Telecommunications: How To Use A MODEM

COMPUTE!

$2.50
April, 1982
Issue 23
Vol. 4, No. 4
63379

The Journal For Progressive Computing™

The World Inside The Computer
A New Learning Column For Parents And Children

Intelligent Input Subroutines For Atari, PET And Apple

Shooting Stars
A Game For Apple, PET/CBM, Atari or OSI Computers

Using the VIC-20 Paddles: Two Games

Disk Checkout Programs For PET/CBM Disk Drives

Atari Mailing List Programs

Reviews: PET EPROM Programmer, VIXEL #1 For VIC Atari Microsoft BASIC Part II.

This is all you really need!

An Apple II®, a printer, a video screen, a modem, a disk drive, CPS Multifunction, and RAMPLUS+.

The CPS Multifunction card and cables are all you need to connect almost any printer, modem, or terminal to your Apple II®. It's really three cards in one. It provides the capabilities of a serial interface, parallel output interface, and real-time clock/calendar. It saves you money, power, and slots. The CPS Multifunction is compatible with DOS, CPM, PASCAL, and BASIC. Suggested retail price $239, including software. Cables $24.95 each.

The RAMPLUS+ card allows you to expand the available memory of your Apple II® to 80K. RAMPLUS+ has two 16K banks of RAM. The card is supplied with 16K of installed RAM, with an additional 16K of plug-in RAM available. It is compatible with DOS, CPM, PASCAL, and BASIC, also. Suggested retail price $189. Additional 16K RAM $24.95.

Mountain™ Computer
INCORPORATED
300 El Pueblo, Scotts Valley, CA 95066
TWX: 910 598-4504 (408)438-6650

The modem is a product of Hayes Microcomputer Products, Inc.
The video screen is a product of NEC.
The printer is a product of Epson America.
The Apple II® is a product of Apple Computer, Inc.
The disk drive is a product of Apple Computer, Inc.

IF YOU'RE WAITING FOR THE PRICE OF WORD PROCESSORS TO FALL WITHIN REASON,

Everyone expected it would happen sooner or later... with WordPro PLUS™ it already has! Now all the marvelous benefits of expensive and advanced word processing systems are available on Commodore computers, America's largest selling computer line. WordPro PLUS, when combined with the new 80 column CBM 8032, creates a word processing system comparable to virtually any other top quality word processor available—but at savings of thousands of dollars!

New, low cost computer technology is now available at a fraction of what you would expect to pay. This technology allowed Commodore to introduce the new and revolutionary CBM 8032 Computer.

WordPro PLUS turns this new CBM 8032 Computer into a sophisticated, time saving word processing tool. With WordPro PLUS, documents are displayed on the computer's screen. Editing and last minute revisions are simple and easy. No more lengthy re-typing sessions. Letters and documents are easily re-called from memory storage for editing or printing with final drafts printed perfectly at over five hundred words per minute!

Our nationwide team of professional dealers will show you how your office will benefit by using WordPro PLUS. At a price far less than you realize.

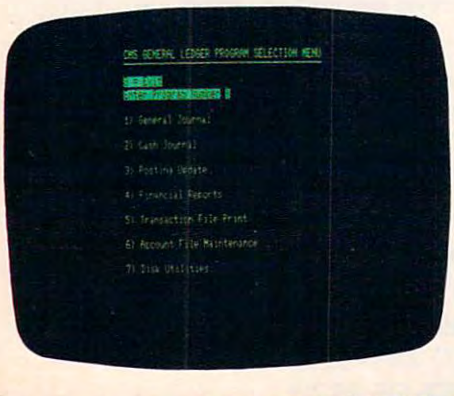
Invest in your office's future...
Invest in WordPro PLUS...
Call us today for the name of the WordPro PLUS dealer nearest you.

Professional Software Inc.
166 Crescent Road
Needham, MA 02194
(617) 444-5224
TELEX: 95 1579

CMS Softwa
General Accou

For the Commodore 8000

Now there is an interactive General Accounting System designed especially for the first time user. The user is led through each function by highlighted prompts explaining the required input at each point. And all input requests are prompted with complete verification. Plus, a step-by-step instruction manual guides the user through the program. The user prompts and the detailed manual make it virtually impossible for the first time user to get lost or to accidentally crash.

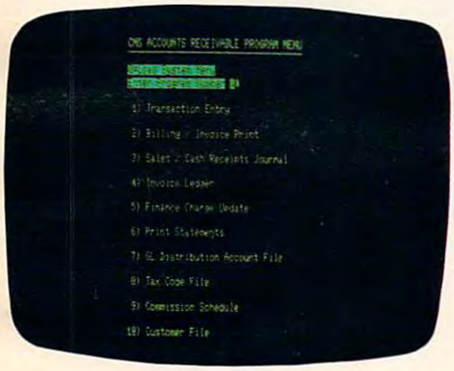


General Ledger

Cash Disbursements and Cash Receipts Journal as well as a General Journal. Maintains account balances for Present Month, Quarter to Date and Year to Date. Accepts postings from Accounts Receivable, Accounts Payable, Payroll and other programs. Also provides user customized financial statements. Up to 1000 accounts and up to 99 departments.

re Systems
nting System II

Series Computer System

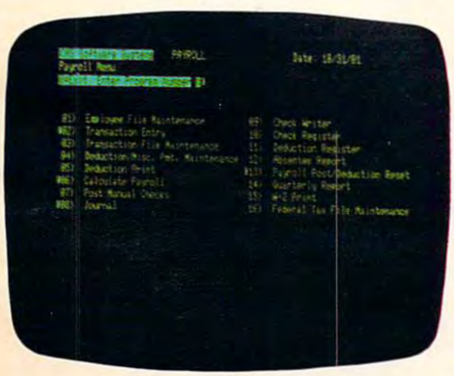


Accounts Receivable

Invoices and Monthly Statements as well as Credit and Debit Memos. Accomodates full or partial payments. User sets finance charge rate and period. User also sets invoice aging reports and aging breaks. Invoices may be distributed among nine different General Ledger accounts with automatic updating to the General Ledger. During invoice data entry the invoice is displayed on the screen and typed exactly as if in a typewriter. File capacity allows 1800 customers and invoices. Five hundred customers allows room for 1300 invoices.

Accounts Payable

Accounts Payable checks with full voucher detail. Detailed check register. Automatic application of Credit Memos. User sets invoice aging reports and aging breaks. Invoices may be distributed among nine different General Ledger accounts with automatic updating to the General Ledger. File capacity allows 2500 vendors and invoices.



Payroll

Payroll checks with full deductions and pay detail. Pays regular, overtime, holiday and piece work hours. Accommodates Weekly, Bi-Weekly, Semi-Monthly and Monthly employees. Up to eight miscellaneous deductions or payments per employee. Prints Payroll Journal, Payroll Check Register and an Absentee Report as well as 941 information and W2 forms. Maintains Monthly, Quarterly and Yearly totals for up to 350 employees. Automatic General Ledger updating.

See your nearest Commodore dealer for a demonstration.

CMS Software Systems

2204 Camp David   Mesquite, TX. 75149   214 285-3581

Turn your Apple into the world's most versatile personal computer.

The SoftCard™ Solution. SoftCard turns your Apple into two computers. A Z-80 and a 6502. By adding a Z-80 microprocessor and CP/M to your Apple, SoftCard turns your Apple into a CP/M based machine. That means you can access the single largest body of microcomputer software in existence. Two computers in one. And, the advantages of both.

Plug and go. The SoftCard system starts with a Z-80 based circuit card. Just plug it into any slot (except 0) of your Apple. No modifications required. SoftCard supports most of your Apple peripherals, and, in 6502-mode, your Apple is still your Apple.

CP/M for your Apple. You get CP/M on disk with the SoftCard package. It's a powerful and simple-to-use operating system. It supports more software than any other microcomputer operating system. And that's the key to the versatility of the SoftCard/Apple.

BASIC included. A powerful tool, BASIC-80 is included in the SoftCard package. Running under CP/M, ANSI Standard BASIC-80 is the most powerful microcomputer BASIC available. It includes extensive disk I/O statements, error trapping, integer variables, 16-digit precision, extensive EDIT commands and string functions, high and low-res Apple graphics, PRINT USING, CHAIN and COMMON, plus many additional commands. And, it's a BASIC you can compile with Microsoft's BASIC Compiler.

More languages. With SoftCard and CP/M, you can add Microsoft's ANSI Standard COBOL, and FORTRAN, or Basic Compiler and Assembly Language Development System. All, more powerful tools for your Apple.

Seeing is believing. See the SoftCard in operation at your Microsoft or Apple dealer. We think you'll agree that the SoftCard turns your Apple into the world's most versatile personal computer.

Complete information? It's at your dealer's now. Or, we'll send it to you and include a dealer list. Write us. Call us.

SoftCard is a trademark of Microsoft. Apple II and Apple II Plus are registered trademarks of Apple Computer. Z-80 is a registered trademark of Zilog, Inc. CP/M is a registered trademark of Digital Research, Inc.

MICROSOFT
CONSUMER PRODUCTS

A Division of Microsoft Inc.
10700 Northup Way • Bellevue, WA 98004

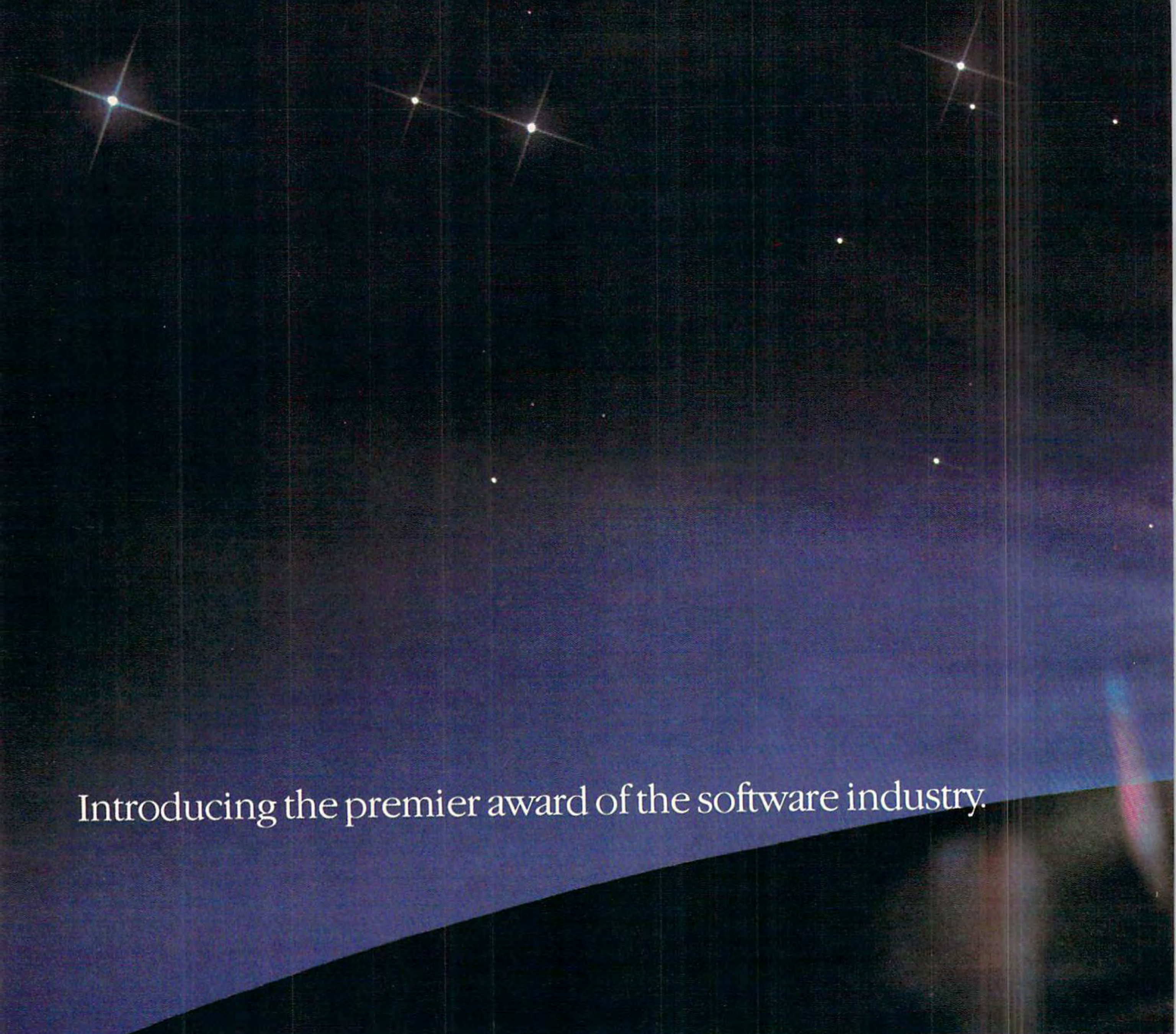
Table of Contents

April, 1982 Vol. 4, No. 4

Article	Author, Page	Guide To Articles And Programs: Computer Specific	Multiple Computers
Features			
Moving Averages	Jerry W. O'Dell, 26		*
Track Down Those Memory Bugs	Leo J. Scanlon, 34		*
Shooting Stars	Frank Cohen, 50		*
Education and Recreation			
Grading Exams On A Microcomputer	Kenneth J. Freese, 70		*
Using The VIC-20 Game Paddles	David Malmberg, 84	V	
Ultracube: Supercube Revisited	David N. Benson, 92	AT	
Using The PET/CBM In The High School Physics Lab	Peter Spencer, 100	P	
Columns and Departments			
The Editor's Notes	Robert Lock, 8		*
Ask The Readers	Robert Lock, Richard Mansfield, and Readers, 12		*
Computers And Society	David Thornburg, 18		*
The Beginner's Page: Making Decisions	Richard Mansfield, 22		*
COMPUTE! Program Listing Conventions	25		*
The World Inside The Computer	Fred D'Ignazio, 62		*
Friends Of The Turtle	David Thornburg, 76		*
Learning With Computers	Glenn Kleiman and Mary Humphrey, 80		*
Micros With The Handicapped	Susan Semancik and Marshall Curtis, 98	P	
Machine Language: Jump To It!	Jim Butterfield, 122		*
Telecommunications: How To Use A Modem	Michael Day, 130		*
Insight: Atari	Bill Wilkinson, 162	AT	
The Journal			
Intelligent Input Subroutines For PET/CBM, Apple, And Atari	R. M. Smythe, 108		*
PET/CBM ASCII To ASCII Conversion	Brian Niessen, 126	P	
Customizing Apple's Copy Program	Roger B. Chaffee, 132	AP	
The Bug In The Universal Wedge	Keith Peterson, 135	P	
Improving The Toolkit's TRACE Function	Robert Lenoil, 135	P	
Atari Mailing List Program	Gary J. Patton, 136	AT	
Browsing The VIC Chip	Jim Butterfield, 142	V	
Using Textplot For Animated Games	David Plotkin, 146	AT	
Accurate Timing In Atari BASIC	John Navas II, 153	AT	
Extending MAE: Apple And PET/CBM	Harold Lindner, 155	AP,P	
Disk Checkout For 2040, 4040, And 8050 Disks	Jim Butterfield, 156	P	
A High Resolution Digital-To-Analog Converter For PET/CBM	G. Eric Matthews and Pamela L. Carter, 174	P	
Renumber VIC-20 BASIC Lines The Easy Way	Charles H. Gould, 177	V	
Reviews			
Atari Microsoft BASIC: Part II	Jerry White, 178	AT	
The "Branding Iron": PET/CBM EPROM Programmer	David A. Hook, 179	P	
VIXEL #1 For VIC-20	Eric Giguere, 181	V	
CAPUTE!: Corrections And Amplifications	**182**		
New Products	**183**		
Advertisers Index	**208**		

AP = Apple, **AT** = Atari, **P** = PET/CBM, **V** = VIC-20, **O** = OSI, **C** = Radio Shack Color Computer, * = All or several of the above.

COMPUTE! The Journal for Progressive Computing (USPS: 537250) is published 12 times each year by Small System Services, Inc., P.O. Box 5406, Greensboro, NC 27403 USA. Phone: (919) 275-9809. Editorial Offices are located at 625 Fulton Street, Greensboro, NC 27403. Domestic Subscriptions: 12 issues, $20.00. Send subscription orders or change of address (P.O. form 3579) to Circulation Dept., **COMPUTE!** Magazine, 515 Abbott Drive, Broomall, PA 19008. Controlled circulation postage paid at Greensboro, NC 27403 and additional mailing offices. ISSN 0194-357X.



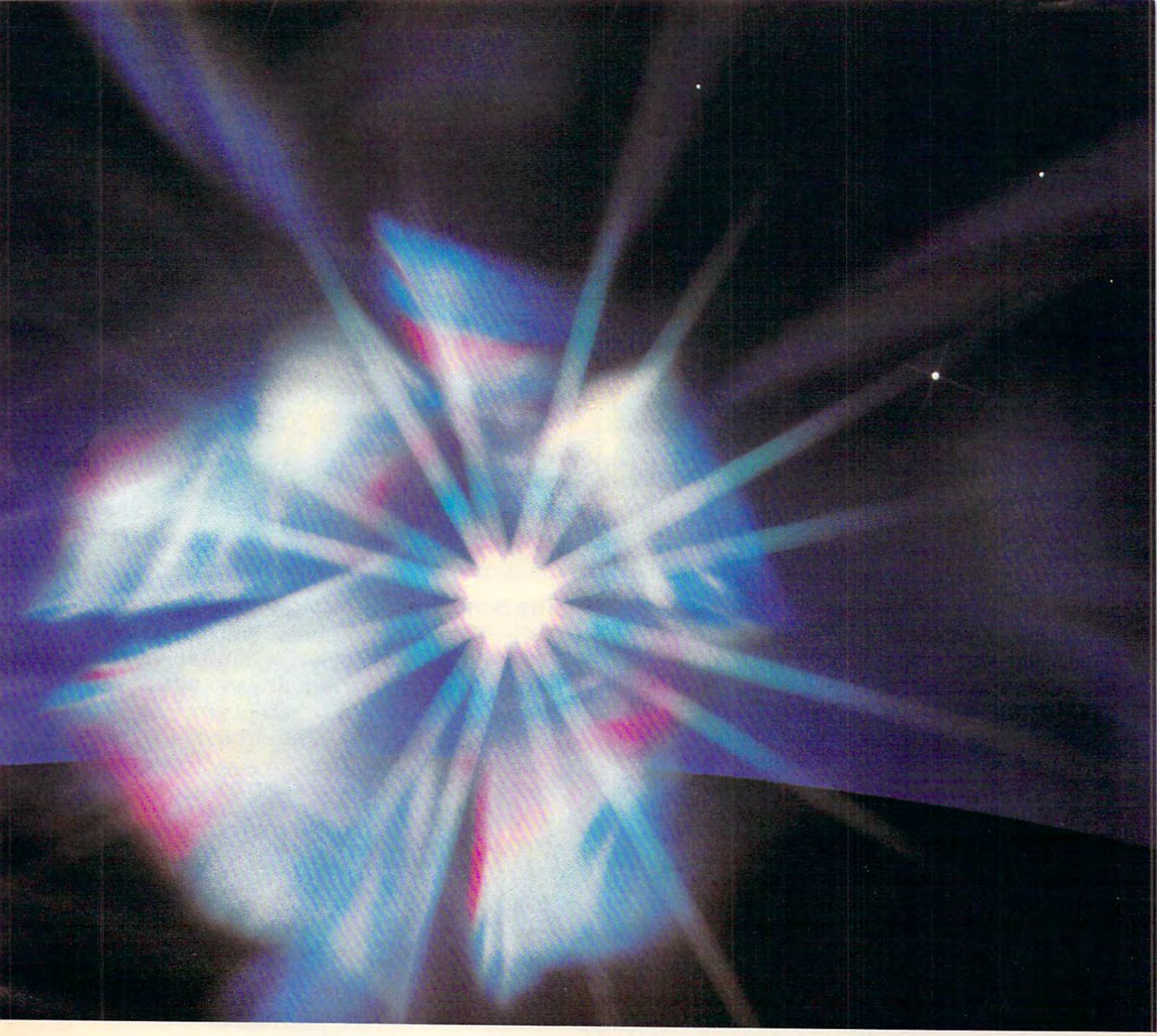
THE ATARI® STAR

Win $25,000 in cash, plus prizes and an ATARI STAR by entering your software in the ATARI® ASAP competition.

