source

The Source also offers a travel club which allows users to make plane, hotel and car rental reservations. And it works. I had occasion to use it once and, aside from the fact that two rooms were accidentally reserved instead of one, everything worked fine. That problem arose on-line when I misinterpreted an ambiguous question on the on-line reservation form I filled out. One may hope the ambiguity has been taken care of.

Another service offered by The Source is "Voicegram," which works in conjunction with the electronic mail system. Any Source subscriber can pick up a phone anywhere and call the Source's toll-free number and dictate a letter, which the operator will enter into the system. The next time the addressee signs on he or she will be notified there's a letter waiting. The mail notification comes in the form of a message: "Mailcall (X)," where X is the number of letter pending. Once into the routine of communicating via electronic mail, you find yourself waiting hopefully to see if the computer comes back with a "mailcall" after you sign on. It's very similar to the feeling experienced when you go out to the mailbox and find it empty—or full.

The list of Source facilities goes on forever—and that's not really too much of an exaggeration (see Figure B). The Source is somewhat like the game of Adventure. You keep discovering new things with each new "path" you take or "room" you enter. The New York Times Consumer Data Base is available and the wealth of information it offers for research by students or writers, or for just casual reading, is enormous. A partial list is shown in Figure C. There's a national Real Estate Locator Service for buying and selling homes. The financial services include prices from the American and New York Stock Exchanges, precious metals prices, commodity prices and futures, and many more.

There are a variety of business, scientific, home and educational programs available on The Source. In addition, there are several programming languages (Basic, Fortran, Pascal, Cobol) available for those interested in program development of such a system. I've put off mentioning these programs and languages until now because I feel they belong at the bottom of the list—for personal computer owners, that is. The Source, and similar systems, are going to be invaluable for telecommunications and information retrieval, not telecomputing. I can't

"When you have eliminated the impossible, whatever remains, however improbable, must be the truth." — Sherlock Holmes

...and the truth is, Hayden publishes the finest software available!

SONGS IN THE KEY OF APPLE (Lopatin) Allows you to hear and see your favorite tunes, pre-programmed tunes, or music you create (up to 200 notes per musical piece). **#03304, Apple II, $10.95.**

SKETCHMODE (Walton) Create computer graphics, modify them, save them, and read them from tape. **#03203, TRS-80 Level II $11.95.**

REVIVE (Gilder) When a program is accidentally erased, **REVIVE** searches through memory and finds the information that enables it to restore the pointers that have been changed. Can be loaded at any time. **#03604, Apple II, $19.95.**

GRIDIRON: A Microfootball Game (Microflair Associates) Be both offensive and defensive quarterbacks. Includes time-outs, penalties, a complete kicking game, and the two-point conversion used in college football. **#03003, TRS-80 Level II, $12.95.**

BIOCURVE (Microflair Associates) Will chart your biorythms against another person's and suggest when you will be in a state of instability and therefore vulnerability. **#03103, TRS-80 Level II, $9.95.**

COMPLEX MATHEMATICS (Gilder) 8 programs that give the user the ability to perform computations of complex numbers in BASIC rather than in FORTRAN. **#01201, PET; #01203, TRS-80 Level II; #01204, Apple II; each $14.95.**

ENGINEERING MATHEMATICS-1 (Gilder) Contains 8 programs useful to the engineer such as: Integration by Simpson's Rule, Quadratic Equations (covering all 3 root cases), etc. **#01301, PET; #01303, TRS-80 Level II; #01304, Apple II; each $14.95.**

GENERAL MATHEMATICS-1 (Gilder) Provides 15 programs useful to anyone who wishes to improve their math skills and accelerate their computations. **#01101, PET; #01103, TRS-80 Level II; #01104, Apple II; each $14.95.**

SARGON II (Spracklens) Winner of the recent European Microchess Tournament. "Buy this program when it becomes available — ...an evaluation routine that enabled it to beat the giants!...unequaled in the end game..." Personal Computing. **#03403, TRS-80 Level II; #03404, Apple II; each $29.95. #03409, Apple II Disk Version, $34.95.**

New! MICROCOMPUTER AIDED DESIGN OF ACTIVE FILTERS (Gilder) 8 programs that simplify the design of active filters and will calculate the component values needed for various bandpass, low pass, and notch type filters. **#01401, PET; #01403, TRS-80 Level II; #01404, Apple II; each $16.95.**

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New Tools, cont'd . . .

picture the typical personal computer owner paying good money to use this system for program development (and paying storage costs) or for running many of the application programs which are probably already available on a personal system, although there are many application programs available which a person might only use once in awhile. I can't picture a small business using The Source's accounts payable, receivable and general ledger programs if a personal computer system is available. However, if the business only has a terminal, then perhaps it becomes a viable approach.

Criticisms

The Source is a fairly new system and has had its share of problems. There have been several system failures which can be quite annoying and even result in lost data (e.g., they request that you re-send mail which was transmitted during a certain period of time after coming up from a "crash"). They've recognized the problem and, to the tune of over one million dollars in new hardware, they're trying to take care of it. Another problem is slow response time when the system gets overloaded. This will also be taken care of, it is said, by the new hardware. In that same area, they've experienced fairly severe system degradation when the UPI data is being downloaded. In the future an entire system will be dedicated to UPI. Figure D contains examples of error messages encountered during "troubled times."

Another problem area, about which I've heard several complaints, is the habit of introducing new services and products before they're available. It's true, and on occasion when trying to get information on a particular program the system responds with "NO DATA." Their early flyers mention having access to Ticketron for theater and sports ticket reservations. This still isn't available, but they're working at getting it, or a similar service, for the system.

They've had their problems in the past and will undoubtedly have more in the future. They're a new and growing company and some of those problems are natural growing pains. However, my feeling on the matter is that the positive sides of The Source far outweigh the negative. TCA has shown a genuine interest in improving trouble areas and responding to customer problems. Their customer service is manned 24 hours a

Photo 2 A printer is almost a must for operating with either system. You'll want hard copy of letters, the ability to print manuals and operating instructions from the system and more.

day, 7 days a week, and subscribers can call in on a toll-free number (or send a letter via the system).

One of the things which might affect the future course of TCA is the competition. At the moment, there's only one company in the field offering a similar service and system: MicroNET, from Compuserve's Personal Computing Division in Columbus, Ohio.

MicroNET

In a telephone interview with Jeff Wilkins, President of Compuserve, and John Meier, Marketing Manager, I asked how they felt about TCA as competition. Their response was that they see MicroNET as being "market-driven" as opposed to "competition-driven." Their objective is to provide a system which will respond to the demands of the market, particularly in providing a wide variety of software for personal computer users.

The two companies, and their respective systems, are coming from two different directions. Compuserve is an established company in computer networks and time-sharing systems which has been around for ten years. They've just recently made the plunge into this market and personal computer subscribers will account for a very small segment of their approximate $19 million in sales for 1979. The bulk of their business is in commercial accounts from investments analysis and banking, the mining industry and the federal government. Their clients include Fortune 500 companies. TCA, on the other hand, is a fairly new company which is for the moment catering primarily to the personal computing market, with the long-term objective of capturing some of that commercial market as well.

MicroNET subscribers, like users of The Source, are also required to have a major credit card in order to take advantage of the system. Billing for time and serices is done automatically each month. The initial sign-up fee for MicroNET is only $9 but the computer time charge is $5

```
INTELLIGENCE SERVICES (US)      (40)          P0064
INTEREST (MONEY)      (40)          P0065
INTERNATIONAL LAW     (19)          P0066
INTERNATIONAL MONETARY SYSTEM       (5)           P0067
ISSUE AND DEBATE (TIMES COLUMN)     (40)          P0068
INVENTIONS AND INVENTORS      (40)          P0069
JEWELS AND JEWELRY      (40)          P0070
LABOR ROLE IN MANAGEMENT      (40)          P0071
LABOR ROLE IN POLITICS      (40)          P0072
LEGAL PROFESSION      (50)          P0073
LIFE STYLES      (40)          P0074
LOBBYING AND LOBBYISTS      (40)          P0075
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MARIJUANA      (40)          P0077
MEDICARE      (40)          P0078
MENTAL HEALTH AND DISORDERS      (40)          P0079
METRIC SYSTEM      (18)          P0080
NATIONAL HEALTH INSURANCE (US)      (50)          P0081
NATIONAL PARKS      (40)          P0082
NEWSPAPERS      (40)          P0083
NOTES ON PEOPLE (TIMES COLUMN)      (40)          P0084
NUCLEAR WASTES      (40)          P0085
OLYMPIC GAMES (1980)      (40)          P0086
PAINTING AND DECORATING      (13)          P0087
PENSIONS      (50)          P0088
PERSONAL COMPUTERS      (38)          P0089
POPULATION AND VITAL STATISTICS      (40)          P0090
POSTAL SERVICE (US)      (40)          P0091
PREGNANCY, OBSTETRICS AND MATERNAL WELFARE      (40)          P0092
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PRIVACY      (40)          P0095
PROSTITUTION      (40)          P0096
REGULATORY AGENCIES      (40)          P0097
```

Figure C.
A partial list of the many, and varied, subjects available through the Source's New York Times Consumer Data Base. The number in parenthesis indicates the number of entries for a particular subject.

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16K-Keyboard B	$995
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Commodore Dual Floppy Disk Drive	$1,295.00
Commodore Printer (tractor feed)	$849.00
Commodore Printer (tractor feed)	$995.00
Second Cassette - from Commodore	$95.00
Commodore PET Service Kit	$30.00
Beeper - Tells when tape is loaded	$24.95
Petunia - Play music from PET	$29.95
Video Buffer - Attach another CRT	$29.95
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TNW Bi-dir. RS-232 printer X-face (see box below)	**$229**
KIM 1 (A Single Board Computer from Commodore)	$179.00

B – large keyboard (graphics not on keys)
N – large keyboard with graphics symbols

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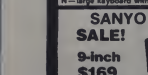

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VISI-Calc	$99
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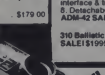

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CIRCLE 125 ON READER SERVICE CARD

per hour. There is, however, an additional $4 per hour connect charge if the subscriber is in an area which requires using Tymnet to access the system. The system hardware consists of 17 Digital Equipment System 10 and 20 mainframes with megaword memories, a small segment being dedicated to MicroNET. A customer service phone number is available, but not toll-free, and it is only manned during normal working hours by someone who can answer questions about MicroNET, non-prime time hours for MicroNET operation are 6PM to 5AM local time.

MicroNET Software Exchange

Another contrast between the two companies is their approach to supplying application programs on the systems. MicroNET, through its Software Exchange service, will be offering programs to be downloaded into personal systems. These will be sold, or, in cases of public domain software, distributed "free!"

Their scheme for an on-line software distribution system allows (while you use the system on a paying basis) subscribers to examine the catalog of programs and select what they want downloaded into their home systems. The user's major credit card is automatically billed for the software.

The Source is quite different from MicroNET in this regard. They have a very limited number of programs available for downloading and they don't anticipate increasing the number substantially in the future.

However, with both systems it is possible for one user to file a program on the system and allow another user to access the program (for downloading or to run on the time-share).

The MicroNET Software Exchange programs available in early December, 1979 consist of 17 programs in the areas of education, business, games, programming tools and energy management—all for the TRS-80 (other systems to be added on a continuing basis). Prices range from $1.00 to $49 with an average of $16.40. The 17 programs consisted of 7 in the area of education, 4 business programs, 3 games, 1 programming tool routine and 2 energy management programs. Judging just from the titles, most of the educational programs sound worthwhile; two of the business programs would be useful (if they're good). The three games consist of Awari, Monopoly Simulation and Minicrossword; the programming

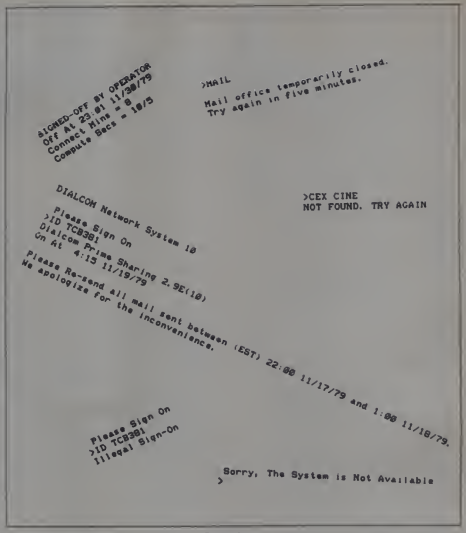

Figure D.
The Source has had its share of problems . . . .
but they're being taken care of.

tool program is a simple base conversion routine; and the two energy management programs (at $49 each) are totally useless—unless you have solar collectors all over the roof of your home. The two business programs I think would be of some interest and value are an Amway Distributor's management package and a loan/mortgage amortization program, which can be found just about anywhere.

The design of the system's responses in this area were the most frustrating aspect. It took me **eight pages** of printing to determine that there were only 17 programs. From the main menu the user goes down to a sub-menu from which a program may be selected. After one selection the program reverts to the main menu, which means the user has to go through the whole thing again to find the other programs in the sub-menu. Very frustrating — especially when you're paying for the time and phone call.

I wish MicroNET every success with this service. Since they're going to be competing with all the other software distribution companies for programs, they're going to need it.

Other MicroNETServices & Software

An electronic mail service is also available on MicroNET. They have a bulletin board service which, in early December, had 14 SALE messages, 9 WANTED messages and 27 NOTICES. One of the nice features of the MicroNET bulletin board, compared to The Source's, is that a scan mode is provided so the user doesn't have to print out each and every message. The system also provides an "Ann Landers" feature by the name of Aunt Nettie. I wouldn't want to comment too harshly on the lack of substance (and waste of time and money in printing out the contents) because it is a new service and may very well improve in the future.

There are a number of games which the user may play, such as,

New Tools, cont'd . . .

Chess, Adventure, Blackjack, Civil War, Backgammon, Othello, Star Trek and more. I'm sure the folks at MicroNET (and The Source) would dearly love to see users get involved with playing some of these games, most of which will rack up a lot of time on the system. Once again, I can't see this area as being particularly useful to personal system owners (terminals, yes - computers, no).

Aficionados of the DEC PDP-10 and 20 systems will appreciate the availability of TECO (and other text editors), BLISIO, MACRO FOCAL, PIP and other DEC languages and utilities. Pascal, Basic, AID and APL are also available on the system.

Summary

I sincerely wish that MicroNET was more "competition driven" than "market driven." The consumer usually benefits when two companies go head-to-head in trying to provide the best for least. However, it doesn't look like that's going to happen here.

When I talked with Jeff Wilkins, President of Compuserve, he would not discuss any future plans for MicroNET—except to say they are negotiating to obtain new data bases. He emphasized that they would discuss new services or products only after they were up and running on the system. As a result, it was kind of difficult to get a feel for the vision and long-range goals they see for the MicroNET system.

I also conducted a similar phone interview with Jack Taub, who is Chairman of the Board of the parent company of the parent company of The Source, Digital Broadcasting. He shared some ideas and future plans which I think you'll find fascinating. For example, The Source is currently being used by approximately 150 U.S. Congressmen. I, for one, want to be among the first to write a letter to one of them using the system. Imagine, if you will, a day in the not-too-distant future when legislators (both state and federal) will be able to send out questionnaires, via The Source, and get immediate feedback from the people. For similar purposes, there are plans to have The Source installed in The White House in the future. That kind of immediate feedback could also be useful for the major television networks to obtain ratings to TV shows and do away with the Nielsen Ratings. Jack Taub indicates they're looking into that. Some of their future projects include data bases and programs for the medical and legal professions, health care, real estate and education. They also hope to interface The Source with Dearnet, a time-share network for the deaf. Some critics and detractors will say that this kind of talk is meaningless, and that they would rather see these things implemented than just talked about. Perhaps, but I think his remarks indicate the perception and imagination behind The Source and I'm impressed. I'm an optimist. □

MicroNET
Compuserve
Personal Computing Division
5000 Arlington Centre Blvd.
Columbus, OH 43220
PH: (614) 457-8600

The Source
Telecomputing Corporation of America
1616 Anderson Raod
McLean, VA 22102
Ph:(703) 821-6660

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SORT	85K	173	SORT and MERGE	85K SORT + 1275K Merge	1757
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The Computer Connection

Lorraine Mecca

The D.C. Hayes Micromodem II has opened the lines of Data Communications to Apple II owners from Atlanta to Los Angeles, and beyond. Once the Micromodem II hardware is installed the user is a dial tone away from the Computer Connection.

The telephone company has been adding to its vast network of phone lines since the turn of the century. There is hardly a city or town in the United States which is not accessible to any phone in the country. So, if an Apple II owner in Bayonne, New Jersey wants access to information stored in a time-sharing computer in Portland, Oregon, the obvious way to connect the two computers would be over the telephone lines.

Although it sounds simple, it isn't. There is a problem. Telephone lines are designed to carry the very limited frequencies of the human voice. On the other hand, computers are designed to transmit digital ones and zeroes.

To make the two systems compatible the digital signals must be modulated and coded onto a narrow band of frequencies the phone company machinery can recognize and transmit without distorting the message. Once these coded signals reach the other computer the frequencies must be demodulated into the original pattern of ones and zeroes.

The device used for this unique translating situation is called a MODEM. The word MODEM is a combination of the words MOdulator/DEModulator.

Lorraine Mecca, 6791 B Westminster Ave., Westminster, CA 92683

There is a wide variety of data communications machinery currently in operation that uses modems for communicating with other electronic devices. Most of these modems, like the D.C. Hayes Micromodem II, are compatible with the Bell System 103-type modem. Theoretically, all of this compatible equipment can be connected to each other if the baud rate and duplex modes match.

The D.C. Hayes Micromodem II is a low speed data communications sub-system for the Apple II computer. It can operate at 110 or 300 baud rates. A baud rate of 300 is approximately equal to 30 characters per second. In most instances, an Apple II equipped with a D.C. Hayes Micromodem would use a 300 baud rate unless it is linked to a Model 33 Teletype machine. These Teletype machines (there are many of them around), and all the machines linked to them, will only send and receive signals at a 110 baud rate. With a D.C. Hayes Micromodem II the baud rate can be changed by POKE and PEEK Basic programming statements or, more simply, by inputting the corresponding control characters outlined in the user's manual.

There must also be compatibility between the Duplex modes of the two connected computers. The D.C. Hayes sub-system can operate in full or half-duplex. Full-Duplex means that data can be sent in both directions at the same time. Regular telephone lines allow for this two way transfer, since both people in a phone conversation can talk at the same time.

Half-duplex allows for transmission in only one direction at a time. This mode is a little more complicated for regular people to use. An "over" or some such indicator signal must follow each segment of the transmission to let the connected computer know when the transmission is over and it can respond.

Setting the D.C. Hayes Micromodem to full or half-duplex is accomplished with a Control F or Control H, respectively, as outlined in the user's manual.

The Computer Connection is in operation 24 hours a day

When you unpack a D.C. Hayes Micromodem II you will notice only four easily identifiable parts:

1. A printed circuit board which mounts into an Apple II peripheral slot.

Connection, cont'd. . .

2. A microcoupler which attaches to the telephone modular cable.

3. A ribbon cable that connects the printed circuit board to the microcoupler.

4. A modular cable that connects the telephone line and the microcoupler.

Before you try to install it, make sure your Apple II is turned OFF and remove the cover. Along the back wall of the computer there are eight printed circuit edge connectors in parallel rows. These slots are numbered 0 through 7. Slots 0,6,&7 are reserved for Basic fimware and disk controller cards. The printed circuit card will work in any slot from 1-7, though the user's manual references slot 3 throughout.

There are cable slots cut in the back of the Apple II case. The ribbon cable should be run through one of the cable slots. The cable connects the printed circuit card to the microcoupler by a connector at each end of the cable. These connectors can only be inserted in one direction. Once the connections are made, the case can be replaced.

There is hardly a city or town in the United States which is not accessible to any phone in the country.

A modular telephone cable provides the final link between the computer and the telephone network. Insert one end into the appropriate squarish hole in the microcoupler box (you will hear a snap when it is inserted correctly). The other end plugs into a similarly squarish hole in the modular telephone jack in the wall. If your home or office is not equipped with a modular phone jack, you must purchase a modular adapter or have the phone company install a modular jack.

There are certain legal restrictions to using a modem with public telephone lines. You cannot connect a computer to a pay phone or a party line. You also must call the phone company business office and give them all the telephone numbers to which you will be connecting your computer (home, office, school, etc.). They will want to know the FCC registration number and the ringer equivalence number. Both of these numbers are given in the user's manual. You must also notify the phone company if you permanently disconnect your computer (I've heard reports that some local phone companies don't want to be bothered with this information).

Now you are set for the Computer Connection. D.C. Hayes firmware included with the sub-system supports three different operation modes.

Terminal Program

By activating the terminal program your Apple II simulates a dumb CRT terminal. In this mode you can call another Apple II equipped with a D.C. Hayes Micromodem II, or any computer equipped with a Bell System 103-type compatible modem. This includes most of the big time-sharing systems.

Remote Console

In this mode your Micromodem II equipped Apple II can be contacted and controlled by a Bell System 103-type equipped dumb terminal.

Program Control

By using a Basic program your Apple II can dial and hang-up the phone, or send and receive data. More advanced programming skills allow for more complicated tasks. The user's manual provides sample programs.

A Computer Connection

Computer Components of Orange County, in Westminster, California, has much to offer the modem equipped Apple II.

"I hope you won't take it too hard being replaced by a computer."

©Creative Computing

In April of 1979, the store owners, Geza Csige and Will Otaguro, installed a dedicated communications phone line into the store. The phone line was attached to one of the store's Apple II demonstration models through a D.C. Hayes Micromodem II. Now, a mere phone call connects customer's home systems with the store system.

The Computer Connection is in operation 24 hours a day and provides callers with a message bulletin board, public domain software, class and workshop schedules and registration, and a number of computer game tournaments. These offerings are expected to increase as the number of modems in home use accelerates. On the drawing board are plans to have an Alpha Micro with 10 megabyte hard disk on line by early Fall.

But why all the freebies? "It's good business," answered Geza Csige. "We've more than doubled our D.C. Hayes Micromodem sales since we installed the line. We learned that we need to supply our customers with things to do with their computers. The more we give them to do, the more they buy."

To reach Computer Component of Orange County via modem dial (714) 898-1984. It is necessary to have a Modem and a terminal to make this connection. To make complete use of the store's facility the home system should contain an Apple II with 32K of memory, a disk drive system, a printer (for hard copies of messages, schedules and programs) and a D.C. Hayes Micromodem II. This is an optimum system, and stripped down versions are useful within limitations.

Computer Components is planning to extend their Computer Connection to the Atari personal computer as soon as a compatible modem is available. □

Pet As A Remote Terminal

Ken Cox

Not long after I bought my PET, I began shopping around for an RS232C interface that could be used with an acoustic coupler. The TNW488/232 from The Networks seemed to meet the requirements. So I ordered it.

Within two weeks I received the interface. It included an excellent manual describing both hardware and software aspects of the unit, along with examples in PET Basic.

The Hardware

I set the appropriate hardware options (device number, baud rate, parity, etc.), soldered together a twenty-five pin connector and plugged it in. Within minutes I had entered the sample test program from the manual.

To my surprise it worked the first time! I had actually sent and received characters through the interface in Basic.

I set the acoustic coupler to loopback (all characters entering are immediately echoed back). This test would check both transmitting and receiving capabilities. To my surprise it worked the first time! I had actually sent and received characters through the interface in Basic. What a snap! Making the PET a 300 baud CRT terminal was going to be much easier than anticipated. Or, so I thought at the time.

The Software

A quick Basic program with written and I made the first attempt to dial the host computer. A few control characters needed to be converted. That change was easily made and I dialed again. This time everything worked as expected except about ten percent of the characters coming from the host computer were being dropped. Then I remembered the warning from the manual: "PET Basic can barely keep up at 300 baud." Evidently the program was just slow enough to lose a few characters. The obvious solution was to make the program a little more efficient. But that is easier said than done, especially with a fifteen line program. A few nights of experimenting told me that this would not work. I certainly did not wish to slow down to 110 baud. The alternative was to write a machine language program to do the same thing.

I had previously done some machine language programming with the 8080A, but not with the 6502, the microprocessor in the PET. As it turned out, I knew enough to be dangerous!

Initially I searched for PET ROM routines to print and receive characters. I found the subroutine to display a character on the screen. That was a lucky find. PET documentation is almost nonexistent. Piecing together several magazine articles helped, but did not completely solve the problem. This is when Doug Gage from The Networks proved to be very helpful. He discovered PET ROM routines to get and send characters. He even wrote a program to emulate a terminal. I was unable to use this program as is, but it did give me some good ideas.

I soon discovered the richness of PET ROM routines and the difficulty, yet power, of machine language. I had an assembler (programmed in Basic) to help me. However, it did not allow mnemonic addresses, a major drawback to debugging. But I still enjoyed programming the 6502.

The PET character set is not totally ASCII so the task is not as straightforward as might be expected. Realizing the difficulty in making a universal CRT emulator for the PET, I set up the requirements for my operation:

1. PET sends all capital letters, numbers, control characters and most special characters.
2. PET receives all of the above plus small letters.
3. Certain characters received by the PET will have to be converted.

The machine language program is placed in memory location 826-1023, the second cassette buffer. This is an excellent place as Basic does not interfere.

Summary

Just a final word on the operation of the program. Pressing RVS prior to any letter transmits the corresponding control character. ASCII characters with a decimal value greater than 122 will be converted incorrectly. This is acceptable to me as I do not use these characters. A more severe limitation is the lack of a BREAK. This is not a hardware feature of the TNW488/232. I know of no way to transmit a BREAK exclusively with software, Finally, pressing the CLR returns the user to Basic.

Over the past two months, I have used my program with the PET into an HP2000 timesharing system with very satisfying results. The program is not perfect, but it certainly works fine for me. □

Ken Cox, 322 Joanne St., Cedar Falls, IA 50613.

Something New for your PET

PET Personal Computer Guide

by C. Donahue and J. Enger

This book is a step-by-step guide for the computer novice who wants to learn how to operate and program the PET computer. Assuming no prior knowledge of computers, this PET Guide contains information on all areas of interest ranging from how to push the buttons on the tape cassette unit to a detailed description of PET memory contents. #30-6. $15.00

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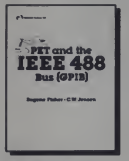

PET and the IEEE 488 Bus (GPIB)

by E. Fisher and C. W. Jensen

This is the only complete guide available on interfacing PET to GPIB. Learn how to program the PET interface to control power supplies, signal sources, signal analyzers and other instruments. It's full of practical information, as one of its authors assisted in the original design of the PET GPIB interface. #31-4. $15.00

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6502

Assembly Language Programming

by L. Leventhal

For the advanced programmer: increase the capabilities and performance of PET (and other 6502-based computers) by learning to program in assembly language.

#27-6. $12.50

Some Common BASIC Programs

By L. Poole and M. Borchers

This book was designed for people who can use a variety of practical BASIC programs — 76 programs in all that cover a wide variety of personal finance, math, statistics, and general interest topics. The documentation in the book is complete so that you can run the programs even if you aren't an experienced programmer.

#06-3. $12.50

PET owners can purchase the programs ready-to-run on cassette or disk, using the book as a manual for program descriptions, operating instructions and programming options.

Disk #33-0. $22.50 Cassette #25-X. $15.00

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S1074

```
KBIN    826 033A A2 04     LDXIM  4      Get character from keyboard
        828 033C 20 B4 03  JSR    947
        831 033F D0 03     BNE    3      If no character go to HPIN
        833 0341 4C 76 03  JMP    886
        836 0344 C9 93     CMPIM  147    If character=CLR,return
        838 0346 D0 04     BNE    4
        840 0348 20 CC FF  JSR    65484
        843 034B 60        RTS
        844 034C C9 12     CMPIM  18     If character=RVS set control
        846 034E D0 08     BNE    8      character flag to 1, go to HPIN
        848 0350 A9 01     LDAIM  1
        850 0352 8D FF 03  STA    1023
        853 0355 4C 76 03  JMP    886
        856 0358 AB        TAY           Transfer character to index reg Y
        857 0359 AD FF 03  LDA    1023   Load control character flag
        860 035C F0 0C     BEQ    12     If control character flag=1
        862 035E A9 00     LDAIM  0      send corresponding control
        864 0360 8D FF 03  STA    1023   character(subtract 64 from value),
        867 0363 98        TYA           reset control character flag=0,
        868 0364 18        CLC           go to HPOUT.
        869 0365 69 C0     ADCIM  192    If control character flag=0,
        871 0367 4C 71 03  JMP    881    go to PRINTSCR.
PRINTSCR874 036A 20 CC FF  JSR    65484  "Untalk and unlisten" GPIB bus
        877 036D 98        TYA
        878 036E 20 BF 03  JSR    959    Print character on screen
HPOUT   881 0371 A2 06     LDXIM  6      Send character to HP
        883 0373 20 E1 03  JSR    993
HPIN    886 0376 A2 07     LDXIM  7      Get input status from RS232
        886 0378 20 B3 03  JSR    947
        891 037B AB        TAY           Store character in index reg Y
        892 037C 29 08     ANDIM  8      If data received bit is not set
        894 037E D0 03     BNE    3      go to KBIN.
        896 0380 4C 3A 03  JMP    826
CHRIN   899 0383 A2 05     LDXIM  5      If data received bit was set,
        901 0385 20 B3 03  JSR    947    get character.
        904 0388 A2 00     LDXIM  0
        906 038A 20 9B 03  JSR    920    Call switch input character routine.
        909 038D 48        PHA
        910 038E 20 CC FF  JSR    65484
        913 0391 68        PLA
        914 0392 20 BF 03  JSR    959    Print character on screen
        917 0395 4C 3A 03  JMP    826    Go to KBIN.
SWITCH  920 0398 AB        TAY           Subroutine to convert from one
        921 0399 BD EF 03  LDAX   1003   character to another.
        924 039C D0 05     BNE    5
        926 039E 98        TYA
        927 039F 20 D7 03  JSR    983    Call ASCII to PET small letter
        930 03A2 60        RTS           conversion routine.
        931 03A3 98        TYA
        932 03A4 DD EB 03  CMPX   1003
        935 03A7 F0 05     BEQ    5
        937 03A9 E8        INX
        938 03AA E8        INX
        939 03AB 4C 98 03  JMP    920
        942 03AE E8        INX
        943 03AF BD EB 03  LDAX   1003
        946 03B2 60        RTS

GETCH   947 03B3 20 C6 FF  JSR    65478  Subroutine to get a character.
        950 03B6 20 E4 FF  JSR    65508
        953 03B9 48        PHA
        954 03BA 20 CC FF  JSR    65484
        957 03BD 68        PLA
        958 03BE 60        RTS
PRINTCHR959 03BF 48        PHA           Subroutine to print a character on
        960 03C0 48        PHA           screen.
        961 03C1 20 CC FF  JSR    65484
        964 03C4 A9 14     LDAIM  20     Delete cursor
        966 03C6 20 D2 FF  JSR    65490
        969 03C9 68        PLA           Print character
        970 03CA 20 D2 FF  JSR    65490
        973 03CD A9 A6     LDAIM  166    Print new cursor
        975 03CF 20 D2 FF  JSR    65490
        978 03D2 20 CC FF  JSR    65484
        981 03D5 68        PLA
        982 03D6 60        RTS
HPPETSML983 03D7 C9 60     CMPIM  96     Subroutine converts ASCII small
        985 03D9 10 01     BPL    1      letters to PET small letters
        987 03DB 60        RTS
        988 03DC 18        CLC
        989 03DD 69 60     ADCIM  96
        991 03DF AB        TAY
        992 03E0 60        RTS
SENDCHR 993 03E1 20 C9 FF  JSR    65481
        996 03E4 20 D2 FF  JSR    65490
        999 03E7 20 CC FF  JSR    65484
       1002 03EA 60        RTS
SWTABLE 1003 03EB 11 00    DBAIY  0
       1005 03ED 12        *
       1006 03EE 00        BRK
       1007 03EF 13        *
       1008 03F0 00        BRK
       1009 03F1 14        *
       1010 03F2 00        BRK
       1011 03F3 1D 00 0C  DBAX   3072
       1014 03F6 93        *
       1015 03F7 5F        *
       1016 03F8 14        *
       1017 03F9 00        BRK
       1018 03FA 77        *
       1019 03FB 77        *
       1020 03FC 77        *
       1021 03FD 77        *
       1022 03FE 60        RTS
CTLFLAG 1023 03FF 00       BRK
                           BASIC Calling Program
```

```
10 OPEN 4,0,0,"KBIN":OPEN 5,4,0,"HPIN"
20 OPEN 6,4,1,"HPOUT":OPEN 7,5,0,"STATUS"
30 POKE 1023,0:REM SET CONTROL CHARACTER FLAG TO OFF
40 POKE 59468,14:REM SET SMALL LETTER CAPABILITY
50 PRINT "clr";:REM CLEAR SCREEN
60 SYS(826):REM CALL MACHINE LANGUAGE PROGRAM
70 POKE 59468,12:REM RESET GRAPHICS CHARACTERS
80 END
```

Remote, cont'd...

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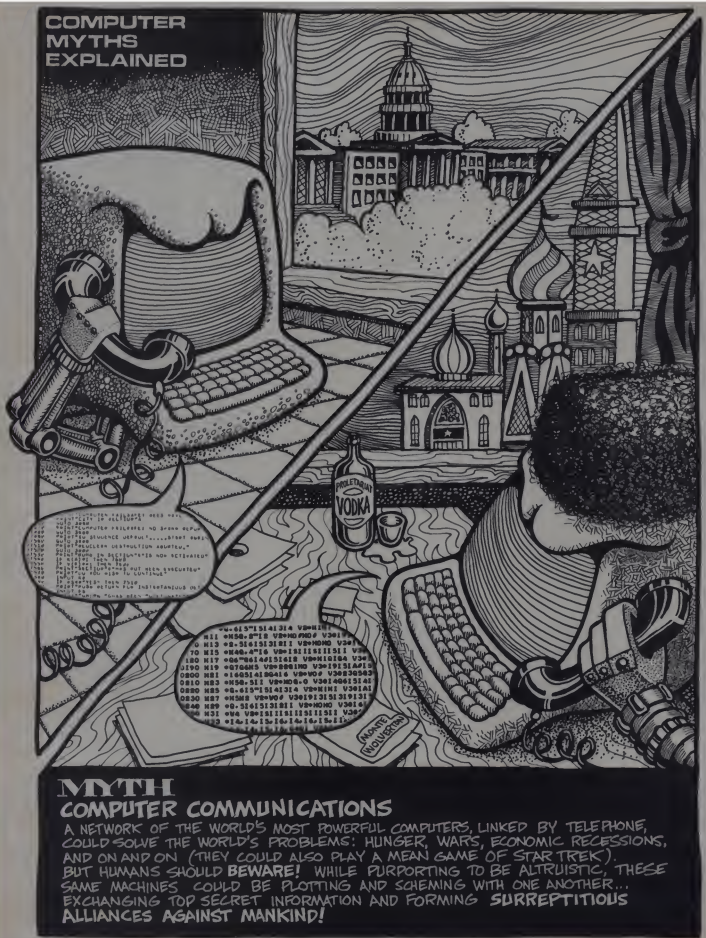

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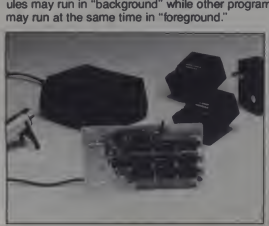

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How To Make A Basic Tree

James W. Garson

A detailed description of the program and techniques presented in last month's "GENE: Retracing Your Past Through Genealogy."

Awhile back a **Creative Computing** reader asked how to store information on his/her genealogy with a microcomputer. This article describes some of the principles of tree construction in Basic and explains how to apply them in constructing a genealogy program. We'll be making reference to the GENE program which appeared in last month's Creative Computing ("GENE: Retracing Your Past Through Genealogy" - Feb 80). It is written in TRS-80 Level II Basic, but can easily be adapted to other versions of Basic which allow string arrays.

Initial Housekeeping

The main problem in working out a genealogy program is to find a way to represent your family tree so it can be modified easily. Here is how. First, set up a string array N$ which will contain your relative's names:

```
DIM N$(100)
```

We will put "UNKNOWN" in N$(1), and then store names of 99 relatives in N$(2), N$(3), . . . , N$(100). It really won't matter what order you put the names in.

Now we set up two more arrays of the same size as N$:

```
DIM M(100), F(100)
```

These arrays contain numbers that point to the places in N$ where the names of the mother and father of a given relative can be found. For example, suppose N$(4) contains:

```
MORTIMER SNERT
```

Then M(4) should contain a number (say it's 21) which tells us where the name of Mort's mom can be found in N$. To put it another way, N$(21), that is, N$(M(4)) will contain the name of Mort's mom. Similarly, N$(F(4)) will contain the name of Mort's father. If it turns out that nobody knows who Mort's father was, we just let F(4) = 1, so that F(4) "points to" what is in N$(1), namely "UNKNOWN." (You should set M(1) = 1 and F(1) = 1, since mothers and fathers of unknown people are unknown too.)

James Garson, University of Notre Dame, Notre Dame, IN 46556.

Working With Your Family Tree

Writing programs to change and to move around in your family tree is fairly easy. If you want to add new names, just write them in the first unoccupied spots in N$. To keep track of where this is, you need to keep a number in a variable (call it P) that points to the last occupied spot in N$. To add a new relative named Samantha Snoggert, we just add 1 to P, and store her name in N$(P). We will also need to update M and F so that they point to the places where the names of her parents are found. Normally we won't remember the numbers where these names are found, but it is easy enough to write a program that takes, for example, the name of Samantha's mother, and then puts the right number in M(P). Here is a program that does just that:

Writing programs to change and to move around in your family tree is fairly easy.

```
10  INPUT "MOTHER'S NAME"; M$
20  FOR J=1 TO P
30  IF N$(J) = M$ THEN GOTO 60
40  NEXT J
50  J=1          (Name wasn't found so
                  person is unknown)
60  M(P)=J       (J is the number for
                  name in M$)
```

Here are a couple of programs that are handy for "moving around" in a family tree of this kind. To print the name of Mort's mother, for example, we just write

```
100  X=M(4)
          (Remember, Mort's number is
          4, so X is his mother's number).
110  PRINT N$(X)
```

To get the name of his grandmother, just change line 100 to:

```
100  X=M(M(4))
          (X is the mother of the mother
          of Mort.)
```

Getting the names of Mort's children takes some searching:

```
500  FOR J=1 TO P
          (P is the number of people we
          have stored.)
510  IF 4=F(J)  THEN PRINT N$(J)
          (If Mort is J's father, print J's
          name.)
520  NEXT J
```

This program is a bit inefficient since it must look at all the names to find those of Mort's kids. The alternative is to set up more pointers for children. Since a relative can have many children, this pointer must be a two dimensional array. For example, C(4, 1) would contain the number for Mort's first child, C(4, 2) the number for his second child, and so on. You will have to decide whether you want to add "forward" pointers like C along with M and F. Doing so would speed up getting data on children and children's children, etc., but the TRS-80 is fast enough that you don't notice the time it takes to do the search. Given that, it isn't worth the bother of setting up the new array C and writing a subroutine to update it every time you add new data.

To get names of Mort's grandchildren, we just change line 510 of the previous program:

```
510  IF 4=F(F(J)) THEN PRINT N$(J)
          (If Mort is father of the father
          of J, then print J's name.)
```

Now this program will only print out names of Mort's grandchildren on the male line; it does not print out names of the children of his daughters. To get all his grandchildren we must write:

```
510  IF 4=F(F(J)) OR 4=F(M(J))
          THEN PRINT N$(J)
```

Here the name for J is printed if Mort is the father of the father of J or the father of the mother of J.

To get a list of Mort's siblings (his brothers and sisters), we just change line 510 to

```
510  IF F(4)=F(J) THEN PRINT N$(J)
          (If Mort's father and J's father
          are the same, print J's name.
```

This program will print out the names of all people who have the same father as Mort (including Mort himself). That means it will list any of Mort's half sisters or half brothers by his father. To get only Mort's full brothers and sisters we write:

```
510  IF F(4)=F(J) AND M(4)=M(J)
          THEN PRINT N $(J)
```

Basic Tree, cont'd . . .

which prints the name of only those people who have the same father and mother as Mort. To get a list that includes Mort's half brothers and sisters, just put OR instead of AND in 510. If we want a list of Mort's aunts and uncles on his father's side, we simply change line 510 again:

```
510 IF F(F(4))=F(J)
        THEN PRINT N$(J)
        (If father of father of Mort is
        father of J, then print.)
```

Further Expansion

Now let's get sex into the picture. To get names of brothers but not sisters, or uncles, but not aunts, we need to be able to tell who is male and who is female. It is easy to store sex data in a new array S$. Then S$(4) can contain "MALE," since that is what Mort is, and S$(21) will contain "FEMALE," since Mort's mother is female.(You may want to savememory by using a numerical array S, and code numbers for the two sexes.) Now that this information is available, we can change our program so that it prints a list of Mort's brothers (by his father):

```
510 IF F(4)=F(J) AND S$(J)="MALE"
        THEN PRINT N$(J)
```

This prints J's name only if J has the same father as Mort and is male. We won't go into all the ramifications on half-uncles and 25th cousins, but it should be clear that if you can state clearly which of Mort's relatives you want, you can write the correct

Now let's get sex into the picture. To get names of brothers but not sisters, or uncles, but not aunts, we need to be able to tell who is male and who is female.

condition into 510 to get a list of their names. In the program GENE (see lines 500-599) you can only get the siblings and children of a given relative listed, but once you understand how to rewrite the condition in lines like 510, you can easily expand this part of the program to handle any other relationships you like.

Getting an entire list of Mort's descendents is a bit complicated. For example, we would have to write

```
510 IF 4=F(F(F(J))) OR 4=F(F(M(J)))
      OR 4=F(M(F(J))) OR
      4=F(M(M(J))) . . .
```

just to get a full list of Mort's great-grandchildren. Maybe that explains why genealogists only trace the male line. It is just too complicated to deal with the whole picture. You could write a program that puts the numbers of Mort's children in an array, and then adds the numbers of their children, and so on, and then prints the names for all the numbers stored. Writing this program isn't too difficult. However, since most genealogists don't keep information on the female lines, you may never need to do this. Since I disagree about which side of the family is most important, here is a simple program that prints out the names of all

You can easily change your mind about what kinds of data to store without messing up the information that represents your family tree.

Mort's mother's descendents on her female line for 5 generations:

```
700 FOR G=1 TO 5
710 PRINT "GENERATION"; G
720 FOR J=1 TO P
730 Z=J
740 FOR L=1 TO G
      (Lines 740-760
      set Z=M (...M(J))
                G times
750 Z=M(Z)
      So Z is the mother of
      (G times) J.)
760 NEXT L
770 IF 21=Z THEN PRINT N$(J)
      (Mort's mom's number is 21;
      Z is the mother of (G times) J.)
780 NEXT J
790 NEXT G
```

You male chauvinists can replace line 750 with Z=F(Z).

Conclusion

There is probably a lot more information you want to store on your relatives than just their names and sexes. It is easy to set up new arrays to store as many different kinds of information as you like. If you want to keep track of birthdays, set up an array D$, and store Mort's birthday in D$(4). GENE doesn't have any extra arrays like this, but you can add them. The advantage of setting up our tree the way we did is so you can easily change your mind about what kinds of data to store without messing up the information that represents your family tree. This may help you solve the inevitable problem of inadequate memory. Any reasonably large genealogy will gobble up 16K. But when you are hunting around for relatives, the only arrays that really have to reside in memory are M, F, N$ and S$. (You can even do without N$, if you can remember relatives by number.) All other information can be on tape, or even in notebooks. During a search you can keep numbers of relatives you want data on in a list, which can later be used to print out or look up specific information. □

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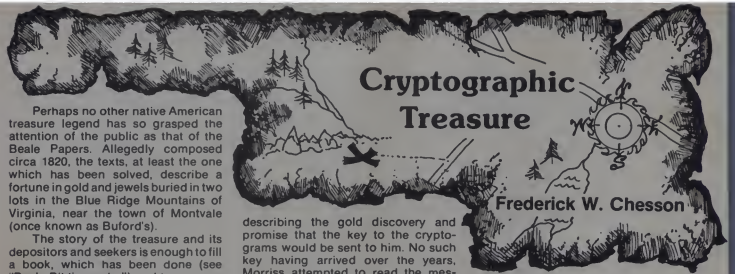


Cryptographic Treasure

Frederick W. Chesson

Perhaps no other native American treasure legend has so grasped the attention of the public as that of the Beale Papers. Allegedly composed circa 1820, the texts, at least the one which has been solved, describe a fortune in gold and jewels buried in two lots in the Blue Ridge Mountains of Virginia, near the town of Montvale (once known as Buford's).

The story of the treasure and its depositors and seekers is enough to fill a book, which has been done (see "Beale Bibliography") and to spawn a myriad of articles. It will be sufficient to say here that the treasure, if it ever existed, is not known to have been recovered. Nor have the two unsolved messages ever been broken; neither have they been statistically proven to be hoaxes, composed of random numbers.

The texts describe a fortune in gold and jewels.

The three messages are assuredly a swarm of numbers. Technically, they are classified as homo-phonic ciphers, in which the letters of the alphabet are replaced with various numbers, the more common of the letters, like E, T, A, O, I, N, etc., having many more substitutes than rarely-used letters like J, X and Z. Paper Number One is composed of 520 numbers, ranging in value from 1 to 2906, with a total variety of 297. Number Two is 763 numbers long, having numbers going from 1 to 994, with a variety of 179. Number Three has 618 numbers, ranging from 1 to 975, with a total of 263 different numbers.

According to generally accepted tradition, all three papers are the product of one Thomas Jefferson Beale (1797-182?-1851?). The question marks indicate that there is still some doubt as to the authenticity of this particular T. J. Beale. In 1819 and 1821 he deposited gold, silver and gems acquired by him and a party of thirty adventurers in an excavation or vault near Goose Creek, in Bedford County, Virginia. Before leaving again in 1822 for the Southwest and more treasure, he gave a box to innkeeper William Morriss with instructions to open it if he did not return in ten years.

After a decent interval of 23 years, Morriss opened the box, to discover the three papers, along with letters describing the gold discovery and promise that the key to the cryptograms would be sent to him. No such key having arrived over the years, Morriss attempted to read the messages, but in vain. Before his death, he shared the secret with one James B. Ward, who had somewhat better luck.

By numbering the words of many texts, such as the Bible, etc., Ward found that the Declaration of Independence would decipher Paper Number Two. The key operated thusly: The first ten words of the Declaration have the following first letters: W I T C O H E I B N . . . When these are numbered in sequence 1 = W, 2 = I, 3 = T, 4 = C, etc., and applied to the first letters of each word, Ward recovered a tantalyzing decipherment which commenced:

"I have deposited, in the country of Bedford, about four miles from Buford's, in an excavation or vault, six feet below the surface of the ground, the following articles belonging jointly to the partie whose names are given in (Paper) Number 3, herewith:

"The first deposit consisted of one thousand and fourteen pounds of gold and three thousand eight hundred and twelve pounds of silver . . .

"Paper Number 1 describes the exact locality of the vault . . . "

In vain did Ward and a host of successors try to fit the Declaration and every other possible book or public document to Papers 1 and 3. Others have attempted dowsing, clairvoyance and just plain intuition for the sites of their pick-and-shovel efforts. In 1970, Dr. Carl Hammer, Director of Computer Sciences at UNIVAC in Washington, DC, was awarded a $500 prize for his paper on "Signature Simulation and Certain Cryptographic Codes." With the use of a Univac computer he showed that the elusive Papers 1 and 3 were not random number accumulations, but were constructed along lines similar to the solved Number 2, although there were grounds to believe that a count was made of more than just the first letter in the words of the key texts.

On Saturday, September 8th, 1979, some seventy computer scientists, cryptographers, historians, treasure hunters and plain interested parties, assembled in the Univac auditorium to hear a variety of topics, ranging from Beale's possible connection with intrigue in New Orleans, to the latest in cryptanalytic computer programs. No breakthrough was publicly announced, though several "impending solutions" were again revealed, as similar ones had been proclaimed at the last Beale Symposium in April, 1972. Meanwhile, the value of the still-buried gold continues to rise, perhaps exponentially.

Frederick W. Chesson, 144 Fiske Street, Waterbury, CT 06710.

Cryptanalysis

The following notes are directed at the newcomer to the Beale Papers, and cryptograms having multiple substitutions in general.

It is not necessary to write out a trial cipher alphabet encompassing all the numbers appearing in the ciphertexts. An examination of the three papers will disclose that there are long strings of cipher numbers which do not go much higher than 120, with test segments having numbers under 100 being quite plentiful.

There is still some doubt as to the authenticity of this particular T. J. Beale.

Take the following string from Number 2:

. . . 47-85-50-37-49-47-64-6-7-71-33-4-43-47-63-1-27 . . .

If you had been trying the Declaration of Independence as a key with words being numbered, your trial substitution would have given the following result:

. . . N E T E E N T H E S E C O N D W A . . .

This recovery is so promising, in terms of the patterns like TEEN, THE, and SECOND, that a little additional filling in would quickly crack the entire message.

Treasure, cont'd . . .

Likewise, in Message Number 1, the following strings are worth checking:

67-104-86-52-88-16-80-121-67-95-122
and 84-16-79-23-16-81-122.

Message Number 3 can be tested with the following strings:

2-44-53-28-44-75-98-102-37-85-107-117-64-88 and 64-10-106-87-75-47-21-29-37-81-44-18 and 24-93-3-19-17-26-60-73-88.

The value of the still-buried gold continues to rise, perhaps exponentially.

If it is desired that the entire message be displayed on a video display, then graphic symbols or two-digit alphanumerics, like J7, BK, +D, N/, may be used to represent the three and four digit ciphertext numbers to save space on the display. This will be especially important if the ciphertext symbols are to remain constant on the screen, while trial deciphermerits are written in beneath. For instance, having decided that in Message Number 2 numbers 7, 33, 37, 49 and 85 stand for the letter E, then an underwriting display program would cause the following:

```
47 85 50 37 49 47 64 8  7 71 33 4 43 47 63 1 27
   E     E  E                                  E
```

Attempting to discover the correct key to the unknown messages may take time, to say the least. Much more progress can possibly be made by attempting to identify the various homophones, not necessarily as representing a given letter, but representing the same letter. One technique is the Contact Radio Test, which compares adjacent numbers to two selected numbers. A simple (ficticious) example follows, where 27 is suspected as standing for the same letter as 99:

. . . 33-17-91-44-27 05-13-86-58 . . .
. . . 33-17-91-44-99-05-13-86-58 . . .

Here, all adjacent numbers, over a 4-span range are identical, indicating an extremely high probability that 27 is a homophone for 99. In practice, such one-for-one correspondences of adjacent numbers are highly unlikely, and one must develop values for matches closer to the target numbers, as in the following example:

. . . 33-17-91-44-27-05-13-86-58 . . .

. . . 65-17-14-21-99-05-33-19-58 . . .

As an actual example, the following Contact Ratio Test is made for numbers 29 and 41 from Message Number Two, both of which are known to stand for plaintext letter T.

22-07-15-140-47-29-107-79-84-56-238
2-616-61-420-822-29-125-14-20-37-105
57-549-216-115-71-29-85-63-43-131-29
102-406-229-549-320-29-66-33-101-818-138

occurrences of 29 − 4 times

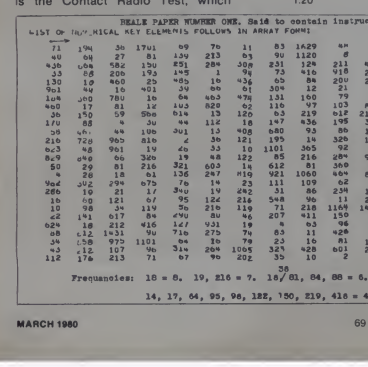
59-818-45-316-104-41-78-154-991-122-138
612-219-37-66-154-41-20-50-06-584-122
138-30-31-62-67-41-85-63-10-106-88
44-110-121-125-96-41-51-50-140-56-47
612-818-81-95-405-41-609-136-14-20-28
459-370-653-486-106-41-107-612-219-275-30

occurrences of 41 − 6 times

0 0 0 0 0 * 2 1 0 1 1 — Number of contacts
1 1 1 2 4 * 4 2 1 1 1 — Arbitrary Multiplier
0 0 0 0 0 * 8 2 0 1 1 — Contact Product

12	Sum (8+2+1+1)
10	Divisor (4+6)
1.20	"Contact Ratio"

In this manner, every number of, say, three or more occurrences is tested against every other number, and the "Contact Ratios" examined for relatively high values. Number pairs having "high" values will "probably" have the same plaintext letter equivalent. This is an ideal example of an application for computer-assisted cryptography testing out the program against the numbers of the solved Message Number Two, to determine the best values of the "Arbitrary Multipliers" and the validity of the procedure in general. Such a program, in Fortran was written in 1970, to attempt to crack the "Zodiac Murders, Message Number Two" . . . but that is another Mystery, for another day. □



REALE PAPER NUMBER ONE. Said to contain instructions on locating the treasure vault.
LIST OF NUMERICAL KEY ELEMENTS FOLLOWS IN ARRAY FORM:

71	194	36	1741	89	76	11	83	1629	48	94	63	132	16	111	95	84	341	975	14
40	64	27	81	139	213	63	94	1120	8	15	3	126	2018	40	74	780	485	1120	280
420	504	582	150	851	288	308	231	124	211	408	225	401	370	11	101	345	139	180	17
33	88	208	193	145	1	96	73	416	918	263	28	500	538	536	117	136	219	27	174
130	19	480	25	65	434	65	84	200	283	118	320	134	36	416	290	15	71	22	224
901	44	16	401	39	60	61	304	12	21	24	283	134	92	63	246	486	602	7	214
108	300	780	16	54	480	478	131	190	79	73	440	95	18	84	583	34	69	198	367
480	17	81	12	105	828	92	116	97	103	462	70	60	1317	471	540	208	161	890	344
36	150	59	586	614	13	120	63	219	612	2160	1780	99	35	18	21	136	872	15	78
170	88	4	30	44	112	18	147	136	195	340	37	122	113	6	140	3	120	505	49
38	46	44	106	301	13	408	580	93	86	116	530	82	588	9	102	38	816	89	71
210	728	960	810	2	36	121	195	51	14	320	148	234	18	135	334	381	828	16	81
603	48	901	90	40	33	70	1101	365	92	88	181	275	346	201	206	86	36	219	328
849	490	66	320	19	48	122	85	216	284	919	861	326	984	233	64	68	232	431	960
50	29	81	216	321	600	14	612	81	300	36	51	62	194	78	56	290	314	576	112
4	26	18	61	136	247	819	921	1060	464	495	10	6	66	119	38	41	49	602	423
964	302	294	675	76	14	23	111	109	62	31	501	823	216	260	34	24	150	1000	182
286	19	19	21	19	14	282	31	26	234	140	407	115	33	191	61	104	86	62	84
16	60	121	67	95	124	216	548	96	11	241	77	364	218	65	667	890	236	158	211
10	98	34	119	54	219	119	71	218	1164	1496	1817	51	39	710	36	3	19	460	219
42	141	617	84	490	80	46	207	411	150	29	38	46	172	85	194	36	261	548	897
624	18	212	416	147	431	19	4	63	96	12	101	418	16	140	230	480	538	19	27
88	132	1431	90	716	275	74	83	11	426	89	72	84	1300	1706	614	221	132	40	102
34	158	975	1101	94	18	79	23	16	81	122	324	403	912	227	936	447	55	86	34
40	112	107	96	314	204	1065	325	428	601	203	124	95	216	414	2906	634	820	2	301
112	176	213	71	67	90	202	35	10	2	41	17	84	241	736	820	214	11	60	760 end
							58												(520)

Frequencies: 18 = 8. 19, 216 = 7. 16, 81, 84, 88 = 6. 10, 11, 34, 58, 63, 71, 86 = 5.

14, 17, 64, 95, 98, 122, 150, 219, 414 = 4.

Beale Bibliography

So much has appeared lately on the Beale Treasure, that a complete listing would be almost as long as this article, and probably out of date by publication time. **The Washingtonian**, an area magazine for the Nation's Capital, carried a Beale feature in its September, 1979 issue.

For a detailed listing of books*, articles, copies of Original Documents, Special Research Materials, and Computer Programs, write to the following address:

The Beale Cypher Association
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Additional References:

The Codebreakers, by David Kahn. Macmillan Co., New York, 1967. Pages 771-772.

"Computers and Cryptology" by F. W. Chesson. **Datamation,** January, 1973.

"Solving Secret Messages With a Computer", by F. W Chesson, **Radio-Electronics,** Dec. 1977.

*BOOK "Gold in the Blue Ridge", by Walter and Pauline Innis Published by R. Luce, Washington, DC, 1967. To be reprinted with updated material.

