

creative computing



the #1 magazine of computer applications and software

March 1980
vol 6, no 3
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**Communications
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Personal Computers**

**Reviews: TI 99/4
Modems, Cobol, Tiny C,
10 Software Packages**

**Lost and
Forgotten Island**

Intelligent Games

44 Articles!

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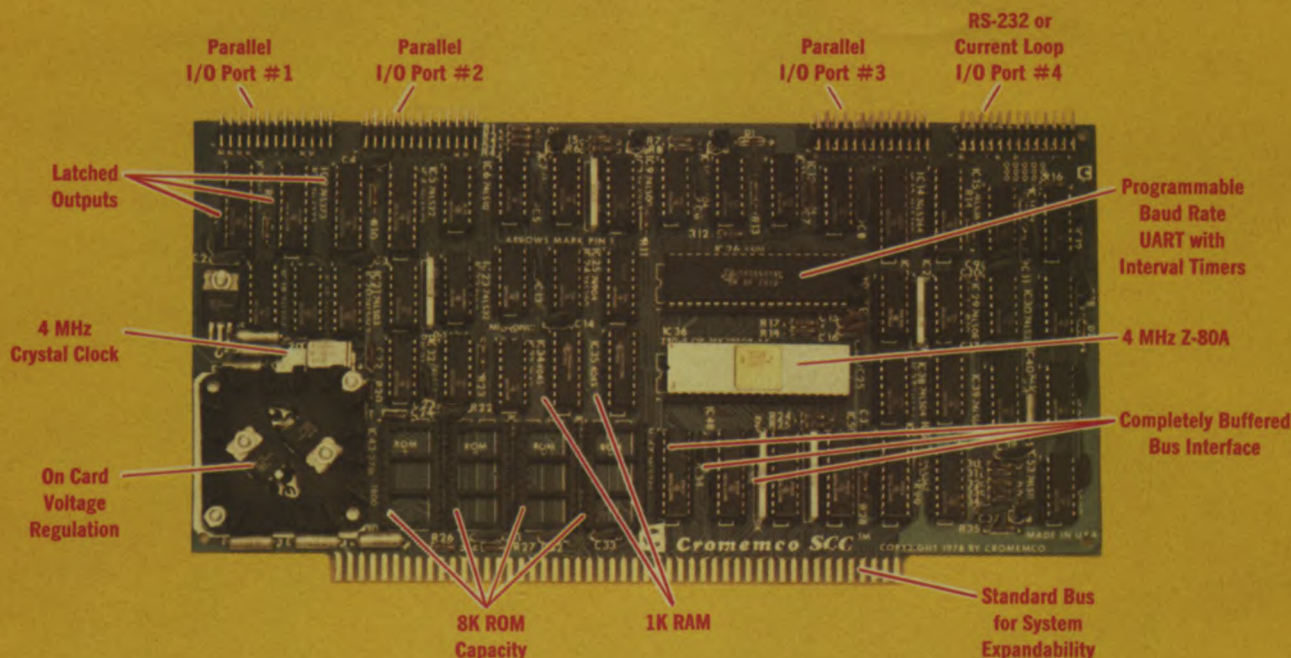
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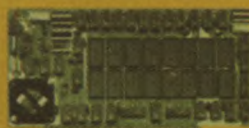
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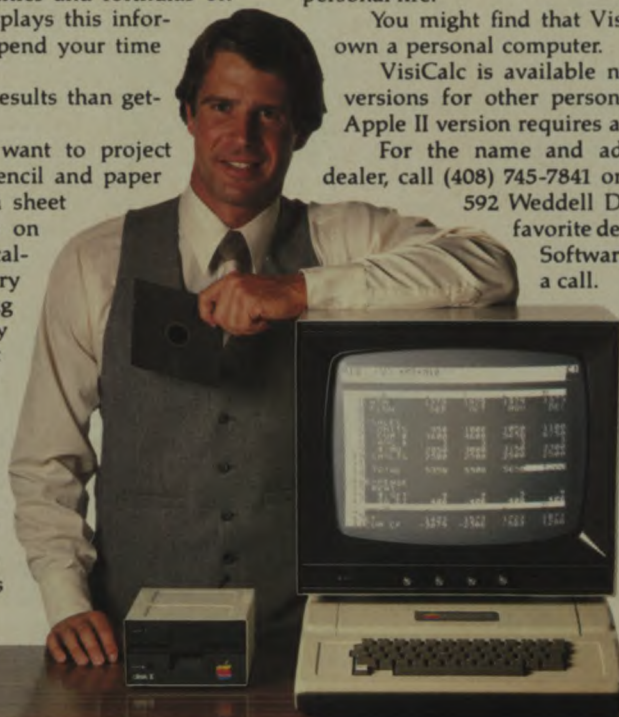
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THE COVER

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.

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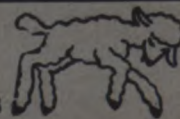
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DATA MANAGER by Dale Kubler starts out where **INFORMATION SYSTEM** leaves off. Requiring 32K and one disk, it accepts up to ten user-defined fields with up to forty characters per field and 255 characters per record. As with all TBS software, data 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

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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 Shroyer, 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

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's 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.

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"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

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— Harold Noy, 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 800 student files, including a weekly updated report card and attendance figures."

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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 shy 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. Prosper 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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7910A Super Board.

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et cetera

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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. \$8.00)

3. Creative Computing, September 1977 and June 1979, and ROM, October 1977. These three magazines contain 10 articles on computer art and animation along with numerous examples of computer

et cetera

graphics done on both large and small computers. (Reg. \$8.00)

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.

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This summer youngsters can sign up for an overnight camp in Moodus, Connecticut where the main activity will be

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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 203-795-6069 or write Computer Camp, Grand View Lodge, Box 22, Moodus, Conn., 06460.

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" is 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 hindered 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 line 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 Luey's Intelligent Computer Games column, the line reading "The new P_1 is the old P_{11} " should read "The new P_1 is the old P_{111} ".

★★★★★

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.

★★★★★

Nell 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.

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[illegible]

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 in several problems are questionable:

9) 6 7 9 13 3

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

16) 2 6 38 7

1445, 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 8 8 7

Why 2?

19) 1 6 11 7

286 is as legitimate as 1625. Just use $7x - 1$ instead of $x^2 + 2$. 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 7 6

Top row totals 16; middle row, 27; bottom row, 367

"What's Your Math IQ?" is at best naive, for it tests neither mathematics nor IQ. What you're doing, as David Pags 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 could 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 in this problem will be gratefully accepted.

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

More Heath Surprises

Dear Editor:

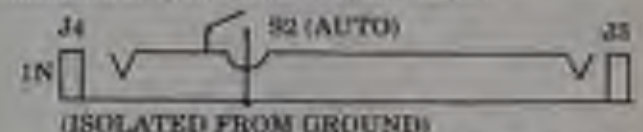
Regarding the articles on Heath Surprises, Dec. 1979 *Creative Computing*: all 55 Heathkit Electronics Centers, DO sell and service the WH-89 & WHS-11-A. We sell and service all Heath Kit and Assembled Computer products, as well as Heath Recommended computer accessories and printers.

William C. Halpin, Manager
Heathkit Electronic Center
10138 Springfield Pike
Woodlawn, OH 45215

TRS-80 Data Monitor Fix

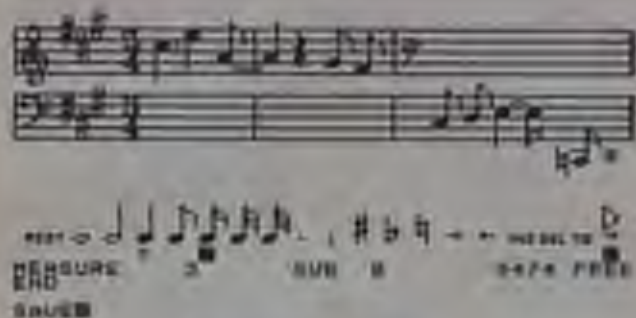
Dear Editor:

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
1908 Ashoe Drive
St. Charles, IL 60174

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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, unshakable 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 gaininess 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 287
Huskin, FL 32870

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 1978).

A short beep — 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
381	IF U1=1 THEN OUT 255, 3
382	IF U1=1 THEN OUT 255, 4
383	U1=U1*(-1)
one small	DEFPNT A-T:
change 30	DEFPNT V-ZT*(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 out ports to create a personal alarm clock. All you do is record your wake up call on cassette, add these two out ports to 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
38 Wynamor Road
Searsdale, 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 Hanache
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 press, 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 failed its tests 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. Daskal, 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 80K 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 W PUSH D PUSH H or RBCI RBCI RBCI RBCI 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, assessing 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
Leleavash, PA 19430

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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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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 370/158 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

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?

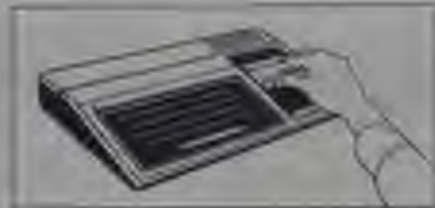
tested, and seems like another progressive step in making home computers more civilized.

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, TI 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 old cheap 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, QSI 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 intrinsic 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

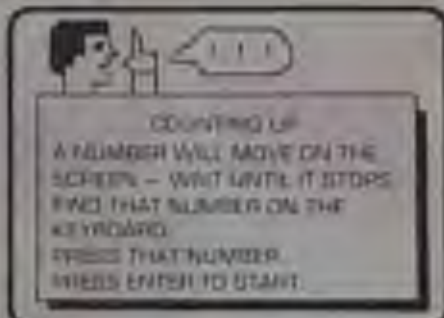
areas (machine level interface and graphics).

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 lock up the computer.

The Solid State Software modules we tried represent a wide range of possible applications for the 99/4. The software stack (yes, it is a disease) seemed to prefer Football. This is a two-player game in which each player enters a play weekly 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 \$2.99 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 thin 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 DMSX 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-Bit from Microsoft, and CIB Cobol from Micro Focus, a British company. Both of these languages will run on any 8086/2-86 microcomputer with the CP/M operating system, provided that adequate storage resources are available.

Requirements of resident and mass storage are stringent. The CIB 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 CIB 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 1950s 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

James McClure, 8801, 114 Cheshire Hill, Troy, NY 12181

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PIZZERIA 1 - Microsoft; Pizza 2 - Micro Focus

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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

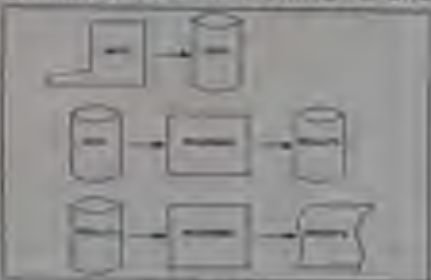


FIGURE 2a.
Mainframe data processing cycle.

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 CIB 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

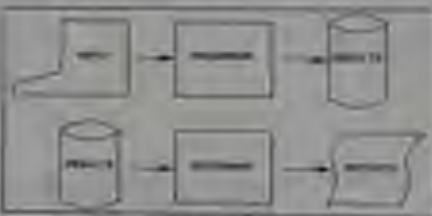


FIGURE 2b.
Microcomputer data processing cycle.

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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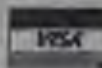
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Cobol, cont'd . . .

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 packages. 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.

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.

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 CTS 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.



"The computer is down! Everybody think!"

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Cobol Data Dictionary Entry	
Account Name	..
Address	..
City State/Zip	..
Telephone	..
Bank Account	..
Bankal Number	..
Bank Branch	..
Bank Code	..
Bank Name	..
Bank Type	..

FIGURE 1
A typical CTF form for use with CTS COBOL

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Cobol, cont'd . . .

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 C15 Cobol supports the communications module, as it is not feasible in the micro-computer environment.

9. Debug Module

Special debugging commands are available in both C15 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 C15 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 C15 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 C15 Cobol. The information may be listed 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 neces-

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

sary 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

KEEP PRICE	PERFORM
0	100
10	90
20	80
30	70
40	60
50	50
60	40
70	30
80	20
90	10
100	0

FIGURE 4a
Microsoft Performance Varying with

keep 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 codes 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 macro 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.

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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Cobol, cont'd . . .

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.

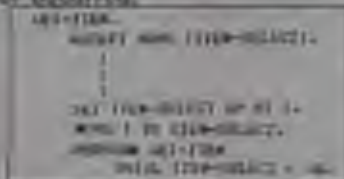
Unlike the Micro Focus compiler, which always outputs error messages at the console, the Microsoft version of Dobot provides only a count of the errors found. In order to determine what errors were actually found, a listing of the program must be requested. This appears to be a calculated way of increasing 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. This machine address is of limited use, since a compiler listed of

the program must be placed 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.

FIGURE 4:
THE LOGICAL EVOLUTION OF PERFORMANCE 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 CFM 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 GDS 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 online 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

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

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 ALTIR DOS.) The Utility Software Manual provides information on the linker, librarian, assembler utilities and their operation.

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

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.

Mike Orr
Cobol Product Manager
Microsoft
10800 NE Eighth, Suite 819
Bellevue, WA 98004
206-455-8080
Telex 328345

Micro Focus Ltd.
58, Acacia Road,
St. Johns Wood,
London NWE 6AG
01-723-8543
Telex 26558 MICROF G

FIGURE 5:
Terminal Screen Microsoft Cobol 8080/8088

Terminal Screen Microsoft Cobol 8080/8088

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Sharpening Your Pencil

Dick Lutz

Michael Shroyer'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 pro-

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

gramming 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 MicroDasy's Pencil Sharpener. If you have Pencil, Sharpener opens new worlds.

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.

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 shorthand substitutes ("mC," "mCb," "sl") 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 in 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 word processing 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're figure out the instruction manual.)

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

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And the system is supported by what we call TAD is the best color manual ever produced for microcomputer software. It contains a step-by-step minimal program designed for the novice. The Manual uses sample files from the system disk and compares his work to simulated screens and outputs in the manual.

Support doesn't stop when you buy the package. As a registered user, you receive our 5-monthly newsletter which answers questions, reports upgrades and teaches new applications of the MAGIC WAND.

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 a reality.

Full sample test results

The MAGIC WAND has probably the most impressive 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 its *my files* with coded sections that you can move by menu name.

Full text formatting comments

The MAGIC WAND allows you to set the left, right, top and bottom margins, page length, indentation, paragraph indentation, including "hanging" paragraphs, first left flush, right flush, justified (one-way), bi-directional, variable line and pitch settings, variable spacing (including half lines, full lines, underlining, bold or broken), conditional hyphenation, sub- and superscripting. You may change any of these commands at run-time without reformating the file.

Sleeping with external state 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 statistical formula generation. But you can also print the report yourself.

References

You may define up to 128 variables with values of up to seven characters. The current value of a variable may be up to 25 characters, and you may print it at any level 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 binary bytes with commands and a special syntax. You may compare or distinguish between variables or use them to format text.

Cysticercal cysts

You may give any `print` command before or 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 (omitted) portions of the file, select specific records to print, skip more than one document (e.g. single files, etc.

Three proportional periods

The MAGIC WAND supports preplanning and carries an NEO. Quickly and easily adjust those burning materials from the platform surface. Intuitive controls. It's all fully featured while using a preplanning tool.

[illegible]

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SINGLE 1940N BLASER SERIES CASE

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SAMPLE of block-text setting in PENCIL without SHARPER.

1. Here's some blocked text, with paragraph numbers "upgraded" to the left, and some phony what it takes to produce it in ELECTRIC PENCIL without SHARPER. Non-printing "root commands" at the left margin generally control printing format.
2. The " " command produces one negative linefeed on the static printer; the margins are simultaneously switched 500 or 1170 to produce indented paragraphs. To make things easy, formatting commands can be placed into position, revealing notes like "margin" and "feed" that are easier to remember during composition.

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SAME result, but set up for SHARPER processing.

1. This is easier to do in SHARPER. The " " command SHARPER to do the necessary reformatting.
2. You'll note that the printed version of the following is very different from the video version. That's because SHARPER had to be "faked" into ignoring its own control characters.
3. Other special commands available include:
 - a. " ", which produces a backspace for overstrike.
 - b. " ", which sends the bell.
 - c. " ", causing a temporary printer stop.
 - d. " " supplies a superscript on and off.
 - e. " " supplies a subscript on and off.
 - f. " " switches to red ribbon (0 for black).
4. Line codes are different on the 801 Sharpener.

Many kinds of format control are possible with Pencil alone, such as the "blocked text" (the printed version) produced by inserting format changes 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 it with / to produce 0 for clarity, or adding those little primples that drop 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 farefare, 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, LASTORDTS, 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 line 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 often, you're 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 "does it," 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:

	CategStdPrice	CategStdPrice
Standard motor		
Special motor		
Deluxe motor		

(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:

Desc	StdPrice	Wholesale	StdPrice
Standard motor	42.00		42.00
Special motor	58.00		58.00
Deluxe motor		73.00	73.00

MicronET

It's off and running. And delivering as promised.

What is MicroNET?

It is the personal computing service of CompuServe, Incorporated. CompuServe is a nationwide commercial time sharing computer network with large-scale mainframes. MicroNET allows the personal computer user access to CompuServe's large computers, software and disc storage during off-peak hours (from 8 PM to 5 AM weekdays, all day on Saturdays, Sundays and most holidays).

What do I get?

You can use our powerful processors with X-Basic, Fortran, Pascal, Macro-10, APL or APL. You get 128K bytes of storage free (just access it at least once a month). Software includes games—including networking multi-player games—personal, business and educational programs.

In addition, there is the MicroNET National Bulletin Board for community affairs,

for sale and wanted notices and the MicroNET Electronic Mail System for personal messages to other MicroNET users. You can even sell software via MicroNET.

NEW! MicroQUOTE, a security information system for corporate stocks and public debt.

NEW! MicroNET Software Exchange with dozens of new programs available for downloading to your personal computer at a specified charge.

NEW! Executive programs for TRS-80, Apple II and CP/M systems (so your machine and ours can talk to each other error-free). You can switch between terminal and local mode while on line.

What do I have to have to use MicroNET?

The standard 300 baud modem. MicroNET has local phone

service in most major cities (see below) and a reduced phone charge in over a hundred others.

What is the cost?

We've saved the best for last. There is a one-time hook-up charge of only \$8.00! Operating time—billed in minutes to your VISA or MasterCard card—is only \$5.00 an hour.

Want more information?

Good. Write to us at the address below. We'll send you a full packet of information about MicroNET.

CompuServe

Personal Computing Division
Dept. C
3000 Arlington Center Blvd.
Columbus, Ohio 43223

MicroNET is available via local phone calls in the following cities: Akron, Atlanta, Boston, Canton, Chicago, Cincinnati, Cleveland, Columbus, Dallas, Dayton, Denver, Detroit, Houston, Indianapolis, Los Angeles, Louisville, Memphis, New York, Philadelphia, Pittsburgh, San Francisco, Stamford (CT), St. Louis, Toledo, Tucson and Washington, D.C.

Access to the MicroNET service is available in 133 other cities for an additional charge of \$4.00 per hour.



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

CIRCLE 188 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, accompany 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

Sharpen's commands Pencil to look at the first "Categ" variable, and change CategStMoPrce into either DealrStMoPrce or IndivStMoPrce. Continuing, then, through the list of variables and replacements, it finds either DealrStMoPrce or IndivStMoPrce, but not both, if the inquiry is from a prospective dealer, upon encountering DealrStMoPrce it makes the substitution using DealrStMoPrce/\$38.00 (etc.). Upon reaching the replacement for indiv StMoPrce (\$8.00), Sharpen is unable to find the required variable, and discards the unwanted replacement.

Alternatively, if the Categ/Indiv entry is encountered first, changing CategStMoPrce into IndivStMoPrce, Sharpen fails to locate DealrStMoPrce but finds IndivStMoPrce, and only the appropriate substitution occurs.

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

Categ/Dealr or Categ/Indiv

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

DealrStMoPrce or IndivStMoPrce

which subsequently goes through a further automatic

DealrStMoPrce/\$38.00 or
IndivStMoPrce/\$8.00

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

Standard Motor \$38.00, suggested
retail \$58.00
or
Standard motor \$8.00

Imagination suggests unlimited variations.

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

These (and similar) uses of Sharpen's automatic merging, with the other options like subscripts, superscripts and printer skipover, open the door to multiplication of superior 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 paid 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 im-

provement 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.

```

1 return
2 FILENAME
3
4 NAME, TITLE
5 FIRM
6 ADDRESS
7 CITY/ST/ZIP
8
9 Dear [name]
10
11 I've been using your product for some time now, and have had excellent results.
12
13 Sincerely,
14
15 [address]

```

```

NAME/John Stivers
NAME/John
TITLE/President
FIRM/ABC COMPANY
ADDRESS/PO Box 36851
CITY/ST/ZIP/Los Angeles CA 90036
your product/PENCIL SHARPEN
NAME/Dale Hartlieb
NAME/Mr. Hartlieb
TITLE/President
FIRM/Hartlieb Enterprises
ADDRESS/28 Beach Street
CITY/ST/ZIP/Glenview IL
NAME/Michael Shroyer
NAME/Mr. Shroyer
TITLE/
FIRM/Michael Shroyer Software
ADDRESS/1250 Vista Quarta Drive
CITY/ST/ZIP/Glenview IL 60025

```

```

NAME/John Stivers
NAME/John
TITLE/President
FIRM/ABC COMPANY
ADDRESS/PO Box 36851
CITY/ST/ZIP/Los Angeles CA 90036
your product/PENCIL SHARPEN

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NAME/Dale Hartlieb
NAME/Mr. Hartlieb
TITLE/President
FIRM/Hartlieb Enterprises
ADDRESS/28 Beach Street
CITY/ST/ZIP/Glenview IL

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NAME/Michael Shroyer
NAME/Mr. Shroyer
TITLE/
FIRM/Michael Shroyer Software
ADDRESS/1250 Vista Quarta Drive
CITY/ST/ZIP/Glenview IL 60025
your product/PENCIL SHARPEN

```

February 1, 1988

NAME, TITLE
FIRM
ADDRESS
CITY/ST/ZIP

Dear [name]

I've been using your product for some time now, and have had excellent results.

Sincerely,

February 2, 1988

NAME, TITLE, FIRM, ADDRESS
CITY/ST/ZIP

Dear [name]

I've been using PENCIL SHARPEN for some time now, and have had excellent results.

Sincerely,

February 3, 1988

Dale Hartlieb, President
Hartlieb Enterprises
28 Beach Street
Glenview IL

Dear Mr. Hartlieb:

I've been using your product for some time now, and have had excellent results.

Sincerely,

February 4, 1988

Michael Shroyer,
Michael Shroyer Software
1250 Vista Quarta Drive
Glenview IL 60025

Dear Mr. Shroyer:

I've been using THE ELECTRIC PENCIL for some time now, and have had excellent results.

Sincerely,

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 Shroyer letter, there being only a space entry 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.



Mailroom Plus

Rod Hallen

I have come across many programs that were designed to maintain mailing lists, but none so 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. Save 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, intervals, 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 it

Mailroom, cont'd . . .

the disk with the same file name, the new file will replace the old one. If the old file was called "NAME1" and you name the new file "NAME51," 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 160 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 doubling our 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've 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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DUPLICATES ANY
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We make disks in our own language. If you want to make a disk, "Data Dubber" will get out there right now. It's the TRS-80's only disk duplicator. It's the only TRS-80 disk duplicator that will duplicate any program tape. It's the only TRS-80 disk duplicator that will duplicate any program tape. It's the only TRS-80 disk duplicator that will duplicate any program tape.

The "Data Dubber" makes it easy to make a disk. It's the only TRS-80 disk duplicator that will duplicate any program tape. It's the only TRS-80 disk duplicator that will duplicate any program tape. It's the only TRS-80 disk duplicator that will duplicate any program tape.

P.O. Box 524-OC

THE PERIPHERAL PEOPLE

P.O. Box 524, Mercer Island, WA 98040

CIRCLE 174 ON READER SERVICE CARD

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MAPPER II is a disk adapter module which enables the TRS-80[®] to run both 5 1/4" and 8" drives. It will interface to the MAPPER I for CVM[®] operation, or can be used alone with our modified TRS-80[®] DOS software. Files can be transferred between the different size drives. Specify cable requirements when ordering. \$899, plus \$30 per cable extension.

SYSTEMS—Omikron's standard systems feature 1600K MAPPER II[®] drives mounted in a dual drive cabinet with heavy duty power supply. MAPPER I and II, cable and CVM[®] software. Dual drives—\$1795; Single drive \$1295.

WARRANTY—6 months parts and labor. Satisfaction guaranteed. Dealer inquiries invited.

Call for details on Omikron's TRS-80[®] DOS package.

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OMIKRON

CIRCLE 174 ON READER SERVICE CARD

Three Mile Island

I am sure by now nearly everyone has heard about 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 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 ctrl-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: ctrl-t for turbines, ctrl-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-

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

Island, cont'd...

sive, 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 lousy 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 980 pounds per square inch pressure. In a real plant it occurs at 5 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 operation of nuclear power plants absolutely nothing changes for weeks on end; a computer gamer would soon tire of it and return to *Star Trek* or *Hunt The Wumpus*.

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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 an "C minus reals and a few other things I didn't have time to do." Not to take 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 capsule 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 intrinsic 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 intrinsic 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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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 "current line" pointer which gets moved 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 teaching (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 full-blown memory-eating 6800 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 so 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 gobbs of memory. For instance, since it is a one-pass compiler it is a little more fuzzy about declarations than the standard

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) manners, RML, Algol also has RYTE 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 58, 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 microassemblers (Digital Research, Microsoft, TDL (whu?) and Cromemco). The macros expand the capabilities of your assembler with three basic functions:

*Conditional execution- IFTHEN, ELSE and ENDF. 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.