ATARI is looking for some of the greatest software from the brightest stars in the software field. And naturally, we're willing to reward you for it.

Every three months, ATARI will be presenting ATARI STARS to the writers of software programs judged first, second and third place in the following categories: consumer (including entertainment, personal interest and development); education; home business (personal finance and record keeping); and system software. The decision of the ATARI judges is final.

Quarterly prizes will be from $750 to $3,000 worth* of selected



ATARI products and an ATARI STAR. The annual Grand Prize will be the coveted Super Star trophy and \$25,000 in cash.**

To be eligible, your software idea must be submitted to and published in the ATARI Program Exchange catalog. Submit your program on the official entry form which we'll rush to you if you send in the attached coupon.

The ATARI STAR Awards are in addition to the percentage of revenues you will automatically be entitled to as a result of sales of your software programs in the ATARI Program Exchange.

If you're a star, ATARI wants to reward you. Send in the coupon today, or call toll-free 800-538-1862, in California 800-672-1850, and you could be the proud winner of an ATARI ASAP STAR Trophy, and some great ATARI prizes.

*Based on manufacturer's suggested retail price.

**Taxes are the sole responsibility of the winner. Void where prohibited by law. Winners will be notified by mail. ATARI employees and their families are not eligible. For more contest details, call the toll-free numbers.

For more contest details, call 800-538-1862, in California 800-672-1850.

Send to: ATARI Software Acquisition Program, Dept. C4E, P.O. Box 427, Sunnyvale, CA 94086

Yes, I want to enter the ATARI ASAP competition. Please rush me my entry form.

Name________

Address________

City________

State/Zip________

ATARI

A Warner Communications Company

We've Brought The Computer Age Home™

The Editor's notes...

Robert C. Lock
Publisher/Editor

"High" End Competition Heats Up

The Apple III and Commodore SuperPet markets continue to see increasing competitive entries. First Xerox, then IBM, and now Hewlett Packard, who last week announced a new system, the HP-XX, designed to compete for the entry level business, scientific, and upper end personal market. Apple, Inc., as we've heard frequently of late, immediately said they weren't worried. IBM promptly announced a sophisticated industrial robot (at slightly under $30,000), a new robot programming language, and guess what? The computer that sits at the heart of these robotic activities is none other than the IBM personal computer. It can control several of the robots at once, and the new language is well developed. ("Grasp" is one of its commands, for example.)

One thing's for sure. Our industry predictions of 200-300% growth this year can't be hurt at all by the increasing exposure and "big media" coverage. The world of megabusiness is finally starting to admit that there really is a future in personal computers. Witness the newsstands the second week in February... the personal computer industry was the cover feature on four different magazines. Time, Newsweek, Forbes, and Business Week all carried feature articles on our "emerging" industry.

Atari, Inc. Rumored To Be Developing The "Ultimate" In Software Protection

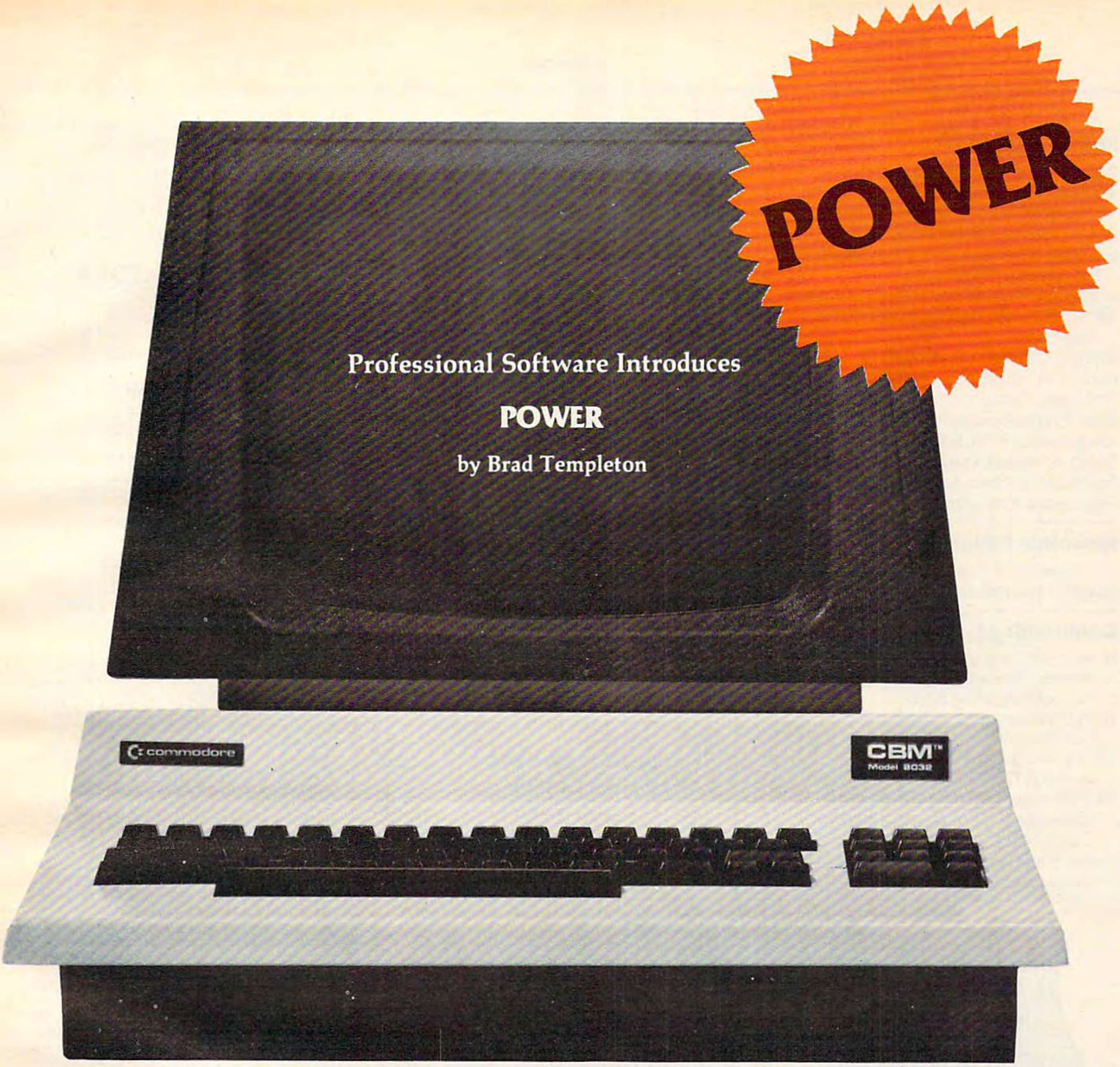
We hear that Atari will be investing significant research and development towards funds establishing a true protection method for their software. Suggested possibilities include a CPU-dependent encryption process. We'll be interested in seeing their progress, and will keep you posted. How big is the problem of software copying? In a recently published interview, Dan Fylstra of VisiCorp (formerly Personal Software) estimated that for every copy of Visicalc sold, two were pirated. That's a substantial impact on any company's sales.

The World Inside The Computer

We're happy to welcome Fred D'Ignazio to **COMPUTE!** as a regular columnist. Fred's brand new column begins with this issue. If you're excited about the use of computers in the home, and especially if you're interested in the use of computers with and by children, read the column. You'll be intrigued.

COMPUTE!'s New Format

Your first Editor's Feedback Cards, commenting on the new format, are starting to arrive. Please keep them coming. We do use your input and suggestions in our planning of the growth and scope of the magazine. We've already refined the format a good deal more to help you identify articles of particular interest to certain machine owners. You'll see more evidence of this in this issue, and (hopefully) complete success by May. Beyond that, we're much more able to identify articles of general interest. Our staff now takes quite a few major articles each issue and generates programs for the various computers. We're certain this helps broaden the utility of the magazine to programmers and users of all machines. ©



ADD POWER™ TO YOUR COMMODORE COMPUTER

$89.95

POWER produces a dramatic improvement in the ease of editing BASIC on Commodore's computers. POWER is a programmer's utility package (in a 4K ROM) that contains a series of new commands and utilities which are added to the Screen Editor and the BASIC Interpreter. Designed for the CBM BASIC user, POWER contains special editing, programming, and software debugging tools not found in any other microcomputer BASIC. POWER is easy to use and is sold complete with a full operator's manual written by Jim Butterfield.

POWER's special keyboard 'instant action' features and additional commands make up for, and go beyond the limitations of CBM BASIC. The added features include auto line numbering, tracing, single stepping through programs, line renumbering, and definition of keys as BASIC keywords. POWER even includes new "stick-on" keycap labels. The cursor movement keys are enhanced by the addition of auto-repeat and text searching functions are added to help ease program modification. Cursor UP and cursor DOWN produce **previous** and next lines of source code. COMPLETE BASIC program listings in memory can be displayed on the screen and scrolled in either direction. POWER is a must for every serious CBM user.

Call us today, for the name of the Professional Software dealer nearest you.

Professional Software Inc.
166 Crescent Road
Needham, MA 02194
Tel: (617) 444-5224 Telex #951579

TM POWER is a Registered Trademark of Professional Software, Inc.

Subscription Information

COMPUTE! Circulation Dept.
515 Abbott Drive
Broomall, PA 19008 USA

TOLL FREE
Subscription Order Line
800-345-8112
In PA 800-662-2444

COMPUTE! Subscription Rates

(12 Issue Year):

US	(one yr.)	$20
	(two yrs.)	$36
	(three yrs.)	$54
Canada and Foreign Surface Mail		$25
Air		
Europe, US Possessions		$38
Middle East, Central America and North Africa		$48
South America, South Africa, Far East and Australia		$88

Small System Services, Inc. publishes:

COMPUTE!
The Journal For Progressive Computing

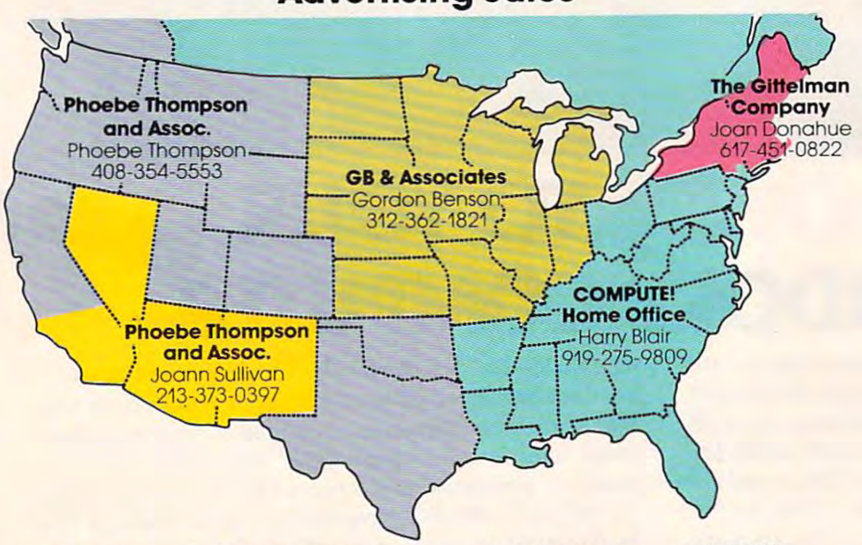
COMPUTE! Books

Corporate office:
625 Fulton Street,
Greensboro, NC 27403 USA

Mailing address: COMPUTE!
Post Office Box 5406
Greensboro, NC 27403 USA

Telephone: 919-275-9809

Advertising Sales



Phoebe Thompson and Associates
101 Church Street, Suite 13
Los Gatos, CA 95030
PHOEBE THOMPSON

Phoebe Thompson and Associates
P.O. Box 7000-462
Redondo Beach, CA 90277
JOANN SULLIVAN

GB & Associates
P.O. Box 335
Libertyville, IL 60048
GORDON BENSON

COMPUTE! Home Office
625 Fulton Street
Greensboro, NC 27403
HARRY BLAIR

The Gittelman Company
Statler Office Building
Suite 518
20 Providence Street
Boston, MA 02116
JOAN DONAHUE

In British Columbia, Canada call 408-354-5553.

Elsewhere in Canada or outside North America call 919-275-9809.

In Alaska or Hawaii call 408-354-5553.

Address all advertising materials to:
Alice S. Wolfe
Advertising Production Coordinator
COMPUTE! Magazine
625 Fulton Street
Greensboro, NC 27403 USA

Coming In The May Issue Of COMPUTE!

Managing Technostress

Getting Your Atari Disk Drive Up To Speed

Recovering From NEW On Apple And CBM

Putting The Squeeze On Your VIC: Getting The Most Out Of 5000 Bytes

Screen Input For PET/CBM

Modifying Apple's Floating Point BASIC

Ask The Readers

Robert Lock, Richard Mansfield, And Readers

Please address any questions or answers to: Ask The Readers, **COMPUTE!** *Magazine, P.O. Box 5406, Greensboro, NC 27403.*

Answers

"The Commodore PET has screen editing capabilities that are easy to use, due to the cursor and INST/DEL keys. The screen editor allows editing on the screen, with insert, delete, and type-over. The problem is BASIC, which doesn't like text without line numbers and PRINT" or REM preceeding the text. But there's an easy way around that. As long as RETURN is not pressed, BASIC doesn't know what you've done. There are, therefore, two solutions: at the end of a line, RIGHT CURSOR (CRSR = ›) to the beginning of the next line. Alternatively, shift-RETURN moves to the beginning of the next line without "entering" the line in BASIC.

Aha! We now have a 40 column by 24 line word processor, except there is no way to copy it. No? Yes! There's a program (published in **COMPUTE!**) [November/December, 1980, #7] *called Keyprint. You press a certain key (backslash) and – zzap! – the contents of the screen are printed out. Great! Read your printout, HOME, go back, and re-edit. The last problem is – how can you save it for later use or editing? We need a clever program (Keysave) which will save screen memory to cassette, or transfer screen memory to the start of BASIC and then save it. The program can reside in memory, since we're only using screen memory.*

Anyone out there want to try a Keysave? Such a capability would make possible an introduction to word processing, and use of the computer for writing, for many elementary schools where a very simple word processor could be used easily by students." Glenn Fisher

---

"This is in response to a question ["Ask The Readers," **COMPUTE!**, February, 1982, #21] *asked by Mr. Michael A. Ivins concerning the saving of screen data to cassette* [on the Atari]. *The following program can be used as a subroutine to do just that.*

```
  0 POKE 82,0:GR. 0
 10 OPEN #3,12,0,"E:":OPEN #5,4,0,"K:"
 15 ? "Do you want to Make or Retrieve a picture?":
    GET #5,A: IF A=ASC("R") THEN 200
 20 ?"Use the keyboard to draw": ?"Hit RETURN to
    save to cassette"
 30 GET#3,A:IF A=155 THEN 100
 40 GOTO 30
 99 REM SAVE TO TAPE
100 POKE 752,1 :? CHR$(126);:OPEN #4,8,0,"C:":
    REM "D:FILESPEC" FOR DISK
110 FOR Y=0 TO 23
120 FOR X=0 TO 39
130 LOC. X,Y,Z
140 PUT #4,Z
150 NEXT X
160 NEXT Y
170 CLOSE #3:CLOSE #4:CLOSE #5
180 END
199 REM LOAD A PICTURE FROM CASSETTE
200 ?"(ESC CTRL CLR)";:OPEN #4,4,0,"C:":REM
    "D:" FOR DISK AGAIN
205 OPEN #6,8,0,"S:"
210 FOR I=1 TO 960
220 GET#4,A:PUT #6,A
230 NEXT I
240 CLOSE #4:CLOSE#3:CLOSE#2:CLOSE#5:
    CLOSE#6
250 GOTO 250
```

The cassette version takes only 50 seconds and the disk version is probably much faster.

Also, for all of you who have the assembler/editor cartridge there is a command to save source programs to cassette. It is LIST#C‹, to save and LOAD#C to retrieve. Just ignore the inevitable ERROR -4 that you get when loading."

"Please advise Mr. Robert Fersch [who asked about customized computer furniture in this column, **COMPUTE!**, January, 1982, #20] *that I am a manufacturer's representative and handle three lines of computer furniture. One, solid wood; another, combines wood and formica; the third, metal and formica.*

The prices are quite low, anywhere from $150 to $500, depending on material, size, storage areas.

Just drop a rough sketch showing dimensions and mention the type of material wanted and I'll send you a quote. (Wood most expensive, metal/formica, least.) Delivery is usually four weeks, all wood is six to eight weeks." Warren Modell
P.O. Box 11
East Station
Yonkers, NY 10704

"I would like to make a couple of small contributions. The first is in the form of an amendment to [The Atari version of] *the maze-generating program of Charles Bond that appeared in the December, 1981, issue (No. 19). The maze generator works perfectly as printed, but the added program to move a "mouse" through the maze apparently contained a bug as well as a mouse. I have found that a single line of code will fix it:*


NASIR
GEBELLI
PRESENTS:
PATHFINDER
PATHFINDER
Never before released, a super arcade-adventure game for Atari . . . alone in a vast transparent maze inhabited by radioactive monsters and nuclear waste, you must blast the waste and free the maze of mutant monsters. By Solitaire Group, requires 24K Atari with disk drive.
MATCH
RACER
MATCH RACER
Brand new for the Atari, this one or two player game tests your driving skills on a race track filled with treacherous obstacles. See how far you can get before your luck and skill run out! By Solitaire Group, requires 16K Atari with disk drive.
ANDROMEDA
ANDROMEDA
Introducing a spectacular, original arcade-adventure for the Atari . . . a battle in inner space . . . you must invade a living organism and destroy its tissues before its antibodies destroy you. By Solitaire Group, requires 16K Atari with disk drive.
HOLLYWOOD
SOFTWARE INC
GEBELLI
Gebelli Software Inc.,
1771 Tribute Rd., Suite A, Sacramento, CA 95815
©1981 Gebelli Software, Inc. Atari is a registered trademark of Atari, Inc.

```
1025 IF PEEK(A)=84 THEN POKE A,0
```

This allows the program to erase the last mouse drawn, and lets the mouse turn back on its own path when it comes to a dead end.