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53 28 44 75 98 102 37 85 107 117 64 88 136 48 151 99

175 89 315 326 78 96 214 218 311 43 89 51 90 75 128

96 33 28 103 84 65 26 41 246 84 270 98 116 32 59 74

66 69 240 15 8 121 20 77 89 31 11 106 81 191 224 328

18 75 52 82 117 201 39 23 217 27 21 84 35 54 109 128

49 77 88 1 81 217 64 55 83 116 251 269 311 96 54 32

120 18 132 102 219 211 84 150 219 275 312 64 10 106 87

75 47 21 29 37 81 44 18 126 115 132 160 181 203 76 81

299 314 337 351 96 11 28 97 318 238 106 24 93 3 19 17

26 60 78 88 14 126 138 234 286 297 321 365 264 19 22 84

56 107 98 123 111 214 136 7 33 45 40 13 28 46 42 107

196 227 344 198 203 247 116 19 8 212 230 31 6 328 65

48 52 59 41 122 33 117 11 18 25 71 36 45 83 76 89 92 31

65 70 83 96 27 33 44 50 61 24 112 136 149 176 180 194

143 171 205 296 87 12 44 51 89 98 34 41 208 173 66 9 35

16 95 8 113 175 90 56 203 19 177 183 206 157 200 218 260 291 305 618

951 320 18 124 78 65 19 32 124 43 53 57 84 96 207 244 66 82 119 71

11 86 77 213 54 88 316 245 303 86 97 106 212 18 37 15 61 89 16 7 81

39 96 14 43 216 118 29 55 109 136 172 213 64 8 227

304 611 221 364 819 375 128 296 11 18 53 76 10 15 23

19 71 84 120 134 66 73 89 96 230 48 77 26 101 127 936

218 439 178 171 61 286 315 215 102 18 167 262 114 218

66 59 48 27 19 13 82 48 162 119 34 127 139 34 128 129

74 63 120 11 54 61 73 92 180 66 75 101 124 265 89 96

126 274 896 917 434 461 235 890 312 413 328 361 96 105

217 66 118 22 77 64 42 12 7 55 24 83 67 97 109 121 135

181 203 219 228 256 81 34 77 319 374 382 675 684 717 864

203 4 18 92 16 63 82 22 46 55 69 74 112 135 186 175

119 213 416 312 343 264 119 186 218 343 417 845 951 124

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416 975 10 22 18 46 137 181 101 39 86 103 116 138 164

212 218 296 815 380 412 460 495 675 820 952. (619 numbers)

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84, 44, 77, 82 = 7. 28, 48, 65, 218 = 6.
15, 32, 33, 64, 73, 75, 85, 98, 112, 116, 124, 136, 203 = 5.
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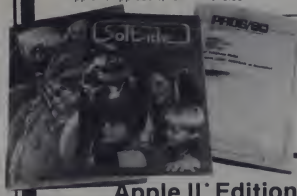

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It'll be "artificial" intelligence for some time

Why Computers Can't Be Intelligent

Hubert L. Dreyfus

Some thought-provoking comments on where we've been during the first years of AI research and reasons why it will be a number of years, if ever, before we see truly intelligent computers.

Even the most tough-minded men and women have a sense that, although they are made out of matter, they are not machines; yet lately they are more and more frequently being told, as if it were obvious, that "each human being is a superbly constructed . . computer"[1] and that computers will eventually behave as intelligently as people do. Some scientists say that computers, like HAL in *2001*, will be just like people; others claim that intelligent machines will be better than human beings, since they will not suffer from fatigue, emotions, self doubt and the illusion that they are not machines. Each of these predictions is associated with its own disaster scenario: the emotional computer loses its cool and destroys everyone in its passionate attempt to save the mission; the purely intellectual computer coolly turns society into a rational hell, fit only for robots. Since spreading the good news of the imminence of artificial intelligence as well as prophesying inevitable disaster is becoming a new media industry, it is high time to look again at our quiet assurance that we are not computers and that claims that computers can be intelligent must be nonsense.

Two of the most popularized computer "successes" which seem to support the notion that scientists are making steady progress toward intelligent machines are Winograd's blocks program (SHRDLU)[2] and the impressive performance of recent chess machines.

When it was first unveiled ten years ago Winograd's program did, indeed, seem a major advance toward intelligent machines. SHRDLU simulates a robot arm which can move a set of variously shaped blocks and allows a person to engage in a dialogue with the computer, asking questions, making statements and issuing commands about this simple world of movable blocks. Workers in AI (artificial intelligence) did not try to cover up the fact that it was SHRDLU's restricted domain which made apparent understanding possible. They even had a name for Winograd's method of restricting the domain of discourse. He was dealing with a "micro-world." Marvin Minsky and Seymour Papert, co-directors of MIT's "robot project," explain:

> Each model — or "micro-world" as we shall call it — is very schematic; it talks about a fairyland in which things are so simplified that almost every statement about them would be literally false if asserted about the real world.[3]

But they immediately add:

> Nevertheless, we feel that they (the micro-worlds) are so important that we are assigning a large portion of our effort toward developing a collection of these micro-worlds and finding how to use the suggestive and predictive powers of the models without being overcome by their incompatibility with literal truth.

Given the admittedly artificial and arbitrary character of micro-worlds, why did Minsky and Papert think they provide a promising line of research?

What characterizes the period of the early seventies, and makes SHRDLU seem an advance toward general intelligence, is the pseudo-scientific concept of a micro-world — a domain which can be analyzed in isolation.

To find the answer we must follow Minsky and Papert's perceptive remarks on the understanding of narrative and their less than perceptive conclusions:

> . . . In a familiar fable, the wily Fox tricks the vain Crow into dropping the meat by asking it to sing. The usual test of understanding is the ability of the child to answer questions like:
>
> "Did the Fox think the Crow had a lovely voice?"
>
> The topic is sometimes classified as "natural language manipulation" or as "deductive logic," etc. These descriptions are badly chosen. For the real problem is not to understand English; it is to **understand** at all. The difficulty in getting a machine to give the right answer does not at all depend on "disambiguating" the words (at least, not in the usual primitive sense of selecting one "meaning" out of a discrete set of "meanings"). And neither does the difficulty lie in the need for unusually powerful logical apparatus. The main problem is that no one has constructed the elements of a body of knowledge about such matters that is adequate for understanding the story. Let us see what is involved.

But while the game's circumscribed character makes a world champion chess program possible in principle, there is a great deal of evidence that human beings play chess quite differently from the way computers do.

To begin with, there is never a unique solution to such problems, so we do not ask what the Understander *must* know. But he will

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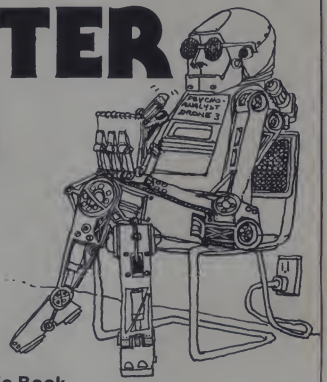

Contents

Artillery-3
Baccarat
Bible Quiz
Big 6
Binary
Blackbox
Bobstones
Bocce
Boga II
Bumbrun
Bridge-It
Camel
Chase
Chuck-A-Luck
Close Encounters
Column
Concentration
Condot
Convoy
Corral
Countdown
Cup
Dealer's Choice
Deepspace
Defuse
Dodgem
Doors
Drag
Dr. Z
Eliza
Father
Flip
Four In A Row
Geowar
Grand Prix
Guess-It
ICBM
Inkblot
Joust
Jumping Balls
Keno
L Game
Life Expectancy
Lissajous
Magic Square
Man-Eating Rabbit
Maneuvers
Mastermind
Masterbagels
Matpuzzle
Maze
Millionaire
Minotaur
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Nomad
Not One
Obstacle
Octrix
Pasart
Pasart 2
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Rabbit Chase
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Safe
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Smash
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Intelligent, cont'd. . .

surely gain by having the concept of FLATTERY. To provide this knowledge, we imagine a "micro-theory" of flattery — an extendable collection of facts or procedures that describe conditions under which one might expect to find flattery, what forms it takes, what its consequences are and so on. How complex this theory is depends on what is presupposed. Thus it would be very difficult to describe flattery to our Understander if he (or it) does not already know that statements can be made for purposes other than to convey literally correct, factual information. It would be almost impossibly difficult if he does not even have some concept like PURPOSE or INTENTION.[4]

The surprising move here is the conclusion that there *could* be a circumscribed "micro-theory" of flattery — somehow intelligible apart from the rest of human life — while at the same time the account shows that an understanding of flattery would depend on a further opening out into the understanding of the rest of our everyday world, with its complex purposes and intentions.

What characterizes the period of the early seventies, and makes SHRDLU seem an advance toward general intelligence, is the pseudo-scientific concept of a micro-world — a domain which can be analyzed in isolation.

In our everyday life we are, indeed, involved in various "sub-worlds" such as the world of the theater, of business, or of mathematics, but each of these is a "mode" of our shared everyday world.[5] That is, sub-worlds are not related like isolable physical systems to larger systems they *compose*; rather, they are local elaborations of a whole which they *presuppose*.

Only recently has the illusion that one can generalize work done in narrowly constrained domains been diagnosed and laid to rest by Winograd himself:

> The AI programs of the late sixties and early seventies are much too literal. They deal with meaning as if it were a structure to be built up of the bricks and mortar provided by the words . . . This gives them a "brittle" character, able to deal well with tightly specified areas of meaning in an artificially formal conversation. They are correspondingly weak in dealing with natural utterances, full of bits and fragments, continual (unnoticed) metaphor and reference to much less easily formalizable areas of knowledge.[6]

While popularizers are still praising SHRDLU, it is now generally acknowledged by serious workers in the field that the micro-world approach to everyday intelligence is a dead end.

Everyday human life turns out to be one interrelated whole, but games are just the sort of totally circumscribed micro-worlds in which computers excel. Thus, while expecting failures in dealing with human language, we should expect game-playing programs to have great success. But we must be on our guard against attributing this success to anything like human intelligence.

Chess, for example, is a perfect micro-world in which relevance is restricted to the narrow domain of the kind of chess piece (pawn, knight, etc.), its color and the position of the piece on the board. The size, weight and temperature of a piece are never relevant. But while the game's circumscribed character makes a world champion chess program possible in principle, there is a great deal of evidence that human beings play chess quite differently from the way computers do. Indeed, computers do not use long-range strategy, learn from experience, or even remember previous moves.

Human intelligence, then, even in games, requires the use of background knowledge; in the everyday world this background knowledge consists of the common sense understanding of how to do things which we share with other human beings.

To understand the difference between human and machine play, we must first understand how a chess program works. A chess program uses situation-action rules. A situation is characterized in terms of context-free features: the position and color of each piece on the board. All possible legal moves and the positions which result are then defined in terms of these features. To evaluate and compare positions, rules are provided for calculating scores on attributes such as "material balance" (where a numerical value is assigned to each piece on the board and the total score is computed for each player) or "center control" (where the number of pieces bearing on each centrally located square is counted). Finally, there must be a formula for evaluating alternative positions on the basis of these scores. Using this approach and looking at around 3 million possible positions, CHESS 4.5 recently won the 84th Minnesota Open Tournament, but a chess master generally looks at the

We have already seen that even in games such as chess no two positions are likely to be identical, so a deep understanding of what is going on is required to decide what counts as a similar position in any two games.

results of less than 100 possible moves and yet plays a far better game. How can this be?

It seems that by playing over book games, chess masters develop the ability to recognize present positions as similar to positions which occurred in classic games. These previous positions have already been analyzed in terms of their significant aspects. Aspects of a chess position include such overall characteristics as "control of the situation" (the extent to which a player's opponent's moves can be forced by making threatening moves), "crampedness of the position" (the amount of freedom of maneuver inherent in both the player's position and the opponent's position), or "over-extendedness" (the fact that while the position might be superficially quite strong, one is not in sufficient control of the situation to follow through and, with correct play by the opponent, a massive retreat will be required). The already analyzed remembered positions focus the player's attention on critical areas before he begins to count out specific moves.

The distinction between features and aspects is central here. *Aspects* play a role in an account of human play similar to that of *features* in the computer model, but there is a crucial difference. In the computer model the *situation is* DEFINED IN TERMS OF *the features*, whereas in human play *situational understanding is* PRIOR TO *aspect specification*. For example, the numerical value of a feature such as material balance can be calculated independently of any understanding of the game, whereas an aspect like over-extendedness cannot be calculated simply in terms of the position of the pieces, since the same board position can have different aspects depending on its place in the long range strategy of a game.

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Intelligent, cont'd. . .

No *feature-based* matching of the present position against a stored library of previous positions could account for a master player's ability to use past experience to zero in. It is astronomically unlikely that two positions will ever turn out to be *identical*, therefore, it is *similar* positions which have to be compared. But similarity cannot be defined as having a large number of pieces on identical squares. Two positions which are identical except for one pawn moved to an adjacent square can be totally different, while two positions can be similar although no pieces are on the same square in each. Thus, similarity depends on the player's sense of the issues at stake, not merely on the position of the pieces. Seeing two positions as similar is exactly what requires a deep understanding of the game. By thus structuring the current situation in terms of aspects of remembered similar situations the human player is able to avoid the massive counting out required by a computer which can only "recognize" positions characterized in terms of context-free features.

Human intelligence, then, even in games, requires the use of background knowledge; in the everyday world this background knowledge consists of the common sense understanding of how to do things which we share with other human beings. Recent work in artificial intelligence has been forced to deal directly with this background of everyday practices. Faced with this necessity, researchers have implicitly tried to treat the background as a

Looking back over the past ten years of AI research, we might say that the basic point which has emerged is that since intelligence must be situated it cannot be separated from the rest of human life.

complex of facts related by rules — sometimes called a "belief system." This assumption that the background of practices can be treated as just another object is the basis of the claim that human beings are just very sophisticated computers. This conviction runs deep in our whole philosophical tradition. Following Martin Heidegger, who is the first to have identified and criticized this view, I will call it the metaphysical assumption.

The obvious question to ask is: Is there any reason besides the persistent difficulties and history of unfulfilled promises in AI for believing that the metaphysical assumption is unjustified? Is there any defense against this subtle version of mechanism? The best argument, I think, is that whenever human behavior is analyzed in terms of facts related by rules, these rules must always contain a *ceteris paribus* condition, that is, they apply "everything else being equal," and what "everything else" and "equal" means in any specific situation can never be fully spelled out. Moreover, this *ceteris paribus* condition is not merely an annoyance which shows that the analysis is not yet complete and might be an "infinite task." Rather the *ceteris paribus* condition points to the background of practices which is the condition of the possibility of all rule-like activity. In explaining our actions we must always sooner or later fall back on our everyday practices and simply say "this is what we do" or "that's what it is to be a human being." Thus, in the last analysis all intelligibility and all intelligent behavior must be traced back to our sense of what we *are*, which is something we can never explicitly *know*.

This claim can best be made plausible by means of an example from an MIT story-understanding project. Consider the following story fragment:

> Today was Jack's birthday. Penny and Janet went to the store. They were going to get presents. Janet decided to get a kite. "Don't do that," said Penny. "Jack has a kite. He will make you take *it* back."

The goal is to construct a theory that explains how the reader understands that *"it"* refers to the new kite, not the one Jack already owns. Grammatical tricks (such as assigning the referent of *"it"* to the last mentioned noun) are clearly inadequate, as the result would be to mistakenly understand the last sentence of the story as meaning that Jack will make Janet take back the kite *he already owns*. It is clear that one cannot know that *"it"* refers to the new kite without knowledge about the trading habits of our society. One could imagine a different world in which newly bought objects are never returned to the store, but old ones are.

The AI approach dictated by the metaphysical assumption is, of course, to try to make the background practices involved in understanding this story explicit as a set of beliefs. But once games and micro-worlds are left behind, a yawning abyss threatens to swallow up those who try to carry out such a program. As Papert notes:

> . . . The story does not include explicitly all important facts. Look back at the story. Some readers will be surprised to note that the text itself does not state (a) that the presents bought by Penny and Janet were for *Jack*, (b) that the (kite) bought by Janet was intended as a present, and (c) that having an object implies that one does not want another.[8]

Our example turns on the question: How does one store the "facts" mentioned in (c) above about returning presents? To begin with there are perhaps infinitely many reasons for taking a present back. It may be the

Weizenbaum argues, for example, that since a computer cannot understand loneliness it cannot fully understand the sentence "'Will you come to dinner with me this evening' . . . to mean a shy young man's desperate longing for love"

wrong size, run on the wrong voltage, be carcinogenic, make too much noise, be considered too childish, too feminine, too masculine, too American, etc. And each of these facts requires further facts to be understood. But we will concentrate on the reason mentioned in (c): that normally, i.e., *everything else being equal*, if one has an object, one does not want another just like it. Of course, this cannot simply be entered as a true proposition. It does not hold for dollar bills, cookies, or marbles. (It is not clear it even holds for kites.) Papert would answer that, of course, once we talk of the norm we must be prepared to deal with exceptions.

But here the desperate hand-waving begins, for the text need not explicitly mention the exceptions at all. If the gift were marbles or cookies the text surely would not mention that these were exceptions to the general rule that one of a kind is enough. So the data base would have to contain *an account of all possible exceptions* to augment the text — if it even makes sense to think of this as a definite list. Worse, even if one listed all the exceptional cases where one would be glad to possess more than one specimen of a certain type of object, there are situations which allow an exception to this exception: already having one cookie is more than enough if the cookie in question is three feet in diameter; one thousand marbles is more than a normal child can handle. Must we then list the situations which

Intelligent, cont'd. . .

lead one to expect exceptions to the exceptions? But these exceptions too can be overridden in the case of, say, a cookie monster or a marble freak and so it goes. The computer programmer writing a story understander must try to list all possibly relevant information, and once that information contains appeals to the *normal* or *typical* there is no way to avoid an endless series of qualifications of qualifications for applying that knowledge to a specific situation.

The only "answer" Papert offers is the metaphysical assumption that the background of everyday life is a set of rigidly defined situations in which the relevant facts are as clear as in a game:

> The fundamental frame assumption is the thesis that . . . most situations in which people find themselves *have sufficient in common* with previously encountered situations for the salient features to be *pre-analyzed* and stored in a *situation-specific* form.[9]

But this "solution" is untenable for two reasons:

1. Even if the current situation is, indeed *similar* to a pre-analyzed one, we still have the problem of deciding which situation it is similar to. We have already seen that even in games such as chess no two positions are likely to be identical, so a deep understanding of what is going on is required to decide what counts as a similar position in any two games. This should be even more obvious in cases where the problem is to decide which pre-analyzed situation a given real-world situation most resembles: for example, whether a situation where there are well-dressed babies and new toys being presented has more in common with a birthday party or a beauty contest.

Since Intelligence must be situated it cannot be separated from the rest of human life.

2. Even if all our lives were lived in identical stereotypical situations, we have just seen that any real-world frame must be described in terms of the normal, and that appeal to the normal necessarily leads to a regress when we try to characterize the conditions which determine the applicability of the norm to a specific case. Only our *general* sense of what is typical can decide here, and *that* background understanding by definition cannot be "situation-specific."

Still, to this dilemma the AI researchers might plausibly respond: "Whatever the background of shared interests, feelings and practices necessary for understanding specific situations, that knowledge **must** somehow be in the human beings who have that understanding. And how else could such knowledge be represented but as some explicit set of facts and beliefs?" Indeed, the kind of computer programming accepted by all workers in AI would require such a data structure, and so would philosophers who hold that all knowledge must be explicitly represented in our minds; but there are two alternatives which, by avoiding the idea that everything we know must be in the form of some explicit description, would avoid contradictions inherent in the information-processing model.

One response, shared by existen-

"The Return of the Archons" tells of a wise statesman named Landru who programmed a computer to run a society.

tial phenomenologists such as Maurice Merleau-Ponty[10] and ordinary language philosophers such as Ludwig Wittgenstein, is to say that such "knowledge" of human interests and practices need not be represented at all. As Wittgenstein puts it in **On Certainty**, "Children do not learn that books exist, that armchairs exist, etc., etc. — they learn to fetch books, sit in armchairs, etc., etc."[11] Just as it seems plausible that I can learn to swim by practicing until I develop the necessary patterns of responses which run off automatically without my ever describing my body and muscular movements to myself, so too what I "know" about cultural practices which enables me to recognize and act in specific situations has been gradually acquired through training — against an already meaningful background — although no one ever did or could make explicit what was being learned.

Another possible account would allow a place for representations, at least in special cases where I have to stop and reflect, but such a position would stress that these are usually not explicit descriptions but more like images, by means of which I explore what I *am*, not what I *know*. In this view I don't normally represent to myself that I have desires, or that standing up requires balance, or, to take an example from Schank's pathetic attempt to make explicit a bit of our interpersonal knowledge, that:

> If two people are positively emotionally related, then a negative change in one person's state will cause the other person to develop the goal of causing a positive change in the other's state.[12]

When it is helpful, however, as in understanding a story, I can picture myself in a specific situation and ask myself what I would do or how I would feel — if I were in Jack's place how I would react to being given a second kite — without having to make explicit all that a computer would have to be told to come to a similar conclusion. We thus appeal to *concrete* representations (images or memories) based on our own experience without having to make explicit the strict rules and their spelled out *ceteris paribus* conditions required by *abstract* symbolic descriptions.

Indeed, it is hard to see how the subtle variety of ways things can matter to us could be exhaustively spelled out. We can anticipate and understand Jack's reaction because we remember what it feels like to be amused, amazed, incredulous, disappointed, disgruntled, saddened, annoyed, disgusted, upset, angry, furious, outraged, etc., and we recognize the impulses to action associated with these various degrees and kinds of concerns. A computer model would have to be given a description of each shade of feeling as well as each feeling's normal occasion and likely result.

The idea that feelings, memories and images *must* be the conscious tip of an unconscious explicit description runs up against both *prima facie* evidence and the problem of explicating the *ceteris paribus* conditions.

"I see no way to put a bound on the degree of intelligence such an organism [i.e., a computer] could, at least in principle attain."

Moreover, this mechanistic assumption is not supported by one shred of scientific evidence from neurophysiology or psychology, or from the past successes of AI, whose repeated failures required appeal to the metaphysical assumption in the first place. When AI workers finally face and analyze their failures, it might well be the metaphysical/mechanistic assumption that they will find they have to reject.

Looking back over the past ten years of AI research, we might say that the basic point which has emerged is that *since intelligence must be situated it cannot be separated from the rest of*

Intelligent, cont'd. . .

human life. The persistent denial of this seemingly obvious point cannot, however, be laid at the door of AI. It starts with Plato's separation of the intellect or rational soul from the body with its skills, emotions and appetites. Aristotle continued this unlikely dichotomy when he separated the theoretical from the practical, and defined man as a rational animal — as if one could separate man's rationality from his animal needs and desires. If one thinks of the importance of the sensory-motor skills in the development of our ability to recognize and cope with objects, or of the role of needs and desires in structuring all social situations, or finally of the whole cultural background of human self-interpretation involved in our simply knowing how to pick out and use chairs, the idea that we can ignore this know-how while formalizing our intellectual understanding as a complex system of facts and rules is highly implausible.

However incredible, this dubious dichotomy now pervades our thinking about everything including computers. In the **Star Trek** TV series, the episode entitled "The Return of the Archons" tells of a wise statesman named Landru who programmed a computer to run a society. Unfortunately, he could give the computer only his abstract intelligence, not his concrete wisdom, so the computer turned the society into a plannified hell. No one stops to wonder how, without Landru's embodied skills, feelings and concerns, the computer could understand everyday situations and so run a society at all.

In COMPUTER POWER AND HUMAN REASON, Joseph Weizenbaum, a well-known contributor to work in AI makes this same mistake. Indeed, the radical separation of intelligence and wisdom is the basic

Just because man is material in the special way that he is, he can never have the clarity characteristic of a computer.

assumption which seems to support but actually undermines the thesis of his otherwise eloquent book. Weizenbaum warns that we demean ourselves if we come to think of human beings on the AI model as devices for solving technical problems. But to make the argument that we are not such devices he embraces the very dichotomy which gives plausibility to AI. Weizenbaum argues, for example, that since a computer cannot understand loneliness it cannot fully understand the sentence "'Will you come to dinner with me this evening' . . . to mean a shy young man's desperate longing for love"[13] (a point which workers in AI would readily admit), while at the same time Weizenbaum grants the dubious AI assumption that "it may be possible . . . to construct a conceptual structure that corresponds to the meaning of the sentence."[14] Stressing these extremes of empathetic wisdom and formalized meaning leads Weizenbaum to overlook the essential point that all meaningful discourse must take place in a shared context of concerns. Thus, in

'Man can embody truth, but he cannot know it'. Keats

spite of his well-documented claim that each culture has what Justice Oliver W. Holmes called its "tacit assumptions" and "unwritten practices,"[15] and his commitment to the strong thesis that these practices "cannot be explicated in any form but life itself,"[16] Weizenbaum, like Minsky, concludes: "I see no way to put a bound on the degree of intelligence such an organism [i.e., a computer] could, at least in principle attain."[17] This surprising admission is inevitable because Weizenbaum, like all AI workers, cannot see that the unexplicatable assumptions and unwritten practices embodied in a culture play an essential role in the intelligent behavior of its members.

Great artists have always sensed the truth, stubbornly denied by both philosophers and technologists that, just because man is material in the special way that he is, he can never have the clarity characteristic of a computer. Artists sense that the basis of human understanding cannot be isolated and explicitly understood. In **Moby Dick,** Melville writes of the tattooed savage, Queequeg, who had "written out on his body a complete theory of the heavens and the earth, and a mystical treatise on the art of attaining truth; so that Queequeg in his own proper person was a riddle to unfold; a wondrous work in one volume; but whose mysteries not even himself could read . . ." The monomaniac philosopher Ahab prefigures AI's insistence that all such cultural know-how be made explicit. One morning turning away from surveying Queequeg, Ahab exclaims, "Oh, devilish tantalization of the gods!" Melville is attracted by the philosopher's demand for explicit, settled knowledge but senses the sacredness of the obscure and endlessly reinterpreted traditional wisdom we each embody. The mysterious symbols engraved in Queequeg's flesh are carefully copied onto Queequeg's coffin which, in the end, saves Ishmael from Ahab's disaster. Yeats expresses even more succinctly the poet's appreciation of our incarnate limitations: "I have found what I wanted — to put it in a phrase, I say, 'Man can embody truth, but he cannot know it'." □

Notes

1. Carl Sagan, "In Defense of Robots;" *Broca's Brain.*
2. Terry Winograd, "A Procedural Model of Language Understanding," *Computer Models of Thought and Language,* Roger Schank and Kennath Colby, eds. (San Francisco: W.H. Freeman Prass, 1973). (SHRDLU is an anti-acronym whose letters don't stand for anything. It was picked up by Winograd from *Mad Magazine,* which uses this frequent typesetter's error as the name of mythical monstars and the like.)
3. Marvin Minsky and Seymour Papert, Draft, July 1970, of a Proposal to ARPA for Research on Artificial Intelligence at M.I.T., 1970-1971, p. 39.
4. *Ibid.,* pp. 42-44.
5. This view is worked out by Martin Heidegger in *Being and Time* (New York: Harper & Row, 1962). See especially, p. 93 and all of section 18.
6. Winograd, "Artificial Intelligence and Language Comprehension," in *Artificial Intelligence and Language Comprehension* (Washington, D.C.: National Institute of Education, 1976), p. 17.
7. Ira Goldstein and Seymour Papert, M.I.T. AI Laboratory, AI Memo No. 337 (July 1975, revised March 1976), "Artificial Intelligence, Language and the Study of Knowledge," pp. 29-31.
8. *Ibid.,* p. 33.
9. *Ibid.,* pp. 30-31. (My italics.)
10. Maurice Merleau-Ponty, *Phanomanology of Perception* (London: Routledge and Kegan Paul, 1962).
11. Ludwig Wittgenstein, *On Certainty* (New York: Harper Torch Book, 1972), p. 62.
12. Roger Schank and Robert P. Abelson, *Scripts, Plans, Goals and Understanding* (Hillsdale, N.J.: Lawrance Erlbaum Associates, 1970), p. 144.
13. Joseph Weizenbaum, *Computer Powar and Human Reason* (San Francisco: W.H. Freeman and Co., 1976), p. 200.
14. *Ibid.*
15. *Ibid.,* p. 226.
16. *Ibid.,* p. 225.
17. *Ibid.,* p. 210.

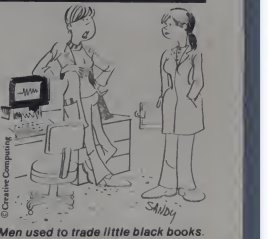

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Table of Contents

OPINION

The Shadow, Buck Rogers, and the Home Computer — *Gardner* 2
The State of the Art — *Halmers* 5
Could a Computer Take Over — *Rush* 8

THEORY AND TECHNOLOGY

A Systems Approach to a Personal Microprocessor — *Suding* 14
Frankenstein Emulation — *Murray* 17
Programming for the Beginner — *Herman* 22
What is a Character — *Peshka* 27
Friends, Humans, and Countryrobots Lend me your Ears — *Rice* 36
Magnetic Recording for Computers — *Manly* 44

COMPUTER KITS

Assembling an Altair 8800 — *Zarrella* 56
Build a 6800 System With This Kit — *Kay* 59
More on the SWTPC 8800 System — *Kay* 64
The New Altair 680 — *Vica* 68
A Data With KIM — *Simpson* 72
True Confessions: How I Relate to KIM — *Gupta* 78
Zilog Z80 — *Hashizume* 81
The Digital Equipment LSI-11 — *Baker* 86
Cromemco TV Dazzler 94

HARDWARE

Flip Flops Exposed — *Browning* 98
Recycling Used ICs — *Mikkelsen* 102
Powerless IC Test Clip — *Errico and Baker* 104
Parallel Output Interfaces in Memory Address Space — *Halmers* 106
Son of Motorola — *Fylstra* 110
Data Paths — *Liming* 117
Build a TTL Pulse Catcher — *Welde* 124
Dressing Up Front Panels — *Wellers* 125
Deciphering Mystery Keyboards — *Helmers* 126
A Quick Test of Keyboards — *Walters* 134
Keyboard Modification — *Macomber* 135
Serialize Those Bits From Your Mystery Keyboard — *Halber* 136
Build a Television Display — *Gantt* 138
The "Ignorance Is Bliss" Television Drive Circuit — *Berbier* 144
Build a TV Readout Device for Your Microprocessor — *Suding* 145
Let There Be Light Pens — *Loomis* 153
Build an Oscilloscope Graphics Interface — *Hogenson* 158
An Introduction to Addressing Methods — *Zarrella* 169
Interface an ASCII Keyboard to a 60mA TTY Loop — *Cotton* 174
Interfacing the 60 mA Current Loop — *King* 175
The Complete Tape Cassette Interface — *Hemenway* 177
Digital Data on Cassette Recorders — *Mauch* 184
Build a Fast Cassette Interface — *Suding* 190
Technology Update 197
What's In a Video Display Terminal? — *Walters* 198
Pot Position Digitizing Idea — *Schulein* 199
Read Only Memories in Microcomputer Memory Address Space — *Eichbauer* 200
More Information on PROMs — *Smith* 203
Getting Input from Joysticks and Slide Pots — *Helmers* 210
Logic Probes — Hardware Bug Chasers — *Burr* 213
Controlling External Devices With Hobbyist Computers — *Bosen* 218
Microprocessor Based Analog/Digital Conversion — *Frank* 222
Add a Kluge Harp to Your Computer — *Helmers* 226
The Time Has Come to Talk — *Atmar* 231
Make Your Own Printed Circuits — *Hogenson* 238

SOFTWARE

Write Your Own Assembler — *Fylstra* 246
Simplify Your Homemade Assembler — *Jewell* 255
Interact With an ELM — *Gable* 261
Design an On Line Debugger — *Wier and Brown* 268
Processing Algebraic Expressions — *Maurer* 275
The "My Dear Aunt Sally Algorithm" — *Grappel* 286
Can YOUR Computer Tell Time? — *Hogenson* 294
A Plot Is Incomplete Without Characters — *Larseth* 300
Hexpawn: A Beginning Project in Artificial Intelligence — *Wier* 309
Shooting Stars — *Nico* 314
Biorythm for Computers — *Fox* 322
Life Line — *Helmers* 326

APPLICATIONS

Total Kitchen Information System — *Lau* 360
A Small Business Accounting System — *Lehman* 364
Chips Found Floating Down Silicon Slough — *Trumbull* 369

RESOURCES

Books of Interest 372
Magazines 375

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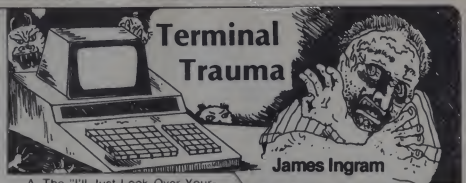
MARCH 1980

79

James Ingram writes us that he is conducting a series of workshops for teachers in 10 small school districts in Central Nebraska. For fun, he has assembled a list of eight reasons (syndromes) that people do not want to touch a computer. Here they are along with a proposed cure.



The following attitudes are adult cop-outs, used only by the timid, the insufferably boring, the excessively narrow-minded, the unconditionally unconfident, and the average first-time user of computers. Children are apparently unaffected by these diseases.

They are generated by little gremlins inside our homo-sapien logic units-short circuits, sparks, and sputters. There is no known immunization agent among humans, but there is a *cure*. As soon as one of these glitches raises its ugly head,

1. Look passe'.

2. Retract your claws from the arm of the chair.

3. Say to yourself, "I am a normal person, in control of my faculties". (Pitch falling from near-hysteria to calm boredom).

4. Open your clenched eyelids and read the directions again!

A. The "I'll-Just-Look-Over-Your-Shoulder" Syndrome: Found in timid adults who are afraid to meet anyone with more vitality than a potato.

B. The "Computers-are-Talking-Over-The-World" Syndrome: Found among predominantly Archie Bunker types.

C. The "Tunnel-Vision-Terrors" Syndrome: Characterized by white knuckles, clenched fists, locked jaw and spine, and glazed eyes. Can strike anyone.

D. The "I'll-Break-It" Syndrome: Found among klutzes and pseudo-klutzes (those who need a convenient excuse).

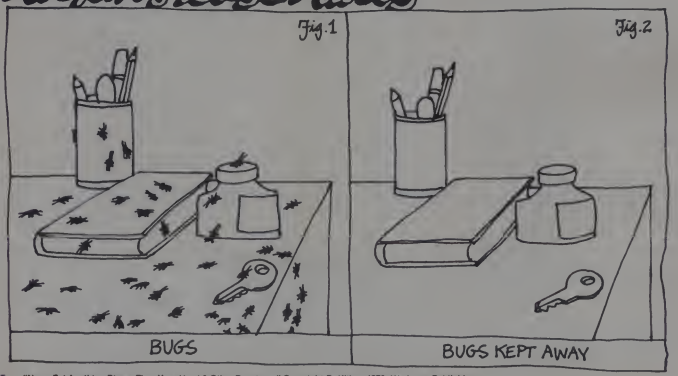
E. The "Ridicule-and-Run" Syndrome: Found predominantly among adults suffering from dumb-o-fobia (fear of appearing unintelligent). Particularly insidious among teachers in presence of students.

F. The "Sneak-Attack" Syndrome: Manifested in user secretly hunting for main power switch or wall plug with dishonorable intentions.

G. The "I-Don't-Have-Time" Syndrome: Most abundant among football, basketball, volleyball, and track coaches, but also strikes the pseudo-busy (yep — those who need a convenient excuse!).

H. The "I-Can't-Program/I-Was-Never-Good-At-Math" Syndrome: Especially dangerous among art and music teachers, and persons with unusually low self-esteem. Also occurs among those who are unsure of their life-role (user-programmer conflict), in conjunction with "G" above.

Keeping Bugs Away



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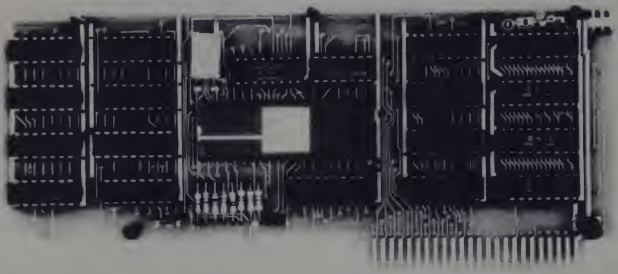

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Interview with Joel Birnbaum

Betsy Staples

Joel Birnbaum is director of the Computer Science Department at the IBM Thomas J. Watson Research Center at Yorktown Heights, New York. His views on personal computing, information networks and natural languages represent a perspective not generally found within the personal computing industry. Here he shares some of his insights with Creative's interviewer, Betsy Staples.

Staples: I'd like to get your thoughts about what's going on in computing today — particularly with minis and micros.

Birnbaum: In home computing, the Radio Shack-like computers that get programmed in various computing languages will continue to prosper, but only for a very select and relatively small clientele as a home computer. I think the things that people in homes want and will be interested in are two: access to other people and access to information. Consequently, I'm much more interested in a home computer as a home communications center. We've looked at developments like the British Prestell — systems which connect television technology to telephone technology with a data base that's able to provide information with a very easy-to-use, menu-driven interface. That, to me, has a chance of becoming a pervasive technology where "pervasive" means telephones and television sets. That's pervasive, not one or two or four million hobbyists or ex-programmers or the occasional housewife who really does want to learn Basic to write a checkbook balancing program or the kids playing the games. I think that there is considerable hope that market forces are at work in both the communications and computer industries — particularly in Europe, but I think it will come here as well — which are going to produce those kind of networks that have information that is of interest to the consumer.

Staples: What sort of information are they going to provide to the consumer?

Birnbaum: Consider the British Prestell system, which is run by the British Post Office. It was a prototype experiment, but now it is of interest to GT&E Sylvania and many other companies in other countries. Prestell has some two or three hundred applications, many of which I find very convincing. These applications involve, for example, data bases of information

about shopping, banking, consumer services, movie schedules, restaurant menus, the best road to take for a scenic trip to the north of England, where can I buy a washing machine in my area at such and such a price, what courses can be taken. It's interactive, two-way and uses a standard TV set without a special interface on it. There are all the usual business sources of information: Standard and Poor's, the New York Times financial index, weather maps and so forth. They have a list of several hundred applications and they look very different, and to me very much more real than the sorts of little programs you see around. A TRS-80 can connect to this machine and it can be a message system, it can be a Telex system, it can be many things. My feeling is that that is the way this will go. I don't know how long it will take. Since it works, initially, at least, over telephone lines with some capabilities, it's a system in which a small computer with a large attached data base which has pages of information can ship those pages over conventional telephone lines and have them appear on the screen of a TV set where they can be interacted with by rather unsophisticated users with a minimum of learning. Also, the people can communicate with each other.

Staples: Do they have educational applications as well?

Birnbaum: Yes they do. The important thing is it's a revolution in publishing because things like the encyclopedia are being coded and placed on that data base. Since you will pay only a local phone call and a small page charge — a penny or a fraction of a penny per page — you needn't buy the Encyclopedia Britannica, you can only ask for articles. Using cable, satellite, or whatever, it gives you broad bandwidth, it will add video and sound as well. I'm quite excited about it not only because of home computing, but because my view of the office of the future is that it doesn't have a chance until it permits remote access. I don't believe that people will be willing to convert back and forth to paper every time they take a trip. Many studies of what goes on in offices indicate that most people are away from their desks more than half the time. Until we have a way of accessing the information from other people's offices or from homes

Birnbaum, cont'd . . .

and motel rooms. I think that the principal supported office systems will not be a reality. On the other hand, this offers a way of getting at that information from any television set. I see the home and office coming together via the common carrier networks and via microprocessors which are imbedded in television sets.

Staples: Do you see IBM being part of this?

Birnbaum: I can't speak about IBM activities other than ours, but IBM Research is interested in it, and we will be experimenting with such a system at Yorktown.

Staples: What about software? Do you think that the quality of software will change, or perhaps even improve now that so many people have access to computers?

Birnbaum: I believe in history, and the history of software engineering is that it has progressed at a much slower rate than hardware — several orders of magnitude behind by any measure — hence, I think that we can expect it to progress, but slowly. I don't think that turning software into hardware solves the problem; it just puts it in a different format. I don't think that exposing the great unwashed public to software is going to solve the problem. Since there are now many more people working on software, I suspect it will improve, but I'm not very sanguine about the rate at which it will improve.

Staples: Do you foresee any problems in overcoming the trepidation which the average non-computer person feels when he or she faces a computer for the first time?

Birnbaum: Enormous. I think that's the most interesting part of the problem, and the hardest.

Staples: What do you think should be done about it?

Birnbaum: I'm not sure. Essentially, what you have to do is make computers more natural to use. There are many different theories about what "natural" means. Many people think it means natural language — speak to it in English, use voice recognition or handwriting. I'm not sure that that's the most important thing. It's one thing. Another is to pose the problem by letting the person address the computer in a way with which he is familiar. For example, we have found in our mechanical assembler project that while this is a computer language, the way in which somebody specifies things is not so much different from the way a manufacturing engineer currently specifies things, even though the engineer doesn't do it through a computer. So the transition from essentially work order to the program is not as large as it would be if he were writing in conventional lines. Similarly, query by example seems to be a very natural way for people to express data base problems. It's not natural in the sense of spoken speech or written mathematics, but it's sort of the way they do it when they do it with a pencil and paper, and so they're able to do it. I think that's the hardest problem. Part of it is related to technology and a lot of it is related to really understanding much more about the cognitive interface than we now do. That needs a lot of experimentation.

Staples: What about the role of documentation in all this?

Birnbaum: Our experience with non-computer professionals and documentation is that no matter how little you give them, it's too much. We have several systems which we have reduced to one or two cards of information, and it's too much. So we've come to start thinking about making a few of our end user experiment systems self-documenting. For example, if, in your home, you don't remember how to do something there's a simple mechanism for asking a question and getting the answer back. We are doing experiments with three or four such systems. I think that the economics are in our favor. Memory is getting cheap, bandwidth is getting cheap, we're learning how to synthesize the voice effectively. I think that systems which are self-teaching are the hope. I don't think there are too many of them in existence. We've built several prototypes; they're an improvement, but they have a long way to go. I consider it a large, unsolved problem that not many people are working on.

Staples: Why isn't anybody working on it?

Birnbaum: It's hard. It needs ideas. It isn't so glamourous. It's hard. □

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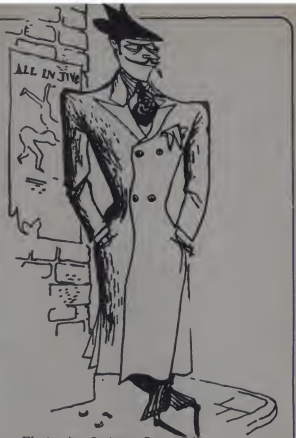

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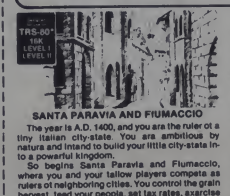

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Inside The TRS-80

Curtis F. Gerald

One important question asked by programmers and experimenters is how variables are stored in a system. For example, IBM 370 computers gain their power in part from the rich variety of storage formats afforded the user. Numerical quantities can be handled in any of seven different forms and there are specialized machine instructions for most of them. In a computer system based on microprocessors much less sophistication is built into the hardware, but the software can provide the needed flexibility. The TRS-80 system is typical.

In Radio Shack's computer there are four types of variables: integers, single precision, double precision and character strings. The user designates which type of variable is to be employed by appending a type designator to the one or two characters that form the name as shown in Table 1.

When BASIC accesses the numeric variables named in the statements of the program, it searches for them in a list that includes the name, the value and a numeric code that indicates the type. The numeric type indicators also show how many bytes are used to store the values. For strings, the indicator does not give the same information. In this case, the number of bytes stored with the name is still equal to the type code three, but the actual value is stored elsewhere. The three bytes stored with the name comprise a two byte address pointer that shows where in memory the characters are located and one byte that gives the number of characters in the string.

Because the BASIC interpreter always scans the list of variables from its head in order to access any of the values or to update a value that is stored, the speed of execution can be increased by causing the more frequently used variables to be stored near the head of the list. This is not hard to do; it can be done by merely using the variables in statements that are executed early. It may be an advantage then to use these variables, even in an artificial way, so they get placed at the beginning of the list.

Type	Type Designator	Example of Name	Bytes for Value	Numeric Type Indicator
Integer	%	P%	2	02
Single Precision*	!	XJ!	4	04
Double Precision	#	K3#	8	08
String	$	AA$	0 to 255	03

* If no designator is specified, the type is single precision by default.

Table 1

Arrays (subscripted variables) are stored in a separate list of variables. All the values that share a common name are stored together. There is some economy of memory space and a possible speed advantage when quantities are stored in an array. All four types of variables may be assigned to arrays in TRS-80 Level II.

Radio Shack's Level II manual gives some information about the storage formats for variables but it is incomplete. One purpose of this article is to supplement that information and also to disclose how pointers are maintained to locate the lists of variables. A second purpose is to provide a program that will list all the variables used by a program in the order in which they are stored.

Integer Variables

The storage format for integer variables is easiest to describe. A total of five bytes is used, as illustrated in Figure 1a. The first byte is always 02, the numeric code that designates an integer variable. The next two bytes give the ASCII equivalent of the characters of the name with the second character preceding the first. If the name is only a single letter a zero byte is inserted where the second character would normally appear. The last two bytes give the hexadecimal digits of the value with the less significant byte preceding the more significant. If the quantity is negative the value is stored as two's compliment. Because only two bytes are provided to store the value, the range of values for integer variables is confined to -32,768 to +32,767.

Two's compliment representation is used almost universally in computers to store negative integers. It offers the major advantage that subtraction can be performed in the same electronic circuitry that is used for addition. To form the two's compliment of a number, its magnitude in 16-bit binary form is first compli-

Byte	Contents Hexadecimal	Decimal	Significance
1	02	2	Numeric type indicator
2	00	0	ASCII for name
3	4A	74	
4	17	23	Least significant — Value bytes
5	00	0	Most significant — Value bytes

(a) Storage format for an integer variable, corresponding to J% = 23.

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1	04	4	Numeric type indicator
2	33	51	Second character } of name
3	58	88	First character } of name
4	00	0	Fraction, least to most significant bytes
5	00	0	
6	20	32	
7	82	130	Exponent, biased by 128 (80 hex)

(b) Storage format for a single precision variable, corresponding to X3 = 2.5 (binary 0.1010 x 2^2)

1	08	8	Numeric type indicator
2	5A	90	Second character } of name
3	5A	90	First character } of name
4	00	0	Fraction, least to most significant bytes
5	00	0	
6	00	0	
7	00	0	
8	00	0	
9	00	0	
10	C8	200	
11	83	131	Exponent, biased by 128

(c) Storage format for a double precision variable, corresponding to ZZ# = −6.25 (binary -0.11001 x 2^3)

1	03	3	Numeric type indicator
2	00	0	Second character } of name
3	53	83	First character } of name
4	04	4	Length of string
5	15	21	Low byte } of address
6	43	67	High byte } of address

(d) Storage format for a string variable, corresponding to S$ = "ABCD"

1	04	4	Numeric type indicator
2	35	53	Second character } of name
3	41	65	First character } of name
4	35	53	Less significant byte } distance parameter
5	00	0	More significant byte } distance parameter
6	02	2	Number of subscripts
7	04	4	Less significant byte } limit of second subscript
8	00	0	More significant byte } limit of second subscript
9	03	3	Less significant byte } limit of first subscript
10	00	0	More significant byte } limit of first subscript
11 through 58			Bytes that represent the values for 12 members of the array

(e) Storage format for the header of an array, corresponding to the statement DIM A5(2,3)

Figure 1

mented (this gives the one's compliment) then one is added. For example, to represent the decimal value -23, we proceed as follows:

1. Write 23 as a binary number: 0000 0000 0001 01111 (00 17 hex)
2. Compliment each bit: 1111 1111 1110 1000 (FF E8 hex)
3. Add one: 1111 1111 1110 1001 (FF E9 hex)

If the example in Figure 1a were for K% = -23, the fourth and fifth bytes would be (in hexadecimal) E9 FF, or (in decimal) 233 255. (One needs to consider the decimal values in addition to the hexadecimal because the response to the PEEK command in

Radio Shack's Level II manual gives some information about the storage formats for variables but it is incomplete.

TRS-80 displays the memory contents in decimal form).

The TRS-80 affords the user a special command to locate where variables are stored in memory. The instruction PRINT VARPTR(K%) will display the decimal value of the memory address where the value is stored. Note that to find the name of the variable one must PEEK in the two bytes preceding VARPTR(K%), and, to find the code that designates the type, one PEEKs in the third byte preceding.

Floating Point Variables

Figures 1b and 1c show the storage formats for single and double precision variables. These quantities are in floating point representation, a form closely related to scientific notation in which the value is represented as a fraction (often called the mantissa) that is to be multiplied by a scale factor. The scale factor is some base value raised to an integer power. In computers, two is the most common base value, but sometimes other bases are used. In particular, IBM 370 systems use sixteen for the base. Since the base value for the scale factor is always two, only the exponent needs to be stored.

Floating point numbers need, in addition to the fraction part and the exponent, two additional pieces of information. The sign of the number must be represented and also the sign of the exponent. The TRS-80 system uses special ways to record these two signs. For the exponent a biasing scheme is used. The exponent part of

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Secrets, cont'd. . .

a floating point number is stored in one byte, affording eight bits for the value. If only positive exponents were involved, a range from 0 to 255 could be accomodated but, because negative values are also required, this is reduced to 0 to 127 (or 0 to 7F in hexadecimal). To represent both positive and negative numbers a bias value of 128 (equal to 80 in hexadecimal) is added to the binary value of the exponent. The result is that decimal values of the biased number from 0 to 128 (0 to 80 in hexadecimal) represent negative exponents (for the base of 2) from -128 to 0, while decimal values from 128 to 255 (80 to FF in hexadecimal) represent positive exponents from 0 to 127.

The sign of the number (which we may think of as the sign of the fraction) is represented in the TRS-80 in a very ingenious way. Normally one would expect that one of the bits would be required to store the sign information. However, advantage is taken of the fact that the fraction part is always normalized. "Normalizing" means that the scale factor is adjusted so that the leading bit of the fraction is always non-zero. For exampie, the binary fraction 0.00011 (equal to 3/32) can be normalized by rewriting it as 0.11 x 2-3. If the number has leading ones before the binary point (as in 10.1, equal to 2 1/2),

The sign of the number (which we may think of as the sign of the fraction) is represented in the TRS-80 in a very ingenious way.

shifting the binary point to the left with a corresponding adjustment of the scale factor gives 0.101 x 22 as the normalized form.

If the fraction part is always normalized, the first bit of information in the fraction is really redundant; we know without looking that it is a one. In the TRS-80 BASIC language this first bit is left a one for a negative fraction but is reset to a zero if the fraction is positive. This provides one more bit of precision in the fraction at the expense of slightly more complex software that performs the arithmetic operations on floating point numbers.

In summary, floating point quantities are stored with one byte representing the biased exponent for the base of two, giving the scale factor. Three bytes (for single precision) or seven bytes (for double precision) are used to hold the normalized binary value of the fraction, with the first bit reset to zero if the number is positive. Some examples are shown in Figure 2.

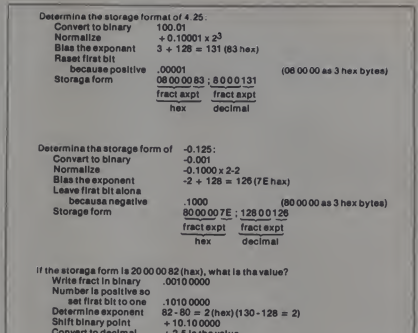

Figure 2. Examples of storage format for floating point values.

There is one final point needed to complete the description of floating point representation. Zero is a special case because its fraction part cannot be normalized. It is conventional, and TRS-80 abides by the convention, to store zero as all zeros in both the fraction and the exponent.

As shown in Figures 1b and 1c, single and double precision numbers differ only in the number of bytes used to store the fraction. Since only one byte is used for the exponent in either case, the range is approximately the same, from -1.7 x 1038 to +1.7 x 1038 as decimal equivalents. The smallest non-zero magnitudes are +1.47 x 10-39. For single precision numbers the precision is equivalent to about 7 decimal digits, while double precision is equivalent to about 17 decimal digits. (When functions are generated, somewhat less precision is given in most cases, due to inaccuracies in the computational routines.)

String Variables

After the rather involved way in which floating point quantities are stored, it is not hard to describe how string variables are stored among the list of variables. As shown in Figure 1d, a one byte type code (03) is followed by two bytes for the name, then a one byte length value and finally a two byte address. Since only one byte is allowed for the length, string variables are limited to a maximum of 255 characters. The address bytes (stored as low address followed by the high address byte) point to the location in memory where the defining characters are located. If the definition is an assignment statement or a DATA statement within the BASIC program, the pointer points to that location within the program. If the value of the string is input from the keyboard, the characters are stored in the special reserved area allocated to strings (at the high end of memory just ahead of the space reserved for machine language programs).

Note how the numeric type indicator relates to the number of bytes used for storage of each kind of variable. In each case it is exactly equal to the number of bytes associated with the name. For numeric quantities, these bytes hold the value directly. For a string variable, it equals the bytes used for the length parameter and the address pointer. Considering that there are additional

Secrets, cont'd. . .

bytes to hold the name and the type designator itself, there are always T + 3 bytes used for each variable where T is the numeric type code.

With subscripted variables (arrays) space is allocated separately from that for the simple variables and this space immediately follows that used by the simple variables. All the values for the members of each array are stored in a group, one after another in order of ascending subscript value. (When more than one subscript is used, the first subscript goes through its entire range before the next subscript is incremented.) At the beginning of each set of array values, a header is stored. Figure 1e gives the contents of each byte of the header.

The first byte in memory for an array is the type indicator, and the next two bytes hold the ASCII values for the name, exactly as for simple variables. The next two bytes give the distance to the next array variable, with the less significant byte coming first. How this distance parameter is determined is shown later. Now comes a single byte that gives the number of subscripts associated with this variable. (In theory, one could use 255 subscripts).

For each of the subscripts, there is a two byte count of the size limit for the subscript, ordered from the last subscript to the first. (This would permit each subscript to be dimensioned to a size of over 1,000,000 if there was memory space to hold them). Note that the size associated with each subscript is one more than the value specified in the DIM statement because the number zero is a valid subscript. The dimension statement DIM X%(1,3,2) would have 2,4 and 3 for the subscript limit values.

The distance measure stored in bytes 4 and 5 of the header can be computed as follows:

Dist = :D1 + 1)(D2 + 1)(...)
(DN + 1)(T) + (2)(N) + 1
where D1, D2, ..., DN are the subscript sizes as specified in DIM statement. T is the numeric type code. N is the number of subscripts.

In the above formula, the factor (D1 + 1)(D2 + 1)(...)(DN + 1) gives the number of members of the array. The formula provides for T bytes for each member, plus two bytes for each subscript to hold its limit value plus one for the number of subscripts. For the example in Figure 1e, this distance is (2 + 1)(3 + 1)(4) + (2)(2) + 1 = 53. It is measured from the sixth byte of the header. One can determine the total memory space used by any array by adding six to its distance parameter.

The headers for all four types of arrays follow this same pattern. The number of bytes associated with the values for each of the members does differ, of course.

You may not be surprised to learn that the system keeps pointers associated with the storage of values for variables. There are four of them. One, at locations 16633/4 (40F9/A in hex), points to the memory location where the first variable begins. This happens to be three bytes beyond the last text byte of the program itself. A second pointer, at locations 16635/6 (40FB/C) points to the beginning of the array variables, while a third, located at 16637/8 (40FD/E) points to the beginning of the array variables, while a third, located at 16637/8 (40FD/E) points to the first byte after the end of the last array variable. A dynamic pointer, kept at 16607/8 (40DF/E0) is continually updated during the execution of the program to show the location of the last variable accessed.

To some degree, the array beginning and ending pointers are also dynamic. Even though an array is specified in a program (either through an explicit DIM statement or implicitly by using a subscripted variable that invokes an automatic DIM(10)), no space is assigned until the DIM statement is encountered during execution. Consequently, before a RUN command is issued, the two array limit pointers point to the same location as the beginning-of-variables pointer. As simple and array variables are encountered, these array limit pointers are continually changed so they point to higher and higher memory locations.

If the value of the string is input from the keyboard, the characters are stored in the special reserved area allocated to strings (at the high end of memory just ahead of the space reserved for machine language programs).

Variables Lister Program

Figure 3 lists a program that displays the name and type for each simple variable, followed by the name, type and dimension sizes for each array. The dimension size values are those that would be specified in a DIM statement. The user can then display the current values for each variable by a succession of PRINT commands. (A routine was written to display these values automatically, but when finished it was found to be so slow and so long that it was judged not useful).

Even though an array is specified in a program (either through an explicit DIM statement or implicitly by using a subscripted variable that invokes an automatic DIM (10)) no space is assigned until the DIM statement is encountered during execution.

The strategy behind the Variables Lister Program is straightforward. Beginning at the location of the first variable, the name and type are picked out and displayed. The program advances to the start of the next variable (the displacement is just the type number plus three) and the process is repeated. Displaying of simple variables is terminated when the program finds the first variable within itself, which is VL. Because of this, that variable name should not be used in the program whose variables are being listed. (By modifying lines 2050 and 2520 to remove the IF conditionals, the routine can be made to include its own variables in the listing).

After encountering its own first variable name, the routine moves to a listing of array variables. These are each displayed in the order in which they occur. Advancing from one array variable to the next is made easy by the distance parameter in bytes 4 and 5 of the header. The end of arrays pointer shows when all the array variables have been scanned.

Using the lister program is probably best done by calling it as a subroutine. At any point in a program where it is desired to list all variables that have been used so far, or defined, a call to the subroutine is inserted. The routine can be made into a standalone program by changing the RETURN in line 2180 to STOP.