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 queuing system to have.

MP/M is a multiprogramming operating system, also for 8080 family processors. It supports task prioritization, dynamic memory allocation and release, task 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 have 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 is 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 disk 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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The Hardware & Software

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 require Data Access Arrangement (DAA) device 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 5" 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*4153432139. 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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The director just wanted to show Co. plus his old friends. He wanted to include the many of the old, the old friends, and a half dozen people played in the new movie. But underneath the new, complete picture, he wanted, and explained that that the new picture was a picture by itself. "The new picture has changed and the old picture changed."

The authors would like to thank the participants of the workshop for their helpful comments. Some observations are already published, and some observations submitted have received previous consideration and approval from the authors.

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GC

M. C. Combs et al.

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 remote 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 "Q" 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 \$369 (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, 5 1/4" North Star, or 5 1/4" 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 Q 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 synchroniza-

tion . . . 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 obnoxious 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 Lincoln Building, Suite B1
4810 Beaune Road
Alexandria, VA 22312

DC Hayes & Associates, Inc.
16 Parkside Park Drive
PO Box 8884
Atlanta, GA 30314

A New Type of Game



Welcome to an astonishing new experience! **ADVENTURE** is one of the most challenging and innovative games available for your personal computer. This is not the average computer game in which you shoot, elude, chase, or get chased by something, master the game within an hour, and then lose interest. In fact, it may take you more than an hour to score at all, and will probably take days or weeks of playing to get a good score. (There is a provision for saving a game in progress).

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, goblins, trolls, bears, dragons, birds, and other creatures during his quest. The game accepts one- or two-word commands such as GET LAMP, GO 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

ORIGINAL ADVENTURE (by Crowther, Woods, Manning and Richer) - Somewhere nearby is a colossal cave where others have found fortunes in treasure and gold, but some who have entered have never been seen again. You start at a small brick building which is the wellhouse for a large spring. You must try to find your way into the underground caverns where you'll meet a giant clam, nasty little dwarves, and much more. This **Adventure** is **Bi-Lingual**—you may play in either **English or French**—a language learning tool beyond comparison. Runs in 32K CP/M system (48K required for SAVE GAME feature). Even includes **SAM76** language in which to run the game. The troll says "Good Luck."

PIRATE ADVENTURE (by Scott Adams) - "Yo Ho Ho and a bottle of rum..." You'll team 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!

sensational software

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 pink? Happy **Adventure**ing.

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**.

TRS-80 Level II (16K) Machine language cassettes for only \$14.95
CS-3007 Adventureland
CS-3008 Pirate Adventure
CS-3009 Mission Impossible Adventure
CS-3010 Voodoo Castle
CS-3011 The Count

TRS-80 Disk (32K) Menu driven machine language routines for only \$24.95
CS-3006 Adventureland and Pirate Adventure
CS-3007 Mission Impossible Adventure and Voodoo Castle

Sorcerer (16K) Machine language cassettes for only \$14.95
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CS-5004 Pirate Adventure
CS-5005 Mission Impossible Adventure

CS-5006 Voodoo Castle
CS-5007 The Count
CP/M 8" Disk (48K) Includes special Sam 76 language in which to run the game \$24.95
CS-5004 Original Adventure

Apple II (16K) A night-mare simulation program \$7.95
CS-4003 Haunted House

Apple II and Apple II Plus (32K) Adventures for your 32K Apple or cassette, \$14.95
CS-4011 Adventureland
CS-4012 Pirate Adventure
CS-4013 Mission Impossible Adventure
CS-4014 Voodoo Castle

(48K) Adventures for your 48K Apple on disk, \$24.95

CS-4009 Adventureland and Pirate Adventure
CS-4010 Mission Impossible Adventure and Voodoo Castle

Pet (32K), \$14.95 turn your Pet into a land of enchantment.
CS-1009 Pirate Adventure and Adventureland

Sensational Savings! Take advantage of the one dollar discount certificate on page 135, redeemable at your local computer store. Or you can order directly from **Creators Computing Software Dept 401, P.O. Box 739-M, Morristown, NJ 07960**. Send payment plus \$1 shipping and handling. For faster service call in your bank card order to 800/631-8112. In NJ call 201/540-0645.

For a FREE Sensational Software Catalog of over 400 programs for eight popular systems Circle number 3300

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 \$19,000. 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

New Tools for a New Era



John Craig



Photo 1. If you rest home without this for your MasterCharge or Visa, then you can forget The Source of MasterCard.

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.

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 Malignant system, and Robert Ryan, who also founded the com-

pary 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	(20)
AUTOMOBILES-Foreign	(20)
BABY-SITTER-AVAILABLE	(1)
BULLETIN-BOARD	(77)
CHATTER	(19)
CLUBS	(23)
COMPUTERS-SALE	(5)
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)
SAVINGS	(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 parentheses indicates the number of items under that category.

At Last! Affordable WORD PROCESSING Made Possible by TRS-80™

NEW SCRIPSIT™
Word Processing
Software for 16K
Level II TRS-80s.
"69" Cassette*
"99" Disk*

EDIT, DELETE, MODIFY—
then print it error-free, 45
characters per second!

**NEW UPPER
AND LOWER
CASE KIT.**
Available for
new or exist-
ing systems.
"99" included!

**NEW TRS-80 DAISY
WHEEL PRINTER.**
Clean and readable
printing, like the very
finest electric typewriters.
"2999"



RADIO SHACK BRINGS YOU A COMPLETE WORD PROCESSING SYSTEM FOR TRS-80 MODEL I COMPUTERS.

Radio Shack smashes another computer "cost barrier" with the new TRS-80 Word Processing System. The system includes our new SCRIPSIT software, Upper/Lower Case Kit and Daisy Wheel Printer. Add it to any 16K Level II TRS-80, or buy a complete system. Once you've tried it, you may never want to use a typewriter again!

The new SCRIPSIT software lets you compose letters and documents of all types on TRS-80's screen in upper case, or upper and lower case with the new Upper/Lower Case Kit. You can move words or entire paragraphs, insert, delete and edit to your heart's content! SCRIPSIT gives you automatic page numbers, page headings and footnotes and makes it easy to indent paragraphs, change line widths, and center your text horizontally or

vertically. Advanced features include justification, hyphenation, global search/replace, and variable screen width. On-going reports, form letters and text with print commands can be stored on TRS-80 cassettes or diskettes for use or revision at any time.



SCRIPSIT software includes an audio cassette course that makes anyone a proficient word processing operator.

PRINT ALL OF THE "ORIGINALS" YOU NEED, FAST AND ERROR-FREE!

Our new WP-50 Daisy Wheel Printer is fast and gives you the same quality of the finest electric typewriters—carbon film ribbon and all! Or, if your job doesn't require "letter" quality, a TRS-80

system with a dot matrix, u/lc printer costs even less.

A complete TRS-80 cassette system with Word Processing Software, Upper/Lower Case Kit and a dot matrix printer is yours for just \$2,048.95! Or choose a really deluxe system with the WP-50 Printer and two floppy disks that store eight hours of 50 WPM typing for only \$3,492.95!

Sound exciting? You bet it is! Visit your nearest Radio Shack outlet or write for details.

*Prices shown are very close to actual pricing and subject to change.

Mail to: Radio Shack, Dept. CMA-426
1300 One Tandy Center
Fort Worth, Texas 76102

I'd Like to Know More!

- ☐ Send details on TRS-80 Word Processing and the 24-page TRS-80 Catalog #RC-2.
☐ Have a representative contact me.

NAME

ADDRESS

CITY

STATE ZIP

I Own Use a TRS-80 ☐ Yes ☐ No

Model

Radio Shack

The biggest name in little computers™

A DIVISION OF TANDY CORPORATION • FORT WORTH, TEXAS 76102

New Tools, cont'd...

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 8PM 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 5 hours per month each). TCA will arrange for the installation of a toll-free number when that quota is met.

Best of all, lie-in to the system is free! If you've been accustomed to paying \$2.50 an hour for Teletype, 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, MasterCard, 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

*** THE SOURCE ***	
ANNOUNCEMENTS (UPDATED FREQUENTLY).....	DATA AGENCIES
ADVANCED APPLICATIONS & PROGRAMS.....	DATA ADAPPS
ASTROLOGY LIBRARY.....	DATA ASTRO-IN
BUSINESS & FINANCE.....	BITDEX
CLASSIFIED ADS & BULLETIN BOARD.....	DATA CLASSI
CONSUMER INFORMATION.....	DATA CONSUM
DINING OUT.....	NETOS
DISCOUNT SHOPPING SERVICE (MONEY SAVERS).....	DATA BOOKS
EDUCATION.....	DATA EDUCAT
ENERGY SAVING NEWS & TIPS.....	ENERGY
FINANCIAL MARKS.....	BITDEX
GAMES.....	DATA GAMES
MAILCALL.....	DATA MAILCAL
NEW YORK TIMES - NEWS SUMMARY.....	DATA NYTIMS
NEW YORK TIMES - CONSUMER DATA BASE.....	NYTIMES
PERSONAL CALENDAR & NOTEBOOK.....	DATA PERSON
PERSONAL FINANCE.....	DATA PERSON
REAL ESTATE ADVISORY (REAL-SOURCE, INC.).....	DATA REALAD
SCIENCE & ENGINEERING.....	DATA SCIENCE
SELF-PERCEPTION.....	DATA EMP, DTA LORE
(PRESS THE RETURN KEY TO CONTINUE, OR "BREAK" TO SELECT A CATEGORY)	
SPORTS.....	DATA SPORTS
SUGGESTION BOX.....	DATA SUGBOX
SYSTEM NEWS.....	DATA SYSTEM
TRAVEL CLUB.....	DATA TRAVEL
UNITED PRESS INTERNATIONAL (UPI).....	DATA UNITED
USER DIRECTORY.....	DATA USERIR
VOICEMAIL.....	DATA VOICEMAIL
WEATHER.....	DATA WEATHER
WISDOM OF THE AGES.....	WISDOM

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

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 amounts to \$0.033 per 2K block per day, note that this can add up considerably.

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 (Microfair 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 (Microfair 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 (Spracklers) Winner of the recent European Microchess Tournament. "Buy this program when it becomes available — ... an evaluation routine that enabled it to beat the giant!...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.

**Available at your
local computer store!**



Hayden Book Company, Inc.
50 Essex Street, Rochelle Park, NJ 07662

Or call (201) 843-0550, ext. 307
**TO CHARGE YOUR ORDER TO
Master Charge or BankAmericard!**
Minimum order is \$10.00; customer pays
postage and handling.

New Tools, cont'd . . .

picture the typical personal computer owner paying good money to use his 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 person is almost a hour for operating with other system. You'll wait half hour of letters, the ability to print manually 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 services is done automatically each month. The initial sign-up fee for MicroNET is only \$5 but the computer time charge is \$5



Figure D

A partial list of the many, and varied, systems available through the Source's New York Times Consumer Users Base. The number in parentheses indicates the number of errors for a particular subject.

New Tools, cont'd . . .

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 Awar, 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 MicroNET Services & 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).

Afronomads of the DEC POP-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, APL 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 would 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 Deafnet, 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. ☐

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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.



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.

Lorraine Mecca, 5781 B Westminster Ave.
Westminster, CA 92683

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 firmware and disk controller cards. The printed circuit card will work in any slot from 1-5, 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."

(C) Creative Computing



In April of 1979, the store owners, Geta Ceiga and Will Ortega, 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 troubles? "It's a good business," answered Geta Ceiga. "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 Components 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 RYS prior to any letter transmits the corresponding control character. ASCII characters with a decimal value greater than 127 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. Eger

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 controls. #30-B. \$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-A. \$15.00

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by L. Leventhal

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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.

#36-B. \$12.50

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

Disk #33-G. \$22.50

Cassette #28-X. \$15.00



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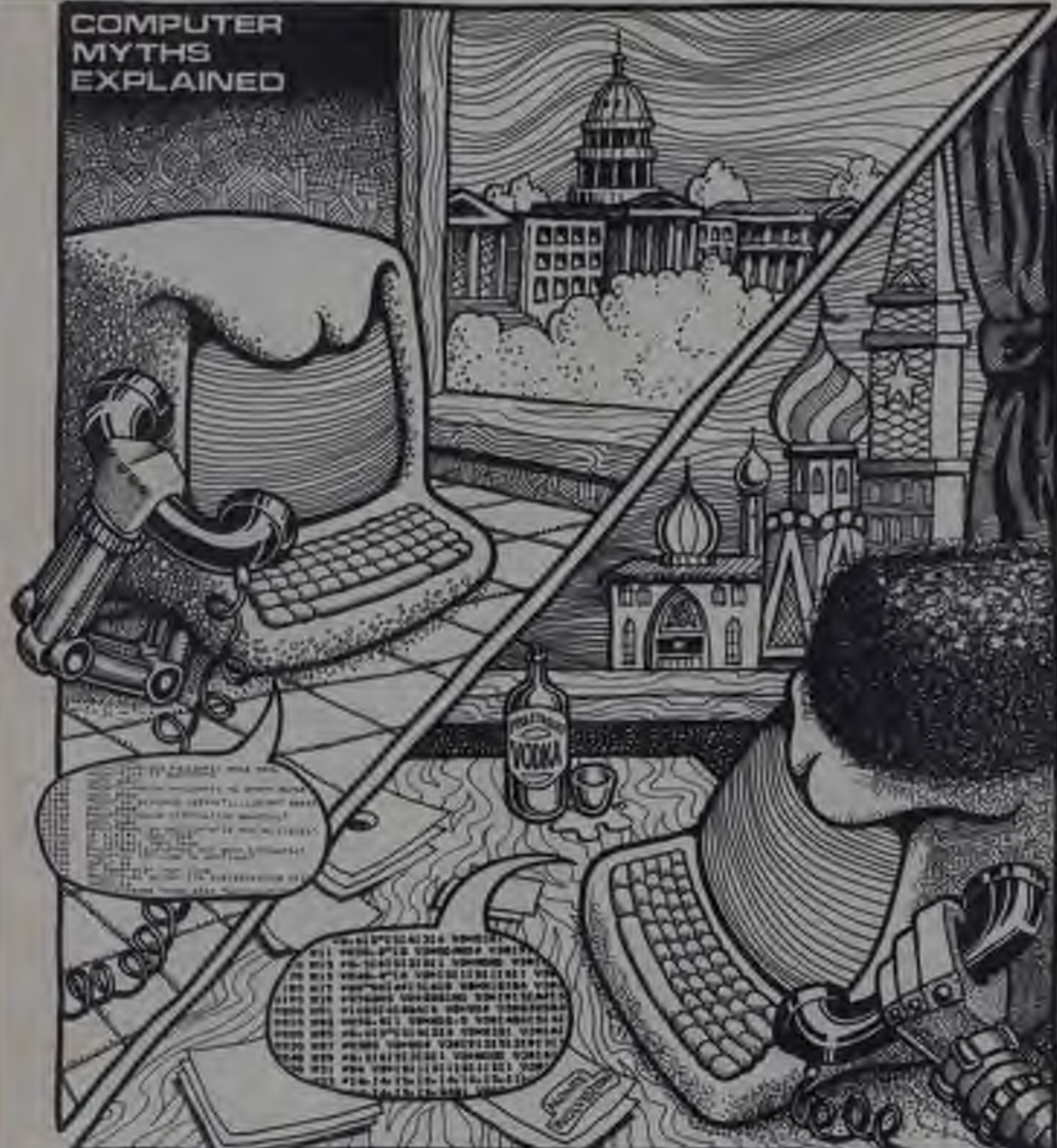
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How To Make A Basic Tree

James W. Garson

A detailed description of the program and techniques presented in last month's *GENE* featuring *Four Past Through Genealogy*.

A while back a *Creative Computing* reader asked how to store information on his/her genealogy with a micro-computer. 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 *NS* which will contain your relative's names:

```
DIM NS(100)
```

We will put "UNKNOWN" in *NS(1)*, and then store names of 99 relatives in *NS(2)*, *NS(3)*, ..., *NS(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 *NS*:

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

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

MORTIMER BERT

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 *NS*. To put it another way, *NS(21)*, that is, *NS(M(4))* will contain the name of Mort's mom. Similarly, *NS(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 *NS(1)*, namely "UNKNOWN". (You should set *M(1) = 1* and *F(1) = 1*, since mothers and fathers of unknown people are unknown too.)

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 *NS*. To keep track of where this is, you need to keep a

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

number in a variable (call it *P*) that points to the last occupied spot in *NS*. To add a new relative named Samantha Snuggert, we just add 1 to *P*, and store her name in *NS(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:

```
10 INPUT "MOTHER'S NAME", M$
20 FOR J=1 TO P
30 IF NS(J) = M$ THEN GOTO 60
40 NEXT J
50 J=1
60 M(P)=J
70 M(P)=J
80 M(P)=J
```

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 M=M(4)
110 PRINT NS(M)
```

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

```
100 X=M(M(4))
110 PRINT NS(X)
```

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

```
100 FOR J=1 TO P
110 IF NS(J) = M$ THEN PRINT NS(J)
120 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 NS(J)
520 IF 4=F(F(F(J))) THEN PRINT NS(J)
```

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 NS(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 NS(J)
520 IF F(4)=F(F(J)) THEN PRINT NS(J)
```

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 NS(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(4)=F(J)
    THEN PRINT 30(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 save memory 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 descendants is a bit complicated. For example, we would have to write

```
510 IF A=F(F(F(J)) OR A=F(F(M))
    OR A=F(M(F(J)) OR
    A=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 descendants on her female line for 5 generations:

```
700 FOR G=1 TO 5
710 PRINT "GENERATION " G
720 FOR J=1 TO N
730 Z=J
740 FOR L=1 TO G
    Lines 740-750
    set Z=M(L,M(J))
    G lines
750 Z=M(Z)
    So Z is the mother of
    (G times) J
760 NEXT L
770 IF Z=2 THEN PRINT N$(J)
    (Mort's mother is 2)
    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 gripped 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 Bedford (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 noises, 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-phonio 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 304, 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 (1797-1827-1851?). The question marks indicate that there is still some doubt as to the authenticity of this particular T. J. Beale. In 1818 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 Morris with instructions to open it if he did not return in ten years.

After a decent interval of 23 years, Morris 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, Morris 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 S 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 tantalizing 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 parties 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 "im-pending 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.

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 true cipher alphabet encompassing all the numbers appearing in the cipher-texts. 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 less 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:

47-85-50-37-49-47-64-5-7-71-33-4-43-47-63-1-27

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:

NETEENTHESCONDWA...

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.

Frederick W. Chesson, 144 Fiske Street, Waterbury, CT 06715.

Treasure, cont'd. . .

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

67-104-08-52-08-18-80-121-67-91-122
and 84-16-79-23-16-61-122.

Message Number 3 can be tested with the following string:

2-44-53-26-44-75-98-102-37-85-137-
117-64-83 and 64-10-106-87-75-47-21-
29-37-81-44-18 and 24-93-9-19-17-26-
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, M/, may be used to represent the three and four digit cipher-text numbers to save space on the display. This will be especially important if the cipher-text symbols are to remain constant on the screen, while VIM decipherments are written in beneath. For instance, having decided that = Message Number 2 numbers 7, 23, 37, 49 and 65 stand for the letter E, then an underwriting display program would cause the following:

[illegible]

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

compared adjacent numbers in two selected numbers. A simple (fictitious) example follows, where 27 is suspected as standing for the same letter as 90:

20-17-91-44-27 05-13-86-58
20-17-91-44-28 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:

23-V-01-44-21-05-13-00-50

66-17-14-21-29-06-33-19-58

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.

29-07-15-140-47-28-107-79-84-56-230
2-616-81-423-822-29-125-14-35-37-106
67-599-216-115-71-25-62-62-63-121-28
132-438-229-545-120-28-68-33-101-816-138

occurrences of 28 = 4 times

occurrences of 41 = 0 limit

11111111 010111—Number of contacts
111124 42111—Arbitrary Multiplier
0000016201—Contact Product

12	Sum (dip14=1)
11	Driver (1110)
13	"Control Ruler"

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 Minitac Message Number Two" — but that is another mystery, for another day. ☐

Walter Dillinger

The review has appeared lately in the *Book* through a thin, a somewhat boring would be almost as long as this article. It is probably part of a more published time. The *Washington*, an *Arts* magazine for the *National* Capital, is one of the *Public* in its September 1979 issue.

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The Coldbreakers, by David Rader. Macmillan Co., New York, 1967. Pp. vii+778.

Computers and Chemistry, by P. W. Christy (Information, January 1971)

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MOJO: "Gold in the Blue Finger," by Wade and
Farrington. Published by R. Linn
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40	88	184	178	895	3	78	78	445	915	283	88	508	128	188	177	188	218	87	178
30	128	12	850	128	888	18	128	85	88	291	218	118	188	88	418	880	15	71	828
20	881	84	851	128	88	88	81	289	12	81	88	882	134	88	15	288	888	888	718
10	188	188	718	128	88	888	438	181	181	78	78	888	78	18	88	881	28	88	188
0	888	17	88	12	188	888	88	118	88	118	888	78	88	181	881	888	181	888	288
9	882	18	188	818	12	128	88	218	818	2188	1888	88	18	18	18	188	812	15	88
8	88	8	8	88	188	18	187	888	888	588	37	188	112	8	180	8	188	888	48
7	188	88	188	888	12	888	888	88	88	118	188	88	88	888	8	188	18	888	78
6	188	788	888	818	8	88	121	188	18	188	188	438	18	88	121	188	888	8	88
5	88	88	888	18	88	88	18	1888	388	88	888	181	178	288	888	788	88	188	888
4	888	88	188	18	88	888	88	218	888	888	888	888	888	888	888	88	218	888	888
3	88	28	88	888	281	888	18	812	88	888	28	88	88	188	78	88	288	118	888
2	88	28	18	88	188	287	818	888	1888	888	888	88	88	88	118	78	88	888	888
1	888	288	288	878	78	28	25	112	188	88	78	881	882	218	888	28	28	1888	188
0	888	18	18	18	28	888	18	888	78	88	888	188	888	118	28	188	88	88	88
9	88	88	188	88	188	218	118	78	218	1888	1888	1817	51	88	888	28	28	888	211
8	88	88	18	888	88	888	88	88	888	888	28	88	178	88	888	28	28	888	888
7	888	188	218	888	881	788	18	88	88	12	181	418	18	188	258	888	888	18	88
6	888	188	1888	88	818	278	78	88	11	888	888	78	88	1888	188	788	188	88	188
5	188	188	1888	888	88	88	78	21	18	88	188	888	888	217	888	888	88	88	88
4	188	188	188	888	818	788	1888	387	888	888	188	888	888	888	888	888	888	888	888
3	188	188	188	78	88	88	888	28	12	88	17	88	888	788	888	218	12	88	788

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Treasure, cont'd...

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297 118 98 114 243 248 118 74 98 12 50 32 14 81 19
74 181 218 85 22 88 15 100 68 77 82 24 122 96 117 26
811 221 10 44 11 48 88 18 126 88 217 28 98 88 204 71
43 221 130 174 212 212 81 89 264 280 88 27 219 2 44
22 28 44 70 30 122 27 85 107 117 64 98 126 48 181 88
178 89 210 218 78 98 214 218 212 43 88 21 50 75 128
84 22 28 102 84 80 21 41 243 84 270 98 110 81 89 74
88 88 240 12 8 122 28 78 88 21 11 102 81 191 284 288
14 78 12 82 117 201 24 20 217 27 21 84 28 84 109 128
89 77 88 1 81 217 84 28 82 112 201 288 211 98 84 28
180 18 128 198 219 212 84 190 219 271 212 84 28 101 27
71 87 21 22 27 81 84 18 128 112 122 160 191 202 76 81
228 214 228 201 98 11 28 97 210 228 106 84 88 2 14 17
24 88 78 88 14 124 128 204 288 287 281 288 284 19 28 84
24 107 88 122 112 214 104 7 22 48 80 12 28 86 48 107
198 227 244 198 202 247 118 18 8 212 228 21 5 202 86
48 88 88 41 122 28 117 11 18 20 71 24 41 88 78 99 98 21
80 70 88 98 27 22 84 80 21 24 112 128 148 178 182 198
143 171 228 228 87 12 44 81 88 24 41 24 170 88 7 28
14 88 8 112 178 98 58 202 19 177 122 204 128 200 218 260 201 288 218
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72 22 48 72 88 124 217 214 212 281 284 217 281 284 282
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212 218 288 212 288 412 488 472 872 882 724. (618 numbers)

Frequencies: 88 = 12, 18 = 11, 88 = 10, 12-68 = 3, 11-81 = 8,

24, 44, 77, 88 = 7, 20, 48, 60, 218 = 4,

18, 28, 22, 84, 78, 78, 88, 88, 112, 114, 128, 178, 288 = 3,

12, 88, 24, 27, 41, 42, 46, 24, 28, 38, 71, 74, 78, 82,

88, 98, 126, 107, 117, 118, 119, 128, 217, 218 = 4,



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Why Computers Can't Be Intelligent

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" 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)¹ 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 variociously shaped blocks and allows a person to engage in a dialogue with the computer, asking questions, making statements and issuing commands.

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.

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 a very schematic; it takes 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.²

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?



Hubert L. Dreyfus

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

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.

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.