I was given the Assembler/Editor cartridge for Christmas, and were it not for Richard Druse's article, Atari Tape Techniques, *in* **COMPUTE!**, *August, 1981, #14, I would have spent a lot more time tracking down what I thought was a serious malfunction in the cartridge. When discussing the transferral of programs to and from cassette, so that they can be run by the BASIC cartridge, the A/E manual never mentions that one must use the LIST"C" and ENTER"C" commands from BASIC. All it says is to follow the procedures in the 410 recorder manual, which never mentions these commands."* William E. L. Grossman

---

Questions

"I am planning to buy a VIC-20 computer, and rather than spend all that extra money for a printer to go with it, I would like to use the Model 35 teletype, which I already have.

The teletype printer takes an 8-bit ASCII code, ignoring the 8th bit, which the keyboard adds as a "parity check." (I'd guess the speed to be about ten characters per second.)

What I need is some kind of an interface that can plug directly into the VIC-20, and connect directly to the selector magnets on my teletype printer.

It would also be nice if the interface could take signals from the teletype keyboard contacts (altering the 8th bit of each character if necessary) and transmit back to the VIC-20 computer...this way, when I'm working with the video display, I can use the regular keyboard that is on the VIC-20; and when I'm getting a hard-copy printout through the teletype, and I need to key-in something, I can do it right there from the teletype keyboard.

Do you know anybody who can build such an interface for me, or show me how to build one myself?"
R. O. Danvers

"I'm 14 years old and own a Commodore PET 2001 with an 8K memory. I once heard of a program in **COMPUTE!** *that would enable my PET to locate programs on fast forward. I also am making a RADAR with D/A and A/D converters and any information would be greatly appreciated on these topics. Thank you."*
Matthew Silveira

This program, originally written by David Wilcox in 1978, can be adapted to any Commodore machine and can add to the speed and usefulness of a cassette-based computer system. The program is to be the first program on each tape, and lines 40 on should be updated to reflect whatever is stored on the tape. The computer then controls, and times, the cassette motor to quickly find a program's location.

The cassette is a *serial* device (where a series of items must be gone through, from item one, before a particular item can be reached). This program, however, makes the cassette a *random access* device when SAVEing or LOADing programs. It behaves the way a disk drive does, moving quickly and directly to the desired location.

```
10 PRINT" PRESS THE FAST-FORWARD K
    EY ON THE CASSETTE DRIVE N
    OW.
20 PRINT" THEN TYPE THE NUMBER OF
    THE PROGRAM YOU WISH TO US
    E.
30 PRINT" THE PROGRAMS ON THIS TAP
    E ARE:
40 PRINT" 0. FIRST PROGRAM'S NAME
50 PRINT" 1. SECOND PROGRAM'S NAME

60 PRINT" 2. ETC...
70 PRINT" 3. ETC...
80 PRINT" 4. ETC...
90 PRINT" 5. ETC...
100 GET N$:IFN$<>""THEN130
110 IF PEEK(519)=0THEN POKE 519,52:
    POKE59411,61
120 GOTO 100
130 N=ASC(LEFT$(N$,1))-48:PRINT"SEA
    RCHING FOR";N
140 POKE59411,53:TS=TI+N*600
150 IF TI<TS THEN 150
160 POKE59411,61
170 PRINT"{CLEAR} PRESS THE STOP KE
    Y ON THE CASSETTE DRIVE AN
    D THEN
180 PRINT"LOAD THE SELECTED PROGRAM
     NORMALLY.
190 PRINT"OR:
200 PRINT" SAVE A NEW PROGRAM ON TH
    IS TAPE AT THIS LOCATION
```

"The Manpower Society is intending, next September, to organize a conference on Computing Personnel Records especially Microcomputerization. As part of that process, they have asked me to survey the packages available on the market. Could I enlist your support in any of the following:

a) finding any existing Reviews of this area

b) obtaining a list of software companies who manufacture such software

c) obtaining any evaluation data available on these packages

I would be grateful for any help you or any of your colleagues could offer." P. W. Hare

---

"I enjoyed Peter Shufe's question in [**COMPUTE!**, November, 1981, #18, pg. 16, on Commodore self-modifying programming.] *I, too, have the problem of having to list out and amend DATA statements in a grading program that I use quite frequently (I'm a teacher). Unfortunately, your brief answer and program embedded therein did not work. Can you possibly expand upon this answer and give a more complete reply?"* Mel Billik

Line 100 was printed incorrectly (see below for correction). The final POKE should be a 13 (carriage return), as our answer to Mr. Shufe's question indicated.

Line 100 is the workhorse here. Whenever you have GOTO 100 within your program, the value of the variable *L* will print a line number, and *Y*, and *Z* will be the data for that DATA line. For example, if your program is keeping a running balance of your checkbook, you might only need to update the current balance. This means that you want the program to change only the one datum, perhaps called CURRENT (variable name).

To accomplish this, when the program is finished with whatever else it does, you could have a line: 700 L=10: Y=CURRENT: GOTO 100 .

Line 100 would not need any additional values so *Z* could be left out. Also, since you are not going to go on with additional DATA updates, you could make line 500 END. When you saved your program, the value of CURRENT would be in a DATA statement in line 10. When you ran the program next month, the DATA in line 10 would again be updated to reflect any changes.

The purpose of *going back into the program* (after line 100 does an update) is to allow you to update large amounts of data, not just one datum. You can use a loop to keep increasing the value of L (line number) for the DATA lines until you reach a limit you set. (This is the reason for line 500 in the original answer to Mr. Shafe).

Line 100 is unused until the end, so line one or zero should jump over it to wherever your program actually starts (1 GOTO 200).

```
100 PRINT"{CLEAR}{03 DOWN}"L"DATA"Y
    ","Z"{DOWN}L="L+2":GOTO500
    {04 UP}":POKE525,2:POKE527
    ,13:POKE528,13:END
```

"My PET 2001 did something very weird the other day. I had my CB2 speaker on in order to listen to a file which was loading (this is very helpful in detecting load errors, try it). The cassette was brand new and only had the file on it and the tape deck was recently cleaned, demagnetized, and realigned. However, instead of the usual buzzing after the file header, I heard, 'This is King's Army!' It couldn't have been more clearly spoken (much better than 'The PET Speaks' program in **COMPUTE!**, *November, 1981, #18). My PET crashed after those famous last words and the speaker emmitted a soft whine typical of a crashed PET. Should I now address my PET as King's Army? Is my PET on the verge of AI? Does the CB2 line listen in on tapes that are loading and CB's too? Now that it has talked, will it soon start to walk? What happened?"* Michael Hall

Anyone else had similar visitations? ©

ACTION QUEST™

16K Assembly Language Real-Time Adventure Game For ATARI® 400/800 Computer

Action Quest is a real time adventure game played with your joystick controller. You, represented as a ghost, move from room to room in an attempt to capture valuable prizes while eluding monsters and solving puzzles. Score is computed based both on prizes captured and elapsed time. Action Quest is entirely played as an action game, no keyboard input is required.

A complete game encompasses 30 rooms and 20 prizes, and prize capture is not always an easy task; a different technique or twist is involved in obtaining each one. Some require physical dexterity to reach while others can be acquired only through an intellectual problem solving path. Even some rooms are initially hidden from the player and must first be found before their prizes can be captured. Action Quest provides challenges both for fast action players as well as for those motivated by intrigue.

$29.95 from your local dealer, or send check or money order to J V Software, 3090 Mark Ave., Santa Clara, CA 95051.

California residents add sales tax.

Available on cassette or diskette.

JV SOFTWARE

3090 MARK AVE. SANTA CLARA, CA 95051

Computers And Society

David D. Thornburg
Los Altos, CA

Last year I devoted two columns to the use of computer games in the classroom. Based on the mail, phone calls, and personal discussions that followed, I am convinced that this topic continues to be a sensitive one for many readers – especially those readers who are teachers.

Most of us have seen newspaper stories describing what some parents and teachers consider to be the negative influence of game arcades. Communities all over the nation are passing ordinances prohibiting or severely restricting children's access to these arcades.

One popular hypothesis is that the game arcades are responsible for truancy, increased juvenile crime, and a multitude of other assorted problems.

The fact that truant officers are often able to find children at the arcades is not surprising – but this hardly means that the arcades are the cause of truancy. To my knowledge (based partly on personal recollections of a distant past), if kids are going to skip classes, they are going to skip classes. Period. When I was a kid, you couldn't go to a soda shop when school was in session because parents and teachers felt that soda shops contributed to truancy.

Every time truants find something to do with their time, this new activity is blamed as the cause of truancy. When viewed in the context of earlier "causes of truancy" such as hanging around pool halls, drinking booze, and shooting dope, I fail to see what makes a few games of Asteroids less desirable.

If people are concerned with truancy, that's fine with me. I think that our children's education is very important. And no matter how motivated a teacher is, he or she can't teach students who don't show up for class. But if you want to find out why kids have been skipping classes, you might want to examine the two areas which seem to be more stable than the latest fad – you might want to evaluate the home and the school. All video games could be destroyed tomorrow, and I doubt that truancy statistics would show any noticeable changes.

Of course, it may be argued that the games are addicting and, for many people, they are. My piano instructor recently acquired blisters on her hands from an overdose of Pac Man. As for myself, Centipede manages to diminish my supply of quarters with great regularity.

By what magic do these microprocessor-based marvels extract billions of quarters from a public eager to fill the games' coin boxes? Let's look at what is happening when someone plays an arcade game. The first few times the player's skill level is quite low and the game ends quickly with a low score. Yet something in the game encourages continued practice and, after a while, the player's proficiency starts to increase. Once a certain level of excellence is achieved, the game provides new challenges. And the quarters keep on flowing.

The player is pursuing a self-directed course of study, and is acquiring new skills with a very high level of self-motivation. The player is actually learning something! Students who show little interest in learning new material in school are spending immense amounts of their own money to learn how to master a game.

Presumably, the student's general goal of learning is shared by teachers (although directed toward different subject areas). However, just because teachers are interested in topics other than eye-hand coordination, it isn't clear that their success couldn't be improved by discovering the reason bored, disinterested students become ardent scholars the minute school lets out and they can zip down to the local arcade to play Galaxian.

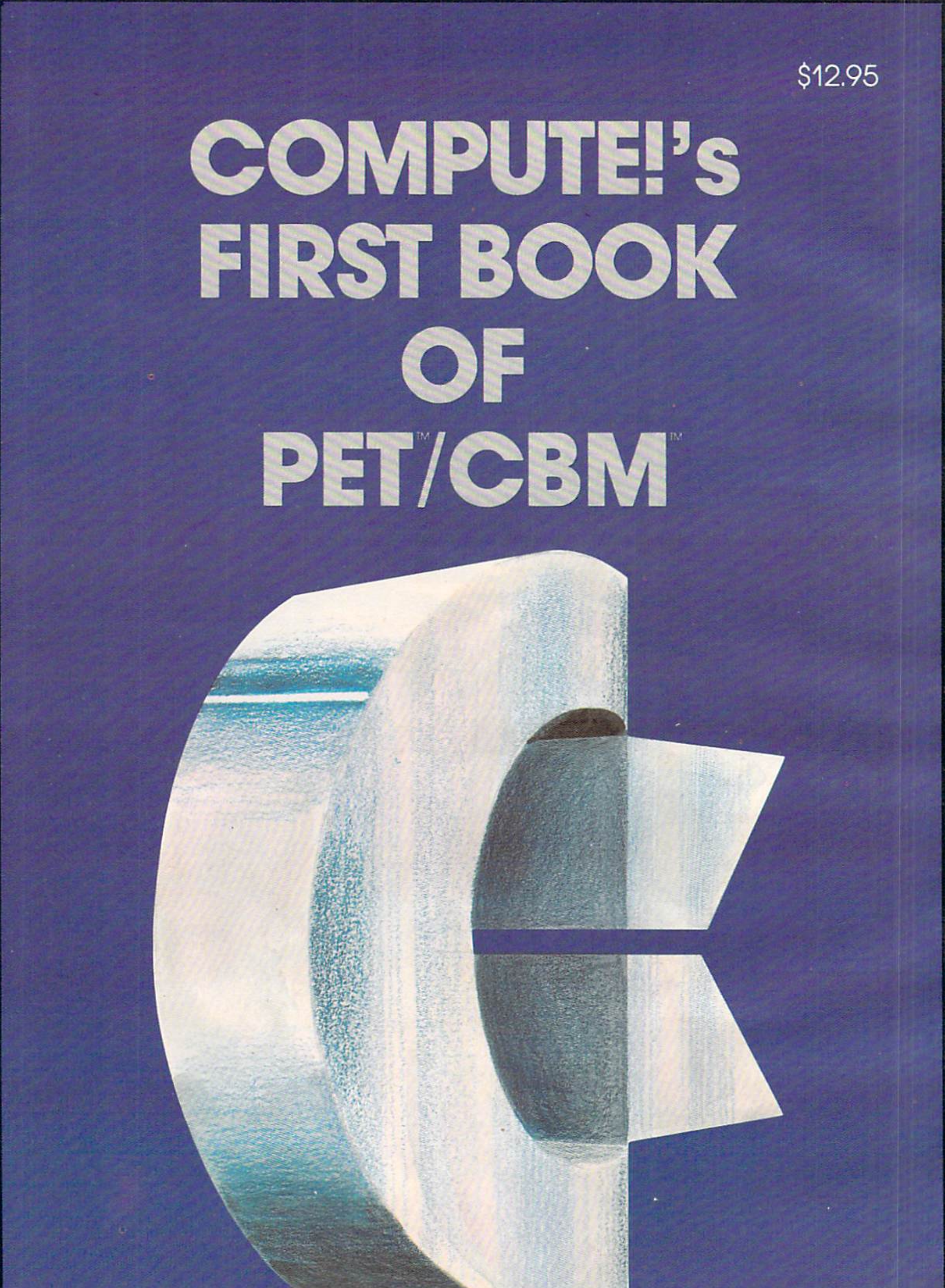
A student who is unwilling to practice repeated pen movement patterns (to improve handwriting) will gladly spend several weeks' allowance to practice repeated joystick motions to master the latest space game. Is it possible that people concerned with teaching the eye-hand coordination needed to write clearly might be able to learn something from the appeal of arcade games? It might be worth checking out.

I'm not suggesting that our schools need to become giant arcades with electronic action versions of the Peloponesian Wars, or Fraction Blaster. But classroom computers are a reality, and there are exciting games for these computers. If the students are showing us that they want to learn from games, and if they are showing us that they really *can* learn something by spending a lot of time with these machines, I think we should pay attention to this message and see if we can't make our students think of the classroom being as important a place of learning as the corner arcade.

Next month I will write about some of the most exciting educational games I have seen – including those from the Children's Television Workshop venture with Busch Gardens: Sesame Place.

Until then, let me know your feelings on this topic. ©

K-RAZY SHOOT-OUT™
For use on the *Atari 400™ or Atari 800™ Personal Computer Systems.
It's a battle of wits and fast action, this challenging game in ROM form. You're trapped in an Alien Fortress. Your mission is to clear your sector of the Alien Droids and progress to the next sector. The first sector seems easy enough...BUT–WATCH-OUT...as you progress from sector to sector, the Droids become more numerous and aggressive. A great challenge and fun too!
K-RAZY SHOOT-OUT is destined to be a favorite of Atari enthusiasts across the country with features like:
• Solid-state ROM pack
• Seven progressive levels of play
• Every game different
• Bonuses and penalties
• Full-color T.V. graphics and space-age sound
• Full-color instruction booklet
• Millions of variations
• A constant challenge
(WARNING: Playing the game could be HABIT forming)
Now at your Atari Dealer!
Coming soon:
• K-DOS™
• K-STAR PATROL™
• BUG-A-BOO™
FROM
K-BYTE™
*Atari is the Registered Trademark of Atari, Inc.
FOLD & TEAR
If not available in your area, send a check or money order directly to:
K-BYTE • P.O. Box 456 • 1705 Austin Street • Troy, Michigan 48099
Toll Free Phone Orders: 1-800-521-0560 • In Michigan: (313) 524-9878
☐ $49.95, plus $1.50 shipping and handling, Michigan residents add 4% sales tax.
☐ $1.00 for instruction book only.
NAME
ADDRESS
CITY
STATE
ZIP
Please allow 3 weeks for delivery.
☐ MasterCard
☐ VISA
CHARGE CARD NO.
EXPIRATION DATE
www.commodore.ca


$12.95
COMPUTE!'s
FIRST BOOK
OF
PET™/CBM™

The Beginner's Page

Making Decisions

Richard Mansfield
Assistant Editor

A major distinction between a computer and an ordinary pocket calculator is that the computer can make decisions. It can be programmed to examine something, to test it, and then to react appropriately to the test results. To see how this works, we'll write a program which gives the computer the personality (and the powers) of Madame Mona, a fortune teller.

First, let's see what is available to us. BASIC has only two decision-making words, IF and ON, but that's all we need. IF decides between two alternatives; ON chooses between several. This is like the difference between two types of tests given in school: true-false or multiple-choice.

When A Decision Is Either/Or

When you write a program, you make a list of things for the computer to do and the list is numbered so it knows in what order you want these commands carried out:

```
10 DIM Q$(200): REM THIS IS FOR ATARI BASIC
   ONLY
100 PRINT "HELLO, MY NAME IS MADAME
    MONA"
110 PRINT "WELCOME TO MY CHAMBERS..."
120 PRINT "HOW OLD ARE YOU ?"
130 INPUT AGE
```

So far, the computer is simply introducing itself and getting your age. It will always start out with these same actions whenever this program is run. It hasn't made any *decisions* yet.

To make decisions, the computer must have some information to work with. Now it has your age, so it can make a decision based on that:

```
140 IF AGE > 17 THEN GOTO 170
150 PRINT "STATE LAW DOES NOT PERMIT
    ME TO"
160 PRINT "TELL THE FORTUNE OF ANYONE
    UNDER 18.": END
```

The IF...THEN... in line 140 decides between two alternatives: whether to continue on with the program or to end it. Whatever you put after the THEN will happen *only if* the item between IF and THEN is *true*.

How does the computer decide what's true and what's false? It tests the item between IF and THEN and leaves itself a *flag* with a zero or a one "written on it" (on PET/CBM computers, the flag is zero or -1). When it finishes, THEN takes over and looks at the flag. If the flag is a zero, the computer ignores anything after the THEN on the line and goes to the next line (line 150 in this case). Should the flag be *true*, (1, or, on Commodore computers, -1) THEN performs the tasks listed after it *before going on to the next line number.*

You can try out these various "truth tests" directly, without even writing a program. Just type: PRINT 5=6. This is obviously not true, so your computer should print 0. Type: ? (shorthand for PRINT) 5 > 6. This is a proposal to the computer that five is greater than six. We'll get to the group of symbols called *relational* (because they show a relation between two numbers) in a minute.