Figure 4 is a test program together with the output from the lister program. □

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```
2000 PRINT "LIST OF SIMPLE VARIABLES"
2010 PRINT "NAME", "TYPE"
2020 VL%=0: VS%=0: VP%=16633
2030 VA%=PEEK(VP%)+PEEK(VP%+1)*256
2040 VP%=PEEK(16635)+PEEK(16636)*256
2050 GOSUB 2500: IF VN$="VL" THEN 2080
2060 PRINT: VA%=VA%+VT%+3
2070 IF VA%<VP% GOTO 2040
2080 VA%=VP%: VP%=PEEK(16637)+PEEK(16638)*256
2090 IF VA%=>VP% RETURN
2100 PRINT: PRINT: PRINT "LIST OF ARRAYS"
2110 PRINT "NAME","TYPE","DIM(S)"
2120 GOSUB 2500
2130 VS%=PEEK(VA%+5)
2140 FOR VL%=1 TO VS%
2150   PRINT PEEK(2*(VS%-VL%)+VA%+6)+PEEK(2*(VS%-VL%)+VA%+7)*256-1;
2160 NEXT VL%: PRINT
2170 VA%=VA%+PEEK(VA%+3)+PEEK(VA%+4)*256+5
2180 IF VA%<VP% THEN 2120 ELSE RETURN
2500 VT%=PEEK(VA%)
2510 VN$=CHR$(PEEK(VA%+2))+CHR$(PEEK(VA%+1))
2520 IF VN$="VL" THEN RETURN ELSE PRINT VN$,
2530 IF VT%=2 PRINT "INT",: RETURN
2540 IF VT%=3 PRINT "STR": RETURN
2550 IF VT%=4 PRINT "SNG": RETURN
2560 IF VT%=8 PRINT "DEL": RETURN
2570 PRINT "ERROR. VARIABLE ";VN$;" HAS TYPE NUMBER OF";VT%: STOP
```

Figure 3. A Variables Lister Program

Variables Used —

VL% for loop control
VS% number of subscripts in an array
VP% utility pointer
VA% beginning address of variable currently being processed
VN$ name of the variable being processed

```
 10 REM A TEST PROGRAM FOR VARIABLES LISTER
 20 AA=2.22
 30 K%=1234
 40 C$="AAAAAA"
 50 DIM XX(2,3)
 60 DIM Y$(5)
 70 XX(2,2)=12.34
 80 PRINT "READY TO LIST VARIABLES"
 90 INPUT "STRIKE ENTER TO LIST THEM";A$
100 GOSUB 2000
110 STOP

Output when RUN:

LIST OF SIMPLE VARIABLES
NAME            TYPE
AA              SNG
K%              INT
C$              STR

LIST OF ARRAYS
NAME            TYPE            DIM(S)
XX              SNG             2 3
Y$              STR             5
BREAK IN 110
```

Figure 4. Test Program and Output

Note: If any key other than ENTER is hit to begin the listing, A$ will be included in the listing.

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Your computer can carry out extended precision computations if you simply teach it to. Consider the problem of computing powers of two up to N, where N is very large. A simple program comes to mind:

```
5 INPUT N
10 PRINT 2↑N
20 GO TO 5
30 END
```

Most machines might allow you to go as high as 2^{38} which is 67,108,864. For 2^{39} which is 134,217,720 you would probably have to settle for 1.342177E+8. From there on you can forget about accuracy, you'll have to settle for being "in the ballpark."

Think About Doubling

If we *think* about the process of doubling though, we should be able to store the individual digits of succeeding powers of two in an array. It's a simple matter to double the digits in an array *A* and store them in *B*. If the digit is greater than 4, we must also carry a 1 into the next place, since 2 times a number greater than 4 has two digits, the first always a 1.

PROGRAM 2 below will print out powers of two until the "cow's come home,"—actually until the value has more than 500 digits. The *A* array is multiplied digit-for-digit by 2, then the carry *C* is added to produce a digit for the *B* array. Lines 120-160 do the computation. Line 140 computes the product and adds the carry *C*. Line 150 sets the carry for the next digit. If a power of two has *D* digits, a counter is bumped in line 125 to keep track of how many digits are in the final answer. Leading zeros are suppressed by making the contents of an array negative until something is stuffed into it—lines 165 and 167.

Stephen Rogowski, 6 Edward St., Cohoes, NY 12047

PROGRAM #2

```
40 DIM A(500),B(500)
50 A(1)=1
60 A(2)=-1
100 L=3
105 M=1
110 C=D=0
120 FOR K=1 TO L
125 D=D+1
130 IF A(K)<0 THEN 165
140 B(K)=MOD(A(K)*2,10)+C
150 IF A(K)>4 THEN C=1 ELSE C=0
160 NEXT K
165 IF C=0 THEN B(K+1)=-1 ELSE B(K)=1
167 IF C=1 THEN B(K+1)=-1
200 PRINT"2↑";M;"IS"
210 FOR G=D+1 TO 1 STEP -1
220 A(G)=B(G)
240 NEXT G
250 FOR F=D TO 1 STEP -1
260 IF B(F)<0 THEN 275
270 IF B(F)=0 THEN PRINT" ";B(F);
    ELSE PRINT B(F);
275 NEXT F
280 PRINT
300 L=D+1
305 M=M+1
307 IF M>250 THEN STOP
310 GO TO 110
400 END
```

Some implementations of BASIC print zeros without a leading plus sign—the spaces between numbers in the printout are actually supressed plus signs. Zero doesn't have a sign. To prevent running significant zeros into the other digits line 270 puts a space in front of embedded zeros.

Now for Division

So much for multiplication! Let's look at a division. I got into this problem while teaching about rational numbers. Fractions either terminate or repeat when expressed as decimals. That's right, every rational number is either a terminating decimal or it repeats at some point. To demonstrate we must be able to express these fractions with more precision than normal computer accuracy permits. The solution is to teach the computer to do long division. Forget about successive subtraction, it's the hard way to divide.

You remember long division with decimal points, and trial divisors and all that. The program below will compute any fraction's decimal equivalent until it terminates or repeats—it'll even say how many places it took to repeat. It sometimes requires patience for the repetition to begin. Did you know that 1/4097 repeats only after 4096 places. The program is simplified by the fact we only compute denominators under 1, hence the presence of 10s in lines 160 and 180. A simple modification would allow all possible numerators with the chosen denominator—although mathematicians amongst the readers will recognize that the number of places in the decimal expansion will remain the same. The program can really be reduced to lines 160 and 180 where the divisions are done. The rest of the logic is for orderly printing and place counting. If you don't have a MOD function—R=MOD(N,D) places the remainder from N/D into R—use R=N-INT(N/D)*D.

PROGRAM #3

```
100 X=1
110 DIM A(100),N(100)
120 PRINT
130 'INPUT NUMERATOR AND DENOMINATOR';
140 INPUT N(X),D
```

```
150 PRINT N(X); " / D; " = ";
160 A(X)=INT((10*N(X))/D)
170 PRINT A(X);
180 N(X+1)=MOD(10*N(X),D)
190 IF N(X+1)=0 THEN PRINT ELSE 230
200 PRINT "(TERMINATES AFTER";X;
210 IF X=1 THEN " DIGIT.)" ELSE " DIGITS.)
220 GO TO 100
230 X=X+1
240 FOR Y=1 TO X-1
250 IF N(X)=N(Y) THEN 260 ELSE 300
260 PRINT
270 PRINT "(REPEATS AFTER";X-1;
280 IF X-1=1 THEN " DIGIT.)" ELSE " DIGITS.)"
290 GO TO 100
300 NEXT Y
310 GO TO 160
320 END
```

Close scrutiny of the results produces some very interesting properties. The list below was produced by a slightly modified (and simplified) version of PROGRAM 3. It is listed below in PROGRAM 4. Notice that there are 16 separate fractional equivalents for fractions with denominators of 17. The expansion has 16 places. Each expansion is a cyclic permutation of the first, i.e. the order of the digits never changes they just start at a different but predictable point. Since 05 is the smallest possible starting point, it must be assigned to 1/17. The next smallest sequence begins with 11, so it must be assigned to 2/17, and so on.

PROGRAM #4

```
100 PRINT "INPUT DENOMINATOR"
110 INPUT N
120 FOR T=1 TO N-1
130 LET X=0
140 PRINT
150 LET A=T
160 PRINT A;" / ";N;" = ";
170 IF (A*10)/N<1 THEN 240
180 LET A=A*10
190 PRINT INT(A/N);
200 LET X=X+1
210 IF X>=N-1 THEN 290
220 LET A=A-INT(A/N)*N
230 GO TO 170
240 LET A=A*10
250 PRINT "0";
260 LET X=X+1
270 IF X>=N-1 THEN 290
280 GO TO 170
290 NEXT T
300 END
```

Some Observations

Even more interesting is a relationship within each expansion. Split each 16 place expansion in half. Consider the first eight digits in order against the last eight. Notice the first half is the nines complement of the second half—i.e. if you add the first eight digits to the last eight, you'll get all nines. This always happens when the denominator is a prime *N* and the decimal period is *N-1*. Using 1/4097, the first 2048 place produces 2048 nines when added to the second 2048 places. Even when prime denominator expansions contain fewer than *N-1* digits, if the period is even, both the cyclic permutations—several in these cases—and the nines complement properties will appear.

```
 1/17 = .0588235294117647
 2/17 = .1176470588235294
 3/17 = .1764705882352941
 4/17 = .2352941176470588
 5/17 = .2941176470588235
 6/17 = .3529411764705882
 7/17 = .4117647058823529
 8/17 = .4705882352941176
 9/17 = .5294117647058823
10/17 = .5882352941176470
11/17 = .6470588235294117
12/17 = .7058823529411764
13/17 = .7647058823529411
14/17 = .8235294117647058
15/17 = .8823529411764705
16/17 = .9411764705882352
```

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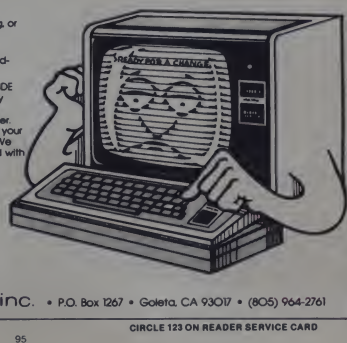

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For magazine articles and whatever

Photographing Your Computer System

Donald Skiff

Whether you're using photographs to illustrate an article for Creative Computing, to make a record of a new hardware design, to get hard copy without a printer by shooting the image on your CRT, or just to send a picture to your Aunt Millie, you can do a better job of it with a little planning and a few hints from the pros...

Illustrations Add a Lot to Communicating

Have you ever tried to describe something complicated without illustrations? I don't mean complicated in theory, either — just the appearance of an object such as a printed circuit board. We've come to really depend on illustrations in magazine articles and books to help us understand the words, and if we want to record or describe some thing we've made, the simplest means is often a camera.

We really depend on illustrations in magazine articles and books to help us understand the words.

It's easy enough to pop a flashcube into an instamatic and grab a quick snapshot of visiting relatives. While we can't use the same technique to get a clear photograph of the inside of our just-completed 64K Turbobyte, with a little care we can produce sharp, clear, well-lighted photos of our equipment, for whatever purpose we choose. We're not offering a course in photography here, but some hints and suggestions specifically aimed at the photographing of objects such as computer components, in a controlled setting, and without the need for a lot of expensive gear.

Donald Skiff, 7211 Scottwood Ave., Cincinnati, OH 45237

Good and Bad Photographs

In spite of what camera advertisements suggest, the difference between a poor photo and an effective one is not the brand (or the price) of the camera. If you can get your hands on a moderately priced 35mm camera (the plastic lenses on many "instant" cameras will not reproduce sharply enough to be useful in this kind of photography), you don't need expensive features such as automatic exposure control and motor-driven film advance. What does make the difference is control by the photographer — control over the amount and range of light used, over the focus of the camera and over what is included in the picture.

Light Makes a Photograph

A photograph is a two-dimensional image of a three-dimensional object. To make it look like three dimensions, we must provide some way to distinguish the depth of the photographed object. Our primary control is the way the object is lighted; perfectly flat lighting tends to obscure shape. As Photos 1 and 2 show, some directionality in the lighting creates highlights and shadows, and allows the flat page to reveal three dimensions.

Photo 1- "Perfectly flat lighting does not reveal shape very well."

We don't want too much, though. Contrast is the amount of gradation of tone values. A steep gradation produces high contrast; the steps of tone seem to go suddenly from light to dark, without much distinction in the middle tones. If your photo contains important detail in those middle tones, you'll lose that detail if the contrast is too high.

A related aspect: Have you ever tried to see clearly when your field of vision included both a very bright light and dimly-lit areas? You have to shade your eyes against the light so you can make out the detail. That means the scene has too great a brightness range for your eyes to accomodate. To put it in numbers, let's say your vision can handle a 100:1 ratio in brightness, without losing the detail. Photographic film can handle about 10:1; a normal print, however, can reproduce only about a 3:1 range. If you shoot a scene that contains a greater range, the photo will lose detail, either in the highlights or the shadows, depending on the amount of exposure. If you expose to retain the detail in the shadows, the lighter areas will "wash out" like the pasty-looking faces of people who were too close to the flash camera at last year's Christmas party. If you adjust the exposure to keep detail in the bright areas, the shadows will be dull and dark. Unless you control your lighting, you are taking a chance that your photos will be unusable.

When you've set up your Turbobyte to shoot it, don't trust your eyes to judge the range of brightness; measure it, if you can. We're talking about lighting here, not light and dark objects in the shot. If necessary, put a medium-gray card in front of the object, and take the light meter readings from that, instead of the object itself. Measure the brightest and the darkest areas. Since that makes the lighting job more complicated, we'll describe some shortcuts later.

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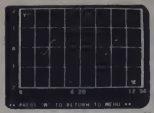

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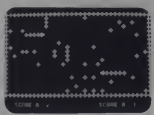

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Photographing, cont'd...

Photo 2- "Directional lighting shows depth and shape. Notice the detail in the shadows, however, held by fill light. Shadows should not be hard and dark."

Sharpness

If you are taking portraits, you may not want wire-sharp images. A portrait is usually an attempt to suggest inner qualities, rather than simply display external details. But an illustration of a device will lose effectiveness if one cannot make out the detail in it. Use a camera with adjustable focus and aperture settings (f-stops). And some means of accurately focusing the lens is necessary; if you're not using a single-lens reflex, measure carefully.

The degree of enlargement, from negative to print, obviously will affect sharpness. You won't gain anything using a good camera if the usable image size on the negative is only a small part of the whole frame. Decide before you shoot what the limits of your final picture will be, and fill up the viewfinder with that part of the scene.

Focus-Depth of Field

A technical photograph should usually be sharp throughout. However, the closer the camera is to the subject, the shallower its field of sharp focus will be. To overcome this shallow field, stop the lens down (use a higher f-stop number), as far as you can.

Photo 3- "Shallow depth of field, produced with aperture setting of f2.8."

For example, a 35mm camera having a 50mm focal length lens stopped down to f16 and focused at 36 inches will give a sharp image of objects from 7 inches in front of that point to 13 inches beyond. The same camera set at f2.8 and still focused at 36 inches will give a sharp image only 1-½ inches in front, and less than 2 inches beyond the point of focus. Photos 3 and 4 illustrate the difference.

Some cameras have a scale on the focusing ring to show the range of sharp focus at different stops. If your camera has no scale, measure the distances from lens to the nearest point and the farthest point you want sharp, then set the camera to focus on a point one-third of the way from front to back, as shown in Figure 1.

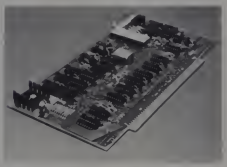


Photo 4- "Stopping the lens down to f16 extends the depth of field to cover the subject."

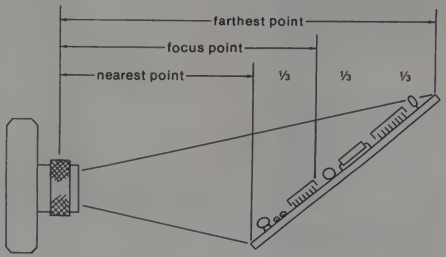


Figure 1: "Rule of thumb for close-up focusing: measure distance across subject, in line with camera, then set focus at one-third that distance beyond nearest point. Stop the lens down as far as you can, to get maximum depth of field."

Stopping the lens down, of course, means that you'll need a lot more light, or longer exposures.

Backgrounds

When we see the world, we really don't see the whole world. And when we're looking through the viewfinder of a camera we are seldom aware of what is in the frame other than the subject. That's how Uncle Joe seems to have a telephone pole sticking out of his head in those family snapshots. And that's how the corner of a sandwich happens to show next to the Turbobyte computer. When you're all ready to snap the shutter, stop and look carefully into the viewfinder for things you don't want in the picture. Backgrounds should be plain. You may have a very pretty rose garden wallpaper behind your computer, but it will detract from the point of the photograph.

Unless you control your lighting, you are taking a chance that your photos will be unusable.

Reflections, Texture, Surface Detail

We're getting down to the finer points of our lesson. The careful eye looking through that viewfinder can see other things you might want to subdue or accentuate. If a smooth surface reflects a light or object outside the frame, it may draw undesired attention to part of the

Photographing, cont'd. . .

picture, or it may create questions in the viewer about its origin.

A main light near the camera will tend to reduce surface detail. Conversely, if you want to emphasize texture, let a light skim across it from one side. Watch for distracting shadows, however.

Lighting Techniques

We've mentioned light several times before now — contrast, range, intensity and in handling reflections and texture. Lighting a photograph is not simply giving it enough light to expose the film.

To show detail, generally a very soft light (without sharp shadows) is best. I usually point my lights at the ceiling and one wall, and use the relected light to flood the subject. Even flash can be used this way, if you think about angles and total distance from source to subject. A single light bounced off the ceiling may well light a flat object, such as a printed circuit board lying on a table. However, it won't give very pleasing results by itself if you're shooting horizontally, especially if there are people in the picture. You need an additional light from one side, either bounced off a nearby wall or shining through a diffusion screen.

A technical photograph should usually be sharp throughout.

Caution: If you try to diffuse a photoflood light with flammable material, be very careful of heat. Don't get the material close to the light, and don't leave it there more than a few seconds. Test the heat with your hand at about the same distance — that will give you an idea of how long to leave the diffuser in place. Most photographers use fiber glass diffusers, but even with fiber glass, use care, because usually the glass is coated with a plastic, which may be flammable.

Another lighting method that works well, although it takes some practice to get uniform results is "painting" with light. Holding the lamp in your hand, open the shutter and move the lamp in a circle, keeping it at a constant distance but in continuous motion. You must use a long shutter speed, of course. The effect is as though the light were a very large source, and shadows are softened, even though there will be a definite direction to the lighting.

Remember the remarks about brightness range? With two lamps of equal brightness, if one is three-fourths the distance from the subject as the other, it will put twice as much light on it. That's a 2:1 ratio. If you use the closer light as a key light (set it up by itself first, until it gives the result you want), then fill in the shadows with the other, one-third to one-half farther away, you'll have a brightness range that will reproduce well. Usually, this fill light works

You may have a very pretty rose garden wallpaper behind your computer, but it will detract from the point of the photograph.

best if it is close to the line of sight from the camera, on the side of the camera opposite that of the key light (Figure 2). Diffusing both lights will produce a usable brightness range with soft shadows -- a dependable

Photo 5- "A single light is seldom adequate. This one is too close to the subject, as well-notice the lack of detail in the lower left."

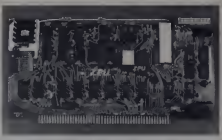


Photo 6- "A broad light source subdues shadows, illuminates more evenly."

arrangement for most detailed photographs.

Aside from trying to work with too great a brightness range, the most common mark of an amateurish photo is the presence of harsh, confusing shadows. Keep the sources of light broad. Compare Photos 5 and 6 for detail. Photo 5 was made with a single light, undiffused and too close for uniform exposure.

Closeups

A frequent complaint about non-professional photographs is that they are taken from too great a distance. They include too much area, de-emphasizing the main subject, and lacking important detail. If your subject is small, get in close. Use close-up lenses on your camera if necessary (these are relatively inexpensive attachments that fit in front of the camera lens). Follow the instructions that come with the attachment regarding focus, depth of field and field size. They don't affect exposure.

Whatever means you use to get in close, remember that the depth of

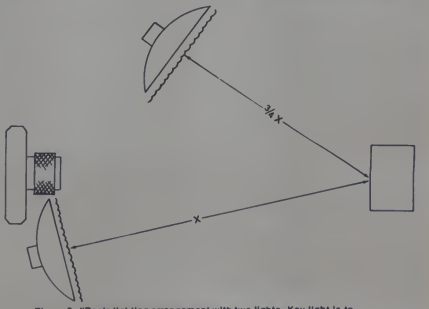


Figure 2: "Basic lighting arrangement with two lights. Key light is to the side, three-fouths the distance of the fill light, to give about 2:1 brightness ratio on the subject. Keep fill light close to camera line of sight."

Photographing, cont'd...

field -- the range of sharpness -- decreases markedly, the closer you get. If you stop your lens down as far as it will go (the highest f-stop), you've done what you can about that, and if the picture doesn't work, you may as well think of another picture. Depth of field is a function of distance, lens aperture size and image size -- not lens quality.

Photographing the CRT

This is a side issue, relative to the things we've been discussing so far. But sometimes a photograph of a video image is the only way a permanent record can be made of the results of a program, and even of the program itself. If you need a photo of your CRT, it's easy to do.

Set the camera on a tripod, exactly in front of the screen. Check the alignment (you may be able to see the camera reflected in the center of the screen). Move in close enough to eliminate everything but the screen and a little bit of the frame. If you get too close, there will be more distortion of the image from the curvature of the screen. If you have a telephoto lens, you can get the same size image from farther back and reduce that distortion.

Use an exposure time longer than 1/60 second. Otherwise, you may get diagonal stripes across the image of the screen, caused by the timing of the screen refresh process. On some video monitors, you may need as much as 1/30 second.

Depth of field — the range of sharpness — decreases markedly the closer you get.

Unless you're photographing a screen design that doesn't include much blank screen, your light meter won't read accurately from the screen itself. You'll have to experiment with exposure. One way to estimate exposure is to place a gray card (the back of a tablet will do) in front of the screen. Under ordinary room light, read the meter off the card. Then move the card to reveal half the screen. By eye, judge the difference in brightness between card and screen image. If the background seems darker, and the image seems lighter than the card, correct exposure should be pretty close to that indicated from the card itself (see Photo 7). Some CRT's have controls that will permit you to adjust the brightness and contrast. Now -- and this is important -- turn off the room lights before you make the shot. Otherwise, you will get reflections of your camera and yourself, and some overall graying of the screen from the room lights. If you must have the lights on, make a hood to cover both the screen and the camera.

Make several exposures of each image, increasing and decreasing the amount of exposure around that indicated (this is called "bracketing"), for safety. For example, if your card reading indicated an f-stop of f8, make one exposure each at f5.6, f8 and f11. When you see your negatives, choose the clearest one to print.

Photo 7- "A medium gray card placed over the CRT image can give a reference tone value for a light meter reading. Adjust screen brightness and contrast to balance across the gray tone, then shoot bracketing exposures for insurance."

What Kind of Equipment?

A single lens reflex is a popular type of 35mm, since it allows you to see, through the lens, exactly the field of view to be included in the negative. This is especially helpful for close-up shots. Fixed-focus cameras are designed to give an acceptable sharp image at but one distance; at any other distance, you lose. So adjustable focus is a must; likewise, adjustable f-stops. Some of the new automatic cameras change the aperture size to give a proper exposure, without regard to your need for depth of field -- be sure you can set the f-stop yourself.

A light meter, either separate from the camera or built in, will save a lot of wasted film.

A tripod permits extended exposure times without camera movement and makes composing the picture much easier. Use a cable release to operate the shutter.

When shooting black and white lights can be almost any kind, from ordinary household lamps to tungsten-halide photofloods or electronic flash lamps. The main difference is in the length of exposure you need to get a good image. Some means of diffusion is necessary. Remember that the duration of a flash is so short you cannot change exposure by adjusting the shutter speed. You must either change the distance of the light from the subject, or change the f-stop.

What Kind of Film?

Generally, slower films have finer grain, although grain size depends somewhat on development method as well. Stay away from extremely fast films, and special developers that increase effective film speed. Such things are useful for night basketball games, but the price is degraded picture quality. If your subjects are stationary, exposures of a minute or so will allow small aperture settings even with 100-watt lamps. Ordinary black and white film from the drugstore, with a speed of 64 or 100 should do nicely. Kodak Panatomic-X is a slow speed, extremely sharp film with beautiful tonal rendition.

Conclusion

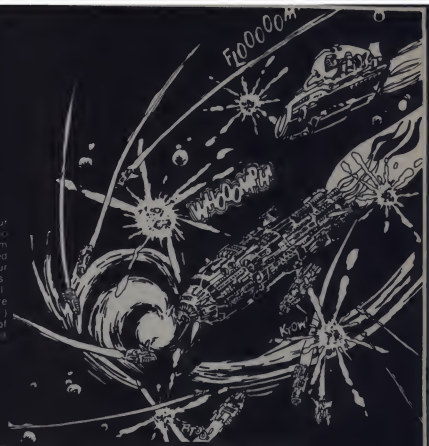
We've tried to give you some pointers here, for getting better photgraphs of your equipment, under typical home conditions. Rules of thumb are not meant to cover everything, but if you are able to make good photos with these hints, then you can experiment to find techniques for more difficult situations. Commercial photo labs don't ordinarily take pains to get good prints from marginal negatives. However, if your negatives are well exposed and well framed, you won't have to pay for custom lab services to get decent prints.

Many people make the mistake of writing directly on the back of a photograph with ball point or felt tip pens. The writing will bleed through when this is done and using a stick-on label is the solution. Ship the photographs back to back to prevent writing from transferring from the back of one photo to the front of another. Type all of the photo captions on a sheet of paper to be included with the text of your article, book, or whatever. Do not put the captions on the back of photos - the back should have the photo identification on a stick-on label, and that is all.

And if you're submitting your photos for reproduction with a magazine article, you stand a better chance that your manuscript will be accepted if your photos are up to the quality of your writing. □

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. Accelerate to place your shots and escape into hyperspace before your opponent comes within range. But be wary he (or she) may circle out of sight and reappear on the opposite side of the galaxy. (This is the classic MIT game redesigned especially for the Apple II.)



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DOMINO GAME

Al Weiss

This program places a standard set of 28 dominoes (double 0 to double 6) on a 7 by 8 array. H prints out the numbers on the dominoes, but not their edges. It is a puzzle for you to determine the exact tiling. To the right of the array, the program prints the 28 dominoes so that you may cross them off as you locate them in the array. The example below shows the output from the program. Also presented is a discussion of how to solve the sample problem. A second sample set of output is given with some hints to solve it. Since the program produces the patterns at random, some will be very easy and some will be quite hard.

What we have not included is a listing of the program. It is left up to you as a programming exercise to write it In whatever language you wish. This is not a contest; there are no prizes. And we don't want to see your output unless you do the job in fewer than 10 lines. (Yes, it can be done.) We'll print the best one we get.

In the following description, the notation D(A,B) will indicate the A,B Domino and the notation L(M,N) will indicate location M,N (where M is the row, counting up from the bottom, and N is the column).

1) The system says there is only one possible location for D(1,1), D(1,2) & D(4,4). Block them out in the array and cross them off the list to the right.

2) Notice that the 0 at L(5,7) cannot be part of D(0,4) for then there could not be any D(0,0). Draw a vertical line to the right of the 0 at L(5,7).

3) The 4 at L(5,8) must therefore be part of D(1,4) and any other adjacent 1's and 4's must be part of different dominoes. Draw a line below the 4 at L(7,3). Block out and cross off D(3,4) at that location. Now draw a line above the 4 at L(2,1) and below the one at L(6,5).

4) Notice that if D(3,6) were located horizontally at L(3,4) then the 6 at L(4,4) would also have to be part of A D(3,6). Draw a line to the right of the 3 at L(3,4).

5) Notice the 6 at L(1,1) which must be part of D(6,4) or D(6,6); the 6at L(3,5) which must be part of D(6,5) or D(6,6); the 6 at L(7,5) which must be part of D(6,4) or D(6,5), therefore no other 6 can be part of one of these dominoes. Draw a line to the right of the 6 at L(1,2), to the right of the one at L(2,5) and to the left of the one at L(7,8). This last line establishes D(1,6). Block it out and cross it off. We can now draw a line to the left of the 6 at L(2,5). We have also established D(1,4), block it out and cross it.

6) Notice that if the 0at L(4,7) were part of the D(0,2) that would force the 0 at L(3,8) to be part of D(0,6) and the 0at L(1,8) to be part of D(0,2) also. This cannot be, so draw a line below the 0 at L(4,7). Block out and cross off D(0,0).

7) Notice the lower right corner of the array, this must contain an even number of cells. Draw a line to the right of L(1,4).

8) If we re-examine the array there is only one possible location for D(0,1). Block it out and cross it off. Do the same for D(0,3), D(0,5) and D(0,4). This forces D(4,5), D(4,6), D(3,5) and D(3,6).

9) Since D(4,6) has been placed, draw a line above the 6 at L(1,1). This forces D(6,6) & D(2,4). Drawing a line above the 6 at L(2,5) forces D(5,6), D(0,2), D(0,6), D(2,2) & D(2,6).

10) There is now only one possible location for D(5,5) which forces D(1,3). The same for D(3,3) & D(2,3), this forces D(2,5) & D(1,5) which completes the entire array.

This array had a unique pattern. Some will contain sub-areas such as:

```
2 4
6 2
```

which contains D(2,4) & D(2,6) In either of two says.

```
    COL  1  2  3  4  5  6  7  8
ROW

 7       2  1  4  3  6  5  4  6        00

 6     5  3  1  5  4  5  0  1          01  11

 5     1  3  0  3  3  0  0  4          02  12  22

 4     5  2  4  6  1  1  0  1          03  13  23  33

 3     3  2  4  3  6  5  2  0          04  14  24  34  44

 2     4  2  3  1  6  4  0  2          05  15  25  35  45  55

 1     6  6  5  5  2  2  2  0          06  16  26  36  46  56  66

       UNIQUE DOMINOES
          11  12  44

 5  5  4  6  6  5  4  3                00

 5  5  3  3  5  4  2  6                01  11

 6  3  0  3  0  6  1  2                02  12  22

 6  3  1  2  5  0  1  2                03  13  23  33

 3  6  4  0  1  4  1  2                04  14  24  34  44

 3  4  5  1  2  0  6  1                05  15  25  35  45  55

 2  1  2  0  0  0  4  4                06  16  26  36  46  56  66

UNIQUE DOMINOES:
   13  44
```

FIGURE 1

After you have done the obvious, here are some hints:

What do you know about the location of D(0,0), D(1,1), D(2,2) & D(5,5)?

What can you tell from the 3's in L(3,1) & L(6,4)?

When you place a domino, notice what possibilities you have eliminated. □

Al Weiss, 10529 Oak Drive, Auburn, CA 95603.

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Basketball Stats & the School Computer

Douglas W. Green
&
Dr. Jeffrey Hering

How many basketball coaches have seen their teams lose a close game due to lack of teamwork? Certainly any fan has seen more examples of selfish play on the courts than they care to admit, and little wonder. With the emphasis placed on the number of points scored by each individual, high scorer and scoring average, who can blame the players for trying to maximize their scoring output? This is not to say that many coaches avoid keeping track of other meaningful statistics, but how often has any fan seen a report on the number of assists, rebounds and steals for each player after a game?

Coach meets computer

When John Jackson, the basketball coach at Cortland High School, Cortland, New York, discovered that the school had a Wang microcomputer, he came to us to see if we could program his basketball stats so the players and the fans could see how well each player has performed in a number of statistical areas important to team play as well as point totals. The idea of providing this type of reinforcement to the players and this type of information to the fans was appealing, so we got to work and prepared the program that is listed here (Program A). It was used successfully during the 1978-79 season. In addition to reporting the statistics recorded during the game, the program calculates shooting percentages and per game ratios for each piece of data. It then adds the totals to those from the other games and prints out a year-to-date stat sheet. The response from all concerned was positive and we expect to continue its use.

Douglas W. Green, Dr. Jeffrey Hering, Cortland Jr-Sr High School, Valley View Drive, Cortland, N.Y. 13045.

Gathering the data

You can employ student managers during the game to record data or you may even find interested students from math classes. It will save time if you run off forms that list the names of the players along one side and the types of data being recorded along another. One person might be assigned to record the number of shots attempted and made along with personal fouls and the time each player entered and left the game. The other recorder would then be responsible for recording rebounds·assists, steals and turnovers. The ability of your recorders can be assessed in a scrimmage so that you have capable people who aren't overloaded with responsibilities ready for the opening tip-off. If your games are filmed or videotaped, you can have your staff practice on one of last year's tapes and you can also evaluate their performance while viewing the game. It will also be necessary to locate and train a student to operate the computer. If your school has a computer programming class this should not be too difficult. Perhaps the teacher will allow this type of effort to count in lieu of an assignment or as an extra credit project.

The players and the fans could see how well each player has performed in a number of statistical areas important to team play.

Program requirements

Data storage space for this program is about 5,000 bytes. Additional core required for the program brings the memory requirement up to about 7,400. More space could be made available if some of the program documentation is deleted. The program as shown accommodates data for thirteen players along with totals for the home team and the opponent. It is also necessary to utilize a second, smaller program in order to set up data files at the beginning of the season (Program B). Since the main program gives instructions to load the year's totals and the names of the players at the beginning of the run, you must see to it that this information is placed immediately after the main program on your magnetic storage device. After you have entered Program A and saved it, enter Program B into the memory and run it. It will ask for the names of players, numbered one through fifteen. The 14th, or next to last player, will be the opponent's totals while the 15th, and last, player will be designated as the home team totals. After you have supplied the names, the program will record this list, B$(), and also save room for the table that stores the statistics, B(). Since no numbers have been entered yet, this will be a table of zeros. After this data has been saved, you should clear the memory and backspace to the beginning of Program A. After you load this program you can run it. The first thing that should happen is the loading of your name list and data table into the memory locations that have been saved for them by statement 20.

Inside the program

We begin by saving space for two 15 by 12 tables and the list of names. Table A, or matrix A if you prefer, receives the data for each player from the most recent game. Table B receives the totals from all of the previ-

Basketball, cont'd. . .

ous games. We begin by loading Table B and the list of names into the memory from the magnetic memory which, in this case, in a cassette tape. It is also necessary to back up to the beginning of this file so the new totals can be stored in the same place. This is the purpose of statement 900.

The program calculates shooting percentages and per game ratios for each piece of data.

Once the old totals are in place, it is time to input the results from the most recent game. If the sheets that your data are originally recorded on are set up in the same order as the input prompts, this can be accomplished in five to ten minutes. If you make an error during the input process, make a note of it so it can be corrected when the system arrives at statement 310. This STOP statement places you in immediate mode so you can change any of your inputs. Suppose you entered a 5 instead of a 6 for the number of field goals attempted by player Number 9. All you need enter to correct this is: A(9,2) = 6 and RETURN. Any program that provides for correction of inputs should have a STOP in it somewhere.

When you finish your corrections, enter CONTINUE and RETURN and the computer will do the rest. It first adds the home team totals for the data in Table A. It then proceeds to the output section of the program located in statements 390 to 740. The HEX statements you see here are a group of codes that Wang Basic uses to facilitate output. HEX(0A) tells the printer to skip a space while HEX(0E) expands the print.

Processing the data

The bulk of the "number crunching" in this program is accomplished within the PRINTUSING statements. Before any work can be done on the data for a given player, it must be determined if he played or not. If someone has not played, the game counter for that individual, column 12 in the matrix, will read zero and attempted division by zero will result. The same holds for players who played but did not shoot. Statements 470 to 560 are designed to avoid these problems. They check to see if there are zeros in columns 2, 4, or 12. If so, the numbers being output are set to zero. If not, the calculations are carried out. If a player has not played, PRINTUSING statements numbers 600 to 690 are used to print zeros. If a player has played, the percentages and ratios are calculated and printed using statements 570 and 660. Please note that the functions defined in statements 40 and 50 are used to expedite rounding and percentage determination.

Matrix manipulation

It is now time to add the totals in matrix B to those from matrix A. This is accomplished by statement 760. This sets matrix B equal to the sum of A and B. Every element in matrix A is added to its corresponding element in matrix B. B(1,L) is set equal to B(1,1) + A(1,1), etc. The new totals are then saved on tape along with the list of players' names. The counter S used in statements 750 and 820 is used to make sure this only happens one time even though the output statements are executed twice. Before the new totals can be output, however, they must be transferred to matrix A. This is accomplished by statement 850 and is necessitated by the fact that only matrix A is used in the output section of the program. After the output is printed using the new totals, statement 750 causes the program execution to terminate.

It is great incentive to see your positive contributions mentioned, even if they do not center around the scoring column.

Propagation of your output

The first task of the coach is to analyze the output. It should be clear from this information why the game was won or lost and who on the team is making the greatest positive contributions. A look at a sample of the output provided by this program will illustrate this. Next in line are the players. They will be eager and interested to see how they measure up in all of the areas listed. It is great incentive to see your positive contributions mentioned, even if they do

```
10 REM *****THIS PROGRAM CAN BE USED TO ESTABLISH YOUR DATA FILE*****
20 REM *****RUN IT ONCE AT THE BEGINNING OF THE SEASON TO INPUT THE NAMES OF YOUR PLAYERS*****
30 REM *****PLAYER NUMBER 14 IS OPPONENT TOTALS*****
40 REM *****PLAYER NUMBER 15 IS THE HOME TEAM TOTALS*****
50 DIM B$(15),B(15,12)
60 FOR N = 1 TO 15
70 PRINT "ENTER THE NAME OF PLAYER NUMBER";N
80 INPUT B$(N)
90 NEXT N
100 DATA SAVE OPEN "B-BALL"
110 DATA SAVE B$(),B()
120 DATA SAVE END
```

VARSITY STATISTICS 1978-79

NAME	NO.	FGM	FGA	FG%	FTM	FTA	FT%	PTS	PTS/G	OREB	DREB	TOT
ATCHESON	20	53	128	41.4	33	48	71.7	139	7.3	19	28	47
DADARIO	52	0	0	0.0	2	2	100.0	2	0.3	2	4	6
DIPOLITO	30	1	9	22.2	0	0	0.0	2	0.3	3	12	15
FOX	10	12	58	20.7	9	14	37.5	33	1.9	9	20	29
FRANCIS	35	123	259	47.5	55	69	53.2	281	14.8	74	83	157
GUZMAN	15	1	3	33.3	0	1	0.0	2	0.4	2	1	3
HAGUWORTH	12	50	106	47.2	27	41	65.9	127	6.7	40	12	52
MARTIN	25	74	202	36.6	42	58	72.4	190	10.0	53	96	149
MULLEM	25	1	5	20.0	0	0	0.0	2	0.4	1	4	5
PALMER	40	28	73	38.4	11	17	64.7	67	3.7	20	35	55
RYAN	32	33	99	33.3	13	24	54.2	79	4.4	29	104	133
SCALES	5	7	17	24.3	3	6	50.0	17	3.4	10	19	29
SCIERA	44	23	66	34.8	10	20	50.0	56	2.9	51	74	125
OPPONENT TOTAL		448	1049	42.7	250	400	62.7	1152	60.6	403	607	1010
CORTLAND TOTAL		407	1048	38.8	209	309	67.6	1023	53.8	341	574	915

NAME	NO.	STL	S/G	ASST	A/G	TO	TO/G	FF	PF/G	MI	MI/G	GP
ATCHESON	20	7	0.4	2	0.1	17	0.9	40	2.1	323	17.0	19
DADARIO	52	0	0.0	1	0.1	0	0.0	3	0.4	14	2.1	7
DIPOLITO	30	1	0.1	0	0.0	7	0.2	3	0.3	32	2.9	11
FOX	10	12	0.7	26	1.5	11	1.0	32	1.9	222	13.0	17
FRANCIS	35	34	1.9	73	4.1	65	3.6	65	3.6	503	28.0	18
GUZMAN	15	1	0.3	1	0.3	2	0.6	1	0.3	10	3.3	3
HAGUWORTH	12	15	0.8	13	0.7	23	1.2	21	1.1	366	19.3	19
MARTIN	25	17	0.9	12	0.6	44	2.3	48	2.5	514	27.1	19
MULLEM	25	1	0.2	1	0.2	3	0.6	3	0.6	15	3.0	5
PALMER	40	4	0.3	2	0.2	20	1.5	40	3.0	270	20.8	13
RYAN	32	16	0.9	16	0.9	35	1.9	34	1.8	294	16.3	18
SCALES	5	10	0.9	12	1.1	19	1.7	10	0.9	205	18.6	11
SCIERA	44	8	0.4	8	0.4	16	1.0	41	2.6	264	13.9	19
OPPONENT TOTAL		154	8.1	171	9.0	311	16.3	285	15.0	3035	161.4	19
CORTLAND TOTAL		136	7.2	136	7.2	342	18.0	137	17.7	3070.0	161.6	19

FG=FIELD GOALS FT=FREE THROWS M=MADE A=ATTEMPTED PTS POINTS /G=PER GAME
REB=REBOUND O=OFFENSIVE D=DEFENSIVE TOTAL STL=STEALS ASST=ASSISTS
TO=TURNOVERS PF=PERSONAL FOULS MI=MINUTES PLAYED GP=GAMES PLAYED

```
10 REM *****THIS STATEMENT SAVES SPACE FOR THE NAMES AND DATA******
20 DIM A(15,12),B(15,12),B$(15)
30 REM *****FUNCTIONS R AND S ARE DEFINED HERE.  THEY ROUND OFF AND CONVERT TO %'S.*****
40 DEFFN S(X) = INT((X+.05)*10)/10
50 DEFFN R(X) = INT((X+.0005)*1000)/10
60 REM *****THESE STATEMENTS LOAD THE NAMES AND DATA FROM PREVIOUS GAMES FROM THE TAPE DRIVE*****
70 DATA LOAD "B-BALL"
80 DATA LOAD B$(),B()
90 BACKSPACE 1F
100 INPUT "WHO WAS THE OPPONENT (INITIALS) AND WHAT WAS THE DATE OF THE GAME (NUMERIC DATE)",F$
110 REM *****HERE IS WHERE YOU ENTER THE DATA FOR THE GAME THAT WAS JUST PLAYED*****
120 FOR N= 1 TO 14
130 PRINT B$(N)
140 INPUT "DID HE PLAY Y OR N",C$
150 IF C$ ="N"THEN 290
160 INPUT "FIELD GOALS MADE",A(N,1)
170 INPUT "FIELD GOALS ATTEMPTED",A(N,2)
180 INPUT "FREE THROWS MADE",A(N,3)
190 INPUT "FREE THROWS ATTEMPTED",A(N,4)
200 INPUT "OFFENSIVE REBOUNDS",A(N,5)
210 INPUT "DEFENSIVE REBOUNDS",A(N,6)
220 INPUT "STEALS",A(N,7)
230 INPUT "ASSISTS",A(N,8)
240 INPUT "TURNOVERS",A(N,9)
250 INPUT "PERSONAL FOULS",A(N,10)
260 INPUT "MINUTES PLAYED",A(N,11)
270 REM *****THIS STATEMENT UPDATES THE NUMBER OF GAMES PLAYED FOR EACH PLAYER*****
280 A(N,12) = A(N,12) + 1
290 NEXT N
300 REM *****THE STOP ALLOWS YOU TO MAKE CORRECTIONS IN IMMEDIATE MODE*****
310 STOP "ENTER YOUR CORRECTIONS THEN PRESS CONTINUE"
320 REM *****HERE IS WHERE THE HOME TEAM'S TOTALS ARE DETERMINED*****
330 FOR M = 1 TO 11
340 FOR N = 1 TO 13
350 A(15,M) = A(15,M) + A(N,M)
360 NEXT N
370 NEXT M
380 A(15,12) = 1
390 REM *****THIS NEXT GROUP OF STATEMENTS CONTROLS THE OUTPUT*****
400 PRINT HEX(0A0A0A0E);"       CORTLAND HIGH BASKETBALL STATS"
410 REM *****HEX 0A SKIPS ONE LINE AND HEX 0E EXPANDS THE PRINT IF YOU ARE USING WANG BASIC*****
420 PRINT HEX(0A0A)
430 PRINT F$
440PRINT
450 PRINT "NAME          ";" NO.";"  FGM";"   FGA";"  FG%";"  FTM";"   FTA";"   FT%";"    PTS";"  P
/G";"   DR@";"   DR@";"   TR@";"  TR/G"
460 FOR N = 1 TO 15
470 REM *****THESE STATEMENTS PREVENT DIVISION BY ZERO FOR PLAYERS WHO DIDN'T PLAY*****
480 IF A(N,12) = 0 THEN 600
490 IF A(N,2) = 0 THEN 540
500 F = FNR(A(N,1)/A(N,2))
510 IF A(N,4) = 0 THEN 560
520 F1 = FNR(A(N,3)/A(N,4))
530 GOTO 570
540 F = 0
550 GOTO 510
560 F1 = 0
570 PRINTUSING 590,B$(N),A(N,1),A(N,2),F,A(N,3),A(N,4),F1,(A(N,1)*2+A(N,3)),FNS((A(N,1)*2+A(N,3))/
A(N,12)),A(N,5),A(N,6),(A(N,5)+A(N,6)),FNS((A(N,5)+A(N,6))/A(N,12))
580 GOTO 610
590 %##################  ###  #### ###.#  ###  ###   ###.#  ####  ##.#  ###   ###   ###   ##.#
600 PRINTUSING 590,B$(N),0,0,0,0,0,0,0,0,0,0,0,0
610 NEXT N
620 PRINT HEX(0A0A0A0A)
630 PRINT "NAME          ";" NO.";"    STLS";"   S/G ";"   ASST";"  A/G";"   TD ";" TD/G";"  PF   ";"
PF/G ";"     MP ";"    MP/G ";"   GP"
640 FOR N = 1 TO 15
650 IF A(N,12) = 0 THEN 690
660 PRINTUSING 680,B$(N),A(N,7),FNS(A(N,7)/A(N,12)),A(N,8),FNS(A(N,8)/A(N,12)),A(N,9),FNS(A(N,9)/A
(N,12)),A(N,10),FNS(A(N,10)/A(N,12)),A(N,11),FNS(A(N,11)/A(N,12)),A(N,12)
670 GOTO 700
680 %##################   ###   ##.#   ###   ##.#  ###  ##.#  ###  ##.#   ####.#   ###.#    ##
690 PRINTUSING 680,B$(N),0,0,0,0,0,0,0,0,0,0,0,0
700 NEXT N
710 PRINT HEX(0A0A);"FG=FIELD GOALS  FT=FREE THROWS  M=MADE  A=ATTEMPTED   PTS=POINTS   /G=PER GAM
E"
720 PRINT "RB=REBOUND  D=OFFENSIVE  D=DEFENSIVE  T=TOTAL  STLS=STEALS  ASST=ASSISTS"
730 PRINT "TO=TURNOVERS  PF=PERSONAL FOULS  MP=MINUTES PLAYED  GP=GAMES PLAYED"
740 REM *****THIS STATEMENT ADDS THE CURRENT TOTALS TO THOSE OF THE PREVIOUS GAMES*****
750 IF S = 1 THEN 870
760 MAT B = A+B
770 PRINT HEX(0A0A0A)
780 REM *****THESE STATEMENTS SAVE THE NEW TOTALS ON TAPE*****
790 DATA SAVE OPEN "B-BALL"
800 DATA SAVE B$(),B()
810 DATA SAVE  END
820 S = S + 1
830 REM *****THIS PLACES THE NEW TOTALS INTO MATRIX A*****
840 REM *****AND REPEATS THE OUTPUT USING THE NEW TOTALS*****
850 MAT A = B
860 GOTO 400
870 END
```

Basketball, cont'd . . .

not center around the scoring column. To be sure, there are negative aspects to this report card as well. Low shooting percentages should help to control the players who consistently take bad shots. Turnovers and personal fouls will also highlight the players who are not concentrating on the coach's instructions. Perhaps, at the end of the season, awards can be given for the player who has the best record for each of the columns on the printout.

Finally, your efforts should be made available to the fans. By placing a copy of the output in the game program, you give them the opportunity to become more knowledgeable about all of the game's aspects. This will also be further incentive to the players to concentrate on increasing their positive contributions and decreasing their negative behaviors.

Further suggestions and other applications

One idea we would like to try involves a change in the calculations of the per game ratios. Instead of using the number of games in which a player participated, it might be interesting to try using the number of minutes played divided by 32. Since 32 minutes is the maximum number of minutes a player can play, it represents one entire game. This would make the comparisons more meaningful since they would all be based on the same amount of time played. The current program does not take into account a situation in which one player having 4 personal fouls and 5 turnovers played almost the entire game, while another player had 2 fouls and 3 turnovers in 5 minutes.

Any team sport where all or most of the players have the same basic objective could profit from this type of analysis.

Perhaps there are other sports that would lend themselves to this type of analysis. Certainly the baseball coach would like to know a lot more about a player than just his batting average. It seems that any team sport where all or most of the players have the same basic objective could profit from this type of analysis. □

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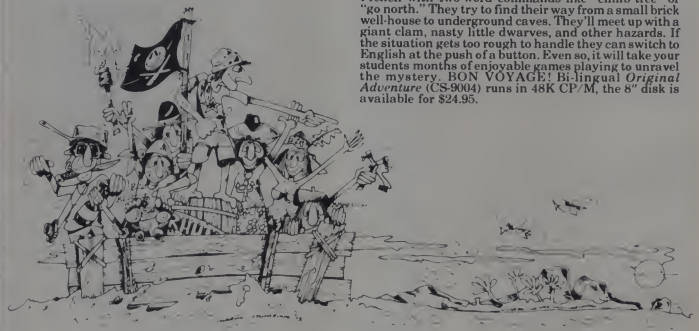

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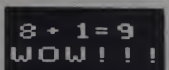
Computer Assisted Instruction Programs

U.S. Map



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The series is designed for the 16K TRS-80 Level II and is attractively packaged in a vinyl binder. Included is a study guide which relates the material to current controversies, stimulates classroom discussion, and provides sample exercises. The series is also available on disk: **Ecology Simulations-1** (CS-3501), **Ecology Simulations-2**(CS-3502),and **Social and Economic Simulations** (CS-3508). At a modest $24.95 each, with quantity discounts available, the series becomes an affordable necessity.

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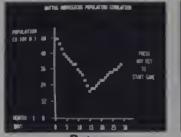
80 Software Critique on Ecology Simulations-1 Jan-March 1980

Ecology Simulations-2



Rats

Malaria

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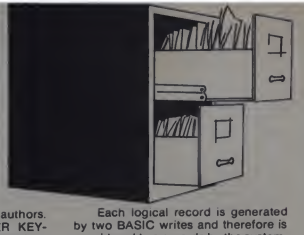
Keyword Access System



Phil Hughes

The keyword access system is a set of programs designed to store information about magazine articles and allow this information to be retrieved in various ways. The data in the file used by KAS consists of Article Name, Author, Magazine Name, Date, Page Number and up to ten keywords or descriptors.

The purpose of KAS is to access information more easily either by an on-line inquiry using a terminal, or by looking through a printed report. The on-line inquiry program allows the user to qualify a search by any or all of the following:

- Magazine Name
- Author
- Up to 10 keywords

A printed report of all the data is available sequentially in the order the information is stored in the file and, also, sorted by keyword.

KAS is implemented on a SWTPC MP-68 computer using BASIC 3.0. It should be relatively easy to transport the system to any other BASIC which supports sequential disk files.

Program Operation

To use KAS it is only necessary to run the menu program. All other program invocations are handled by use of the CHAIN statement within the programs. When each program terminates normally it returns to the menu program. Figure 1 shows a typical session with KAS. The operations performed are as follows:

1. The menu program is loaded and run.
2. As a select is desired, SEL is entered in response to the menu display. This causes program SELECT to be loaded and run.
3. CREATIVE COMPUTING is entered in response to the MAGAZINE NAME prompt because only articles which have appeared in Creative Computing are desired.
4. Only a carriage return is entered in response to the AUTHOR NAME prompt because we are not looking for specific authors.
5. In response to ENTER KEYWORDS, GAME is entered on the first line, MUSIC on the second, and a carriage return on the third. This indicates that we have two keywords to look for, GAME and MUSIC.
6. In response to the ANY KEYWORD MATCH OR ALL KEYWORDS prompt,we enter ALL. This indicates that in order for a record to be selected it must have both GAME and MUSIC in its keyword list.
7. KAS now searches the data file using the specified criteria and prints out three records which match.
8. Another search is now performed for articles by M OGLESBY and two are found.
9. A third search is performed using only the keywords BIBLE and CAI (for computer aided instruction). One record is located.
10. Finally a search for a match on either the keyword MUSIC or the keyword ART is performed by answering the ANY KEYWORD MATCH OR ALL KEYWORDS prompt with ANY.
11. Control is returned to MENU by answering N to the EOF - ANOTHER SEARCH prompt. The ADD program is then selected.
12. Using ADD, three new articles from July 1979 Creative Computing are added to the data file.
13. Next a printed report is requested by answering REP to the menu. Printer output was requested and the result of this request can be seen in Figure 2.
14. Finally a list of part of the file is requested using the program LIST.

Program Description

The data file used by KAS is COMPUTER.KAS. The string variable Z$ is set to this value so it is easy to change. Also, the programs could be modified to ask for the file name so multiple files could be handled on each disk.

Each logical record is generated by two BASIC writes and therefore is considered two records by the system. The first of these records is the list of the ten keywords. Unused entries contain no characters but are still delimited by a comma. The second record contains Article Name, Magazine Name, Date, Page Number and two Author Names.

These date files are compatible with the file format for the TSC Text Editor and therefore you can use the editor to make corrections. For this reason there is no update program in KAS.

Internally, KAS consists of six programs. The program MENU uses the CHAIN command to load each of the five programs that either write to or inquire on the data file COMPUTER.-KAS. When a program terminates normally, it returns control to MENU.

CREATE is a program that initializes the data file. It prompts for a file name so that a live data file will not be inadvertently initialized.

ADD is the program that adds new entries at the end of the current file. Because mini-FLEX does not allow updates to existing files, the data file is read and written out as a new file named WORK.KAS. New records are then added at the end of WORK.KAS. When all adds are complete the old data file is deleted (KILL) and WORK.-KAS is renamed.

LIST allows you to print out all or part of the data file in the order the records were created. The only input consists of the first and last record numbers to be listed. Entering a large number as the last record number will cause all records from FIRST to the end of file to be listed.

SELECT is the on-line inquiry program. It allows you to search for records which have a particular magazine name, author name and keyword(s) up to ten. In operation, it prompts for the selection criteria and then searches the data file sequentially for records that match the specified criteria. All records that match are formatted and printed. When a search is complete it asks if you want to do another search. A yes (Y) response

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KAS, con't . . .

restarts the selection criteria prompting sequence. A no (N) response results in a CHAIN back to the menu program.

REPORT is the program that generates a printed report of the data file sorted by keyword. Each record can have up to ten keywords, therefore it could generate up to ten entries in the report. This program is more complicated than the others because of the sort, therefore, I will explain its operation in detail.

First, I'll explain its subroutines. The READ RECORD subroutine (Line 180) uses the value of variable Z8 as a file number and reads the next record. This routine is used to read both the data file and the temporary sort files. The WRITE RECORD subroutine (Line 230) uses the value of variable Z7 as a file number and writes a record. This routine is used to write the temporary sort files. Both of these routines uses variables as follows:

- K$(10) Keywords
- A$ Article Title
- M$ Magazine Name
- D$ Magazine Date
- P Page Number
- W$(2) Author Name(s)

The PRINT KEYWORD REPORT subroutine (Line 1160) reads the temporary sort files and prints the report. It uses the READ RECORD subroutine and the REPORT PAGE HANDLER.

MENU Program

```
0001 REM KEYWORD ARTICLE STORAGE MENU PROGRAM
0002 REM SSC 1-22-79
0010 POKE 62,40:REM STRING LENGTH-40
0020  L=5:REM NUMBER OF SUBSYSTEMS
0030 DIM T$(L),PS(L)
0040 DATA ADD,ADD,REP,REPORT,LIS,LIST,SEL,SELECT,CRE,CREATE
0050 FOR I=1 TO L:READ T$(I),PS(I):NEXT I
0100 PRINT :PRINT "KEYWORD ACCESS SYSTEM - V1.1"
0110 PRINT
0120 PRINT TAB(10);"MENU":PRINT
0130 PRINT "ADD - ADD ARTICLE TO FILE"
0140 PRINT "REP - REPORT SORTED BY KEYWORD"
0150 PRINT "LIS - LIST ENTRIES"
0160 PRINT "SEL - SELECT ENTRIES"
0170 PRINT "CRE - CREATE A NEW DATA FILE"
0180 PRINT "END - TERMINATE PROCESSING"
0190 PRINT
0200 INPUT "ENTER SUBSYSTEM DESIRED",A$
0210  A$=LEFT$(A$,3)
0220 FOR I=1 TO L
0230 IF A$=T$(I) THEN 300
0240 NEXT I
0250 IF A$="END" GOTO 9000
0260 PRINT "INVALID SUBSYSTEM,
0270 GOTO 200          TRY AGAIN"
0300 CHAIN PS(I)
9000 END
```

CREATE Program

```
0001 REM CREATE DATA FILE
0002 REM SSC 1-22-79
0060  E$="***"
0070  F$=""
0080 PRINT "DATA FILE CREATE - V1.1":PRINT
0090 INPUT "ENTER FILE NAME",Z$
0100 OPEN #1,Z$
0110 WRITE #1,E$,F$,F$,F$,F$,F$,F$,F$,F$,F$
0120 WRITE #1,F$,F$,F$,F,F$,F$
0130 CLOSE #1
0140 CHAIN MENU
```

The REPORT PAGE HANDLER consists of three subroutines and handles page titles, subtitles and page length. The following variables are used:

- T$ Page Title
- S$ Subtitle
- L6 Minimum space required to print an entry
- L7 Current line on page
- L8 Current page number
- L9 Lines per page (including margins)

Variable L6 is used to prevent printing a subtitle on the bottom of a page when there is insufficient room for at least one entry.

A call to the INIT subroutine (line 1310) initializes the report handler and allows you to set up the paper position. A call to the SET SUBTITLE subroutine (line 1470) spaces one line and then prints the subtitle in S$ if there is enough room on the page for a complete entry as specified by the value of L6. If there is not enough space, a new page is started and both a title and subtitle are printed.

Fig.1: Sample run of MENU and SELECT

```
READY
*LOAD MENU

READY
*RUN

KEYWORD ACCESS SYSTEM - V1.1

        MENU

ADD - ADD ARTICLE TO FILE
REP - REPORT SORTED BY KEYWORD
LIS - LIST ENTRIES
SEL - SELECT ENTRIES
CRE - CREATE A NEW DATA FILE
END - TERMINATE PROCESSING

ENTER SUBSYSTEM DESIRED? SEL

SELECT/LIST SUBSYSTEM

ENTER ONLY 'RETURN' IF YOU DONT WANT TO SELECT ON
THE CRITERIA LISTED.
OTHERWISE ENTER MATCH STRING

MAGAZINE NAME? CREATIVE COMPUTING
AUTHOR NAME?
ENTER KEYWORDS
? GAME
? MUSIC
?
ANY KEYWORD MATCH OR ALL KEYWORDS? ALL


A MUSICAL NUMBER GUESSING GAME
     by K INMAN
CREATIVE COMPUTING                MAR APR 1977
PAGE 110

SHARPS & FLATS
     by J KUYPER
CREATIVE COMPUTING                MAR APR 1977
PAGE 114

MUSICAL MAGIC SQUARES
     by F HOFSTETTER
CREATIVE COMPUTING                MAR APR 1977
PAGE 116

EOF - ANOTHER SEARCH
? Y
MAGAZINE NAME?
AUTHOR NAME? M OGLESBY
ENTER KEYWORDS
?