To begin with, there is never a unique solution to such problems, so we do not ask what the Under-stander must know. But he will

Hubert L. Dreyfus, Philosophy Dept., University of California, Berkeley, CA 94720

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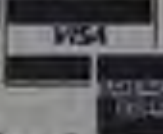
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Intelligent, cont'd...

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 impossible if he does not even have some concept like PURPOSE or INTENTION.*

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.¹ That is, sub-worlds are not related like isolated 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.²

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 54th 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 one 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 had 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 indicate 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.³

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 if 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.¹

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 wedding concert.

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-Ponty² 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."³ 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 in 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 there are usually *not* explicit descriptions but more like images, by means of which I capture 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 Schenck's pathetic attempt to make explicit a bit of our interpersonal knowledge, that

if two people are positively emo-

tionally 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.⁴

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 site — 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 representation (images or memories) based on our own experience without having to make explicit the strict rules and their spelled out salient panibus 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 typical 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 *celatus panibus* 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 the 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 planned 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 love¹² (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 unexplicable 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 mathematician 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 Ahab's soul 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" (*Aviation* 8, 1969).
2. Terry Winograd, "A Procedural Model of Language Understanding," *Computational Models of Thought and Language*, Roger Schank and Kenneth Colby, eds. (San Francisco: W.H. Freeman Press, 1972). (CHPDLU is an acronym whose letters don't stand for anything. It was coined up by Winograd from *Mall Magazine*, which used this frequent typewriter's error as the name of mythical monsters and the like.)
3. Marvin Minsky and Seymour Papert, Draft, July 1972, of a Proposal to AFOSR 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. 92 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. In *Colloquy and Seymour Papert, M.I.T. AI Laboratory, AI Memo No. 337* (July 1976, revised March 1978), "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, *Phenomenology of Perception* (London: Routledge and Kegan Paul, 1962).
11. Ludwig Wittgenstein, *On Certainty* (New York: Harper Torch Books, 1972), p. 42.
12. Roger Schank and Robert P. Abelson, *Script-Plans: Plans and Understanding* (Hillsdale, N.J.: Lawrence Erlbaum Associates, 1972), p. 144.
13. Joseph Weizenbaum, *Computer Power and Human Reason* (San Francisco: W.H. Freeman and Co., 1976), p. 205.
14. *Ibid.*
15. *Ibid.*, p. 209.
16. *Ibid.*, p. 225.
17. *Ibid.*, p. 210.



"Men used to trade little black books. Now they trade data base systems."

James Ingram writes us that he is conducting a series of workshops for teachers in 10 urban school districts in Central Nebraska. For fun, he has assembled a list of eight "syndromes" that people do not wait 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 ignitions. 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 passive.
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 rising from near-hysteria to calm boredom).
4. Open your clenched eyelids and read the directions again!



James Ingram

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-Word" Syndrome: Found among predominantly Archie Bunker types.

C. The "Tunnel-Vision-Terror" 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 "Hide-and-Run" Syndrome: Found predominantly among adults suffering from dumb-a-fobia (fear of appearing unintelligent). Par-

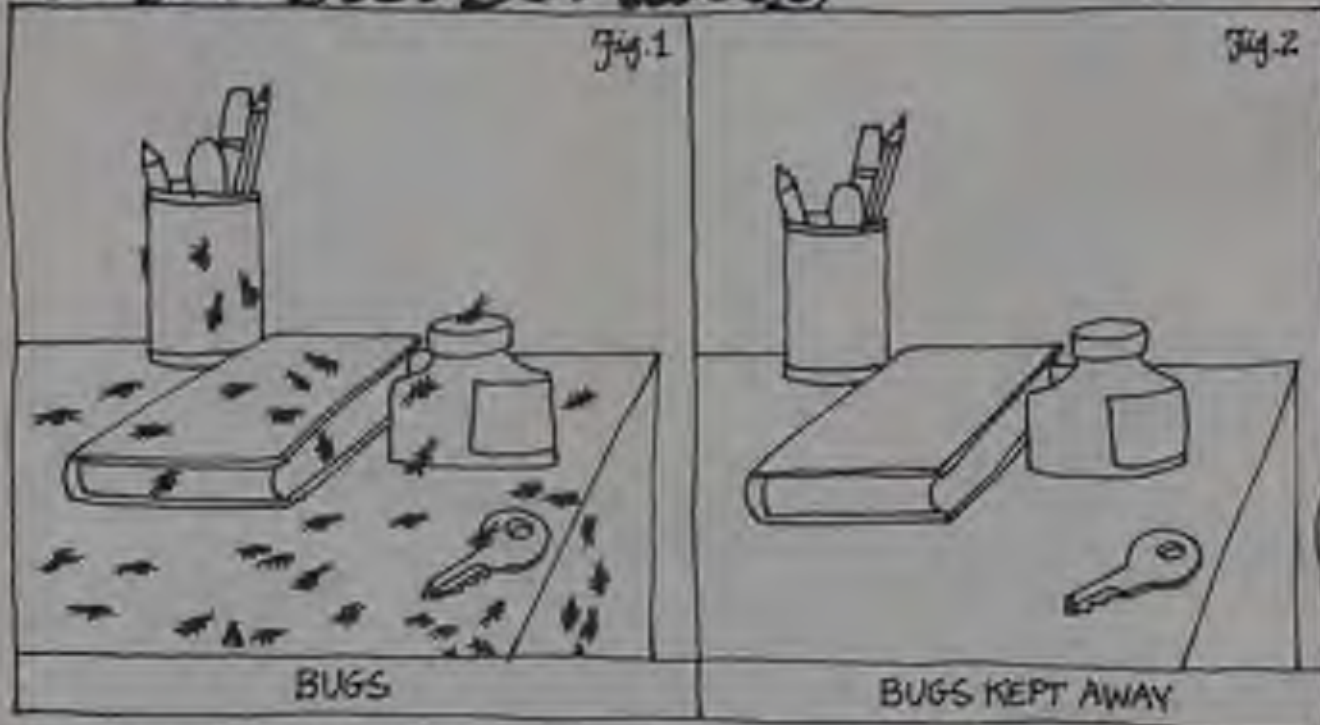
ticularly insidious among teachers in presence of students.

F. The "Sneak-Attack" Syndrome: Manifested in user secretly hunting for main power switch or wall plug with dishonorable intentions.

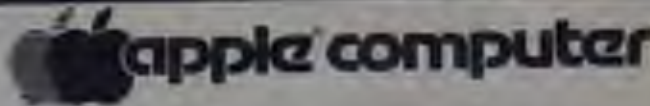
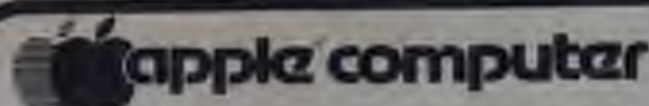
G. The "I-Don't-Have-Time" Syndrome: Most abundant among football, basketball, volleyball, and track coaches, but also strikes the corridor-busy (yep — those who need a convenient excuse).

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.

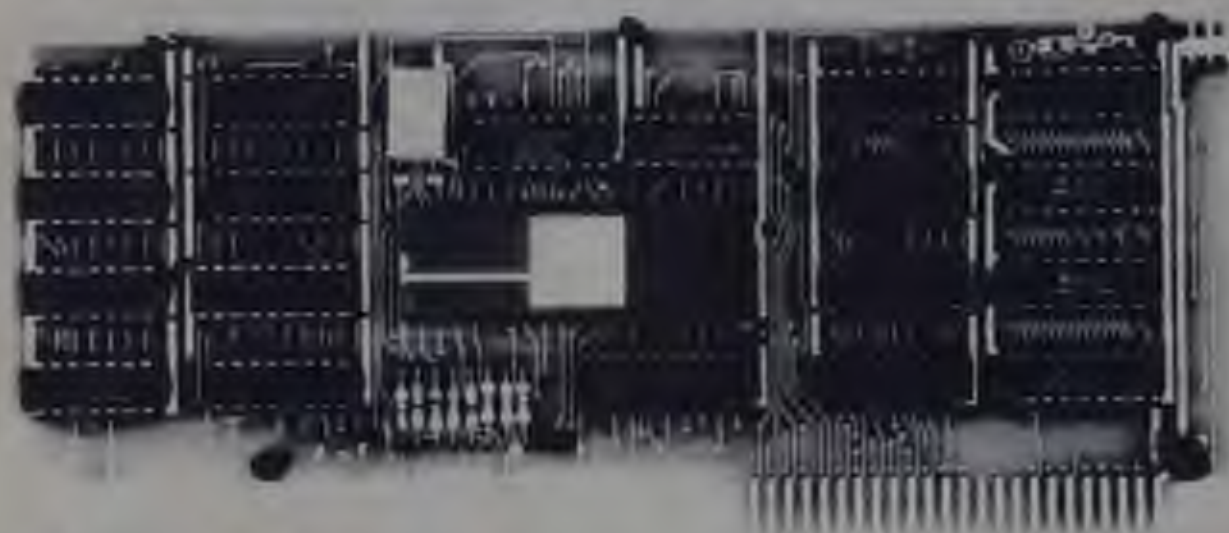
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Interview with Joel Birnbaum

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 years 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 Prestel — 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 Prestel system, which is run by the British Post Office. It was a prototype experiment, but now it is of interest to GTE, Sylvania and many other companies in other countries. Prestel 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

Bimbaum, 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?

Bimbaum: 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?

Bimbaum: 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 uneducated 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?

Bimbaum: 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?

Bimbaum: 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?

Bimbaum: 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 may 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?

Bimbaum: It's hard. It needs ideas. It isn't so glamorous. It's hard. □

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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.

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 complement. 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 complement 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 complement of a number, its magnitude in 16-bit binary form is first compli-

Type	Type Designator	Example of Name	Bytes for Value	Numeric Type Indicator
Integer	%	PI%	2	02
Single Precision	!	SJ!	4	04
Double Precision	@	KD@	8	08
String	\$	AAA\$	0 to 255	03

* If no designator is specified, the type is single precision by default.

Table 1

Byte	Contents Hexadecimal	Decimal	Significance
1	02	2	Numeric type indicator
2	00	0	ASCII for name
3	4A	74	
4	12	18	Least significant } Value bytes
5	00	0	

(a) Storage format for an integer variable, corresponding to P% = 22.

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1	04	4	Numeric type indicator	
2	33	61	Second character	of name
3	50	68	First character	
4	80	0	Fraction, least to	most significant bytes
5	00	0		
6	20	32		
7	82	100	Exponent, biased by 128 (80 hex)	

(b) Storage format for a single precision variable, corresponding to $2.3 = 2.3$ (binary 2.1110×2^0)

1	38	8	Numeric type indicator	
2	6A	90	Second character	of name
3	5A	80	First character	
4	32	0	Fraction, least to	most significant bytes
5	00	0		
6	80	0		
7	30	0		Exponent, biased by 128
8	00	0		
9	00	0		
10	C8	200		
11	82	121		

(c) Storage format for a double precision variable, corresponding to $228 = 228$ (binary 2.1100×2^7)

1	03	3	Numeric type indicator	
2	20	2	Second character	of name
3	53	63	First character	
4	24	4	Length of string	
5	15	21	Low byte	of address
6	43	87	High byte	

(d) Storage format for a string variable, corresponding to $Q2 = "ABCD"$

1	04	4	Numeric type indicator	
2	35	53	Second character	of name
3	41	85	First character	
4	35	53	Less significant byte	of address
5	80	0	More significant byte	
6	03	2	Number of subscripts	
7	04	4	Less significant byte	of address
8	60	0	More significant byte	
9	03	2	Less significant byte	of address
10	60	0	More significant byte	
11 through 60			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 A(52,3)`

Figure 1

mented (this gives the one's complement) than 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 0111
(0017 hex)
2. Complement each bit: 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 is

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

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 accommodated 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 example, the binary fraction 0.00011 (equal to $3/32$) can be normalized by rewriting it as 0.11×2^{-3} . If the number has leading ones before the binary point (as in 10.1, equal to $2 \frac{1}{2}$),

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 0.101×2^2 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

Determine the storage format of 4.25:

Convert to binary 105.01

Normalize $+0.10001 \times 2^3$

Bias the exponent $3 + 128 = 131$ (83 hex)

Reset first bit

because positive

Storage form

00001
09 00 00 00 ; 8 0 0 0 1 31

frac exp1 frac exp2

hex decimal

(09 00 00 as 3 hex bytes)

Determine the storage form of -0.125:

Convert to binary -0.001

Normalize -0.1000×2^{-2}

Bias the exponent

Leave first bit alone

because negative

Storage form

-0.125
-0.001
 -0.1000×2^{-2}
 $-2 + 128 = 126$ (7E hex)

1000
80 00 00 7E ; 126 00 126

frac exp1 frac exp2

hex decimal

(80 00 00 as 3 hex bytes)

If the storage form is 20 00 00 82 (hex), what is the value?

Write frac in binary .00100000

Number is positive so

set first bit to one

Determine exponent

Shift binary point

Convert to decimal

.00100000
10100000
 $82 - 80 = 2$ (hex) ($2 - 128 = -126$)
 $\times 10.10000$
 $= 2.5$ is the value

If the storage form is C0 00 00 7F (hex), what is the value?

Write frac in binary .11000000

Number is negative,

leave first bit a one

Determine exponent

Shift binary point

Convert to decimal

.11000000
11000000
 $7F - 80 = -1$ (hex) ($-1 - 128 = -129$)
 $\times 0.1100000$
 $= -0.375$

Figure 2. Examples of storage format for floating point values.

value of the fraction, with the first bit reset to zero if the number is positive. Some examples are shown in Figure 2.

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 -1.7×10^{38} to $+1.7 \times 10^{38}$ as decimal equivalents. The smallest non-zero magnitudes are $+1.47 \times 10^{-39}$. 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

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 $\text{DIM } X\%(1,3,2)$ 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:

$$\text{Dist} = (D1 + 1)(D2 + 1) \dots (DN + 1)(T + 1) + (2)(N) + 1$$

where $D1, D2, \dots, DN$ 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 $(D1 + 1)(D2 + 1) \dots (DN + 1)$ 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 $(2 + 1)(3 + 1)(4 + 1)(2) + 1 = 53$. 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

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).

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.

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 2020 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 2160 to STOP.

Figure 4 is a test program together with the output from the lister program. □

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2900 PRINT "LIST OF SIMPLE VARIABLES"
2910 PRINT "NAME", "TYPE"
2920 VLS=0: VPS=0: VPS=16633
2930 VAS=PEEK(VPS)+PEEK(VPS+1)*256
2940 VPS=PEEK(16635)+PEEK(16636)*256
2950 GOTO 2960, IF VPS="VL" THEN 2980
2960 PRINT, VAS+VAS+VPS+3
2970 IF VAS+VPS DONE 2940
2980 VAS=VPS: VPS=PEEK(16637)+PEEK(16638)*256
2990 IF VAS+VPS RETURN
3100 PRINT, PRINT, PRINT "LIST OF ARRAYS"
3110 PRINT "NAME", "TYPE", "DIM(S)"
3120 GOTO 2900
3130 VPS=PEEK(VAS+3)
3140 FOR VLS=1 TO VPS
3150   PRINT PEEK(2*(VPS-VLS)+VAS+6)+PEEK(2*(VPS-VLS)+VAS+9)*256+1
3160 NEXT VLS: PRINT
3170 VAS=VAS+PEEK(VAS+31)+PEEK(VAS+31)*256+3
3180 IF VAS+VPS THEN 2100 ELSE RETURN
3190 VPS=PEEK(VAS)
3210 VPS=OR$(PEEK(VAS+2)),OR$(PEEK(VAS+1))
3220 IF VPS="VL" THEN RETURN ELSE PRINT VPS,
3230 IF VPS=2 PRINT "INT",, RETURN
3240 IF VPS=3 PRINT "STR", RETURN
3250 IF VPS=4 PRINT "DNG", RETURN
3260 IF VPS=8 PRINT "DGL", RETURN
3270 PRINT "ERROR: VARIABLE ",VLS," HAS TYPE NUMBER NOT VPS, STOP

```

Figure 3. A Variables Listner Program

VL%	for loop control
VS%	number of subscribers in an array
VP%	utility pointer
VA%	beginning address of variable currently being processed
VHE	name of the variable being processed

```

10 REM A TEST PROGRAM FOR VARIABLE LISTING
20 AI=3.14
30 IS=1234
40 CS$="AAAAA"
50 DIM X(2,3)
60 DIM T(5)
70 X(2,2)=12.34
80 PRINT "READY TO LIST VARIABLES"
90 INPUT "ENTER ENTER TO LIST THEM",AI
100 DIMS X(0)
110 STOP

```

Swissair when JETI

LIST OF DOUBLE VARIABLES

NAME	TYPE
AA	END
Z	INT
CA	STR

LIST OF ABSTRACTS

NAME	TYPE	UNIT
13	150	2
14	175	3

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Figure 4. Test Procedures and Cycleway

Note: If any key other than ENTER is hit to begin the listing, AS will be included in the listing.



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Stephen J. Rogowski



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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^{31} which is 57,108,864. For 2^{32} 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 "bow'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.

PROGRAM #2

```
40 DIM A(500),B(500)
50 A(1)=1
50 A(2)=1
100 L=3
105 M=1
110 C=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)=1
167 IF C=1 THEN B(K+1)=-1
200 PRINT 2;"M:";L
210 FOR Q=D+1 TO 1 STEP -1
220 A(Q)=B(Q)
240 NEXT Q
250 FOR F=0 TO 1 STEP 1
260 IF B(F)<0 THEN 270
270 IF B(F)=0 THEN PRINT "B(F):";
      ELSE PRINT B(F);
275 NEXT F
280 PRINT
300 L=L+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 suppressed 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(1),D
```

```

150 PRINT N(X) / D: = 1
160 A(X) = INT(10*N(X)/D)
170 PRINT A(X)
180 R(X+1) = MOD(10*N(X),D)
190 IF R(X+1) = 0 THEN PRINT ELSE 230
200 PRINT (TERMINATES AFTER X:
210 IF X=1 THEN "DIGIT:" ELSE "DIGITS:")
220 GO TO 160
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 160
300 NEXT Y
310 GO TO 160
320 END

```

Cross 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: "1/N" = 1
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 " "
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 nine's 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 nine's 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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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 something 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.

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: "Particularly 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 accommodate. 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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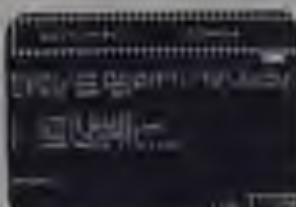
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Photographing, cont'd...



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. How-



Photo 3: "Shallow depth of field, produced with aperture setting of 2.8."

ever, 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.

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 1-1/2 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."

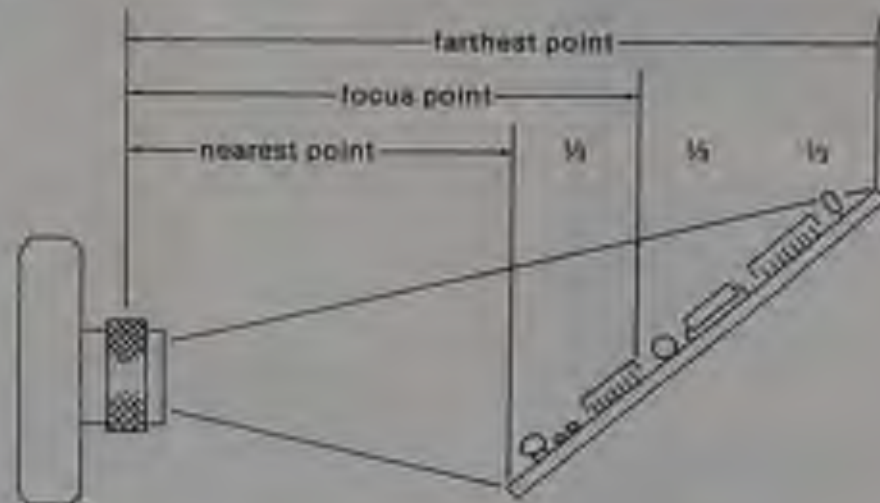


Figure 1: "Rule of thumb for close-up focusing: measure distance across subject, in line with camera, then set focus at one-third that distance beyond nearest point. Stop the lens down as far as you can, to get maximum depth of field."

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

Unless you control your lighting, you are taking a chance that your photos will be unusable.

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.

Reflections, Texture, Surface Detail

We're getting down to the floor 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 reflected 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 softens 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 on the side, three-fourths the distance of the fill light, so give about 2:1 brightness ratio on the subject. Keep its 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 this, 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 1/20 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 against 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 photographs 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. □

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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. It 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(5,6) 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 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(6,5); the 5 at 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(7,6). 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 0 at L(4,7) were part of the D(0,2) that would force the 0 at L(3,6) to be part of D(0,6) and the 0 at L(1,6) 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) 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).

8) 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(5,5) & D(1,5) which completes the entire array.

This array had a unique pattern. Some will contain sub-areas such as:

```
2 4
0 2
```

which contains D(2,4) & D(2,6) in either of two ways.

COL	1	2	3	4	5	6	7	8	
ROW									
1	2	1	4	1	5	5	4	6	00
2	3	3	1	1	4	5	0	3	01 11
3	1	3	0	1	1	0	0	4	02 12 22
4	5	2	4	6	1	1	0	1	03 13 23 33
5	1	2	4	1	5	5	2	0	04 14 24 34 44
6	4	0	3	1	4	4	0	3	05 15 25 35 45 55
7	6	4	0	0	7	7	2	0	06 16 26 36 46 56 66
(A) 28 DOMINOES 11 44									
1	5	5	4	6	5	5	4	1	00
2	5	5	1	1	5	4	2	6	01 11
3	4	1	3	1	3	6	1	2	02 12 22
4	1	1	2	5	0	1	2		03 13 23 33
5	4	4	0	1	4	2	2		04 14 24 34 44
6	3	4	5	1	2	0	6	1	05 15 25 35 45 55
7	2	1	2	0	0	0	4	4	06 16 26 36 46 56 66
(B) 28 DOMINOES 11 44									

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).

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. □

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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?

Coches 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 re-

sponse from all concerned was positive and we expect to continue its use.

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 scrim-

The players and the fans could see how well each player has performed in a number of statistical areas important to team play.

mage 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.

Program requirements

Data storage space for this program is about 5,500 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-

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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, is 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 85.

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

NAME	POINTS	REBOUNDS	ASSISTS	STEALS	BLOCKS	FIELD GOALS	3-POINTERS	FREE THROWS	POINTS PER GAME	REBOUNDS PER GAME	ASSISTS PER GAME	STEALS PER GAME	BLOCKS PER GAME	FIELD GOALS PER GAME	3-POINTERS PER GAME	FREE THROWS PER GAME
WANG	10	5	2	1	0	10	0	10	10	5	2	1	0	10	0	10
CHEN	15	8	3	2	1	15	0	15	15	8	3	2	1	15	0	15
LIU	20	12	4	3	2	20	0	20	20	12	4	3	2	20	0	20
WU	25	15	5	4	3	25	0	25	25	15	5	4	3	25	0	25
WANG	30	18	6	5	4	30	0	30	30	18	6	5	4	30	0	30
CHEN	35	20	7	6	5	35	0	35	35	20	7	6	5	35	0	35
LIU	40	22	8	7	6	40	0	40	40	22	8	7	6	40	0	40
WU	45	25	9	8	7	45	0	45	45	25	9	8	7	45	0	45
WANG	50	28	10	9	8	50	0	50	50	28	10	9	8	50	0	50
CHEN	55	30	11	10	9	55	0	55	55	30	11	10	9	55	0	55
LIU	60	32	12	11	10	60	0	60	60	32	12	11	10	60	0	60
WU	65	35	13	12	11	65	0	65	65	35	13	12	11	65	0	65
WANG	70	38	14	13	12	70	0	70	70	38	14	13	12	70	0	70
CHEN	75	40	15	14	13	75	0	75	75	40	15	14	13	75	0	75
LIU	80	42	16	15	14	80	0	80	80	42	16	15	14	80	0	80
WU	85	45	17	16	15	85	0	85	85	45	17	16	15	85	0	85
WANG	90	48	18	17	16	90	0	90	90	48	18	17	16	90	0	90
CHEN	95	50	19	18	17	95	0	95	95	50	19	18	17	95	0	95
LIU	100	52	20	19	18	100	0	100	100	52	20	19	18	100	0	100
WU	105	55	21	20	19	105	0	105	105	55	21	20	19	105	0	105
WANG	110	58	22	21	20	110	0	110	110	58	22	21	20	110	0	110
CHEN	115	60	23	22	21	115	0	115	115	60	23	22	21	115	0	115
LIU	120	62	24	23	22	120	0	120	120	62	24	23	22	120	0	120
WU	125	65	25	24	23	125	0	125	125	65	25	24	23	125	0	125
WANG	130	68	26	25	24	130	0	130	130	68	26	25	24	130	0	130
CHEN	135	70	27	26	25	135	0	135	135	70	27	26	25	135	0	135
LIU	140	72	28	27	26	140	0	140	140	72	28	27	26	140	0	140
WU	145	75	29	28	27	145	0	145	145	75	29	28	27	145	0	145
WANG	150	78	30	29	28	150	0	150	150	78	30	29	28	150	0	150
CHEN	155	80	31	30	29	155	0	155	155	80	31	30	29	155	0	155
LIU	160	82	32	31	30	160	0	160	160	82	32	31	30	160	0	160
WU	165	85	33	32	31	165	0	165	165	85	33	32	31	165	0	165
WANG	170	88	34	33	32	170	0	170	170	88	34	33	32	170	0	170
CHEN	175	90	35	34	33	175	0	175	175	90	35	34	33	175	0	175
LIU	180	92	36	35	34	180	0	180	180	92	36	35	34	180	0	180
WU	185	95	37	36	35	185	0	185	185	95	37	36	35	185	0	185
WANG	190	98	38	37	36	190	0	190	190	98	38	37	36	190	0	190
CHEN	195	100	39	38	37	195	0	195	195	100	39	38	37	195	0	195
LIU	200	102	40	39	38	200	0	200	200	102	40	39	38	200	0	200
WU	205	105	41	40	39	205	0	205	205	105	41	40	39	205	0	205
WANG	210	108	42	41	40	210	0	210	210	108	42	41	40	210	0	210
CHEN	215	110	43	42	41	215	0	215	215	110	43	42	41	215	0	215
LIU	220	112	44	43	42	220	0	220	220	112	44	43	42	220	0	220
WU	225	115	45	44	43	225	0	225	225	115	45	44	43	225	0	225
WANG	230	118	46	45	44	230	0	230	230	118	46	45	44	230	0	230
CHEN	235	120	47	46	45	235	0	235	235	120	47	46	45	235	0	235
LIU	240	122	48	47	46	240	0	240	240	122	48	47	46	240	0	240
WU	245	125	49	48	47	245	0	245	245	125	49	48	47	245	0	245
WANG	250	128	50	49	48	250	0	250	250	128	50	49	48	250	0	250
CHEN	255	130	51	50	49	255	0	255	255	130	51	50	49	255	0	255
LIU	260	132	52	51	50	260	0	260	260	132	52	51	50	260	0	260
WU	265	135	53	52	51	265	0	265	265	135	53	52	51	265	0	265
WANG	270	138	54	53	52	270	0	270	270	138	54	53	52	270	0	270
CHEN	275	140	55	54	53	275	0	275	275	140	55	54	53	275	0	275
LIU	280	142	56	55	54	280	0	280	280	142	56	55	54	280	0	280
WU	285	145	57	56	55	285	0	285	285	145	57	56	55	285	0	285
WANG	290	148	58	57	56	290	0	290	290	148	58	57	56	290	0	290
CHEN	295	150	59	58	57	295	0	295	295	150	59	58	57	295	0	295
LIU	300	152	60	59	58	300	0	300	300	152	60	59	58	300	0	300
WU	305	155	61	60	59	305	0	305	305	155	61	60	59	305	0	305
WANG	310	158	62	61	60	310	0	310	310	158	62	61	60	310	0	310
CHEN	315	160	63	62	61	315	0	315	315	160	63	62	61	315	0	315
LIU	320	162	64	63	62	320	0	320	320	162	64	63	62	320	0	320
WU	325	165	65	64	63	325	0	325	325	165	65	64	63	325	0	325
WANG	330	168	66	65	64	330	0	330	330	168	66	65	64	330	0	330
CHEN	335	170	67	66	65	335	0	335	335	170	67	66	65	335	0	335
LIU	340	172	68	67	66	340	0	340	340	172	68	67	66	340	0	340
WU	345	175	69	68	67	345	0	345	345	175	69	68	67	345	0	345
WANG	350	178	70	69	68	350	0	350	350	178	70	69	68	350	0	350
CHEN	355	180	71	70	69	355	0	355	355	180	71	70	69	355	0	355
LIU	360	182	72	71	70	360	0	360	360	182	72	71	70	360	0	360
WU	365	185	73	72	71	365	0	365	365	185	73	72	71	365	0	365
WANG	370	188	74	73	72	370	0	370	370	188	74	73	72	370	0	370
CHEN	375	190	75	74	73	375	0	375	375	190	75	74	73	375	0	375
LIU	380	192	76	75	74	380	0	380	380	192	76	75	74	380	0	380
WU	385	195	77	76	75	385	0	385	385	195	77	76	75	385	0	385
WANG	390	198	78	77	76	390	0	390	390	198	78	77	76	390	0	390
CHEN	395	200	79	78	77	395	0	395	395	200	79	78	77	395	0	395
LIU	400	202	80	79	78	400	0	400	400	202	80	79	78	400	0	400
WU	405	205	81	80	79	405	0	405	405	205	81	80	79	405	0	405
WANG	410	208	82	81	80	410	0	410	410	208	82	81	80	410	0	410
CHEN	415	210	83	82	81	415	0	415	415	210	83	82	81	415	0	415
LIU	420	212	84	83	82	420	0	420	420	212	84	83	82	420	0	420
WU	425	215	85	84	83	425	0	425	425	215	85	84	83	425	0	425
WANG	430	218	86	85	84	430	0	430	430	218	86	85	84	430	0	430
CHEN	435	220	87	86	85	435	0	435	435	220	87	86	85	435	0	435
LIU	440	222	88	87	86	440	0	440	440	222	88	87	86	440	0	440
WU	445	225	89	88	87	445	0	445	445	225	89	88	87	445	0	445
WANG	450	228	90	89	88	450	0	450	450	228	90	89	88	450	0	450
CHEN	455	230	91	90	89	455	0	455	455	230	91	90	89	455	0	455
LIU	460	232	92	91	90	460	0	460	460	232	92	91	90	460	0	460
WU	465	235	93	92	91	465	0	465	465	235	93	92	91	465	0	465
WANG	470	238	94	93	92	470	0	470	470	238	94	93	92	470	0	470
CHEN	475	240	95	94	93	475	0	475	475	240	95	94	93	475	0	475
LIU	480	242	96	95	94	480	0	480	480	242	96	95	94	480	0	480
WU	485	245	97	96	95	485	0	485	485	245	97	96	95	485	0	485
WANG	490	248	98	97	96	490	0	490	490	248	98					

```

10 REM *****STATEMENT SAVES SPACE FOR THE NAMES AND DATA*****
20 DIM N(1),I(7),D(15),J(2),D(15)
30 REM *****FUNCTIONS R AND C ARE DEFINED HERE. THEY ROUND OFF AND CONVERT TO C'S.*****
40 DEF FN R(X)=INT((X+.05)/10)/10
50 DEF FN C(X)=INT((X+.0005)*1000)/1000
60 REM *****THESE STATEMENTS LOAD TWO NAMES AND DATA FROM PREVIOUS GAMES FROM THE TAPE DRIVE*****
70 DATA LOAD "B-BALL"
80 DATA LOAD H(1),R(1)
90 BACKSPACE 17
100 INPUT "WHAT WAS THE OPPONENT (INITIALS) AND WHAT WAS THE DATE OF THE GAME (NUMERIC DATE)?,"F(1)
110 REM *****HERE IS WHERE YOU ENTER THE DATE FOR THE GAME THAT WAS JUST PLAYED*****
120 FOR M=1 TO 14
130 PRINT B(1);
140 INPUT "DID HE PLAY Y OR N?,"C(1)
150 IF C(1) <> "N" THEN 230
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 "TURNSOVERS","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 M
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 K=1 TO 11
340 FOR L=1 TO 13
350 R(L,K)=R(L,K)+A(N,K)
360 NEXT L
370 NEXT K
380 A(T(1),12)=L
390 REM *****THE NEXT GROUP OF STATEMENTS CONTROL THE OUTPUT*****
400 PRINT HEX$(ASC(ASCII)) "    CERTLAND HIGH BASKETBALL STATS"
410 REM *****ON SKIPS ONE LINE AND HEX AC EXPANDS THE PRINT IF YOU ARE USING BASIC BASIC*****
420 PRINT HEX$(ASC(ASCII))
430 PRINT F(1)
440 PRINT
450 PRINT "NAME      " " NO." " FOR" " FOR" " FT%" " FT%" " PIR" " PIR" " STL" " STL" " TOT"
460 FOR M=1 TO 14
470 REM *****THESE STATEMENTS PREVENT DIVISION BY ZERO FOR PLAYERS WHO DIDN'T PLAY*****
480 IF A(N,12)=0 THEN 490
490 IF A(N,2)=0 THEN 540
500 F=F+FN(A(N,1)/A(N,2))
510 IF A(N,4)=0 THEN 540
520 FI=FN(A(N,3)/A(N,4))
530 GOTO 570
540 F=0
550 USUFI=0
560 FI=0
570 PRINTUSING 599,D(1),A(N,1),A(N,2),F,A(N,3),A(N,4),FI,A(N,11),PI2=A(N,5),FMR=A(N,11)/PI2,A(N,6)/
A(N,12),A(N,7),A(N,8),A(N,9),A(N,10),A(N,11),FMC=A(N,6)/A(N,11),A(N,11)/A(N,12)
580 GOTO 610
590 PRINTUSING 599,D(1),0,0,0,0,0,0,0,0,0,0,0
600 PRINT
610 NEXT M
620 PRINT HEX$(ASC(ASCII))
630 PRINT "NAME      " " NO." " STL%" " STL%" " PIR" " PIR" " TOT" " TOT" " IF" " IF"
640 FOR M=1 TO 14
650 IF A(N,12)=0 THEN 690
660 PRINTUSING 600,D(1),A(N,7),FMC=A(N,7)/A(N,12),A(N,8),FMC=A(N,8)/A(N,12),A(N,9),FMC=A(N,9)/A(N,12),A(N,10),FMC=A(N,10)/A(N,12)
670 GOTO 700
680 PRINTUSING 600,D(1),0,0,0,0,0,0,0,0,0,0
690 PRINT
700 NEXT M
710 PRINT HEX$(ASC(ASCII)) "FC=FIELD GOALS FT=FREE THROWS M=MADE WATTEMPTED FIS=FIRST /S=PER DAN ET
720 PRINT "S=SHOOTING S=OFFENSIVE S=OFFENSIVE I-TOTAL STL=STEALS AST=ASSISTS"
730 PRINT "TO=TURNSOVERS PP=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 S/S
760 MAX S=S+1
770 PRINT HEX$(ASC(ASCII))
780 REM *****THESE STATEMENTS SAVE THE NEW TOTALS ON TAPE*****
790 DATA SAVE OPEN "B-BALL"
800 DATA SAVE B(1),R(1)
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 MAX S=0
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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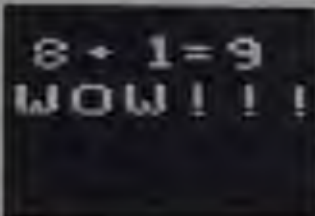
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80 Software Critique on
Ecology Simulations-1
Jan-March 1980

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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 CAJ (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 data 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 Z6 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 200) 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 use variables as follows:

- K5(10) Keywords
- A5 Article Title
- M5 Magazine Name
- D5 Magazine Date
- P Page Number
- W5(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.

EDIT KEYWORD ARTICLE STORAGE MENU PROGRAM

```

0001 REM *** 5-22-77
0002 REM *** 5-22-77
0003 PAGE 82,407 REM STAIN LENGTH=41
0004 LPS1000 NUMBER OF SUBSYSTEMS
0005 REM TAIL,PRNT
0006 DATA AND,AND,REP,REPORT,LIS,LIST,SEL,SELECT,LIS,PRATE
0007 REM 1ST TO LAST KEYWORD,PRNTONLY 1
0008 PRINT PRINT "KEYWORD ACCESS SYSTEM - V1.1"
0009 PRINT
0010 PRINT TAB(10),"MENU"PRINT
0011 PRINT "ADD - ADD ARTICLE TO FILE"
0012 PRINT "REP - REPORT SORTED BY KEYWORD"
0013 PRINT "LIS - LIST ENTRIES"
0014 PRINT "SEL - SELECT ENTRIES"
0015 PRINT "END - CREATE A NEW DATA FILE"
0016 PRINT "END - TERMINATE PROGRAM"
0017 PRINT
0018 INPUT "ENTER SUBSYSTEM DESIRED",A5
0019 GOTO A5ALPHABETIC,27
0020 FOR I=1 TO 4
0021 IF A5=PRATE THEN GOTO
0022 IF A5=REP THEN GOTO
0023 IF A5=LIS THEN GOTO
0024 IF A5=SEL THEN GOTO
0025 IF A5=END THEN GOTO
0026 PRINT "INVALID SUBSYSTEM"
0027 GOTO CHAIN PRATE
0028 GOTO END

```

MENU Program

EDIT KEYWORD ARTICLE STORAGE MENU PROGRAM

```

0001 REM *** 5-22-77
0002 REM *** 5-22-77
0003 PAGE 82,407 REM STAIN LENGTH=41
0004 LPS1000 NUMBER OF SUBSYSTEMS
0005 REM TAIL,PRNT
0006 DATA AND,AND,REP,REPORT,LIS,LIST,SEL,SELECT,LIS,PRATE
0007 REM 1ST TO LAST KEYWORD,PRNTONLY 1
0008 PRINT PRINT "KEYWORD ACCESS SYSTEM - V1.1"
0009 PRINT
0010 PRINT TAB(10),"MENU"PRINT
0011 PRINT "ADD - ADD ARTICLE TO FILE"
0012 PRINT "REP - REPORT SORTED BY KEYWORD"
0013 PRINT "LIS - LIST ENTRIES"
0014 PRINT "SEL - SELECT ENTRIES"
0015 PRINT "END - CREATE A NEW DATA FILE"
0016 PRINT "END - TERMINATE PROGRAM"
0017 PRINT
0018 INPUT "ENTER SUBSYSTEM DESIRED",A5
0019 GOTO A5ALPHABETIC,27
0020 FOR I=1 TO 4
0021 IF A5=PRATE THEN GOTO
0022 IF A5=REP THEN GOTO
0023 IF A5=LIS THEN GOTO
0024 IF A5=SEL THEN GOTO
0025 IF A5=END THEN GOTO
0026 PRINT "INVALID SUBSYSTEM"
0027 GOTO CHAIN PRATE
0028 GOTO END

```

CREATE Program

The REPORT PAGE HANDLER consists of three subroutines and handles page titles, subtitles and page length. The following variables are used:

- T5 Page Title
- S5 Subtitle
- L0 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 S5 if there is enough room on the page for a complete entry as specified by the value of L8. 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	MAGAZINE & PLATS ON J KUPFER CREATIVE COMPUTING PAGE 114	MAY APR 1977
READY \$RUN	NATIONAL WHITE HOUSE ON F HOFFSTETER CREATIVE COMPUTING PAGE 115	MAY APR 1977
KEYWORD ACCESS SYSTEM - V1.1	USE - FURTHER SEARCH: T Y MAGAZINE NAME AUTHOR NAME M GALLERY ENTER KEYWORDS T	
MENU	WORD ON R GALLERY CREATIVE COMPUTING PAGE 117	MAY APR 1977
ADD - ADD ARTICLE TO FILE REP - REPORT SORTED BY KEYWORD LIS - LIST ENTRIES SEL - SELECT ENTRIES END - CREATE A NEW DATA FILE END - TERMINATE PROGRAM	WATCHMAN ON R GALLERY CREATIVE COMPUTING PAGE 74	SEP OCT 1976
ENTER SUBSYSTEM INQUIRY SEL	USE - FURTHER SEARCH: T Y MAGAZINE NAME AUTHOR NAME ENTER KEYWORDS T CAL T SCALE T	
SELECT/LIST SUBSYSTEM	ANY KEYWORD MATCH OR ALL KEYWORDS? ALL	
ENTER ONLY "RETURN" IF YOU WANT WANT TO SELECT ON ONE CRITERIA LISTED. OTHERWISE ENTER WATCH STRING	FILE 0017 ON R MONTAGNI CREATIVE COMPUTING PAGE 124	MAY APR 1977
MAGAZINE NAME CREATIVE COMPUTING AUTHOR NAME ENTER KEYWORDS T GALT T RUSSELL T		
ANY KEYWORD MATCH OR ALL KEYWORDS? ALL		
A NATIONAL WHITE HOUSE GALT ON J KUPFER CREATIVE COMPUTING PAGE 114		MAY APR 1977

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KAS, con't. . .

The third entry in the report page handler is line 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

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 VS. Once an end of file is reached, all the keywords in VS 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 FG) 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

```

0000 REM REPORT SUBROUTINE
0010 REM Version 1.5 1-82-VK
0020 REM SRC, P.O. Box 2847, Olympia, WA 98501
0030 LINE=132
0040 INPUT "SEARCH TO WRITER?",IX
0050 IF IX
0060 IF LEFT(STR$(IX),1) THEN FOR IV=1
0070 GOTO 110
0080 REM
0090 REM IF/WHEN **
0100 REM ** READ RECORDS (SCRUB)
0110 READ #IN,KEY1,KEY2,KEY3,KEY4,KEY5,KEY6,KEY7,KEY8,KEY9,KEY10
0120 IF KEY1=0 THEN
0130 READ #IN,KEY1,KEY2,KEY3,KEY4,KEY5,KEY6,KEY7,KEY8,KEY9,KEY10
0140 RETURN
0150 REM ** WRITE RECORDS (SCRUB)
0160 WRITE #OUT,KEY1,KEY2,KEY3,KEY4,KEY5,KEY6,KEY7,KEY8,KEY9,KEY10
0170 RETURN
0180 REM END OF IF/WHEN **
0190 REM
0200 REM "COMPUTER, KAS"
0210 REM SEARCHWORDS, SEARCHED, SEARCHED, SEARCHED
0220 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0230 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0240 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0250 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0260 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0270 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0280 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0290 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0300 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0310 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0320 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0330 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
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0370 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
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0670 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0680 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0690 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0700 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0710 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
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0970 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0980 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
0990 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1000 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1010 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1020 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1030 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1040 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1050 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1060 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1070 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1080 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1090 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1100 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1110 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1120 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1130 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1140 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1150 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1160 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1170 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1180 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1190 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1200 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1210 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1220 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1230 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1240 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
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1280 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1290 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1300 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1310 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1320 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1330 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1340 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1350 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1360 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1370 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1380 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1390 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1400 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1410 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1420 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1430 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1440 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1450 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1460 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1470 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1480 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1490 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1500 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1510 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1520 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1530 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1540 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1550 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1560 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1570 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1580 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1590 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1600 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1610 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1620 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1630 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1640 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1650 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1660 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1670 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1680 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1690 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1700 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1710 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1720 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1730 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
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1760 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1770 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1780 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1790 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1800 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1810 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1820 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1830 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1840 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1850 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1860 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1870 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1880 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1890 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1900 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1910 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1920 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1930 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1940 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1950 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1960 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1970 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1980 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
1990 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED
2000 REM SEARCHED, SEARCHED, SEARCHED, SEARCHED

```

Fig.2: Sample run of REPORT

[illegible]

KAS, con't...

PORT PAGE HANDLER subroutines if there are more keywords in V\$ then the next fan 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 present 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., OR 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 KEY EXPAND LIST

0001 REM EXP 7-22-79

0010 REM K\$123,MS123

0020 REM "COMPUTER,KAS"

0030 PRINT "PRINT LIST SUBSYSTEM"PRINT

0040 PRINT "FILE IS J29"

0050 PRINT

0060 OPEN #1,29

0070 INPUT "START, END RECORD NUMBERS",A,B

0080 REM PRINT THE FILE

0090 A=A+1

0100 READ #1,A\$123,A\$127,A\$131,A\$145,A\$151,

A\$163,A\$171,A\$187,A\$193,A\$207

0110 IF A\$123="" GOTO 1000

0120 READ #1,A\$123,A\$127,A\$131,A\$145,A\$151,

A\$163,A\$171,A\$187,A\$193,A\$207

0130 IF A\$123="" GOTO 1000

0140 IF A\$123="" GOTO 1000

0150 IF A\$123="" GOTO 1000

0160 IF A\$123="" GOTO 1000

0170 IF A\$123="" GOTO 1000

0180 IF A\$123="" GOTO 1000

0190 IF A\$123="" GOTO 1000

0200 IF A\$123="" GOTO 1000

0210 IF A\$123="" GOTO 1000

0220 IF A\$123="" GOTO 1000

0230 IF A\$123="" GOTO 1000

0240 IF A\$123="" GOTO 1000

0250 IF A\$123="" GOTO 1000

0260 IF A\$123="" GOTO 1000

0270 IF A\$123="" GOTO 1000

0280 IF A\$123="" GOTO 1000

0290 IF A\$123="" GOTO 1000

0300 IF A\$123="" GOTO 1000

0310 IF A\$123="" GOTO 1000

0320 IF A\$123="" GOTO 1000

0330 IF A\$123="" GOTO 1000

0340 IF A\$123="" GOTO 1000

0350 IF A\$123="" GOTO 1000

0360 IF A\$123="" GOTO 1000

0370 IF A\$123="" GOTO 1000

0380 IF A\$123="" GOTO 1000

0390 IF A\$123="" GOTO 1000

0400 IF A\$123="" GOTO 1000

0410 IF A\$123="" GOTO 1000

0420 IF A\$123="" GOTO 1000

0430 IF A\$123="" GOTO 1000

0440 IF A\$123="" GOTO 1000

0450 IF A\$123="" GOTO 1000

0460 IF A\$123="" GOTO 1000

0470 IF A\$123="" GOTO 1000

0480 IF A\$123="" GOTO 1000

0490 IF A\$123="" GOTO 1000

0500 IF A\$123="" GOTO 1000

0510 IF A\$123="" GOTO 1000

0520 IF A\$123="" GOTO 1000

0530 IF A\$123="" GOTO 1000

0540 IF A\$123="" GOTO 1000

0550 IF A\$123="" GOTO 1000

0560 IF A\$123="" GOTO 1000

0570 IF A\$123="" GOTO 1000

0580 IF A\$123="" GOTO 1000

0590 IF A\$123="" GOTO 1000

0600 IF A\$123="" GOTO 1000

0610 IF A\$123="" GOTO 1000

0620 IF A\$123="" GOTO 1000

0630 IF A\$123="" GOTO 1000

0640 IF A\$123="" GOTO 1000

0650 IF A\$123="" GOTO 1000

0660 IF A\$123="" GOTO 1000

0670 IF A\$123="" GOTO 1000

0680 IF A\$123="" GOTO 1000

0690 IF A\$123="" GOTO 1000

0700 IF A\$123="" GOTO 1000

0710 IF A\$123="" GOTO 1000

0720 IF A\$123="" GOTO 1000

0730 IF A\$123="" GOTO 1000

0740 IF A\$123="" GOTO 1000

0750 IF A\$123="" GOTO 1000

0760 IF A\$123="" GOTO 1000

0770 IF A\$123="" GOTO 1000

0780 IF A\$123="" GOTO 1000

0790 IF A\$123="" GOTO 1000

0800 IF A\$123="" GOTO 1000

0810 IF A\$123="" GOTO 1000

0820 IF A\$123="" GOTO 1000

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"Rolodex"

Data Base

Program -

For

Home &

Office

John Armstrong

This program was inspired and adapted from 'Mallor' 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.

Glossary

File - Consists of a number of records.
Record - Consists of Descriptor word, Surname, Forename, 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.)

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"Well, concrete computers are definitely not the answer."

John Armstrong, 8038 Dale Dr., Downey, CA 90242.

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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 Kent Modest of Texas Instruments and converted to Microsoft BASIC by Jeffrey Yuan.

Bruce Hicks, School of Secondary Education,
University of Illinois, Urbana, IL, 61801.

MAN

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 HISTORY OF LIFE'S VALUES, DANGERS.

YOU HAVE BEEN CRASHED ON A REMOTE ISLAND. YOU HAVE THE CHOICE OF MINING FOR GOLD AND/OR BUILDING A BOAT TO SURVIVE THE APPROACHING STORMS. CAN YOU SURVIVE? IF SO, WITH HOW MUCH GOLD?

0 0 0 0 1 0 0 0

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 0, 0 WORK POINTS, WHICH IS 0 PERCENT OF THE TOTAL, AND THE FOLLOWING TOOLS:

PICKAXE
AXE
LUNNET
PICKAXE

JUST HIT RETURN WHEN YOU ARE READY TO GO ON.

HAWTHORNE HAS 0 DOLLARS WORTH OF GOLD, A TOOL PROFICIENCY OF 0, 0 WORK POINTS, WHICH IS 0 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 YOU WANT TO TRADE TOOLS? YES

WHO DO YOU WANT TO TRADE? EMERSON

WHO ELSE WANTS TO TRADE? HAWTHORNE

EMERSON, ARE YOU SELLING ANY GOLD IN THIS TRADE? NO

EMERSON, ARE YOU SELLING ANY TOOLS? NO IN THIS TRADE? YES

EMERSON, HOW MANY TOOLS ARE YOU SELLING? 1

EMERSON, WHAT IS THE NAME OF A TOOL THAT YOU ARE SELLING IN THIS TRADE? PICKAXE

HAWTHORNE, ARE YOU SELLING ANY GOLD IN THIS TRADE? NO

HAWTHORNE, ARE YOU SELLING ANY TOOLS? NO IN THIS TRADE? YES

HAWTHORNE, HOW MANY TOOLS ARE YOU SELLING? 1

HAWTHORNE, WHAT IS THE NAME OF A TOOL THAT YOU ARE SELLING IN THIS TRADE? CHISEL

THIS IS YOUR LAST CHANCE TO CALL OFF THE TRADE. IF YOU WANT TO CALL IT OFF TYPE "D" OTHERWISE TYPE ANY OTHER LETTER AFTER THE QUESTION MARK.
D

DO YOU WANT TO TRADE NOW? NO

EMERSON, WHAT ARE YOU GOING TO WORK ON TODAY? BOAT

EMERSON HAS EARNED 0 MORE WORK POINTS.

EMERSON HAS BEEN INJURED BY THE PICKAXE. HIS/HER TOTAL PROFICIENCY WILL NOW BE LOST IN HALF.

HAWTHORNE, WHAT ARE YOU GOING TO WORK ON TODAY? BOAT

HAWTHORNE HAS EARNED 1 MORE WORK POINTS.