For now, just notice that the computer again says this is false by printing a zero. Type: ? 5 < 6 and you get a *true* response because five *is* less than six. (An easy way to remember the *less-than* < and *more-than* > symbols is to look at the symbols themselves. They look like what they mean. The wide open side of the symbols points to the larger (more-than) number and the closed, pointed side points to the smaller (less-than) number.)

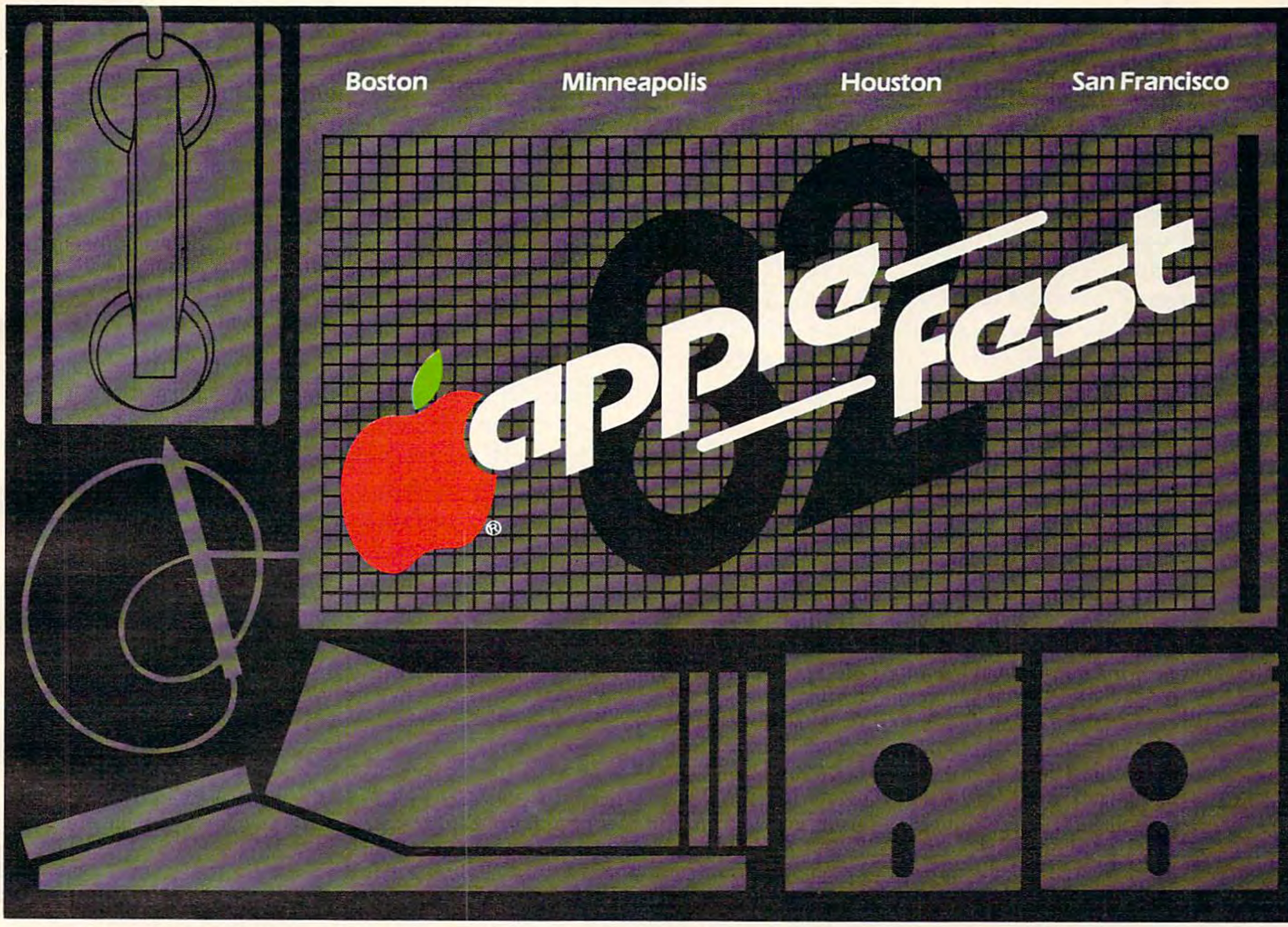
In our example, the item between IF and THEN in line 140 says that AGE is greater than 17. If someone answers the age question with the number 19, the item is true and the computer will GOTO 170. If AGE is 14, the item is false, so the instructions following THEN are ignored and the program moves on to lines 150 and 160.

IF...THEN decisions are made using the following symbols:

= Equals
< Less than
<= Less than or equals
> More than
>= More than or equals
<> Does not equal

You can also use the "logic" symbols (AND and OR) to make IF...THEN tests. They allow the computer to test *several items at the same time* between the IF and the THEN. We could change the program above by typing in three lines differently. In the new version, Mona's ethical position becomes somewhat clearer:

```
120 PRINT "HOW OLD ARE YOU ?" : INPUT AGE
130 PRINT "HOW MUCH MONEY DID YOU
```



The Most Spectacular Extravaganza Ever... For Apple Users

At Applefest '82 hundreds of manufacturers, distributors and dealers will showcase the entire spectrum of Apple-compatible products including computers, components, peripherals, plug-in cards, publications, gifts, magazines, services, accessories and software for home, office and school.

Hands-on centers and multimedia presentations will demonstrate the newest applications for business, education and entertainment.

Seminars and workshops, conducted by the world's leading Apple authorities, will detail new uses to make your Apple more enjoyable and more useful than you ever imagined.

You'll meet thousands of other Apple owners and find the newest of everything for your Apple under one roof . . . and for sale at super show prices.

So if you use an Apple . . . or are thinking about buying one, you won't want to miss a minute of Applefest '82.

Ticket & Hotel Information

Send your check and a note indicating the specific show you wish to attend. Tickets and hotel information will be mailed back to you. Tickets can also be purchased at the show. Make all checks payable to Northeast Expositions Inc. 824 Boylston Street, Chestnut Hill, Mass. 02167 Tel: 617 739 2000.

Exhibitor Information

For specific exhibitor information on one or all of the Applefest '82 shows call Northeast Expositions at the telephone number above.

Applefest/Boston
Fri-Sun May 14-16, 1982
Hynes Auditorium
Show Hours: 11AM to 6PM Daily
Admission: $6 per day or $10 for 2 days, $15 for 3 days

Applefest/Minneapolis
Thurs-Sun Sept 16-19, 1982
Minnesota Auditorium and Convention Hall
Show Hours: 11 AM to 6 PM Daily
Admission: $5 per day or $8 for 2 days, $12 for 3 days, $15 for 4 days

Applefest/Houston
Fri-Sun Nov 19-21, 1982
Albert Thomas Convention Center
Show Hours: 1PM to 10PM Daily
Admission: $5 per day or $8 for 2 days, $12 for 3 days

Applefest/San Francisco
Fri-Sun Dec 3-5, 1982
Moscone Center
Show Hours: 1PM to 10PM Daily
Admission: $5 per day or $8 for 2 days, $12 for 3 days

Applefest is produced by Northeast Expositions Inc. and is sanctioned by Apple Computer Inc. and The Boston Computer Society.

```
      BRING MONA ?" : INPUT CASH
140 IF AGE > 17 OR CASH >= 10 THEN GOTO 170
```

In this version, as before, line 140 allows the program to continue if the customer is over 17, but it also takes into account any youngsters with ten dollars or more. Here, either age *or* money can influence Mona's decision. You could type this in directly, too: ? 5=6 OR 6=6 will give you a *true*, but ? 5=6 AND 6=6 will be *false* because AND expects them *both* to be correct (OR only needs one of them to be correct).

Selecting Between Several Possibilities

ON...GOTO (or GOSUB) does not test or create flags. It simply expects a number and sends the program off to the lines which follow the GOTO. ON X GOTO 100, 200, 375, 400 means that if X is one, the program will jump to line 100, if X is three, the program starts following the instructions listed on line 375. You can have as many line numbers after X as will fit on one line. If, by some mistake, X is beyond the range of line numbers listed after the GOTO (99447 or 0 or a negative number), the program will just continue on without jumping to any of the lines listed.

```
170 PRINT " ASK MADAME A QUESTION THAT
      CAN"
180 PRINT " BE ANSWERED BY YES OR NO..."
190 INPUT Q$
200 X=INT (RND(1) * 5) + 1
210 ON X GOSUB 230, 240, 250, 260, 270
220 PRINT: GOTO 170
230 PRINT " NO ": RETURN
240 PRINT " YES ": RETURN
250 PRINT " MAYBE ": RETURN
260 PRINT " IT IS FAIRLY LIKELY ": RETURN
270 PRINT "MONA DOESN'T KNOW. ASK ME
      LATER ": RETURN
```

We ask for a random number between 1 and 5 in line 200 which will determine what GOSUB takes effect in line 210. We could have written a series of IF...THEN lines:

```
210 IF X=1 THEN GOSUB 230
211 IF X=2 THEN GOSUB 240
```

but the ON structure makes things simpler. We can just create a list of choices and let the computer select from them using ON.

To make this program more interesting, you might want to add to Mona's repertoire of answers. Simply put some more lines in and then add them to the list on line 210. Don't forget to change the number five in line 200 to equal the number of answers you've created. RND will then give a random number between one and the total number of possible answers. ©

COMPUTE!'s Listing Conventions

Many of the programs which are listed in **COMPUTE!** use special keys (cursor control keys, color keys, etc.) To make it easy to tell *exactly* what should be typed in when copying a program into the computer, we have established the following listing conventions.

For The Atari

All the editing and cursor control characters are spelled out and surrounded by brackets in the program listings: {CLEAR} for "clear screen." Other characters, such as CTRL-T (the "ball" character) will be listed as the "normal" character, but it will be within brackets: {T}. A series of identical control characters will be indicated by a number within the brackets: {3DOWN} means type ESC CURSOR-DOWN three times; {12 R} would mean type CTRL-R twelve times. Remember to press the ESC (escape) key before each cursor control key. If you should see {ESC} itself in a program listing, you would press ESC *twice*.

Two of the control characters, {=} and {-}, should be shifted. Any reverse field text will be enclosed within vertical lines. (In other words, any time you see a vertical line within a program listing in **COMPUTE!**, press the Atari logo key {人}.)

Atari Conventions

```
{CLEAR}= SHIFT-< (Clear Screen)
{UP}= CTRL-minus (Cursor Up)
{DOWN}= CTRL-equals (Cursor Down)
{LEFT}= CTRL-plus (Cursor left)
{RIGHT}= CTRL-asterisk (Cursor right)
{BACK S}= BACK S (Back space)
{DELETE}= CTRL-DELETE (Delete character)

{DEL LINE}= SHIFT-DELETE (Delete Line)
{INSERT}= CTRL-INSERT (Insert character)

{INS LINE}= SHIFT-INSERT (Insert line)
{ESC}= ESC (ESCape key pressed twice)
{TAB}= TAB (Tab key)
{CLR TAB}= CTRL-TAB (Clear tab setting)
{SET TAB}= SHIFT-TAB (Set tab stop)
{BELL}= CTRL-2 (Ring buzzer)
```

For PET/CBM/VIC

Generally, any PET/CBM/VIC program listings will contain bracketed words which spell out any special characters: {DOWN} would mean to press the cursor-down key; {3DOWN} would mean to press the cursor-down key three times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listing. For example, <u>S</u> would mean to type the S key while holding the shift key. This would result in the "heart" graphics symbol appearing on your screen.

Sometimes in a program listing, especially within quoted text when a line runs over into the next line, it is difficult to tell where the first line ends. How many times should you type the SPACE bar? In our convention, when a line breaks in this way, the ~ symbol shows exactly where it broke. For example:

```
100 PRINT "TO START THE GAME  ~
    YOU MAY.HIT ANY OF THE KEYS
    ON YOUR KEYBOARD."
```

shows that the program's author intended for you to type two spaces after the word *GAME*.

For The Apple

Programs listed as "Microsoft" are written for the PET/CBM, Apple, OSI, etc. Although the programs are general in nature, you may need to make a few changes for them to run correctly on your Apple. Microsoft BASIC programs written for the PET/CBM sometimes contain special cursor control characters. The following table shows equivalent Apple words. Notice that these Apple commands are *outside* quotations (and even separate from a PRINT statement). PRINT"[RVS]YOU WON" becomes INVERSE: PRINT"YOU WON":NORMAL

[CLEAR[(Clear Screen) HOME

[HOME] (Home cursor) VTAB 0:HTAB 0

[DOWN] (Cursor down)
POKE 37,PEEK(37)+(PEEK(37)<23)

[UP] (Cursor up)
POKE 37,PEEK(37)-(PEEK(37)>0))

[LEFT] (Cursor left) PRINT CHR$(8);

[RIGHT] (Cursor right)
POKE 36,PEEK(36)+(PEEK(36)>(PEEK(32)
+PEEK(33)))

[RVS] (Inverse video on. Turns off automatically after a carriage return. To be safe, turn off inverse video after the print statement with NORMAL unless the PRINT statement ends with a semicolon.)
INVERSE

[OFF] (Inverse video off) NORMAL

Shifted characters can represent either graphics characters or uppercase letters. If within text, just use the non-shifted character, otherwise substitute a space. Some "generalized" programs contain a POKE such as POKE 59468,14. Omit these from the program when typing it in. One final note: you will probably want to insert a question mark or colon within an INPUT prompt. PET/CBM and many other BASICs automatically print a question mark:

INPUT "WHAT IS YOUR NAME";N$
becomes
INPUT "WHAT IS YOUR NAME?";N$

All Commodore Machines

Clear Screen	{CLEAR}	**Cursor Left**	{LEFT}
Home Cursor	{HOME}	**Insert Character**	{INST}
Cursor Up	{UP}	**Delete Character**	{DEL}
Cursor Down	{DOWN}	**Reverse Field On**	{RVS}
Cursor Right	{RIGHT}	**Reverse Field Off**	{OFF}

VIC Conventions

Set Color To Black	{BLK}	**Function Two**	{F2}
Set Color To White	{WHT}	**Function Three**	{F3}
Set Color To Red	{RED}	**Function Four**	{F4}
Set Color To Cyan	{CYN}	**Function Five**	{F5}
Set Color To Purple	{PUR}	**Function Six**	{F6}
Set Color To Green	{GRN}	**Function Seven**	{F7}
Set Color To Blue	{BLU}	**Function Eight**	{F8}
Set Color To Yellow	{YEL}	**Any Non-implemented Function**	{NIM}
Function One	{F1}		

8032/Fat 40 Conventions

Set Window Top	{SET TOP}	**Erase To Beginning**	{ERASE BEG}
Set Window Bottom	{SET BOT}	**Erase To End**	{ERASE END}
Scroll Up	{SCR UP}	**Toggle Tab**	{TGL TAB}
Scroll Down	{SCR DOWN}	**Tab**	{TAB}
Insert Line	{INST LINE}	**Escape Key**	{ESC}
Delete Line	{DEL LINE}		

©

The Microsoft Version of this program will work on Apple, OSI, PET/CBM, and any Microsoft BASIC computer which has enough memory to absorb the dimensioning in line 40. Changes for the Atari are in Program 2.

Moving Averages

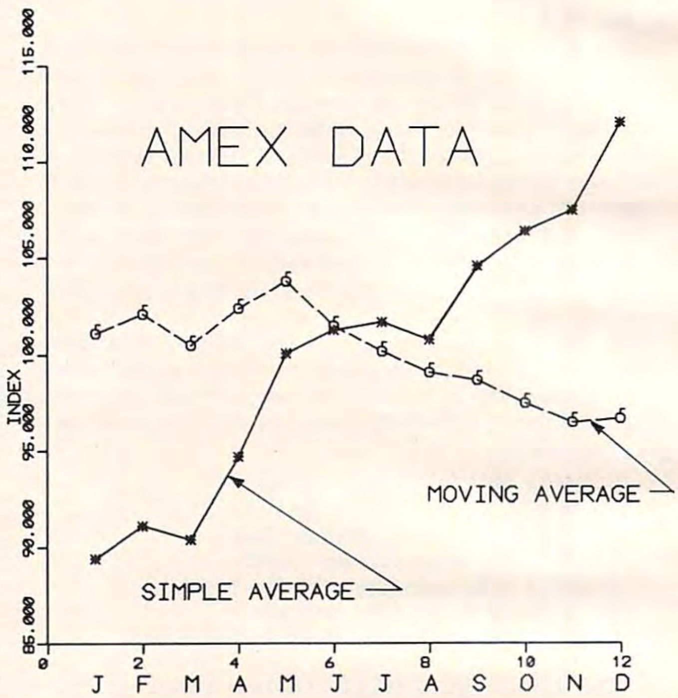
Jerry W. O'Dell
Eastern Michigan University

One of the nice things about having a microcomputer in your business is the fact that you can do calculations easily that would be almost impossible to do by hand. A good example of this is the *moving average*. They are commonly used in businesses (we'll see why in a minute), and yet they are a perfect nightmare to calculate by hand. I'll bet that it would take a whole day to do one, and then it probably wouldn't be right.

What is the moving average? This is best explained by using some data. Table 1 contains American Stock Exchange indices, by month, for the boom years of 1963 to 1968. The problem involves whether there are systematic monthly variations in AMEX prices. There are theories in the stock market that prices go up during certain times of the year. Is there any truth to this?

overall average (15.35) and multiplying by 100. These percentages are plotted in Figure 1 as the "simple average" values. The plot was done by an expensive CalComp plotter on a large computer (but you could do as well with a MIPLOT, I'll bet).

Figure 1.



Look at the figure and the values in the "% simple average" row. Notice that they keep going up throughout the year. Aha! We can conclude from the AMEX data that stock prices gradually go up during the year. If we buy stocks in January, then we can make a killing of about 20% during the year. It sounds too good to be true. What is

Table 1.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1963	7.5	7.6	7.5	7.7	8.5	8.6	8.6	8.6	9.0	9·1	9.0	8.5
1964	8.9	9.0	9.2	9.2	9.1	9.2	9.7	9.7	10.2	10.3	10.4	10.2
1965	11.0	11.5	11.7	12.0	12.1	11.5	11.0	11.5	12.0	12.5	13.5	14.5
1966	15.0	16.0	15.9	16.5	16.3	15.5	15.4	14.0	13.0	12.5	12.6	13.0
1967	14.9	16.0	17.0	17.8	19.0	19·0	20.5	22.5	22.6	22.8	22.0	24.0
1968	25.0	23.8	22.0	24.0	27.2	29.5	28.5	26.5	29.5	30.8	31.5	33.0
Simple Average	13.7	14.0	13.9	14.5	15.4	15.6	15.6	15.5	16.1	16.5	17.2	
% Simple Average	89.4	91.1	90.4	94.7	100.1	101.3	101.7	100.8	104.6	106.4	$07.5	112.1
% Moving Average	101.1	102.1	100.5	102.4	103.8	101.5	100.2	99.1	98.7	97.5	96.5	96.7

In Table 1, the *simple average* is just the plain old average that everyone knows how to figure, for each month. The row, "% simple average," is calculated by dividing the simple average values by the

going on?