DODGEM
     by M OGLESBY
CREATIVE COMPUTING                MAR APR 1977
PAGE 117

WATCHMAN
     by M OGLESBY
CREATIVE COMPUTING                SEP OCT 1976
PAGE 74

EOF - ANOTHER SEARCH
? Y
MAGAZINE NAME?
AUTHOR NAME?
ENTER KEYWORDS
? CAI
? BIBLE
?
ANY KEYWORD MATCH OR ALL KEYWORDS? ALL

BIBLE QUIZ
     by S WENTWORTH
CREATIVE COMPUTING                MAR APR 1977
PAGE 124
```

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KAS, con't . . .

The third entry in the report page handler is the LINE COUNT subroutine (line 1570). It must be called before each print statement. If the current page is full, it starts a new page printing the title and the subtitle followed by "(continued)."

Now let's look at the program flow of REPORT. First the data file is read and all new keywords are put into the string array V$. Once an end of file is reached, all the keywords in V$ are sorted. Now scratch files are established (A.KAS, B.KAS, . . .) for selecting records that contain the keywords. If there are more keywords than scratch files (there probably are, only ten scratch files are set up), then only the first 10 (value of F9) keywords are selected on the first pass. Records which contain any of these keywords are saved in the appropriate scratch file (or files for multiple keywords). Once a complete pass is made of the input data file the files are rewound and each scratch file is printed with its associated keyword using the RE-

REPORT Program

```
0080 REM REPORT SubSYSTEM
0090 REM Version 1.5 7-12-79
0100 REM SSC, P.O. Box 2847, Olympia, WA 98507
0110 LINE= 132
0120 INPUT "OUTPUT TO PRINTER",Z$
0130  Z9=1
0140 IF LEFT$(Z$,1)="Y" THEN Z9=7
0150 GOTO 310
0160 REM
0170 REM I/O BLOCK **
0180 REM ** READ RECORD [GOSUB]
0190 READ #Z8,K$(1),K$(2),K$(3),K$(4),K$(5),K$(6),K$(7),K$(8),K$(9),K$(10)
0200  Z6=Z6+1
0210 READ #Z8,A$,M$,D$,P,W$(1),W$(2)
0220 RETURN
0230 REM ** WRITE RECORD [GOSUB]
0240 WRITE #Z7,K$(1),K$(2),K$(3),K$(4),K$(5),K$(6),K$(7),K$(8),K$(9),K$(10)
0250 WRITE #Z7,A$,M$,D$,P,W$(1),W$(2)
0260 RETURN
0270 REM END OF I/O BLOCK **
0280 REM
0310  Z$="COMPUTER.KAS"
0320 REM K$=KEYWORDS, A$=ARTICLE NAME, M$=MAGAZIN
0330 REM D$=DATE, P=PAGE NUMBER, W$=AUTHORS
0340 DIM K$(10),W$(2)
0350  F9=9:REM SCRATCH FILE COUNT
0360 REM Z6=READ RECORD COUNT
0370 REM Z7 IS OUTPUT FILE NUMBER FOR WRITE GOSUB
0380 REM Z8 IS INPUT FILE NUMBER FOR READ GOSUB
0390 DIM V$(255): REM KEYWORD LIST
0400  Z8=0
0410 REM GET ALL KEYWORDS IN V$
0420 OPEN #Z8,Z$
0430 GOSUB 180:REM READ RECORD
0440 IF EOF(Z8)=1 GOTO 550
0450 FOR I=1 TO 10
0460 IF K$(I)="" GOTO 430
0470 FOR J=1 TO V
0480 IF K$(I)=V$(J) GOTO 530
0490 NEXT J
0500  V=V+1
0510 IF V>255 STOP: REM TOO MANY UNIQUE KEYWORDS
0520  V$(V)=K$(I)
0530 NEXT I
0540 GOTO 430
0550 CLOSE #Z8
0560 PRINT V;" UNIQUE KEYWORDS READ FROM ";Z$
0570 PRINT Z6;" RECORDS READ"
0580 REM SORT KEYWORDS
0590 IF V<2 GOTO 740
0600  C=0:REM CHANGE FLAG
0610 FOR I=1 TO V-1
0620 IF V$(I)<V$(I+1) GOTO 650
0630  C=1
0640  T$=V$(I):V$(I)=V$(I+1):V$(I+1)=T$
0650 NEXT I
0660 IF C=1 GOTO 600
0670 REM >>
0680 REM BUILD A REPORT FILE FOR EACH KEYWORD
0690 REM IF WE HAVE MORE KEYWORDS THAN FILES GO DO IT AGAIN
0700  F6=V
0710  T$="KAS INDEX BY KEYWORD":GOSUB 131U
0720  F7=1
0730  F8=F9
0740 IF F6<F8 F8=F6
0750  Z8=0
0760 OPEN #U,Z$
0770 REM OPEN WORK FILES (A.KAS, B.KAS, ...)
0780 FOR I=1 TO F8
0790  Y$=CHR$(ASC("A")+I-1)
0800 OPEN #I,Y$
0810 SCRATCH #I
0820 NEXT I
0830 REM >>
0840 GOSUB 180:REM READ RECORD
0850 IF EOF(Z8)=1 GOTO 960
0860 FOR J=F7 TO F7+F8-1
0870 FOR L=1 TO 10
0880 IF K$(L)="" GOTO 940
0890 IF V$(J)<K$(L) GOTO 930
0900 REM WRITE RECORD TO CORRECT FILE
0910  Z7=J+1-F7
0920 GOSUB 230
0930 NEXT L
0940 NEXT J
0950 GOTO 840
0960 CLOSE #0
0970 REM >>
0980 REM REWIND FILES
0990 FOR I=1 TO F8:RESTORE #I:NEXT I
1000 GOSUB 1160: REM PRINT REPORTS
1010 REM DELETE WORK FILES
1020 FOR I=1 TO F8
1030  Y$=CHR$(ASC("A")+I-1)
1040 CLOSE #I:KILL Y$
1050 NEXT I
1060  F7=F7+F9
1070  F6=F6-F8
1080 IF F6>0 GOTO 740
1090 PRINT :PRINT
1100 PRINT " END OF KEYWORD REPORT"
1110 REM
1120 PORT= 1
1130 CHAIN MENU
1140 REM END OF MAIN PROGRAM ***
1150 REM
1160 REM ** PRINT KEYWORD REPORT [GOSUB]
1170  L6=3:L9=66
1180 FOR I=1 TO F8
1190  Z8=I
1200 REM PRINT SUBTITLE
1210  S$=V$(I+F7-1):GOSUB 1470
1220 GOSUB 180:REM READ RECORD
1230 IF EOF(Z8)=1 GOTO 1280
1240 GOSUB 1570
1250 PRINT TAB(5);A$;"  by ";W$(1),W$(2)
1255 GOSUB 1570
1260 PRINT TAB(8);M$,D$;TAB(50);"Page ";P
1270 GOTO 1220
1280 NEXT I
1290 RETURN
1300 REM ** REPORT PAGE HANDLER [GOSUB]
1310 REM INITALIZE ENTRY
1320 REM TITLE=T$, SUBTITLE=S$, LINES/PAGE=L9, CURRENT PAGE=L8
1330 REM CURRENT LINE=L7, MIN SPACE/ENTRY=L6, SCRATCH=L5
1340 REM - INIT
1350  L8=0
1360 INPUT "POSITION PAPER",S$
1370 PORT= Z9
1380 GOTO 1410
1390 REM NEW PAGE AND THEN TITLE
1400 FOR L5=L7 TO L9:PRINT:NEXT L5
1410  L8=L8+1
1420 PRINT T$;TAB(70);"- ";L8;"-"
1430 PRINT :PRINT
1440  L7=4
1450 RETURN
1460 REM
1470 REM - SET SUBTITLE
1480 PRINT :L7=L7+1
1490 REM IF NO ROOM FOR 1 ENTRY THEN PAGE EJECT
1500 IF L7<L9-5-L6 GOTO 1530
1510 REM NEW PAGE & PRINT TITLE
1520 GOSUB 1400
1530 PRINT S$:REM SUBTITLE
1540  L7=L7+1
1550 RETURN
1560 REM
1570 REM - LINE COUNT
1580 IF L7<L9-5 GOTO 1630
1590 REM NEW PAGE & PRINT TITLE
1600 GOSUB 1400
1610 PRINT S$;" (continued)"
1620  L7=L7+1
1630  L7=L7+1
1640 RETURN
1650 REM ** END OF REPORT PAGE
     HANDLER
```

Fig.2: Sample run of REPORT

```
8080
    A MUSICAL NUMBER GUESSING GAME  by K INMAN
        CREATIVE COMPUTING          MAR APR 1977    Page 110

ART
    PASART  by C LUND
        CREATIVE COMPUTING          MAR APR 1977    Page 122

BAGELS
    MASTERBAGELS  by H HAMILTON
        CREATIVE COMPUTING          JAN FEB 1977    Page 84

BANNER
    POSTER  by B HUNTRESS
        CREATIVE COMPUTING          NOV DEC 1976    Page 84

BASIC
    SWARMS  by R MILLER
        CREATIVE COMPUTING          MAY JUNE 1977   Page 113
    EUCHRE  by V RAYBAUD
        CREATIVE COMPUTING          MAY JUNE 1977   Page 120
    TICKERTAPE  by B GARDNER
        CREATIVE COMPUTING          MAY JUNE 1977   Page 126
    TWO-TO-TEN  by
        CREATIVE COMPUTING          NOV DEC 1976    Page 88
    HAIKU GENERATOR  by P EMMERICH
        CREATIVE COMPUTING          SEP OCT 1976    Page 34
    PREJUDICE ANALYSIS  by R KAHN       M GROSS
        CREATIVE COMPUTING          SEP OCT 1976    Page 67
    WATCHMAN  by M OGLESBY
        CREATIVE COMPUTING          SEP OCT 1976    Page 74
    BRAIN TEASER  by H KNIPPENBERG
        CREATIVE COMPUTING          JULY 1979       Page 104
    ZONE X  by J MADEHEIM
        CREATIVE COMPUTING          JULY 1979       Page 106
    NICHE  by J LEHMAN
        CREATIVE COMPUTING          JULY 1979       Page 87

BIBLE
    BIBLE QUIZ  by S WENTWORTH
        CREATIVE COMPUTING          MAR APR 1977    Page 124

BOARD
    BRAIN TEASER  by H KNIPPENBERG
        CREATIVE COMPUTING          JULY 1979       Page 104

CAI
    BIBLE QUIZ  by S WENTWORTH
        CREATIVE COMPUTING          MAR APR 1977    Page 124
    PREJUDICE ANALYSIS  by R KAHN       M GROSS
        CREATIVE COMPUTING          SEP OCT 1976    Page 67

CARD
    EUCHRE  by V RAYBAUD
        CREATIVE COMPUTING          MAY JUNE 1977   Page 120
    TWO-TO-TEN  by
        CREATIVE COMPUTING          NOV DEC 1976    Page 88

CHANCE
    TWO-TO-TEN  by
        CREATIVE COMPUTING          NOV DEC 1976    Page 88

DICE
    STRIKEY  by B GREMBOWSKI
        CREATIVE COMPUTING          JAN FEB 1977    Page 88

EASY
    FLIP  by J JAMES
        CREATIVE COMPUTING          MAR APR 1977    Page 126

ECOLOGY
    NICHE  by J LEHMAN
        CREATIVE COMPUTING          JULY 1979       Page 87

FORTRAN
    DELMAR  by R MORGAN             K RODERICK
        CREATIVE COMPUTING          SEP OCT 1976    Page 76

GAME
    TWONKY  by M CAPELLA
        CREATIVE COMPUTING          MAY JUNE 1977   Page 110
    SWARMS  by R MILLER
        CREATIVE COMPUTING          MAY JUNE 1977   Page 113
    EUCHRE  by V RAYBAUD
        CREATIVE COMPUTING          MAY JUNE 1977   Page 120
    TICKERTAPE  by B GARDNER
        CREATIVE COMPUTING          MAY JUNE 1977   Page 126
    BRAIN TEASER  by H KNIPPENBERG
        CREATIVE COMPUTING          JULY 1979       Page 104
    ZONE X  by J MADEHEIM
        CREATIVE COMPUTING          JULY 1979       Page 106
    NICHE  by J LEHMAN
        CREATIVE COMPUTING          JULY 1979       Page 87

HORSE
    DELMAR  by R MORGAN             K RODERICK
        CREATIVE COMPUTING          SEP OCT 1976    Page 76

HP2000
    SCALES  by M THOSTENSON
        CREATIVE COMPUTING          MAR APR 1977    Page 112
    SHARPS & FLATS  by J KUYPER
        CREATIVE COMPUTING          MAR APR 1977    Page 114
    DRAG  by
        CREATIVE COMPUTING          JAN FEB 1977    Page 83

LOGIC
    MASTERBAGELS  by H HAMILTON
        CREATIVE COMPUTING          JAN FEB 1977    Page 84

MASTERMIND
    MASTERBAGELS  by H HAMILTON
        CREATIVE COMPUTING          JAN FEB 1977    Page 84

MOON
    LEM  by B COTTER
        CREATIVE COMPUTING          NOV DEC 1976    Page 86

MUSIC
    A MUSICAL NUMBER GUESSING GAME  by K INMAN
        CREATIVE COMPUTING          MAR APR 1977    Page 110
    SCALES  by M THOSTENSON
        CREATIVE COMPUTING          MAR APR 1977    Page 112
    SHARPS & FLATS  by J KUYPER
        CREATIVE COMPUTING          MAR APR 1977    Page 114
    MUSICAL MAGIC SQUARES  by F HOFSTETTER
        CREATIVE COMPUTING          MAR APR 1977    Page 116

PAPER TAPE
    TICKERTAPE  by B GARDNER
        CREATIVE COMPUTING          MAY JUNE 1977   Page 126

PASCAL
    PASART  by C LUND
        CREATIVE COMPUTING          MAR APR 1977    Page 122

PDP-8
    TICKERTAPE  by B GARDNER
        CREATIVE COMPUTING          MAY JUNE 1977   Page 126

POETRY
    HAIKU GENERATOR  by P EMMERICH
        CREATIVE COMPUTING          SEP OCT 1976    Page 34

POSTER
    POSTER  by B HUNTRESS
        CREATIVE COMPUTING          NOV DEC 1976    Page 84

QUIZ
    BIBLE QUIZ  by S WENTWORTH
        CREATIVE COMPUTING          MAR APR 1977    Page 124

RACE
    DRAG  by
        CREATIVE COMPUTING          JAN FEB 1977    Page 83
    DAYTONA 500  by G CHURCHILL
        CREATIVE COMPUTING          JAN FEB 1977    Page 86
    DELMAR  by R MORGAN             K RODERICK
        CREATIVE COMPUTING          SEP OCT 1976    Page 76

SIMULATION
    SWARMS  by R MILLER
        CREATIVE COMPUTING          MAY JUNE 1977   Page 113
    NICHE  by J LEHMAN
        CREATIVE COMPUTING          JULY 1979       Page 87

TRIANGLE
    PASART  by C LUND
        CREATIVE COMPUTING          MAR APR 1977    Page 122

UNIVAC
    EUCHRE  by V RAYBAUD
        CREATIVE COMPUTING          MAY JUNE 1977   Page 120

END OF KEYWORD REPORT
```

KAS, con't . . .

PORT PAGE HANDLER subroutines. If there are more keywords in V$ then the next ten are selected and the input file is passed once again. This process is repeated until all the keywords have been processed.

Wrap Up

To insure that the selective search capabilities perform as desired you must be careful to spell keywords the same. For example, if you use GAME as a keyword for some of the articles about games and GAMES for others, then you will have to do two searches to locate all games. The same type of problem exists for author names.

To prevent this problem I have been using the following conventions when building files:

1. Only use singular forms of keywords (e.g., GAME not GAMES).
2. Enter author names as first initial, space, last name (e.g., P HUGHES).
3. Establish standard magazine names (e.g., DR DOBBS and KILOBAUD not Dr. Dobbs and KILOBAUD Microcomputing).
4. Use upper case letters only in all fields.
5. Delete all punctuation except space.

You are also better off to create many small files rather than one large one. This will save a lot of search time. For example, the file I have been using in this article contains only articles from Creative Computing and those articles all contain programs. Happy searching. □

LIST Program

```
0001 REM KEYWORD LIST
0002 REM SSC 1-22-79
0080 DIM K$(12),W$(2)
0090  ZS="COMPUTER.KAS"
0100 PRINT :PRINT "LIST SUBSYSTEM":PRINT
0110 PRINT "FILE IS ";ZS
0120 PRINT
0200 OPEN #1,ZS
0210 INPUT "START, END RECORD NUMBERS",S,E
0300 REM PRINT THE FILE
0310  N=N+1
0330 READ #1,K$(1),K$(2),K$(3),K$(4),K$(5),
      K$(6),K$(7),K$(8),K$(9),K$(10)
0340 IF EOF(1)=1 GOTO 1000
0350 READ #1,A$,M$,D$,P,W$(1),W$(2)
0360 IF N<S GOTO 300
0370 IF N>E GOTO 1000
0400 REM PRINT ENTRY
0410 PRINT :PRINT"...",N,"..."
0420 PRINT A$
0430 PRINT " by ";W$(1);" ";W$(2
0440 PRINT "  ";M$,D$,"Page ";P
0450 FOR I=1 TO 10
0460 IF K$(I)="" GOTO 500
0470 PRINT K$(I);"      ";
0480 NEXT I
0500 PRINT
0510 GOTO 300
1000 CLOSE #1
1100 CHAIN MENU
```

ADD Program

```
0001 REM ADD ITEM SUBSYSTEM
0002 REM SSC 1-22-79
0050 ZS="COMPUTER.KAS"
0100 REM K$=KEYWORDS, A$=ARTICLE NAME, M$=MAGAZINE NAME
0110 REM D$=DATE, P=PAGE NUMBER, W$=AUTHORS
0120 DIM K$(10),W$(2)
0200 OPEN #0,ZS
0210 OPEN #1, WORK.KAS
0220 SCRATCH #1
0250 REM COPY OLD FILE TO WORK FILE
0260 READ #0,K$(1),K$(2),K$(3),K$(4),K$(5),K$(6),K$(7),K$(8),K$(9),K$(10)
0270 READ #0,A$,M$,D$,P,W$(1),W$(2)
0280 IF K$(1)="***" THEN 500
0290 IF EOF(0)=1 GOTO 500
0300 WRITE #1,K$(1),K$(2),K$(3),K$(4),K$(5),K$(6?,K$(7),K$(8),K$(9),K$(10)
0310 WRITE #1,A$,M$,D$,P,W$(1),W$(2)
0340  R=R+1
0350 GOTO 250
0500 REM ADD NEW RECORDS AT END OF FILE
0510 INPUT "ARTICLE NAME",A$
0520 IF A$="" GOTO 1000
0530 INPUT "MAGAZINE, DATE, PAGE",M$,D$,P
0540 FOR I=1 TO 10:K$(I)="":NEXT I
0550 INPUT "AUTHORS (2)",W$(1),W$(2)
0570 FOR I=1 TO 10
0580 INPUT "KEYWORD",K$(I)
0590 IF K$(I)="" GOTO 700
0600 NEXT I
0700 REM WRITE A NEW RECORD
0710 WRITE #1,K$(1),K$(2),K$(3),K$(4),K$(5),K$(6),K$(7),K$(8),K$(9),K$(10)
0720 WRITE #1,A$,M$,D$,P,W$(1),W$(2)
0750 GOTO 500
1000 REM CLEAN UP THE FILES
1010 CLOSE #0,#1
1020 KILL ZS
1030 RENAME WORK.KAS,ZS
1040 CHAIN MENU
```

SELECT Program

```
0001 REM KEYWORD SELECT/LIST
0002 REM SSC 7-12-79
0020 DIM K$(10),W$(2)
0030 REM LS=KEYWORD MATCH LIST
0040 REM YS=AUTHOR MATCH
0050 REM NS=MAGAZINE NAME MATCH
0090  ZS="COMPUTER.KAS"
0100 OPEN #1,ZS
0200 PRINT :PRINT"SELECT/LIST SUBSYSTEM":PRINT
0210 PRINT "ENTER ONLY 'RETURN' IF YOU DONT WANT
0220 PRINT "  CRITERIA LISTED."     TO SELECT ON THE";
0230 PRINT "OTHERWISE ENTER MATCH STRING"
0240 PRINT
0300 REM GET SELECTION CRITERIA
0305  B1=0
0310 INPUT "MAGAZINE NAME",N$
0320 INPUT "AUTHOR NAME",Y$
0330 FOR I=1 TO 10
0340 PRINT "ENTER KEYWORDS"
0350 FOR I=1 TO 10
0360 INPUT LS(I)
0370 IF LS(I)="" THEN 390
0380 NEXT I
0390  B2=I-1
0400 IF B2=0 GUTO 500
0410  B1=1
0420 IF B2>1 GOTO 500
0430 INPUT "ANY KEYWORD MATCH OR ALL KEYWORDS",B$
0440  B1=1
0450 IF B$="ALL" B1=B2
0500 REM READ FILE
0510 PRINT
0520 READ #1,K$(1),K$(2),K$(3),K$(4),K$(5),K$(6),
      K$(7),K$(8),K$(9),K$(10)
0530 IF EOF(1)=1 GOTO 2000
0540 READ #1,A$,M$,D$,P,W$(1),W$(2)
0600 REM DO WE HAVE A MATCH?
0610 IF N$="" GOTO 650
0620 IF N$=M$ GOTO 650
0630 GOTO 520
0650 IF Y$="" GOTO 720
0660 IF W$(1)=Y$ GOTO 720
0670 IF W$(2)=Y$ GOTO 720
0680 GOTO 520
0720 REM
0800 REM KEYWORD MATCH
0810  C1=0
0830 IF B1=0 THEN 1000
0840 FOR I=1 TO B2
0850 FOR J=1 TO 10
0860 IF LS(I)=K$(J) THEN 900
0870 NEXT J
0880 GOTO 910
0900  C1=C1+1
0910 IF C1>=B1 THEN 1000
0920 NEXT I
0950 GOTO 520
1000 REM IT MATCHED - PRINT IT
1010 PRINT A$
1020 PRINT TAB(5);"by ";W$(1);
1030 IF W$(2)<>"" PRINT " & ";W$(2);
1040 PRINT
1050 PRINT M$,D$,"PAGE ";P
1060 PRINT :PRINT
1200 GOTO 520
2000 PRINT :PRINT"EOF - ANOTHER SEARCH"
2005 RESTORE #1
2010 INPUT B$
2020 IF LEFT$(B$,1)="Y" GOTO 300
9999 CHAIN MENU
```

APPLE II DISK SOFTWARE

DATA BASE MANAGER

IFO PROGRAM

The IFO (Information File Organizer) can be used for many applications such as sales activity, check registers, balance sheets, client/patient records, billing, information retrieval and much more. This can be accomplished easily and quickly without prior programming knowledge.

Up to 1000 records with a maximum of 20 headers and 10 report formats can be stored on a single diskette. Information can be sorted and searched (3 levels). Mathemetical functions can be performed to menipulate the information. Subtotals and totals can be calculated on any numeric field.

Many error protection devices provided.
Program diskette and instruction menuel $100

MAILING LIST PROGRAM

Print labels sorted or searched by 8 fields. Data lines include: ACCT #, FIRST NAME, LAST NAME (CO.), ATTN, ADDRESS #1, ADDRESS #2, CITY, STATE, ZIP (9 digits), PHONE #. On-screen editing. **CAPITAL NAMES** option on first two lines. Line up and varfeble specing routines and more. Many error protection devices provided.

Fest end quick lebel generation.
Program diskette and instruction menuel $40

INVENTORY PROGRAM

2 disk drive, menu-driven program. Inventory catagories include: STOCK#, DESCRIPTION, VENDOR ID, CLASS, LOCATION, REORDER PT, REORDER QTY, COST, SELLING PRICE, # ON ORDER, ORDER DATE, QTY ON HAND. All records can be entered, changed, updeted, deleted or viewed. Reports can be sorted in ascending/descending order by any catagory. 7 search catagories (3 automatic). Calculates $ VALUE of inventory end YTD, MTD and period items sold. Accumulates inventory over a 13-month period. Plus much more. Requires a 132-column, serial/parellel printer. Completa turnkay operation with bootstrap DISK.

Program diskette and instruction menual $140

All programs requiro 48K end Applesoft II on ROM or Appla II Plus. Compatible with Pascel systems. Run from any port of the computer end work with serial/parallel printers. Requires 1 disk drive unless noted otherwise.

Write for Information on PAYROLL PACKAGE.

SEND CHECK/MONEY ORDER TO:

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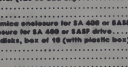
Level II 16K (w/o num. keypad)	$750.00
Expansion Interface	$269.00
Expansion Interface 16K	$423.00
Expansion Interface 32K	$837.30
16K Memory Kit for TRS-80 or Apple	$89.95

TRS-80 & NORTH STAR ADD-ON DRIVES



CUSTOM ENCLOSURE

CABLE INCLUDED

Shugart SA 400 or BASF 6106 single drive system in custom enclosure $415.00
Double drive system in custom enclosure. $825.00

BASF 6106 40 track, drive only	$390.00
Shugart SA 400	$410.00
Seamen 9" drive	$399.00
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★TRS-80★

.....GAMES.....

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PACKAGE ONE

GRAPHIC-TREK "2666" — This full graphics, real time game is full of fast, exciting action! Explosing photon torpedoes and phasers fill the screen! You must actually maneuver the enterprise to dock with the giant space stations as well as to avoid klingon torpedoes! Has shields, galactic memory readout, dam-age reports, long range sensors, etc! Has 2 levels, four different klingon ships, and Earth's future, your job is to WARP — Time: 3095, Place: Earth's Solar System — Klingons: 4 — Earth's future, your job is to defend the earth against the klingon invasion! Battles on Mars, Venus, Saturn, Neptune, etc! Earth's Forces: Add-ons — Space Fighters — Laser Cannon — Neutrino Blasters! Warp Forces: Robots — Saucers — Counterstrikers — Proton Destroyers! Multi level game lets you advance to a more complicated game as you get better! ★ STAR WARS — Maneuver your space fighter deep into the nucleus of the Death Star! Drop your bomb, then escape via the only exit. This graphics game is really fun! May the Force be with you! ★ SPACE TARGET — Shoot at enemy ships within a target! Has 3 levels of play! ★ SAUCERS — This text capture them — or if you're cruel, destroy them! Fun graphics, real time game! ★ INVADERS — Similar to the original but with many new twists. Try to outmaneuver to win the distinguished cross! Requires spirit and timing to win! Watch out!

PACKAGE TWO

CHECKERS 2.1 — Finally! A checkers program that will challenge everyone! Expert as well as amateur! Uses 3 ply search to find best possible move. Picks randomly between equal moves to assure you of a different, identical games. ★ POKER FACE — The computer uses psychology as well as logic to try and beat you at poker. Cards are shuffled using TRS-80's full graphics. Computer raises, calls, and sometimes even folds! Great practice for your Saturday night poker match! (Plays 5 card draw). ★ SYNONIC — Tell the computer a little about yourself and he'll predict things about you you won't believe! A real mind bender! Great amusement for parties. ★ TAMBLE MANIA — Try and solve your assembled into an unknown position. Will switch any two pieces for a move. Has 3 levels of play! Game is for 2 people and has been used by many colleges and universities. (And occasionally stars some of the best players in the world!) Can be played by two or more people. One person inputs a word to the computer while the others look away. The computer then displays the word. Each player takes turns guessing letters.

PACKAGE THREE

POETRY — This program lets you choose the subject as well as the mood of the poem you want. You give TRS-80 certain nouns or names, then the mood, and it does the rest! It has a 1000-word + vocabulary of nouns, verbs, adjectives and adverbs! ★ ELECTRIC ARTIST — Manual draw, line draw, Auto: draw, erase and move. Uses graphics bits not bytes. Saves drawing on tape or disk! ★ GALACTIC BATTLE — The famous computer game with many options! Has 3 levels of play! Can you outwit the computer only have short range phasers! Can you guess the computer's words using your human intuitive and logical abilities? You'll need it, to beat the computer! ★ AIR COMMAND — Battle the computer! Requires split second timing. This is a FAST action arcade game

PACKAGE FOUR

LIFE — 100 BASIC machine language program runs full generation! Over 100 generations per minute make it truly animated! You make your starting pattern, the computer does the rest! Program can be stopped and changes made! Watch it grow! ★ SPACE LANCER — This full graphics simulation lets you pick what planet, asteroid or moon you wish to land on! Has 3 skill levels that make it fun for everyone. ★ GREED II — Multi level game is fun and challenging! Beat the computer to the gold! Has options to change it to suit odds and luck! Computer keeps track of his winnings and yours. Quick! Before the computer does! ★ GALACTIC EMPIRE — Can you defend your planet against the evil empire? Can you keep your people from becoming slaves? Has numerous options! Can you destroy the enemy without losing your own ships? Full graphics! ★ ESCROT — A group of renegade robots have escaped and are spotted in an old ghost town on Mars! Your task as the "Droid Hunter" is to destroy the robots before they destroy you! Has 3 skill levels! Challenging! Full graphics!

PACKAGE FIVE

SUPER HORSERACE — Have your bets just like at the real racetrack! 8 horses race in this spectacular graphic display! Up to 8 people can play! Uses real odds but has that element of chance you see in real life! Keeps track of everyone's winnings and losses. This is one of the few computer simulations that can actually get a room of people cheering! ★ MAZE MOUSE — The mouse with a memory! The computer can generate random mazes of whatever size you specify! Then it's off to find the cheese! Amazing, he'll always get there! ★ LASER KILLER — You command a one man submarine that has been shrunken to the size of bacteria in this exciting graphic adventure! Inside this tiny submarine's bloodstream, your mission is to destroy the deadly amoeba infection ravaging his body! ★ LOGIC — This popular game is based on Mastermind but utilizes tactics that make it more exciting and challenging! 2 levels of play! Is really fun for everyone. ★ SUBMARINER — Shoot torpedoes at the enemy ships to get points. Fast action graphics, arcade type game is exciting and fun for everyone!

PACKAGE SIX

20 HOME FINANCIAL PROGRAMS — Figures amortization, annuities, depreciation rates, interest rates, earned interest on savings and much, much more. Easy to use, will get good and again. A must for the conscient-ous, intuition minded person.

PACKAGE SEVEN

BACKGAMMON 5.5 — 2 different skill levels make this game a challenge to average or advanced players (Not recommended for beginners). Learns for best possible moves to beat you! FANTASTIC GRAPHICS. Plays doubles and uses international Crawford rule. ★ CHECKBOOK — Balances your checkbook, adds deposits and subtracts checks for comprehensive at material. Great for teenagers and adults to improve reading skills. ★ PT 109 — Command a PT boat in the South Pacific. Seven depths get higher points in this fast action graphics game. ★ YAHTZEE — Play Yahtzee with the computer! This game is a lot more fun and challenging against a TRS-80! ★ WALL STREET — Can you turn your $50,000 into a million dollars? That's the object of this great game. Needs an actual stock market to play!

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CIRCLE 193 ON READER SERVICE CARD

"Rolodex" Data Base Program - For Home & Office

John Armstrong

This program was inspired and adapted from 'Mailer' program which is part of the North Star user library and written by K. Randazzo. It was developed as a name and address retrieval system but could possibly be used as a general-purpose data base system in other applications. With modifications and enhancements it could definitely be made into a good general-purpose data base system.

My requirements were derived from a need to search through a number of records using a "descriptor" or alternatively, a surname. A detailed list of requirements include the ability to:

1. Search by Descriptor word.
2. Search by Surname.
3. Search by any Keyword contained in the file.
4. Alphabetize entire file by Descriptor or Surname.
5. Add records to the file.
6. Update, examine, or delete a record.
7. List the entire file.

The program was written utilizing North Star BASIC and DOS. The flexibility and power in the string variable commands, used to format a printed record and put data into the fields of the records, was a joy to use.

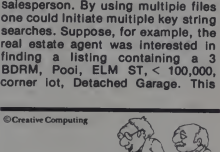
Searching is accomplished by descriptor or surname (specifying letter or word) or by a KEY string which can be any alphanumeric combination believed to be in the file. A display of the record in which they are contained follows each HIT.

The speed of searching is quite fast when using the descriptor or surname. It's quite slow when using the KEY string search but still useful in finding a record containing a unique string.

This type of program could be adapted to file library items. It would allow rapid access to specific Keyword items for such things as notebooks, magazine articles and books. Another adaptation of the program could be in the rapid access of real estate listings containing key requirements from a client or a salesperson. By using multiple files one could initiate multiple key string searches. Suppose, for example, the real estate agent was interested in finding a listing containing a 3 BDRM, Pool, ELM ST, < 100,000, corner lot, Detached Garage. This would result in possibly six searches eliminating several listings with each pass. Then, on the final pass the resultant printout would reveal the listings that met the description or even if no printout resulted it still would be useful information indicating that, at present, no listing met all the requirements.

Before running this program a file must be created of the proper length and type to run with North Star BASIC/DOS or whatever BASIC system you're using. The number of blocks assigned determine the number of records the file can contain. A little thought should be given to your own particular needs.

A menu list assists the user in selecting the proper module and full prompting after accessing the module will be displayed. □



"Well, concrete computers are definately not the answer."

Glossary

File - Consists of a number of records.

Record - Consist of Descriptor word, Surname, Forname, Address, Town, State, Zipcode and Telephone number. All of which are contained within their own fields.

Field - A specified and fixed number of bytes assigned to each of the functional words or groups of words.

Alphabetizing - Sorting of records in a file in alphabetical order using the descriptor or surname of each record as the object of the sort.

Random Access of a file - Accessing a record in a file directly.

Descriptor - A word selected to best describe a person or a company's relation to you (e.g., PLUMBER, ELECTRICIAN, FRIEND, ENGINEER, etc.)

John Armstrong, 8035 Cole St., Downey, CA 90242.

```
          ROLODEX LIST PROGRAM

ENTER FILE NAME >LIST9.2

#1....ADD TO LIST          #6....KEYWORD SEARCH
#2....LIST ENTRIES         #7....DESCRIPTOR SEARCH
#3....EXAMINE ONE ENTRY    #8....ALPHABETIZE LIST (BY SURNAME)
#4....UPDATE AN ENTRY      #9....ALPHABETICAL SEARCH
#5....DELETE AN ENTRY      #10...EXIT PROGRAM
                           #11...ALPHABETIZE LIST (BY DESCRIPTOR)
SELECT MODULE >1
DESCRIPTOR:AIR CONDX REPAIR
SURNAME: MCCLELLAN
FORENAME: W.F.
# AND STREET: 11076 ALONDRA
TOWN: PARAMOUNT
STATE: CALIF
ZIPCODE: 90706
TELEPHONE # - AREA CODE + NUMBER: 213 867-5717

ADD ANOTHER? (Y/N) Y
DESCRIPTOR:REALTY BOARD
SURNAME: COMPTON/LYNWOOD
FORENAME: REALTY BD
# AND STREET: 8005 FIRESTONE BLVD
TOWN: LYNWOOD
STATE: CALIF.
ZIPCODE: 90262
TELEPHONE # - AREA CODE + NUMBER: 213 638-1189

#1....ADD TO LIST          #6....KEYWORD SEARCH
#2....LIST ENTRIES         #7....DESCRIPTOR SEARCH
#3....EXAMINE ONE ENTRY    #8....ALPHABETIZE LIST (BY SURNAME)
#4....UPDATE AN ENTRY      #9....ALPHABETICAL SEARCH
#5....DELETE AN ENTRY      #10...EXIT PROGRAM
                           #11...ALPHABETIZE LIST (BY DESCRIPTOR)
SELECT MODULE >2
                  THIS MODULE PRINTS THE FILE

START WITH ENTRY NUMBER: 0

PRINT WITH SURNAME FIRST?(Y/N)>N

*AIR CONDX REPAIR      MCCLELLAN          ,W.F.                    0
   11076 ALONDRA
   PARAMOUNT          CALIF              90706
   213 867-5717

*REALTY BOARD          COMPTON/LYNWOOD    ,REALTY BD               1
   8005 FIRESTONE BLVD
   LYNWOOD            CALIF.        90262
   213 638-1189

*BEES                  LEWIS              ,T.A.                    2
   2961 SANTA ANA ST
   SOUTH GATE         CALIF.        90280
   213 587-3059

*TECH BOOKS            CALIF TECH BOOK SUP ,T.A.                   3
   215 E REGENT
   INGLEWOOD          CALIF.        90286
   213 675-7191

PRESS RETURN TO CONTINUE

#1....ADD TO LIST          #6....KEYWORD SEARCH
#2....LIST ENTRIES         #7....DESCRIPTOR SEARCH
#3....EXAMINE ONE ENTRY    #8....ALPHABETIZE LIST (BY SURNAME)
#4....UPDATE AN ENTRY      #9....ALPHABETICAL SEARCH
#5....DELETE AN ENTRY      #10...EXIT PROGRAM
                           #11...ALPHABETIZE LIST (BY DESCRIPTOR)
SELECT MODULE >3
EXAMINE ENTRY NUMBER: 2

LEWIS                 T.A.                 *BEES                  2
   2961 SANTA ANA ST
   SOUTH GATE         CALIF.        90280
   213 587-3059

EXAMINE ANOTHER ENTRY? (Y/N)

#1....ADD TO LIST          #6....KEYWORD SEARCH
#2....LIST ENTRIES         #7....DESCRIPTOR SEARCH
#3....EXAMINE ONE ENTRY    #8....ALPHABETIZE LIST (BY SURNAME)
#4....UPDATE AN ENTRY      #9....ALPHABETICAL SEARCH
#5....DELETE AN ENTRY      #10...EXIT PROGRAM
                           #11...ALPHABETIZE LIST (BY DESCRIPTOR)
SELECT MODULE >4
ITEM TO UPDATE? 2

LEWIS                 T.A.                 *BEES                  2
   2961 SANTA ANA ST
   SOUTH GATE         CALIF.        90280
   213 587-3059

UPDATE THIS ENTRY? (Y/N) Y


DESCRIPTOR:
SURNAME:
FORENAME:
# AND STREET:
TOWN:
STATE:
ZIPCODE: 90281
TELEPHONE # - AREA CODE + NUMBER:
```

```
THIS IS THE UPDATED ENTRY.

LEWIS                 T.A.                 *BEES                  2
   2961 SANTA ANA ST
   SOUTH GATE         CALIF.        90281
   213 587-3059

IS THIS CORRECT? (Y/N) Y

#1....ADD TO LIST          #6....KEYWORD SEARCH
#2....LIST ENTRIES         #7....DESCRIPTOR SEARCH
#3....EXAMINE ONE ENTRY    #8....ALPHABETIZE LIST (BY SURNAME)
#4....UPDATE AN ENTRY      #9....ALPHABETICAL SEARCH
#5....DELETE AN ENTRY      #10...EXIT PROGRAM
                           #11...ALPHABETIZE LIST (BY DESCRIPTOR)
SELECT MODULE >6

ENTER KEY= GATE

LEWIS                 T.A.                 *BEES                  2
   2961 SANTA ANA ST
   SOUTH GATE         CALIF.        90281
   213 587-3059
PRESS RETURN TO CONTINUE

#1....ADD TO LIST          #6....KEYWORD SEARCH
#2....LIST ENTRIES         #7....DESCRIPTOR SEARCH
#3....EXAMINE ONE ENTRY    #8....ALPHABETIZE LIST (BY SURNAME)
#4....UPDATE AN ENTRY      #9....ALPHABETICAL SEARCH
#5....DELETE AN ENTRY      #10...EXIT PROGRAM
                           #11...ALPHABETIZE LIST (BY DESCRIPTOR)
SELECT MODULE >7
 DESCRIPTOR SEARCH:

SEARCH BY <L>ETTER OR <W>ORD? L

DESCRIPTOR WORD BEGINNING WITH: R

COMPTON/LYNWOOD       REALTY BD            *REALTY BOARD          1
   8005 FIRESTONE BLVD
   LYNWOOD            CALIF.        90262
   213 638-1189

PRESS RETURN TO CONTINUE

#1....ADD TO LIST          #6....KEYWORD SEARCH
#2....LIST ENTRIES         #7....DESCRIPTOR SEARCH
#3....EXAMINE ONE ENTRY    #8....ALPHABETIZE LIST (BY SURNAME)
#4....UPDATE AN ENTRY      #9....ALPHABETICAL SEARCH
#5....DELETE AN ENTRY      #10...EXIT PROGRAM
                           #11...ALPHABETIZE LIST (BY DESCRIPTOR)
SELECT MODULE >7
 DESCRIPTOR SEARCH:

SEARCH BY <L>ETTER OR <W>ORD? W

DESCRIPTOR WORD SEARCHING FOR: REALTY BOARD

COMPTON/LYNWOOD       REALTY BD            *REALTY BOARD          1
   8005 FIRESTONE BLVD
   LYNWOOD            CALIF.        90262
   213 638-1189
```

```
10 REM                *PROGRAM ROLODEX*
20 A=12:REM ASCII FORM FEED
30 Z$=CHR$(A):'Z$\REM CLEAR SCREEN
40 DIM N$(20),N8(20),N1$(20),S$(40),T$(20),S1$(13),Z1$(7),T1$(15)
50 DIM X$(40)
60 S1=20+20+20+40+20+13+7+15+2:REM ENTRY SIZE
70 DIM E$(S1),E1$(S1),W$(S1),B$(40):REM STRINGS USED TO HOLD ENTRY
80 B$=" "
90 TAB(15):"ROLODEX LIST PROGRAM"\'\'
100 INPUT"ENTER FILE NAME >";F$\'
110 OPEN #0,F$:READ #0,N
120 '\ REM SELECT MODULE
130 '"#1....ADD TO LIST          #6....KEYWORD SEARCH"
140 '"#2....LIST ENTRIES         #7....DESCRIPTOR SEARCH"
150 '"#3....EXAMINE ONE ENTRY #8....ALPHABETIZE LIST (BY SURNAME)"
160 '"#4....UPDATE AN ENTRY   #9....ALPHABETICAL SEARCH"
170 '"#5....DELETE AN ENTRY   #10...EXIT PROGRAM"
180 '"                        #11...ALPHABETIZE LIST (BY DESCRIPTOR)"
190 INPUT "SELECT MODULE >";M
200 IF M<1 OR M>11 THEN 190
210 IF M=1 THEN 280
220 IF M=2 THEN 440
230 IF M=3 THEN 570
240 IF M=4 THEN 650
250 IF M=5 THEN 820
260 IF M=6 THEN 1440
270 IF M=7 THEN 1540
280 IF M=8 THEN 1740
290 IF M=9 THEN 2280
300 IF M=10 THEN 2480
310 IF M=11 THEN 1730
320 REM + ADD +
330 IF K<1B5 THEN 360
```

```
340'
350''FILE FULL'\GOTO 120
360 E$=E$+B$+B$+B$+B$+B$+B$:REM INITIALIZE E$ TO BLANKS FOR EDITING
370 GOSUB 1090:REM COLLECT ENTRY TO E$
380 WRITE #03,N#5$+5,E$
390 N=N+1
400 \'INPUT "ADD ANOTHER" (Y/N) ",A$
410 IF A$="Y" THEN 370
420 WRITE #0%0.N,NOENDMARK
430 GOTO 120
440 REM * LIST *
450'TAB(20),"THIS MODULE PRINTS THE FILE"\'
460 INPUT"START WITH ENTRY NUMBER: ",L\'
470 INPUT "PRINT WITH SURNAME FIRST?(Y/N)",Y$
480 B=0
490 FOR J=L TO N-1
500 READ #0%J#5$+5,E$
510 IF Y$="Y" THEN 520 ELSE 530
520 GOSUB 1340\GOTO 540
530 GOSUB 1360
540 NEXT J\'
550 GOSUB 2470
560 GOTO 120
570 REM * EXAMINE *
580 INPUT "EXAMINE ENTRY NUMBER: ",J
590 IF J>=N THEN 120
600 READ #0%J#5$+5,E$
610 GOSUB 1340\'
620\'INPUT "EXAMINE ANOTHER ENTRY? (Y/N) ",A$
630 IF A$="Y" THEN 580
640 GOTO 120
650 REM * UPDATE *
660 INPUT "ITEM TO UPDATE? ",J\'
670 IF J>N THEN \'"THERE ARE",N," ENTRIES ON THE FILE" ELSE 700
680 \'INPUT "TRY ANOTHER? (Y/N) ",A$
690 IF A$="Y" THEN 650 ELSE 120
700 READ #0%J#5$+5,E$
710 GOSUB 1340\'
720 INPUT "UPDATE THIS ENTRY? (Y/N) ",A$\'
730 IF A$="Y" THEN 760
740 INPUT "TRY ANOTHER? (Y/N) ",A$
750 IF A$="Y" THEN 650 ELSE 120
760 \'GOSUB 1090
770 WRITE #0%J#5$+5,E$,NOENDMARK
780 \'\'"THIS IS THE UPDATED ENTRY.."\'
790 GOSUB 1340\'
800 INPUT "IS THIS CORRECT? (Y/N) ",A$
810 IF A$="Y" THEN 120 ELSE 760
820 REM * DELETE *
830 INPUT "DELETE WHICH ENTRY? ",D\'
840 IF D>N THEN \'"NO SUCH ENTRY.THERE ARE",N,"ENTRIES ON THE FILE"\'
850 IF D<N THEN GOSUB 2470
860 IF D=N THEN 120
870 J=D
880 REM CALL UP DELETE
890 READ #0%D#5$+5,E$
900 GOSUB 1340
910 INPUT"DELETE THIS ENTRY? (Y/N) ",A$\'
920 IF A$="Y" THEN 960
930 INPUT "TRY AGAIN (Y/N) ",A$
940 IF A$="Y" THEN 820
950 GOTO 120
960 INPUT "PRESS 'RETURN' TO DELETE ",R$\'
970 READ #0%(N-1)#5$+5,E1$
980 FOR J=N-2 TO D STEP -1
990 READ #0%J#5$+5,E$
1000 WRITE #0%J#5$+5,E1$,NOENDMARK
1010 E1$=E$
1020 NEXT
1030 N=N-1
1040 IF N<0 THEN N=0
1050 WRITE #0%0.N,NOENDMARK
1060 INPUT "DELETE ANOTHER ENTRY? (Y/N) ",A$
1070 IF A$="Y" THEN 820
1080 GOTO 120
1090 REM * SUBROUTINE TO GET ENTRY TO E$ *
1100 INPUT "DESCRIPTOR",N0$\N0$=N0$+B$
1110 IF N0$(1,1)="" THEN N0$=E$(1,20)
1120 INPUT"SURNAME",N$\N$=N$+B$
1130 IF N$(1,1)="" THEN N$=E$(21,40)
1140 INPUT"FORENAME",N1$\N1$=N1$+B$
1150 IF N1$(1,1)="" THEN 1120
1160 IF N1$(1,1)="" THEN N1$=E$(41,60)
1170 INPUT"# AND STREET",S$\S$=S$+B$
1180 IF S$(1,1)="" THEN 1140
1190 IF S$(1,1)="" THEN S$=E$(61,100)
1200 INPUT"TOWN",T$\T$=T$+B$
1210 IF T$(1,1)="" THEN 1170
1220 IF T$(1,1)="" THEN T$=E$(101,120)
1230 INPUT"STATE",S1$\S1$=S1$+B$
1240 IF S1$(1,1)="" THEN 1200
1250 IF S1$(1,1)="" THEN S1$=E$(121,133)
1260 INPUT"ZIPCODE",Z1$\Z1$=Z1$+B$
1270 IF Z1$(1,1)="" THEN 1230
1280 IF Z1$(1,1)="" THEN Z1$=E$(134,140)
1290 INPUT "TELEPHONE $ - AREA CODE + NUMBER: ",T1$\T1$=T1$+B$
1300 IF T1$(1,1)="" THEN 1260
1310 IF T1$(1,1)="" THEN T1$=E$(141,155)
1320 E$=N0$+N$+N1$+S$+T$+S1$+Z1$+T1$
1330 RETURN
1340 REM * PRINTING SUBROUTINE - W/PHONE -SURNAME FIRST *
1350 \'\'E$(21,40)," ",E$(41,60),"#",E$(1,20),", ",J,\GOTO 1370
1360 \'\'"#",E$(1,20),"  ",E$(21,40),", ",E$(41,60),"  ",J
1370"   ",E$(61,100)
1380"   ",E$(101,120),"  ",E$(121,133),"  ",E$(134,140)
1390"   ",E$(141,155)
1400 B=B+1
1410 IF B=9 THEN 1420 ELSE 1430
1420 \'A$=0
1430 RETURN
1440 INPUT "ENTER KEY= ",I$
1450 L=LEN(I$)
1460 FOR J=0 TO N-1
1470 READ#0%J#5$+5,E$
1480 FOR I=1 TO 156-K
1490 IF E$(I,I+(K-1))=K$ THEN 1500 ELSE 1510
1500 GOSUB 1340\L=156-K
1510 NEXT I
1520 NEXT J
1530 GOSUB 2470\GOTO 120
1540 REM * DESCRIPTOR SEARCH ROUTINE *
1550 \' DESCRIPTOR SEARCH=\'\'\
1560 INPUT"SEARCH BY CL>ETTER OR <WORD? ",A$\'
1570 IF A$="W" THEN 1650
1580 INPUT"DESCRIPTOR WORD BEGINNING WITH: ",L$\'
1590 FOR J=0 TO N-1\READ #0%J#5$+5,E$
1600 IF E$(1,1)=L$(1,1) THEN GOSUB 1340
1610 NEXT J
1620 '
1630 GOSUB 2470
1640 GOTO 120
1650 REM DESCRIPTOR WORD SEARCH
1660 INPUT "DESCRIPTOR WORD SEARCHING FOR: ",W$\'
1670 FOR J=0 TO N-1\READ #0%J#5$+5,E$
1680 W$=W$+B$
1690 IF E$(1,20)=W$(1,20) THEN GOSUB 1340
1700 NEXT
1710 \' GOSUB 2470\GOTO 120
1720 REM * ALPHABETIZING MODULE *
1730 A=1\B=20\GOTO 1750
1740 A=2\B=40
1750 REM INITIALIZE BEGIN AND END POINTS TO ENTIRE FILE
1760 P=0
1770 L=1
1780 D(L)=N
1790 M=0
1800 REM SET END OF FILE SEGMENT
1810 J=B(L)
1820 REM SET START OF ARRAY SEGMENT
1830 I=M-1
1840 REM IF ONLY 1 OR 2 ELEMENTS HANDLE SPECIALLY
1850 IF (J-M)<3 THEN 2160
1860 M1=INT((I+J)/2)
1870 REM FIND A LARGE ELEMENT AMONG THE SMALL ONES
1880 I=I+1
1890 IF I=J THEN 2040
1900 READ#0%I#5$+5,E$\READ#0%M1#5$+5,E1$
1910 IF E$(A,B)<=E1$(A,B) THEN 1880
1920 REM FIND A SMALL ELEMENT AMONG THE LARGE ONES
1930 J=J-1
1940 IF I=J THEN 2040
1950 READ#0%J#5$+5,E$\READ#0%M1#5$+5,E1$
1960 IF E$(A,B)>=E1$(A,B) THEN 1930
1970 REM EXCHANGE OUT OF PLACE ELEMENTS
1980 READ#0%I#5$+5,E$\READ#0%J#5$+5,E1$
1990 W$=E$\E$=E1$\E1$=W$
2000 WRITE#0%I#5$+5,E$,NOENDMARK\WRITE#0%J#5$+5,E1$,NOENDMARK
2010 P=P+1\'P,
2020 GOTO 1880
2030 REM FILE NOW DIVIDED.MOVE COMPARE ELEMENTS BETWEEN
2040 IF I<M1 THEN I=M1-1
2050 IF J<M1 THEN 2110
2060 READ#0%I#5$+5,E$\READ#0%M1#5$+5,E1$
2070 W$=E$\E$=E1$\E1$=W$
2080 WRITE#0%I#5$+5,E$,NOENDMARK\WRITE#0%M1#5$+5,E1$,NOENDMARK
2090 P=P+1\'P,
2100 REM SAVE STARTING POINT FOR FILE SEGMENT OF LARGE ELEMENTS
2110 L=L+1
2120 D(L)=I
2130 REM REPEAT QUICKSORT OF FILE SEGMENT OF SMALL ELEMENTS
2140 GOTO 1810
2150 REM THE FOLLOWING HANDLES THE 1 AND 2 ELEMENT CASES
2160 IF J=M-2 THEN 2230
2170 READ#0%M#5$+5,E$\READ#0%(M+1)#5$+5,E1$
2180 IF E$(A,B)<=E1$(A,B) THEN 2230
2190 W$=E$\E$=E1$\E1$=W$
2200 WRITE#0%M#5$+5,E$,NOENDMARK\WRITE#0%(M+1)#5$+5,E1$,NOENDMARK
2210 P=P+1\'P
2220 REM SET BEGIN AND END POINTS FOR FILE SEGMENT OF LARGE ELEMENTS
2230 M=B(L)+1
2240 L=L-1
2250 IF L>0 THEN 1810
2260 REM END OF SORT
2270 GOTO 120
2280 REM * ALPHABETICAL SEARCH ROUTINE *
2290 \' 1\''ALPHABETICAL SEARCH=\'\'\
2300 INPUT"SEARCH BY <LETTER OR <NAME? ",A$\'
2310 IF A$="N" THEN 2390
2320 INPUT "LAST NAMES BEGINNING WITH: ",L$\'
2330 FOR J=0 TO N-1\READ #0%J#5$+5,E$
2340 IF E$(21,21)=L$(1,1) THEN GOSUB 1340
2350 NEXT J
2360 '
2370 GOSUB 2470
2380 GOTO 120
2390 REM NAME SEARCH
2400 INPUT "LAST NAME SEARCHING FOR: ",W$\'
2410 FOR J=0 TO N-1\READ #0%J#5$+5,E$
2420 W$=W$+B$
2430 IF E$(21,40)=W$(1,20) THEN GOSUB 1340
2440 NEXT J
2450 \'GOSUB 2470
2460 GOTO 120
2470 INPUT "PRESS RETURN TO CONTINUE",R$\RETURN
2480 WRITE #0%0.N,NOENDMARK\CLOSE #0\END
READY
```

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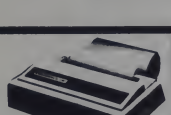

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Another new game from Creative Computing ....

Lost & Forgotten Island

Bruce Hicks

Lost and Forgotten Island is a survival game involving cooperation and decisions between different values. It's played by one, two or three people.

You're all stranded on a desert island. On each turn, you can individually work on the boat (to escape from a coming storm) or mine for gold. Each player also has tools to help accomplish the different tasks; tools can be traded with other players. At the end of the game you are told if you made it off the island and how much gold you have.

This program was passed along to us by Ken Modesitt of Texas Instruments and converted to Microsoft BASIC by Jeffrey Yuan. □

Bruce Hicks, School of Secondary Education, University of Illinois, Urbana, IL, 61801.


```
RUN
WELCOME TO THE LOST AND FORGOTTEN ISLAND.
WOULD YOU LIKE SOME INSTRUCTIONS? YES
LOST AND FORGOTTEN ISLAND IS A SURVIVAL GAME BASED ON
COOPERATION.  IT CONTAINS A MIXTURE OF LIFE'S VALUES.
TRADING
        YOU HAVE BEEN SHIPWRECKED ON A REMOTE ISLAND.
YOU HAVE THE CHOICE OF DIGGING FOR GOLD AND/OR BUILDING
A SHIP TO SURVIVE THE APPROACHING HURRICANE.
CAN YOU SURVIVE?  IF SO, WITH HOW MUCH GOLD?

          G O O D    L U C K

HOW MANY PEOPLE (1,2, OR 3) ARE PLAYING? 2

PLAYER  1  WHAT NAME ARE YOU USING ? EMERSON

PLAYER  2  WHAT NAME ARE YOU USING ? HAWTHORNE

THIS IS DAY  1



EMERSON HAS  0  DOLLARS WORTH OF GOLD, A TOOL
PROFICIENCY OF  5 ,  0  WORK POINTS, WHICH
IS  0  PERCENT OF THE TOTAL, AND THE FOLLOWING TOOLS:

      PICKAXE
      AXE
      LUNSER
      PICKAXE

JUST HIT RETURN WHEN YOU ARE READY TO GO ON.?



HAWTHORNE HAS  0  DOLLARS WORTH OF GOLD, A TOOL
PROFICIENCY OF  11 ,  0  WORK POINTS, WHICH
IS  5  PERCENT OF THE TOTAL, AND THE FOLLOWING TOOLS:

      PICKAXE
      CHISEL
      HAMMER
      CHISEL

JUST HIT RETURN WHEN YOU ARE READY TO GO ON.?


THE SUM OF EVERYONE'S WORK POINTS IS  0 .