HAWTHORNE HAS BEEN INJURED BY THE PICKAXE. HIS/HER TOTAL PROFICIENCY WILL NOW BE LOST IN HALF.

THIS IS DAY 2

EMERSON HAS 0 DOLLARS WORTH OF GOLD, A TOOL PROFICIENCY OF 0, 0 WORK POINTS, WHICH IS 0 PERCENT OF THE TOTAL, AND THE FOLLOWING TOOLS:

CHISEL
AXE
LUNNET
PICKAXE

JUST HIT RETURN WHEN YOU ARE READY TO GO ON.

HAWTHORNE HAS 0 DOLLARS WORTH OF GOLD, A TOOL PROFICIENCY OF 0, 0 WORK POINTS, WHICH IS 0 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 1.

THE SUM IS ABOVE 10 HIT

DO YOU WANT TO TRADE TOOLS? YES

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...and life on earth is over in thirty years.

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FIGURE 1. PART OF THE TABLE OF THE 17 VOWELS OF THE 1901 EDITION

ENVIRONMENTAL MONITORING AND ASSESSMENT

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1941/1942 and 1942/1943. 2. *Ann. N.Y. Acad. Sci.*

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SABONINO RAIL 247-100,000-PAIRS PER YEAR; 8 FIVE
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1. 1998年12月1日
2. 1998年12月1日
3. 1998年12月1日
4. 1998年12月1日

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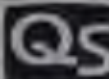
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254 PRINT
255 IF NOT FOUND THEN
256   GOTO 257
257 PRINT "THESE ARE THE NAMES OF THE PLACES."
258 PRINT
259 GOTO 260
260 FOR I=1 TO 10
261   PRINT I
262   GOTO 263
263 FOR I=1 TO 10
264   PRINT I
265   GOTO 266
266 FOR I=1 TO 10
267   PRINT I
268   GOTO 269
269 FOR I=1 TO 10
270   PRINT I
271   GOTO 272
272 FOR I=1 TO 10
273   PRINT I
274   GOTO 275
275 FOR I=1 TO 10
276   PRINT I
277   GOTO 278
278 FOR I=1 TO 10
279   PRINT I
280   GOTO 281
281 FOR I=1 TO 10
282   PRINT I
283   GOTO 284
284 FOR I=1 TO 10
285   PRINT I
286   GOTO 287
287 FOR I=1 TO 10
288   PRINT I
289   GOTO 290
290 FOR I=1 TO 10
291   PRINT I
292   GOTO 293
293 FOR I=1 TO 10
294   PRINT I
295   GOTO 296
296 FOR I=1 TO 10
297   PRINT I
298   GOTO 299
299 FOR I=1 TO 10
300   PRINT I
301   GOTO 302
302 FOR I=1 TO 10
303   PRINT I
304   GOTO 305
305 FOR I=1 TO 10
306   PRINT I
307   GOTO 308
308 FOR I=1 TO 10
309   PRINT I
310   GOTO 311
311 FOR I=1 TO 10
312   PRINT I
313   GOTO 314
314 FOR I=1 TO 10
315   PRINT I
316   GOTO 317
317 FOR I=1 TO 10
318   PRINT I
319   GOTO 320
320 FOR I=1 TO 10
321   PRINT I
322   GOTO 323
323 FOR I=1 TO 10
324   PRINT I
325   GOTO 326
326 FOR I=1 TO 10
327   PRINT I
328   GOTO 329
329 FOR I=1 TO 10
330   PRINT I
331   GOTO 332
332 FOR I=1 TO 10
333   PRINT I
334   GOTO 335
335 FOR I=1 TO 10
336   PRINT I
337   GOTO 338
338 FOR I=1 TO 10
339   PRINT I
340   GOTO 341
341 FOR I=1 TO 10
342   PRINT I
343   GOTO 344
344 FOR I=1 TO 10
345   PRINT I
346   GOTO 347
347 FOR I=1 TO 10
348   PRINT I
349   GOTO 350
350 FOR I=1 TO 10
351   PRINT I
352   GOTO 353
353 FOR I=1 TO 10
354   PRINT I
355   GOTO 356
356 FOR I=1 TO 10
357   PRINT I
358   GOTO 359
359 FOR I=1 TO 10
360   PRINT I
361   GOTO 362
362 FOR I=1 TO 10
363   PRINT I
364   GOTO 365
365 FOR I=1 TO 10
366   PRINT I
367   GOTO 368
368 FOR I=1 TO 10
369   PRINT I
370   GOTO 371
371 FOR I=1 TO 10
372   PRINT I
373   GOTO 374
374 FOR I=1 TO 10
375   PRINT I
376   GOTO 377
377 FOR I=1 TO 10
378   PRINT I
379   GOTO 380
380 FOR I=1 TO 10
381   PRINT I
382   GOTO 383
383 FOR I=1 TO 10
384   PRINT I
385   GOTO 386
386 FOR I=1 TO 10
387   PRINT I
388   GOTO 389
389 FOR I=1 TO 10
390   PRINT I
391   GOTO 392
392 FOR I=1 TO 10
393   PRINT I
394   GOTO 395
395 FOR I=1 TO 10
396   PRINT I
397   GOTO 398
398 FOR I=1 TO 10
399   PRINT I
400   GOTO 401
401 FOR I=1 TO 10
402   PRINT I
403   GOTO 404
404 FOR I=1 TO 10
405   PRINT I
406   GOTO 407
407 FOR I=1 TO 10
408   PRINT I
409   GOTO 410
410 FOR I=1 TO 10
411   PRINT I
412   GOTO 413
413 FOR I=1 TO 10
414   PRINT I
415   GOTO 416
416 FOR I=1 TO 10
417   PRINT I
418   GOTO 419
419 FOR I=1 TO 10
420   PRINT I
421   GOTO 422
422 FOR I=1 TO 10
423   PRINT I
424   GOTO 425
425 FOR I=1 TO 10
426   PRINT I
427   GOTO 428
428 FOR I=1 TO 10
429   PRINT I
430   GOTO 431
431 FOR I=1 TO 10
432   PRINT I
433   GOTO 434
434 FOR I=1 TO 10
435   PRINT I
436   GOTO 437
437 FOR I=1 TO 10
438   PRINT I
439   GOTO 440
440 FOR I=1 TO 10
441   PRINT I
442   GOTO 443
443 FOR I=1 TO 10
444   PRINT I
445   GOTO 446
446 FOR I=1 TO 10
447   PRINT I
448   GOTO 449
449 FOR I=1 TO 10
450   PRINT I
451   GOTO 452
452 FOR I=1 TO 10
453   PRINT I
454   GOTO 455
455 FOR I=1 TO 10
456   PRINT I
457   GOTO 458
458 FOR I=1 TO 10
459   PRINT I
460   GOTO 461
461 FOR I=1 TO 10
462   PRINT I
463   GOTO 464
464 FOR I=1 TO 10
465   PRINT I
466   GOTO 467
467 FOR I=1 TO 10
468   PRINT I
469   GOTO 470
470 FOR I=1 TO 10
471   PRINT I
472   GOTO 473
473 FOR I=1 TO 10
474   PRINT I
475   GOTO 476
476 FOR I=1 TO 10
477   PRINT I
478   GOTO 479
479 FOR I=1 TO 10
480   PRINT I
481   GOTO 482
482 FOR I=1 TO 10
483   PRINT I
484   GOTO 485
485 FOR I=1 TO 10
486   PRINT I
487   GOTO 488
488 FOR I=1 TO 10
489   PRINT I
490   GOTO 491
491 FOR I=1 TO 10
492   PRINT I
493   GOTO 494
494 FOR I=1 TO 10
495   PRINT I
496   GOTO 497
497 FOR I=1 TO 10
498   PRINT I
499   GOTO 500
500 FOR I=1 TO 10
501   PRINT I
502   GOTO 503
503 FOR I=1 TO 10
504   PRINT I
505   GOTO 506
506 FOR I=1 TO 10
507   PRINT I
508   GOTO 509
509 FOR I=1 TO 10
510   PRINT I
511   GOTO 512
512 FOR I=1 TO 10
513   PRINT I
514   GOTO 515
515 FOR I=1 TO 10
516   PRINT I
517   GOTO 518
518 FOR I=1 TO 10
519   PRINT I
520   GOTO 521
521 FOR I=1 TO 10
522   PRINT I
523   GOTO 524
524 FOR I=1 TO 10
525   PRINT I
526   GOTO 527
527 FOR I=1 TO 10
528   PRINT I
529   GOTO 530
530 FOR I=1 TO 10
531   PRINT I
532   GOTO 533
533 FOR I=1 TO 10
534   PRINT I
535   GOTO 536
536 FOR I=1 TO 10
537   PRINT I
538   GOTO 539
539 FOR I=1 TO 10
540   PRINT I
541   GOTO 542
542 FOR I=1 TO 10
543   PRINT I
544   GOTO 545
545 FOR I=1 TO 10
546   PRINT I
547   GOTO 548
548 FOR I=1 TO 10
549   PRINT I
550   GOTO 551
551 FOR I=1 TO 10
552   PRINT I
553   GOTO 554
554 FOR I=1 TO 10
555   PRINT I
556   GOTO 557
557 FOR I=1 TO 10
558   PRINT I
559   GOTO 560
560 FOR I=1 TO 10
561   PRINT I
562   GOTO 563
563 FOR I=1 TO 10
564   PRINT I
565   GOTO 566
566 FOR I=1 TO 10
567   PRINT I
568   GOTO 569
569 FOR I=1 TO 10
570   PRINT I
571   GOTO 572
572 FOR I=1 TO 10
573   PRINT I
574   GOTO 575
575 FOR I=1 TO 10
576   PRINT I
577   GOTO 578
578 FOR I=1 TO 10
579   PRINT I
580   GOTO 581
581 FOR I=1 TO 10
582   PRINT I
583   GOTO 584
584 FOR I=1 TO 10
585   PRINT I
586   GOTO 587
587 FOR I=1 TO 10
588   PRINT I
589   GOTO 590
590 FOR I=1 TO 10
591   PRINT I
592   GOTO 593
593 FOR I=1 TO 10
594   PRINT I
595   GOTO 596
596 FOR I=1 TO 10
597   PRINT I
598   GOTO 599
599 FOR I=1 TO 10
600   PRINT I
601   GOTO 602
602 FOR I=1 TO 10
603   PRINT I
604   GOTO 605
605 FOR I=1 TO 10
606   PRINT I
607   GOTO 608
608 FOR I=1 TO 10
609   PRINT I
610   GOTO 611
611 FOR I=1 TO 10
612   PRINT I
613   GOTO 614
614 FOR I=1 TO 10
615   PRINT I
616   GOTO 617
617 FOR I=1 TO 10
618   PRINT I
619   GOTO 620
620 FOR I=1 TO 10
621   PRINT I
622   GOTO 623
623 FOR I=1 TO 10
624   PRINT I
625   GOTO 626
626 FOR I=1 TO 10
627   PRINT I
628   GOTO 629
629 FOR I=1 TO 10
630   PRINT I
631   GOTO 632
632 FOR I=1 TO 10
633   PRINT I
634   GOTO 635
635 FOR I=1 TO 10
636   PRINT I
637   GOTO 638
638 FOR I=1 TO 10
639   PRINT I
640   GOTO 641
641 FOR I=1 TO 10
642   PRINT I
643   GOTO 644
644 FOR I=1 TO 10
645   PRINT I
646   GOTO 647
647 FOR I=1 TO 10
648   PRINT I
649   GOTO 650
650 FOR I=1 TO 10
651   PRINT I
652   GOTO 653
653 FOR I=1 TO 10
654   PRINT I
655   GOTO 656
656 FOR I=1 TO 10
657   PRINT I
658   GOTO 659
659 FOR I=1 TO 10
660   PRINT I
661   GOTO 662
662 FOR I=1 TO 10
663   PRINT I
664   GOTO 665
665 FOR I=1 TO 10
666   PRINT I
667   GOTO 668
668 FOR I=1 TO 10
669   PRINT I
670   GOTO 671
671 FOR I=1 TO 10
672   PRINT I
673   GOTO 674
674 FOR I=1 TO 10
675   PRINT I
676   GOTO 677
677 FOR I=1 TO 10
678   PRINT I
679   GOTO 680
680 FOR I=1 TO 10
681   PRINT I
682   GOTO 683
683 FOR I=1 TO 10
684   PRINT I
685   GOTO 686
686 FOR I=1 TO 10
687   PRINT I
688   GOTO 689
689 FOR I=1 TO 10
690   PRINT I
691   GOTO 692
692 FOR I=1 TO 10
693   PRINT I
694   GOTO 695
695 FOR I=1 TO 10
696   PRINT I
697   GOTO 698
698 FOR I=1 TO 10
699   PRINT I
700   GOTO 701
701 FOR I=1 TO 10
702   PRINT I
703   GOTO 704
704 FOR I=1 TO 10
705   PRINT I
706   GOTO 707
707 FOR I=1 TO 10
708   PRINT I
709   GOTO 710
710 FOR I=1 TO 10
711   PRINT I
712   GOTO 713
713 FOR I=1 TO 10
714   PRINT I
715   GOTO 716
716 FOR I=1 TO 10
717   PRINT I
718   GOTO 719
719 FOR I=1 TO 10
720   PRINT I
721   GOTO 722
722 FOR I=1 TO 10
723   PRINT I
724   GOTO 725
725 FOR I=1 TO 10
726   PRINT I
727   GOTO 728
728 FOR I=1 TO 10
729   PRINT I
730   GOTO 731
731 FOR I=1 TO 10
732   PRINT I
733   GOTO 734
734 FOR I=1 TO 10
735   PRINT I
736   GOTO 737
737 FOR I=1 TO 10
738   PRINT I
739   GOTO 740
740 FOR I=1 TO 10
741   PRINT I
742   GOTO 743
743 FOR I=1 TO 10
744   PRINT I
745   GOTO 746
746 FOR I=1 TO 10
747   PRINT I
748   GOTO 749
749 FOR I=1 TO 10
750   PRINT I
751   GOTO 752
752 FOR I=1 TO 10
753   PRINT I
754   GOTO 755
755 FOR I=1 TO 10
756   PRINT I
757   GOTO 758
758 FOR I=1 TO 10
759   PRINT I
760   GOTO 761
761 FOR I=1 TO 10
762   PRINT I
763   GOTO 764
764 FOR I=1 TO 10
765   PRINT I
766   GOTO 767
767 FOR I=1 TO 10
768   PRINT I
769   GOTO 770
770 FOR I=1 TO 10
771   PRINT I
772   GOTO 773
773 FOR I=1 TO 10
774   PRINT I
775   GOTO 776
776 FOR I=1 TO 10
777   PRINT I
778   GOTO 779
779 FOR I=1 TO 10
780   PRINT I
781   GOTO 782
782 FOR I=1 TO 10
783   PRINT I
784   GOTO 785
785 FOR I=1 TO 10
786   PRINT I
787   GOTO 788
788 FOR I=1 TO 10
789   PRINT I
790   GOTO 791
791 FOR I=1 TO 10
792   PRINT I
793   GOTO 794
794 FOR I=1 TO 10
795   PRINT I
796   GOTO 797
797 FOR I=1 TO 10
798   PRINT I
799   GOTO 800
800 FOR I=1 TO 10
801   PRINT I
802   GOTO 803
803 FOR I=1 TO 10
804   PRINT I
805   GOTO 806
806 FOR I=1 TO 10
807   PRINT I
808   GOTO 809
809 FOR I=1 TO 10
810   PRINT I
811   GOTO 812
812 FOR I=1 TO 10
813   PRINT I
814   GOTO 815
815 FOR I=1 TO 10
816   PRINT I
817   GOTO 818
818 FOR I=1 TO 10
819   PRINT I
820   GOTO 821
821 FOR I=1 TO 10
822   PRINT I
823   GOTO 824
824 FOR I=1 TO 10
825   PRINT I
826   GOTO 827
827 FOR I=1 TO 10
828   PRINT I
829   GOTO 830
830 FOR I=1 TO 10
831   PRINT I
832   GOTO 833
833 FOR I=1 TO 10
834   PRINT I
835   GOTO 836
836 FOR I=1 TO 10
837   PRINT I
838   GOTO 839
839 FOR I=1 TO 10
840   PRINT I
841   GOTO 842
842 FOR I=1 TO 10
843   PRINT I
844   GOTO 845
845 FOR I=1 TO 10
846   PRINT I
847   GOTO 848
848 FOR I=1 TO 10
849   PRINT I
850   GOTO 851
851 FOR I=1 TO 10
852   PRINT I
853   GOTO 854
854 FOR I=1 TO 10
855   PRINT I
856   GOTO 857
857 FOR I=1 TO 10
858   PRINT I
859   GOTO 860
860 FOR I=1 TO 10
861   PRINT I
862   GOTO 863
863 FOR I=1 TO 10
864   PRINT I
865   GOTO 866
866 FOR I=1 TO 10
867   PRINT I
868   GOTO 869
869 FOR I=1 TO 10
870   PRINT I
871   GOTO 872
872 FOR I=1 TO 10
873   PRINT I
874   GOTO 875
875 FOR I=1 TO 10
876   PRINT I
877   GOTO 878
878 FOR I=1 TO 10
879   PRINT I
880   GOTO 881
881 FOR I=1 TO 10
882   PRINT I
883   GOTO 884
884 FOR I=1 TO 10
885   PRINT I
886   GOTO 887
887 FOR I=1 TO 10
888   PRINT I
889   GOTO 890
890 FOR I=1 TO 10
891   PRINT I
892   GOTO 893
893 FOR I=1 TO 10
894   PRINT I
895   GOTO 896
896 FOR I=1 TO 10
897   PRINT I
898   GOTO 899
899 FOR I=1 TO 10
900   PRINT I
901   GOTO 902
902 FOR I=1 TO 10
903   PRINT I
904   GOTO 905
905 FOR I=1 TO 10
906   PRINT I
907   GOTO 908
908 FOR I=1 TO 10
909   PRINT I
910   GOTO 911
911 FOR I=1 TO 10
912   PRINT I
913   GOTO 914
914 FOR I=1 TO 10
915   PRINT I
916   GOTO 917
917 FOR I=1 TO 10
918   PRINT I
919   GOTO 920
920 FOR I=1 TO 10
921   PRINT I
922   GOTO 923
923 FOR I=1 TO 10
924   PRINT I
925   GOTO 926
926 FOR I=1 TO 10
927   PRINT I
928   GOTO 929
929 FOR I=1 TO 10
930   PRINT I
931   GOTO 932
932 FOR I=1 TO 10
933   PRINT I
934   GOTO 935
935 FOR I=1 TO 10
936   PRINT I
937   GOTO 938
938 FOR I=1 TO 10
939   PRINT I
940   GOTO 941
941 FOR I=1 TO 10
942   PRINT I
943   GOTO 944
944 FOR I=1 TO 10
945   PRINT I
946   GOTO 947
947 FOR I=1 TO 10
948   PRINT I
949   GOTO 950
950 FOR I=1 TO 10
951   PRINT I
952   GOTO 953
953 FOR I=1 TO 10
954   PRINT I
955   GOTO 956
956 FOR I=1 TO 10
957   PRINT I
958   GOTO 959
959 FOR I=1 TO 10
960   PRINT I
961   GOTO 962
962 FOR I=1 TO 10
963   PRINT I
964   GOTO 965
965 FOR I=1 TO 10
966   PRINT I
967   GOTO 968
968 FOR I=1 TO 10
969   PRINT I
970   GOTO 971
971 FOR I=1 TO 10
972   PRINT I
973   GOTO 974
974 FOR I=1 TO 10
975   PRINT I
976   GOTO 977
977 FOR I=1 TO 10
978   PRINT I
979   GOTO 980
980 FOR I=1 TO 10
981   PRINT I
982   GOTO 983
983 FOR I=1 TO 10
984   PRINT I
985   GOTO 986
986 FOR I=1 TO 10
987   PRINT I
988   GOTO 989
989 FOR I=1 TO 10
990   PRINT I
991   GOTO 992
992 FOR I=1 TO 10
993   PRINT I
994   GOTO 995
995 FOR I=1 TO 10
996   PRINT I
997   GOTO 998
998 FOR I=1 TO 10
999   PRINT I
1000   GOTO 1001
1001 FOR I=1 TO 10
1002   PRINT I
1003   GOTO 1004
1004 FOR I=1 TO 10
1005   PRINT I
1006   GOTO 1007
1007 FOR I=1 TO 10
1008   PRINT I
1009   GOTO 1010
1010 FOR I=1 TO 10
1011   PRINT I
1012   GOTO 1013
1013 FOR I=1 TO 10
1014   PRINT I
1015   GOTO 1016
1016 FOR I=1 TO 10
1017   PRINT I
1018   GOTO 1019
1019 FOR I=1 TO 10
1020   PRINT I
1021   GOTO 1022
1022 FOR I=1 TO 10
1023   PRINT I
1024   GOTO 1025
1025 FOR I=1 TO 10
1026   PRINT I
1027   GOTO 1028
1028 FOR I=1 TO 10
1029   PRINT I
1030   GOTO 1031
1031 FOR I=1 TO 10
1032   PRINT I
1033   GOTO 1034
1034 FOR I=1 TO 10
1035   PRINT I
1036   GOTO 1037
1037 FOR I=1 TO 10
1038   PRINT I
1039   GOTO 1040
1040 FOR I=1 TO 10
1041   PRINT I
1042   GOTO 1043
1043 FOR I=1 TO 10
1044   PRINT I
1045   GOTO 1046
1046 FOR I=1 TO 10
1047   PRINT I
1048   GOTO 1049
1049 FOR I=1 TO 10
1050   PRINT I
1051   GOTO 1052
1052 FOR I=1 TO 10
1053   PRINT I
1054   GOTO 1055
1055 FOR I=1 TO 10
1056   PRINT I
1057   GOTO 1058
1058 FOR I=1 TO 10
1059   PRINT I
1060   GOTO 1061
1061 FOR I=1 TO 10
1062   PRINT I
1063   GOTO 1064
1064 FOR I=1 TO 10
1065   PRINT I
1066   GOTO 1067
1067 FOR I=1 TO 10
1068   PRINT I
1069   GOTO 1070
1070 FOR I=1 TO 10
1071   PRINT I
1072   GOTO 1073
1073 FOR I=1 TO 10
1074   PRINT I
1075   GOTO 1076
1076 FOR I=1 TO 10
1077   PRINT I
1078   GOTO 1079
1079 FOR I=1 TO 10
1080   PRINT I
1081   GOTO 1082
1082 FOR I=1 TO 10
1083   PRINT I
1084   GOTO 1085
1085 FOR I=1 TO 10
1086   PRINT I
1087   GOTO 1088
1088 FOR I=1 TO 10
1089   PRINT I
1090   GOTO 1091
1091 FOR I=1 TO 10
1092   PRINT I
1093   GOTO 1094
1094 FOR I=1 TO 10
1095   PRINT I
1096   GOTO 1097
1097 FOR I=1 TO 10
1098   PRINT I
1099   GOTO 1100
1100 FOR I=1 TO 10
1101   PRINT I
1102   GOTO 1103
1103 FOR I=1 TO 10
1104   PRINT I
1105   GOTO 1106
1106 FOR I=1 TO 10
1107   PRINT I
1108   GOTO 1109
1109 FOR I=1 TO 10
1110   PRINT I
1111   GOTO 1112
1112 FOR I=1 TO 10
1113   PRINT I
1114   GOTO 1115
1115 FOR I=1 TO 10
1116   PRINT I
1117   GOTO 1118
1118 FOR I=1 TO 10
1119   PRINT I
1120   GOTO 1121
1121 FOR I=1 TO 10
1122   PRINT I
1123   GOTO 1124
1124 FOR I=1 TO 10
1125   PRINT I
1126   GOTO 1127
1127 FOR I=1 TO 10
1128   PRINT I
1129   GOTO 1130
1130 FOR I=1 TO 10
1131   PRINT I
1132   GOTO 1133
1133 FOR I=1 TO 10
1134   PRINT I
1135   GOTO 1136
1136 FOR I=1 TO 10
1137   PRINT I
1138   GOTO 1139
1139 FOR I=1 TO 10
1140   PRINT I
1141   GOTO 1142
1142 FOR I=1 TO 10
1143   PRINT I
1144   GOTO 1145
1145 FOR I=1 TO 10
1146   PRINT I
1147   GOTO 1148
1148 FOR I=1 TO 10
1149   PRINT I
1150   GOTO 1151
1151 FOR I=1 TO 10
1152   PRINT I
1153   GOTO 1154
1154 FOR I=1 TO 10
1155   PRINT I
1156   GOTO 1157
1157 FOR I=1 TO 10
1158   PRINT I
1159   GOTO 1160
1160 FOR I=1 TO 10
1161   PRINT I
1162   GOTO 1163
1163 FOR I=1 TO 10
1164   PRINT I
1165   GOTO 1166
1166 FOR I=1 TO 10
1167   PRINT I
1168   GOTO 1169
1169 FOR I=1 TO 10
1170   PRINT I
1171   GOTO 1172
1172 FOR I=1 TO 10
1173   PRINT I
1174   GOTO 1175
1175 FOR I=1 TO 10
1176   PRINT I
1177   GOTO 1178
1178 FOR I=1 TO 10
1179   PRINT I
1180   GOTO 1181
1181 FOR I=1 TO 10
1182   PRINT I
1183   GOTO 1184
1184 FOR I=1 TO 10
1185   PRINT I
1186   GOTO 1187
1187 FOR I=1 TO 10
1188   PRINT I
1189   GOTO 1190
1190 FOR I=1 TO 10
1191   PRINT I
1192   GOTO 1193
1193 FOR I=1 TO 10
1194   PRINT I
1195   GOTO 1196
1196 FOR I=1 TO 10
1197   PRINT I
1198   GOTO 1199
1199 FOR I=1 TO 10
1200   PRINT I
1201   GOTO 1202
1202 FOR I=1 TO 10
1203   PRINT I
1204   GOTO 1205
1205 FOR I=1 TO 10
1206   PRINT I
1207   GOTO 1208
1208 FOR I=1 TO 10
1209   PRINT I
1210   GOTO 1211
1211 FOR I=1 TO 10
1212   PRINT I
1213   GOTO 1214
1214 FOR I=1 TO 10
1215   PRINT I
1216   GOTO 1217
1217 FOR I=1 TO 10
1218   PRINT I
1219   GOTO 1220
1220 FOR I=1 TO 10
1221   PRINT I
1222   GOTO 1223
1223 FOR I=1 TO 10
1224   PRINT I
1225   GOTO 1226
1226 FOR I=1 TO 10
1227   PRINT I
1228   GOTO 1229
1229 FOR I=1 TO 10
1230   PRINT I
1231   GOTO 1232
1232 FOR I=1 TO 10
1233   PRINT I
1234   GOTO 1235
1235 FOR I=1 TO 10
1236   PRINT I
1237   GOTO 1238
1238 FOR I=1 TO 10
1239   PRINT I
1240   GOTO 1241
1241 FOR I=1 TO 10
1242   PRINT I
1243   GOTO 1244
1244 FOR I=1 TO 10
1245   PRINT I
1246   GOTO 1247
1247 FOR I=1 TO 10
1248   PRINT I
1249   GOTO 1250
1250 FOR I=1 TO 10
1251   PRINT I
1252   GOTO 1253
1253 FOR I=1 TO 10
1254   PRINT I
1255   GOTO 1256
1256 FOR I=1 TO 10
1257   PRINT I
1258   GOTO 1259
1259 FOR I=1 TO 10
1260   PRINT I
1261   GOTO 1262
1262 FOR I=1 TO 10
1263   PRINT I
1264   GOTO 1265
1265 FOR I=1 TO 10
1266   PRINT I
1267   GOTO 1268
1268 FOR I=1 TO 10
1269   PRINT I
1270   GOTO 1271
1271 FOR I=1 TO 10
1272   PRINT I
1273   GOTO 1274
1274 FOR I=1 TO 10
1275   PRINT I
1276   GOTO 1277
1277 FOR I=1 TO 10
1278   PRINT I
1279   GOTO 1280
1280 FOR I=1 TO 10
1281   PRINT I
1282   GOTO 1283
1283 FOR I=1 TO 10
1284   PRINT I
1285   GOTO 1286
1286 FOR I=1 TO 10
1287   PRINT I
1288   GOTO 1289
1289 FOR I=1 TO 10
1290   PRINT I
1291   GOTO 1292
1292 FOR I=1 TO 10
1293   PRINT I
1294   GOTO 1295
1295 FOR I=1 TO 10
1296   PRINT I
1297   GOTO 1298
1298 FOR I=1 TO 10
1299   PRINT I
1300   GOTO 1301
1301 FOR I=1 TO 10
1302   PRINT I
1303   GOTO 1304
1304 FOR I=1 TO 10
1305   PRINT I
1306   GOTO 1307
1307 FOR I=1 TO 10
1308   PRINT I
1309   GOTO 1310
1310 FOR I=1 TO 10
1311   PRINT I
1312   GOTO 1313
1313 FOR I=1 TO 10
1314   PRINT I
1315   GOTO 1316
1316 FOR I=1 TO 10
1317   PRINT I
1318   GOTO 1319
1319 FOR I=1 TO 10
1320   PRINT I
1321   GOTO 1322
1322 FOR I=1 TO 10
1323   PRINT I
1324   GOTO 1325
1325 FOR I=1 TO 10
1326   PRINT I
1327   GOTO 1328
1328 FOR I=1 TO 10
1329   PRINT I
1330   GOTO 1331
1331 FOR I=1 TO 10
1332   PRINT I
1333   GOTO 1334
1334 FOR I=1 TO 10
1335   PRINT I
1336   GOTO 1337
1337 FOR I=1 TO 10
1338   PRINT I
1339   GOTO 1340
1340 FOR I=1 TO 10
1341   PRINT I
1342   GOTO 1343
1343 FOR I=1 TO 10
1344   PRINT I
1345   GOTO 1346
1346 FOR I=1 TO 10
1347   PRINT I
1348   GOTO 1349
1349 FOR I=1 TO 10
1350   PRINT I
1351   GOTO 1352
1352 FOR I=1 TO 10
1353   PRINT I
1354   GOTO 1355
1355 FOR I=1 TO 10
1356   PRINT I
1357   GOTO 1358
1358 FOR I=1 TO 10
1359   PRINT I
1360   GOTO 1361
1361 FOR I=1 TO 10
1362   PRINT I
1363   GOTO 1364
1364 FOR I=1 TO 10
1365   PRINT I
1366   GOTO 1367
1367 FOR I=1 TO 10
1368   PRINT I
1369   GOTO 1370
1370 FOR I=1 TO 10
1371   PRINT I
1372   GOTO 1373
1373 FOR I=1 TO 10
1374   PRINT I
1375   GOTO 1376
1376 FOR I=1 TO 10
1377   PRINT I
1378   GOTO 1379
1379 FOR I=1 TO 10
1380   PRINT I
1381   GOTO 1382
1382 FOR I=1 TO 10
1383   PRINT I
1384   GOTO 1385
1385 FOR I=1 TO 10
1386   PRINT I
1387   GOTO 1388
1388 FOR I=1 TO 10
1389   PRINT I
1390   GOTO 1391
1391 FOR I=1 TO 10
1392   PRINT I
1393   GOTO 1394
1394 FOR I=1 TO 10
1395   PRINT I
1396   GOTO 1397
1397 FOR I=1 TO 10
1398   PRINT I
1399   GOTO 1400
1400 FOR I=1 TO 10
1401   PRINT I
1402   GOTO 1403
1403 FOR I=1 TO 10
1404   PRINT I
1405   GOTO 1406
1406 FOR I=1 TO 10
1407   PRINT I
1408   GOTO 1409
1409 FOR I=1 TO 10
1410   PRINT I
1411   GOTO 1412
1412 FOR I=1 TO 10
1413   PRINT I
1414   GOTO 1415
1415 FOR I=1 TO 10
1416   PRINT I
1417   GOTO 1418
1418 FOR I=1 TO 10
1419   PRINT I
1420   GOTO 1421
1421 FOR I=1 TO 10
1422   PRINT I
1423   GOTO 1424
1424 FOR I=1 TO 10
1425   PRINT I
1426   GOTO 1427
1427 FOR I=1 TO 10
1428   PRINT I
1429   GOTO 1430
1430 FOR I=1 TO 10
1431   PRINT I
1432  
```

ON DISK

PARLEZ-VOUS
ESPANOL, NEIN?



LANGUAGE TEACHER

by Cindy and Andrew Bartonillo

Learn the basics of a foreign language with the Language Teacher.

Using your TRS-80* with a single disk drive, you do the essential vocabulary study in a manner more satisfying and interesting than the traditional manner. You can currently choose among French, Italian, German or Spanish.

Each Language Teacher offers hundreds of word combinations, verb conjugations and phrases. You choose the topic of the drill and whether it is foreign language to English or vice versa (e.g., phrases: Spanish-to-English). There is an option of having multiple choice answers as well as being retested on missed items. The program gives a running percentage of correct answers.

Full printer capability and maximum use of **MEMORIES** further enhance the program. Teachers will appreciate being able to print a quiz and the ample documentation.

Acorn produces several foreign languages in the Language Teacher series. These include French, Italian, German and Spanish. Each is available at only \$19.95 for a TRS-80 with one disk drive and 32k of memory. Ask for these and other quality Acorn programs at your local computer store.

* TRS-80 is a trademark of Tandy/Coro.



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Software Products, Inc.

804 North Carolina Avenue, S.E., Washington, D.C. 20003

CIRCLE 103 ON READER SERVICE CARD

DYNACOMP

Quality software for: Apple II Plus
TRS-80 (Level II)
North Star

All software is supplied with complete documentation which includes clear explanations and examples. Each program will run with standard terminals (32 characters or wider) and within 128K program memory space. Except where noted, all software is available on North Star diskette (North Star BASIC) or Microsoft BASIC for those North Star systems running under CP/M. TRS-80 cassette (Level II) and Apple cassette (AppleSoft BASIC). These programs are also available on PAPER TAPE (Microsoft BASIC).

FLIGHT SIMULATOR

(as described in SIMULATOR, Volume I)

A realistic and accurate three-dimensional simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real aircraft. You can practice instrument approaches and navigation using initial and constant headings. The more advanced form can also perform loops, ball rolls and similar aerobically maneuvers.

Price: \$17.95 suggested

SIMULATOR, Volume II (RTS Publications)-\$4.00

VALDEZ

A simulation of superlateral navigation in the former British Island and Valdez Harbors. The program uses an accurate 24000ft sound radar map and employs physical models of ship response and tidal currents. Chart your own course through ship and sailing traffic. Any terminal terminal may be used for display.

Price: \$14.95 suggested

BRIDGE 2.0

An all-inclusive version of this most popular of card games. This program both **BITS** and **PLAYS** other content to duplicate bridge. Depending on the contract, your computer opponent will either play the offense or defense. If you feel too high the computer will double your contract. **BRIDGE 2.0** provides challenging entertainment for advanced players and is an excellent learning tool for the bridge novice.

Price: \$17.95 suggested

HEARTS 1.5

An exciting and participating computer version of this popular card game. Hearts is a trick-taking game in which the purpose is not to take any hearts or the queen of trumps. Play against two computer opponents who are armed with heuristic-based planning strategies.

Price: \$14.95 suggested

MAIL LIST 1

A heavy-duty mailing list program which sorts through your customer list by user-defined product code, customer name or Zip Code. Entries to the list can be conveniently added or deleted and the program format allows the use of standard two address labels. Each diskette can hold approximately 500 entries.

Price: \$18.95 suggested (available for North Star only)

TEXT EDITOR 1 (Letter Writer)

An easy-to-use, line-oriented text editor which provides virtually line editing and simple paragraph editing. This text editor is ideally suited for composing letters and is quite capable of handling much longer jobs.

Price: \$14.95 suggested

COMPRESS

Make your BASIC programs run faster and use less memory by saving them in a compressed format. This program compresses programs by 20% or more, while saving execution speed by a comparable amount. Save money by storing more programs on each diskette or cassette.

Price: \$6.95 suggested

GAMES PACK 1

Seven entertaining games for less than a dollar a diskette. Play CATANIST, CRAPS, DUTCH, MONOPOLY, SLOT MACHINE, BLACKJACK and LUNAR LUNDS. This is an excellent way to introduce your children to computers.

Price: \$12.95 suggested

All orders are processed within 48 hours. Please enclose payment with order. If paying by MASTERCARD or VISA, include all numbers not card. Foreign orders add 10% for shipping and handling.

Write for detailed descriptions of these and other programs available from DYNACOMP.



DYNACOMP

P.O. Box 162 Dept C

Webster, New York, 14580

New York State residents please add 7% NY sales tax.



CIRCLE 144 ON READER SERVICE CARD

[illegible][illegible]



Christopher Howerton

Is speed chess your game? Well, don't go out and buy a chess clock when you can use your computer to give you one.

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 allotting 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 rewritten, 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 -806 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.



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 330-620.

I hope you enjoy it.