The confusing factor is simply the fact that the prices increased *continuously* throughout the period; it's called inflation! Oh, there are a few places in

.. one good thing

MUPET
can save you $20,000.

Reduce your hardware costs - let Mupet work for you.

- Mupet allows as many as eight students to share a common disk drive and printer.
- With Mupet software transparency you can have any combination of CBM hardware and programs of your choice.
- Word processors share associated hardware, minimize hardware investment.

Mupet works hard, now priced from $750.00.

Call CMD - the company with world renowned expertise on Commodore and distributors of Mupet and Mupet II, The Manager, DTL Basic Compiler and Supergraphics.

CMD

CANADIAN MICRO DISTRIBUTORS LTD.
365 Main St., Milton, Ontario L9T 1P7
416-878-7277

leads to another..

MUPET II
saves money and time too!

Mupet II offers all the advantages of Mupet, plus:

- Will store commands if disk and printer are being used allowing continued use of computer and completion of stored command in turn.
- Protects against incorrect use of harmful disk commands.
- No more printer interface - background printing supported on IEEE, RS 232C and parallel ports included in controller.
- Programmable 16K RAM controller, expandable to 32K provides user defineable operating systems.
- Up to 16 computers may be connected to central printer and disk drives.

Integrate intra-office terminals for common data access allowing independent analysis for such functions as:

- Accounting
- Sales forecasts, budgets and orders
- Production scheduling
- Word processing

The only product available capable of serving Commodore Computers up to 100 feet apart.

MUPET II a small price for huge capabilities, from:

$995.00

which prices went back for a month, but that's rare. If a constant factor, such as inflation, gradually and relentlessly pushes prices up, it will show up in these simple averages. Statisticians call such factors *secular trends*, but you can see how they work without all the fancy terminology.

Eliminating Secular Trends

What is needed is some way of getting rid of the secular trend. There are many ways of doing this, and many variations on the many ways, but perhaps the most widely used method is called the *moving average*. The moving average is the other line in Figure 1, and it removes the trend. Notice here that, instead of stock prices going up during the year, with the moving average method, we find that prices go down a bit. They don't go down a lot, only from about 102% to 97%, but the real direction, with the *trend* removed, is slightly downward.

In short, moving averages lead to precisely the opposite conslusion in this case. You shouldn't buy in January and sell in December. With moving averages, you'd buy in December, and sell in May.

Moving averages are useful. Now, how do you calculate them? That is a complicated business! What you do is add up the twelve months surrounding each month, and get an average for each month (for each year) from that. The trouble with that is that this gives you halfway month sums (June-July, say). So then you have to average those to get back to whole months. And on and on. Obviously, it's too complicated to explain in full here. If you want details, look at McElroy's *Applied Business Statistics* (Chapter 13), or Storkton and Clark's *Introduction to Business and Economic Statistics*. The explanation takes pages.

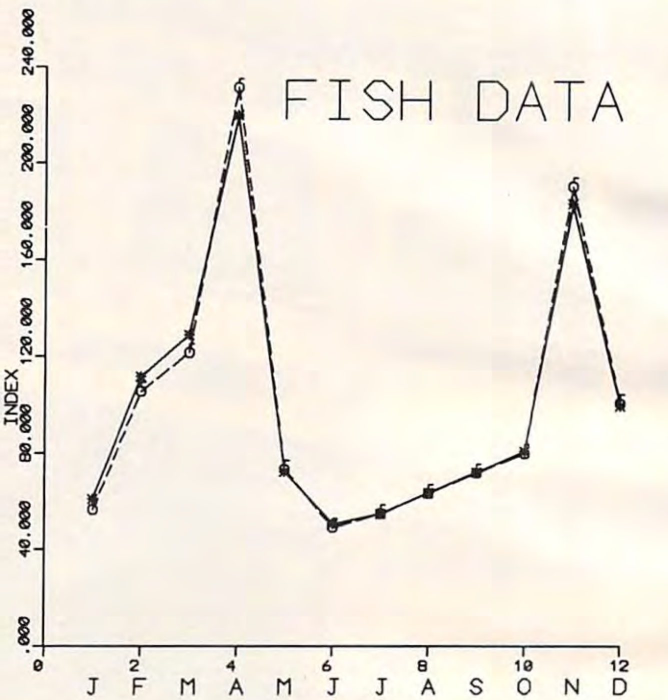
With your microcomputer you can simply type in Program 1, and it will do all the work for you. The listing has comments for those interested in how the program works, but I'd leave them out. They'll only slow down the program and, after all, you have a copy (this one!) of the comments.

The data is put in, by year, in the DATA statements at the bottom. And you have to put in the number of years, in line 30. Then the program takes over and is finished in about 30 seconds.

Are Moving Averages Always Reliable?

Do moving averages *always* smooth out data? Not if there is a real monthly variation. Take, for example, Figure 2, which is a plot of the quantity of fish taken (in millions of pounds) from Lake Michigan in the years 1952-1957. One curve is the simple average, and the other curve is the moving average. Notice here that the two curves are almost identical, so much so that I didn't try to identify them. Here, there really is a seasonal variation, and it shows up even when the long term trend is removed. It's

Figure 2.



obvious that you should go fishing in April and November, and avoid June, July, and August, when most people, of course, go fishing (data from Michigan Department of Conservation).

You can do moving averages in about 30 seconds that would take many hours to do by hand. And, if you're making business decisions, you'd better do so, if you suspect monthly trends.

A few warnings are in order. There are all sorts of moving averages: you can do them monthly, quarterly, and I think that in the stock market they do them at 29 day intervals. The program can be changed to do that, if you change the indices. And there are variations in the way people calculate them. Some people use medians, some drop extreme values, and so on.

The program has been carefully tested. There is one potential problem, however, that might crop up on some other computers. Some of the subscripts on some of the variables may go out of range occasionally, and refer to values that don't exist. I like my programs to be as simple as possible, and the BASICs that I've tried are very forgiving in that way. However, perhaps somewhere someone has a BASIC that won't be that nice, and you might have to add some statements to fix that; it would make the program a good deal longer, so I didn't. As listed the program will handle 20 years. If you want more years, you'll have to change the dimension statements in line 40 (12 times the number of years desired).

DTL BASIC COMPILER

- Compatible with all existing Basic interpreter commands
- Improved Performance based on faster execution times
- Accepts extensions to Basic implemented in RAM or ROM
- Large Programs (16K+) will benefit from memory savings
- Provides demanding two pass syntax and logic analysis
- Security Key attaches to either cassette port

A Basic COMPILER for your Commodore Microcomputer by Drive Technology

DTL-BASIC is a Basic compiler for Commodore machines designed to convert existing programs to machine code and run them without modification. Compiled programs will run much faster and operate in exactly the same way as the un-compiled versions. Compiled code is typically 20 to 50% smaller than source code. For large programs this saving will more than offset the 4K run-time library appended to each compiled program, providing additional internal memory space.

The compiler implements true integer arithmetic as well as real arithmetic. Use of integers can lead to significant speed improvements. Special compile time options make identification and conversion of real variables to integers a simple task.

A 'Compiler' security key, which plugs into either cassette port, is supplied together with the DTL-BASIC compiler. This key must be used in order to compile a program or to run the compiled version. In order to allow for the distribution of compiled versions of user developed programs, a second type of key known as a 'Run-Time' key is available in any required quantities. Software developers can obtain private security key sets with unique serial numbers providing comprehensive protection of their products while allowing customers to make backup copies of compiled programs.

DTL-BASIC is a disk based system requiring a 32K PET/CBM and comes complete with an in-depth user manual and a Compiler Security Key. Three versions of the compiler exist for CBM 3032, CBM 4032, and CBM 8032 machines. Please specify machine type and disk type (4040 or 8050) on which compiler is to be supplied.

DTL BASIC WITH MANUAL AND SECURITY KEY $350.00

RUN-TIME KEYS .... $50.00 EACH

FROM

CMD

CANADIAN MICRO DISTRIBUTORS LTD.

365 Main St., Milton, Ontario L9T 1P7
416 878-7277

THE COMPANY THAT BROUGHT YOU
MUPET • DOUBLE-MUPET • SPOOLER
THE MANAGER • I/O PRODUCTS

Program 1: Microsoft Version

```
10 REM MOVING AVERAGE PROGRAM
20 REM CHANGE N TO SUIT N OF YEARS
30 N=6
40 DIM IN(240),SM(240),Y(240),Z(12
   ),MO$(12)
50 DATA "JANUARY  ","FEBRUARY ","M
   ARCH    ","APRIL    "
60 DATA "MAY      ","JUNE     ","J
   ULY     ","AUGUST   "
70 DATA "SEPTEMBER","OCTOBER  ","N
   OVEMBER ","DECEMBER "
80 FOR I=1 TO 12
90 READ MO$(I) :REM READ PRINTOUT ~
   HDRS
100 NEXT I
110 T=N*12  :REM TOTAL N OF MONTHS
120 KV=0  :REM COUNTER FOR MONTHS
130 FOR I=1 TO N :REM LOOP TO READ ~
    YRS
140 FOR J=1 TO 12  :REM LOOP TO RD ~
    MOS
150 KV=KV+1
160 READ IN(KV)  :REM READ IN DATA
170 NEXT J
180 NEXT I
190 KB=5     :REM ST COUNT B AT JUNE
200 KM=T-12
210 FOR I=1 TO N :REM BIG LOOP FOR ~
    HWY
220 FOR J=1 TO 12  :REM LOOP FOR MO
    S
230 KB=KB+1
240 KC=KB-6     :REM INDEX FOR WHOLE
     YR
250 FOR K=1 TO 12
260 KC=KC+1
270 SM(KB)=SM(KB)+IN(KC) :REM HF MO
     SUMS
280 NEXT K
290 NEXT J
300 NEXT I
310 FOR J=6 TO (T-7) :REM RANGES FOR 4
320 Y(J+1)=(IN(J+1)/((SM(J)+SM(J+1)
    )/24))*100
330 NEXT J
340 FOR I=1 TO 12 :REM MAIN SUM LP
350 KQ=I+6
360 IF KQ<13 THEN 380
370 KQ=KQ-12
380 KR=KQ
390 FOR J=1 TO N :REM LOOP FOR YEAR
    S
400 Z(KQ)=Z(KQ)+(Y(KR)/(N-1))
410 KR=KR +12
420 NEXT J
430 G=G+Z(KQ)
440 NEXT I
450 CR=1200/G
460 PRINT TAB(1);"MONTH";TAB(17);"A
    VERAGE"
470 FOR I=1 TO 12
480 PRINT MO$(I),Z(I)*CR  :REM ANSW
    ERS
490 NEXT I
500 PRINT
8000 DATA  7.5, 7.6, 7.5, 7.7, 8.5, ~
     8.6
8005 DATA  8.6, 8.6, 9.0, 9.1, 9.0, ~
     8.5
8010 DATA  8.9, 9.0, 9.2, 9.2, 9.1, ~
     9.2
8015 DATA  9.7, 9.7,10.2,10.3,10.4,1
     0.2
8020 DATA 11.0,11.5,11.7,12.0,12.1,1
     1.5
8025 DATA 11.0,11.5,12.0,12.5,13.5,1
     4.5
8030 DATA 15.0,16.0,15.9,16.5,16.3,1
     5.5
8035 DATA 15.4,14.0,13.0,12.5,12.6,1
     3.0
8040 DATA 14.9,16.0,17.0,17.8,19.0,1
     9.0
8045 DATA 20.5,22.5,22.6,22.8,22.0,2
     4.0
8050 DATA 25.0,23.8,22.0,24.0,27.2,2
     9.5
8055 DATA 28.5,26.5,29.5,30.8,31.5,3
     3.0
```

Program 2: Atari Version

Minor changes were necessary to convert this program to run in Atari BASIC, such as string array simulation for the reading of the twelve months of the year. Because Mr. O'Dell has the months padded to the right with spaces, this is easy. Note the period at the end of each month in lines 50-80. This is necessary to preserve the trailing blanks in some of the items. The period makes the string ten characters long, but, because T$ was only DIMensioned for nine characters, that's all that is read in. The POKE 85,n simulates a TAB statement. — The Editors

Make these changes to the Microsoft version:

```
40 DIM IN(240),SM(240),Y(240),Z(12),MONT
H$(9*12),T$(9)
50 DATA JANUARY  .,FEBRUARY .,MARCH    .
,APRIL    .
60 DATA MAY      .,JUNE     .,JULY     .
,AUGUST   .
70 DATA SEPTEMBER.,OCTOBER  .,NOVEMBER .
,DECEMBER .
80 FOR I=1 TO 12
90 READ T$:MONTH$(I*9-8,I*9)=T$
100 NEXT I
160 READ TEMP:IN(V)=TEMP
460 PRINT " MONTH";:POKE 85,17:PRINT "AV
ERAGE"
480 PRINT MONTH$(I*9-8,I*9);:POKE 85,18:
PRINT Z(I)*CR
```

©

Problems with memory cells in your computer's RAM (where you do your programming) can sometimes be quite subtle. It would be clear that you had a bad cell somewhere if your computer responded to your question, ? FRE(1) by saying that you had 320 bytes free before you'd even put a program in. But what about the less obvious memory problems? A cell might only go strange when the cell next to it *contains a five. Or it might work fine, but fail after a certain amount of time passes. Such subtle failures, fortunately relatively rare, can have you looking in vain for a bug in your program. Mr. Scanlon presents a sophisticated memory testing program here (in machine language, for any computer which uses the 6502 chip, Apple, CBM/PET, Atari, OSI, VIC). This program can uncover some of those more subtle cell failures.*

Track Down Those Memory Bugs!

Leo J. Scanlon
Inverness, FL

If you just went out and bought a new tape recorder, a pair of jeans, or a quart of milk, you'd find out in short order just how good or bad the product is. If the tape recorder makes a Sousa march sound like a funeral dirge, back to the store it goes. Likewise, the jeans will show their quality after the first washing, and your nose knows if the milk is bad!

Unfortunately, faults in a computer memory board may not be that evident. Certainly, you will spot obvious defects – a crack in the board, missing chips, and the like – but if the board is operating at all, you'll probably need a diagnostic program to pinpoint any specific problem. This article presents one such program. It was developed on a Rockwell AIM 65 microcomputer, but it can run on any 6502-based computer, provided you alter the output routines. The general *principles* can, of course, be applied to other types as well.

Besides "dead" chips, which cannot store any data, memory boards have a variety of other potential problems. For example, some chips contain one or more bits that will not accept information, or bits that just hold the information briefly, then lose it. Other chips will not accept certain bit *patterns*, or affect other memory chips in the array. We can't hope to write a single program that will identify all possible errors, but the program given here will isolate most errors – or at least give you enough information to delve deeper into the problem.

The Test Algorithm

The diagnostic program in this article uses an algorithm that was implemented for 68000-based systems by Robert D. Grappel ("M68000 Diagnostic Program Tests Memory," *EDN*, April 15, 1981, pp. 157-158). This algorithm has two main loops. The first loop fills the tested portion of memory with increasing bit patterns; 00000000_2 is written into the first byte, 00000001_2 is written into the second byte, and so on. With this done, the second loop checks the memory contents and prints an error message each time a mismatch is detected.

The test then repeats, each time incrementing the contents of each byte. Thus, after 256 cycles, each byte has held all possible values. Note that the test is destructive; any pre-test information in the affected RAM will be eradicated.

The program described here also allows you to check for either *hard failures* or *soft failures*. Hard failures are those that cause the loss of ability to change the state of one or more bits, whereas soft failures allow a change, but revert back to the original state after a period of time. For soft failure testing, the time delay between write and read/verify has been set at one minute, arbitrarily.

Program Flowcharts

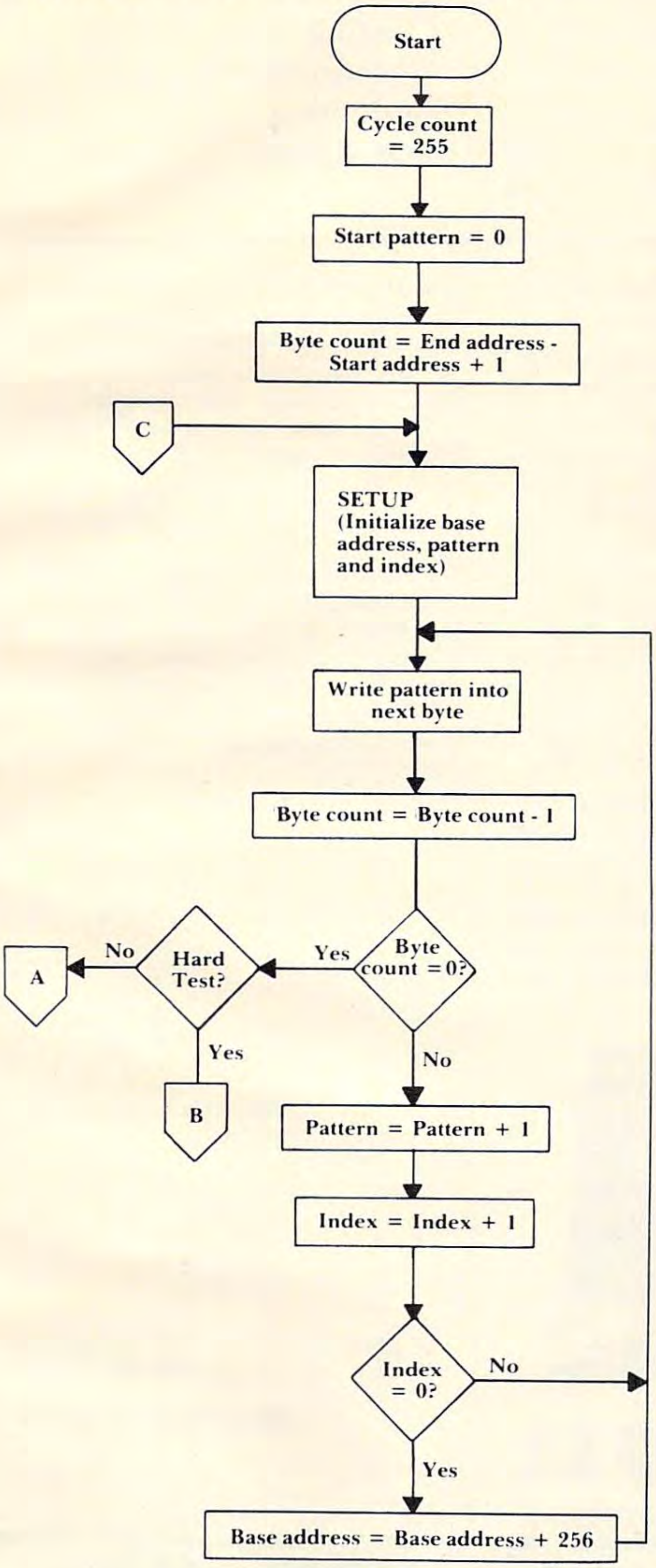
With the two tasks now defined, we can look at a program that will do the job. Before doing so, however, it will be helpful to investigate the overall structure of the two loops, by looking at their flowcharts.