DO ANY OF YOU WISH TO TRADE TOOLS? YES

WHO (ONE NAME ONLY PLEASE) WISHES TO TRADE? EMERSON

WHO ELSE WISHES TO TRADE? HAWTHORNE

EMERSON, ARE YOU GIVING ANY GOLD IN THIS TRADE? NO

EMERSON, ARE YOU GIVING ANY TOOL(S) IN THIS TRADE? YES

EMERSON, HOW MANY TOOLS ARE YOU GIVING? 1

EMERSON, WHAT IS THE NAME OF A TOOL THAT YOU ARE GIVING IN TRADE? PICKAXE

HAWTHORNE, ARE YOU GIVING ANY GOLD IN THIS TRADE? NO

HAWTHORNE, ARE YOU GIVING ANY TOOL(S) IN THIS TRADE? YES

HAWTHORNE, HOW MANY TOOLS ARE YOU GIVING? 1

HAWTHORNE, WHAT IS THE NAME OF A TOOL THAT YOU ARE GIVING IN TRADE? CHISEL

THIS IS YOUR LAST CHANCE TO CALL OFF THE TRADE.  IF YOU
WANT TO CALL IT OFF TYPE 'Y' OTHERWISE TYPE ANY OTHER LETTER AFTER
THE QUESTION MARK.
? J

DO ANY TWO OF YOU WISH TO TRADE NOW? NO

EMERSON, WHAT ARE YOU GOING TO WORK ON TODAY? BOAT

EMERSON HAS EARNED  2  MORE WORK POINTS.

EMERSON HAS BEEN INJURED BY THE PICKAXE.  MISHER
TOOL PROFICIENCY WILL NOW BE CUT IN HALF.

HAWTHORNE, WHAT ARE YOU GOING TO WORK ON TODAY? BOAT

HAWTHORNE HAS EARNED  3  MORE WORK POINTS.

HAWTHORNE HAS BEEN INJURED BY THE PICKAXE.  MISHER
TOOL PROFICIENCY WILL NOW BE CUT IN HALF.

THIS IS DAY  2



EMERSON HAS  0  DOLLARS WORTH OF GOLD, A TOOL
PROFICIENCY OF  3 ,  2  WORK POINTS, WHICH
IS  34  PERCENT OF THE TOTAL, AND THE FOLLOWING TOOLS:

      CHISEL
      AXE
      LUNSER
      PICKAXE

JUST HIT RETURN WHEN YOU ARE READY TO GO ON.?



HAWTHORNE HAS  0  DOLLARS WORTH OF GOLD, A TOOL
PROFICIENCY OF  6 ,  3  WORK POINTS, WHICH
IS  64  PERCENT OF THE TOTAL, AND THE FOLLOWING TOOLS:

      PICKAXE
      HAMMER
      CHISEL
      PICKAXE

JUST HIT RETURN WHEN YOU ARE READY TO GO ON.?


THE SUM OF EVERYONE'S WORK POINTS IS  5 .

THE STORM IS ABOUT TO HIT

DO ANY OF YOU WISH TO TRADE TOOLS? NO
```

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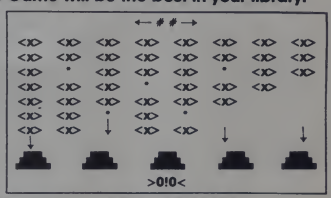

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CIRCLE 165 ON READER SERVICE CARD

EMERSON, WHAT ARE YOU GOING [illegible] TODAY?

EMERSON HAS EARNED 1 MORE WORK POINTS.

EMERSON HAS BEEN INJURED BY THE AXE. HIS/HER
TOOL PROFICIENCY WILL NOW BE TOO IN GOLD.

HAWTHORNE, WHAT ARE YOU GOING TO WORK ON TODAY? GOLD

EMERSON HAS 3150 MORE 24K DOLLARS MORE GOLD.
HAWTHORNE HAS JUST MADE 4955 DOLLARS MORE GOLD.

THIS IS DAY 3

EMERSON HAS 3497 DOLLARS WORTH OF GOLD, A TOOL
PROFICIENCY OF 2 , 3 WORK POINTS, WHICH
IS 48 PERCENT OF THE TOTAL, AND THE FOLLOWING TOOLS:

CHISEL
AXE
LUMBER
PICKAXE

JUST HIT RETURN WHEN YOU ARE READY TO GO ON.?

HAWTHORNE HAS 4955 DOLLARS WORTH OF GOLD, A TOOL
PROFICIENCY OF 6 , 3 WORK POINTS, WHICH
IS 52 PERCENT OF THE TOTAL, AND THE FOLLOWING TOOLS:

PICKAXE
HAMMER
CHISEL
PICKAXE

JUST HIT RETURN WHEN YOU ARE READY TO GO ON.?

THE SUM OF EVERYONE'S WORK POINTS IS 5 .

THE STORM IS ABOUT TO HIT

DO ANY OF YOU WISH TO TRADE TOOLS? NO

EMERSON, WHAT ARE YOU GOING TO WORK ON TODAY? BOAT

EMERSON HAS EARNED 0 MORE WORK POINTS.

HAWTHORNE, WHAT ARE YOU GOING TO WORK ON TODAY? BOAT

HAWTHORNE HAS EARNED 2 MORE WORK POINTS.

THIS IS DAY 4

EMERSON HAS 3497 DOLLARS WORTH OF GOLD, A TOOL
PROFICIENCY OF 2 , 4 WORK POINTS, WHICH
IS 42 PERCENT OF THE TOTAL, AND THE FOLLOWING TOOLS:

CHISEL
AXE
LUMBER
PICKAXE

JUST HIT RETURN WHEN YOU ARE READY TO GO ON.?

HAWTHORNE HAS 4955 DOLLARS WORTH OF GOLD, A TOOL
PROFICIENCY OF 6 , 5 WORK POINTS, WHICH
IS 58 PERCENT OF THE TOTAL, AND THE FOLLOWING TOOLS:

PICKAXE
HAMMER
CHISEL
PICKAXE

JUST HIT RETURN WHEN YOU ARE READY TO GO ON.?

THE SUM OF EVERYONE'S WORK POINTS IS 9 .

THE RESULTS FOR EMERSON:

EMERSON, YOU MADE IT BACK BUT THE BOAT NEARLY SWAMPED.
SO, HALF OF YOUR GOLD WAS THROWN OVERBOARD.
THIS MEANS YOU HAVE 1238 DOLLARS WORTH OF GOLD LEFT.

THE RESULTS FOR HAWTHORNE:

[illegible]

[illegible]

DO YOU WISH TO PLAY [illegible]? NO

**********[illegible]**********

OK

```
10 DIM I$(9),T,U,A,V,W,X,Y,A$(13),C1(13)
20 DIM V1(3,9),W(6,9),I(6,9),A(6,9),U1(13),V2(13)
30 DIM W$(5,6)
40 REM ***** EMERSON [illegible] *****
50 REM ADAPTED FROM "CREATIVE COMPUTING" VOL. 7-NO.3, FALL,1976
60 REM
70 PRINT"WELCOME TO THE LOST AMP FORGOTTEN ISLAND."
80 PRINT"WOULD YOU LIKE SOME INSTRUCTIONS";
90 INPUT Z$
100 IF Z$="NO" THEN 140
110 IF Z$<>"YES" THEN 90
120 PRINT"INVALID ANSWER - PLEASE RE-TYPE, YES OR NO"
130 GOTO90
140 PRINT"LOST AMP FORGOTTEN ISLAND IS A SURVIVAL GAME BASED ON"
150 PRINT"COOPERATION.  [illegible] A MEASURE OF LIFE'S VALUES."
160 PRINT"TREASURES"
170 PRINT"                YOU HAVE BEEN SHIPWRECKED ON A REMOTE ISLAND."
180 PRINT"YOU MUST USE [illegible] TO GOLD AND/OR BUILDING"
190 PRINT"A SHIP IS SPARED THE APPROACHING HURRICANE."
200 PRINT"CAN YOU SURVIVE IN SO, WITH HOW MUCH GOLD?"
210 PRINT
220 PRINT"                [illegible]"
230 PRINT
240 IE=RND(1)
250 FOR I=1TO 5
260 FOR J=1TO 6
270 I2(I,J)=0
280 I3(I,J)=0
290 V1(I,J)=0
300 V2(I,J)=0
310 NEXT J
320 NEXT I
330 FOR I=1 TO 6
340 W(I)=0
350 NEXT I
360 FOR I=1 TO 5
370 W(I)=0
380 G1(I)=0
390 G2(I)=0
400 C3(I)=0
410 C1(I)=0
420 NEXT I
430 M1=0:M2=0:M3=0
440 FOR I=1 TO 6
450 READ I$(I)
460 NEXT I
470 PRINT
480 REM [illegible]
490 REM
500 PRINT"MUP RAFT FIRST, IN TO OUT PLAYING";
510  FOR U1=1 TO 2
520 FOR U2=1 TO 9
530 T2(M1,U2)=0
540 NEXT U2
550 NEXT U1
560 INPUT M1
```

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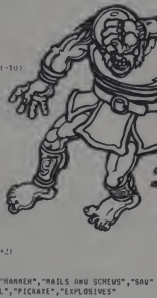
```
570 PRINT
580 IF N1=1 THEN 600
590 IF N1=3 THEN 610
600 PRINT"YOU MUST PLAY WITH 1,2, OR 3 PLAYERS."
610 PRINT
620 GOTO 500
630 E=0
640 FOR N=1 TO NT
650 B1(N)=0
660 C1(N)=0
670 C1(N)=0
680 W1(N)=0
690 NEXT N
700 C2=0
710 FOR I=1 TO N1
720 PRINT"PLAYER ";I;" WHAT NAME ARE YOU USING ";
730 INPUT$1(I)
740 PRINT
750 FOR J=1 TO 3
760 IF J=I THEN 820
770 IF $1(I)=$1(J) THEN 820
780 PRINT"SOMEONE ELSE ALREADY HAS THIS NAME SO PLEASE CHOOSE";
790 PRINT" ANOTHER."
800 PRINT
810 GOTO 730
820 NEXT J
830 NEXT I
840 FOR U3=1 TO 3
850 FOR U4=1 TO 9
860 I2(U3,U4)=1
870 I2(U3,U4)=I2(U3,U4)*(-10)
880 NEXT U4
890 NEXT U3
900 REM
910 FOR I=1 TO 5
920 I1(1,I)=1
930 NEXT I
940 I3(1,6)=2
950 I3(2,7)=1
960 I3(2,8)=1
970 I3(2,9)=2
980 E=6-N1
990 FOR I=1 TO N1
1000  FOR J=1 TO E
1010 R1=INT(RND(1)*9+1)
1020 I2(I,J)=R1
1030 V1(I,J)=I3(I,R1)
1040 V2(I,J)=I3(2,R1)
1050 NEXT J
1060 C1(I)=INT(RND(1)*11*2)
1070 NEXT I
1080 GOSUB 1130
1090 DATA"AXE","DRISLL","HAMMER","NAILS AND SCREWS","SAW
1100 DATA"LUMBER","SHOVEL","PICKAXE","EXPLOSIVES"
1110 STOP
1120 REM
1130 REM ***** SUBROUTINE LAFIS21 *****
1140 REM
1150 REM THIS IS LAFIS 21
1160 REM ***** TRADING TOOLS *****
1170 IF N1=1 THEN 1720
1180 IF N1=3 THEN 1200
1190 M$(3)="STORAGE"
1200 J$(1)="A"
1210 J$(2)="ANOTHER"
1220 FOR I=1 TO 9
1230 J$(I)=J$(I-1)
1240 NEXT I
1250 I$(1)="WHO (ONE NAME ONLY PLEASE) WISHES TO TRADE"
1260 I$(2)="WHO ELSE WISHES TO TRADE"
1270 S=4
1280 FOR M=1 TO 5
1290 REM ***** WHICH OAT? *****
1300 PRINT"THIS IS OAT ";M
1310 PRINT
1320 GOSUB 4060
1330 PRINT
1340 PRINT
1350 IF S=1 THEN 1040
1360 IF S=3 THEN 1420
1370 S=S-1
1380 PRINT"THE STORM IS ABOUT TO HIT"
1390 PRINT
1400 IF M=1 THEN 2970
1410 GOTO 1460
1420 IF M=5 THEN 1450
1430 X=INT(RND(1)*4+1)
1440 IF X=4 THEN 1460
1450 S=3
1460 IF M=1 THEN 2970
1470 PRINT"DO ANY OF YOU WISH TO TRADE TOOLS";
1480 INPUT A$
1490 PRINT
1500 IF A$="YES" THEN 1530
1510 IF A$="NO"THEN 2970
1520 PRINT"PLEASE TRY AGAIN.  YOU MUST ANSWER 'YES' OR 'NO'."
1530 PRINT
1540 GOTO 1460
1550 FOR I=1 TO 3
1560 FOR J=1 TO 9
1570 I3(1,J)=I2(I,J)
1580 V3(1,J)=V1(I,J)
1590 V4(1,J)=V2(I,J)
1600 NEXT J
1610 B2(I)=B1(I)
1620 NEXT I
1630 FOR J=1 TO 2
1640 M3(J)=1
1650 NEXT J
1660 FOR I=1 TO 2
1670 PRINT$1(I);
1680 INPUT$9(I)
1690 PRINT
1700 IF $9(I)=N$(I) THEN 1790
1710 IF $9(I)=W$(2)THEN 1780
1720 IF $9(I)=W$(3) THEN 1730
1730 PRINT"YOU MUST ANSWER WITH ";W$(1);", ";W$(2);", OR ";W$(3)
1740 PRINT"--------PLEASE TRY AGAIN."
1750 PRINT
1760 GOTO 1670
1770 M3(I)=M3(I)+1
1780 M3(I)=M3(I)+1
1790 NEXT I
1800 FOR I=1 TO 2
1810 M4=1
1820 PRINT$9(I);", ARE YOU GIVING ANY GOLD IN THIS TRADE";
1830 INPUT C$
1840 PRINT
1850 IF C$="Y"THEN 2870
1860 IFC$="NO" THEN 2110
1870 IF C$="YES" THEN 1980
1880 IF C$="I" THEN 1940
1890 PRINT"PLEASE TRY AGAIN.  YOU MUST ANSWER 'YES', 'NO',"
1900 PRINT" 'X' (TO CALL OFF THE TRADE), OR 'I' (TO SEE THE LIST OF "
1910 PRINT"TOOLS WHICH EVERYONE HAD BEFORE THE START OF THIS TRADE)."
1920 PRINT
1930 GOTO 1820
1940 PRINT"YOUR SITUATION AT THIS TIME"
1950 PRINT
1960 GOSUB4110
1970 GOTO 1870
1980 PRINT$9(I);", HOW MUCH GOLD (IN DOLLARS) ARE YOU GOING TO GIVE";
1990 INPUT A7
2000 PRINT
2010 IF B1(M3(I))>=A7 THEN 2050
2020 PRINT"YOU MAY NOT GIVE MORE THAN YOU HAVE (";B1(M3(I));" DOLLARS"
2030 PRINT
2040 GOTO 1990
2050 IF A7>0 THEN 2090
2060 PRINT"YOU MAY NOT INPUT A NEGATIVE NUMBER.  TRY AGAIN."
2070 PRINT
2080 GOTO 1980
2090 B1(M3(I))=B1(M3(I))-A7
2100 B2(M3(I-1))=B1(M3(I-1))+A7
2110 PRINT$9(I);", ARE YOU GIVING ANY TOOL(S) IN THIS TRADE";
2120 INPUT D$
2130 PRINT
2140 IF D$="X" THEN 2890
2150 IF D$="NO"THEN 2240
2160 IF D$="YES" THEN 2270
2170 IF D$="I" THEN 2230
2180 PRINT"TRY AGAIN.  YOU MUST ANSWER 'YES', 'NO', 'I' (TO"
2190 PRINT"SEE THE TOOLS EVERYONE HAD BEFORE THIS TRADE"
2200 PRINT"STARTED), OR 'X' (TO CALL OFF THE TRADE)."
2210 PRINT
2220 GOTO 2110
2230 PRINT"YOUR SITUATION AT THIS TIME"
2240 PRINT
2250 GOSUB 4110
2260 GOTO 2110
2270 PRINT$9(I);", HOW MANY TOOLS ARE YOU GIVING";
2280 INPUT M5
2290 PRINT
2300 FOR J=1 TO M5
2310 PRINT$1(I);", WHAT IS THE NAME OF ";J;"(J);" TOOL THAT ";
2320 PRINT"YOU ARE GIVING IN TRADE";
2330 INPUT L$
2340 PRINT
2350 IF L$="X"THEN 2890
2360 IF L$="B"THEN 2230
2370 IF L$="I"THEN 2580
2380 FOR R=1 TO 9
2390 IF I$(R)=L$THEN 2480
2400 NEXT R
2410 PRINT"PLEASE USE THE NAME OF A TOOL, USE 'B' IF YOU WANT TO"
2420 PRINT"GO AHEAD WITH THE TRADE WITHOUT GIVING MORE TOOLS,"
```



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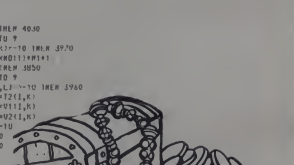
CIRCLE 144 ON READER SERVICE CARD

```
2430 PRINT"USE  I  IF YOU WANT TO SEE THE LIST OF TOOLS EVERYONE"
2440 PRINT"HAD BEFORE THIS TRADE STARTED."
2450 PRINT"OR USE  X  IF YOU WANT TO CALL OFF THE TRADE."
2460 PRINT
2470 GOTO 2310
2480 FOR K=1 TO 9
2490 IF T2(M3(I),I)=1THEN 2620
2500 NEXT K
2510 PRINT"THAT";T;", YOU DO NOT HAVE THIS TOOL.  PLEASE TRY AGAIN."
2520 PRINT"YOU MUST USE THE NAME OF A TOOL YOU HAVE, USE  B  TO GO"
2530 PRINT"AHEAD WITH THE TRADE WITHOUT GIVING MORE TOOLS, USE  I"
2540 PRINT"TO CALL OFF THE TRADE, OR USE  I  TO SEE THE LIST OF TOOLS WHICH
     EVERYONE"
2550 PRINT"HAD BEFORE THE START OF THIS TRADE."
2560 PRINT
2570 GOTO 2310
2580 PRINT"YOUR SITUATION AT THIS TIME"
2590 PRINT
2600 GOSUB 4110
2610 GOTO 2310
2620 T3(M3(I),K)=-10
2630 V3(M3(I),K)=0
2640 V4(M3(I),K)=0
2650 FOR L=K TO 9
2660 IF T3(M3(I-1),L)=-10 THEN 2680
2670 NEXT L
2680 T3(M3(I-1),L)=B
2690 V3(M3(I-1),L)=V1(M3(I),K)
2700 V4(M3(I-1),L)=V2(M3(I),K)
2710 K=L+1
2720 NEXT J
2730 NEXT I
2740 PRINT"THIS IS YOUR LAST CHANCE TO CALL OFF THE TRADE.  IF YOU"
2750 PRINT"WANT TO CALL IT OFF TYPE 'X' OTHERWISE TYPE ANY OTHER LETTER
     AFTER"
2760 PRINT"THE QUESTION MARK."
2770 INPUT G$
2780 PRINT
2790 IF G$="X"THEN 2890
2800 FOR I=1 TO3
2810 FOR J=1 TO 9
2820 T2(I,J)=T3(I,J)
2830 V1(I,J)=V3(I,J)
2840 V2(I,J)=V4(I,J)
2850 NEXT J
2860 B1(I)=U2(I)
2870 NEXT I
2880 RE=
2890 PRINT"DO ANY TWO OF YOU WISH TO TRADE NOW";
2900 INPUT M$
2910 PRINT
2920 IF M$="YES"THEN 1550
2930 IF M$="NO"THEN 2970
2940 PRINT"PLEASE TRY AGAIN.  YOU MUST ANSWER 'YES' OR 'NO'."
2950 PRINT
2960 GOTO 2890
2970 FOR I=1 TO M1
2980 IF C3(I)=1 THEN 4000
2990 P1=C1(I)
3000 RE= ***** WHAT TYPE OF WORK TODAY? *****
3010 PRINT"MR";I;", WHAT ARE YOU GOING TO WORK ON TODAY";
3020 INPUT A$
3030 PRINT
3040 IF A$="ROAD" THEN 3430
3050 IF A$="GOLD" THEN 3110
3060 PRINT "PLEASE ANSWER 'ROAD' IF YOU WANT TO WORK ON THE ROAD"
3070 PRINT"OR 'GOLD' IF YOU WANT TO MINE GOLD."
3080 PRINT
3090 GOTO 3010
3100 RE= ***** WORKING ON SOME GOLD *****
3110 FOR J=1 TO 9
3120 IF T2(I,J)<>1 THEN 3240
3130 PRINT"MR";I;", DO YOU WISH TO USE ANY TO MINE GOLD?"
3140 PRINT"REMEMBER THAT THE AXE DROPS GREATLY IN VALUE"
3150 PRINT"IF IT IS USED TO MINE GOLD."
3160 INPUT C$
3170 PRINT
3180 IF C$="NO" THEN 3280
3190 IF C$="YES"THEN 3230
3200 PRINT"PLEASE TRY AGAIN. YOU MUST USE  YES  OR  NO".
3210 PRINT
3220 GOTO 3130
3230 V2(I,J)=V1(I,J)
3240 P1=P1+V2(I,J)*C1(I)
3250 V1(I,J)=(INT((V1(I,J)/2*10+.5))/10
3260 V2(I,J)=0
3270 GOTO 3290
3280 P1=P1+V2(I,J)*C1(I)
3290 NEXT J
3300 Z8=RND(1)*2+1
3310 FOR K=1 TOM1
3320 IF C3(K)=1 THEN 3400
3330 L=K-0
3340 IF K=I THEN 3400
3350 C4=.25
3360 GOSUB 4.25
3370 PRINT"MR";I;" HAS JUST MADE ";INT(Z8)*" DOLLARS MORE GOLD."
3380 PRINT"THAT'S";INT(Z8)*.25
3390 PRINT
3400 NEXT K
3410 PRINT
3420 GOTO 3590
3430 RE= ***** WORKING ON THE ROAD *****
3440 B1(I)=1
3450 FOR J=1 TO 9
3460 IF T2(I,J)<>2 THEN 3520
3470 FOR K=1 TO 9
3480 IF T2(I,K)=3 THEN 3510
3490 P1=P1 +2*V1(I,J)*C1(I)
3500 GOTO 3530
3510 NEXT K
3520 P1=P1+V1(I,J)*C1(I)
3530 NEXT J
3540 Z8=1/12
3550 PRINT"MR";I;" HAS EARNED ";INT(Z8)" MORE WORK POINTS."
3560 PRINT
3570 W(I)=W(I)+Z8
3580 C2=C2+Z8
3590 P=INT(RND(1)*(P+1)*1)+1
3600 FOR J=1 TO 9
3610 IF T2(I,J)=3 THEN 3640
3620 IF T2(I,J)=3 THEN 3640
3630 IF T2(I,J)<>8 THEN 3700
3640 IF T<>T2(I,J)THEN 3990
3650 PRINT"MR";I;" HAS BEEN INJURED BY THE ";T$(T2(I,J));".  HIS(HER)"
3660 PRINT"TOOL PROFICIENCY WILL NOW BE CUT IN HALF."
3670 PRINT
3680 L1(I)=INT((C1(I)/2)*.5)
3690 J=9
3700 IF T2(I,J)<>9 THEN 3990
3710 IF T<>T2(I,J) THEN 3990
3720 PRINT"MR";I;" HAS BEEN KILLED BY AN ACCIDENTAL"
3730 PRINT"DISCHARGE OF SOME OF THE EXPLOSIVES.  PLEASE"
3740 PRINT"NOTIFY HIS(HER) FRIENDS AND RELATIVES IF YOU MAKE IT BACK."
3750 PRINT
3760 C3(I)=1
3770 IF B7=1 THEN 3800
3780 M$(I)="STORAGE"
3790 B7=1
3800 G1(I)=0
3810 G2(I)=0
3820 IF M1=1 THEN 4030
3830 FOR K=1 TO 9
3840 IF T2(I,K)=-10 THEN 3970
3850 M3=INT(RND(1)*M1+1
3860 IF M3=1 THEN 3850
3870 FOR L=1 TO 9
3880 IF T2(M3,L)<>-10 THEN 3960
3890 T2(M3,L)=T2(I,K)
3900 V1(M3,L)=V1(I,K)
3910 V2(M3,L)=V2(I,K)
3920 T2(I,K)=-10
3930 V1(I,K)=0
3940 V2(I,K)=0
3950 L=9
3960 NEXT L
3970 NEXT K
3980 J=9
3990 NEXT J
4000 NEXT I
4010 NEXT M
4020 GOSUB 4040
4030 RE=
4040 GOSUB 4440
4050 REM THE FOLLOWING IS THE SUBROUTINE S(A1)
4060 FOR I=1 TO 3
4070 FOR J=1 TO 9
4080 T1(I,J)=T2(I,J)
4090 NEXT J
4100 M=M1-1
4110 C4=C2
4120 FOR K=1 TO M1
4130 PRINT
4140 PRINT
4150 IF C3(M)=1 THEN 4340
4160 IF C2>20 THEN 4190
4170 Z2=1
4180 L=INT((W(M)/C2)*100+.5)
4190 PRINT"MR";M$(M);" HAS ";INT(W(M));" DOLLARS WORTH OF GOLD, A TOOL"
4200 PRINT"PROFICIENCY OF ";C1(M);", ";INT(W(M));" WORK POINTS, WHICH"
4210 PRINT"IS ";L;" PERCENT OF THE TOTAL, AND THE FOLLOWING TOOLS:"
4220 PRINT
4230 FOR J=1 TO 9
4240 A$=" "
4250 IF (Z1M,J)>-10 THEN 4270
4260 IF T2(M,J)<>A,J2) THEN 4280
```



```
4270 K$="*"
4280 PRINTTAB(6);K$;T$(12(H,J2))
4290 NEXT J2
4300 PRINT
4310 PRINT"JUST HIT RETURN WHEN YOU ARE READY TO GO ON.";
4320 INPUT F$
4330 PRINT
4340 NEXT H
4350 PRINT
4360 PRINT"THE SUM OF EVERYONE'S WORK POINTS IS ";INT(C4);"."
4370 PRINT
4380 C2=C4
4390 RETURN
4400 DATA"AXE","CHISEL","HAMMER","NAILS AND SCREWS","SAW"
4410 DATA"LUMBER","SHOVEL","PICKAXE","EXPLOSIVES"
4420 RETURN
4430 REM
4440 REM ***** SUBROUTINE LAFIS31 *****
4450 REM
4460 DEF FNE(Z7)=2.718^Z7
4470 DEF FNC(Z8)=FNE(Z8)+FNE(-Z8)
4480 DEF FNS(Z9)=FNE(Z9)-FNE(-Z9)
4490 C4=C2
4500 IF C2<>0 THEN 4520
4510 C2=1
4520 IF Z1=3 THEN 4590
4530 C4=0
4540 FOR I=1 TO N1
4550 IF C3(I)=1 THEN 4570
4560 IF W(I)/C2<.25 THEN 4580
4570 C4=C4+W(I)
4580 NEXT I
4590 FOR I=1 TO N1
4600 IF C3(I)=1 THEN5030
4610 PRINT
4620 PRINT
4630 REM
4640 REM ***** THE RESULTS *****
4650 REM
4660 PRINT
4670 PRINT"THE RESULTS FOR ";N$(I);":"
4680 PRINT
4690 PRINT
4700 IF W(I)/C2<.25 THEN 4720
4710 W(I)=C4
4720 Z1=INT(60*2.710^((-W(I))/6))
4730 Z2=INT(50*(1+((FNS((7-W(I))/8.5))/FNC((7-W(I))/8.5))))
4740 Z3=INT(50*(1+(FNS((14-W(I))/5)/FNC((14-W(I))/5))))
4750 R5=INT(RND(1)*101)
4760 IF B(I)<>1THEN 4960
4770 IF R5>Z1 THEN 4820
4780 PRINT"PROPER CONDOLENCES WILL BE SENT TO THE FRIENDS"
4790 PRINT"AND RELATIVES OF ";N$(I);" WHO DROWNED DURING"
4800 PRINT"TYPHOON URSULA."
4810 GOTO 5030
4820 IF R5>Z2 THEN 4860
4830 PRINTN$(I);", YOU MADE IT BACK TO HONOLULU BUT A"
4840 PRINT"LARGE WAVE WASHED YOUR GOLD OVERBOARD.  SORRY."
4850 GOTO 5030
4860 IF R5>Z3 THEN 4920
4870 PRINTN$(I);", YOU MADE IT BACK BUT THE BOAT NEARLY SWAMPED."
4880 PRINT"SO, HALF OF YOUR GOLD WAS THROWN OVERBOARD."
4890 PRINT"THIS MEANS YOU HAVE ";INT(B1(I)/2);
4900 PRINT" DOLLARS WORTH OF GOLD LEFT."
4910 GOTO 5030
4920 PRINTN$(I);", CONGRATULATIONS---------------"
4930 PRINT"YOU MADE IT WITH ALL YOUR GOLD,";INT(B1(I));
4940 PRINT" DOLLARS WORTH."
4950 GOTO 5030
4960 IF R5>=97 THEN 5000
4970 PRINTN$(I);" DID NOT GET OFF THE ISLAND AND WAS "
4980 PRINT"KILLED BY TYPHOON URSULA."
4990 GOTO 5020
5000 PRINTN$(I);", YOU SURVIVED TYPHOON URSULA, BUT LOST ALL YOUR GOLD"
5010 PRINT"AND HAD BETTER START MAKING SMOKE SIGNALS BECAUSE YOU WERE"
5020 PRINT"LEFT BEHIND."
5030 NEXTI
5040 PRINT
5050 PRINT"DO YOU WISH TO PLAY ANOTHER GAME";
5060 INPUT C$
5070 PRINT
5080 PRINT
5090 PRINT
5100 PRINT
5110 PRINT"*********************************************"
5120 PRINT
5130 IF C$="NO" THEN 5190
5140 IF C$="YES" THEN 70
5150 PRINT"YOU MUST ANSWER 'YES' OR 'NO'.  PLEASE TRY AGAIN."
5160 PRINT
5170 GOTO 5050
5180 RETURN
5190 END
OK
```

LET IT ALL HANG OUT!

Creative's own outrageous **Bionic Toad** in dark blue on a light blue shirt for kids and adults.

Computer Bum — black design by cartoonist Monte Wolverton on gray denim-look skirt with black neckband and cuffs.

I'd rather be playing spacewars — black with white spaceships and lettering.

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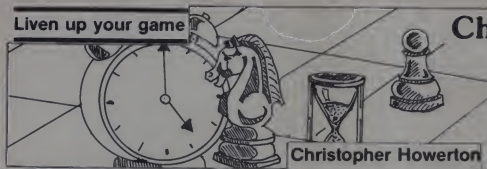


Chess Clock

Christopher Howerton

Is speed chess your game? Well, don't go out and buy a chess clock when you can use your computer to time moves.

Chess is an interesting intellectual game, but it lacks action. Many people do not play chess simply because it takes so long. Well, if you want to put real action into your chess game, then this program is for you.

A chess clock is basically two stop watches connected in such a way that exactly one of the stop watches is running at any instant. While a player is deciding on his move, his clock is running. As soon as he moves his piece, and is happy with his chosen move, the player presses a button which stops his clock and starts his opponent's clock.

Unlike regular chess, a player may alter a move which he has made, so long as he hasn't pressed the button. The game ends with a checkmate as in regular chess, or when someone runs out of time. By alloting a weaker player more time for his game, a chess clock can effectively handicap a game. However, a chess clock is also used in speed chess. To play speed chess, allow each player four minutes of playing time. You will find that this time limit puts action into a chess game. It also drives some players mad.

Mechanical chess clocks have been in existence for many years, but are expensive enough that I couldn't justify buying one at my level of play. Then, late (after the Tonight show) one Friday evening, the need for a chess clock again arose as Jeff, Dave and I simultaneously developed a craving for a game of speed chess. Fortunately, one of us (exactly whom is lost in the mists of time) noticed that in that very room was a general purpose, stored program, electronic digital computer. We greeted the rising sun with a working chess clock. The version presented here is almost totally re-written, but the basic ideas and algorithms were developed that night by the three of us.

This program is written using Apple's Integer Basic, and takes advantage of that language's low-resolution graphics facilities. Integer Basic is a simple language, so there should be no trouble converting this program to other Basics, provided these differences are taken into account:

1. Variable names in Integer Basic are allowed to be more than 2 characters long. You will have to shorten variables such as PLAYER.

2. CALL -936 clears the screen and homes the cursor.

3. Lines 560-570, 1560-1570 and 1470-1480 are equivalent to GET (receiving input without hitting the RETURN key).

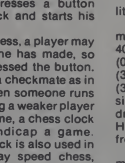
4. PEEK(-16336) is used to make a little beep on the Apple's speaker.

5. In low-resolution graphics mode, the screen is broken into a 40 x 40 grid. The top left-hand corner is (0,0). The top right-hand corner is (39,0). The lower right-hand corner is (39,39). PLOT is used to color in a single grid square. VLIN n,m AT z draws a vertical line from (z,n) to (z,m). HLIN n,m AT z draws a horizontal line from (n,z) to (m,z).

6. In low-resolution graphics mode, all the graphing described in (5) is done in whatever color the variable COLOR currently represents. It should be an integer between 0 and 15.

The digits displayed on the clock are represented using a 7 segment display. Lines 820-880 "light" the correct segments for a given digit "N." Figure 1 shows which segment each of these lines light.

FIGURE 1



I believe that the program is quite understandable and "trick" free. It is quite long at first glance, but you will notice that one half of the program consists of REM statements to help you understand it. When you make your copy, please retain the credits in lines 390-520.

I hope you enjoy it. □

```
>LIST CHESS TIMER
   10 REM      VE MIGHTY CHESS CLOCK
   20 REM
   30 REM  IF THERE ARE ANY PROBLEMS
   40 REM  OR SUGGESTIONS, CONTACT:
   50 REM
   60 REM          JEFF BONNYCASTLE
   70 REM          12081-99 AVE
   80 REM          SURREY B.C.  CANADA
   90 REM          V3T-1E6
  100 REM
  110 REM
  120 REM  N$#    :FIRST PLAYER'S NAME
  130 REM  N1$    :OTHER PLAYER'S NAME
  140 REM  L$     :STRING VARIABLE FOR
  150 REM          GATHERING INPUT AND
  160 REM          PRINTING THE LOSER
  170 REM  COLOUR:15 FOR ONE PLAYER
  180 REM         0 FOR THE OTHER ONE
  190 REM  VPOS   :Y POSITION OF THE
  200 REM          TWO TIME DISPLAYS
  210 REM  TIME   :SECONDS REMAINING
  220 REM          FOR EACH PLAYER
  230 REM  CLOCK  :HOLDS THE 10 DIGITS
  240 REM          CURRENTLY DISPLAYED
  250 REM  CLOC2  :HOLDS THE 5 DIGITS
  260 REM          FOR THE TIME OF THE
  270 REM          PLAYER WHOSE CLOCK
  280 REM          IS MOVING
  290 REM
  300 REM
  310 DIM N$(200),N1$(200),L$(200
      )
  320 DIM COLOUR(2),VPOS(2),TIME(
      2),CLOCK(9),CLOC2(4)
  330 REM
  340 REM
  350 CALL -936: CLEAR SCREEN, PRINT CREDITS
  360 REM
  370 REM
  380 CALL -936
  390 PRINT "          VE MIGHTY CHESS
      CLOCK"
  400 PRINT : PRINT  PRINT
  410 PRINT "DEVELOPED IN THE DEAD OF
      NIGHT, WITH"
  420 PRINT "WEREWOLVES BAYING AT THE
      DOOR, AND"
  430 PRINT "VARIOUS OTHER BEASTIES AL
      READY INSIDE."
  440 PRINT "BY "
  450 PRINT
  460 PRINT : PRINT "CHRISTOPHER E. HO
      WERTON"
  470 TAB 5: PRINT "ALLAN D. BOOTH"
  480 TAB 9: PRINT "JEFFREY J. BONNYCA
      STLE"
  490 PRINT
  500 PRINT "WE ALMOST DIDN'T MAKE IT.
      "
  510 VTAB 20
  520 PRINT "     HIT ANY KEY TO CONTI
      NUE"
```

Christopher Howerton, 13572 92 Ave., Surry, BC, CANADA V3V 1H7.

Clock, cont'd . . .

```
530 REM
540 REM WAIT FOR ANY KEY TO BE HIT
550 REM
560 IF PEEK (-16384)<127 THEN
    560
570 POKE -16368,0
580 GOTO 360
590 REM
600 REM
610 REM
620 REM THIS SUBROUTINE PRINTS A
630 REM DIGIT "N" AT POSITION X,Y
640 REM USING A 7 SEGMENT DISPLAY
650 REM
660 REM
670 REM
680 REM FIRST ERASE ALL 7 SEGMENTS
690 REM
700 COLOR=C
710 VLIN V,V+8 AT X
720 VLIN V,V+8 AT X+4
730 HLIN X,X+4 AT V
740 HLIN X,X+4 AT V+4
750 HLIN X,X+4 AT V+8
760 REM
770 REM NOW PRINT THE DIGIT AT THE
780 REM CORRECT POSITION, WITH THE
790 REM CORRECT COLOUR.
800 REM
810 COLOR=COLOUR(PLAYER)
820 IF (N=0 OR N=2 OR N=3 OR N=
    5 OR N>6) THEN HLIN X,X+4 AT
    V
830 IF (N=0 OR N=4 OR N=5 OR N=
    6 OR N>7) THEN VLIN V,V+4 AT
    X
840 IF (N<5 OR N>6) THEN VLIN V,
    V+3 AT X+4
850 IF (N>1 AND N<7) THEN HLIN
    X+1,X+4 AT V+4
860 IF (N=0 OR N=2 OR N=6 OR N=
    8) THEN VLIN V+4,V+8 AT X
870 IF (N<2) THEN VLIN V+4,V+8 AT
    X+4
880 IF (N=0 OR N=2 OR N=3 OR N=
    5 OR N=6 OR N=9) THEN HLIN
    X,X+4 AT V+8
890 RETURN
900 REM
910 REM
920 REM      INITIALISATION
930 REM MAKE NICE BLUE BACKGROUND
940 REM PUT IN THE COLONS, AND DRAW
950 REM THE DIVIDING LINE
960 REM
970 REM
980 GR
990 MOVES=0
1000 COLOR=2: FOR Z=0 TO 39: VLIN
     0,39 AT Z: NEXT Z
1010 COLOUR(0)=15:COLOUR(1)=0
1020 YPOS(0)=4:YPOS(1)=25
1030 COLOR=COLOUR(0
1040 PLOT 7,7: PLOT 7,8: PLOT 7,
     10: PLOT 7,11: PLOT 24,7: PLOT
     24,8: PLOT 24,10: PLOT 24,11
1050 HLIN 1,38 AT 19
1060 COLOR=COLOUR(1)
1070 HLIN 1,38 AT 20
1080 PLOT 7,28: PLOT 7,29: PLOT
     7,31: PLOT 7,32: PLOT 24,28
     : PLOT 24,29: PLOT 24,31: PLOT
     24,32
1090 REM
1100 REM
1110 REM        MORE INITIALISATION
1120 REM GET THE PLAYERS' NAMES AND
1130 REM THEIR RESPECTIVE GAME TIMES
1140 REM
1150 REM
1160 FOR I=0 TO 9:CLOCK(I)=-1: NEXT
     I
1170 FOR PLAYER=0 TO 1
1180 PRINT : PRINT : PRINT
1190 IF PLAYER=0 THEN: INPUT "WHO'S PL
     AYING WHITE? ",N$
1200 IF PLAYER=1 THEN: INPUT "WHO'S PL
     AYING BLACK? ",N$
1210 PRINT "HOW MUCH TIME DO YOU WANT
     ?"
1220 PRINT
1230 INPUT "HOURS",H
1240 IF H<0 AND H>=8 THEN 1260
1250 PRINT "SORRY, BUT YOU CAN ONLY H
     AVE 8 HOURS"
1260 GOTO 1220
1270 PRINT
1280 INPUT "MINUTES",M
1290 IF M<0 AND M<=59 THEN 1330
1300 PRINT "YOU MUST HAVE BETWEEN 0 A
     ND 59 MINUTES"
1310 GOTO 1270
1320 PRINT
1330 INPUT "SECONDS",S
1340 IF S<0 AND S<=59 THEN 1370
1350 PRINT "YOU MUST HAVE BETWEEN 0 A
     ND 59 SECONDS"
1360 GOTO 1320
1370 TIME(PLAYER)=S+60*M+3600*H
1380 GOSUB 2020
1390 NEXT PLAYER
1400 PLAYER=0
1410 PRINT "HIT ANY KEY TO START THE
     TIMER": PRINT
1420 REM
1430 REM  WAIT FOR A KEY TO BE HIT
1440 REM  THEN CLEAR STROBE AND
1450 REM  START WHITE'S CLOCK
1460 REM
1470 IF ( PEEK (-16384)<127) THEN
     1470
1480 POKE -16368,0
1490 GOTO 1600
1500 REM
1510 REM  IF ANY KEY HAS BEEN HIT,
1520 REM  CLEAR THE STROBE, BEEP,
1530 REM  STOP ONE CLOCK, AND START
1540 REM  THE OTHER CLOCK.
1550 REM
1560 IF ( PEEK (-16304)<127) THEN
     GOTO 1710
1570 POKE -16339,0
1580 FOR I=1 TO 8.II= PEEK (-16336
     )+ PEEK (-16335)+ PEEK (-16336
     ): NEXT I
1590 PLAYER= ABS (PLAYER-1)
1600 MOVES=MOVES+1
1610 PRINT : PRINT
1620 PRINT "                MOVE NUMBER
     ";(MOVES+1)/2
1630 PRINT
1640 REM
1650 REM REDUCE PLAYER'S TIME BY 1
1660 REM AND SEE IF HE HAS ANY TIME
1670 REM LEFT.   IF HE DOESN'T, BEEP
1680 REM AND POINT OUT THAT HE HAS
1690 REM LOST THE GAME
1700 REM
1710 TIME(PLAYER)=TIME(PLAYER)-1
1720 IF TIME(PLAYER)>-1 THEN 1980
1730 FOR I=1 TO 500.II= PEEK (-16336
     )+ NEXT I
1740 L$=N$
1750 IF PLAYER=0 THEN L$=W$
1760 PRINT L$(1, LEN(L$)-1)," LOSES ON
     TIME AT MOVE NUMBER ";(MOVES+
     1)/2
1770 PRINT : INPUT "DO YOU WANT ANOTH
     ER GAME? ",A$: PRINT
1780 PRINT : PRINT : PRINT
1790 IF LEFT$(A$,1)="Y" THEN 900
1800 TEXT : CALL -936
1810 VTAB 5: PRINT "GOOD-BYE, ";
     N$: PRINT : N$=""
1820 VTAB 20: TAB 8: PRINT "FOR NOW A
     NYWAY!"
1830 END
1840 REM
1850 REM WE GET HERE ONLY IF A
1860 REM PLAYER'S DISPLAYED CLOCK IS
1870 REM TO BE DECREMENTED BY ONE
1880 REM SECOND.
1890 REM
1900 GOSUB 2020
1910 GOTO 1560
1920 REM
1930 REM
1940 REM THIS SUBROUTINE DECREMENTS
1950 REM A PLAYER'S CLOCK BY ONE
1960 REM SECOND.
1970 REM
1980 REM FIRST, DETERMINE WHAT EACH
1990 REM OF THE PLAYER'S CLOCK'S
2000 REM DIGITS SHOULD BE.
2010 REM
2020 T=TIME(PLAYER)
2030 CLOK2(0)=T/3600
2040 CLOK2(1)=(T-CLOK2(0)*3600)/
     600
2050 CLOK2(2)=(T-CLOK2(0)*3600-CLOK2(
     1)*600)/60
2060 CLOK2(3)=(T-CLOK2(0)*3600-CLOK2(
     1)*600-CLOK2(2)*60)/10
2070 CLOK2(4)=(T-CLOK2(0)*3600-CLOK2(
     1)*600-CLOK2(2)*60-CLOK2(3)
     *10
2080 REM
2090 REM NOW FIND THE Y COORDINATE
2100 REM OF THE PLAYER'S CLOCK.
2110 REM THEN, REMEMBER ANY DIGIT
2120 REM WHICH HAS CHANGED.
2130 REM
2140 Y=YPOS(PLAYER): FOR A=0 TO 4
2150 X=1 N=CLOK2(0.
2160 IF N=CLOCK(P) THEN GOSUB 690
2170 X=9.N=CLOK2(1)
2180 IF N=CLOCK(P+1) THEN GOSUB
     690
2190 X=17 N=CLOK2(2)
2200 IF N=CLOCK(P+2) THEN GOSUB
     630
2210 X=26 N=CLOK2(3)
2220 IF N=CLOCK(P+3) THEN GOSUB
     690
2230 X=34.N=CLOK2(4)
2240 GOSUB 690
2250 FOR I=0 TO 4
2260 CLOCK(P+I)=CLOK2(I)
2270 NEXT I
2280 REM
2290 REM THIS IS THE TIMING LOOP
2300 REM WHICH WE MUST USE SO THAT
2310 REM THE CLOCK IS RELATIVELY
2320 REM ACCURATE
2330 REM
2340 FOR I=1 TO 220: NEXT I
2350 RETURN
2360 END
```

Sensational Software

Sorcerer Software

Graphics Games (CS-5001) Six Exciting graphics games. Bombard an atom with protons and neutrons in **Nuclear Reaction.** Calculate the trajectory on your **Pie Lob** in this comical game: **LEM** is a real time lunar landing game and **Dodgem** is a checker-type strategy game. Bonus: an intriguing graphics demonstrator, **Bounce.** (8K) $7.95

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Apple II

Apple II Software

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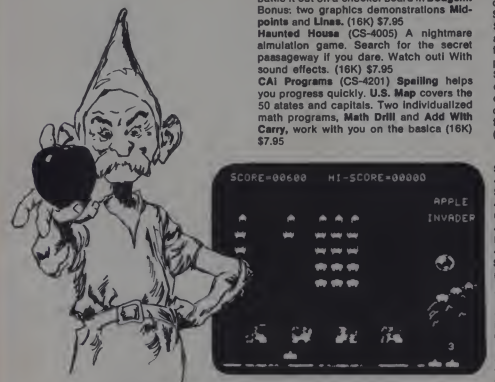

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Super Invader (CS-4006) Features high resolution graphics and antics by the moon creatures. A field of 55 aliens march across the screen showering you with lasers. As you pick them off one-by-one, your parapits wear away, and they whiz across the screen coming closer and closer to your level, with the **original** moon creatures and action twice as fast as any other invader game on the market. (32K) $19.95 Also runs on Apple II Plus

Space War (CS-4009) The object is the destruction of the opponents ship by missile fire, by collision with the sun, or by explosion upon re-entry from hyperspace. Space war offers you 5 different modes of operation including reverse gravity. Ships can circle behind the screen and reappear on the other side of the galaxy. All the features of the arcade game on your micro. (16K) $14.95

Apple II Software on Disk

Space Games and Sports Games (CS-4501) (32K) $14.95

Strategy Games and Brain Games (CS-4502) (43K) $14.95

CAI Programs and Know Yourself (CS-4503) (32K) $14.95

Haunted House and Outdoor Games (CS-4504) (32K) $14.95

Space War and Super Invadar (CS-4508) (48K) $29.95

Apple Gradebook (CS-4506) Apple Gradebook brings the speed and accuracy of the computer to the teachers traditional grading and record keeping procedures. Gradebook stores and maintains all student records, summarizes the state of the class as a whole, and lets you check on the progress of any individual. (32K) $24.95

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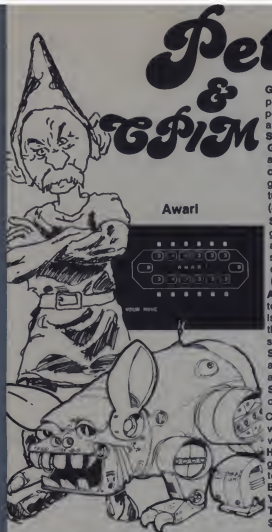

Pet Software

Graphics Games-1 (CS-1004) Five action packed graphics contests. Pursue your opponent through "Zap doors" in **Chase** or attempt a prison break in **Escape.** Includes **Sweep, Dart,** and **Snoopy,** (8K) $7.95

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CP/M Software

Original Adventure (CS-9004) One of the most innovative and challenging game simulations available for your CP/M system. As you search underground caverns for hidden treasures you'll have to cope with a giant clam, nasty little dwarves and other perils. If you wish you can even speak to the characters in French! (48K) $24.95 8" disk

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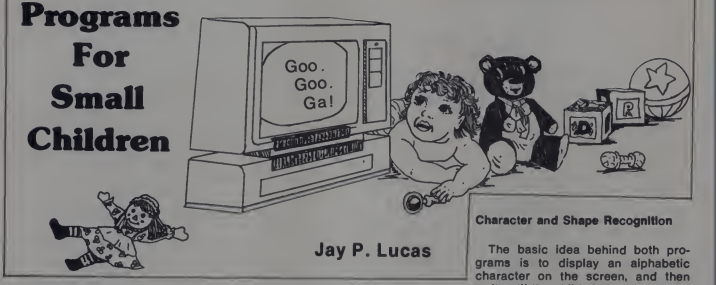
Programs For Small Children



Jay P. Lucas

At what age should one introduce his child to the wonders of the blinking light machine? The question is really an academic one, since the attraction of the flashing screen and all those bouncy buttons on the keyboard makes the computer irresistable to kids from the moment they become aware of them. Possibly a more practical article would be one addressed to fencing methods for keeping kids out of the computer room. But, alas, they do toddle in and even become quite annoyed at your monopolizing what obviously is a neat toy that should be theirs.

This article presents three programs designed for those rank novices in life. They were constructed as much to protect the computer as to enlighten the young child, for they deliver only specific responses to the infinite stimuli that a toddler can subject a machine to. If you somehow guard your on off switch and reset button, plus the deposit/examine toggles, if you have them, then your machine should be safe in their sticky little hands.

The "Baby Sitter"

The first program is little more than a playful machine sentry. It was written for a child who has just learned to crawl or walk over to the terminal and only knows that when he touches the keys he deserves a stimulating response. This he gets, in sight and sound, but no more (unless he finds Control-C, to crash into the system). It's the type of simple minded program I recommend everyone load in and run just prior to walking away from the terminal for a moment. The use of the WAIT statement in line 10 means the child does not have to remember to push the 'RETURN' button, even if he could find it. This program, plus some wet wipes to clean off the keyboard, is all you need for a child up to about the age of two.

The second and third programs are variants of each other, the second being by far the more versatile. These were designed for two to four year year olds, the younger half of the Sesame Street set. And, like the TV show, these programs emphasize teaching the kids the alphabet as well as having fun.

Jay P. Lucas, 3409 Saylor Pl., Alexandria, VA 22304.

```
 5 'THIS IS PROGRAM #1, for the Youngsters
 10 WAIT 16,1 ' WAIT UNTIL ANY INPUT IS SENSED FROM TERMINAL
 20 OUT 17,16:N=3^4:OUT 17,18'CLEARS DELTA DATA SCREEN
 30 PRINT"HI ZACK":PRINT:PRINT:PRINT
 40 FOR N=1 TO 20
 50 PRINT"BOO"
 60 NEXT
 70 GOTO 10
 80 'EXIT, OF COURSE, BY A CONTROL-C
OK
LIST

 10 REM THIS IS PROGRAM #3 TO PRINT LETTERS NORMAL SIZE ON THE SCREEN
 20 '
 30 '
 40 PRINT CHR$(16);CHR$(18) '  THIS CLEARS MY SCREEN
 50 PRINT:PRINT:PRINT:PRINT TAB(20);"HI  Z  A  C  K"
 55 FOR M=1 TO 900:NEXT M
 60 '
 70 '
 80 FOR N= 65 TO 90  '  THE ASCII CODES FOR THE CAPITAL LETTERS
 90 PRINT CHR$(16);CHR$(18)'  CLEAR SCREEN
 100 PRINT STRING$(10,10);TAB(20);CHR$(N)'10 line feeds, tab, then letter
 110 T= INP(17)
 120 T=T AND 127' zeroes the 8th bit
 130 IF T<> N AND T<> N+32  THEN 110' small or capital letter
 140 PRINT :PRINT:PRINT:PRINT:PRINT "V  E  R  Y   G O O D"
 145 FOR M= 1 TO 40 :PRINT CHR$(7):NEXT M 'bell
 150 NEXT N
OK
```

Character and Shape Recognition

The basic idea behind both programs is to display an alphabetic character on the screen, and then wait until the child pushes the proper key with that character on the keyboard. If an adult or older child is present, he can sound out the letter while it is being displayed and thus help the child work on pronunciation. Program 2 derives its versatility by its ability to actually draw out the characters in large strokes on the screen. To perform, though, it requires a terminal with absolute (sometimes called direct) cursor positioning, such as the Soroc, the Intertube, the new SWTPC, one of the integrated computer/terminal units, or the like. I discovered my used Delta Data airline-type terminal had this feature three years after purchasing it while stumbling around the user's manual looking for another control character code. If your device is

Children, cont'd . . .