```

310 REM
320 REM
330 REM
340 REM
350 REM
360 REM
370 REM
380 REM
390 REM
400 REM
410 REM
420 REM
430 REM
440 REM
450 REM
460 REM
470 REM
480 REM
490 REM
500 REM
510 REM
520 REM
530 REM
540 REM
550 REM
560 REM
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740 REM
750 REM
760 REM
770 REM
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790 REM
800 REM
810 REM
820 REM
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850 REM
860 REM
870 REM
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980 REM
990 REM

```

```

1000 REM
1010 REM
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1120 REM
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1180 REM
1190 REM
1200 REM
1210 REM
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1960 REM
1970 REM
1980 REM
1990 REM

```

```

2000 REM
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2020 REM
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2100 REM
2110 REM
2120 REM
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2150 REM
2160 REM
2170 REM
2180 REM
2190 REM
2200 REM
2210 REM
2220 REM
2230 REM
2240 REM
2250 REM
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2780 REM
2790 REM
2800 REM
2810 REM
2820 REM
2830 REM
2840 REM
2850 REM
2860 REM
2870 REM
2880 REM
2890 REM
2900 REM
2910 REM
2920 REM
2930 REM
2940 REM
2950 REM
2960 REM
2970 REM
2980 REM
2990 REM

```

Clock, cont'd.

```

530 REM
540 REM WAIT FOR BNA KEY TO BE HIT
550 REM
560 IF PEEK (+16384)/640 THEN
565   REM
570   POKE -16385-8
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,V40 AT Y
720   VLIN V,V40 AT V44
730   HLIN X,X44 AT Y
740   HLIN X,X44 AT V44
750   HLIN X,X44 AT V48
760 REM
770 REM NOW PRINT THE DIGIT AT THE
780 REM CORRECT POSITION WITH THE
790 REM CORRECT COLOUR
800 REM
810   COLOR=COLOR+1/PLAYER1
820   IF V40 OF V40 OF V40 OF V40 OF V40
830     OF V40 THEN HLIN X,X44 AT
840     Y
850   IF V40 OF V40 OF V40 OF V40 OF V40
860     OF V40 THEN VLIN V,V44 AT
870     X
880   IF V40 OF V40 OF V40 OF V40 OF V40
890     OF V40 THEN VLIN V44,V40 AT Y
900   IF V40 OF V40 OF V40 OF V40 OF V40
910     OF V40 THEN HLIN X44,X40 AT
920     Y
930 RETURN
940 REM
950 REM
960 REM INITIALISATION
970 REM MAKE A80E BLUE BACKGROUND
980 REM PUT IN THE COUNTING AND DATA
990 REM THE DIVIDING LINE
1000 REM
1010 REM
1020 REM
1030 REM
1040   PLOT 7,7: PLOT 7,8: PLOT 7,
1050     10: PLOT 7,11: PLOT 24,7: PLOT
1060     24,8: PLOT 24,10: PLOT 24,11
1070
1080   HLIN 8,38 AT 15
1090   COLOR=COLOR+2
1100   HLIN 8,38 AT 20
1110   PLOT 7,28: PLOT 7,29: PLOT
1120     7,30: PLOT 7,32: PLOT 24,28
1130     PLOT 24,29: PLOT 24,30: PLOT
1140     24,32
1150 REM
1160 REM

```

```

1110 REM MORE INITIALIZATION
1120 REM GET THE PLAYERS' NAMES AND
1130 REM THEIR RESPECTIVE GIVE TIMES
1140 REM
1150 REM
1160 FOR I=0 TO 9:GOTO 1141: NEXT
1170 FOR PLAYERS TO 1
1180 READ IN: READ: PRINT
1190 IF PLAYERS THEN INPUT "WHO'S PL
1200 IF PLAYERS THEN INPUT "WHO'S P
1210 IF PLAYERS THEN INPUT "WHO'S P
1220 IF PLAYERS THEN INPUT "WHO'S P
1230 IF PLAYERS THEN INPUT "WHO'S P
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1290 IF PLAYERS THEN INPUT "WHO'S P
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1950 IF PLAYERS THEN INPUT "WHO'S P
1960 IF PLAYERS THEN INPUT "WHO'S P
1970 IF PLAYERS THEN INPUT "WHO'S P
1980 IF PLAYERS THEN INPUT "WHO'S P
1990 IF PLAYERS THEN INPUT "WHO'S P
2000 IF PLAYERS THEN INPUT "WHO'S P

```

```

1760 REM 1
1760 LEAVE
1760 IF PUNYER'S THEN LEAVE
1760 PRINT LEFT: LEFT(1)):" LOSES BY
1760 TIME OF MOVE: RIGHT:" (MOVE-
1760 1)/2
1770 /END: PRINT "DO YOU WANT TO
1770 OR OTHER?":
1770 PRINT PRINT
1770 IF LEFT(1) THEN GO
1780 TEST: GOTO 1800
1790 VTR=3: PRINT "0000-BYE":
1790 MVR:" NO": VTR
1800 VTR=20: TR=3: PRINT "YOU ARE A
1800 MVR":
1800 END
1810 REM
1820 REM WE GET HERE ONLY IF A
1830 REM PUNYER'S DISPLAYED CLOCK IS
1840 REM TO BE SUBSTITUTED BY ONE
1850 REM SECOND
1860 REM
1870 REM
1880 REM
1890 REM
1900 REM
1910 REM
1920 REM
1930 REM
1940 REM THIS SUBROUTINE WORKS ITS
1950 REM A PUNYER'S CLOCK BY ONE
1960 REM SECOND
1970 REM
1980 REM
1990 REM FIRST: DETERMINE WHAT EACH
2000 REM OF THE PUNYER'S CLOCKS
2010 REM DIGITS SHOULD BE
2020 REM
2030 REM
2040 REM
2050 REM
2060 REM
2070 REM
2080 REM
2090 REM
2100 REM
2110 REM
2120 REM
2130 REM
2140 REM
2150 REM
2160 REM
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Sensational Software

Boomer Software

Graphics Games (CS-5001) Six exciting graphics games. Bombard an alien with protons and neutrons in *Nuclear Reaction*. Calculate the trajectory on your Pile Lab in this corridor game. LEM is a real time lunar landing game and *Dodgem* is a checker-type strategy game. Bonus: an intriguing graphics demonstrator. Bonus. (8K) \$7.95

Smart Alex (CS-6000) Are you a genius? Test your expertise in 7 categories: Science, Geography, History, Computers, T.V. and Movies, English, and Trivia. Over 200 questions in all. (8K) \$7.95

Five Sorcerer Adventures

Fantasy, mystery and sorcery for your personal computer. Machine language packages for only \$14.95: *Adventureland* (CS-6000), *Phaze Adventure* (CS-6004), *Mission Impossible Adventure* (CS-6005), *Voodoo Castle* (CS-6006) and *The Court* (CS-6007). All will run in 16K. Check our Adventure listings on Page 49 for details on Adventure for six popular systems.

Apple II

Apple II Software

Space Games (CS-4001) Three challenging galactic games. Get the TIE fighters in your blaster sights and zap them with your lasers in *Star Wars*. In *Rocket Pilot* you're in control of launching and landing your craft; an advanced real-time game. Repel the *Saucer Invasion* with your missiles (high resolution graphics) Bonus: Dynamic Bonus demonstration. (16K) \$7.95

Sports Games-1 (CS-4002) Take the field the Great American Computer Game: *Baseball*. Also featuring *Baseball* on tape. *Torpedo Alley*, and *Darts*. (16K) \$7.95
Strategy Games-1 (CS-4003) Blockade is the popular arcade game of skill and suspense. Defend your space vessel against UFO's. *Checkers* is a beginners game and *Genius* is for trivia experts — over 7 categories to choose from. (16K) \$7.95
Brain Games-1 (CS-4004) Bombard an alien with protons and electrons in *Nuclear Reaction*. *Parrot* and *Shilling Digits* challenge your ability to mimic sequences of letters, tones, and digits. Two opponents battle it out on a checker board in *Dodgem*. Bonus: two graphics demonstrations *Midpoints* and *Lines*. (16K) \$7.95
Haunted House (CS-4005) A nightmare simulation game. Search for the secret passages if you dare. Watch out! With sound effects. (16K) \$7.95
CAI Programs (CS-4201) Spelling helps you progress quickly. *U.S. Map* covers the 50 states and capitals. Two individualized math programs, *Math Drill* and *Add With Carry*, work with you on the basics. (16K) \$7.95

Know Yourself (CS-4301) Compare your life style and life expectancy. Investigate your attitudes and your sex role, your mental health to "the norm" and your physical response to alcohol. Four analytical programs. (16K) \$7.95

Super Invader (CS-4500) Features high resolution graphics and action 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 pencils melt 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-4505) 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) (48K) \$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 Invader (CS-4505) (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



For a FREE Sensational Software Catalog of over 400 programs for eight popular systems call 1-800-828-8888 ext. 8300.

Pet & CP/M

Awari

Pet Software

Graphics Games-1 (CS-1004) Five action packed graphics contents. Pursue your opponent through "Zap Boats" in Chase or attempt a prison break in Escape. Includes Sweep, Dart, and Snoopy. (BK) \$7.95

Graphics Games-2 (CS-1005) Bombers at atom with protons and electrons in Nuclear. LEM is a real time lunar lander game. Shoot it out in Artillery. Also features Dodgem and beginner's Checkers. (BK) \$7.95

Study Made Easy (CS-1200) These programs create study drills for any subject automatically. The package includes three sample drills and the program needed to create interactive easy-to-use study drills. (BK) \$14.95

Action Games (CS-1208) Battle it out with torpedoes, night charges, and parachutists in Bats, Tanks, and Spies. Breakout is the popular arcade game of ball and paddle. (BK) \$7.95

Sensational Simulations (CS-1201) Rule ancient Sumeria in Hammurabi or be a Far Trader. Make your fortune at the Stock Market or just have fun with Animal or Word. (BK) \$7.95

Conversational Games-2 (CS-1006) Test your wit in 8 unusual games. Compose poetry with Haiku. Eliza plays psychoanalyst. Hexleffer and Harika are intriguing strategy games. Hangman will keep you on your toes. (BK) \$7.95

Board Games (CS-1007) The classics: Yahtzee, Backgammon, and Blackjack. Trek-3 is a Star Trek spectacular. (BK) \$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 devils and other perils. If you wish you can even speak to the characters in French! (4BK) \$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 irresistible 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 pro-

gram 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 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.

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 SNTFC, 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

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10 "THIS IS PROGRAM #1, for the Youngsters
20 WAIT 10, 1 " WAIT UNTIL ANY INPUT IS DETECTED FROM TERMINAL
30 OUT 17, "ACK+STR:OUT 17, "B"CLEARS DATA SCREEN
40 PRINT "BACK+PRINT:PRINT:PRINT
50 FOR N=1 TO 20
60 PRINT "B"
70 NEXT
80 GOTO 10
90 "EXIT, OF COURSE, BY A CONTROL-C
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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 received 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 Trek*s, 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 "dungeon" is an archaic form of our "dungeon," and not some "to-klass 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 whose identity you've assumed. 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 (abyssal) 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 separate 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-equipped, 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 instructional manual ("Book of Lore") details the appearance and contents of each of the fifty-odd rooms on each of the four levels (11). 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 program 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 (compiling 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 30 (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 add-on 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 gamers 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:

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Other vendors mentioned in this review are:

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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, Doctor Pen-dragon, 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.

With thyme I consort,
With the yolk, in short,
I'm quite in my ease in dexterity;
Yet all divine use this,
And savants can't lose me,
For I am the center of gravity.



The Kitchen Sink

Crossing The Desert



he famous explorer, Weyland 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

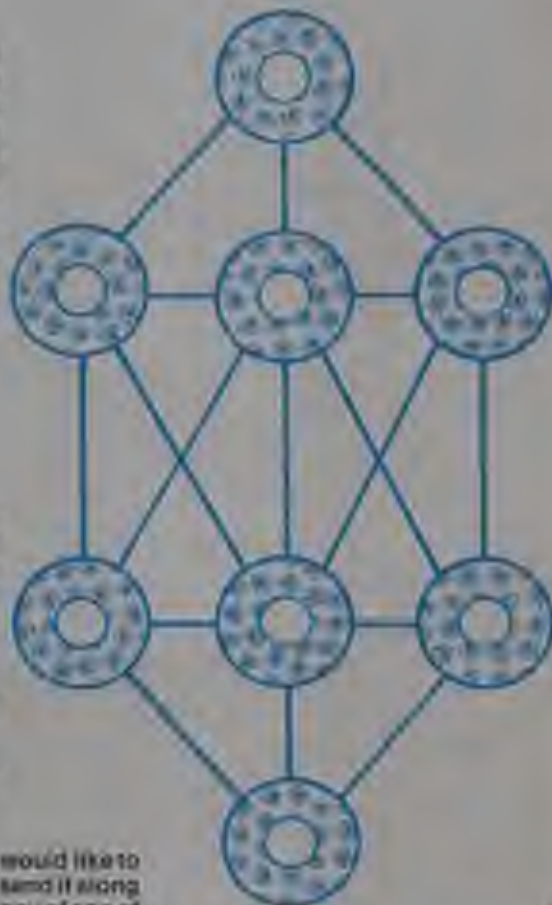
The following letter is said to have been sent to a gentleman in Great Britain. True to this kind of "Ripley" oddity the letter was promptly delivered to the addressee. Can you decipher the complete address?