Figure 1 shows the sequence of operations for the write loop, the loop that fills the test portion of memory with increasing bit patterns. This loop is preceded by some necessary initialization. First, the cycle count is set to 255. We actually want *256* cycles, but with a microprocessor that has only eight-bit registers (and memory locations), it is convenient to use 255, and plan ending the test when the cycle count has decremented *past* zero, to an all-ones (hex FF) state.

Next, the start pattern – the pattern that will be written into the first test location – is initialized to zero. Admittedly, zero is arbitrary. Since we will cycle through memory 256 times, each location will eventually receive every possible bit pattern. Therefore, it really doesn't matter which value goes into the first byte.

The microprocessor then calculates the byte count, by taking the difference between the specified end address and start address, and adding one. This is followed by a call to a set-up subroutine, which sets the "base address" equal to the starting address, fetches the start pattern and sets a byte index equal to zero. (The use of the terms base address and index here show that we plan to use

Figure 1: Initialization and Write Sequences



one of the 6502's *indexed* addressing modes. These modes calculate an effective address by adding the contents of an index register – X or Y – to an absolute or indirect base address.)

At this point, the microprocessor enters the actual write loop. It starts by writing a pattern into memory, decrementing the byte count, then checking whether test memory has been entirely filled with test patterns (byte count = 0). When the byte count is zero, the microprocessor branches to the read/verify loop, at either its soft error test or hard error test entry point; path A or path B, respectively. Otherwise, pattern and index are incremented, in preparation for writing to the next byte.

When the index has been incremented past hex FF, and reaches zero, a new base address is calculated, by adding 256 to the existing base address. Again, this is necessary because our index registers are only eight bits wide. A nonzero index causes the microprocessor to loop back to write the next pattern into memory. This concludes our discussion of the write loop.

As expected, the sequence of the read/verify loop (Figure 2) is very similar to that of the write loop. However, the read/verify loop has two separate entry points, one for soft error testing (in which the loop is preceded by a one-minute time delay), and the other for hard error testing. The read/verify loop begins with a call to the SETUP subroutine, to fetch the starting test pattern and reinitialize the base address and index.

With this initialization completed, the byte-by-byte comparisons begin. This consists of comparing the contents of each memory location against the test pattern that was written into it. If a mismatch is detected, the microprocessor calls an error subroutine, to print out the pertinent information – bad address, expected pattern and the pattern read. The rest of the read/verify loop is identical to the bottom of the write loop, except that when all locations have been read, the read/verify loop increments the start pattern and checks for end-of-test (cycle count less than zero). If further testing is necessary, the microprocessor branches back to the beginning of the write loop.

The Diagnostic Program

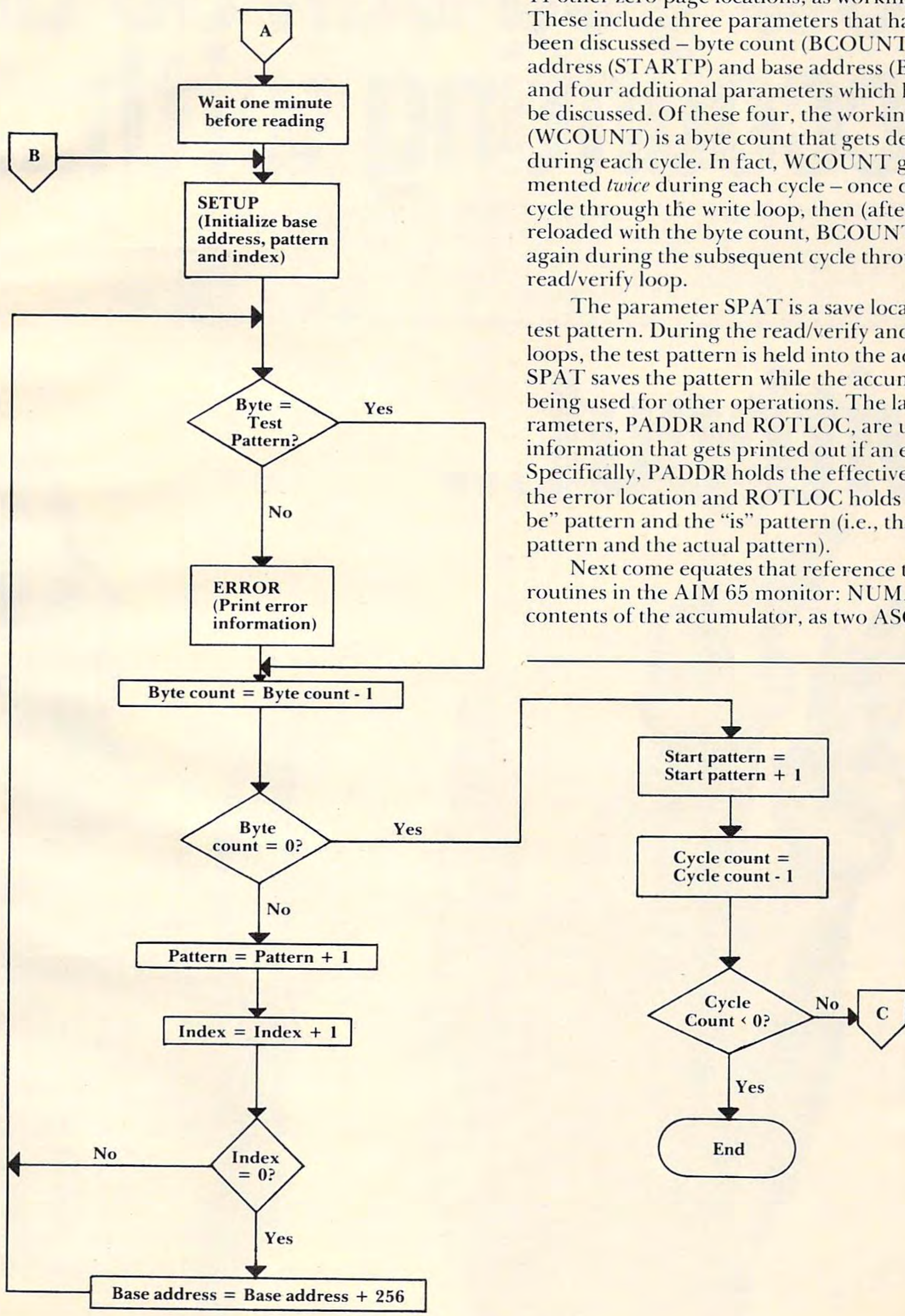
Now that you understand the criteria of the program and its sequences, we can look at the program itself. Program 1 shows the initialization and write sequence, the portion of the program that was flowcharted in Figure 1. Note that before executing the program, three parameters must be stored in zero page:

1. Store the *starting address* in locations 00 and 01, with the low byte in 00.

2. Store the *ending address* in locations 02 and 03, with the low byte in 02.

3. Select soft error testing or hard error testing by storing a value of 00 or 01, respectively, in location 04.

Figure 2: Read/Verify Sequence



Besides these five locations, the program uses 11 other zero page locations, as working storage. These include three parameters that have already been discussed – byte count (BCOUNT), starting address (STARTP) and base address (BADDR) – and four additional parameters which have yet to be discussed. Of these four, the working byte count (WCOUNT) is a byte count that gets decremented during each cycle. In fact, WCOUNT gets decremented *twice* during each cycle – once during a cycle through the write loop, then (after being reloaded with the byte count, BCOUNT) once again during the subsequent cycle through the read/verify loop.

The parameter SPAT is a save location for the test pattern. During the read/verify and write loops, the test pattern is held into the accumulator; SPAT saves the pattern while the accumulator is being used for other operations. The last two parameters, PADDR and ROTLOC, are used to hold information that gets printed out if an error occurs. Specifically, PADDR holds the effective address of the error location and ROTLOC holds the "should be" pattern and the "is" pattern (i.e., the expected pattern and the actual pattern).

Next come equates that reference three subroutines in the AIM 65 monitor: NUMA prints the contents of the accumulator, as two ASCII charac-

Now you can do all accounting with...

without...

the filing, typing and

Silicon Office is the latest microcomputer oftware program from the Bristol Software Factory.

Designed specifically for use with the ommodore PET 8096, it'll help you run your office vith the minimum amount of effort and maximum fficiency.

Think of it like three normal software packages n one, each separate package totally interactive with ne other.

For around $7,000, you can have the complete lectronic office, the solution to practically all your usiness problems. The price includes Commodore ardware, a high quality daisy wheel printer and ilicon Office software.

Silicon Office is made up from a flexible nformation management system which lets you create and maintain an extensive filing arrangement. Allowing you to search quickly through your records, making cross references between files in order to gain the facts you require.

A highly sophisticated word processing program allows you to generate letters, documents and reports. Letting secretaries get on with the more important tasks.

And a fully comprehensive calculator means you can handle all the number crunching you're ever likely to do in a business situation. Leaving the accounts department to concentrate on more profitable things.

But that's not all by any means.

Silicon Office also has a special programmability feature which means you or your dealer can expand and tailor the Silicon Office program to your business.

When Silicon Office is used in an everyday business situation, certain command sequences are inevitably repeated. By writing short, very simple programs which are entered into the computer's memory, Silicon Office can perform the necessary tasks, automatically.

And last, but by no means least is an optional communications facility.

It doesn't take much imagination to see the potential of Silicon Office in virtually any line of business.

So to get a better grasp, send away for our brochure. It'll only cost you a stamp. And it could save you a fortune. Or talk to your local Commodore dealer who has all the facts at his fingertips.

You'll soon see how you're much better off with Silicon Office. Than without.

SILICON OFFICE

I can't wait to get my hands on a free copy of the Silicon Office brochure.

Name____________________

Position____________________

Company____________________

Address____________________

A/CMI

I own a Commodore PET (Please tick box) YES ☐ NO ☐

BSF Send to: The Bristol Software Factory, c/o Associated Marketing Systems Inc., 55 Central Drive, Farmingdale, New York NY 11735

SILICON OFFICE

Program 1: Source Code for Initialization and Write Sequences

```
HDE ASSEMBLER REV 2.2

ADDR   OBJECT     LABEL  SOURCE

2000              ; THIS PROGRAM TESTS MEMORY FOR BOTH HARD AND
2000              ; SOFT ERRORS.
2000              ; BEFORE EXECUTING, STORE THE FOLLOWING
2000              ; PARAMETERS IN MEMORY:
2000              ;  LOCS. 00 AND 01 = STARTING ADDRESS
2000              ;  LOCS. 02 AND 03 = ENDING ADDRESS
2000              ;  LOC. 04 = HARD ERROR (01) OR SOFT ERROR (00)
2000              ; THE PROGRAM RETURNS TO THE MONITOR WHEN DONE.

2000              ; USER-SUPPLIED PARAMETERS

2000                     *=0
0000              START  *=*+2            ; STARTING ADDR
0002              END    *=*+2            ; ENDING ADDR
0004              HARD   *=*+1            ; HARD/SOFT ERROR TEST SELECT

0005              ; EQUATES FOR WORKING STORAGE IN ZERO PAGE

0005              BCOUNT *=*+2            ; BYTE COUNT
0007              WCOUNT *=*+2            ; WORKING BYTE COUNT
0009              STARTP *=*+1            ; STARTING PATTERN
000A              BADDR  *=*+2            ; BASE ADDRESS
000C              SPAT   *=*+1            ; PATTERN IS SAVED HERE
000D              PADDR  *=*+2            ; ERROR BYTE ADDRESS
000F              ROTLOC *=*+1            ; WORKING BYTE FOR PRINT ROUTINE

0010              ; AIM 65 MONITOR SUBROUTIINES

0010              NUMA   =$EA46           ; PRINT A, AS TWO ASCII CHARS.
0010              OUTPRI =$F000           ; OUTPUT A TO PRINT BUFFER
0010              CRLOW  =$EA13           ; RESET DISPLAY & PRINTER

0010              ; INITIALIZATION SEQUENCE

0010                     *=$200
0200   A2 FF      INIT   LDX #255         ; CYCLE COUNT = 255
0202   A9 00             LDA #0           ; STARTING PATTERN = 0
0204   85 09             STA STARTP
0206   38                SEC              ; BYTE COUNT = END ADDR. -
0207   A5 02             LDA END          ;  START ADDR. + 1
0209   E5 00             SBC START
020B   85 05             STA BCOUNT
020D   A5 03             LDA END+1
020F   E5 01             SBC START+1
0211   85 06             STA BCOUNT+1
0213   E6 05             INC BCOUNT
0215   D0 02             BNE MLOOP
0217   E6 06             INC BCOUNT+1
0219   20 8C 02   MLOOP  JSR SETUP        ; INITIALIZE COUNT, ADDR, INDEX
021C              ; WRITE SEQUENCE

021C   91 0A      WRITE  STA (BADDR),Y    ; WRITE PATTERN INTO NEXT BYTE
021E   85 0C             STA SPAT         ;  AND SAVE PATTERN
0220   38                SEC              ; DECREMENT BYTE COUNT
0221   A5 07             LDA WCOUNT
0223   E9 01             SBC #1
0225   85 07             STA WCOUNT
0227   A5 08             LDA WCOUNT+1
0229   E9 00             SBC #0
022B   85 08             STA WCOUNT+1
022D   D0 0A             BNE INCP         ; BYTE COUNT = 0?
022F   C5 07             CMP WCOUNT
0231   D0 06             BNE INCP
0233   C5 04             CMP HARD         ;  YES.  GO READ/VERIFY
0235   D0 23             BNE READH
0237   F0 0C             BEQ READS
```

ROCKWELL Microcomputers from Excert, Inc.

THE AIM 65/40
Single Board or Smorgasbord

- A full size terminal style keyboard w/8 special function keys
- A smart, 40 character display with its own microprocessor
- A 40 column printer w/text and graphic output
- Up to 64K of on-board RAM and ROM
- On-board interfaces include RS232, dual audio cassette and 2 user I/O R6522 devices
- Firmware includes interactive monitor and text editor w/options of Assembler, BASIC, FORTH and PL/65

THE AIM 65
Take-Out Order

- A full size terminal style keyboard w/3 special function keys
- A 20 character display
- A 20 column printer w/text and graphic output capability
- Up to 4K RAM and 20K ROM on-board
- On-board interfaces include 20MA TTY, dual audio cassette and 1 user I/O R6522 device
- Firmware includes interactive monitor and text editor w/options of Assembler, BASIC, FORTH, PASCAL, & PL/65

And if the above isn't enough,
Try the RM65 — a product line filled with embellishments including:

32K DRAM Board	ACIA Board	Prototype cards
CRT Controller	IEEE-488Board	Adaptor Buffer Modules
Floppy Disk Controller	CPU/SBC Board	General Purpose I/O Board
PROM Programmer	4-16 Slot Card Cages	PROM/ROM Board

NEW LOWER PRICES AND A CASH DISCOUNT* TO BOOT!

A65/40-16 (16K RAM)	$1225
A65/40-32 (32K RAM)	$1295
A65/40-A (Assembler)	$ 85
A65/40-B (BASIC)	$ 65

A65-1 (1K RAM)	$420
A65-4 (4K RAM)	$445
A65-4B (4K RAM w/BASIC)	$495
A65-PS (PASCAL)	$100
A65-F (FORTH)	$ 65
A65-A (Assembler)	$ 35

Mail Order to:

Educational Computer Division
EXCERT INCORPORATED

- SALES
- SERVICE
- INSTALLATION
- CONSULTING

P.O Box 8600
White Bear Lake, MN 55110
(612) 426-4114

Higher quantities quoted upon request, COD's accepted, shipping will be added. *Deduct 5% cash discount on prepaid orders. Minnesota residents add 5% sales tax. Prices subject to change without notice.

```
LINE#    ADDR   OBJECT      LABEL   SOURCE

01-0680  0239   A5 0C       INCP    LDA SPAT           ;  NO.  GET PATTERN
01-0690  023B   18                  CLC                ;   AND INCREMENT IT
01-0700  023C   69 01               ADC #1
01-0710  023E   C8                  INY                ; INCREMENT INDEX
01-0720  023F   D0 DB               BNE WRITE          ; INDEX = 0?
01-0730  0241   E6 0B               INC BADDR+1        ;  YES.  ADD 256 TO BASE ADDRESS
01-0740  0243   D0 D7               BNE WRITE          ;   AND GO WRITE TO NEXT BYTE
```

ters; OUTPRI sends one character to the print buffer; CRLOW initializes the display and printer to their "start" positions.

The rest of Program 1 shows the source code for the initialization sequence and the write loop. The programming is straightforward, so you should have no problem following it if you studied the flowchart in Figure 1. Note that the write loop is terminated when the byte count has been decremented to zero. At that time, we interrogate the contents of the user-specified parameter HARD (location $04), and branch to the read/verify sequence, at either READS (if HARD contains zero) or READH (if HARD contains a nonzero value).