```
1  REM THIS IS PROGRAM 2, WHICH WRITES LARGE LETTER FORMS ON THE SCREEN
5 PRINT CHR$(16);CHR$(18) ' This clears my screen
6 '
8 ' SAMPLE DATA     LETTER, No. of strokes, Z,X1,Y1,X2,Y2(all for first
stroke),   Z,X1,Y1,X2,Y2(for second stroke) etc.
10 DATA A,4,0,3,7,3,16,0,3,10,14,10,0,14,7,14,16,1,3,9,14,9
20 DATA B,6,0,3,7,3,16,0,3,7,8,7,0,3,16,8,16,0,3,10,8,10,1,8,7,8,10,1,9,
10,9,16
30 '
40 '
50 '
399 DATA &
400 PRINT"SCREEN WRITER OF LETTERS, KNOWN AS 'SCREEN'."
415 PRINT "I WILL NOW PRINT OUT LETTERS. PRESS THE CORRESPONDING LETTER
ON THE KEYBOARD AFTER I FINISH MINE."
418 PRINT CHR$(16);CHR$(18)  '  THIS CLEARS MY TERMINAL'S SCREEN
419 READ L$
421 IF L$="&" THEN PRINT "BYE BYE" :END
500 READ ST  'No of strokes
510 FOR A=1 TO ST
520 READ Z,X1,Y1,X2,Y2
530 GOSUB 1000
540 NEXT A
550 X=1:Y=25:GOSUB 1500:PRINT " PRESS THE LETTER."
560 F=INP(17):IF F>127 THEN F=F-128
570 F$=CHR$(F):IF F>32 THEN FF$=CHR$(F-32) ELSE FF$=F$
575 IF L$=F$ OR L$=FF$ THEN PRINT "GOOD BOY" : GOTO 418
578 GOTO 560
600 X=30:T=25:GOSUB 1500:END
998 '
999 '
1000 ' THIS IS SCREEN =  A SUBROUTINE FOR WRITING FORMS ON THE SCREEN
1002 ' INPUT : X1,Y1 beginning coordinates; X2,Y2 ending coordinates of
        the stroke.   Z>0 means straight stroke,Z<1 implies arc up or to
        the right, Z= -1  implies arc down or to the left.
1010 IF Z<>0 THEN 1320
1020 IF X1 <> X2 THEN  1100
1030 X=X1
1040 FOR N= 1 TO (ABS (Y1-Y2))+1
1050 IF Y1<Y2 THEN Y=Y1 -1 +N  ELSE Y=Y1+1-N
1060 GOSUB 1500
1070 NEXT N
1080 GOTO 1480
1090 '
1100 IF Y1 <> Y2 THEN 1180
1110 Y=Y1
1120 FOR N=1 TO (ABS (X1-X2))+1
1130 IF X1<X2 THEN X=X1 -1+N ELSE X=X1+1-N
1140 GOSUB 1500
1150 NEXT N
1160 GOTO 1480
1170 '
1180 IF ABS(X1-X2)>ABS(Y1-Y2) THEN 1260
1190 FOR N= 1 TO (ABS(Y1-Y2))+1  'for every Y line
1200 IF Y1<Y2 THEN Y=Y1 -1 +N ELSE Y=Y1+1-N
1210 IF X1<X2 THEN X=X1 + INT((X2-X1)/(Y2-Y1)*(Y-Y1))
        ELSE X=X1 - INT((X2-X1)/(Y2-Y1)*(Y1-Y))
1220 GOSUB 1500
1230 NEXT N
1240 GOTO 1480
1250 '
1260 FOR N= 1 TO (ABS(X1-X2)) + 1  'for every X row
1270 IF X1<X2 THEN X=X1 -1 +N ELSE X=X1 +1 -N
1280 IF Y1 < Y2 THEN Y= Y1 + INT((X-X1)*(Y2-Y1)/(X2-X1))
        ELSE Y= Y1 - INT((X1-X)*(Y2-Y1)/(X2-X1))
1290 GOSUB 1500
1300 NEXT N
1310 GOTO 1480
1315 '
1320 IF X1 <> X2 THEN 1400
1330 R=(ABS(Y1-Y2))/2
1340 FOR N=1 TO (ABS(Y1-Y2)) + 1 'for each Y
1350 IF Y1<Y2 THEN X=X1+N-1:DX=ABS(Y1-R-Y) ELSE Y=Y1-N+1:DY=ABS(Y2+R-Y)
1360 DX=INT(SQR((R^2)-(DY^2)))
1370 IF Z>0 THEN X=X1+DX ELSE X=X1-DX
1380 GOSUB 1500
1390 NEXT N:GOTO 1480
1400 IF Y1<Y2 THEN PRINT "ERROR. Points must be horiz or vert for circu
lar joining.":STOP
1410 R=(ABS(X1-X2))/2
1420 FOR N=1TO (ABS(X1-X2))+1 'for each X
1430 IF X1<X2 THEN X=X1+N-1:DX=ABS(X1-R-X) ELSE X=X1-N+1:DX=ABS(X2+R-X)
1440 DY=INT(SQR(R^2 - DX^2))
1450 IF Z>0 THEN Y=Y1-DY ELSE Y=Y1 + DY
1460 GOSUB 1500
1470 NEXT N
1480 RETURN
1490 '
1500 B=18T10:OUT 17,16:B=7T15:OUT 17,14:B=5T14:OUT 17,X:B=8T10:OUT 17,Y:
B=3T15:OUT 17,A2 'This subroutine places a * at position X,Y
1510 FOR J=1 TO 225:NEXT J
1520 RETURN
```

so equipped, then Program 2 will draw lines or arcs on the screen between any two points you specify within a matrix 40 characters across and 21 lines down from the traditional (upper left) home position. The letters are each formed from a number of these lines put together in a single data statement. If you do not have absolute cursor positioning, the same affect can be accomplished with PRINT statements and the judicious application of the TAB function.

They toddle in and become quite annoyed at your monopolizing what obviously is a neat toy that should be theirs.

The potential application of Program 2 are actually much broader than the display of only alphabetic characters. The subroutine at line 1500 will join any two points in the screen matrix by a straight (or straight-as-possible) line, or a circular arc, if requested. If you indicate the arc drawing option, the two points must be either mutually horizontal or vertical; however, the arc can be specified to be either concave up or down, or right or left. Thus, the program can be adapted to draw large circles, squares, airplanes or what-have-you, and respond to spelled out descriptions of the figure. Of course, the INP statement on line 560 would then have to be replaced with an INPUT statement to accept the whole word responses, in which case older children can be taught to end their answers with 'RETURN' to effect the word comparisons.

More Character Recognition

Program 3 is a smaller version of the character seeking Program 2. It was designed to present the alphabet sequentially in regular character size figures, rewarding the child in sight and sound when correctly pushing the key with that character printed atop. It is a no-nonsense, no-frills program that is quick and easy to enter and easy to impiement on any system.

The three programs were written in ALTAIR Disk Basic, 4.0, and run on an Altair 8800 a using a standard CRT terminal on channels 16 (control) and 17 (data). The system has been child tested on American models, 1.6 and 2.7 years old, meeting with great success. The kids learned the alphabet and the computer survived. □

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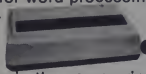

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The Temple of Apshai

Roxton Baker

"The Temple of Apshai" is the third major game from Automated Simulations. Like its two predecessors, Starfleet Orion and Invasion Orion, it is available for both the TRS-80 and the PET. My direct experience with the Temple is on the TRS-80, but I believe the PET version is very similar.

The Orion games have, as of this writing, remained relatively unknown. They are not heavily promoted, have recieved little attention in magazines and are somewhat expensive. The Temple, being priced even higher, less familiar in concept and less well advertised, may suffer the same result.

This is unfortunate, as these are all games of unusual quality and significance. The three could more fairly be called "supergames" in company only with Scott Adams' excellent Adventure series. All of these, the Temple in particular, are of great internal complexity and detail. Though not in itself apparent to the user, this sophistication results in a game action inherently more satisfying than that of the Star Treks, arcade shoots and graphics extravaganzas that form the body of light TRS-80 software.

This review will discuss how the game is built, how it works internally and how well it plays. It is impressive in all of these aspects, though its pacing suffers from some speed limitations discussed later.

It is not surprising that all of the supergames make use of a similar structure. One "master" program creates and manages the fantasy world in which you play. The master finds data for this scenario in one of several available data files. Thus, there are several available worlds. In each world, or adventure, the juxtaposition and attributes of locations, treasures, monsters, etc., can be totally different. However, the objective of the game and the structure (if not the detail) of the commands you issue stay the same. This technique allows the creation of many different games without requiring the authors to rewrite, and the players to relearn, the basic rules. One would hope for the further advantage, yet to be seen, of not requiring the customer to repurchase the master program.

The Temple of Apshai, then, is comprised of a master program ("DUNJONMASTER") and four data files. The vendor assures us that "dunjon" is an archaic form of our "dungeon," and not some "lo-kiass kwikee" spelling. In fact, one of its meanings is "labyrinth," which applies here to the four different scenarios (Levels 1-4) that DUNJONMASTER can create from the data files.

Each level is a maze of connected rooms and hallways. Distributed throughout are various treasures, traps and monsters. These four separate labyrinths provide you with the opportunity to build the wealth and character of the adventurer whoseidentityyou'veassumed. Building up this character is, in fact, the entire object and purpose of the Dunjonquest system; the four-leveled Temple of Apshai is the first available exercise-ground.

Readers familiar with the popular game of "Dungeons and Dragons," and its derivatives, will recognize the idea immediately. The manual explains that the Dunjonquest system is a mechanization of D&D wherein the computer assumes the most important duties of the "Dungeon Master." These involve creating the dungeon and managing both the attributes of the characters, and the results of their play. Although lacking the full panoply of D&D, and its interplay of a multitude of character types, the computer simulation is complete enough to allow the rough translation of individual characters from the standard game into the Temple.

The concept of the player's "character" is most important to this game. Character is defined in terms of six numerical parameters, the values of which can range from 3 (abysmal) to 18 (super). These parameters are:

Intelligence

Intuition

Ego

Strength

Constitution

Dexterity

Each of these bears in its own way on the outcome of any event or action involving the character.

A seventh parameter, "experience," permanently modifies the effect of the six defining values. Experience points accrue from your character's exploits in the dungeon, and are used as a positive weighting factor. Thus, as you adventure, your character seems to become a little more intelligent, a little stronger, etc. This is the primary way that a character is built.

Also, while in the dungeon, you search for money, magical items and anything else that might help you. You may find a healing potion that will cure your wounds, or a magic sword more deadly than your factory piece. All of these can make you a stronger adventurer but they can be lost. Many treasures have a defined monetary value. At a central location (the inn) you can sell them in order to buy better (but heavier) arms and more medicine. There you must deal with the Innkeeper.

INNKEEPER is a seperate program that runs on a startup and

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Apshai, cont'd . . .

whenever you leave the dungeon. If it is the beginning of a new game and you do not have a character, the innkeeper will create one. Your new character will be endowed with a random set of six defining values, and with a small amount of silver. Or, you may have left the dungeon in mid-game, to cash in your booty. In either case, it is at the Inn that you are able to bargain your available money for arms and equipment. A shrewd merchant, the innkeeper will size up your character and deal accordingly. Don't be surprised at anything he says or does.

Upon leaving the Inn, you have a choice of dungeon levels to enter. New characters, inexperienced and ill-equiped, should venture only into the first level dungeon of the Temple (the Gardens). Good treasures are scarce here, but the monsters of this level are not as dangerous as on the other levels. It is when you enter the first room of the dungeon, and begin to meet monsters, that the action begins.

The TRS-80 screen display within the dungeon is schematic in form: a top view of the room around you and the connecting halls. A marker indicates your position and heading. You may also see the symbol of a treasure. On the right is displayed your current fatigue, wounds and the weight you carry. A number of single-keystroke commands are available for turning, movement and other actions.

The eye-popping instuctional manual ("Book of Lore") details the appearance and contents of each of the fifty-odd rooms(!) on each of the four levels (!!). It tells you of the many possible traps, and of the twenty treasures of each level and their value. It describes the twenty-three exotic monsters, differing in ferocity and toughness, that may attack you in the temple. And it includes everything else you would normally expect of a manual, in spades. This book even surpasses the high standards of the rest of the game— an excellent effort by the authors.

The mechanics of running the Temple programs on a TRS-80 should be mentioned. As of 9/79, the version you receive is on tape. You must load INNKEEPER to define your character, and then DUNJONMASTER to begin play. Both of these are lengthy Basic programs. INNKEEPER loads in nine data blocks (comprising one data file) with which DUNJONMASTER creates the dungeon level you requested. This all takes about ten minutes, just for tape loading. My copy was perfect, but tapes deteriorate with use. To make a backup copy you must be able to duplicate the 36 (total) data blocks. This will require utility software such as CLONE from Mumford. These are not complaints; there is a price to pay for running such a complex system of programs from tape.

Disk users must load the programs and data files onto disk. The necessary utility software is listed (but not supplied on tape). Then changes must be carefully made to INNKEEPER and DUNJONMASTER to allow for disk I/O. Disk users can save the state of dungeons that they leave in a new data file. Tape data files are hard to use, so the ability to create them was left out of the already crowded (16K) tape versions.

My TRS-80 Disk Basic would not read the Basic programs on the original tape. I had to first load them in under Level II Basic, and save them off to a blank tape. Then I read these new copies in under Disk Basic, and put them on disk. This procedure took time and created bugs. You are likely to have the same problem. If you want a true disk version of the Temple, contact Automated Simulations. They may make one available if there are enough requests.

Is this supergame a good game? Yes. In fact, it is one of the best games available for the TRS-80. It is interesting to learn, and both fun and challenging to play. The complexity of the action and the scenarios is beyond simple description, but is simply presented.

I might suggest a few improvements to the actual implementation of the Temple on the TRS-80. A higher-speed graphics technique (such as poke graphics) should be used in the drawing and redrawing of rooms. This occurs often and takes about thirty seconds each time, resulting in a significant decrease in overall game speed. The use of a TRS-80 clock speed-up kit (as offered by Mumford or Archbold) helps, but even when cut by one third, the delay is too long. Compare this with Adams' machine-language adventures, where location changes are instantaneous and you move as fast as you type.

Another nice addition to the Temple would be cassette-port sound effects for traps, monster attacks, etc. This would add to the fun, but there may not be room for such programming in 16K.

The documentation for the Temple needs no improvement. The beautiful 56-page manual explains everything, and does it well. This adds great value to the game. Beyond that, the friendly people at Automated Simulations are available by phone for questions and comments. And, they can spell— a skill unheard of in programmers.

That this is such a nice package indicates that the authors are game-players first, and computerists second. Today's serious gamers expect their wargames, role-playing games, etc. to be carefully designed, thoroughly researched, adequately tested, well-documented and handsomely produced. Today's computer hobbyist merely hopes for a game not totally dull, with a legible page of instructions. Both pay the same. The disparity in products arises from the twenty-year lead that the gamers have.

The price is high, but the Temple stands up well in a value comparison with the competition. You could easily do much worse. Computer game authors too often confuse programming effort with programming worth. The consumer discovers this error in judgement at his own expense. I would like to see lower prices on all these programs, particularly those supplied without such fine documentation. People just cannot afford all of the good software that they should have.

The Temple of Apshai is available for TRS-80 (reviewed here) and for PET. It is priced at $24.95. The TRS-80 tape version runs in 16K; the disk version in 32K. They are identical. The PET version requires 32K. Dealers may have it, or you can order directly from:

Automated Simulations
P.O.Box 4232
Mountain View, California 94040
415-964-8021

Other vendors mentioned in this review are:

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Actual photo of screen during a Dunjonquest game

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puzzles & problems

Let's start right out with a puzzle from Merlin's new book entitled "Merlin's Puzzler 3." In this latest excursion to Merlin's Isle we have the opportunity to visit the yearly puzzle convention. In The Hall of Talking Statues there is a bust called "The Kitchen Sink." Merlin's court artist, Ector Pendragon, raided the kitchen one night in a fit of artistic creation and made off with just about every utensil in the place. The next day Merlin found this bust on his desk. Artistically, it speaks for itself. (see the figure at the right). If you press the button at the base of the figure it will propound a puzzle in rhyme for you to solve. Let us see if we can solve its latest profundity.

The Kitchen Sink

With thieves I consort,
With the vilest, in short,
I'm quite at my ease in depravity;
Yet all divines use me,
And savants can't lose me,
For I am the center of gravity.

Crossing The Desert

The famous explorer, Wayland Fenel, will soon be crossing the Sahara Desert in a four wheel truck with specially designed and built tires. Each tire is guaranteed for 12,000 miles. The total length of the trip will be 27,000 miles. Explorer Fenel does not want to run any of the tires for more than 12,000 miles and, since weight is an important factor for him, he doesn't want to carry any more tires than necessary. What is the minimum number of tires he can use to safely accomplish his goal?

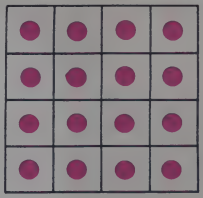
This puzzle is from Mr. Henry Rakoff of Peoria, Illinois. A copy of one of the "Merlin Puzzler" books will be sent to Mr. Rakoff for his effort.

The Flatland Puzzle

Attention, puzzle fans, the lad on the right is trumpeting the praises of a new exercise in Flatland befuddlement. The problem is simple enough. On the banner hanging from his trumpet is a design made up of three interlocking squares. You must duplicate this design by drawing one continuous line without lifting your pencil from the paper. The zinger is that at no point may one part of the line cross over any other part of the line. (This puzzle is from Merlin's Puzzler 2).

Dot's Enough

In the October issue of **Creative Computing** Merlin presented a problem that challenged the reader to draw six connecting straight lines that would pass through all sixteen dots depicted in the diagram to the right. One of our valued readers, Professor James R. McGraw of Livermore, California, has come up with a solution that goes Merlin not one, but two better. Professor McGraw has solved the puzzle by using only four connecting straight lines. Professor, a copy of "Merlin's Puzzler" is on the way! And now, puzzlers, see if you can come up with the Professor's answer.



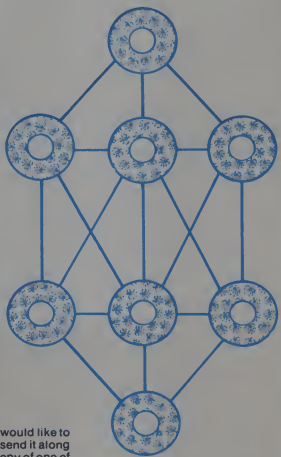
WOOD
JOHN
ENGLAND

A Postal Puzzle

The following letter is said to have been sent to a gentleman in Great Britain. True to this kind of "Ripley" oddity the letter was promptly delivered to the addressee. Can you decipher the complete address?

The Plate Problem

From Merlin's neighbor, Bill Iorio, a scion of the famous Iorio glass founding family of Flemington, New Jersey, comes an interesting problem. In the illustration above I have laid out eight glass plates. There are several connecting lines between them. Your puzzle is to arrange the numbers 1 through 8 on the plates in such a manner that no two consecutive numbers will be joined by any one of the lines. If your thinking cap is on straight you should solve this one in five minutes. (This puzzle is from Merlin's Puzzler 1).



An Aggravating Uncle

An uncle with a turn for figures presented his youthful nephew with a box of soldiers, but made it a condition that he should not play with them till he could discover, on arithmetical principles, how many the box contained. He was told that if he placed them three in a row, there would be one left over; if he placed them four in a row, there would be two left over; if five in a row, three left over; if six in a row, he would have four left over. The total number was under 100.

How many soldiers did the box contain? (This puzzle is from the book "Puzzles Old and New" by Professor Hoffmann).

Remember, readers, if you have a favorite puzzle that you would like to share with the other readers of **Creative Computing** then send it along to Merlin. If he uses your puzzle he will send you a free copy of one of his books.

Answers on page 192.

Your Editor, Charles Barry Townsend

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

Two-Person Games

Two-person games, such as chess, backgammon and checkers, are usually more interesting and challenging than one-person games, and it is to these that we shall be devoting most of our studies. The introduction of a second player creates manifold difficulties that do not exist in a one-person game, but fortunately for today's programmers these difficulties have been extensively analyzed in the computing literature and the problems are now rather well understood.

The Two-Person Game Tree

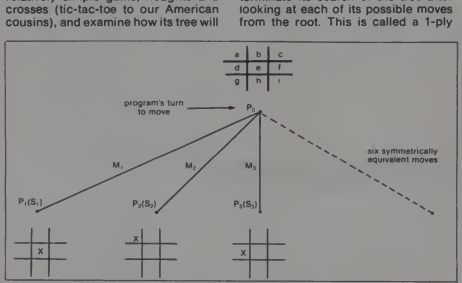
Game trees become more complex structures when an opponent appears on the scene. Let us consider a relatively simple game, noughts and crosses (tic-tac-toe to our American cousins), and examine how its tree will look after a move or two of look-ahead. We shall assume that "cross" moves first.

From the initial position there are three essentially different moves:

1) e (the centre)
2) a,c,g, and i (the corners)
3) b,d,f, and h (middle of the edges)

On the first move, any of group 2 is equivalent to any other, since all four moves are merely reflections or rotations of each other. Similarly, within group 3 all moves are equivalent. This technique of utilizing symmetry to reduce the magnitude of the problem is worthwhile when programming a game that lends itself to a symmetrical analysis. By reducing the number of moves that need to be examined at any point in the tree you will be cutting execution time dramatically, because the combinatorial effects of tree growth are enormous. The savings in time that can be achieved through using symmetry can be extremely valuable when improving the performance of the program by making its evaluation function more sophisticated (and slower).

If we so decide, our program can terminate its search of the tree after looking at each of its possible moves from the root. This is called a 1-ply search because the program only looks one "ply" deep. (The term "ply" is used to denote a single move by one player.) In order to decide which move to make, out of m_1, m_2, and m_3, the program will then apply its evaluation function to the three positions at the lower end of the tree (these are called the terminal positions). Whichever position had the best score will then be assumed to be the most desirable position for the program, and the program will make the move leading to that position.



How should we set about designing our evaluation function? This is one of the fundamental problems in game playing programming because a good evaluation function will help the program to make good judgements, and hence to play well, even though the depth of look-ahead may be shallow. A poor function, on the other hand, might well result in poor play even with a deep and time-consuming search of the game tree. It is therefore worthwhile to put some careful thought into the design of the evaluation function, and the following example should illustrate the type of thinking that is necessary.

The object of the game is to create a row of three of your own symbols. We shall call this a "3-row." The next most important thing is to prevent your opponent from making a 3-row, which means that he should not have a 2-row after you move (a 2-row has two symbols of one player and one empty space). Next most important is the creation of your own 2-rows; then it is important not to leave your opponent with 1-rows (one of his symbols and two empty spaces); and finally you should try to create your own 1-rows. All of these features could well be incorporated into a noughts and crosses evaluation function.

If we denote the number of cross' 3-rows by c_3
the number of nought's 2-rows by n_2
the number of cross' 2-rows by c_2
the number of nought's 1-rows by n_1
and the number of cross' 1-rows by c_1
then one measure of the merit of a

Games, cont'd . . .

position from cross' point of view would be

$c_3 - n_2 + c_2 - n_1 + c_1$

but this measure has one obvious drawback. It does not allow for the fact that the term c_3 is more important than n_2, which is more important than c_2, and so on. This can be done by multiplying each of the terms in the evaluation function by some numerical weighting, in such a way that the weightings (hopefully) reflect the relative importance of each feature. The evaluation function then becomes

$(k_3 \times c_3) - (k_2' \times n_2) + (k_2 \times c_2) - (k_1' \times n_1) + (k_1 \times c_1)$

where k_3, k_2', k_2, k_1' and k_1 are the numerical weightings. Since one c_3 is worth more than all the n_2s in the world, i.e., a winning row is more important than any number of 2-rows, we can set k_3 to be some arbitrarily high number, say 128. By studying the game for a few minutes it is possible to see that if one side has a 3-row, the other side may have at most two 2-rows, so to reflect the relative importance of one's own 3-rows and enemy 2-rows it is necessary to ensure that $k_3 > 2 \times k_2'$. We can therefore try $k_2' = 63$. (If one side has a 3-row and his opponent two 2-rows, the opponent will not have any 1-rows to upset this scoring mechanism.)

If there are no 3-rows, but one side only has a 2-row, his opponent cannot have more than three 1-rows, as in the following situation:

So $k_2' > 2 \times k_1$ and $k_2 > 2 \times k_1'$

and we can try $k_2 = 31$, $k_1' = 15$ and $k_1 = 7$. Remember that we can modify these values in the light of experience with the program, the values 128, 63, 31, 15 and 7 are merely our first estimates. Having made these estimates we should then ensure that the score for a noughts and crosses position will never cause an overflow, and we do this by setting up positions which will have the largest and smallest possible scores, and counting the number of 3-rows etc. in each. This is a very important part of evaluation function design, and I remember a chess programmer who could not understand why his program crashed whenever it was winning or losing by a great margin — he had forgotten to allow for the possibility of one side being two queens ahead and when that happened his evaluation calculations created an overflow.

If we now return to Figure 1 we can see that each of the three possible first moves results in the creation of a different number of 1-rows. Applying the evaluation function

$128 \times c_3 - 63 \times n_2 + 31 \times c_2 - 15 \times n_1 + 7 \times c_1$

to the three positions P_1, P_2 and P_3 we find that in each case $c_3 = n_2 = c_2 = n_1 = 0$, and therefore:

$S_1 = 128 \times 0 - 63 \times 0 + 31 \times 0 \quad 15 \times 0 + 7 \times 4 \quad 28$
$S_2 = 128 \times 0 - 63 \times 0 + 31 \times 0 \quad 15 \times 0 + 7 \times 3 \quad 21$
$S_3 = 128 \times 0 - 63 \times 0 + 31 \times 0 \quad 15 \times 0 + 7 \times 2 \quad 14$

and S_1 is the most desirable of these scores so the program would make the move m_1 to reach position P_1 (i.e. it would play in the center).

The 2-Ply Search

The 1-ply search is the simplest form of tree search in a two-person game, but it does not take into account the fact that once the program has made its move there is an opponent waiting to reply. It may be the case that a move which, superficially, looks strong, is seen to be an error when we look a little bit further into what may happen. The 2-ply search will "see" more than the 1-ply search and so moves made on the basis of a 2-ply search will be more accurate (provided the evaluation function is not a disaster area). How can we take into account this extra dimension of the opponent's move?

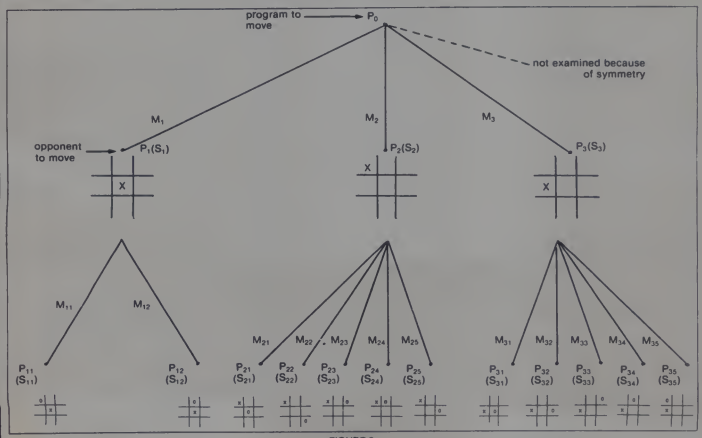


FIGURE 2.

Games, cont'd . . .

Let us look at the same tree, grown one ply deeper, i.e., to a total depth of two ply — one move by the program and one move by its opponent.

If "cross" plays in the center, "nought" has two essentially different replies, in a corner or on the middle of an edge (represented by positions P_{11} and P_{12}, respectively). If "cross" makes his first move in a corner (P_2), "nought" will have five different reply moves (m_{21} m_{22} m_{23} m_{24} and m_{25}) leading to positions P_{21}, P_{22} P_{23} P_{24} and P_{25}. After "cross" plays move m_3, "nought" again has five replies. It is easy to see how the tree grows. In last month's example, the 8-puzzle, the *branching factor* (number of branches from each position on the tree) was never more than three. Here it is more, even allowing for symmetry.

Let us consider how the program might analyze the situation. It uses its evaluation function to assign scores to the terminal nodes P_{11} and P_{12}. In each case $c_3=n_2=c_2=0$. In position P_{11}, $c_1 = 3$ and $n_1 = 2$. In position P_{12}, $c_1 = 3$ and $n_1 = 1$.

We now have:

$S_{11} =(-15 \times 2)+(7 \times 3) = -9$
$S_{12} =(-15 \times 1)+(7 \times 3) = 6$

This information indicates that if the program is sitting in position P_1, with its opponent to move, its opponent may choose between moves m_{11} (leading to position P_{11} of value -9) and m_{12} (leading to position P_{12} of value 6). The program's opponent wants to minimize the score and so it would choose move m_{11}, for a score of -9, and so the real value of position P_1, represented by S_1, is this *backed-up* score of -9.

If we apply the evaluation function to positions P_{21} . . . P_{25} we will get:

$S_{21} =(-15 \times 3) + (7 \times 2) = -31$
$S_{22} =(-15 \times 2) + (7 \times 2) = -16$
$S_{23} =(-15 \times 2) + (7 \times 2) = -16$
$S_{24} =(-15 \times 1) + (7 \times 2) = -1$
$S_{25} =(-15 \times 2) + (7 \times 3) = -9$

Wishing to minimize the score when making its move from P_2, the program's opponent would choose move m_{21}, leading to position P_{21} and a score of -31.

Similarly, when applying the evaluation function to positions P_{31} . . . P_{35}, we get:

$S_{31} = -38$
$S_{32} = -8$
$S_{33} = -31$
$S_{34} = -16$
$S_{35} = -23$

so the program's opponent, when making its move from P_3, would choose move m_{31} for a score of -38.

We now have the following situation. If the program makes move m_1, its opponent, with best play, can achieve a score of -9. If the program plays m_2 then its opponent can achieve a score of -31. If the program plays M_3 then its opponent can score -38.

Just as the program's opponent wishes to minimize the score, so the program wishes to maximize the score. The program must now choose between m_1 (for -9), m_2 (for -31) and m_3 (for -38). Since the maximum of these three values is -9, the program will play move m_1, and the backed-up score at the root of the tree will be -9. This represents the score that will be achieved with best play from both sides.

This procedure of choosing the maximum of the minimums of the maximums of the minimums . . . etc. is known, not surprisingly, as the *minimax* method of tree searching. It is an algorithm that finds the move which will be best, assuming correct play for both sides, providing that the evaluation function is reasonably accurate.

Memory Requirements for a Minimax Search

One of the great advantages of the minimax type of search is that it is not necessary to retain the whole tree in memory. In fact it is necessary to keep only one position at each level of look ahead, together with a certain amount of information about the moves from each of these positions. Let us see how this works for our 2-ply tree.

From the initial position P_0, the program generates the first move for cross, to position P_1. Before proceeding to the other moves that cross can make, the program generates the first reply move by nought, m_{11}, reaches position P_{11} and assigns it the score S_{11} (-9). This is the first terminal node to be evaluated, so the score of -9 represents the best score found so far and this is the score that is assigned to S_1. Since P_1 is the first move at 1-ply to be examined, this score of -9 also represents the best score found so far at the 1-level, and this is the score assigned to S_0.

The program now looks at P_{12}, which we sometimes refer to as the brother of P_{11} (and P_1 is father to both of them). The program determines the score S_{12}, compares this value (6) with the best score found so far at this level (-9) and finds the -9 preferable, so the scores S_1 and S_0 need not be adjusted at this stage. The program next looks for another brother to P_{11}, but finding none, it goes back up the tree and looks for a brother to P_1, which leads it to position P_2 and then to P_{21}. On the way down this part of the tree the program assigns to P_2 a score of -9, since this is the best that can be achieved so far. When looking at P_{21} the program finds a score of -31, which is better for the program's opponent than -9 and so S_2 is now set to -31.

Note that as this process continues, the brother nodes that have been examined in the past no longer serve any useful purpose and so they can be discarded. At the present point in our search we no longer need the brother of P_2 that has already been examined (P_1), so P_1 and its successor nodes are not kept in the tree at this time. The tree, at this moment, comprises only P_0, P_2 and P_{21}.

Having evaluated P_{21} we throw it away and look at P_{22}, which has a score of -16. The program's opponent would not prefer this to the -31 already discovered, and so no change is made to S_2. The program discards P_{22} and replaces it with P_{23} for a score of -16, also of no value to the program's opponent, and this is replaced in turn with P_{24} and P_{25} which also produce no change in S_2. Since S_2 (-31) is less attractive for the program than the best score found so far (-9 at S_0), the score at P_2 is not backed-up. P_2 itself is discarded to make way for P_3, and the same process continues, with the program looking in turn at the scores of P_{31} . . . P_{35}.

Task for the Month

The evaluation function for noughts and crosses which we have been using in this example has five features. Try to devise evaluation functions with as few features as possible, for playing noughts and crosses with (a) a 2-ply search; and (b) a 3-ply search, and test your functions by writing a program to play the game using a minimax search. The fact that deeper search will sometimes compensate for a less powerful evaluation function may make it possible for you to reduce the number of features while still writing a program that can play perfectly. If you complete this task, or even if you do not, you might like to think of a way to make the search much faster. This will be the subject of next month's article. □

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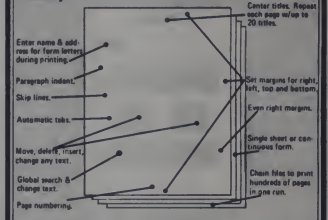

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(frā'kas) n.l. a noisy dispute or fight; loud quarrel or disturbance; brawl; 2 a fantastic computer adventure challenging any number of players to explore a secret maze packed with hidden treasure, guarded by wily adversaries...

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Apple-Cart

Chuck Carpenter

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Put It There

Using the POKE command to put a byte of data into memory is quite useful. Examination of a variety of Apple programs will illustrate the point. Some programs which include musical segments for instance, use a series of POKEs to poke in the machine language routine that controls the pitch and duration values. This technique is fine for setting and resetting various program pointers and control bytes. But for longer routines, there are a couple of other techniques that are useful. One way is to use a combination of READ and DATA statements. Another is to use a string parsing routine to separate and POKE the data into memory. The economy of coding your program using a simple series of POKEs, or one of the other methods, will depend on how much work you want to do (or how much memory can be saved).

Just Plain POKEs

Using the tone generating routine as an example, the POKE statements required would take two program lines. Not too bad, but this routine is only 19 bytes long. Here's an example.

```
1500 REM
1510 REM  *** RANDOM TON
1520 REM  ********************
1530 REM
1540 POKE 2,173: POKE 3,48: POKE
     4,192: POKE 5,136: POKE 6,208
     : POKE 7,4: POKE 8,188: POKE
     9,1: POKE 10,240
1550 POKE 11,0: POKE 12,202: POKE
     13,208: POKE 14,246: POKE 15
     ,166: POKE 16,0: POKE 17,76
     : POKE 18,2: POKE 19,0: POKE
     20,96
1560 CALL -936: VTAB 12: TAB 14:
     PRINT "RANDOM TONES"
1570 IF PEEK (-16286)>127+1 THEN
     RETURN
1580 IF PEEK (-16287)>127+1 THEN
     1600
1590 GOTO 1570
1600 P= RND (100)+20:D= RND (100
     )+20
1610 POKE 0,P: POKE 1,D: CALL 2
1620 GOTO 1570
```

The program segment first loads the machine language routine from the series of POKEs starting at memory location 2. Each POKE uses a data pair representing the decimal value of the memory location and the data byte to be put in that location. Note that it is necessary to convert hexadecimal values to decimal with this method.

Program lines 1560 to 1580 are used to control the routine. Line 1570 examines pushbutton 2. If it's off then button 1 is examined in line 1580. If neither button is pressed, the program loops back to line 1570 and keeps checking. If button 2 is pressed the program ENDs or RETURNs if it's used as a subroutine. Line 1600 generates a random value for the pitch and duration of the tone to be played. The values have been adjusted so that extremes are held to a reasonable audio range. Line 1610 then POKEs the values for pitch and duration into memory locations 0 and 1 and CALLs the machine language program at memory location 2.

As long as button 1 is held down and button 2 is not pressed, random tones of random duration will be heard from the speaker. A listing of this program from the Apple II disassembler looks like this.

```
0002-  AD 30 C0    LDA   $C030
0005-  88          DEY
0006-  D0 04       BNE   $000C
0008-  C6 01       DEC   $01
000A-  D0 08       BEQ   $0014
000C-  CA          DEX
000D-  D0 FB       BNE   $0005
000F-  A6 00       LDX   $00
0011-  4C 02 00    JMP   $0002
0014-  60          RTS
```

If you use this range of memory for other than integer Basic programs you can clobber some routines. Locate the program in page 3 starting at address $300 (decimal 768). There is usually space available here (after DOS is loaded) for short programs. To use this program with Applesoft, change the random value generators to: P=INT((RND(1)*100)+20) and D=INT((RND(1)*100)+20).

READ and DATA

To do the same thing with the Applesoft READ . . . DATA combination, write the program something like this:

```
1000  REM  ** POKE DATA **
1010  REM
1020  LET MEMRY = 768
1030  READ BYTE: IF BYTE = 256 GOTO
      1100
1040  POKE MEMRY,BYTE
1050  LET MEMRY = MEMRY + 1
1060  GOTO 1030
1070  DATA  173,48,192,136,208,4,
      188,1,240
1080  DATA  8,202,208,246,166,0,
      76,0,3,96
1090  DATA  256
1100  RESTORE : RETURN
```

With this technique, the DATA statements contain the machine language program. Memory start is specified in line 1020 and incremented in line 1050. (Note the use of MEMRY as a variable. MEMORY would have looked like MEM OR Y because OR is a reserved word.) As long as no Byte value is greater than 255 ($FF) then the program continues to loop at line 1060. Only one POKE statement is used at line 1040. The advantage of using this method is in the addition of more Bytes of data. It is only necessary to add more DATA statements to increase the program to any size. Don't forget to RESTORE the READ . . . DATA pointer. An OUT OF DATA error would result when you tried to use the routine again. Another way to write this type of routine is shown below.

```
1000  REM  ** POKE DATA **
1010  REM
1020  FOR I = 768 TO 788
1030  READ J
1040  POKE I,J
1050  NEXT I
1060  RETURN
1070  DATA  173,48,192,136,208,4,
      188,1,240
1080  DATA  88,202,208,246,166,0,
      76,0,3,96
```

With this variation, you need to know the start and end addresses. Only the start address is needed with the first routine. Remember to convert the hexadecimal values in the program to decimal before including them in the DATA statements. Also, it is not necessary, except for clarity, to leave the escape value (256) on a separate line. A disadvantage is not being able to POKE in random with this routine.

String Parsing

Another way to put machine language programs into memory involves the use of strings. Again, using the tone generating program as an example, here's a way to write the program; first in Integer then in Applesoft.

```
1000  REM  ** Parse & POKE **
1010  REM
1020  LET LOC = 768
1030  DIM H$(32)
1040  LET H$ = "AD30C088D004C601F
      008CAD0F5A6004C"
1050  GOSUB 1100
1060  LET H$ = "000360"
1070  GOSUB 1100
1080  RETURN
1090  REM  POKE H$ values into me
      mory
1100  FOR I = 1 TO  LEN (H$) STEP
      2
1110  LET H1 =  ASC (H$(I)) - 176
1120  IF H1 =  > 9 THEN H1 = H1 -
      7
1130  LET H2 =  ASC (H$(I + 1)) -
      176
1140  IF H2 > 9 THEN H2 = H2 - 7
1150  POKE LOC,H1 * 16 + H2
1160  LET LOC + LOC + 1
1170  NEXT I: RETURN
```

For Applesoft, the string H$ does not have to be dimensioned so line 1030 will not be needed. Down to line 1090, the program otherwise remains the same. The string parsing routine has a couple of changes. This is how it looks:

```
1100  FOR I + 1 TO  LEN (H$) STEP 2
1110  LET H1 =  ASC ( MID$ (H$,I,
      1)) - 48
1120  IF H1 =  > 9 THEN H1 = H1 - 7
1130  LET H2 =  ASC ( MID$ (H$,I +
      1,1)) - 48
1140  IF H2 > 8 THEN H2 = H2 - 7
1150  POKE LOC,H1 * 16 + H2
1160  LET LOC + LOC + 1
1170  NEXT I: RETURN
```

In both examples, the beginning address called LOC is $300. Additional program lines are needed to provide the pitch and duration values. Store these at two memory locations at the beginning or end of the machine language routine. I left them at 00 and 01 in this program.

The parsing-POKEing subroutine does a number of things for you. First, it converts each character to the ASCII value in lines 1110 and 1130. Next, the value is adjusted to keep the number within the HEX range of 0 to 15. This is done in lines 1120 and 1140. In line 1150, the ASCII pairs are converted to HEX numbers and POKEd into memory at location LOC. The difference in the numbers subtracted in lines 1110 and 1120 comes from the way each version of Basic handles the keyboard strobe bit. Integer leaves it on the ASCII value; Applesoft does not. The process continues until all the data pairs represented in string(s) H$ are put in memory.

This routine has all the advantages of the READ . . . DATA routine. You can easily change the program being put in memory by changing the contents of the strings. Also, you do not have to convert the HEX values to decimal; the program does all conversions for you. Be careful when entering the data into the strings. It's easy to get mixed-up because of the compacted form used. Enter one string of 32 characters at a time. Then check it carefully **before** you press RETURN to enter it.

Using a technique like this, you can overlay the same small area of memory with a variety of programs. CALL a subroutine and RUN it as an option within your main program. Each one would run from the memory space. Of course, you could just link the machine language program to your Basic program . . . but that's another story.

Hold It There

Reviewing a long list of data requires using some technique to keep the data on the screen from passing by too fast. One way is to count the number of data lines printed. Then stop the program after 20 or so lines are printed. Something like this:

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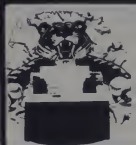

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CIRCLE 134 ON READER SERVICE CARD

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CIRCLE 107 ON READER SERVICE CARD

```
1000  READ D$(I): IF D$(I) = "END
      " GOTO ....
1010  PRINT D$(I)
1020  C = C + 1
1030  IF C <  > 20 GOTO 1050
1040  VTAB 22: PRINT "PRESS RETUR
      N TO CONTINUE": GET A$: IF A
      $ <  > CHR$ (13) GOTO 1040
1050  NEXT I
```

This Applesoft routine assumes you have initialized a FOR . . . NEXT loop to READ a list of DATA statements. The statements in line 1040 use the GET command to halt the program for an input. To insure that only the RETURN key is used, use CHR$(13) to accept only that key. An equivalent halt feature in Integer Basic, uses PEEKs to read the keyboard strobe ($C000) and then POKEs to reset the strobe ($C010).

```
1180 X =  PEEK ( - 16384): IF X <
     128 THEN 1180
1190  POKE  - 16368,0
```

Another possibility in Applesoft would include the SPEED command. If the output needs to be read while being listed, then slow the printing speed down by using — 990 SPEED=150. Don't forget to set SPEED=255 after the list routine is completed.

Text Typer

To do an equivalent print speed control in Integer Basic, use a string parsing routine to print each character separately. A delay between printed characters will provide the desired speed control. Here's a short routine to illustrate one way to do it.

```
100 DIM TXT$(40):A=-16336: REM  Sekr
110 CALL -936: GOTO 210
120 REM  ** Text Typer **
130 REM
135 FOR D=1 TO 200: NEXT D
140 FOR I=1 TO LEN(TXT$)
150 PRINT TXT$(I,I);
160 IF TXT$(I,I)=" " THEN 180
170 SOUND= PEEK (S)- PEEK (S)
180 FOR D=1 TO 50: NEXT D
190 NEXT I
200 RETURN
210 REM  ** Text Strings **
220 TXT$="The text typer prints thes
    e strings"
230 PRINT
240 GOSUB 120
250 TXT$="one character at a time wi
    th sound."
260 PRINT
270 GOSUB 120
280 VTAB 22: END
```

Lines 100 and 110 initialize the program parameters, clear the screen and direct the program to the text strings. The strings are identified starting at line 210. Each string calls the typing routine at line 120 after being identified (or reidentified). Add as many strings as desired at this point. The text subroutine uses a FOR . . . NEXT loop to parse the string one character at a time. Line 160 checks for spaces, and if the character is not a space, line 170 toggles the speaker to make a tapping sound. A short delay is produced in line 180 to give the desired typing effect. Line 190 goes back for more characters and line 200 RETURNs to the main program when all strings have been printed. To use the same program in Applesoft, change lines 150 and 160 like this:

```
150  PRINT  MID$ (TXT$,I,1);
160  IF  MID$ (TXT$,I,1) = " "
     THEN 180
```

Also, you can use strings that are subscripted variables in Applesoft. A loop outside the print loop can then be used to call the strings. If you want to direct the output of these programs to a printer, be sure to cancel the effect of these routines. Otherwise, the already slow printer will become even slower.

More Stoppers

The buttons on the game paddle can be used as program stoppers too. To do this, use a program line something like this:

```
300  IF  PEEK ( - 16287) > 127
     THEN 300
```

Put this line at the beginning of the loop that reads and lists your program. Each time you press and hold the button on paddle 1, the program will halt. You might want to make it halt with one push and start on another.

One more way to halt a program uses the Applesoft WAIT command. Insert this routine in your listing program and use any key to suspend and start the listing.

```
410  IF  PEEK ( - 16384) > 127 THEN
     POKE  - 16368,0
420  WAIT  - 16384,128,0: POKE  -
     16368,0
```

Sargon II

If you have been looking for an excellent chess program, try Sargon II. Several problems were reported with Sargon. There was no evidence of them during the games played on this version. Version 2 has 6 levels of play ranging in time-to-make-a-move from several seconds to several hours. I only tried levels 2 and 4. The playing time at these levels was quite acceptable. Not being a world-rated player, I won't judge playing skill. Several other reviewers however, have rated Sargon II above average. I know I had to work quite hard and found it could be beaten by multi-pronged offense. Sargon II plays what I consider an aggressive game and no vague moves were made (by Sargon anyway).

Implementation is good. Graphics are well done and use the entire screen. Moves are entered on a text page and become a log of game moves. The ESCape key is used to switch from text to graphics. There were two things I didn't like. There is no sound made when 'check' occurs, and you can't make a back-up copy of the tape. Hayden uses a scrambled load-and-go technique with the tape. I'm not in favor of programs I can't copy. As for the non-audible check, it's a matter of paying attention. The text page shows that check has occurred and check is obvious by the position of the pieces. A little 'beep' would be nice though.

After playing a few games, moves were quite easy to make. The algebraic system is used and reference to a grid map became only occasionally necessary. Entry mistakes and illegal moves are audible. Evidence that the program is working is included on the text page. Gives you that 'warm feeling' that all is OK when the computer is doing a long deep search. Board set-up for trying those 'mate-in-two' challenges is provided, and correction of moves is possible if you made the wrong choice. The choice of moves being considered by Sargon II is displayed on the text page. Sargon II by Dan and Kathe Spracklen is available at $29.95 from Hayden Book Co. and most computer stores. I found Sargon II quite enjoyable, and I think you will too.

[*Ed. Note — Be sure to watch for the second Creative Computing Microcomputer Chess Tournament which will include both Sargon II and Z-Chess II. Early reports are that Sargon has met its match in Z-Chess.*]

A 6502 Book

The book, 6502 Assembly Language Programming, by Lance Leventhal, is part of the Osborne series. It is the latest entry into the list of books for 6502 assembly language programming. Lance Leventhal has also written several other books in the Osborne series. His technical reputation was previously established by an industry standard — Introduction to Microprocessors: Software, Hardware, Programming; a Prentice Hall publication. Of particular significance is the fact that all programs in the book were tested on an Apple II.

My negative comments are few. There is not enough descriptive material for the beginner who is trying to learn outside a classroom. The Osborne-influenced style of presentation is sometimes difficult to read. And, as with most other 6502 books, an assumption is made that the reader already knows how to **begin** a program. Another area, indexing, is more thorough than other books on the 6502 but assumes the reader is familiar with the concept. Beyond these minor complaints, I found the book to be quite acceptable.

Extensive data is provided for programming the 6502. Although the book isn't intended for hardware design, the techniques of program-

ming 6502 devices and the related interface components are thoroughly described. For the hardware person who programs, there are plenty of useful how-to-do-its. For the software person, an equally diverse range of information is provided. The patient beginner can eventually find answers to most any 6502 programming question. (Especially if some questions can be answered by associates in a users group.)

Because this book contains such an in-depth and wide ranging coverage of 6502 programming, no short review like this one, can be too effective. However, here is a brief summary of the contents of the 16 chapters of this book.

- Chapters 1 and 2 — These chapters contain information on the basics of assembly language programming and support systems used for the development of programs.
- Chapter 3 — All the 6502 instructions, including address modes, flags and special features are discussed here.
- Chapters 4 through 10 — Development of a wide range of programs and techniques are included in these chapters.
- Chapter 11 — I/O techniques for the 6502 and all the related I/O devices are covered in this chapter.
- Chapter 12 — The most extensive development of the 6502 interrupt capabilities I know of is provided here. All the devices used with the 6502 are covered, too.
- Chapters 13 thru 15 — Programming tasks, development, documentation and redesign are the subject of these chapters.
- Chapter 16 — Sample projects conclude the coverage of 6502 Assembly language programming.

This is one of the better books on 6502 programming. It will make a worthy addition to your technical library.

The Source

Apple owners with modems can take advantage of a national information network. This network called The Source is available over the telephone system. For a one-time hook-up charge of $100.00 and small charges for connect time and memory use, you can benefit from these features:

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A variety of other features are planned. Users claim all sorts of benefits from financial advantages to camraderie and friendship. For more information contact: Telecomputing Corporation of America, 1616 Anderson Road, McLean, Virginia 22102.

Mensa

A new Special Interest Group has been formed within American Mensa. The Group, The Apple Cart, is primarily for owners of Apple Computers. It publishes a newsletter and operates a software exchange for its members. Annual dues are $4.00 for Mensa members and $6.00 for those who are not members of Mensa. For more information send a stamped and addressed return envelope to:

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The ANA1 two letter user commands are CA = Calculate, no graph. CG = Clear Graphs, leave Grids. CK = Checking out program, known data. CO = Color of next graph (red, green, violet, white, blue). CS = Clear Screen. DL = Draw Line between points. FI = Filter data for time, magnitude, or percent change. FU = Data, transform, or constant Function with +-.x./ operator. GD = Graphic mode, display all Graph Data on screen. GR = Graph data to screen. GS = Set Grid Scale. HE = Help, summary of any commands usage. LD = Load Data from disk file from inputted date to memory. LG = Leave Graphs, automatic Grid rescaling. LO = Look, select a range of the LD data and GR, All commands can now be used on this range. LS = Least squares linear fit of the data. MA = Moving Average of the data. NS = No Scale, next graph on screen does not use Grid Scale. NT = No Trace. PR = User implimented Printer routine. TD = Text mode, display Text Data on screen. TI = Time number to date or vice versa. TR = Trace. TS = Text Size. The number of lines outputted to screen when in TD. UT1/U2 = User 1/2 implimented routines. VD = Values of Data outputted in text. VG = Values of Grid, low/high/delta. VT = Values of Transform outputted in text.

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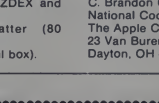
CIRCLE 149 ON READER SERVICE CARD

Software for the Apple II



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CIRCLE 181 ON READER SERVICE CARD

TRS-80 Strings

Stephen B. Gray

For this sixteenth go-around, let's look at three light pens that open a whole new world of game and graphics programming, a short graphics program that may give you some ideas and three clever game cassettes.

Light Pens

One of the more fascinating computer peripherals is the light pen. It doesn't just sit there and hum, like a disk drive. You can do something with it, in fact, a great deal.

With a light pen, you can play a game on a CRT without ever touching the keyboard. No need to memorize which key does what in a game. Just touch the pen to the screen.

Many other applications may come to mind, such as menu selection, graphics, even computer music.

Four Level-II 16K light-pen cassettes were advertised by Quality Software in the Dec. 1979 Creative (p 181). The programs, which can also be used without a light pen, are Sketch-80, poker, rummy, Match Cards (Concentration) plus Bank Shot and Fastgammon.

Let's look at three light pens now on the market. By the way, the name is a misnomer. You don't write anything on the screen. You point, and the computer figures out just where you're pointing.

3G Light Pen

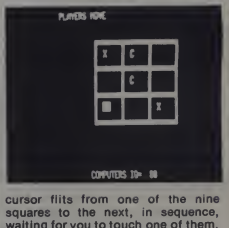
The light pen from 3G Company inc. (Rt. 3, Box 28A, Gaston, OR 97119) has, like the other two pens, the shape of a slim felt-tip pen. The 3G pen has a cord connected to a small circuit board, 2 by 2 3/4 inches in size. The board contains an amplifier, covered by a potting compound to prevent shorts. A connector is attached, to plug into the expansion port at the left rear of a Level-II TRS-80 keyboard. The connector is double-ended, so that it fits between the expansion port and the cable that goes to the expansion interface, like a link in a strand of pop beads. The 3G light pen gets its power from the TRS-80.

You plug the card in, then load the program provided by 3G on cassette. With RUN 8000, you get the short demo program that shows in

the photo. It asks WHICH IS THE CAPITAL OF OREGON? and gives three choices, each followed by a white square. If you point with the light pen to the square following WINSTON, the display tells you NO, THAT'S A CIGARETTE. If you point at the GASTON square, the response is NO, BUT THANKS FOR THE THOUGHT. If you aim at the SALEM square, you get YOU ARE RIGHT!

You don't even have to touch the light pen to the screen. It works as much as a quarter of an inch away from the glass.

On a RUN, you get tic-tac-toe, with the computer getting smarter (and harder to beat) if it loses a game. On the game grid, a white



cursor flits from one of the nine squares to the next, in sequence, waiting for you to touch one of them. Once a square has an X or O in it, the cursor no longer stops at that square.

A minimum of paper comes with the 3G pen (which is $34.95 plus $1.50 for postage and handling). One sheet tells how to use the pen, and how to create your own program. To create your own, you use two GOSUBs, provided on the other sheet. One "initializes things," the other "makes sure the correct light is detected." The nub of it all is, "Wherever you want to select an answer by pointing the 3G pen to the screen, create a graphics block for each choice in a FOR loop...if INP (99) > 127, the pen has detected light—this is when we GOSUB 2000. PP = 1 is returned from GOSUB 2000 if the light detected was actually one of the graphics blocks."

INP(99) means the computer is reading the light-pen input at input port 99. See page 8/4 of the TRS-80 Level-il manual for more details.

3G also provides a printout of the "capital of Oregon" demo program. No printout of the tic-tac-toe program is provided, as it is quite long, about 200 lines, some them muitipie-statement lines.

Micro Matrix PhotoPoint

The $19.95 PhotoPoint iight pen from Micro Matrix (Box 938, Pacifica, CA 94044) comes with three pages of information, a cassette with three games (backgammon, tic-tac-toe, word sampler) and a 9-volt battery that plugs into a battery clip connected to the light-pen cable.

The cable also has a plug that connects to the cassette recorder's AUX jack for low sensitivity (ignores text, looks only at graphics) or the MIC jack for high sensitivity (pen is sensitive to any light from the screen, but is mostly insensitive to ambient light).

The PhotoPoint uses the amplifier in your tape recorder, which is why it is $19.95. To turn on the amplifier, remove any cassette from the machine, then hoid in the record-interiock pin and at the same time press down the Record and Play buttons.

The pen has a hoiiow tip that is removable, providing a choice of either a 1-mm or 2-mm aperture. To play the backgammon game you need to use the MIC jack, and to remove the tip. To move the backgammon men, you point at selection dots, one of which is located at the

inner end of each point. If you try to make an invaiid move, the computer will teii you so. When you touch any of the selection dots, they flicker in rotation as though a biack dot were circuiating among them. The selection dot turns to an X when you select a FROM—and aiso when you select a TO —.

Many other applications may come to your mind, such as menu seiection (picking, from an occasional on screen list, the next thing for a program to do), graphics, even computer music.

In the tic-tac-toe game, you have to aim rather preciseiy at a point 1/8 inch to the right of one of the numbers in each of the nine game squares for your choice to be sensed.

Word Sampler is more of a demonstration than a game. You write a short sentence, or eise the computer chooses THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG. You point to any of the words, and the computer displays that word above the sentence, starting at the ieft margin, and continuing with further words, so you can construct a new sentence from the oid one.

The instruction sheet includes two programs for the PhotoPoint. One is called the Cube Chase. When you point the pen at the white square (not reaiiy a cube) on the screen, it quickiy moves eisewhere. The program is quite simple, and is rearranged and edited here to be easier to understand:

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Strings, cont'd . . .