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 NW10 6UP, 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

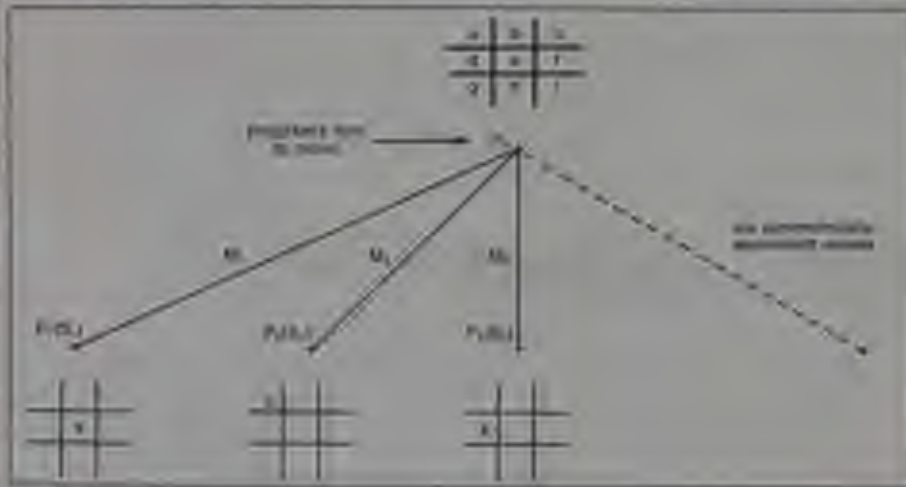
the number of nought's 2-rows by n_2 ,

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 "front" point of view would be

$$P_3 = R_3 + C_3 - R_1 + C_1$$

but this measure has one obvious drawback. It does not allow for the fact that the term C_3 is more important than R_3 , which is more important than C_1 , 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

$$E_3 = k_3 \cdot R_3 + k_2 \cdot R_2 + k_1 \cdot R_1 + k_2 \cdot C_2 + k_1 \cdot C_1 + k_3 \cdot O_3$$

where k_3 , k_2 , k_1 , k_2 , k_1 and k_3 are the numerical weightings. Since one C_3 is worth more than all the R_3 s 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 $k_3 = 63$. (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:

	0	
X		0
X		

$$\text{So } k_2 > 2 \times k_1 \text{ and } k_2 > 3 \times k_1$$

and we can try $k_2 = 31$, $k_1 = 15$ and $k_3 = 7$. 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

$$128 \times 0 + 63 \times 0 + 31 \times 0 + 15 \times 2 + 7 \times 0 = 70$$

to the three positions P_1 , P_2 and P_3 we find that in each case $C_2/R_2/C_2/R_2 = 0$, and therefore:

$$E_1 = 128 \times 0 + 63 \times 0 + 31 \times 0 + 15 \times 2 + 7 \times 0 = 70$$

$$E_2 = 128 \times 0 + 63 \times 0 + 31 \times 0 + 15 \times 0 + 7 \times 3 = 21$$

$$E_3 = 128 \times 0 + 63 \times 0 + 31 \times 0 + 15 \times 0 + 7 \times 3 = 21$$

and E_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 "look" more than the 1-ply search and on 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?

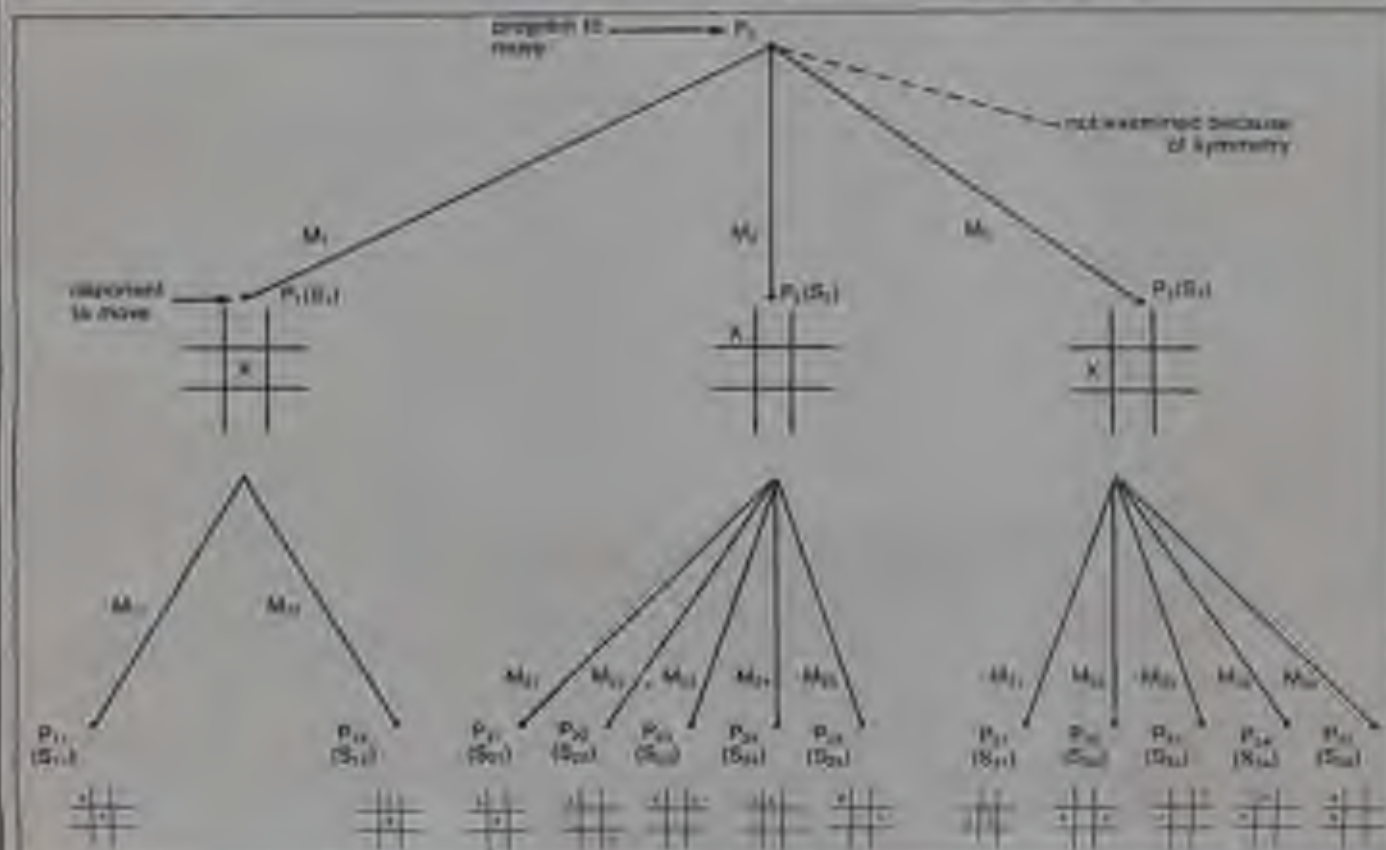


FIGURE 2

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_{11}), "nought" will have two different reply moves (m_{11} , m_{12} , m_{13} , m_{14} and m_{15}) leading to positions P_{21} , P_{22} , P_{23} , P_{24} and P_{25} . After "cross" plays move m_{11} , "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_{21} and P_{22} . In each case $c_1 = r_1 = c_2 = 0$. In position P_{21} , $c_1 = 3$ and $r_1 = 2$. In position P_{22} , $c_1 = 3$ and $r_1 = 1$.

We now have:

$$S_{21} = (-15 + 2) + (7 \times 3) = -9$$

$$S_{22} = (-15 + 1) + (7 \times 3) = 6$$

This information indicates that if the program is sitting in position P_{11} , with its opponent to move, its opponent may choose between moves m_{11} (leading to position P_{21} of value -9) and m_{12} (leading to position P_{22} 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_{11} , represented by S_{11} , is this backed-up score of -9.

If we apply the evaluation function to positions P_{23} ... P_{25} we will get:

$$S_{23} = (-15 \times 3) + (7 \times 2) = -31$$

$$S_{24} = (-15 \times 2) + (7 \times 2) = -16$$

$$S_{25} = (-15 \times 2) + (7 \times 2) = -16$$

$$S_{26} = (-15 \times 1) + (7 \times 2) = -1$$

$$S_{27} = (-15 \times 2) + (7 \times 3) = -9$$

Wishing to minimize the score when making its move from P_1 , the program's opponent would choose move m_{11} , leading to position P_{21} , and a score of -9.

Similarly, when applying the evaluation function to positions P_{24} ... P_{25} , we get:

$$S_{31} = -38$$

$$S_{32} = -6$$

$$S_{33} = -31$$

$$S_{34} = -16$$

$$S_{35} = -23$$

so the program's opponent, when making its move from P_2 , would choose move m_{11} 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 3-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_{21} , and assigns it the score S_{21} (-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_{11} . 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_{22} , compares this value (6) with the best score found so far at this level (-9) and finds the -9 preferable, so the scores S_{11} and S_{22} 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 S_{21} a score of -9, since this is the best that can be achieved so far. When looking at P_{22} , the program finds a score of -31, which is better for the program's opponent than -9 and so S_{21} 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_1 that has already been examined (P_{12}), 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_1 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_{21} . 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_{21} . Since S_{21} (-31) is less attractive for the program than the best score found so far (-9 at S_{11}), the score at P_1 is not backed-up. P_1 itself is discarded to make way for P_2 , 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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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.

```
1200 REM
1310 DEF FPP = 344000/1000
1320 REM *****
1330 REM
1340 POKE 2:170: POKE 3:40: POKE
4:100: POKE 5:100: POKE 6:200
: POKE 7:40: POKE 8:100: POKE
9:10: POKE 10:240
1350 POKE 11:8: POKE 12:200: POKE
13:200: POKE 14:240: POKE 15
:100: POKE 16:10: POKE 17:70
: POKE 18:20: POKE 19:80: POKE
20:80
1360 CALL (RND)*1748:127:1748:1
PRINT "RANDOM TONES"
1370 IF POKE 19:255:137:1 THEN
RETURN
1380 IF POKE 19:128:137:1 THEN
END
1390 GOTO 1370
1400 F = RND*(100+20)+20:100
:20
1410 POKE 9:F: POKE 1:50: CALL 2
1420 GOTO 1370
```

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.

```
0000- 50 50 50 LBA 80900
0001- 80 DEF
0002- 50 04 BNE 8090C
0003- 50 01 DEC 841
0004- 70 08 BEQ 80914
0005- 5A GOS
0006- 20 F8 BNE 80965
0007- 40 00 LDA 810
0008- 4C 02 00 JMP 80902
0009- 50 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 MEMORY = 768
1030 READ BYTE: IF BYTE = 255 GOTO
1100
1040 POKE MEMORY+BYTE
1050 LET MEMORY = MEMORY + 1
1060 GOTO 1030
1070 DATA 170,40,100,200,40,
108,1,240
1080 DATA 8,200,200,240,100,0,
70,0,3,88
1090 DATA 255
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 MEMORY as a variable. MEMORY would have looked like MEM OFF Y because OFF is a reserved word.) As long as no Byte value is greater than 255 (\$FF) then the program continues to loop at line 1030. 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 I
1040 POKE I:I
1050 NEXT I
1060 RETURN
1070 DATA 170,40,100,200,40,
108,1,240
1080 DATA 8,200,200,240,100,0,
70,0,3,88
```

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 (255) 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 ** PAPER & PINK **
1010 REM
1020 LET LOC = 769
1030 GET HR(32)
1040 LET HR = "ASDCDEFGH4EDJIT"
1050 GOSUB L300
1060 LET HR = "000000"
1070 GOSUB L100
1080 RETURN
1090 REM PINK HR = 000000 0000 00
1100
1110 FOR I = 1 TO LEN HR: STEP 2
1120 LET HI = ASC HR(I) - 48
1130 IF HI > 9 THEN HI = HI - 7
1140 LET HI2 = ASC HR(I+1) - 48
1150 IF HI2 > 9 THEN HI2 = HI2 - 7
1160 POKE LOC+HI + 16 + HI2
1170 LET LOC = LOC + 1
1180 NEXT I: RETURN
```

For Applesoft, the string HR does not have to be dimensioned as 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 HR: STEP 2
1110 LET HI = ASC HR(I) - 48
1120 IF HI > 9 THEN HI = HI - 7
1130 LET HI2 = ASC HR(I+1) - 48
1140 IF HI2 > 9 THEN HI2 = HI2 - 7
1150 POKE LOC+HI + 16 + HI2
1160 LET LOC = LOC + 1
1170 NEXT I: RETURN
```

In both examples, the beginning address called LOC is 5000. 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 POKE'd 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) HR 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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CIRCLE 134 ON READER SERVICE CARD

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CIRCLE 137 ON READER SERVICE CARD

```

1070 READ D4(1): IF D4(1) = "END
    GOTO 1080
1080 PRINT D4(1)
1090 C = C + 1
1100 IF C < 20 GOTO 1090
1110 VTA8 22: PRINT "PRESS RETURN
    TO CONTINUE" GET A4: IF A
    < 1 : CHR$(13) GOTO 1040
1120 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).

```

1130 X = PEEK(-16384): IF X <
    128 THEN 1180
1140 POKE(-16384),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 Typing

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 T$(140):G=0:GOTO 110
110 CALL "SND" GOTO 110
120 REM ** Text Timing **
130 REM
140 FOR D=1 TO 200: NEXT D
150 FOR I=1 TO LEN(T$)
160 PRINT T$(I);
170 IF T$(I) = " " THEN 180
180 SOUND=PEEK(161)-PEEK(161)
190 FOR D=1 TO 50: NEXT D
200 NEXT I
210 RETURN
220 REM ** Text Timing **
230 T$="The text start prints slow
    & returns"
240 PRINT
250 SOUND=120
260 VTA8 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 sub-routine 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 160 and 180 like this:

```

130 PRINT MID$(T$,I,1)
180 IF MID$(T$,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(-16387) < 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(-16384),0
420 WAIT -16384,128,0: POKE(-
    16384),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 list page. Sargon II by Dan and Kalne 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 6802 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 the 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 Bowyer

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:

- UPI and NY TIMES, BIZDEX and misc. data bases
- Text editor and formatter (80 columns)
- Inter-user messages (mail box)

- Public bulletin board.
- Chatting with other users.
- Disk storage @ \$503/2K/day.
- Applications programs (141).
- Languages: Ext. Basic, Fortran, Cobol, RPG-III, Pascal.

A variety of other features are planned. Users claim all sorts of benefits from financial advantages to camaraderie and friendship. For more information contact: Telecomputing Corporation of America, 1618 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:

C. Brandon Grisham, Jr.
National Coordinator
The Apple Cart
23 Van Buren Street
Dayton, OH 45402

STOCK MARKET ANALYSIS PROGRAM
DJI WEEKLY AVERAGE 1997-1998

BASIC ANALYSIS is a set of BASIC Programs which enables the user to perform analysis on the Dow Jones Indices: weekly average data. From 1 month to 8 years of your selected DJ data can be plotted on the screen. Screen is one of 5 colors using Apple II High Resolution capabilities. The DJ data can be transformed into different colored graphic representations called transforms. These are user specified moving averages, a work savings time in data manipulation. There is time, magnitude or percentage changes, and user defined relationships between the data, a transform, or a combination of - + * / operators. Custom lines can be drawn between graphic points. Arbitrary price values in their status of occurrence can be displayed in text on the screen. Any graphic text can be superimposed as a users printer. The first scale is automatically set in the range of the graphic and can be user changed. An arbitrary custom graphic is wanted can be plotted on the screen and plotted at any time. The user can enter numbers to locate on the CUD transform data or course can use your own data base. BASIC commands can be used with the reports of 1988 MAC. An auxiliary program allows the user to easily update the CUD file with current DJ weekly data.

[illegible]

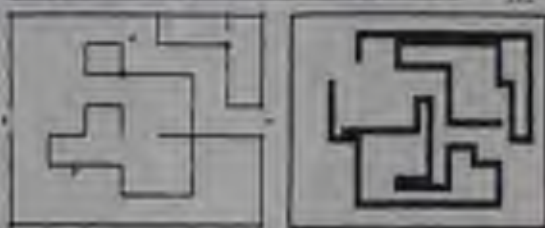
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¹ Software Review in Call of Duty II. © 2005. An example of an inverted pyramid of software engineering text at Apple's Mac OS X. Downloaded January 1, 2007.

CIRCLE 149 ON READER SERVICE CARD

Software for the Apple II



1000000 1000000

11288 • J. Neurosci., September 24, 2008 • 28(39):11282–11288

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Abstract—The purpose of this study was to determine the effect of a 10-week training program on the heart rate (HR) and energy expenditure (EE) of sedentary, middle-aged women. The subjects were randomly assigned to a control group (CON) and an exercise group (EX). The EX group performed a 10-week training program consisting of three sessions per week of aerobic exercise. The HR and EE were measured at baseline and at the end of the 10-week training program. The EX group showed a significant decrease in HR and a significant increase in EE compared to the CON group. The results of this study suggest that a 10-week training program can improve the cardiovascular fitness and energy expenditure of sedentary, middle-aged women.

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CIRCLE 181 ON READER SERVICE CARD

TRS-80 Strings

Stephen B. Gray



For this sixteenth go-round, 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. 161). 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 cord 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 fills 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, "Whenever 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 2500. PP=1 is returned from GOSUB 2500 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-II 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 multiple-statement lines.

Micro Matrix PhotoPoint

The \$19.95 PhotoPoint light 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 hold in the

record-interlock pin and at the same time press down the Record and Play buttons.

The pen has a hollow 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 invalid move, the computer will tell you so. When you touch any of the selection dots, they flicker in rotation as though a black dot were circulating among them. The selection dot turns to an X when you select a FROM—and also when you

select a TO —.

Many other applications may come to your mind, such as menu selection (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 precisely 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 else 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 left margin, and continuing with further words, so you can construct a new sentence from the old 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 really a cube) on the screen, it quickly moves elsewhere. 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 ** AS = THE CUBE **
120 AS = CHR$(191) + CHR$(191)
130 PRINT "PUT THE PEN ON THE
    CUBE"
140 REM ** RANDOM LOCATION **
150 R = RND(255) + 64
160 REM ** PRINT CUBE **
170 PRINT @R, AS;
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 160
270 REM ** KEEP LOOKING **
280 GOTO 160

```

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

```
260 GOTO 160
```

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 89, you can use PhotoPoint programs with the 3G pen, and vice versa.

Esmark's Vidiet-Stik

Slimmer, longer and more expensive than the other two light pens, the Vidiet-Stik at \$62.95 plus \$1.50 for p&h from Esmark Inc. (507 1/2 E. McKinley Hwy., Milwaukee, WI 43244) has both a built-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 Toussaint, President of Esmark, because "it never mistakes, 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 Vidiet-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 Vidiet-Stik against the glass until the switch clicks on, you need only push until the switch contacts meet, at which moment the square under the 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.

Vidiet 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 Vidiet-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 Vidiet-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 15843,S:
POKE 15844,B:POKE 15845,D:
POKE 15846,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@404,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, Kikcloud and Personal Computing Magazines

- | | |
|---|--|
| 1. Chess — written in Basic. Basic Machines | 7. Basketball — just like Basketball. Games article from January 1979 Personal Computing. |
| 2. Scrabble — makes your computer a Scrabble opponent. | 8. Horse Racing — expanded version of December and January 1980 Byte article. Graphics, horses run free to form, and performance maintained. Husbands win, place and show payoffs. |
| 3. Baseball — based on Major League results, keeps all statistics. Players perform due to the. Game in July 1979 Personal Computing and November 1979 Byte. | 9. Trainers — same as above but for Trainers. |
| 4. Bowling Secretary — keeps all necessary statistics. Seen in June 1979 Kikcloud. | 10. Penetration — a technique way to evaluate wages at the Truck or TTS. |
| 5. Taxes — all new tax laws. Long form, short form, Schedule A, B, C and Income Averaging. Seen in March 1979 Personal Computing. | 11. Games — 3D TAC TAC 708, as in April 1979 Kikcloud. Review in January 1979 Personal Computing and Football as in February 1979 Personal Computing. |
| 6. Accounting — double entry system produces Journal Entry Log, Balance Sheet and Income Statement. | 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 company (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 DJI 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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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 BBS 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 advertisement next to this column (just turn a page or two.)

Cursor (PO Box 550, Gilets, CA 95017, 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 column 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
```

```
5
```

Now try:

```
PRINT 12 OR 7
```

```
15
```

```
PRINT NOT 12 AND 7
```

```
3
```

```
PRINT NOT 12 OR 7
```

```
-3
```

Odd, isn't it? Let's start by looking at the Boolean fruits first.

Enter this small program to see how the PET determines if a number is TRUE or FALSE:

```
10 INPUT B
20 IF B THEN PRINT "TRUE": GOTO 40
30 PRINT "FALSE"
40 PRINT
50 GOTO 10
```

```
RUN
```

```
1 1
```

```
TRUE
```

```
2 0
```

```
FALSE
```

```
3 -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 or 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:

```
RUN
```

```
10 INPUT "X,Y", X,Y
20 PRINT "X>Y?" VALUE: X > Y
30 PRINT "X=" VALUE: X
40 PRINT "Y<X?" VALUE: Y < X
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, i.e., Y=X<0. Here are a few legal PET statements:

```
IF A>5 THEN PRINT "HELLO"
```

```
IF 2+4<5 THEN PRINT "HELLO"
```

```
Z=X<0
```

```
W=(A)>5+(B)>2+(C)<3
```

PET, cont'd...

When brewing these concoctions, the PET might get confused — and you will see a **?TYPE MISMATCH ERROR**. Use parentheses 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<0 THEN Y=2: GOTO 140
110 IF X>0 THEN Y=3: GOTO 140
120 Y=1
140 END
```

This can be replaced by:

```
100 Y=(X<0)*2+(X>0)*3
```

Take care to use parentheses 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 1s 0000 0000 0000 0000
1 1s 0000 0000 0000 0001
2 1s 0000 0000 0000 0010
3 1s 0000 0000 0000 0011
4 1s 0000 0000 0000 0100
5 1s 0000 0000 0000 0101
6 1s 0000 0000 0000 0110
7 1s 0000 0000 0000 0111
255 1s 0000 0000 1111 1111
256 1s 0000 0001 0000 0000
32767 1s 0111 1111 1111 1111
(written 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:

```
+255 1s 0000 0001 0000 0000
+5 1s 0000 0000 0011 1111
+2 1s 0000 0000 0000 1010
+1 1s 0000 0000 0000 0001
+0 1s 0000 0000 0000 0000
-1 1s 1000 0000 0000 0000
-2 1s 1000 0000 0000 0001
-3 1s 1000 0000 0000 0010
-255 1s 1000 0000 0111 1111
-256 1s 1000 0001 0000 0000
```

This method of making negative numbers has the odd property of two values for zero. Thus 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 1s 0000 0000 0000 0000
+ 1 1s 0000 0000 0000 0001
+ 2 1s 0000 0000 0000 0010
+ 3 1s 0000 0000 0000 0011
+ 4 1s 0000 0000 0000 0100
+ 5 1s 0000 0000 0000 0101
+ 6 1s 0000 0000 0000 0110
+ 7 1s 0000 0000 0000 0111
```

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 0000
-7 0000 0000 0000 1111
```

(Remember we add them!)
(The carry goes into 256 so is 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:

```
+255 1s 0000 0001 0000 0000
+5 1s 0000 0000 0011 1111
+2 1s 0000 0000 0000 1010
+1 1s 0000 0000 0000 0001
+0 1s 0000 0000 0000 0000
-1 1s 1111 1111 1111 1111
-2 1s 1111 1111 1111 1110
-3 1s 1111 1111 1111 1101
-255 1s 1111 1111 0000 0000
```

This is known as Two's Complement, and is the PET's method for doing integer arithmetic. Note that the Zero problem has vanished. One way to visualize Two's Complement is shown below. (Just for 4 bits this time)

```
+15 1s 0 1111
+14 1s 0 1110
+13 1s 0 1101
+12 1s 0 1100
+11 1s 0 1011
+10 1s 0 1010
+9 1s 0 1001
+8 1s 0 1000
+7 1s 1 1111
+6 1s 1 1110
+5 1s 1 1101
+4 1s 1 1100
+3 1s 1 1011
+2 1s 1 1010
+1 1s 1 1001
+0 1s 1 1000
```

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 same. If they don't, the result is zero.

OR: 1100 if either bit is one, the result is one. Both zero gives a zero.