The read/verify sequence, shown in Program 2, also follows its earlier flowchart (Figure 2), and

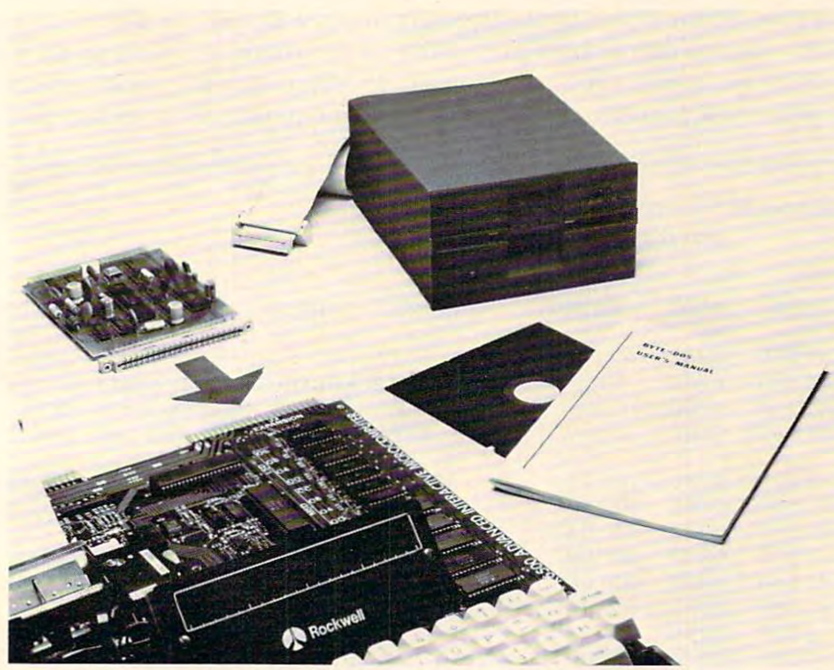
Program 2: Source Code for Read/Verify Sequence

```
LINE#    ADDR   OBJECT      LABEL   SOURCE

01-0760  0245               ; READ/VERIFY SEQUENCE.  ENTER HERE FOR SOFT
01-0770  0245               ; ERROR TESTING

01-0790  0245   8A          READS   TXA                ; SAVE X (CYCLE COUNT) ON STACK
01-0800  0246   48                  PHA
01-0810  0247               ; WAIT ONE MINUTE BEFORE BEGINNING TO READ
01-0820  0247   A9 C8       DELAY1 LDA #200            ; EXECUTION COUNT = 200
01-0830  0249   A2 A5       D300    LDX #$A5           ; LOAD X AND Y FOR A 300 MS. DELAY
01-0840  024B   A0 EA               LDY #$EA
01-0850  024D   CA          WAIT    DEX
01-0860  024E   D0 FD               BNE WAIT           ; LOOP UNTIL X = 0
01-0870  0250   88                  DEY
01-0880  0251   D0 FA               BNE WAIT           ; LOOP UNTIL Y = 0
01-0890  0253   38                  SEC                ; DECREMENT TIMING BYTE
01-0900  0254   E9 01               SBC #1
01-0910  0256   D0 F1               BNE D300           ; LOOP UNTIL A = 0
01-0920  0258   68                  PLA
01-0930  0259   AA                  TAX                ; RESTORE CYCLE COUNT
01-0940  025A               ; ENTER HERE FOR HARD ERROR TESTING
01-0950  025A   20 8C 02    READH   JSR SETUP          ; REINITIALIZE PARAMETERS
01-0960  025D   D1 0A       COMP    CMP (BADDR),Y      ; BYTE = TEST PATTERN?
01-0970  025F   85 0C               STA SPAT
01-0980  0261   F0 03               BEQ DECBC
01-0990  0263   20 A1 02            JSR ERROR          ;  NO. PRINT ERROR MESSAGE
01-1000  0266   38          DECBC   SEC                ;  YES.  DECREMENT BYTE COUNT
01-1010  0267   A5 07               LDA WCOUNT
01-1020  0269   E9 01               SBC #1
01-1030  026B   85 07               STA WCOUNT
01-1040  026D   A5 08               LDA WCOUNT+1
01-1050  026F   E9 00               SBC #0
01-1060  0271   85 08               STA WCOUNT+1
01-1070  0273   D0 04               BNE INCP1          ; BYTE COUNT = 0?
01-1080  0275   C5 07               CMP WCOUNT
01-1090  0277   F0 0B               BEQ DECCC
01-1100  0279   A5 0C       INCP1   LDA SPAT           ;  NO.  GET PATTERN
01-1110  027B   69 01               ADC #1             ;   AND INCREMENT IT
01-1120  027D   C8                  INY                ; INCREMENT INDEX, TOO
01-1130  027E   D0 DD               BNE COMP           ; INDEX = 0?
01-1140  0280   E6 0B               INC BADDR+1        ;  YES.  ADD 256 TO BASE ADDRESS
01-1150  0282   D0 D9               BNE COMP           ;   AND GO COMPARE NEXT BYTE
01-1160  0284   E6 09       DECCC   INC STARTP         ; INCREMENT START PATTERN
01-1170  0286   CA                  DEX                ; DECREMENT CYCLE COUNT
01-1180  0287   E0 FF               CPX #$FF           ; COUNT CYCLE NEGATIVE?
01-1190  0289   D0 8E               BNE MLOOP
01-1200  028B   00                  BRK                ;  YES.  RETURN TO MONITOR
```

DOS FOR AIM-65®: $499.00

COMPLETE!

INSTANT EASY ACCESS TO YOUR AIM-65 PROGRAMS!
MANIPULATE OBJECT FILES AT THE TOUCH OF A KEY.
NEW BYTE-DOS DISC OPERATING SYSTEM.
153K BYTES ON-LINE. INEXPENSIVELY!



BYTE–DOS COMMANDS

- **FORMAT** - Prepares New Disc
- **BAD SECTOR SCAN** - QC's Disc
- **DUMP** - RAM File to Disc
- **LOAD** - Disc File to Ram
- **LIST** - Prints Disc File Names
- **ERASE** - Eliminate a File
- **UNERASE** - File Recovery
- **RENAME** - Rename a File
- **COPY** - Copy 1 File
- **TRANSFER** - Copy Complete Disc
- **KOMPRESS** - Optimizes Disc Space

AND MORE!

IT'S EASY AND FUN TO USE!

BYTE MICROSYSTEMS
CORPORATION
1477 ELKA AVENUE, SAN JOSE, CA 95129 408/446/0559

- *BYTE-DOS OPERATES WITH THE AIM-65 MONITOR, BASIC, ASSEMBLER, EDITOR, PL/65 AND FORTH. ACCESS IS THROUGH PROGRAM I/O AND F1-F3 KEYS. BYTE-DOS SUPPORTS ONE OR TWO 5¼" OR 8" FLOPPYS!*
- *BYTE-DOS $499 SYSTEM INCLUDES DISC CONTROLLER CARD, TEAC FD-50A DISC DRIVE (153K FORMATTED BYTES), BYTE-DOS SOFTWARE SYSTEM, CABLES, CONNECTORS, MANUALS. COMPLETE! JUST PLUG IT TOGETHER AND USE!*

AIM-65 is a trademark of Rockwell International

master charge THE INTERBANK CARD
VISA

SEND ME THE FULL STORY!

Name ____________________
Company ____________________
Address ____________________
City ____________ State ______ Zip ________
Telephone ______________ ☐ home ☐ work

☐ I own an AIM-65.
☐ I'm thinking of buying an AIM-65.
☐ Send full BYTE-DOS Data.

needs no additional description. However, you may be interested in the one-minute time delay routine that gets executed if you are testing for soft errors. This routine, DELAY1, generates the one-minute delay by executing a 300-millisecond delay routine (D300) 200 times! Readers who are interested in the details of this and other delay routines are referred to my book *6502 Software Design* (Howard W. Sams & Co., 1980). Because the D300 uses the X Register – which holds our program's cycle count – the contents of that register must be saved on the stack while the time delay is being generated.

The final program, Program 3, shows the source code for the set-up subroutine (SETUP), followed by the error printout subroutine (ERROR). As was mentioned previously, if the read/verify sequence reads a pattern that does not match the expected pattern, the error subroutine prints out three items of information: the address of the offending location, the expected pattern (the "S/B" pattern) and the pattern that is actually read (the "IS" pattern). As an aid to identifying faulty *bits* within a memory location, the S/B and IS patterns are printed in a binary representation. To do this, ERROR calls a second subroutine (BINARY) that left-rotates the contents of a working zero-page location, ROTLOC, eight times. After each rotate operation, BINARY outputs an ASCII 1 or ASCII 0 to the printer.

Figure 3 shows the kind of listing that the ERROR subroutine produces. To generate this listing on my AIM 65, I selected three locations within the monitor ROM – LOCATIONS $E000, $E001, and $E002 – knowing that a read/verify test on ROM will always fail. As you can see, the printout has been retyped for publication, because the AIM 65 printer output does not reproduce very well.

Program 3: Source Code for Set-Up and Error Subroutines

```
LINE#    ADDR   OBJECT     LABEL  SOURCE             PAGE 0004

01-1230  028C
01-1250  028C              ; THIS SUBROUTINE TRANSFERS THE BYTE COUNT TO
01-1260  028C              ; THE WORKING BYTE COUNT, SETS BASE ADDR =
01-1270  028C              ; START ADDR, FETCHES THE PATTERN, AND SETS INDEX = 0

01-1290  028C   A5 05      SETUP  LDA BCOUNT         ; INITIALIZE WORKING BYTE COUNT
01-1300  028E   85 07             STA WCOUNT
01-1310  0290   A5 06             LDA BCOUNT+1
01-1320  0292   85 08             STA WCOUNT+1
01-1330  0294   A5 00             LDA START          ; TO BEGIN, BASE ADDR = START ADDR
01-1340  0296   85 0A             STA BADDR
01-1350  0298   A5 01             LDA START+1
01-1360  029A   85 0B             STA BADDR+1
01-1370  029C   A5 09             LDA STARTP         ; INITIALIZE PATTERN
01-1380  029E   A0 00             LDY #0             ; INDEX = 0
01-1390  02A0   60                RTS

01-1410  02A1              ; PRINT ERROR INFORMATION
01-1420  02A1              ;  BAD ADDRESS (HEX)
01-1430  02A1              ;  S/B PATTERN (BINARY)
01-1440  02A1              ;  IS PATTERN (BINARY)

01-1460  02A1   98         ERROR  TYA                ; SAVE Y ON STACK
01-1470  02A2   48                PHA
01-1480  02A3   18                CLC                ; CALCULATE PRINT ADDRESS
01-1490  02A4   65 0A             ADC BADDR
01-1500  02A6   85 0D             STA PADDR
01-1510  02A8   A9 00             LDA #0
01-1520  02AA   65 0B             ADC BADDR+1
01-1530  02AC   85 0E             STA PADDR+1
01-1540  02AE   20 13 EA          JSR CRLOW          ; RESET DISPLAY AND PRINTER
01-1550  02B1   A0 00             LDY #0             ; PRINT LOC LINE
01-1560  02B3   B9 0B 03   LOOP1  LDA LINE1,Y
01-1570  02B6   20 00 F0          JSR OUTPRI
01-1580  02B9   C8                INY
01-1590  02BA   C0 07             CPY #7
01-1600  02BC   D0 F5             BNE LOOP1
01-1610  02BE   A5 0E             LDA PADDR+1
01-1620  02C0   20 46 EA          JSR NUMA
01-1630  02C3   A5 0D             LDA PADDR
```

```
ADDR   OBJECT     LABEL   SOURCE

02C5   20 46 EA           JSR NUMA
02C8   20 13 EA           JSR CRLOW
02CB   B9 0B 03   LOOP2   LDA LINE1,Y       ; PRINT S/B LINE
02CE   20 00 F0           JSR OUTPRI
02D1   C8                 INY
02D2   C0 0F              CPY #15
02D4   D0 F5              BNE LOOP2
02D6   A5 0C              LDA SPAT
02D8   20 F6 02           JSR BINARY
02DB   20 13 EA           JSR CRLOW
02DE   A0 0F              LDY #LINE3-LINE1
02E0   B9 0B 03   LOOP3   LDA LINE1,Y       ; PRINT IS LINE
02E3   20 00 F0           JSR OUTPRI
02E6   C8                 INY
02E7   C0 17              CPY #23
02E9   D0 F5              BNE LOOP3
02EB   68                 PLA
02EC   48                 PHA
02ED   A8                 TAY
02EE   B1 0A              LDA (BADDR),Y
02F0   20 F6 02           JSR BINARY
02F3   68                 PLA
02F4   A8                 TAY
02F5   60                 RTS

02F6                      ; PRINT PATTERN IN BINARY FORMAT

02F6   A0 08      BINARY  LDY #8
02F8   85 0F              STA ROTLOC
02FA   26 0F      ROTATE  ROL ROTLOC        ; IS BIT A 1 OR A 0?
02FC   90 04              BCC SBZERO
02FE   A9 31              LDA #'1'          ; IT'S A 1
0300   D0 02              BNE PBIT
0302   A9 30      SBZERO  LDA #'0'          ; IT'S A 0
0304   20 00 F0   PBIT    JSR OUTPRI
0307   88                 DEY
0308   D0 F0              BNE ROTATE
030A   60                 RTS

030B                      ; MESSAGES FOR ERROR SUBROUTINE

030B   20 20      LINE1   .BYT '  LOC.='
0312   20 20      LINE2   .BYT '     S/B='
031A   20 20      LINE3   .BYT '      IS='
0322                      .END

ERRORS = 0000   END OF ASSEMBLY = 0321
```

Execution Times For The Test Program

Having seen the source code listings, you now know that the test program occupies slightly more than a page of memory; to be exact, it occupies 290 bytes. However, you're probably more curious about how long the program takes to execute – which translates to how long you will have to stand around before you know whether or not the memory is "bug-free."

In testing for *hard errors*, the program takes about 25 seconds to test 1024 (or 1K) bytes, if your computer has a 1-MHz clock. This means that it will take six minutes and 45 seconds to test a 16K-byte board.

In testing for *soft errors*, the program introduces a one-minute time delay between each write and read/verify sequence. And since the program executes 256 cycles, soft error testing will always take two hours and 16 minutes more than hard error testing, *regardless* of how much memory is being tested! Therefore, it will take roughly two hours, 22 minutes and 45 seconds to test a 16K board for soft errors. Clearly, it's best to check for hard errors first, then re-check for soft errors if you're still having problems.

Figure 3: Sample Error Printout

```
LOC.=E000
  S/B=00000000
    IS=01000110
LOC.=E001
  S/B=00000001
    IS=01010010
LOC.=E002
  S/B=00000010
    IS=01001111
LOC.=E000
  S/B=00000001
    IS=01000110
LOC.=E001
  S/B=00000010
    IS=01010010
LOC.=E002
  S/B=00000011
    IS=01001111
LOC.=E000
  S/B=00000010
    IS=01000110
LOC.=E001
  S/B=00000011
    IS=01010010
LOC.=E002
  S/B=00000100
    IS=01001111
        .
        .      (253 more sets of listings follow.)
        .
```

©

NEECO

WHY BUY FROM THE BEST?

Service... Support... Software...

commodore

16K B (16K RAM-40 Column) - Lim. Qty	$ 995
32K B (32K RAM-40 Clm.) - Lim. Qty	$1295
4016 (16K RAM 4.0 Basic-40 Clm.)	$ 995
4032 (32K RAM 4.0 Basic-40 Clm.)	$1295
8032 (32K RAM 4.0 Basic-80 Clm.)	$1495
8050 Dual Disk (1 Meg Storage)	$1795
4040 Dual Disk (343K Storage)	$1295
8010 IEEE Modem	$ 280
C2N Cassette Drive	$ 75
CBM - IEEE Interface Cable	$ 40
IEEE - IEEE Interface Cable	$ 50
VIC 20 Home/Personal Computer	$ 295

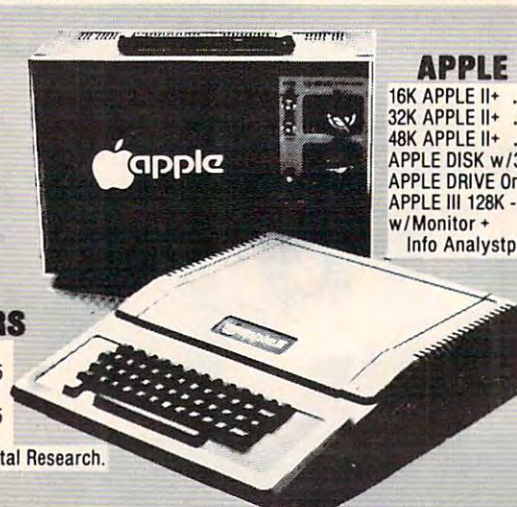
CALL NEECO FOR ANY OF YOUR COMMODORE COMPUTER NEEDS

NEC SPINWRITER PRINTERS

5530 (Parallel)	$3055
5510 (Serial)	$3055
5520 (KSR-Serial)	$3415
Tractor Option	$ 225

EPSON PRINTERS

MX-80 PRINTER	$ 645
MX-80 FT	$ 745
MX-100	$ 945
MX-70	$ 459
INTERFACE CARDS	
8141 (RS-232)	$ 75
8150 (2K Buffered RS-232)	$ 150
8161 (IEEE 488)	$ 55
8131 (Apple Card)	$ 85
8230 (Apple Card)	$ 25
8220 (TRS-80 Cable)	$ 35



APPLE

16K APPLE II+	$1330
32K APPLE II+	$1430
48K APPLE II+	$1530
APPLE DISK w/3.3 DOS	$ 650
APPLE DRIVE Only	$ 490
APPLE III 128K - In Stock! w/Monitor + Info Analystpak	$4740

DIABLO 630 PRINTER

DIABLO 630 - Serial - RS-232	$2710
Tractor Option	$ 250

AMDEK MONITORS

Video 100 12" B+W	$ 179
Video 300 12" Green	$ 249
Color I 13" Low Res	$ 449
Color II 13" High Res	$ 999

INTERTEC COMPUTERS

64K Superbrain (360 Disk Storage), CP/M™	$3495
64K QD Superbrain (700K Disk Storage), CP/M™	$3995

*CP/M is a registered trademark of Digital Research.

ATARI COMPUTERS

Atari 400 (16K RAM)	$ 399
Atari 800 (32K RAM) - good thru 8/31	$1080
Atari 410 RECORDER	$ 89.95
Atari 810 DISK DRIVE	$ 599.95

NEECO carries all available ATARI Software and Peripherals.

PROFESSIONAL SOFTWARE

WordPro 1 8K	$ 29.95
WordPro 3 (40 Clm.)16K	$ 199.95
WordPro 3+	$ 295
WordPro 4 (80 Clm.) 32K	$ 375
WordPro 4+	$ 450

JUST A SAMPLE OF THE MANY PRODUCTS WE CARRY, CALL US FOR OUR NEW 60-PAGE CATALOG.
WE WILL MATCH SOME ADVERTISED PRICES ON CERTAIN PRODUCTS LISTED UNDER SIMILAR "IN STOCK" CONDITIONS.

NEECO

679 HIGHLAND AVE.
NEEDHAM, MA 02194

(617) 449-1760
Telex: 951021

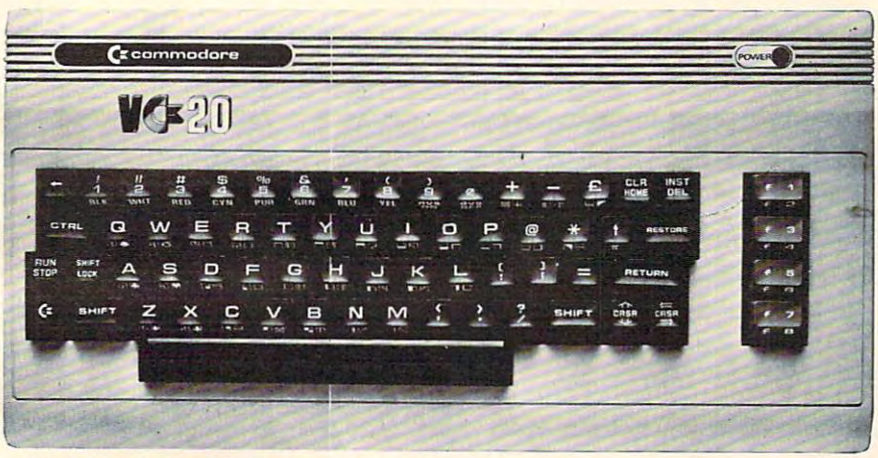
MON-FRI 9:00 - 5:00

MasterCharge and VISA Accepted

NEECO INTRODUCES THE CBM VIC-20 COMPUTER!