```
100 CLS
110 REM ** A$ = THE CUBE **
120 A$ = CHR$ (191) + CHR$ (191)
130 PRINT "PUT THE PEN ON THE
    CUBE"
140 REM ** RANDOM LOCATION **
150 R = RND (959) + 64
160 REM ** PRINT CUBE **
170 PRINT@R, A$;
180 REM ** I = SAMPLE OF THE
    PEN **
190 I = INP (255)
200 REM ** PRINT SAMPLE **
210 PRINT@50,"INP (255) = ";I;
220 REM ** RESET PORT **
230 OUT 255,4
240 REM ** IF I IS GREATER THAN
    130, THE **
250 REM ** PEN SEES LIGHT;
    RELOCATE CUBE **
260 IF I >130 PRINT@R, " ";
    :GOTO 150
270 REM ** KEEP LOOKING **
280 GOTO 190
```

You might think line 260 could be separated into two lines, since it contains two statements. Try it by deleting the last nine characters of line 260 and adding

```
265 GOTO 150
```

which will make quite a difference. Why? (Hint: IF.....)

Micro Matrix says one of the software companies (Instant Software) will sell a variety of light-pen programs for the PhotoPoint, at $7.95 to $14.95. Also, if you change the INP number from 255 to 99, you can use PhotoPoint programs with the 3G pen, and vice versa.

Esmark's Vidlet-Stik

Slimmer, longer and more expensive than the other two light pens, the Vidlet-Stik at $62.95 plus $1.50 for p&h from Esmark Inc. (507½ E. McKinley Hwy., Mishawaka, IN 46544) has both a bulit-In amplifier and a switch in the tip, and comes with a demo tape that includes three games.

The switched tip makes the pen easier to use, says Stephen Tousaint, President of Esmark, because "It never misfires, and you don't have to be so careful about moving the pen around."

To use the Esmark pen like the two others, so it's always on, put the cap on, make a hole in it and put a 1/8-inch piece of plastic tubing inside the cap to depress the switch tip. As of the beginning of 1980, all Esmark pens have been supplied with this cap.

The Vidlet-Stik consists of a 6 3/4-inch pen connected to a small junction box to which is also connected a cable with a jack at the end. The box and cable-with-plug connect between the recorder's EAR jack and the TRS-80 cable.

After putting jacks into plugs, you protect an area of memory for the machine-language light-pen routine to be loaded into. The number you use for memory protection depends on how much memory you have.

The Demonstration Tape instructions tell you how to first load a test program that enables you to set your monitor's "contrast and brightness levels until accurate operation is achieved."

Then you can go on to the TOWERS game, which is Towers of Hanoi, and which is a natural for a light pen. Each of the three towers

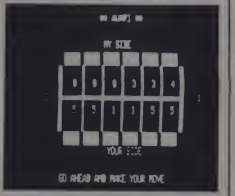
has a white square beneath it. To move a disk, you point first to the square beneath the tower from which the disk is to be moved, and then to the square under the tower to which the disk is to be moved. Although in theory you should push the Vidlet-Stik against the glass until the switch clicks on, you need only push until the switch contacts meet, at which moment the square under he tower disappears.

If you try to put a disk on top of a smaller disk, ILLEGAL MOVE is displayed.

With seven disks to be moved, the minimum number of moves is 127, which takes awhile. If you rest your light-pen-holding hand on the top rear of the keyboard, you might just depress the BREAK key. Careful. . .

The TOWERS game is a much more interesting game when played with a light pen than with a keyboard, because all your attention is on the screen, and you can play much faster. The computer keeps score of how many moves you take to transfer the seven disks. After you learn the trick, it's merely a matter of trying to do it in 127 moves, which isn't easy if you're tired or distracted.

The second game, AWARI, is the old Egyptian game of transferring beads from one pit to another, and is made much easier with a light pen. In



the Esmark version, you can let the machine play against itself, or against you, or you can play against another person and let the computer keep score. Once you've learned how to beat the machine, from then on it's only a matter of figuring out how to do it faster.

STIK-TAC-TOE is a standard tic-tac-toe game, on a 3-by-3 grid. The test program fills the screen with numbers from 1 to 255. When the brightness and contrast are set properly, touching any number with the light pen causes all other numbers to disappear momentarily from the screen.

Using the pen and the software, you can select "any one of up to 255 unique items presented on the CRT at one time," which in the test program is 255 numbers.

Vidlet stands for Video Integrated Electronic Tracking. The 33-page manual explains how the tracking software works, by causing "all 255 selectable positions on the screen to blink on and off in such a way that each emits, one bit at a time, a binary number which is equal to its position on the face of the screen." This binary number "precisely identifies where the Vidlet-Stik is pointing."

This Signature Coded Target Recognition routine is proprietary, and has a patent pending on it. It's used only in the test routine, not in the three games.

The test program and STIK-TAC-TOE game are given in Basic, and both include the assembler code required for the light pen. Also included is an assembler listing of that code, called LINKED/VIDIET, along with machine language listings of the Vidlet-Stik driver software for the TRS-80.

VIDIET contains seven subroutines, such as for detecting the incoming light pulse, and for locating the pen's relative position on the CRT and then returning this value in the HL register pair to the mainline routine. These programs can also be used with TRS-80 disk Basic under DOS.

Esmark offers Level-II "Light-Ware" tapes each month, with "up to five new games, puzzles, drills and educational quizzes or simulations." One of last year's tapes contains a four-peg jump puzzle, Othello "with a twist," and a game of LIFE with mutations, at $19.95. Only the calibration program and STIK-TAC-TOE work with Level-I.

Short Program #8

David Riley, of Ferndale, Michigan, sent in a short program whose "overall effect is to produce an everchanging picture just above the center of the screen:

```
5 CLS
10 B = RND(192)-1 : IF B<129 GOTO10
11 U = RND(192)-1 : IF U<129 GOTO11
12 S = RND(192)-1 : IF S<129 GOTO12
13 S1 = RND(192)-1 : IF S1<129 GOTO
   13
14 D = RND(192)-1 : IF D<129 GOTO
   14
20 POKE 15580,U : POKE 15643,S :
   POKE 15644,B : POKE 15645,D :
   POKE 15646,S1
30 FOR X = 1 TO 500 : NEXT :
   RANDOM : GOTO 10
```

"Lines 10-14 set their variables to the TRS-80 graphics codes. Line 20 pokes these values into the screen positions right around each other. Line 30 is a timing loop and restarts the sequence."

The program creates a cluster of five graphics characters, four across and a fifth one on top of the second of the four.

Can you shorten the program by simplifying the method of generating five random numbers between 129 and 191? Can the repetitiveness of lines 10-14 be reduced or eliminated? How can this program be used to create patterns of a decorative nature?

By the way, if you'd like to see which graphics characters are actually used to make up the cluster, you could add a line

```
21 PRINT@464,U;S;B;D;S1
```

which will print the five character codes under the cluster. You could go even further and show the individual characters that make up the cluster, since it's often difficult to figure out what they look like separately:

```
22 POKE 15889, U
23 POKE 15895,S
24 POKE 15900,B
25 POKE 15905,D
26 POKE 15910,S1
```

which puts each of the five graphics characters under its corresponding code. If you do this, you may want to lengthen the timing loop to provide more time for examining the five parts that make up the main cluster.

Micro-Fantastic Programming

Three fascinating Level-II 16K games are available from Micro-Fantastic Programming (Box 2307, Grand Central Station, New York, NY 10017).

In WORDO ($14.95) you guess the word chosen by the computer, with clues furnished by your TRS-80 about letter position. But instead of guessing a letter at a time, as in Hangman, you guess an entire five-letter word. The computer tells you how many letters in your word

TRS-80/NORTH STAR SOFTWARE

By J. Roehrig as seen in Byte, Kilobaud and Personal Computing Magazines

1. **Chess** — written in Basic. Beats Microchess.
2. **Scrabble** — makes your computer a Scrabble opponent.
3. **Baseball** — based on Major League results, keeps all statistics. Players perform true to life. Seen in July 1978 Personal Computing and November 1979 Byte.
4. **Bowling Secretary** — keeps all necessary statistics. Seen in June 1978 Kilobaud.
5. **Taxes** — all new tax rates. Long form, short form, Schedules A, B, C and Income Averaging. Seen in March 1978 Personal Computing.
6. **Accounting** — double entry system produces Journal Entry Log, Balance Sheet and Income Statement.
7. **Basketball** — just like Baseball. Cover article from January 1979 Personal Computing.
8. **Horse Racing** — improved version of December and January 1980 Byte article. Graphics, horses run true to form, past performances maintained. Realistic win, place and show payoffs.
9. **Trotters** — same as above but for Trotters.
10. **Handicapper** — a systematic way to evaluate wagers at the Track or OTB.
11. **Games** — 3D TIC TAC TOE as in April 1978 Kilobaud. Boxing as in January 1978 Personal Computing and Football as in February 1978 Personal Computing.
12. **Backgammon** — a challenging opponent who uses the doubling cube. Very graphic.

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Strings, cont'd . . .

match those in the word selected by the computer from its bank of just over 1000 words.

For example, if you enter the word STORE, and the computer's word is TORCH, the display will be STORE 3. If you then enter STOVE, the display is STOVE 2, so you know R is one of the letters in the computer's word, and V isn't.

The computer keeps track of how many words you had to enter to guess the secret word, displays the number of games played so far, the total words you chose and the average per game.

You can play against the computer, or against another player. The computer furnishes a "scratchpad" in the form of a displayed alphabet. As you guess letters that you know definitely are, or are not, in the computer's word, you can delete them from the alphabet. There's also a place to display "letters known."

The basic concept of WORDO is not original with this comany (a simple version, WORD, is in Creative's "Basic Computer Games"). But what makes this version interesting is the very convenient display you use in playing the game, plus the huge store of words. You're supposed to use only real five-letter words, although the computer has no way of knowing you're cheating if you enter ABCDE. Although it is programmed to label as NOT VALID any combination of five letters that doesn't include a vowel or a Y.

The wordbank includes WAXEN, MOXIE, VIDEO, LYRIC, and BAYOU, in addition to ordinary words such as BLANK and CANDY.

While WORDO is a mental challenge, WHEREAMI? is test of quick reflexes, and I found it just as much of a challenge.

The basic idea is simple. The playing area for this "penny arcade game for two" is a large rectangle. A small box appears now and then at various locations, either with a number in it to show the points you get if you hit it before your opponent gets there, or question marks to show it may be a plus or a minus score, revealed upon being hit.

When the playing area appears, two arrows start moving upward on either side of the field. You control one, with four keys making your arrow go up, left, right or down, and your opponent controls the other. All you have to do is to change the direction in which your arrow is moving, so that it hits the box.

But if you go in direct reverse, such as trying to go north when just before you were heading south, your opponent scores any plus points that happen to be in the box. If you hit your opponent's arrow, he scores. If you hit the border, he scores. And if you hit the mystery box and it contains a minus score, it's subtracted from your score.

So WHEREAMI? is not all that easy, because you don't have time to stop and think, as in WORDO. You've got to hit the box before your opponent does, and he's heading right for it, and there's no time to lose, and. . .

For only $10.95, you too can wear your nerves to a frazzle trying to hit boxes with arrows. Or are you quick on the draw?

The third game, THE STOCK EXCHANGE, is meant for someone very familiar with investing in stocks, or someone who wants to learn all about it.

The object of this game is to increase the value of either of your two $100,000 portfolios of ten stocks each, or to play against someone, with a portfolio each.

You can buy and sell, long or short. The display shows the DJII index, and arrow indicating whether the market is higher than the previous day's closing, and a number showing exactly how much. The display also shows the day of the week (you start on Monday morning) and the time (you start at 10:00). The time changes every two minutes, "corresponding to about four seconds in real time."

A list of ten stocks and their current price is displayed. With each time change, the stock prices also change. You can't just sit and think about what to do. The market is moving, and you've got to move with it, buying and selling to increase the value of your portfolio(s).

There's a 1½-percent commission charge when you trade stock, and you have to be careful not to buy or sell short beyond your available cash. You can stop at the end of a day's trading, or go on.

This is highly complicated, and I won't tell you how much I lost. If you're in the market, or would like to try your luck with no investment other than $15.95 for the cassette, this game might be just the thing to drive you nuts. Or do you think you really know how to play the market? □

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SEE REVIEW BY STEPHEN GRAY IN TRS-80 STRINGS - MARCH ISSUE OF *CREATIVE COMPUTING*

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CIRCLE 195 ON READER SERVICE CARD

Personal Electronic Transactions

by Gregory Yob

I am happy to hear from you, and encourage your correspondence. I will try to acknowledge all correspondence, and a SASE makes things easier for both of us. Please send your letters to "Personal Electronic Transactions" c/o PO Box 354, Palo Alto, CA 94301.

Belatedly I Mention:

As a columnist, I am supposed to be up on everything concerning the PET, and in practice this ideal is rarely met. Amid the many fine PET products are those which I intend to mention "next month" and then forget to, or those I learn about and then fail to check out immediately.

Connecticut microComputer offers a line of analog-to-digital and digital-to-analog interfaces for the PET (Just the thing if you are into controlling things at a higher level than just 'on' or 'off'.) I won't describe these, as CMC almost always has their advertising next to this column (Just turn a page or two.)

Cursor (PO Box 550, Goleta, CA 93017, 12 issues for $36.00) is a cassette-magazine for the PET. Each monthly issue has six programs for your pleasure and an insert sheet with gossip and other information in teeny reduced type. **Cursor** is one of the treasures in PET-land, and if you haven't got it, **go get it. Cursor** definitely gets my mark for having good and **original** software. Many of their programs have sound, and the interface mentioned in my columns on Music (Jan '79) works just fine.

Quickies Revisited

In January ('80) I mentioned some hex-to-decimal and vice versa routines as examples of "Quickie" programs which did a lot in 10 lines or less. You were invited to send me examples of other neat "Quickies" — the result? I now have **lots** of two and three line hex/decimal/gumbo conversion routines! What I **meant** was to see other **ideas**, not better versions of hex and decimal!!!

Is the PET Logical?

Turn on the PET, and enter:

```
PRINT 12 AND 7
 4
```

Now try:

```
PRINT 12 OR 7
 15

PRINT NOT 12 AND 7
 3

PRINT NOT 12 OR 7
-9
```

Odd, isn't it? Let's start by looking at the Boolean truths first.

Enter this small program to see how the PET determines if a number is TRUE or FALSE:

```
10 INPUT N
20 IF N THEN PRINT "TRUE": GOTO 40
30 PRINT "FALSE"
40 PRINT
50 GOTO 10

RUN
? 1
TRUE

? 0
FALSE

? -1
TRUE
```

As you play with this, you will discover that:

```
ZERO IS FALSE
EVERYTHING ELSE IS TRUE
```

When the PET is deciding if an IF is to be executed or not, the expression following the IF is evaluated, and then checked for TRUE vs FALSE. TRUE (of course) executes the following statement or jump, and FALSE doesn't.

If you are sharp, this brings a deduction: Relational operators produce numbers! Let's see if this is so:

```
NEW

10 INPUT "X,Y"; X,Y
20 PRINT X">"Y":"SPC(VALUE:"X  Y
30 PRINT X"=" Y":"SPC(VALUE:"X= Y
40 PRINT X"<"Y":"SPC(VALUE:"X  Y
50 PRINT
60 GOTO 10
```

Here, two numbers, X and Y, are entered. In Line 20, their values and the relation being examined, >, are displayed, and then the value of the expression X>Y is shown. Lines 30 and 40 act in a similar manner. Here's a RUN:

```
RUN
X,Y? 1,2
 1 > 2  VALUE: 0
 1 = 2  VALUE: 0
 1 < 2  VALUE:-1

X,Y? 2,1
 2 > 1  VALUE:-1
 2 = 1  VALUE: 0
 2 < 1  VALUE: 0

X,Y? 2,2
 2 > 2  VALUE: 0
 2 = 2  VALUE:-1
 2 < 2  VALUE: 0
```

Ah, so — When a relational expression is TRUE, the PET uses the number -1, and when a relational expression is FALSE, 0 (zero) is used.

This leaves you with two interesting flexibilities with the PET. First, you may use an expression without a relational operator in an IF test. For example, IF X is the same as IF X <>0. This saves space and runs faster. Second, relational expressions can be used in assignment statements, ie, Y=X>3. Here are a few legal PET statements:

```
IF X+5/Y THEN PRINT "HELLO"

IF 2+A$<B$ THEN PRINT "WHACKO"

Z=A=B=C

M=(A$>B$)+2=(A$<B$)
```

PET, cont'd . . .

When brewing these concoctions, the PET might get confused — and you will see a ?TYPE MISMATCH ERROR. Use parenthesis to separate numbers from string comparisons.

On rare occasions, these may be used to save some effort. For example, suppose you have:

```
100 IF X<10 THEN Y=2: GOTO 140
110 IF X>20 THEN Y=5  GOTO 140
120 Y=0
140 REM ......
```

This can be replaced by:

```
100 Y=-((X<10)*2+(X>20)*5)
```

Take care to use parenthesis as needed. The relational operations are performed after the arithmetic ones. For example, 1+2=3 will result in −1 rather than zero. 1+2 is evaluated, giving 3, and then 3=3 is checked, giving TRUE, or −1.

To understand how AND, OR and NOT work, we need to take a short detour into:

Two's Complement Tutorial

Most of you probably already know how to count in binary. As a refresher, here are a few numbers:

```
    0   is 0000 0000 0000 0000
    1   is 0000 0000 0000 0001
    2   is 0000 0000 0000 0010
    3   is 0000 0000 0000 0011
    4   is 0000 0000 0000 0100
    7   is 0000 0000 0000 0111
    8   is 0000 0000 0000 1000
  255   is 0000 0000 1111 1111
  256   is 0000 0001 0000 0000
32767   is 0111 1111 1111 1111
(broken into groups of 4 for clarity.)
```

There is a reason for looking at these as 16 bit numbers — the PET does its logical operations on 16 bit integers. If you wanted to use all 16 bits, the largest number would become 65535. However, if you did so, the smallest number would become zero, and there wouldn't be any negative numbers.

In the 6502 (and almost every other computer too), the convention of a sign bit is used. In the case of the PET's integers, the highest bit (the one on the left) is chosen for the sign. A positive number has a sign of 0, and a negative number uses 1. If a short table of numbers were now created, it would look like this:

```
+256   is          0000 0001 0000 0000
+ 63   is          0000 0000 0011 1111
+  2   is          0000 0000 0000 0010
+  1   is          0000 0000 0000 0001
+  0   is          0000 0000 0000 0000
-  0   is          1000 0000 0000 0000
-  1   is          1000 0000 0000 0001
-  2   is          1000 0000 0000 0010
- 63   is          1000 0000 0011 1111
-256   is          1000 0001 0000 0000
```

This method of making negative numbers has the odd property of two values for zero, Plus Zero, and Minus Zero. If you try a few additions and subtractions, this gets to be very clumsy, very fast.

To simplify addition and subtraction with negative numbers, the operation of subtraction is changed to addition with negative numbers. For example, 15−7 is converted into 15+(−7). The new form of a negative number consists of 1) Make the Sign Bit a 1, and 2) Flip all of the bits — make 1 into 0 and vice versa. The Table above would now become:

```
                (+1 and up the same as before)
+  0    is          0000 0000 0000 0000
-  0    is          1111 1111 1111 1111
-  1    is          1111 1111 1111 1110
-  2    is          1111 1111 1111 1101
- 63    is          1111 1111 1100 0000
-256    is          1111 1110 1111 1111
```

This system is called One's Complement, and it still suffers from two values of zero. Here is a sample subtraction:

```
   15      0000 0000 0000 1111
  -7       1111 1111 1111 1000
   7       0000 0000 0000 0111

(Remember we add these!)
(The carry goes into limbo to the left.)
```

Oops! We are one short — the true answer is 8. The solution is to always add one after doing subtraction. Another solution is to make the number negative, and then to add one. Our table now looks like:

```
+256    is          0000 0001 0000 0000
+ 63    is          0000 0000 0011 1111
+  2    is          0000 0000 0000 0010
+  1    is          0000 0000 0000 0001
   0    is          0000 0000 0000 0000
-  1    is          1111 1111 1111 1111
-  2    is          1111 1111 1111 1110
- 63    is          1111 1111 1100 0001
-256    is          1111 1111 0000 0000
```

This is known as Two's Complement, and is the PET's method for doing integer arithmetic. Note that the Zeros problem has vanished. One way to visualize Two's Complement is shown below: (Just for 4 bits this time)

```
+ 15    is          0 1111
+ 14    is          0 1110
+ 13    is          0 1101
+ 12    is          0 1100
 ....    ....       .........
- 12    is          1 0100
- 13    is          1 0011
- 14    is          1 0010
- 15    is          1 0001
- 16    is          1 0000
```

First, the smallest number in Two's Complement is one larger in magnitude than the largest number — in the 4 bits shown above, the largest number is +15 and the smallest is −16. Second, if you start at the bottom (−16) and count up, the numbers are the same as the positive numbers starting at zero with the sign bit changed.

The PET is Logical

At last we can attack AND, OR and NOT. The PET takes the values being used, converts them into 16 bit Two's Complement Numbers, and then does the operation on a bit-by-bit basis. Here are some examples:

```
AND: 1100 If the bits match, they are the
       0101 same.  If they don't, the result
       0100 is zero.

OR:  1100 If either bit is one, the result
       0101 is one.  Both zero gives a zero.
       1101

NOT: 0011 Flip them - one to zero, zero to
       1100 one.
```

With these in mind, to go back to the first examples:

```
12 AND 7:

     0000 0000 0000 1100        (12)
     0000 0000 0000 0111        ( 7)
     0000 0000 0000 0100        ( 4)

12  OR 7:

     0000 0000 0000 1100        (12)
     0000 0000 0000 0111        ( 7)
     0000 0000 0000 1111        (15)

NOT 12 AND 7:

     0000 0000 0000 1100        (12)
     1111 1111 1111 0011        (-13)
                              - This is NOT 12
     0000 0000 0000 0111        ( 7)
     0000 0000 0000 0011        ( 3)

NOT 12 OR  7:

     1111 1111 1111 0011        (-13)
                              (NOT 12 from above)
     0000 0000 0000 0111        ( 7)
     1111 1111 1111 0111        (-9)
```

The PET performs NOT first, then AND, and finally OR. This can lead to trouble if you aren't careful:

```
PRINT 1 AND 2 OR 3
    3
PRINT 1 AND (2 OR 3)
    1
```

Use parenthesis liberally as needed.

One common operation is to set or clear bits in 8 bit bytes. You can use AND to clear a bit by ANDing with a zero in the bit's position. This can also be used to remove unwanted bits (known as masking). OR can set bits by placing a 1 in the appropriate position with OR.

I hope this is of some help. It is hard to compress into two pages the material which often takes 30 pages in most beginning computer science texts.

PET Has a Light Pen

A light pen is a photosensor (usually at the tip of a pen-like wand) which is placed next to a CRT screen. The pen tells the computer where the pen is placed on the screen. If several options are put on the display, the pen

PET, cont'd . . .

may be used to select between them.

3G Company (Rt 3, Box 28A, Gaston, OR 97119) offers a light pen for the PET at a cost of about $30.00. My pen consists of a wand which looks like a felt pen, a cable about 40 inches long, and a small PC card which attaches to the PET's User Port. The enclosed instructions explain which way to attach the pen to the User Port (It's very easy to put it on upside down. This is harmless, but the pen won't work.) Also included are a listing of a Basic program to demonstrate the use of the pen, the bits used in the User Port, and some insert sheets from two software vendors, Quill Software and Distinctive Interiors (an unusual company name!). The Quill offerings were more interesting, so I obtained the programs to see how the light pen might be used.

The light pen works by creating a cursor on the PET screen, flashing it, and checking if the pen's output is matching the cursor's flashing. Most of the programs would draw several squares on the screen and then flash the cursor sequentially through the squares. If the pen's presence was suspected, the cursor's scan will stop and a few more flashes made to verify the pen's presence. This was fast enough for two or three choices, and went more slowly for more squares. (One of Quill's programs simulates the PET keyboard. The scan takes a few seconds to do for the 75-odd keys.)

In many cases the light pen wouldn't "catch" the cursor as it went by. The pen has to be held perpendicular to the screen, and I found that turning up the screen's brightness helped a lot.

Quill's software is seven programs — most of which are simply standard games modified to take the light pen's input instead of the keyboard's entry. One program, the Light Pen Keyboard, shows some promise. It coulid be developed further, say to at least give input to a Basic program, or (even better, but hard to do) to actually serve as a substitute for the keyboard.

The light pen interests me in two ways. First, the personal computer can be used to assist handicapped persons in several ways. If any of my readers are doing this, let me know. The light pen may be simpler to use than a keyboard for those with motor handicaps, for example. The second interest is in relating to young children who aren't very handy with language and symbols. Pictures may be drawn on the screen for the child to make selections via the light pen. Most present personal computer applications stress the information/symbol processing aspect of the machines — and they can be used for entirely non-verbal and non-symbolic activities (like Pong).

As an exercise for the light pen, and to help launch new concepts (perhaps), here is a program which lets you draw simple pictures on the screen via the light pen.

The first task was to see how the light pen functioned. The low three bits in the User Port serve the pen. Bit 2 provides the pen's power (CMOS doesn't use much current, and the 1 or 2 mA of the PET's User Port is sufficient.) Bit 1 is used to "cock" the light Pen. By turning Bit 1 off and on, the pen is enabled to detect light. Once light is detected, the pen will remain insensitive until Bit 1 is toggled again. Bit 0 provides the pen's output, with 1 for no light and 0 for light.

My test program ended up like this:

```
10 PRINT"clr rvs sp sp sp sp sp sp sp sp
20 GOSUB 5000
30 PRINT"hm dn dn dn dn   "PEEK(LP)"  sp sp"
50 POKE LP,4:POKE LP,6
60 FOR J=1 TO 25:NEXT: GOTO 30

5000 REM INIT PEN
5010 POKE 59459,254
5020 LP=59471
5030 POKE LP,4:POKE LP,6
5040 RETURN
```

This drew a band of light at the top of the screen, and the number 6 or 7 appears three lines below. When the pen doesn't see any light, the value is 7, and when it is on the band of light, 6 appears. In fiddling around with this I learned that: 1) Lines 50 and 5030 are absolutely required — once the pen senses light, Bit 1 must be toggled. 2) The delay in line 60 is needed (probably due to a RC circuit in the PEN — remember that the PET screen flickers at 60 Hz and needs to be filtered out.) The minimum delay was FOR J=1 TO 6 with my pen, and I advise using FOR J=1 TO 10 as your pen might be a little different than mine.

In routine 5000, LP is used to speed up the looking at the User Port — remember that Basic can fetch a variable about 10 times faster than converting 59471. Line 5010 simply sets up the User Port's data direction register.

As space is limited, here's the final program and then a few comments.

```
10 GOSUB 5000: GOSUB 6000
20 KB=515:K1=26:KB=10:KZ=255
30 REM SETUP SCREEN
40 PRINT "clr"
50 GOSUB 5300
60 REM NOW TRACK IT
70 GOSUB 5400
80 CQ=CP
90 IF PEEK(KB)=K1 THEN POKE CP,OT
100 IF PEEK(KB)=K0 THEN POKE CP,OS
110 GOTO 70

5000 REM INIT PEN
5010 POKE 59459,254
5020 LP=59471
5030 LA=4:LB=6:LC=7
5040 CP=33268:CH=0:OT=81:OS=32:OD=160
5050 CX=40:CY=41:CZ=39
5100 POKE LP,LA:POKE LP,LB
5110 FORJ=1TO30:NEXT:RETURN

5200 REM CURSOR PRIMITIVE
5210 CH=PEEK(CP):F=0
5220 POKE CP,OS:GOSUB 5100
5230 IF PEEK(LP)=LB THEN F=1
5240 POKE CP,OD
5245 FOR J=1TO30:NEXT
5250 IF PEEK(LP)=LC THEN F=1
5260 POKE CP,CH
5270 RETURN

5300 REM WAIT FOR PEN
5310 F1=0
5320 GOSUB 5200:IF F=0 THEN F1=F1+1
5330 IF F1<2 THEN 5320
5340 CQ=CP:RETURN

5400 REM CURSOR TRACKING
5410 CP=CQ-CY:GOSUB5200:IFF=0THENRETURN
5420 CP=CQ-CZ:GOSUB5200:IFF=0THENRETURN
5430 CP=CQ-CZ:GOSUB5200:IFF=0THENRETURN
5440 CP=CQ-1 :GOSUB5200:IFF=0THENRETURN
5450 CP=CQ   :GOSUB5200:IFF=0THENRETURN
5460 CP=CQ+1 :GOSUB5200:IFF=0THENRETURN
5470 CP=CQ+CZ:GOSUB5200:IFF=0THENRETURN
5480 CP=CQ+CY:GOSUB5200:IFF=0THENRETURN
5490 GOTO 5410