NOT: 0011 Flip them — one is zero, zero is 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 (~12)
0000 0000 0000 0111 (7)
0000 0000 0000 0011 (~7)
0000 0000 0000 0011 (3)
```

```
NOT 12 OR 7:
1111 1111 1111 0011 (~12)
0000 0000 0000 0111 (7)
1111 1111 1111 0111 (~7)
```

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
1
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 could 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 Poop).

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-thresholds in the User Port serve the pen. Bit 0 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 last program ended up like this:

```

10 PRINT "1-9 10 11 12 13 14 15 16 17 18 19 20"
20 GOTO 3000
30 PRINT "You are the winner!" THEN (IF) "No"
40 FINE LP, APOKE LP, P
50 FOR J=1 TO 25 NEXT: GOTO 10

```

5000 MEM INIT PEN
 5010 PORE 39435.234
 5020 LP=59471
 5030 PORE LP,4 PORE 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 5000 are absolutely required — once the pen senses light, BH 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 FORJ=1 TO 6 with my pen, and I advise using FORJ=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 READ DATA, DATA READ
20 IS=51/121+32.12-18/12+25
30 NEW SETUP 30000
40 PRINT "11"
50 READ DATA
60 NEW DATA TRACK 17
70 READ DATA
80 END
90 IF FIXA(X)=1 THEN PONE OF, 27
100 IF PONE(120)=0 THEN PONE OF, 33
110 STOP 78
5200 NEW UNIT PIR
5310 PONE 32432, 124
5320 LP=19471
5330 LA=43-5/10+7
5340 CH=32783, CH=0, 37+3/100+32.120+160
5350 Z=32, CH=32, CH=33

```

```

1100 POKL LP,CAITKE LP,LP
1110 POKL=ITCK:WRT:NTURN
1200 REM CURSOR POSITIONING
1210 CH=PSIN(IP)-1#2
1220 POKL CP,PSIN(IP)
1230 IF POKL(LP)=L THEN P=T
1240 POKL CP,20
1250 FOR J=ITCK:WRT
1260 IF HEEK(LP)=L THEN P=T
1270 POKL CP,20
1280 RETURN
1300 REM WAIT FOR PEN
1310 P1=0
1320 WHILE SIZE IF P=0 THEN P1=P1+1
1330 IF P1<2 THEN GOTO
1340 GOTO RETURN
1400 REM CURSOR TRACKING
1410 CP=CP-CY:MOVUSIZE:IF=STHEWRTURN
1420 CP=CP-CY:MOVUSIZE:IF=STHEWRTURN
1430 CP=CP-CY:MOVUSIZE:IF=STHEWRTURN
1440 CP=CP-1:MOVUSIZE:IF=STHEWRTURN
1450 CP=CP:MOVUSIZE:IF=STHEWRTURN
1460 CP=CP+1:MOVUSIZE:IF=STHEWRTURN
1470 CP=CP+CY:MOVUSIZE:IF=STHEWRTURN
1480 CP=CP+CY:MOVUSIZE:IF=STHEWRTURN
1490 GOTO SIZE
1500 PRINT":): LIGHTPEN ERRORS
1510 PRINT"on 12 12 use the LIGHTPEN TO
1520 MAKE A
1530 PRINT"SIMPLE PICTURE.
1540 PRINT"on 12 12 WHEN YOU START, A CURSOR
1550 WILL
1560 PRINT"APPEAR IN THE MIDDLE OF THE SCREEN
1570 PRINT"THE LIGHTPEN ON THE CURSOR,
1580 PRINT"AND AS YOU MOVE THE PEN THE CURSOR
1590 PRINT"WILL FOLLOW THE PEN.
1600 PRINT"on 12 12 IF YOU MOVE THE PEN TOO
1610 FAST,
1620 PRINT"THE CURSOR WILL STOP FOLLOWING AND
1630 PRINT"YOU WILL HAVE TO PUT THE PEN BACK
1640 ON
1650 PRINT"THE CURSOR.
1660 PRINT"on 12 12 PRESS 'Y' TO END BUT
1670 PRINT"12 TO
1680 PRINT"ENTER DONE.
1690 PRINT"on 12 12 PRESS ANY KEY TO START
1700 GOTO START:IF=STHEWRTURN
1710 RETURN

```

See the instructions in lines 8020 — 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 "I" 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 60 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 POKE'd into place.

Routine 5000 mostly sets things up. The PORE in 5016 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 in subtracted to CP to



The comments and opinions of the author are given for educational purposes only and are not meant to be legal advice. Specific legal questions should be referred to your personal attorney.

Software Patents

Harold L. Novick

Patents for software? Don't be silly! Everyone 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[®] 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 sector 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 computer 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 boundary and not the Constitutional boundary. 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."

© 1983 Computer



"Somehow this just doesn't feel like paradise without a computer."

© 1983 Computer

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 1 and then presses the equals sign. The resulting product gives you a three-digit number to begin with.

Vince starts by entering the number 58 into the calculator and then pressing $\times$ ("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 snags 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:

$$472 - 7 = 465 - 5 = 460 - 6 = 450 - 5 = 445 - 5 = 440 + 4 = 444.$$

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.

Key, who has been quietly meditating, reaches over and executes the following series of operations:

$$472 \div 4 = 118 - 8 = 110 + 1 = 111.$$

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 Shlomo Thirumangalakudi and Harold B. Stalovitch. 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 34 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 DK. \$12.00

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Plot program — plot any function over any range on X-Y coordinates. Plot scattergram for any data.

Requires 4K. \$10.00

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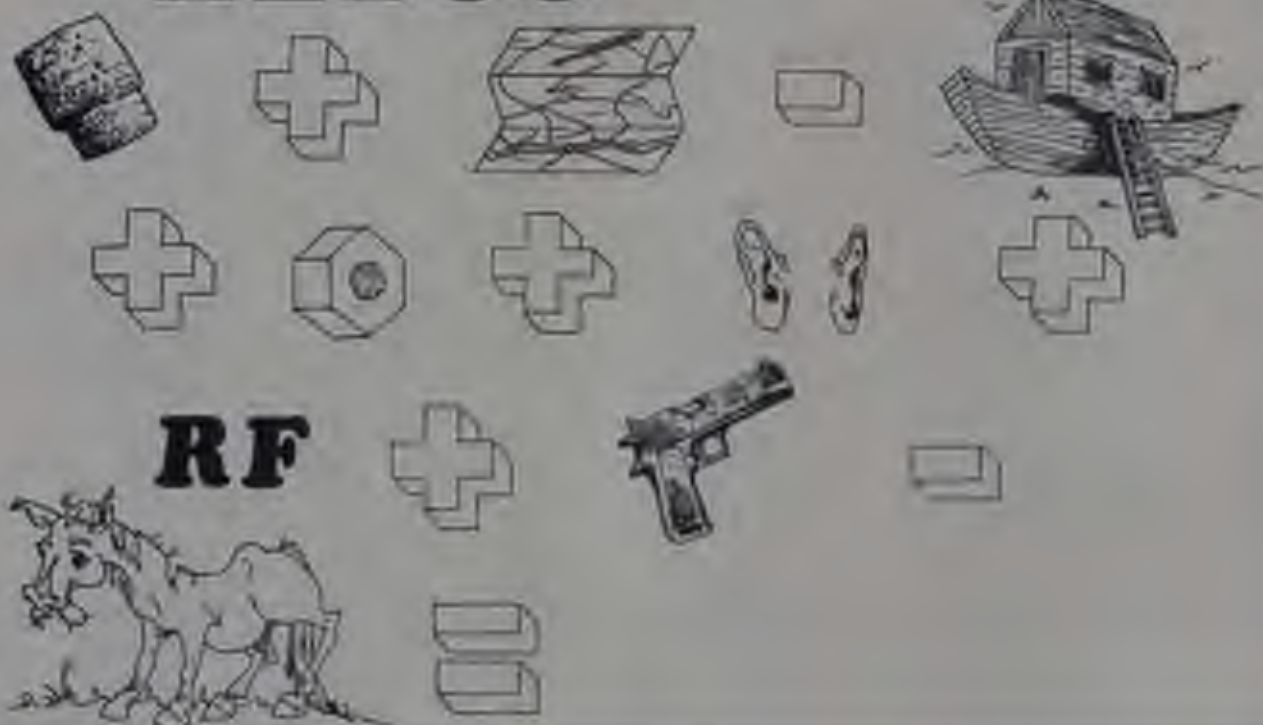
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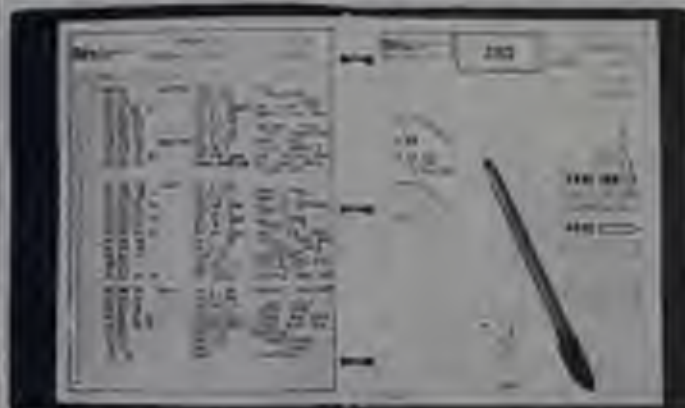


REBUS

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BITS PROGRAMMER PADS™



Good programming deserves good documentation. BITS Inc. has developed a programming form to help assembly language programmers write and preserve their programs in a loose-leaf notebook format. **BITS PROGRAMMER PADS™** are now available for the 8080A, Z-80, 1802, 6800, and 6302 microprocessors. On one side of the form the processor's register architecture is laid out along with continuous memory locations. This allows the details of your program's register use, stack manipulations, indexed addressing, and table and data storage to be permanently recorded. The other side is for your program or subroutine listing. Its source listing is entered in the instructions, labels and comments columns. Assembling is done next by filling in the object code column which is wide enough for two or three byte instructions. Memory locations are assigned in the address column. If revision or relocation of the program is necessary, the ad-

dress column can be renewed using typewriter correction tape (a white paper tape about 1/32" wide) and memory addresses re-assigned.

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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.

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Atlanta Computer Mart—5091 Buford Hwy., Atlanta 30340, (404) 455-0647. 10-6 Mon-Sat.

ILLINOIS

ComputerLand/Drexler's Grove—136 Ogden Ave., Downers Plaza 60515, (312) 964-7762. 10-6 Mon-Sat, 10-8 Tue, Thu.

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Science Fantasy Bookstore—38 Eliot St., Harvard Sq., Cambridge 02138, (617) 547-5917. 11-5 Mon-Sat, 11-8 Thu. Apple Games, Shuttle-Adventure Insider.

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Send contributions to "The Compleat Computer Catalogue," Creative Computing, P.O. Box 785-M, Morrisville, 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 to the various signal lines.

CMC Marketing Corp., 10611 Harwin Dr., Suite 608, Houston, TX 77036, (713) 966-4960.

CIRCLE 230 ON READER SERVICE CARD



Z-80 BASED SINGLE BOARD COMPUTER

The Model 8020 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 minifloppies (144K 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 8020 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 PTH computer features 80 ready-to-run Telemath programs, all of which are cross-referenced to 3 of the leading Math texts.

The system is a supplementary program for grades E-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 30 seconds. Once an activity is loaded into the computer it can run all day with no further teacher attention. \$2,000.

Psychotechnics, Inc., 1900 Pickwick Ave., Glenview, IL 60025, (312) 725-5850.

CIRCLE 232 ON READER SERVICE CARD

Z-80 BASED EDUCATIONAL SYSTEM

The Primarias 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 sound-track 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. \$1250.

Primarias, Inc., 4185-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 6800 processor, feature dual in-line motherboard design, and are expandable to 512K 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 \$295; the 69K is \$495 in kit form.

Southwest Technical Products Corporation, 219 N. Rhapsody, San Antonio, TX 78216.

CIRCLE 234 ON READER SERVICE CARD

Memory



32K STATIC MEMORY MODULE

A 32K static memory module, from Micro Control Company, features complete 8-100 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 \$995 for the 2 Mhz model and \$895 for the 4Mhz version.

Micro Control Company, 7066 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 96 characters. The internally contained paper roll is friction fed. \$999.

Printer Terminal Communications Corp., 124 Tenth St., Ramona, CA 92065, (714) 789-5300.

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 500 CPS 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 feeder. \$3900.

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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 \$50 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 Industries of America RS-232 standard.

It has a software selectable baud rate, number of data bits, parity and number of stop bits. \$225.

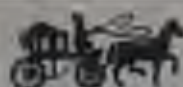
A quality 300-band acoustic modem has originate and answer modules, as well as a test capability. The modem is connected to the 99/4 through the RS-232 interface and a built-in cable. \$225.

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 3 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, Labock, Texas 79408.

CIRCLE 200 ON READER SERVICE CARD



REMOTE CONTROL FOR TRS-80, APPLE, \$100

MicroMini'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 BSH X-10 (SecurityHome 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; \$100 \$114.95.

The MicroMini Inc., 917 Midway, Woodmere, NY 11598. (516) 374-6750.

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CIRCLE 143 ON READER SERVICE CARD

TARBELL VDS-II Vertical Disk Subsystem

- 100% IBM compatible
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- 100% IBM compatible
- 100% IBM compatible
- 100% IBM compatible
- 100% IBM compatible
- 100% IBM compatible
- 100% IBM compatible



174 CIRCLE 206 ON READER SERVICE CARD CREATIVE COMPUTING



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, schematic charts and graphs at will, and store or change them as desired.

Fit-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 Ramada Blvd., Northridge, CA 91324 (213) 849-5580.

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, 18684 Oxnard St., Torrance, CA 91250.

CIRCLE 243 ON READER SERVICE CARD

PRODATA GROUP

ATARI 400	\$453.20
ATARI 800	\$846.00
PET	\$680.10
TI 99/4	\$952.20
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AS ON 1 DAY!

Practice Data Included!

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OPTION ANALYSIS SYSTEM

This system is unique for the market specialist. Working with price, volume, volatility, and calculated average daily premium, this system gives the user a full view of the market. Followed by the average of the market. For \$29.95 per month (no commission) plus weekly data base and technical information. 1984-85 LEAD, 2nd FEB 85

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Technical analysis, 20 step-by-step instructions, for the stock market specialist. This system gives the user the complete, the 100-100 price-volume data base and 27 step-by-step instructions. 1984-85 LEAD, 2nd FEB 85

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Provides the user with the most comprehensive financial analysis of your stock and bond portfolio. For \$29.95 per month (no commission) plus weekly data base and technical information. 1984-85 LEAD, 2nd FEB 85

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Provides the user with the most comprehensive financial analysis of your stock and bond portfolio. For \$29.95 per month (no commission) plus weekly data base and technical information. 1984-85 LEAD, 2nd FEB 85

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This program for 1984-85 provides the user with the most comprehensive financial analysis of your stock and bond portfolio. For \$29.95 per month (no commission) plus weekly data base and technical information. 1984-85 LEAD, 2nd FEB 85

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MARCH 1985

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FCC certified for direct
connection to phone lines via
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USR-310 Originate Acoustic Coupler



\$159

Penril 300/1200 Modem Originate/Auto-Answer

- D-300 or 1200 Baud
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CIRCLE 254 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) 825-8082.

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 1989.

Personal APL News, PO Box 1151-H4, Mil. Shasta, CA 96067.

CIRCLE 246 ON READER SERVICE CARD

Systems Software

LANGUAGES

A development package for the TRS-80 Model II from Raet Computers 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 Newline editor/assembler and disassembler, \$100. Raet Computers, 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 148K 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 X-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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Compatible with TRS-80, Apple, Pet or any other Centronics-type system

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CIRCLE 167 ON READER SERVICE CARD

CP/M ↔ IBM

Compatibility
with

REFORMATTER

For \$200 you can now transfer data between big and small systems.

REFORMATTER, a Diskon 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 94612. (415) 662-6055.

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 Ardena Blvd., Redondo Beach, Ca 90278. (213) 374-1673.

CIRCLE 250 ON READER SERVICE CARD

DATA BASE PACKAGES

The HS/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. HIR, 6480 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

Whatalet, 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 "what", 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. \$27.50. Island Cybernetics, PO Box 256, Port Aransas, TX 78373.

CIRCLE 254 ON READER SERVICE CARD

MISCELLANEOUS

The HS/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. HIR, 6480 Gila Ct., Plano, TX 75023.

CIRCLE 255 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 found on 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 Plus 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, 7094 San Remo Tr., Yucca Valley, CA 92284. (714) 365-9718.

CIRCLE 256 ON READER SERVICE CARD

The HS/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." \$20. J.D. HIR, 6480 Gila Ct., Plano, TX 75023.

CIRCLE 257 ON READER SERVICE CARD

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CIRCLE 258 ON READER SERVICE CARD

Computer Design Labs

Microcomputer Systems, Inc. is a leading manufacturer of software for the Apple II, TRS-80, and Commodore 64. Our software is designed to help you learn the basics of computer programming and to provide you with a variety of useful tools and utilities.

Let us help you learn the basics of computer programming. Our software is designed to help you learn the basics of computer programming and to provide you with a variety of useful tools and utilities.

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HOME MANAGEMENT

The H8/1800 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 interest 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. Tarento Associates, PO Box 9078, San Rafael, CA 94903. (415) 472-2670.

CIRCLE 252 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., 3300 Brittany Dr., #1000, St. Petersburg, FL 33716. (813) 864-4347.

CIRCLE 253 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 254 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.

Howards Software Services, 7722 Hollywood Ave., Dept. C, Los Angeles, CA 90045.

CIRCLE 255 ON READER SERVICE CARD

Racet Computers 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. \$60. Racet Computers, 702 Palmdale, Orange, CA 92666. (714) 687-5010.

CIRCLE 256 ON READER SERVICE CARD

CP/M 2.0 from 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, 2245 Broadway, New York, NY 10024. (212) 580-0002.

CIRCLE 257 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 data manipulations. \$99. Micro Architect, 90 Dothan St., Arlington, MA 02174.

CIRCLE 258 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, 2245 Broadway, New York, NY 10024. (212) 580-0002.

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CIRCLE 220 ON READER SERVICE CARD

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Computers, Books

Although this issue seems to suggest that — and sometimes really — all of present-day book publishers are always in need of hints on what kind of world will suitly surround them, it you could never imagine that of the book industry's own role of the world (the thought that all likely to come in the future by the turn of the century, which will also be a day, and what?)

One key change likely to occur over the next 20 years will be a transformation of the major trend — out of all trends. This means even more rapid change, including books, and information services, in media, a substantial shift from university production. Many will move to university production, and will produce books, such as in systems more rapid change. Although many more channels — and may see that kind of the future will be a new, it seems not only — in fact, we already do — in a new culture that combines it with information and role of data.

Instead of viewing a single image of reality, we get much more in latitude and even more complex image of reality, but all these have been the common trend for 20 years now, in addition. These things are completely unique. That's why computers — and the power of making them (especially) called the "Book of the Future."

Author of "Future Shock" is updating coming "The Third Wave" also.



Home Data System

General Telephone & Electronics has been named as manufacturer and marketer under the Byline name, the hardware for Master's computer-based information home entertainment and information processing system.

Thomas R. Shepard, senior vice president and general manager of GTE Entertainment Products, Boston, N.Y., said "GTE sees the system as a device beginning as an educational device and ultimately becoming a home computer."

The system, which connects to a television set, uses preprogrammed microchips and consists of a 16-bit microprocessor main computer with two hard-disk controllers.

The second component is the keyboard, which is expected to be introduced in 1982.

Control Data is test-marketing its Plato educational terminal system in 100 Minnesota homes at a reduced lease price to determine the potential of the residential market.

CDC has been operating the Plato program at a trial deficit of \$24 million since the firm took it over from a government-funded program six years ago. There are about 1,000 terminal-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 its terminal by home residents to sell it

Plato in Home Test

they "use the terminal in a meaningful way," it should be sold. Minneapolis, Plato has been long known that home users usually play computer games, with the largest difficulty, then move on to more sophisticated educational programs. Educational software ranges from the elementary school to the college level professional level.

CDC is leasing the Plato program and software to residents of 100 Minnesota homes for \$100 a month. Users must also receive themselves by changing it into a telephone company provided system in which the user must pay an installation fee and a \$2-per-month

lease fee. The user pays for the program software but for the hardware fee to the other Plato computer system. CDC's standard monthly lease price is \$1,750 for a 128K terminal for its most customers, or for going customers, and even more expensive and in any other.

CDC plans to give a total of 10 additional Plato terminals in homes in two other states, possibly next year, to assess marketing and usage. The use will have a new reference in part through the financial link to the American computer market. Such a move would help to help the market, CDC said.



Computers Help the Environment Too!

Engineers had to satisfy the equations, which led to a new, in the results. Some models are expensive and they take a long time to run. Now the computer program is to use very realistic models with ease.

The model may help solve a problem in Arizona, where the U.S. Army Corps of Engineers is designing parts of Mohave Bay to keep it open for shipping. Computer models may show where to build a dam to help the shipping operations without endangering wildlife habitat. The computer model was

originally designed for NASA to help model future growth of the bay.

A study of lifting in a bay in Texas has been an ongoing project since 1970. CDC every year and a new. That's what it costs to design the channel for an incoming river from Mexico. Professor Farmer hopes to find a way to help the lifting without creating other environmental problems.

The Tennessee Valley Authority uses Professor Farmer's approach to determine optimum methods. Some an environmental statement is prepared that would show how water plants, fish, and even the mouth to produce thermal effects in sewage treatment that are caused by the operation of turbine power generation.

Computer Answers Queries About Books

A computerized system for recommending which to read is now available to help you decide on books to read. Thousands of books were of course no longer in print.

All to read some books and how the computer answered. Will you get it, get it early and early as you.

The 101-101-101 (101-101-101) is from Information Dialogue, Inc. of Minneapolis. It contains information on books, authors, and publishers. It also contains information on books, authors, and publishers. It also contains information on books, authors, and publishers.

The key to the computer is its search. When you enter a word, the computer searches for books that contain that word. It also searches for books that contain that word. It also searches for books that contain that word.

Some computers have been used in department stores. Each store is able to program its own recommendations. It also searches for books that contain that word. It also searches for books that contain that word.

Shakespeare & Chaucer Meet the Computer

All most universities, computer scientists and English scholars are about as competitive as of knowledge. However, at the University of Colorado at Denver, Michael Freuden is dependent upon computer science for the development of concordances.

A concordance is an alphabetical index of the principal words and their contexts in a book or the work of an author. Produced manually, a Shakespeare concordance took eighteen years. And a Chaucer concordance began in the 1800s was completed in 1927. Researchers used by computers can now handle masses of information faster and with incredible accuracy.

"There isn't much time saved in



service section last winter, the choice 'homeland' was not 'homeland' either. When the 'homeland' was not the screen was loaded, the computer responded with 'You've got to be kidding'.

A customer list was a message on the screen, typically 'Hello, I'm here to help. Teach me and begin. After being taught, 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 search process.



the word-punching or proofreading phase," says Freuden, "but you only have to do it once. From then on, retrieval is automatic and allows double checking."

In addition to alphabetical concordances, computer science offers the capability of placing an author within the context of other authors. In this sense, Freuden predicts, "Students won't have to be satisfied with their own knowledge from textbooks. No one really knows or is related to an author. We now have a humanly knowledge of determining facts."

Freuden directs the Center for Computer Research at CU and hopes that it will become a regional model for computer education in the humanities. Adapting the work of authors in the humanities to computers isn't too easy, Freuden says, and still offers major problems.

Meet Arok

The handsome fellow is AROK, a 640K-2, 275-point (288) built by Ben Spink of Polix 1983. AROK 1983 is the garbage, with the dog, which is not, and brings in the year. A built-in computer is programmed for 10,000 tasks and AROK, who is an approved by the police, is not a computer. The result is a woman I think I'm going to find from a woman. Says Spink.



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To order, send payment plus \$1.00 shipping or bankcard number to Creative Computing Software, P.O. Box 780-M, Morristown, NJ 07960. Or call toll-free 800/831-8112 (in NJ 201/540-0445).



Reviews

Stephen B. Gray



Payroll With Cost Accounting — CBASIC, by Lou 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 8080/286 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, so, 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 miles 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 Geheilmachreiber machines; The History of the JOHNNIAC, by Fred Greenberger; an 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 computerist, 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 629 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 *Infocystems* 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.

Microsoft Basic, by Ken Knecht. Delithium 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 8800B 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 not 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, alphanumeric, 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. 357 pages, hardcover \$24.95. Second edition. 1978.

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 551 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 \$9.95. 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 (Buz-won!, 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 (Hurdle, 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, Horseshoe, Roulette, etc.), Card and Board (Aces, Ducey, Checkers, Gomoku, 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 RUNs 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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Computer Coin Games, by Joe Weisbecker, Creative Computing Press, Morristown, N.J. 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 rules are laid down in 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, N.J., and designed RCA's 1802 microprocessor, as well as the VIP and RLP 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. 185 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 TIMES (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 EOP.

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 Dillithium'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 \$3.50, 1978.

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 new 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 in a nonconformist 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 Levy

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Leo's Electronic Lesson

Wendy Adams



Dear Sir:

My background in computers is that of being a "Computer Widow." I have helped build, punch, poke, prod a computer system into the semblance of working order. In other words, we can now play Wumpus on it.

For two and a half years I have read computer magazines, listened to endless descriptions of different electrical capacities, soldered boards, picked through computer-electronic surplus stores, tried to decipher conversations that hardly use a regular English word, punched in programs with the nerve-racking help of my personal backseat driver and tolerated computer language to slip into our everyday lives: "Let's interface with the Wilson's tonight" or "I'm not tracking our conversation." (Does "MOV over to your own side of the bed" count?)

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 1, 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 deferred" 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 graphics, simulations, computer assisted instruction, probability, functions, magic squares and programming styles.

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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 book 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 Weissbauer 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. Enlivened by outrageous cartoons, teachers, students and self-learners of all ages will enjoy this 96 page softbound book. [10R] \$3.35.



Problems for Computer Solution

Stephen J. Ruzewski

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The Impact of Computers on Society and Ethics: A Bibliography

Gary M. Abelson

REFERENCE

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 1000 alphabetical entries of books, magazine articles, news items, scholarly papers and other works dealing with the impact of computers on society and ethics. Covers 1946 through 1979. 128 pp hardbound, \$17.95. [12E].

GRADES 3 TO 8

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GRADES 4 TO 8



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Marion J. Ball & Sylvia Chapp

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This is a blockbuster of a book containing the majority of material from the first 12 issues of Byte magazine. The 148 pages devoted to hardware are crammed full of how-to articles on everything from TV displays to joysticks to cassette interfaces and computer kits. But hardware without software might as well be a boat anchor, so there are 125 pages of software and applications ranging from on-line debuggers to games to a complete small business accounting system. A section on theory examines the how and why behind the circuits and programs, and "opinion" looks at where this explosive new hobby is heading. 386 pp softbound. \$11.95 [6F]

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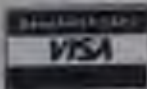
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Puzzle Answers.

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, 2 1/2 tires per wheel on 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:



DOTS 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 ENG-LAND.)

Rebus Answer (page 188)
COMPUTERS R FUN

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- ☐ A. No system at present
- ☐ B. Trs-80
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