6000 PRINT"clr LIGHTPEN ORAWER
6010 PRINT"dn dn sp sp USE THE LIGHTPEN TO
     MAKE A
6020 PRINT"SIMPLE PICTURE.
6030 PRINT"dn sp sp WHEN YOU START, A CURSOR
     WILL
6040 PRINT"APPEAR IN THE MIDDLE OF THE SCREEN.
6050 PRINT"PUT THE LIGHTPEN ON THE CURSOR.
6060 PRINT"AND AS YOU MOVE THE PEN THE CURSOR
6070 PRINT"WILL FOLLOW THE PEN.
6080 PRINT"dn sp sp IF YOU MOVE THE PEN TOO
     FAST,
6090 PRINT"THE CURSOR WILL STOP FOLLOWING ANO
6100 PRINT"YOU WILL HAVE TO PUT THE PEN BACK
     ON
6110 PRINT"THE CURSOR.
6120 PRINT"dn sp sp PRESS '1' TO ORAW OOTS
     AND '0' TO
6130 PRINT"ERASE OOTS.
6200 PRINT"dn dn PRESS ANY KEY TO START
6210 GETA$:IFA$=""THEN6210
6220 RETURN
```

See the instructions in lines 6000 — for how to use the program. The cursor is easily "lost" and you must move the pen carefully. Sometimes two positions will activate the lightpen, giving two dots if you press the '1' key.

Line 20 sets up these values: KB is the PEEK location for the keyboard scan (New ROMS will use the value 151 here.), K1 is the code for the '1' key, and K0 for the '0' key. Line 50 calls the "wait for the pen" routine 5300. Once the pen is found, the tracking begins in line 70. When the pen is tracked, Routine 5400 returns and the keyboard is checked for '0' or '1'. If a key is detected, CP indicates where the cursor is, and a dot or a space is POKEd into place.

Routine 5000 mostly sets things up. The POKE in 5010 is done only once, so there's no transformation of numbers into variables. LP is the pen address; LA, LB and LC are the values used with the pen. CP points to the middle of the screen initially. CH is to hold the screen's character while the cursor is in the same place. DT is the code for SHIFT-Q, DS for SPACE and DD for RVS-SPACE. The PET screen is 40 characters wide. CX, CY and CZ can be added or subtracted to CP to

get the adjacent and diagonal locations. (i.e., CP+CX is the next position down.)

Routine 5100 actually initializes the lightpen. Note how 5000 "drops through" to use this code the first time. At 5200 the essential details of detecting the cursor are performed. First, in Line 5210, the character already on the screen is grabbed for safekeeping and a detection flag, F, is set to zero. Lines 5220 through 5250 turn the cursor off, check the pen, turn it on, check the pen. If the pen is following the cursor, the conditions in 5230 and 5240 will not be true and F is zero. F=1 implies the cursor wasn't seen. (I Intended this to work the other way, but it was late at night and I'm lazy.)

Routine 5300 checks for the pen by calling 5200. If the pen was found, the counter F1 is incremented. Three successful checks indicates that the pen was found.

The tracking routine 5400 uses CQ as the "permanent" pen position and CP for the cursor position. A 3 × 3 square is scanned for the lightpen, and if the pen is found (F=0), the routine exits. (Note: Line 80 then updates CQ to the new pen's position.) The tracking scan repeats until the pen is found. (And you put it there!) □

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Software Patents

Harold L. Novick

Patents for software? Don't be silly! Eeryone knows that you can't patent computer programs. Even the Supreme Court said so. Right? Wrong! But ,how can there be so many contradictory statements about the same subject: software?

The fundamental core of the problem in the identity crisis that has beset computer software is that computer software is different things to different people. Perhaps a solution to the problem will come from the realization that, like people, computer software plays many roles, and has many facets. The legal institution, as it is presently established however, can only cover one facet at a time. Copyrights, whose strengths and weaknesses have been exploited in past Forums cover one of those facets. Patents,which will be investigated in this and future Forums, cover another.

Patents can be obtained for certain useful, new and unobvious ideas and protect the underlying concepts themselves, not just the particular embodiments or "expressions" of those concepts. Copyrights, on the other hand, cover only the expression of the idea and not the idea itself.

But many people ask, how can you patent CP/M® for one example; or the Electric Pencil II™; for another example; or CBasic for a third example? The answer, though rhetorical,is the question, "How can you patent an automobile or an airplane?" Conceptually, the problem is the same in both cases. An oversimplified response is that you can only patent differences. A single patent that covers every conventional automobile as an entire entity does not exist. Rather, hundreds of thousands of patents exist for each aspect of the entity. There are hundreds of patents for the carburetor, hundreds of patents for the transmission, hundreds of patents for the engine, and so on. Similarly, a patent might claim a specific automobile having a specific feature that is emphasized, such as one that comprises a body, wheels and a specific suspension system.

The same is true for software. Take CBASIC, for example. CBASIC is "a comprehensive, commercially oriented compiler/interpreter designed for use with the CP/M operating system." As explained in the reference manual, "CBASIC uses the CP/M file accessing routines to store and retrieve data from soft sectored IBM compatible diskette files." There are available, however, numerous and different Basic's. If there are differences between them, it is not in their having standard statements, such as the IF...THEN statement. The present differences in the statements, if any, are in how the operating program treats the statements and data,and how it processes them.

Suppose, however, that were not the case. Then the "inventor" (or is it "author")of the first computer language might try to patent the language as a system or method for solving problems. The method for a compiler language could include reading into memory a program containing a plurality of numbered statements and data, testing each statement to identify it and, when identified, assembling a machine language translation of each statement into a file, and finally, executing the assembled file to solve the problem.

Back to reality, however, where computer languages, including Basic, have been around for some time. Instead, suppose that the originators of CBASIC developed an original, novel and unobvious subroutine for rapidly accessing the desired CP/M routine, or, suppose the CBASIC compiler program included a unique, non-mathematical algorithm for handling IF...THEN statements. Perhaps the algorithm tags that statement and certain others with a code and uses a scratch pad memory so that the total amount of RAM memory needed to generate, store and run the intermediate file is a minimum. None of these examples is or uses a mathematical equation. On the other hand, none of these examples covers the basic concept of the entire CBASIC computer program.

Under current law, all of the above examples should be patentable. Unfortunately, that law, or more correctly that interpretation of a congressional statute, was not expressed by the Supreme Court, but by a lower court, the Court of Customs and Patent Appeals (CCPA). The two cases decided by the Supreme Court which "everybody" said held that computer programs were not patentable were cases in

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which the CCPA was reversed. Thus, the present position of the CCPA and, hence, the current state of law may be reversed in a future case.

The present state of the law regarding the patentability of software is grounded on the interpretation of the congressionally enacted Patent Laws. These laws, in turn, as well as the Copyright Laws are grounded on the Constitution. The Constitution grants the power to Congress to pass laws "to promote the progress of science and the useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."

As a result of Supreme Court interpretation of the word discoveries" in the Constitution, to mean essentially applied engineering, it would appear that Congress could not pass laws that would permit patents for laws of science, but can only grant patents for applications of those laws of science. Thus, if the law of gravity were just discovered, it could not be patented. However, one could patent a paper making machine that uses the law of gravity to drain water from pulp in a faster way.

Congress has passed the present Patent Laws within the presently prescribed constitutional limits. But, it appears from some Supreme Court pronouncements that the language of the Patent Laws is narrower than what the Constitution would allow Thus, when testing to see if an invention is directed to patentable subject matter, such as in computer programming cases, the Supreme Court reviews the claimed invention with what the Court interprets as the statutory boundry and not the Constitutional boundry. In fact, in an ambiguous statement, the Supreme Court has been interpreted to have said that Congress should broaden the patent laws if Congress wants to provide patent protection for the particular so-called computer program inventions involved in the two cases before the court.

The present Patent Laws are limited to inventions or discoveries of new and *useful* processes, machines, manufactures, or compositions of matter, or of any new and *useful* improvements thereof. Although these categories are not exclusive, and a single invention can fall into more than one of them, still, for an invention to be patentable, it must be able to be categorized into one of them.

The entire controversy of the patentability of software distills down to the interpretation of the word "useful." But, as interpreted, this is not your common, everyday variety of the word "useful." Rather, the word is a term of art that probably means something more like "applied" than "valuable" or helpful." The Supreme Court phrases the controversy this way: "Phenomena of nature, though just discovered, mental processes, abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work." The Court concludes therefore, "If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end." **Gottschalk v. Benson**, 409 US 63, 66 (1972).

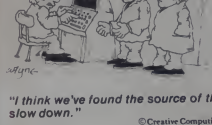
The **Benson** case, quoted above, involved a mathematical algorithm and patent claims to a method of converting signals from binary coded decimal form to pure binary form. The method comprised shifting signals, checking for binary 1's, and adding and masking certain signals when a binary 1 is discovered. The Court said that this method claim was too abstract and sweeping and had an end use that could vary too widely and be performed not only by too large a variety of machines, but also without any machines at all. Thus, it seems that the Court was saying that the claimed invention was not a "useful" method, that is, an applied method, because the claims were too abstract, too wide sweeping in nature.

Note that the discussion above is in terms of the claimed invention and not the invention *per se* . This distinction is important.

The Patent Laws state that a patent can be granted only after a proper application is filed. The application must consist of a written description of the invention and of the manner and process of making and using the invention in as "full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains. . . to make and use the same. The written description must also set forth the best mode of carrying out the invention. Finally, the application must conclude with "one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention."

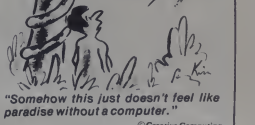
Thus, one view of the Supreme Court **Benson** decision is that the Court did not say the inventive concept was unpatentable, it only said that the particular way it was claimed was unpatentable. If, however, the mathematical algorithm in the **Benson** case were claimed with many details of a telephone switching system, the combination is arguably patentable. Of course, the scope of that invention would be greatly narrowed when it was claimed with the added limitation. Does this mean that computer programs, if properly claimed, are patentable? In an over simplified generalization, the CCPA says yes; the Patent and Trademark Office says no. The legal controversy is again being presented to Supreme Court for resolution in two new cases. One case, **Diamond, Commissioner of Patents and Trademarks v. Bradley,** involves firmware used to change data in the scratch pad registers of certain high performance computers. The other case, **Diamond v. Diehr,** involves a computerized method for operating molding presses used in the manufacture of rubber articles. If the Supreme Court decides to hear these cases, will that end the controversy?

In the time honored fashion of the Tales of the Arabian Nights, more on the patentability of software next month. □



"I think we've found the source of the slow down."

©Creative Computing



"Somehow this just doesn't feel like paradise without a computer."

©Creative Computing

A Game for the Pocket Calculator . . . .

Triple Trip

The calculator's flexibility and instantaneous feedback capabilities suggest a wide variety of possible games. Here's another in our ongoing series that came to me while I was sitting in the bathtub the other day contemplating the endless ways some mason had fitted together a limited variety of wall tiles. The game is called TRIPLE TRIP because its object is to arrive at a three-digit number in which all three numbers are identical, using the least number of moves.

NUMBER OF PLAYERS: Any number can play, but two to four makes a good group.
APPROXIMATE TIME REQUIREMENT: Depending on the number of players, from five to fifteen minutes.
SKILLS INVOLVED: Knowledge of addition, subtraction, multiplication, and division plus a devious mind and a "quicker-better" attitude.
CHANCE FACTOR: None.
PLAY OF THE GAME:

(1) One player punches in any *two-digit* number over 25 and presses the multiply key while covering the display. A second player punches in a *single-digit* number greater than 3 and then presses the equals sign. The resulting product gives you a three-digit number to begin with.

Vince starts by entering the number 59 into the calculator and then pressing X ("times"). Covering the display, he holds the calculator toward Lillian who enters an 8 and then presses "=". When Vince removes his hand from the display, 472 is revealed.

(2) The idea now is to transform the product from Step 1 into a three-digit number in which all three digits are identical. The player may either add, subtract, multiply or divide using only *one* of the digits from the display at a time. Each complete operation is counted as one move. With every new display, the player uses one of the new digits from it to make his next move. He continues until he gets a three-digit number with all three digits the same.

Lillian seizes the calculator and divides 472 by 2. The display immediately shows 236. She quickly subtracts 6 from this to get 230. Now she subtracts 3 and her display lights up as 227 from which she subtracts the 7, which leaves her with 220. From here it's clear sailing and with a triumphant smile, she casually adds a 2. The result is 222, and she's done it in five moves.

(3) Any player who thinks he can do the same thing in fewer moves now has one minute to challenge. He picks up the calculator and tries out his strategy.

Vince refuses to be outdone by Lillian. After a few seconds of heavy concentration, he grabs the calculator and executes the following series of moves:

472 – 7 = 465 – 6 = 459 – 9 = 450 – 5 = 445 – 5 = 440 + 4 = 444.

Alas, Vince needed six moves for his TRIPLE TRIP and Lillian still remains victorious.

(4) Once a challenger has tried to beat another player's strategy, again one minute is given to permit new challenges. The player with the fewest number of moves is the winner.

Kay, who has been quiety meditating, reaches over and executes the following series of operations:

472 ÷ 4 = 118 – 8 = 110 + 1 = 111.

Her three brilliantly executed moves speak for themselves. Vince and Lillian concede.

VARIATIONS:

(1) More advanced players can begin with a four-digit display and use two digits at a time. (Quadruple Quest???)

(2) A more difficult way of getting to the target is to limit play to only those digits that appeared in the original display.

(3) A rule can be added to eliminate anyone who gets a decimal quotient anytime during the game.

TRIPLE TRIP is reprinted with permission of the publisher from Games With the Pocket Calculator by Sivasailam Thiagarajan and Harold B. Stolovitch. The authors rate TRIPLE TRIP as one of the more difficult games. Enjoy it with your family and friends, laugh, and have fun, but don't be surprised if you sharpen your feeling for numerical interaction.

The book includes 24 basic games and many variations for all ages and levels of difficulty. They are all good, interactive, thinking games, not tricks. The book is published by Dymax and is available from them or from Creative Computing for just $3.95. (Use the handy order card.)

OHIO SCIENTIFIC CIP

Graphics design program — draw any image directly on screen using movable cursor without POKE. Make full use of graphics. Store image on tape.
Requires 8K. $12.00
4K version w/o tape storage $10.00

Plot program — plot any function over any range on X-Y coordinates. Plot scattergram for any data.
Requires 4K. $10.00

BENCHMARK SOFTWARE
7533 Venetian Way
Indianapolis, IN 46217

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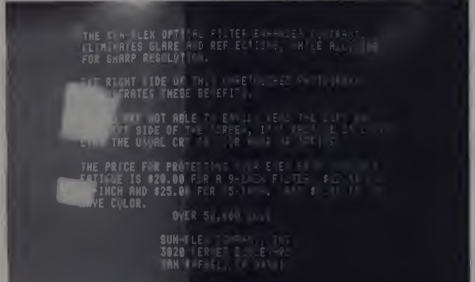

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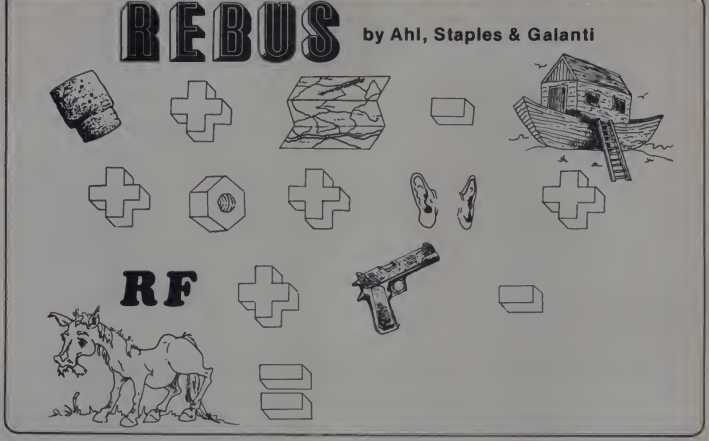

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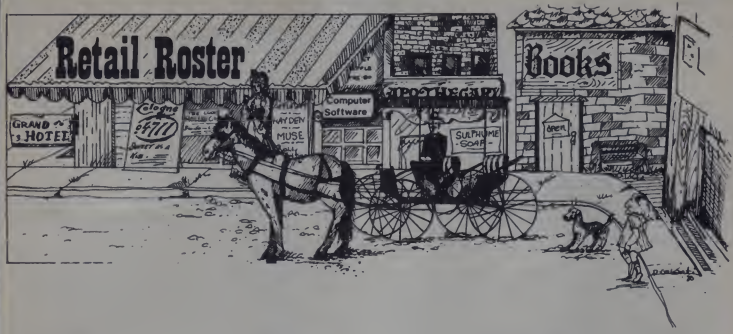

CALIFORNIA

D.E.S. Data Equipment Supply—8315 Firestone Blvd, Downey 90241; (213) 923-9361. 8AM-9PM 7 days. Complete computer facility—Commodore Pet dealer—"$olid Gold $oftware" specialists.

PC Computers—10166 San Pablo Ave, El Cerrito 94530; (415) 527-6657. 9-5:30 Mon-Sat. Commodore Pet, Compucolor and Atari.

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The Computer Store—63 S. Main St, Windsor Locks 06096; (203) 627-0188. 10-6 MTWF, 10-8 Thu, 10-4 Sat.

GEORGIA

Atlanta Computer Mart—5091 Buford Hwy, Atlanta 30340; (404)455-0647. 10-6 Mon-Sat.

ILLINOIS

ComputerLand/Downers Grove—136 Ogden Ave, Downers Plaza 60515; (312) 964-7762. 10-6 Mon-Sat, 10-8 Tue, Thu.

Data Domain of Schaumburg—1612 E. Algonquin Rd, Schaumburg 60195; (312) 397-8700. 12-9 Tue-Fri, 11-5 Sat. Largest book & magazine selection.

Farnsworth Computer Center—1891 N. Farnsworth Ave, Aurora 60505; (312) 851-3888. 10-8 Mon-Fri, 10-5 Sat. Apple, Hewlett-Packard, Cromemco, HP calculators, IDS-440G printers.

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ComputerLand of Louisville—10414 Shelbyville Rd, Louisville 40223; (502) 245-8288. 10-5:30.

MASSACHUSETTS

NEECO—679 Highland Ave, Needham 02194; (617) 449-1760. 9-5:30 Mon-Fri. Commodore, Apple, Superbrain, TI99/4.

Science Fantasy Bookstore—18 Eliot St, Harvard Sq, Cambridge 02138;(617)547-5917. 11-5 Mon-Sat, 11-8 Thu. Apple Games:Shuttle-Adventure Invader.

MICHIGAN

Computer Mart—560 West 14 Mile, Clawson 48017; (313)288-0040. The Midwest's largest computer store! (We will not be undersold!!)

NEW HAMPSHIRE

Computer Mart of New Hampshire—170 Main St, Nashua 03060; (603) 883-2386; 10-5. Dental-medical computer specialists, Data General & Apple systems.

NEW YORK

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.

PENNSYLVANIA

Personal Computer Corp.—24-26 W. Lancaster Ave, Paoli 19301; (215) 647-8643. 10-6 Mon-Fri, 10-8 Wed, 10-5 Sat.

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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."

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We welcome entries from readers for the "Compleat Computer Catalogue" on any item related, even distantly, to computers. Please include the name of the item, a brief evaluative description, price, and complete source data. If it is an item you obtained over one year ago, please check with the source to make sure it is still available at the quoted price.

Send contributions to "The Compleat Computer Catalogue," *Creative Computing*, P.O. Box 789-M, Morristown, NJ 07960.

Computers

MICROCOMPUTER MAINFRAME

CMC Marketing Corp. announces the Model 2018 Microcomputer Mainframe System. The system consists of an 18-slot S-100 bus motherboard housed in a heavy duty precision formed cabinet that is convertible to either a desk top or rack mounted unit.

The motherboard provides interconnections for up to 18 printed circuit cards using the standard S-100 bus format. A jumper system provides active or inactive termination on the various signal lines.

CMC Marketing Corp., 10611 Harwin Dr., Suite 406, Houston, TX 77036. (713) 995-4960.

CIRCLE 230 ON READER SERVICE CARD

Z-80 BASED SINGLE BOARD COMPUTER

The Model 80-20 is the newest in R2E's family of Z-80 based small business microcomputer systems. The single-board system includes a Z-80 CPU; 32K of RAM (64K optional); two single-side, double-density miniflopppies (140K bytes of storage each); ASCII keyboard; parallel Centronics printer interface; cabinet and power supply.

Complementing the system is a 1024 character upper/lower case CRT display with large easy-to-read characters.

Software for the 80-20 includes R2E's BAL Language (Business Oriented Basic) with sequential, indexed sequential and random access file management, plus a macro assembler. Optional are Fortran, Cobol, Pascal, APL, CBasic and MBasic (compiler and interpreter)—all operating under CP/M. $3,000.

R2E of America, 47 Bedford St., S.E. Minneapolis, MN 55414.

CIRCLE 231 ON READER SERVICE CARD

EDUCATIONAL COMPUTER SYSTEM

Psychotechnics, Inc. announces its Validated Computer Math System. The PTI computer features 80 ready-to-run Telemath programs, all of which are cross-referenced to 3 of the leading Math basals.

The system is a supplementary program for grades K-8 which can also be implemented as a mature remedial math program at the secondary or adult level.

The press of a button allows a teacher to load an activity, or change to a new activity in less than 20 seconds. Once an activity is loaded into the computer it can run all day with no further teacher attention. $3500.

Psychotechnics, Inc., 1900 Pickwick Ave., Glenview, IL 60025. (312) 729-5850.

CIRCLE 232 ON READER SERVICE CARD

Z-80 BASED EDUCATIONAL SYSTEM

The Primarius IVS (Interactive Video System) offers color computer graphics with a Z-80 based microprocessor to present multi-sensory interactive lessons stored on single cassette tapes.

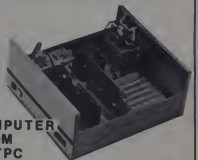
Each tape contains a recorded soundtrack as well as a digitally recorded program that allows the IVS to operate remote from its PDP 11/45 mainframe without giving up any on-line capabilities.

It has graphics resolution of 256 x 192 pixels (2 color), 128 x 192 pixels (color) and a full ASCII character set.

Input is via a 12-key keyboard and an 8 1/2 x 11 Sensor Panel for high resolution photographic overlays. $1200.

Primarius, Inc., 4196-J Sorrento Valley Blvd., San Diego., CA 92121.

CIRCLE 233 ON READER SERVICE CARD



COMPUTER FROM SWTPC

Southwest Technical Products has introduced the SWTPC 69A and 69K computers. Both computers use the Motorola MC 6809 processor, feature dual-bus motherboard design, and are expandable to 56K of RAM.

Flex DOS, Basic, Pascal and an assembler are immediately available, as are editor and debug programs for use in system development. The 69A is available assembled for $595; the 69K is $495 in kit form.

Southwest Technical Products Corporation, 219 Rhapsody, San Antonio, TX 78216.

CIRCLE 234 ON READER SERVICE CARD

NEW PRODUCTS!

Super Color S-100 Video Kit $599.95
Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802 8080 8085 Z80 etc

Gremlin Color Video Kit $59.95
32 x 16 alphanumerics and graphics up to 8 colors with 6847 chip. 1K RAM to 8.000 Plugs into Super Elf 44 pin bus. Not expandable to high resolution Graphics.

Quest Super Basic
Quest, the leader in inexpensive 1802 systems announces another first. Quest is the first company worldwide to ship a **full size Basic** for 1802 systems. A complete function **Super Basic** by **Ron Canker** including floating point capability with Scientific notation (number range - 17E^). 32 bit integer + 2 billion. Multi dim arrays. String arrays. String manipulation. Cassette I/O. Save and load. Basic. Data and machine language programs, and over 75 Statements, Functions and Operators.
Easily adaptable on most 1802 systems. Requires 12K RAM minimum for Basic and user programs. Cassette version in stock now. ROM versions coming soon with exchange privilege allowing some credit for cassette version

Super Basic on Cassette $40.00

Tom Pittman's 1802 Tiny Basic Source listing now available. Find out how Tom Pittman wrote Basic and how to get the most out of it. Never offered before. $19.00

S-100 4-Slot Separation $ 9.95

Super Monitor V1.1 Source Listing $15.00
Assists Boot: Assembler, Editor, Disassembler, D/A/D, Super Sound-Music, EPROM programmer, Stringy Floppy Disc System.

RCA Cosmac Super Elf Computer $106.95
Compare features before you decide to buy any other computer. There is no other computer on the market today that has all the desirable benefits of the **Super Elf** for so little money. The Super Elf is a small single board computer that does many **big** things. It is an excellent computer for training and for learning programming with its machine language and yet it is easily **expanded** with **additional memory, Full Basic, ASCII Keyboards, video character generation, etc.**
Before you buy another small computer, see if it includes the following features: Small monitor, State and Mode displays; Single step, Optional address displays; Power Supply, Audio Amplifier and Speaker. Fully socketed for all ICs. Real cost of in warranty repairs, Full documentation
The **Super Elf** includes a **ROM** monitor for program loading, editing and execution with **SINGLE STEP for program debugging** which is not included in others at the same price. With **SINGLE STEP** you can see the microprocessor chip operating with the **unique Quest** address and data bus displays **before, during** and **after** execution of instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.
An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. The **Super speaker system** included for writing your own music or using many music programs which are written. The speaker amplifier may also be used to drive relays for control purposes

Super Expansion Board with Cassette Interface $89.95
This is truly an astounding board. This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4k of low power RAM** but with addressable anywhere in 64K with built in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board contains slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed**. EPROM can be used for the monitor and Tiny Basic or other purposes.
A 4K Super ROM Monitor $19.95 is available as an on board option of 2708 EPROM fully addressable anywhere in 64K with built in memory protect and a **cassette interface** Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board contains slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed**. EPROM can be used for the monitor and Tiny Basic or other purposes.
A 4K Super ROM Monitor $19.95 is available as an on board option of 2708 EPROM fully addressable anywhere in 64K with built in memory protect and a **cassette interface**.

Memory

32K STATIC MEMORY MODULE

A 32K static memory module, from Micro Control Company, features complete S-100 bus compatibility, low power consumption, and a full two-year warranty.

Other features of this memory module include buffered inputs, tri-state outputs, bank select switches, no DMA restrictions, and a complete set of programming switches for easy interfacing.

Prices are $695 for the 2 Mhz model and $895 for the 4Mhz version.

Micro Control Company, 7956 Main st., NE, Minneapolis, MN 55432. (612) 786-8750.

CIRCLE 235 ON READER SERVICE CARD

Terminals & I/O

8 1/2" RECEIVE-ONLY SERIAL PRINTERS

Printer Terminal Communications Corporation has introduced a low cost version of its line of microprocessor-controlled 8 1/2-inch receive-only serial printers.

Designated the Model 877, the new unit is targeted specifically at no-frills applications where reliability is the overriding concern.

It prints 120 characters per second at 80 characters per line, 10 characters per inch, using the ASCII set of 95 characters. The internally contained paper roll is friction fed, $999.

Printer Terminal Communications Corp., 124 Tenth St., Ramona, CA 92065. (714) 789-5200.

CIRCLE 236 ON READER SERVICE CARD

HIGH-QUALITY DOT MATRIX PRINTER

Computer Textile, Inc. has announced that it is now carrying the hard-to-find Sanders Media 12/7 printer. The media 12/7 is a dot-matrix printer that is capable of producing letter-quality print. Using the "Infinite Matrix" principle, the printer can make up to four passes on one line and offset the picture dots by just a few mils. This makes possible letter-quality print.

Print speed varies from up to 216 CPS in one-pass fonts (for first drafts) to 50CPS in a four pass letter-quality font.

Multiple typefaces are available in a variety of sizes and styles. The Media 12/7 features the ability to mix typefaces on the same line. The Media 12/7 allows up to eleven typefaces to be stored internally in ROM.

Options include an RS-232 interface, forms tractor and cut sheet feeter. $3900.

Computer Textile, Inc., 10960 Wilshire Blvd., Suite 1504, Los Angeles, CA 90024. (213) 477-3067.

CIRCLE 237 ON READER SERVICE CARD

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16K $959

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PRINTERS

ANADEX DP 8000	$785.00
CENTRONICS 730-1	795.00
AXIOM EX 801	495.00
AXIOM EX 820	795.00
TRENDCOM 100	335.00

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ADD $64 FOR ASSEMBLED & TESTED

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The SORCERER is a Z80 CPU based micro computer internally expandable to 48K. 4K ROM resident monitor. I/O connector for S-100 expansion. Parallel and serial interface. Dual cassette I/O. Graphic resolution of 240 x 512. 30 lines of 64 characters, 8 x 8 dot matrix. Full ASCII set (upper and lower case), plus standard graphic symbols. User may define up to 128 characters. Keyboard is 63-key data processing type, plus a 16 key numeric input pad.

32K 1,148.00 48K 1,298.00

LEEDEX VIDEO 100

12" BLACK & WHITE MONITOR

•VIDEO BANDWIDTH 12 MHz ± 3db
•COMPOSITE VIDEO INPUT

$129.00

SOROC IQ 120

- SERIAL RS232C
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CIRCLE 216 ON READER SERVICE CARD

DOT-MATRIX IMPACT PRINTER

Eaton LRC introduces the Model 7000+, a high-speed, low-cost, dot-matrix impact printer designed for small business and home computer systems. It features 1.25 lines per second uni-directional printing, with a line speed of 1.25 lines per second, and prints a 3-1/3 inch line.

It comes with a wide variety of interfaces, including TRS-80 parallel, Apple parallel, RS-232C and PET IEEE, and accepts the full ASCII character set (upper and lower case) and can print in both a single or double wide front. Options available include a 120 character buffer; and a version that prints 64, 40, 32, or 20 characters per line, selectable under software control. $389.

LRC, an Eaton company, Riverton, WY 82501. (307)856-4821.

CIRCLE 238 ON READER SERVICE CARD

SERIAL INTERFACE CARD FOR APPLE

The 7710A Asynchronous Serial Interface from California Computer Systems is a plug-in card which enables the Apple II to communicate with all RS-232-C standard serial devices.

Features include fully selectable baud rates from 50-19,200 baud, 8 and 9-bit transmission, optional odd, even, or no parity. Software programmable interrupts, double buffered data I/O, full handshaking, and power-down ROM are included. The card is available in kit form, or fully assembled and tested.

California Computer Systems, 250 Caribbean, Sunnyvale, CA 94086. (415) 734-5811.

CIRCLE 239 ON READER SERVICE CARD

Mailroom™

Now for CP/M

The reason you put your mailing list on your computer in the first place was to get the machine to do the hardest work. If your mailing list software can't show you which addresses are near Boston, or who's name sounds like Kouzouvelowski, (or was that Kasvalinski?) then you're not using Mailroom.

Don't let your computer make you do the hardest part. Mailroom is now available in CBASIC-2 for CP/M users as well as in the popular North Star Basic version.

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Peripherals

PERIPHERALS FOR TI-99/4

Five peripherals to expand the capability of the TI-99/4 home computer have been announced by Texas Instruments. The mini-floppy disk system, which includes a controller with up to 3 disk drives, can store up to 90,000 bytes of information on each diskette. Up to 127 files may be defined on each diskette.

A special Solid State Software command module with utilities including disk and file maintenance commands is included with the mini-floppy system. The system has a suggested retail price of $300 for the controller and $500 for each drive.

An RS-232 interface converts the parallel data bus of the TI-99/4 to a serially formatted output which conforms to the Electronic Institute of America RS-232 standard.

It has a software selectable baud rate, number of data bits, parity and number of stop bits. $225.

A quality 300-baud acoustic modem has originate and answer modules, as well as a test capability. The modem is connected to the 99/4 through the RS-232 interface and a built-in cable. $225.

The Speech Synthesizer has over 300 words which are accessible from Basic or which may be used by Solid State Software command modules to instruct and comment verbally rather than displaying messages on the screen. $150.

A thermal printer prints 32 columns of 5x7 dot-matrix characters on 3.5 inch thermally sensitive paper at a speed of 30 characters per second. There are 2 pre-defined character sets which are selectable from Basic, and Basic programs can also define special characters in 5x7 matrix format. $400.

Texas Instruments Incorporated, Consumer Relations, P.O. Box 53, Lubbock, Texas 79408.

CIRCLE 240 ON READER SERVICE CARD

REMOTE CONTROL FOR TRS-80, APPLE, S100

MicroMint's Busy Box facilitates wireless remote control of AC operated lights and appliances in the home or office. It converts program commands into an ultrasonic message which is transmitted to the popular BSR X-10 (Sears)Home Control System. The Busy Box is signal compatible with most computers and includes complete on board port addressing.

TRS-80, $104.95; Apple II, $109.95; S100 $114.95.

The MicroMint Inc., 917 Midway, Woodmere, NY 11598. (516) 374-6793.

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CIRCLE 143 ON READER SERVICE CARD

DIGITIZER AND DRAWING SOFTWARE FOR APPLE

Rainbow Computing, Inc. has announced the VersaWriter, a digitizer and software drawing package for the Apple II Computer. The new system provides high resolution, mass color graphics comparable to the quality of the Apple.

The VersaWriter's drawing arm, traced over a picture, brings in that picture as a data structure. The user can create drawings, architectural plans, schematics charts and graphs at will, and store or change them as desired.

Fill-in with up to six colors, scaling, centering and disk storage are all part of the software.

The complete system consists of the VersaWriter drawing board and interface, diskette software, calibration chart and instruction manual. The drawing board plugs directly into the game I/O. Users require an Apple Computer with Disk II, 32K of memory, and Applesoft ROM. $199.

Rainbow Computing, Inc, 9719 Reseda Blvd., Northridge, CA 91324. (213)349-5560.

CIRCLE 242 ON READER SERVICE CARD

LOW-COST MODEM

The CAT acoustic modem is designed specifically for the personal and small computer market.

The 300 baud answer/originate EIA RS-232C modem is engineered to transmit data over all telephone lines, is Bell 103 compatible and has an AC Wall mount transformer.

Novation, 18664 Oxnard St., Tarzana, CA 91256.

CIRCLE 243 ON READER SERVICE CARD

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This system is strictly for the market speculator. Working with price, calculated volatility, and calculated average daily premium, this system picks the best buys from 75 or more options. Judgement by the analyst is required. For $35.00 you receive two programs plus example data base and instruction manual. TRS 80 LEVEL II and PET

STOCK MARKET ANALYSIS SYSTEM

Technical analysis, 12 daily and 15 weekly indicators, for the stock market enthusiast. This system signaled the Oct 78 debacle. For $25.00 you receive two programs plus data base and 27 page detailed instruction manual.
TRS 80 LEVEL I or II 16K and PET

FINANCIAL ANALYSIS SYSTEM

Includes two programs and hard copy instructions for better control of your stock and option transaction. For $20.00 you receive software with eight analysis routines. Two of these routines are stock transactions which made money and option transactions which made money. Six more program routines exist with some consideration given to taxes. Please indicate:
TRS 80 LEVEL II 16K or PET 8K

ACCOUNTING ANALYSIS SYSTEM

Includes two programs and hard copy instructions for a small cash enterprise. From your data base a Profit and Loss Statement as well as a Balance Sheet are produced. In addition simple budget comparisons are made. Please remit $20.00 and indicate:
TRS 80 LEVEL II 16K or PET 8K

LETTER PROCESSER

This program for TRS 80 owners with printers. Generates letters to different individuals with the same body. Cassette file stores names and addresses. Remit $15.00

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CIRCLE 214 ON READER SERVICE CARD

Vendor Literature

GUIDE TO BUSINESS SOFTWARE

TRS-80 Yellow Pages 2.1 is a 16-page newsletter/catalog devoted to serious business software. It includes information on selecting business software for the TRS-80 computers, and describes all the software produced by Micro Architect.

For a free copy, send two stamped, long, self-addressed envelopes to Micro Architect, 96 Dothan St., Arlington, MA 02174.

CIRCLE 244 ON READER SERVICE CARD

SOFTWARE CATALOG FOR TRS-80 MODEL II

National Software Marketing has Published a catalog of software for the TRS-80 Model II.

The software described includes accounts receivable, accounts payable, general ledger, payroll, inventory, rental management, order entry and a variety of financial and mathematical programs.

National Software Marketing, Inc., PO Box 6195, Hollywood, FL 33021. (305) 625-6062.

CIRCLE 245 ON READER SERVICE CARD

Newsletters

APL NEWSLETTER

Personal APL News, will cover all aspects of personal use of APL with or without a computer, including hobby, educational, professional and very small business.

An important feature will be an ongoing resource directory, giving details of available APL hardware, software, services, books and personal uses of APL, one category per issue.

U.S. and Canada, $1.00; elsewhere, $2.00 for 1980.

Personal APL News, PO Box 1131-H4, Mt. Shasta, CA 96067.

CIRCLE 246 ON READER SERVICE CARD

Systems Software

LANGUAGES

A development package for the TRS-80 Model II from Racet Computes includes a machine language "Superzap" which enables the user to change ASCII fields as well as hex fields, patches for a disk-based editor/assembler and disassembler, and upload service for the Apparat Newdos editor/assembler and disassembler. $100. Racet Computes, 702 Palmdale, Orange, CA 92665. (714) 637-5016.

CIRCLE 247 ON READER SERVICE CARD

People's Pascal I, a tiny Pascal compiler written in Basic for a 16K TRS-80 Level II system, enables the user to write fast, efficient machine language code while working with a higher-level language. $15. People's Pascal II is said to be easier to use and faster operating. $23. Computer Information Exchange, Box 158, San Luis Rey, CA 92068.

CIRCLE 248 ON READER SERVICE CARD

OPERATING SYSTEMS

The Multi-user Oasis operating system for Z-80 microcomputers features ISAM files, hard and floppy disk support, editor, user accounting with logon, password, privilege level and file security. A business system software package is also available. Phase One Systems, Inc., 7700 Edgewater Dr.,

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For $200 you can now transfer data between big and small systems.

REFORMATTER, a Diskette Utility Program, enables you now to transfer textual data files in either direction between Z-80 or 8080 based micros operating under CP/M and IBM systems using 3741 diskettes or systems accepting input data through conversion from the IBM 3741 diskette.

Detailed program information available from:

MicroTech Exports
912 Cowper Street
Palo Alto, CA 94301
Tel: 415/328-1712

CIRCLE 189 ON READER SERVICE CARD

Suite 830, Oakland CA 94621. (415)562-8085.

CIRCLE 249 ON READER SERVICE CARD

A **translator** is now available to convert Microproducts/Apple II Four-Character Label Editor/Assembler text files to a format compatible with the new Apple II Six-Character Label Editor/Assembler. The user will be able to upgrade assembly language programming capabilities without abandoning source code programs previously written on the original Editor/Assembler. $9.95. Microproducts, 2107 Artesia Blvd., Redondo Beach, Ca 90278. (213) 374-1673.

CIRCLE 250 ON READER SERVICE CARD

DATA BASE PACKAGES

The H8/H89 **Data Base Management System** allows the user to add, delete and update records in the data base; sort;list all or part of the data base; read the data base from a disk file or write it to a disk file. $25. J.D. Hill, 6400 Gila Ct., Plano, TX 75023.

CIRCLE 251 ON READER SERVICE CARD

Spelling Bee is a record-oriented, spelling dictionary data base operating system containing 25,000 of the most frequently misspelled words. It is written in Basic for Apple, CP/M, North Star and TRS-80. $50. Puma Software, PO Box 974, Downey, CA 90241.

CIRCLE 252 ON READER SERVICE CARD

Whatsit?, a conversational filing and query program for personal computers is now available in a printing version for the Apple II. The Apple Model includes a "Soundex Request" for retrieving entries by phonetic matching "useful," says the manufacturer, when spelling is unknown or forgotten." Prices start at $100. Computer Hardware, PO Box 14694, San Francisco, CA 94114.

CIRCLE 253 ON READER SERVICE CARD

Information Master is an interactive information management program for CP/M and CP/M compatible operating systems which runs on 8080 and Z-80 Computers with at least 32K of RAM and two floppy disks. The program is said to be particularly useful for applications which require flexible access to a large body of information over a long period of time. $37.50. Island Cybernetics, PO Box 208, Port Aransas, TX 78373.

CIRCLE 254 ON READER SERVICE CARD

MISCELLANEOUS

The H8/H89 **Assembler Program Development System** is a group of programs written in Basic and designed to aid assembly language program development. The system consists of an executive program, a Help program for listing documentation and two utilities. $25. J.D. Hill, 6400 Gila Ct., Plano, TX 75023.

CIRCLE 251 ON READER SERVICE CARD

Applications Software

EDUCATIONAL

Teacher Plus is one of two programs from Charles Mann & Associates designed to teach the floating point Basic of the Apple II and Apple II Plus. The 17-lesson program teaches all frequently used Basic commands as well as most basic computer logic techniques. **Plus Teaching Pac** includes, in addition to all the elements of Teacher Plus, a Floating Point Dictionary which references all Basic commands. Prices range from $24.95 to $59.95. Charles Mann & Associates, Micro Software Division, Customer Relations Branch, 7594 San Remo Tr., Yucca Valley, CA 92284. (714) 365-9718.

CIRCLE 256 ON READER SERVICE CARD

The H8/H89 **Computer Aided Instruction** System includes a variety of math and reading/spelling drill programs as well as a general tutoring program which allows the user to write CAI "courseware." $25. J.D. Hill, 6400 Gila Ct., Plano, TX 75023.

CIRCLE 251 ON READER SERVICE CARD

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Carl Galletti and Roger Amidon, owners

MACRO I

All of the software below is available on any of the following media for operation with a Z80 CPU using Pre CP/M® or similar disk operating system (each as our item TYPE):

for TRS-80® CP/M (Model One):
for 5" CP/M (unformatted single density)
for 5¼" CP/M (soft sectored single density)
for 5¼" North Star CP/M (single density)
for 5¼" North Star CP/M (double density)

BASIC I

A powerful and fast Z80 Basic interpreter with 14 digit accuracy. Includes full LEVEL II/MICROSOFT language, automatic CALL LOGOO for chaining, COPY to move text EDITOR, FULL LINE INPUT error intercept (assumed) for handling in the event of a bad input, and many other much more. It runs a little over 12 K and is ROMable. An excellent choice for games. 8080 like programs are loaded in 7 digits in order to make it one of the fastest around. $60.95

BASIC II

Basic I but with 17 digit precision (digits to speed similar to the business world with sin, x single sec/side or speed. Sin 1 radian in 1.2 sec. Includes all the extra's of Basic with new error codes). $99.95

BUSINESS BASIC

The most powerful Basic for business applications. It adds to Basic II with random access files, PRINT USING, and a full set of commands for handling comprehensive access to multiple disk files. PRIVACY command to prohibit user access to source code global editing added. Implementation of ISAM (Indexed Sequential Access Method) using Basic (not running at demon). $119.95

ZBRT

A character oriented text editor with 25 commands and macro capability for arranging multiple text files together with powerful search/change capability with options, prompts and a complete array of character mode edit device and display functions. $49.95

ZTR

Z80 Text Editor Package. Not just a text editor, it supports a language which allows you to edit text and also write, save and recall programs which manipulate text. Commands include conditional branching and looping, string and numeric variables, expression evaluation and much more. Contains 36 value registers and 10 text registers. Can be used as a powerful text manipulation language or as a text editor. $99.95

TOP

A Z80 Text Output Processor which will do text formatting for manuals, documents, letters, etc. Commands are easy to learn and use with any text editor. Does justification, underlining and headings, table of contents, indexing and much more! $49.95

CP/M is a trademark of Digital Research.
TRS-80 is a trademark of Radio Shack.

MACRO II

A macro assembler which will generate relocatable or absolute code for the 8080 or Z80. Long standard total mnemonics plus 8080 and Z80 mnemonics are supported. Macro instructions, 16 nesting levels. Full absolute ops, 11 arithmetic/logical operations, local and global symbols, chaining files, conditional capability with optional listing and cross reference. Can be used as a disk assembler or by generating .HEX files if it is doing all the work for you. It actually makes assembly language programming fun! Far less of an effort and more creative! $49.95

MACRO III

Expands upon MACRO II by including floating point arithmetic (8 digit accuracy smoked) thereby being able to add full advantage of the optional L-rider. Also a sine and data function has been added and the listing capability improved. $69.95

MACRO IV

How many times have you wished that the same subroutine in each new program? The most professional programmers compile a macro library of these subroutines and use it as a tool in the development of new programs. Development time is thus drastically reduced and becomes comparable to working on a high level language but with all the added of assembly language. So get the MACRO IV and start building the foundation of a library of routines. Usable with MACRO I, II or III or as an assembler, version 2.0 or later. $89.95

DEBUG I

Many programmers get up on an array or assembly language and then find that their own programs are so large and more powerful. To them, assembly language seems difficult to understand and below it all. Debug I will change all that. Debug I is not just another name. By Debug I, Debug I you can easily follow the flow of any Z80 or 8080 program 1 line at the program one step at a time or 15 steps or whatever. Debug I displays the contents of all registers and memory locations and what 1 and 2 byte mnemonics can then be made. Debug I commands is all under your control. You can even stop displaying unwanted registers. Any of the 64K memory locations can be set during execution. Debug I can say for most many times over by saving you valuable programming time. $69.95

DEBUG II

This is an expanded debugger which has all of the features of Debug I plus many more. You can trap (i.e. stop a program) upon a set of register flag value memory location contents. Trace (display) operation can be variable and executed command. This makes it easy to learn new instructions by single stepping through them and watching the effect. Find & FAILED functions allows searching between ASCII binary, decimal, hex and/or signed decimal or split octal. Too many to list.

Z80 is a trademark of Zilog.
CP/M is a trademark of Digital Research.

Trap, split octal, unsolicited interrupts are TDL's.

Prices features and more sent out to your door. Verify power or send $1.00 for Debug I and Debug II and 1 must run on a Z80 but with debug both Z80 and 8080 code. $69.95

ZAPPLE

A Z80 executive and debug monitor which will operate with the Apple II computer and its Apple II CP/M card. Front panel execute many hit display read and write of RAM or floppy. Trace step and more! Disk $19.95. Also available in 2K x8 PROM/ROM/EPROM for the Apple II, the D.C.A.C.#2 and 1 Pack $49.95. Kit $49.95. 8448 II bare board $49.95.

Pre PIE and the 7A/3240 + for $648 in $12.95

8080 version of Zapple - does $19.95

TINY

A NEW Z80 disk operation system! This is not CP/M. It's better! You can edit run programs, copy files, and more! It's small, unlike CP/M! This operating system was designed specifically for the small system. Full complement of file & peripheral instruction set in other words its not stunted even though it's small. Only 2K bytes long. Runs on any Z80 CPU, 1/0 form, VERSA FLOPPY, North Star DOUBLE, and Digital Micro Systems. $49.95

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Dealer Inquiries invited

CIRCLE 131 ON READER SERVICE CARD

HOME MANAGEMENT

The H8/H89 Personal Accounts Payable System is designed to maintain information on household bills. It is written in Basic and requires a minimum of 24K of memory. J.D. Hill, 6400 Gila Ct., Plano, TX 75023.

CIRCLE 251 ON READER SERVICE CARD

BUSINESS

A **General Ledger System** for the TRS-80 Model II features unlimited inherent files, a year-to-year comparison on the income statement and balance sheet, account transaction summary reports up to a full year, and automatic posting of retained earnings to user-defined accounts. Taranto Associates, PO Box 6073, San Rafael, CA 94903. (415) 472-2670.

CIRCLE 259 ON READER SERVICE CARD

Management Systems Software announces two business programs for the TRS-80; a forecasted **cash-flow budget** with which the user can plan a firm's cash needs for up to twelve periods ($125), and a program which considers current tax laws in producing a **lease vs. purchase evaluation** ($100). Management Systems Software, Inc., 5200 Brittany Dr., #1006, St. Petersburg, FL 33715. (813) 864-4347.

CIRCLE 260 ON READER SERVICE CARD

A line of disk-based business software for the TRS-80 from Hebbler Software Services includes **Accounts Receivable/Invoicing** and **Payroll** for both Models I and II. The programs are available separately for the Model I only. Prices range from $39.95 to $99.95. Hebbler Software Services, 7142 Elliott Dr., Dallas, TX 75227.

CIRCLE 268 ON READER SERVICE CARD

Taxpreparer by Howardsoft is a disk-based package for the Apple which aids the user in preparing the 1979 Federal Income Tax Return. Form 1040 and all schedules are included. $69.

Howard Software Services, 7722 Hosford Ave., Dept. C, Los Angeles, CA 90045.

CIRCLE 261 ON READER SERVICE CARD

Racet Computes announces a **Generalized Subroutine Facility** for the TRS-80 Model II. Machine language functions include multi-key—multivariable in-memory sort, multi-key character string in-memory sort, USR PEEK and POKE capability, compress and uncompress data, move blocks of data, and propagate across arrays. $50. Racet Computes, 702 Palmdale, Orange, CA 92665. (714) 637-5016.

CIRCLE 262 ON READER SERVICE CARD

CP/M 2.0 fom Lifeboat Associates makes it possible to run CP/M programs on the TRS-80 Model II. The system has nearly 500K bytes per disk with double density formatting, but will read/write standard single density disks. $170. Lifeboat Associates, 2248 Broadway, New York, NY 10024. (212) 580-0082.

CIRCLE 263 ON READER SERVICE CARD

Mail-M2 is a mailing list system for the TRS-80 Model II which features multiple labels (up to four) across a page, form input, a report generator, Shell sort, error trapping, random access search or sort by any field, statistics, two levels of security, a report generator and date manipulations. $99. Micro Architect, 96 Dothan St., Arlington, MA 02174.

CIRCLE 264 ON READER SERVICE CARD

Lifeboat Associates announces **Postmaster**, an integrated mailing list management system for all popular 8080 and Z-80 computers using CP/M. The package includes a program to prepare and edit form letters and to record-sort based on any specified field. $150. Lifeboat Associates, 2248 Broadway, New York, NY 10024. (212) 580-0082.

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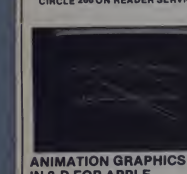

ANIMATION GRAPHICS IN 3-D FOR APPLE

An Illinois software firm has announced a three-dimensional line-drawing package for Apple hi-res graphics.

Permitting three-dimensional animation (and of course its two-dimensional subset), this set of programs allows the user to create and manipulate a three-dimensional data base, and view it in perspective. The package is especially suited for the study of complex three-dimensional objects in "wire-frame" form, which the user may "fly around" or view from any angle.

The programs, which come in either Applesoft or machine-language versions, perform three-dimensional coordinate translation, rotation and scaling. Prices range from $30 to $55.

SubLogic, Box V, Savoy IL 61874.

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Computers, Books

Although they have been accused often — and sometimes justly — of provincialism, book publishers are always in need of hints on what kind of world will soon surround them. If you could direct the attention of the book industry to only one of the important changes that are likely to occur in our culture by the turn of the century, which one would you flag, and why?

One key change likely to occur over the next 25 years will be a demassification of the mass media — and of our minds. This means even more special-interest magazines, books and information services. It means a substantial shift from uniformity-producing network television to diversity-producing cable and cassette. It means each of us will receive more varied images through many more channels — and that less and less of the culture will be shared. It means we shall live — in fact, we already do — in a blip culture that bombards us with unrelated chips or blips of data.

Instead of receiving a unified image of reality, we are each forced to fabricate our own individualized image of reality out of these blips. What the culture cries out for, even now, is synthesis. Two things will ultimately answer that cry: computers — and that powerful information technology called the book.

Alvin Toffler
Author of "Future Shock," the forthcoming "The Third Wave," etc.

Home Data System

General Telephone & Electronics has been licensed to manufacture and market, under the Sylvania name, the hardware for Mattel's computer-based Intellivision home entertainment and information processing system.

Thomas R. Shepherd, senior vice-president and general manager of GTE Entertainment Products, Batavia, N.Y., said GTE sees the system as a device beginning as an entertainment product, moving to an educational device and ultimately becoming a home computer.

The system, which connects to a television set, uses preprogrammed cartridges and consists of a 16-bit microprocessor master component with two hand-held controllers.

The second component is the keyboard, which is expected to be introduced in 1980.

Control Data is test-marketing its Plato educational terminal-mainframe system in 100 Minneapolis homes at a reduced lease price to determine the potential of the residential market.

CDC has been operating the Plato program at a total deficit of $38 million since the firm took it over from a government-funded pilot program six years ago. There are about 1,000 revenue-producing Plato terminals installed with customers, but Plato isn't expected to be a profitable business for CDC before 1983.

CDC is studying the use of the terminals by home residents to see if they "use the terminal in a meaningful way," a spokesman said. Minneapolis Plato use results have shown that home users usually play computer games with the terminal initially, then move on to more sophisticated educational programs. Educational software ranges from the elementary school to the college and professional level.

CDC is leasing the Plato terminal and software to residents of 100 Minneapolis homes for $100 a month. Users install the terminal themselves by plugging it into a telephone company-provided device for which the user must pay an installation fee and a $3-per-month lease fee. The user also must pay the telephone bill for the telephone link to the Arden Hills computer center. CDC's standard monthly lease price is $1,100 to $1,200 per terminal for its Plato customers in the airline, automotive, and power utility industries and in universities.

CDC plans to place a total of 50 additional Plato terminals in homes in two other cities sometime next year in similar marketing test projects. The user cost may vary in other cities, in part because the telephone link to the Arden Hills computer center would be long distance from a city other than Minneapolis, CDC said.

Plato In Home Test

Computers Help the Environment Too!

Engineers had to simplify the equations, which led to errors in the results. Scale models are expensive and they cause different errors in the results. Now the computer enables us to use very realistic models with ease.

In the early 1800's, scientists devised several mathematical equations to help them describe the motions of solid particles in fluids. The equations were so complex though, they could not be solved. Now an IBM 3033 processor at Louisiana State University is helping solve these equations, and in turn is helping engineers determine the best courses of action to take to meet massive environmental challenges.

For example, at the mouth of the Mississippi River, new land is constantly forming, creating a hazard to shipping. The mathematical model of this complex process was developed by Richard C. Farmer, professor of chemical engineering. The model describes a large number of differing forces and directions of fluids and substances in motion.

The model may help solve a problem in Alabama, where the U.S. Army Corps of Engineers is dredging parts of Mobile Bay to keep channels clear for shipping. Computed results may show where to deposit sediment from the dredging operations without endangering precious oyster beds. This computer model was originally developed for NASA to help interpret satellite photos of the bay.

A study of silting in a river in Texas may help an energy company save $300,000 every year and a half. That's what it costs to dredge the channel so oil tankers can reach refinery docks. Professor Farmer hopes to find a way to halt the silting without creating other environmental problems.

The Tennessee Valley Authority uses Professor Farmer's approach to determine optimum methods, from an environmental standpoint, to dispose of the waste heat from power plants. TVA also uses the model to predict thermal effects in storage reservoirs that are caused by the operation of turbine power generators.

Computer Answers Queries About Books

A bountiful bookstore can be an intimidating place for a shopper, especially if one is unsure of what one wants, or where to find it. Thousands of books and, of course, no salesperson in sight.

Ah, to snap one's fingers and have the questions answered. Well now we can, just as easily and virtually as fast.

The TST-180 B. Dalton Bookfinder, informally called "Book Rogers" is from Information Dialogues, Inc. of Minneapolis. Besides containing a wealth of information for book-lovers, it doesn't operate like other computers with keyboards that require punching and paper that requires handling. With Book Rogers, all the user does is touch a screen with his or her finger. That's it.

The key to this computer is its 15-inch, television-like screen that, when touched, displays the information the person has requested, such as, what books are recommended reading, book prices, book descriptions, plus answers to trivia questions like, What was O'Henry's real name? Who was the first American to win the Nobel Prize? and What is the first name of private eye Mike Hammer's secretary?

Similar computers have been tried in department stores. Each retail store is able to program its own touch-sensitive computer to meet its needs and provide a stamp of individuality, even a sense of humor. One terminal had, as part of its travel service section last winter, the choices "someplace warmer" and "someplace colder." When the "someplace colder" spot on the screen was touched, the computer responded with "You've got to be kidding!"

A customer first sees a message on the screen, typically "Hello. I'm here to help. Touch me and begin." After being touched, the computer displays a variety of categories on the screen, along with a new message, such as: Touch area of interest." From there, the user is introduced to the various possibilities for information about that particular store. In some cases, terminals are even equipped with telephones that customers can use to order merchandise from store departments that are programmed into the computer.

As Book Rogers might say, welcome to the twenty-first century.

Meet Arok

This handsome fellow is AROK, a 6-foot-2, 275-pound robot built by Ben Skora of Palos Hills, Illinois. AROK takes out the garbage, walks the dog, serves drinks, and brings in the mail. A built-in computer is programmed for certain tasks, and AROK can also be operated by remote control. However, AROK is not quite complete. "He needs a woman. I think I'm going to build him a woman," says Skora.

Shakespeare & Chaucer Meet the Computer

At most universities, computer scientists and English scholars are about as compatible as oil and water. However, at the University of Colorado at Denver, Michael J. Preston is dependent upon computer science for the development of concordances.

A concordance is an alphabetical index of the principle words and their contexts in a book or the works of an author. Produced manually, a Shakespeare concordance took eighteen years, and a Chaucer concordance begun in the 1860s was completed in 1927. Researchers aided by computers can now handle masses of information faster and with meticulous accuracy.

"There isn't much time saved in the card-punching or proofreading phases," says Preston, "but you only have to do it once. From then on retrieval is simple and allows endless expansion."

In addition to simplifying production, computer science offers the capability of placing an author within the context of other writers. "In the future," Preston predicts, "students won't have to be satisfied with the old copout from professors — 'No one really knows' or 'It relates to an oral tradition.' We now have a humanly feasible means of determining facts."

Preston directs the Center for Computer Research at CU and hopes that it will become a "regional model shop" for computer application in the humanities. Adapting the work of scholars in the humanities to computers hasn't been easy, Preston says, and still offers major problems.

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Reviews

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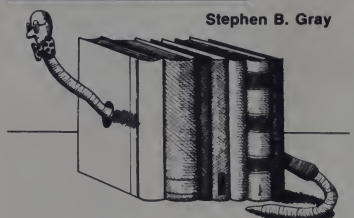

Payroll With Cost Accounting — CBASIC, by Lon Poole, with Mary Borchers, Martin McNiff and Robert Thomson. Osborne/McGraw-Hill, Berkeley, CA 94710. 376 pages, paperback $15. 1979.

This is the first in a new series of business-software books, with programs written in CBASIC, according to the press release. Actually, it's a translation of the 1977 Osborne book of the same title, by Poole and Borchers. Two other earlier Osborne program books, **General Ledger,** and **Accounts Payable And Accounts Receivable,** are being (or have been) translated into CBASIC for the new series.

The new Payroll book is almost exactly like the previous edition, except that the programs are in CBASIC, "a popular commercial Basic for 8080/Z80 microcomputers which use a CP/M operating system," according to the back cover. Although the CBASIC edition has the same number of pages as the previous edition (which used the extended Basic designed for the Wang 2200), the paper is thicker, so the new version is almost twice as thick, over an inch, and spiral-wire bound, with wire-ends that tend to catch on various things, in accordance with Murphy's special law regarding the perversity of inanimate objects.

Some of the noteworthy features of these programs are: interactive data entry with what is said to be easy correction of data-entry errors; monthly, quarterly and yearly cumulative totals for each employee; summaries of the current year's paychecks for each employee; job costing (labor distribution) with cumulative totals and overhead calculations; flexible deduction schedule for every employee; check printing with full deduction and pay detail; and 16 different reports, including W-2 and 941.

The book contains 38 application programs and 11 support modules (10 of which are common subroutines). In the 142 pages of source listings, only some of the statements have line numbers, as the book puts it, "if you are converting the listings to another version of Basic, you may have to assign line numbers to every statement. This will mean changing some of the existing line numbers. Be sure to also change any GOTO's or GOSUB's that reference the changed line numbers." Happy hunting!

The documentation includes an operator's manual, with screen-display formats, sample reports, and file descriptions and layouts. Chapter Five explains Special CBASIC-2 And Hardware Features. Chapter Six gives suggestions on how to change the programs, for customization.

As usual with Osborne publications, this new Osborne/McGraw-Hill book is complete in just about every possible detail, such as the source listings being documented with in-line remarks.

All you need is $15 and somebody with enough patience to input 140 pages of programs into your computer via the keyboard. (Actually, you can get these programs on disk from several sources.)

Annals of the History of Computing, Editor-in-Chief, Bernard A. Galler. AFIPS, 1815 North Lynn St., Arlington, VA 22209.

This isn't a book, but deserves to be mentioned in these pages. The annals are published quarterly by the American Federation of Information Processing Societies, Inc. Annual subscription rates are $15 for a member of an AFIPS constituent society, $20 for an individual non-member, $40 for institutions, and $12.50 for a single copy.

According to the foreword, the Annals of the History of Computing is the first periodical to be published by AFIPS, and covers "scholarly papers and anecdotal notes, rigorously researched material and controversial remembrances, articles on the pioneers in the field and on the milieu of the time."

The first issue, Volume 1 Number 1, July 1979, contains articles about BINAC, "the first operational stored-program computer completed in the United States"; the History of Fortran I, II and III, by John Backus, who led the development of Fortran; Early Work on Computers at Bletchley, England, where computers were developed during World War II to decipher German messages encoded on the Enigma and Geheimschreiber machines; The History of the JOHNNIAC, by Fred Gruenberger; Fortran anecdote, Fortran Comes to Westinghouse-Bettis, 1957; reviews of books about the Countess of Lovelace and about the mathematical works of Babbage and several departments.

The various writing styles are quite clear and straightforward, and nearly everything in this first number can be read and understood by a high-school computernik, although the Fortran article has portions that only a programmer could fully appreciate.

The Annals make fascinating reading for anyone with an interest in the beginnings of digital computers. But don't expect to see an article about the IBM 370, not for some years yet. Although the Annals don't (apparently there's a Writer's Guide that does), a computer won't be written up until about 15 years after its introduction, to give it the proper historical perspective.

A department I'd like to see added to the Annals is "Where Are They Now?" which would describe the fate of early machines such as ORDVAC, MANIAC and ORACLE, and let us know if they've been scrapped, or if all or part of each is still around, in a company basement or on view in a museum.

Introduction to Business Data Processing, by D. K. Carver. John Wiley & Sons, Inc., New York. 376 pages, hardcover $16.95. Second edition, 1979.

The subtitle of this introductory-level textbook is "With Basic, Fortran And Cobol Programming." The title of the first edition was "Introduction to Data Processing"; the second edition's title reflects a change in emphasis from a general approach to a systems viewpoint.

The 21 chapters deal with punched cards, number systems, input/output, CPU, data entry, storage, processors, data communications, systems, programming and business data processing. The appendices tell how to operate an IBM 029 card punch and a Teletype 33.

The author's style is pleasantly informal, and his text is full of very well chosen photographs, drawings and charts, along with some cartoons from Infosystems magazine. Each chapter ends with a summary, glossary of terms and study questions.

The book is well written, in an easygoing yet thorough manner. The chapters on Basic, Fortran IV and Cobol, cover a great deal, build up in very logical sequences and touch on many small but important points along the way.

Enough information is given for the student to be able to write payroll programs in Basic and Fortran, and to compute mortgage-interest payments in Cobol.

The text is a pleasure to read, with two columns per page and a highly legible sans-serif typeface.

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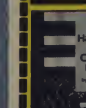

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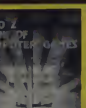

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Microsoft Basic, by Ken Knecht. Dilithium Press, Box 92, Forest Grove, OR 97116. 162 pages, paperback $8.95. 1979.

According to the back cover, this is "At last, a tell-it-all Basic book for TRS-80 users!" But page 1 says "The Basic we will be describing in this book is MITS Basic." So this is not really a book about TRS-80 Level-II Basic, but about the Basic used on a computer no longer being manufactured, the MITS Altair.

The author explains, on page 4, "The next question you might have is why do we use the MITS version of Basic? Well, I have been using it for several years and am familiar with its uses and operations. It would also be difficult to obtain the documentation for all the other Basic versions and note the differences (also confusing). The documentation is hard to come by and new versions of Basic seem to be born every month or so."

Sorry, but that explanation isn't quite good enough. Even though the author does have a chapter on Radio Shack Level-II Basic, in which he describes in some detail the commands in MITS Extended Basic that don't exist in Level-II Basic, and vice versa, this is nevertheless a book that should have been published at least two years ago, if not three. The last product with an Altair name on it, an 8-800B computer kit, came off the line in the summer of 1978.

The book begins with a glossary of terms, seven pages of definitions that should be placed individually in the text where relevant, or put at the end of the book in an appendix. But up front, where it's likely to be ignored, or could scare off some readers, by giving too much too soon, all that stuff about initialization, alphanumerics, string literals. Better to open with the Getting Started chapter.

The book is fairly well written — up to page 44. The next chapter, on arithmetic in Basic, skimps on functions such as RND; also, the seven short sentences on RND are confusing.

This chapter contains a long perpetual-calendar program, much too long for this book, and without much explanation at all.

The chapter on strings doesn't give any examples at all for many of the statements. More space should have been spent on arithmetic and strings, and less on disk, to which 28 pages are devoted.

Principles of Interactive Computer Graphics, by William M. Newman and Robert F. Sproull. McGraw-Hill Book Co., New York. 557 pages, hardcover $24.95. Second edition, 1979.

This second edition of a very popular 1973 textbook will have you salivating over all the ideas it will give you for using interactive graphics with your computer. Even if you're already far into graphics, this comprehensive guide is bound to show you some new areas.

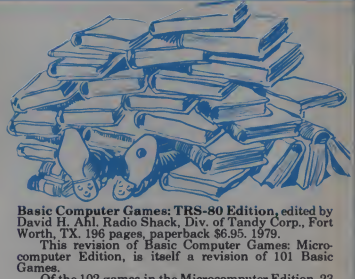
There's only one catch: to fully understand this book, you've got to have a knowledge of calculus and matrices. And a knowledge of Pascal wouldn't hurt, because all the programming examples are in that language.

The 28 chapters are divided into six parts, on Basic Concepts (point-plotting, line-drawing, clipping and windowing, etc.), Graphics Packages, Interactive Graphics (input devices, input techniques, event-handling, input functions), Raster Graphics, Three-Dimensional Graphics and Graphics Systems.

There's an appendix on vectors and matrices, but you'd need an advanced math degree to understand it. The bibliography is comprehensive, listing 533 items.

The second edition contains five new chapters "responding to an urgent need for information on raster-scan graphics," as the jacket puts it. A new chapter on user interface design is included, plus new material on geometric modules, shading, display devices and device-independent systems.

This is probably the most informative book on interactive computer graphics ever written. If you're into graphics, have $25 and the need to know more than you've been able to pick up here and there, this book is for you.



Basic Computer Games: TRS-80 Edition, edited by David H. Ahl. Radio Shack, Div. of Tandy Corp., Fort Worth, TX. 196 pages, paperback $6.95. 1979.

This revision of Basic Computer Games: Microcomputer Edition, is itself a revision of 101 Basic Games.

Of the 102 games in the Microcomputer Edition, 23 have been converted to TRS-80 Level-I Basic and run in 4K. The rest are for 16K Level-II Basic. A printer is required for three: Amazing, Banner and Love.

The layout of the TRS-80 edition is the same as for the Microcomputer Edition: a brief explanation, a RUN and a LISTing. The same clever cartoons by Sandy Dean are used.

Few actual changes were made in the programs themselves, since the MITS Basic in which the Microcomputer Edition games were written is Microsoft Basic, which is the basis for TRS-80 Level-II Basic. The main difference is that the programs for the Microcomputer Edition were written for a hard-copy terminal, and had to be converted to a screen-oriented system. Also, Boolean operators are a little different in the two Basics.

Very little use is made of TRS-80 graphics, other than to set up simple playing fields. The reason for this, according to Eric Van Horn, who managed the conversion effort, is that the idea of the game book is to provide the basic programs for the games, and let the reader experiment with adding whatever graphics and other enhancements he wants.

As Dave Ahl's introduction puts it, "We hope that you will add your own enhancements. Graphics, personalization, additional skill levels and humorous remarks are obvious places to start. As you gain experience, try changing the playing algorithms to make a deterministic game into a heuristic one." Into a what?

One useful page from the Microcomputer Edition is missing from this one: the Contents By Game Category page, with twelve sections: Introductory Fun (Buzzword, Russian Roulette, Poetry, etc.), Educational (Hammurabi, Kinema, Hangman, etc.), Plotting and Pictures (Calendar, Sine Wave, 3-D Plot, etc.), Number or Letter Guessing (Stars, Trap, etc.), Remove an Object (Batnum, Nim, etc.), Matrix Manipulation (Hurkle, Mugwump, Pizza, etc.), Logic (Awari, Bagels, Hexapawn, Tower, etc.), Space (LEM, Super Star Trek, etc.), Sports Simulation (Basketball, Bullseye, Hockey, etc.), Gambling and Casino (Blackjack, Horserace, Roulette, etc.), Card and Board (Acey Ducey, Checkers, Gomoko, War) and Combat (Bombs Away, Combat, Gunner).

The few graphics used don't look right, because there is no way to reproduce TRS-80 screen-oriented graphics on a line printer. So what would be a graphics-block rectangle on a TRS-80 screen, comes out as a dot in the same RUN's here.

But these are small problems, in view of the many good points of this fine collection of programs now transcribed for the "hundreds of thousands of new, enthusiastic users," to borrow a phrase from this very useful book.

A second book of Basic Computer Games for the TRS-80 is in the works at Creative Computing, and may be available from Radio Shack before long.

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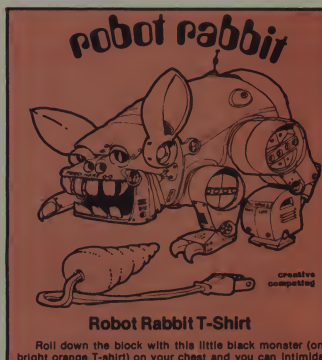

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Computer Coin Games, by Joe Weisbecker. Creative Computing Press, Morristown, NJ. 87 pages, paperback $3.95. 1979.

If the title is a little mysterious, the subtitle on the cover explains a little: "The penny switch games that help you learn and love computer circuits." Penny switch?

The introduction explains a little more: "By sliding pennies around you see exactly how some simple computer circuits work."

The penny is used as a flip-flop, with the penny's heads-up and tails-up positions corresponding to the flip-flop's two states. "Each time you trace through the penny switch, its state is reversed. . . .Penny switches can be combined to form computing networks in the same manner that flip-flop circuits could in an actual computer," according to page 34.

The book starts off with Basic Penny Switch, and then provides several penny-switch games and puzzles such as Escape, Heads Up, Pick a Number and Pennythink. The coins are laid down on diagrams printed in the book.

Section II begins with an explanation of binary numbers, and then gives a detailed technical explanation of the penny switch by showing just how it represents a flip-flop. Some complex penny-switch operations are given, including Converting to Decimal, Binary Addition, Octal Addition, Decimal Addition and Accumulator.

This is a highly ingenious book, and requires only about ten pennies as hardware. As the author says about the games that his book shows how to play with pennies, "All of these games could be constructed with lights, switches and transistor circuits. They would be more expensive and you wouldn't get to see exactly how they work since the paths taken by electrical signals aren't visible. The Penny Switch lets you actually trace the path of electrical signals through various simple computer circuits."

For the person with enough imagination to be able to follow the basic idea of the penny switch, this is a fine way to start learning the basics of computer circuits. However, the author describes the operations in enough detail so that very little is left to the imagination. What isn't explained in the first half, which describes the games, is covered in the second half, which explains them.

The only thing missing from the book is a biographical note about the author. Joe Weisbecker is a member of the technical staff at RCA Laboratories in Princeton, NJ, and designed RCA's 1802 microprocessor, as well as the VIP and ELF computers.

The book's illustrations, by Sunstone Graphics, are quite different from the usual run of computer-oriented drawings and many show a wry sense of humor.

TRSDOS & DISK Basic Reference Manual, For the Radio Shack TRS-80 Disk Operating System. Radio Shack division of Tandy Corp., Fort Worth, TX. 183 pages, paperback $5.95. 1979.

This manual is included with the TRS-80 Mini-Disk system, and is also available separately. This first edition describes TRSDOS Version 2.1 and DISK Basic Version 1.1. It follows the general format of other TRS-80 manuals, with the unique exception that it is the only one so far to have an index!

The Introduction is mainly about the notation conventions, such as using brackets to enclose optional material, var$ for string-variable names, etc.

The section on Mini-Disk Operation shows, with eight drawings and photos, and a schematic, how the disk drives are connected, how a diskette works, and how to use one.

The TRSDOS Overview describes what the disk operating system is, how it uses RAM, how to enter a command and includes three pages on file specifications.

The Commands section describes the three system commands and the 18 library commands, with a fair amount of detail. On extended utilities, you get eight

pages on TRSDOS utilities BACKUP and FORMAT, and auxiliary utilities TAPEDISK and DISKDUMP/BAS.

In the section on TRSDOS Technical Information, you learn about memory organization, disk organization, file structure, system routines for assembly-language I/O, physical and logical records in TRSDOS, fundamental TRSDOS I/O calls, and TRSDOS error codes.

Section 7, on DISK Basic, is the longest in the book, 78 pages, covering enhancements to Level-II Basic such as TIME$ (real-time clock), disk-related features that include file-manipulation commands such as MERGE, file-access statements such as LSET, and file-access functions such as EOF.

The four appendices include a 10-page glossary, memory map, TRSDOS character tables of bit-pattern codes and decimal/hex codes and conversion tables in decimal, binary, hex and octal.

This is one of the very few books you can buy to get an idea of what using disk on a TRS-80 is like (the only other one I know of is Dilithium's "Microsoft Basic," (also reviewed here). If you're thinking of going to disk, but aren't sure just what it's all about, read this first. It covers just about all the details.

TRS-80 Assembly-Language Programming by William Barden, Jr. Radio Shack, paperback $3.95. 1979.

Many TRS-80 owners have begun to grow weary of Basic and are enticed by the added speed, efficiency and challenge of assembly language programming. The next step then is to buy T-BUG or the EDITOR/ASSEMBLER. Unfortunately, neither contains enough documentation for the proficient Basic programmer to make the jump. There is a wealth of information in books and magazines on the Z80 microprocessor, which the TRS-80 uses, but too much of it assumes a great deal of prior knowledge and not enough of it relates to the way that the TRS-80 is set up. The novice is left to pick up bits and pieces and fend for himself.

The **TRS-80 Assembly-Language Programming** manual ties all this information together and fills in the gaps. William Barden, Jr., who also authored **The Z80 Microcomputer Handbook,** has put together the ideal book for TRS-80 owners who want to expand their knowledge of their machine.

The book begins with a short discussion on the Z80 architecture, not an in-depth analysis of its electronic aspects (this book is not for the hardware buff) but an overview of information about the Z80 that a programmer would need to know. For example, what and where the registers are, what an instruction set is, basic fundamental information that many authors assume the reader has.

The next few chapters give a taste of the instruction set and addressing modes. Two chapters excellently demonstrate how to use the EDITOR/ASSEMBLER and T-BUG.

Section II gets more to the meat of the matter. The instruction set is explained more fully along with certain I/O operations of the TRS-80. The instruction set is not handled in a group-by-group fashion (i.e., the 8 bit load group, the 16 bit load group, etc.) but rather by demonstrating applications, how to move data, handle strings. Each new application brought more functions into play, thus building the instruction set.

This book will not take you by the hand in quite the same way the Level I manual did, but it is written in a light-hearted tone. References are repeatedly made to a nonexistent class that is asking questions throughout the book.

Unfortunately, no listings or guide to the ROM's and their routines are given. The only other weak point is that the op-code listing in the back is hard to follow, but plenty of those are floating around.

If you are a TRS-80 owner who has been wanting to get your assembly language background from one source, this is the place to get it. *Daniel Louy*

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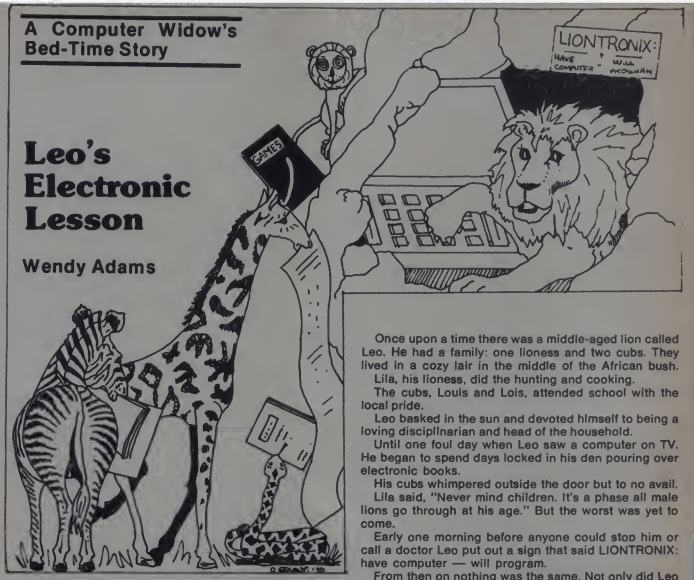

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I really enjoy the humorous articles in your magazine and hope that you will see fit to use this one.

Wendy Adams, age 29; one 8 year old daughter; one computer; one combination husband/computer operator; Assoc. of Art in Early Childhood Education; Computer Education picked up on the streets and in pool halls.

Love,
Wendy Adams

Wendy Adams, Route I, Box 47, Jefferson, OR 97352.

Once upon a time there was a middle-aged lion called Leo. He had a family: one lioness and two cubs. They lived in a cozy lair in the middle of the African bush.

Lila, his lioness, did the hunting and cooking.

The cubs, Louis and Lois, attended school with the local pride.

Leo basked in the sun and devoted himself to being a loving disciplinarian and head of the household.

Until one foul day when Leo saw a computer on TV. He began to spend days locked in his den pouring over electronic books.

His cubs whimpered outside the door but to no avail.

Lila said, "Never mind children. It's a phase all male lions go through at his age." But the worst was yet to come.

Early one morning before anyone could stop him or call a doctor Leo put out a sign that said LIONTRONIX: have computer — will program.

From then on nothing was the same. Not only did Leo never leave his computer's side but strange people began to file through the lair to his den: Monkeys with efficiency problems, giraffes with incompetent billing systems, zebras needing design layouts and any manner of snakes calling themselves hobbyists.

Leo spoke an odd language with these intruders. Words like: Fortran, capacitor, conductance, chips, bits, bytes, hardware (that really wasn't anything hard) and software (that really wasn't anything soft).

Lila and the cubs were at their wits end. They hadn't seen or talked to Leo for months and he was spending all their savings on something called floppy disks. (Which of course, were not even very floppy).

Late one night Lila crept into the den where Leo was snoozing fitfully over his keyboard. He was muttering "Three errors detected" over and over again.

Cautiously she punched in a message. It said:

```
10 LEO GO TO LIVING ROOM
20 REM — FAMILY NEEDS YOU
30 RUN HAPPY FAMILY LIFE
40 GO TO 10
50 END
```

From then on everything was fine. Every once and awhile Leo would sneak back to his computer but it always gave him the same instructions and Leo very conscientiously followed them.

THE END □

Books For Classroom And Self Teaching

ALL GRADE LEVELS

Computers in Mathematics: A Sourcebook of Ideas

Here is a huge sourcebook of ideas for using computers in mathematics instruction. This large format book contains sections on computer literacy, problem solving techniques, art and graphing, simulations, computer assisted instruction, probability, functions, magic squares and programming styles.

One section presents over 250 problems, puzzles and programming ideas--more than is found in most "collection of problems" books.

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The book includes many activities that don't require a computer. And if you're considering expanding your computer facilities you'll find the section on how to select a computer complete with a microcomputer comparison chart invaluable.

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]

GRADES 7 AND UP

Computer Coin Games

Computer Coin Games by Joe Weisbecker 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.

Problems for Computer Solution

Stephen J. Rogowski

GRADE 9 AND UP

Here are 90 problems with a thorough discussion and references for each. Eleven types of problems are included, for example, arithmetic, algebra, geometry, number theory, probability and science. Even includes three classic unsolved problems and seven appendices. 104 pages softbound, $4.95 [9Z].

The teacher's edition contains solutions with complete listing in Basic, sample run and in-depth analysis explaining the algorithms and theory involved. 280 pp softbound, $9.95 [9Y].

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].

GRADES 3 TO 8

Computer Rage

This fun and educational new board game is based on a large-scale multiprocessing computer system. The object is to move your three programs from input to output. Moves are determined by the roll of three binary dice representing bits in a computer. Hazards include priority interrupts, program bugs, decision symbols, power failures and restricted input and output channels. Notes are included for adapting game for school instruction. A perfect introductory tool to binary math and the seemingly-complex computer. [6Z] $8.95.

GRADES 4 TO 8

Be A Computer Literate

Merlon J. Bell & Sylvie Cherp

This informative, full color book is an ideal first introduction to the world of computers. Covers kinds of computers, how they work, their applications in society, flowcharts and writing a simple program. Full color drawings, diagrams and photos on every page coupled with large type make this book easy to read and understand. Used as a text in many schools. 66 pp softbound, $3.95 [6H].

The Best of Creative Computing

The first two years of **Creative Computing** magazine have been edited into two big blockbuster books. **American Vocational Journal** said of Volume 1, "This book is the 'Whole Earth Catalog' of computers." [6A] Volume 2 continues in the same tradition. "Non-technical in approach, its pages are filled with information, articles, games and activities. Fun layout." —**American Libraries.** [6B] Each volume $8.95.

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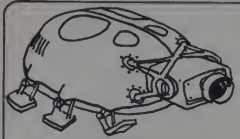

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The Best of Byte

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]

Katie and the Computer

Fred D'Ignazio and Stan Gilliam. This is a delightful story told in words and full color drawings of Katie's adventures when she "falls" into a computer. In Katie's journey through the land of Cybernia she meets the Software Colonel, the Bytes, the Table Manager and even a ferocious Program Bug. Her journey parallels the path of a simple command through the stages of processing in a computer, thus explaining the fundamentals of computer operation to 4-10 year olds. Supplemental explanatory information is contained in the front and back end papers. 42 pp. hardbound $6.95.

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].

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This unique book by Ruth Leavitt covers the latest techniques in computer art, animation and sculpture. In its pages 35 artists explain how they use computers as a new means of self-expression. **The San Francisco Review of Books** said "Get yourself a copy of this book if you enjoy feeding your mind a diet of tantalizing high-impact information." Over 160 illustrations, some in full color. 121 pages hardbound [6E] $10.00. Softbound [6D] $4.95.

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Index To Advertisers

Reader Service	Advertiser	Page
221	Aardvark Software	23
101	Aardvark Technical Services	123
102	AB Computers	179
103	Acorn Software	129
104	AJA Software	35
*	ALF Products	13
105	Alpha Supply Co.	159
106	American Square Computers	179
*	Apple Computer Co.	16
107	The Apple Shoppe	151
108	Apple TV & Computing	143
109	ASAP Computer Products	173
110	Automated Resource Management	179
111	Automated Simulations	143
112	Ballantine Books	29
113	Basics & Beyond	141
114	Benchmark Software	167
115	Bits	168
116	Bobwhita Medical Services	155
117	The Bottom Shelf	5
118	Buss	47
119	C&S Electronics	155
120	California Computer Systems	8-9
121	Chaftiz	179
122	Chas. Mann & Assoc.	113
123	Cload	95
124	Compucolor Corp.	C2
125	Compumart Corp	55
126	Compuserve (MicroNet)	33
127	Compusoft Publishing	47
128	ComputerCity (CPU Shop)	75,92
129	Computer Corner/NJ	179
130	Computer Corner/White Plains	179
131	Computer Design Labs	177
*	Computer Factory	178
*	Computer Headware	109
132	Computer Information Exchange	113
220	The Computer Shopper	178
133	Computersmiths	149
216	Computer Specialties	172
134	The Computer Stop	84,151
135	Computerwara	123
136	Computerworld	149
137	Computronics	87
138	Connecticut MicroComputer	163
139	Corvus Systems	C3
140	Cottage Software	92
141	Cromemco	1
142	Digital Marketing	83
143	Disc 3/Mart	174
*	Dollars & Sense	186
144	Dynacomp	129
145	Edu-wara Services	123
147	Electronic Trend Publications	141
148	Hayden Book Co.	53,192
149	Galaxy	153
150	Gooth Software	125
151	Instant Software	85
152	Ithaca Intersystems	109
153	JJR Data Research	157
154	John Wiley & Sons	113
155	Level IV	125
214	The Layland Co.	175
*	Lifeboat Associates	43
156	Lobo Drives International	19
157	Matchless Systems	176
158	Mead-Hatcher Assoc.	141
159	Micro Magazine	187
160	Micro Ap	21
161	Micro Computer Tech.,Inc.	115
162	micro educational	179
163	Micro Fantastic Programming	158
164	Micro Learning Wara	143
165	Micro Management Systems	125
166	Micro Music	67
213	Microsatte	115
168	Micro Architect	84
169	Micro Tech Exports	176
170	Microwara Assoc.	115
171	Mountain Hardware	65
219	Muse Co.	39
213	National Software Mktg.	84
*	NRI Schools	25
172	North Star Computers	7
173	Ohio Scientific	C4
174	Omikron	37
175	Omni Communications	84
176	Osborne/McGraw-Hill	61
218	Pacific Exchanges	177
215	Peachtree Software	45
177	Percom Data Co.	41
178	The Peripheral People	37
179	Personal Software	2
180	Picklas & Trout	159
181	Powersoft	153
182	Prodata	175
183	The Program Stora	69
184	Programma International	99
185	James Provoost	179
186	Quality Software	127
187	Quest Electronics	171
188	RACET computas	57
*	Radio Shack	51
189	Radio Shack Sales Center	157
*	Rainbow Computing	149
190	RCA	63
191	Recreational Computing	70
192	Ritam Corp.	10
193	Simutek	119
194	Small Business Applications	31
195	Small System Software	159
196	The Software Exchange	71,138-139
197	Software Tech./Computers	119
198	The Software Works,Inc.	173
199	SSM	15
200	Steve Shaw	175
201	Sorac Technology	16
202	Southwestern Data Systems	127
217	Sunflex	187
203	Sunshine Computar Co.	105
204	Sybex	185
205	TAB Books	183
206	Tarbell Electronics	174
*	Tora Systems Inc.	119
208	Total Information Services	163
209	Trans Net	35
*	Trenton Computer Fair	27
210	Ucatan Computer Stora	49
*	University Microfilms	187,167
211	US Robotics	175
212	Vantaga Press	167

Creative Computing

300	Adventure	49
300	Air Traffic Controller	47
300	Apple II Software	121
*	Back Issues	96-97
*	Best of Byte	79
300	CP/M Software	39
*	Creative Computing Press	189-191
300	Educational Software	110-111
*	Mora Basic Games	73
*	Robot Rabbit t-shirt	186
300	Sensational Software	134-135
300	Space War/Super Invader	103
300	Sports Games	181
*	Subscriptions	127
*	T-Shirts	131
300	TRS-80 Software	93

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Puzzle Answers.

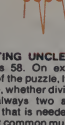
KITCHEN SINK: The answer is the letter "v."

DESERT PUZZLE: Since each tire may be used only 12,000 miles, he will need 27,000/12,000, or, 2¼ tires per wheel or a total of 9 tires. In practice, he would switch the four tires on the ground with a fifth tire every 3,000 miles. Thus, when each tire had traveled 12,000 miles, the truck would have traveled 15,000 miles. He would then put on four new tires for the remaining 12,000 miles.

FLATLAND PUZZLE:

PLATE PROBLEM:

DOT'S ENOUGH: The key is — don't go through the center of each "dot".



AGGRAVATING UNCLE: The number of soldiers was 58. On examination of the conditions of the puzzle, it will be found that in each case, whether divided by 3, 4, 5, or 6, there are always two short of an even division. All that is needed, therefore, is to find the least common multiple of 3, 4, 5, and 6, and deduct 2 from it. The L.C.M. of 3, 4, 5, and 6 is 60, and 60 - 2 = 58, the required number.

POSTAL PUZZLE: It was delivered to John Underwood, Andover, England. (That is, JOHN under WOOD and over ENGLAND.)

Rebus Answer (page 168)
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103	108	113	118	123	253	258	263	268	273
104	109	114	119	124	254	259	264	269	274
105	110	115	120	125	255	260	265	270	275
126	131	136	141	146	276	281	286	291	296
127	132	137	142	147	277	282	287	292	297
128	133	138	143	148	278	283	288	293	298
129	134	139	144	149	279	284	289	294	299
130	135	140	145	150	280	285	290	295	300
151	156	161	166	171	301	306	311	316	321
152	157	162	167	172	302	307	312	317	322
153	158	163	168	173	303	308	313	318	323
154	159	164	169	174	304	309	314	319	324
155	160	165	170	175	305	310	315	320	325
176	181	186	191	196	326	331	336	341	346
177	182	187	192	197	327	332	337	342	347
178	183	188	193	198	328	333	338	343	348
179	184	189	194	199	329	334	339	344	349
180	185	190	195	200	330	335	340	345	350
201	206	211	216	221	351	356	361	366	371
202	207	212	217	222	352	357	362	367	372
203	208	213	218	223	353	358	363	368	373
204	209	214	219	224	354	359	364	369	374
205	210	215	220	225	355	360	365	370	375
226	231	236	241	246	376	381	386	391	396
227	232	237	242	247	377	382	387	392	397
228	233	238	243	248	378	383	388	393	398
229	234	239	244	249	379	384	389	394	399
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   - ☐ B. Trs-80 ☐ F. PET
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103	108	113	118	123	253	258	263	268	273
104	109	114	119	124	254	259	264	269	274
105	110	115	120	125	255	260	265	270	275
126	131	136	141	146	276	281	286	291	296
127	132	137	142	147	277	282	287	292	297
128	133	138	143	148	278	283	288	293	298
129	134	139	144	149	279	284	289	294	299
130	135	140	145	150	280	285	290	295	300
151	156	161	166	171	301	306	311	316	321
152	157	162	167	172	302	307	312	317	322
153	158	163	168	173	303	308	313	318	323
154	159	164	169	174	304	309	314	319	324
155	160	165	170	175	305	310	315	320	325
176	181	186	191	196	326	331	336	341	346
177	182	187	192	197	327	332	337	342	347
178	183	188	193	198	328	333	338	343	348
179	184	189	194	199	329	334	339	344	349
180	185	190	195	200	330	335	340	345	350
201	206	211	216	221	351	356	361	366	371
202	207	212	217	222	352	357	362	367	372
203	208	213	218	223	353	358	363	368	373
204	209	214	219	224	354	359	364	369	374
205	210	215	220	225	355	360	365	370	375
226	231	236	241	246	376	381	386	391	396
227	232	237	242	247	377	382	387	392	397
228	233	238	243	248	378	383	388	393	398
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Business Applications

The C8P DF utilizes full size 8" floppy disks and is compatible with Ohio Scientific's advanced small business operating system, OS-65U and two types of information management systems, OS-MDMS and OS-DMS.

The computer system comes standard with a high-speed printer interface and a modem interface. It features a full 53-key ASCII keyboard as well as 2048 character display with upper and lower case for business and word processing applications.

Home Control

The C8P DF has the most advanced home monitoring and control capabilities ever offered in a computer system. It incorporates a real time clock and a unique FOREGROUND/BACKGROUND operating system which allows the computer to function with normal BASIC programs at the same time it is monitoring external devices. The C8P DF comes standard with an AC remote control interface which allows it to control a wide range of AC appliances and lights remotely without wiring and an interface for home security systems which monitors fire, intrusion, car theft, water levels and freezer temperature, all without messy wiring. In addition, the C8P DF can accept Ohio Scientific's Votrax voice I/O board and/or Ohio Scientific's new universal telephone interface (UTI). The telephone interface connects the computer to any touch tone or rotary dial telephone line. The computer system is able to answer calls, initiate calls and communicate via touch-tone signals, voice output or 300 baud modem signals. It can accept and decode touch-tone signals, 300 baud modem signals and record incoming voice messages. These features collectively give the C8P DF capabilities to monitor and control home functions with almost human-like capabilities.

Process Controller

The C8P DF incorporates a real time clock, FOREGROUND/BACKGROUND operation and 16 parallel I/O lines. Additionally a universal accessory BUS connector is accessible at the back of the computer to plug in additional 16 lines of parallel I/O and/or a complete analog signal I/O board with A/D and D/A and multiplexers.

Clearly, the C8P DF beats all existing small computers in conventional specifications plus it has capabilities far beyond any other computer system on the market today.

C8P DF is an 8-slot mainframe class computer with 32K static RAM, dual 8" floppies, and several open slots for expansion.

C8P $895

Or get started with a C8P with cassette interface, 8K BASIC-in-ROM which includes most of the features of the C8P DF except the real time clock, 16 parallel I/O lines, home security interface and accessory BUS. It comes with 8K static RAM and Ohio Scientific's ultra-fast 8K BASIC-in-ROM. It can be expanded to a C8P DF later. Base price $895. Virtually all the programs available on disk are also available for the C8P cassette system on audio cassette.

Computers come with keyboards and floppies where specified. Other equipment shown is optional.

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