Commodore breaks the computer price barrier —

$299.95



CBM VIC-20 PERSONAL COMPUTER

VIC-20 SPECIFICATIONS

- 8 colors - built in
- sound generation - built in
- programmable function keys
- 5K memory expandable to 32K
- standard PETBASIC in ROM
- full-size typewriter keyboard
- graphics character set
- plug-in program/memory cartridges
- low-priced peripherals
- joystick/paddles/lightpen
- self-teaching materials

* WORKS WITH ANY HOME TELEVISION

$74.95

C2N TAPE CASSETTE DRIVE

CALL NEECO TODAY FOR ADDITIONAL VIC-20 INFORMATION . . .
As the CBM VIC-20 is a "new" product, prices and specifications are subject to change w/o notice.

NEECO

NEECO WILL MATCH ANY ADVERTISED PRICE ON CBM EQUIPMENT FROM ANY OTHER COMPANY WITH PRODUCT IN STOCK.

679 HIGHLAND AVE.
NEEDHAM, MA 02194

(617) 449-1760
Telex: 951021

MON-FRI 9:00 - 5:00
MasterCard and VISA Accepted

Here's a game that's easy to program, short, and fun. There are versions of the game here for Atari, PET/CBM, Apple, and OSI.

Shooting Stars

Frank Cohen
Pacific Palisades, CA

"So what does your computer do?" I remember my parents asking me that question over and over again when I was a teenager, just getting into computers. I couldn't begin to answer a question like that. So, instead, I wrote a simple demo program to show them what was possible. After an hour of programming with my new O.S.I. Superboard II, I came up with Shooting Stars.

I originally saw a program like this on a friend's computer system and thought it would be easy to convert to my computer. And indeed it was.

The object of the game is to clear the screen of as many targets as possible using the fewest missiles. The number of targets is variable. When you first start the program it will clear the screen and print the welcome message. After a few seconds it will ask, "HOW MANY STARS?". Depending on how complex or how long a game you want to play, you can enter the number of targets you want to fire at. A suggested value is 30 to begin with. The program will then set up the star field and start the missile launcher.

To launch a missile, wait until the launcher passes under a star and hit the space bar. The number of missiles is unlimited. Your score is the ratio of missiles to targets destroyed. If you want to finish the game before you destroy all the missiles, press the A key. After you finish it will tell you how well you scored and ask if you want to play again. To play again leave another quarter under your computer and type, "Yes."

There are a number of areas where this program could be expanded. For example, add sound effects using the audio output port, make the number of missiles limited, or make the targets mobile. As the program is really very short when it has been condensed (using multiple instructions per line) it shouldn't take you a long time to add to Shooting Stars.

It's not a very complex program, but it does impress "non-computer" people. And it answers the question, "So, what does your computer do?" Well, at least for a while.

OSI Version

```
10 REM SHOOTING STARS V1.2
20 REM BY FRANK COHEN
30 REM BASED ON AN IDEA FROM ROB
   HOCKER
40 REM
100 REM INITIALIZE
110 X2=53989
120 X3=0
130 SC=0
140 S2=0
150 GOSUB1000
160 REM
170 REM PRINT GREETING
180 PRINT"WELCOME TO..."
190 PRINT:PRINT"          SHOOTING
    STARS"
200 FORI=1TO17:PRINT:NEXTI
210 REM
220 REM PLOT STARS
230 INPUT"HOW MANY STARS?";S
240 S1=S
250 GOSUB1000
260 X1=INT(RND(1)*480)
270 IF PEEK(X1+53381)=27 THEN260
280 POKEX1+53381,27
290 S=S-1
300 IFS>0THEN260
310 FORI=53405 TO 54141 STEP 32
320 FORJ=ITOI+8
330 IFPEEK(J)=27THENS1=S1-1
340 S5=S1
350 POKEI+J,32
360 NEXT J
370 NEXT I
375 REM
380 REM MOVE LAUNCHER
390 POKE 530,0
400 X3=0
410 POKEX2+32,248
420 POKEX2,32
430 X2=X2+1
440 IFX2>54012THEN POKEX2,32:X2=
    53989
450 REM
460 REM CHECK FOR WINN
470 IF S1<1THEN800
480 REM
490 REM READ KEYBOARD DIRECTLY
500 POKE530,1:POKE57088,253
510 IFPEEK(57088)=191THEN800
520 IFPEEK(57088)<>239THEN380
530 REM
540 REM FIRE A MISSILE
550 S2=S2+1
560 X4=X2-32
```

TAKE A HARD LOOK AT OUR ATARI SOFTWARE CATALOG.

Order your new Cybersoft ATARI 400/800 software catalog today. Just fill out the coupon, clip, and mail along with $1.00 per catalog ordered to Cybersoft, Box 505, Bellevue, WA 98009.

Name ________________
Address ________________
City ________________
State ________ Zip ________

Cybersoft™ presents more Grand Masters custom ATARI® programs.

Here's your chance to treat yourself and your ATARI to leading micro computer software excellence with new selections from our new catalog.

We have the "best of the best" programs from the Grand Masters of micro-computer software: Automated Simulations, Crystal, Swifty Software, Adventure International, Datasoft, Personal Software, and Dynacomp. All sold by mail. And, with the CYBERSOFT ironclad guarantee*.

Space Chase *(Swifty Software) 16K* Nifty eye-hand coordination tests . . . If you clear one galaxy of "planets" and avoid destruction at the hands of an alien ship you are rewarded by an attack by two aliens and then three. Game keeps score and displays high score. Colorful graphics and good playing. Cassette $14.95

Fastgammon™ *(Quality Software) 8K* The best of the computer backgammon games. You can repeat games with the same dice rolls to try different strategies. You roll dice or let computer roll for you. This machine language program challenges experienced and beginners alike. Underutilizes ATARI® graphics but playing quality more than makes up. Cassette $19.95

Introductory Specials! **K-Shoot-Out** *(K-Byte)* The exciting new ROM cartridge the ATARI soft world is buzzing about. Arcade quality, graphics and sounds. You manuever your rapid fire space age gunfighter through sector mazes eliminating droids as you go. The further you go the tougher the droids. Shades of the old west and the 21st century! Reg. $49.95. Special price $44.95!

(New!) **Rear Guard** *(Adventure International) 16K-T, 24 K-D* This space battle puts you in charge of a speeding jet skimming on alien surface battling waves of enemy vessels. Advanced features include running high score, two player option, advanced difficulty levels. Full uses of ATARI graphics and sounds. Superb horizontal scrolling. Intro price $17.95 tape, $22.95 disc.

(New!) **Shadow Hawk One** *(Horizon Simulations) 48K* Futuristic computer game of space faring piracy. Your warship Shadow Hawk One is all that's left of the Noble Free Space Confederation. You prey on the enemy empire's merchant fleet capturing raw materials which you can trade for better weaponry, shielding and missiles. 3-D game requires a full 48 K memory and it uses every bit in one of the most spectacular games ever released for ATARI. Retails for $49.95. Our price $44.95.

Crush, Crumble and Chomp *(Automated Simulations) 32K* Tired of destroying countless monsters? This one is for you. You are the monster. Pick from six. You may be the giant amphibian, Goshilla. Knock down the Golden Gate bridge or tip over the Empire State Building. But look out for the National Guard. You pick the goal and see if you can make it. Five objectives. Cassette $29.95

Bridge 2.0 *(Dynacomp) 24K* Now you can practice your bridge at home before you have to embarrass yourself at the neighbors. Bridge 2.0 bids (Goren) and plays both contract and duplicate bridge. It even doubles if you get carried away with your bidding. No graphics, but clearly arranged format makes playing easy. Cassette $17.95

Star Trek 3.5 *(Adventure International) 24K* Lots of color, lots of action as you hyperwarp through the quadrants in your search for Klingons. This program will satisfy the "trekkie" in us all. Cassette $14.95

Adventureland *(Adventure International) 24K* Designed for the novice at adventuring and a great way to get hooked on the world of adventure. As you make your way through an enchanted world you will encounter wild animals, spell-ridden critters and more. Your task is to avoid the perils as you try to collect the 13 lost treasures. Cassette $14.95

Mission Impossible *(Adventure International) 24K* Another adventure from the great Scott Adams. Beginning "Good morning, your mission is . . .", your task is to save a nuclear reactor from destruction. This adventure game is not easy. Cassette $14.95

For Your Business. With more top business programs coming.

File Manager 800 *(Synapse) 40K* The premier data base management system available for ATARI. Not a translation. File Manager fully utilizes the special keyboard of ATARI. It creates files, sorts data, prints lables to your specifications. The full documentation is clear and easily understood. We think this one is fully competitive with data base systems at several times the price. Disk, 825 Printer $94.95

Text Wizard™ *(Datasoft) 32K* ATARI owners have waited a long time for a high quality, full blown word processor. This easy-to-use and comparatively inexpensive program has received raves from users across the country. This program fully utilizes the unique ATARI keyboard and ease of cursor movement. Justifies right, left and center. Pagination. Word search and substitute. Diskette and ATARI 825, Centronics 737 or Epson MX-80 printer. $99.95

***CYBERSOFT Ironclad Guarantee.**

We fully guarantee the software we sell. If for any reason, you are not satisfied with your purchase, return the program within 30 days in its original packaging. We'll refund your money, no questions asked.

Our order system is as accurate and fast as our software. Just dial for our new catalog:

TOLL FREE
1-800-247-2000 EXT. 505

(In Iowa 1-800-362-2133, extension 505). Or, you can write to CYBERSOFT at P.O. Box 505 Bellevue, Washington 98009. VISA and MasterCard gladly accepted.

Include $2.00 handling charge per order. Washington residents add 6.6% sales tax.

cybersoft

```
570 X4=X4-32
580 IFPEEK(X4)=27THEN630
590 POKEX4+32,32:POKEX4,139
600 IFX4>53381THEN570
610 POKEX4,32:GOTO 380
620 REM
630 REM SCORE ONE
640 POKEX4+32,32
650 POKEX4,32
660 SC=SC+1
670 S1=S1-1
680 REM
690 REM DESTROY A STAR
700 RESTORE
710 FORI=1TO15
720 READZ:POKEX4,Z
730 NEXTI
740 DATA233,232,233,232,226,187,184
    ,185
750 DATA184,186,232,186,27,185,32
760 GOTO 380
800 REM
810 REM PRINT FINAL SCORE
820 GOSUB1000
830 PRINT"GREAT..."
840 PRINT:PRINT"      YOU SCORED ";
    (S5/S2)*100;" %"
850 PRINT:PRINT:INPUT"DO YOU WANT
    TO PLAY AGAIN";A$
860 POKE530,0
870 IFA$="YES"THEN10
880 STOP
1000 REM CLEAR SCREEN SUBROUTINE
1010 FORI=1TO32
1020 PRINT
1030 NEXTI
1040 RETURN
9999 END
```

Note: If you added Super-Cursor (**COMPUTE!**, December, 1981, #19) to your Superboard II, then the clear screen subroutine at 1000 is unnecessary. You can replace it with: PRINT CHR$(1),CHR$(2). This works only with Supercursor.

Atari Version

This is not a line-by-line translation of Mr. Cohen's Shooting Stars program but rather, a game programmed especially for the Atari which plays a similar game.

The object of the game is to destroy a number of shooting stars (you select how many). Your score is the percentage of stars hit versus shots fired. Press SPACE to fire.

The game is fully commented, so you can trace the execution of the program and modify it as you please. Note that this game uses a little-known Atari graphics mode. More applications of these four color text/graphics modes would be welcome.

```
100 REM ************************
110 REM |  ATARI SHOOTING STARS  |
120 REM ************************
150 REM ------------------
160 REM Generate playfield
170 REM Using 3-color IRG mode 4
180 REM Set up GRAPHICS 1
190 REM Text line at top of
200 REM screen
210 GRAPHICS 0:POKE 752,1:REM Disable cu
rsor
220 DLIST=PEEK(560)+256*PEEK(561)+4:REM
Display list
230 SCREEN=PEEK(88)+256*PEEK(89):SCREEN=
SCREEN+40:REM Screen memory
240 POKE DLIST-1,6+64:POKE DLIST+2,6:REM
 IRG 6=Graphics mode 1
250 FOR I=3 TO 24:POKE DLIST+I,4:NEXT I:
REM change mode 0 lines to IRG 4
260 SETCOLOR 0,6,6:REM Set COLOR 1 to vi
olet
270 POSITION 3,0:? #6;"SHOOTING STARS"
280 DIM C(6):REM HOLDS STARS
290 C(0)=42+128:REM Reverse-field asteri
sk
300 C(1)=20+64:REM [CTRL-T], Ball
310 C(2)=20+128+64:REM Reverse-field bal
l
320 C(3)=16+64:REM [CTRL-P], Club
330 C(4)=16+128+64:REM Reverse field clu
b
340 C(5)=96:REM [CTRL-,] diamond
350 C(6)=96+128:REM Reverse-field diamon
d
360 FOR I=1 TO 30:FOR J=1 TO 10*RND(1):S
OUND 0,I+10*RND(1),10,8:NEXT J:NEXT I:SO
UND 0,0,0,0:REM Sound effect
370 ? "{CLEAR}":POSITION 1,0:? "HOW MANY
 STARS";
380 TRAP 370:INPUT STARS:TRAP 0
390 IF STARS=0 THEN GRAPHICS 0:END
400 IF STARS>50 THEN ? "{CLEAR}|too many
 stars{A}|":FOR W=1 TO 300:NEXT W:GOTO 3
70
410 ? "{CLEAR}":POSITION 3,0:? "SHOOTING
 STARS"
420 REM Draw stars
430 FOR I=1 TO STARS
440 STAR=C(INT(6*RND(0)+1))
450 REM START is column where the star w
ill fall from, length is distance
460 START=INT(40*RND(0)):LENGTH=INT(18*R
ND(0))
```

DYNACOMP

Quality software for:*

ATARI — **TRS-80 (Level II)****
PET/CBM — **NORTH STAR*****
APPLE II Plus — **CP/M Disks/Diskettes**
OSBORNE-1 — **(See Availability box MBASIC/CBASIC)**
ALTAIR**** — **SUPERBRAIN*******

DYNACOMP OFFERS THE FOLLOWING

- Widest variety
- Guaranteed quality
- Fastest delivery
- Friendly service
- Free catalog
- Toll free order phone

CARD GAMES

NEW

BRIDGE MASTER (North Star only) — **Price: $21.95 Diskette**
If you liked DYNACOMP'S BRIDGE 2.0, you will absolutely love BRIDGE MASTER. BRIDGE MASTER is a comprehensive bridge program designed to provide hours of challenging competition. Bidding features include the Blackwood convention, Stayman convention, pre-emptive openings, and recognition of demand bids and jump-shift responses. After playing a specific hand, you may replay the same hand, with the option of switching cards with your computer opponents. This feature allows you to compare your bidding and playing skills to BRIDGE MASTER. Bonuses for game contracts and slams are awarded as in duplicate bridge. Doubled contracts are scored based upon a computer assigned vulnerability. A score card is displayed at the conclusion of each hand. The score card displays a summary of total hands played, total points scored, number of contracts made and set, and #s bids made. BRIDGE MASTER is clearly the best computer bridge program available.
DYNACOMP'S previous BRIDGE 2.0 customers may upgrade to BRIDGE MASTER for a nominal charge of $5.00 plus postage and handling (see ordering information box).

NEW

BACCARAT (Atari only) — **Price: $18.95 Cassette/$22.95 Diskette**
This is the European card game which is the favorite of the Monte Carlo jet set. Imagine yourself at the gaming table with 007 to your left and Goldfinger to your right. Learn and play BACCARAT at your leisure on the Atari. Contains full high resolution color graphics and matching sound. Runs in 16K. Requires one joystick.

NEW

GIN RUMMY (Apple diskette only) — **Price: $22.95 Diskette**
This is the best micro computer implementation of GIN RUMMY existing. The computer plays exceptionally well, and the HIRES graphics are superb. What else can be said?

NEW

POKER PARTY (Available for all computers) — **Price: $17.95 Cassette/$21.95 Diskette**
POKER PARTY is a draw poker simulation based on the book, POKER, by Oswald Jacoby. This is the most comprehensive version available for microcomputers. The party consists of yourself and six other (computer) players. Each of these players (you will get to know them) has a different personality in the form of a varying propensity to bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! Apple cassette and diskette versions require a 32 K (or larger) Apple II.

NEW

GO FISH (Available for all computers) — **Price: $14.95 Cassette/$18.95 Diskette**
GO FISH is a classic children's card game. The opponent is a friendly computer with user inputs that are simple enough for small children to easily master. The Apple and Atari versions employ high resolution graphics for the display of hands. A must for children!

NEW

BLACKJACK COACH (32K TRS-80 only) — **Price $29.95 Cassette/$33.95 Diskette**
BLAGKJACK COACH is both a game and an educational tool. With this program you may quantitatively test standard and special playing and betting methods, including the several card count schemes. You can simply play, play with the computer as a coach, or statistically test your method under long run automatic play. All the standard player choices are included: insurance, spliting pairs, double downs and surrender (optional). The computer analyzes the technique and provides detailed summary reports which statistically pinpoint the strengths and weaknesses of your play. Don't risk your money at the tables until you have practiced with BLACKJACK COACH!

THOUGHT PROVOKERS

MANAGEMENT SIMULATOR (Atari, North Star, OSBORNE and CP/M only) — **Price: $19.95 Cassette $23.95 Diskette**
This program is both an excellent teaching tool as well as a stimulating intellectual game. Based upon similar games played at graduate business schools, each player or team controls a company which manufacturers three products. Each player attempts to outperform his competitors by setting selling prices, production volumes, marketing and design expenditures etc. The most successful firm is the one with the highest stock price when the simulation ends.

FLIGHT SIMULATOR (Available for all computers) — **Price: $17.95 Cassette/$21.95 Diskette**
A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real airfoil. You can practice instrument approaches and navigation using radials and compass headings. The more advanced flyer can also perform loops, half-rolls and similar aerobatic maneuvers. Although this program does not employ graphics, it is exciting and very addictive. See the software review in COMPUTRONICS. Runs in 16K Atari.

VALDEZ (Available for all computers) — **Price: $15.95 Cassette/$19.95 Diskette**
VALDEZ is a computer simulation of supertanker navigation in the Prince William Sound/Valdez Narrows region of Alaska. Included in this simulation is a realistic and extensive 256 × 256 element map, portions of which may be viewed using the ship's alphanumeric radar display. The motion of the ship itself is accurately modelled mathematically. The simulation also contains a model for the tidal patterns in the region, as well as other traffic (outgoing tankers and drifting icebergs). Chart your course from the Gulf of Alaska to Valdez Harbor! See the software reviews in 80 Software Critique and Personal Computing.

BACKGAMMON 2.0 (Atari, North Star, OSBORNE and CP/M only) — **Price: $14.95 Cassette/$18.95 Diskette**
This program tests your backgammon skills and will also improve your game. A human can compete against a computer or against another human. The computer can even play against itself. Either the human or the computer can double or generate dice rolls. Board positions can be created or saved for replay. BACKGAMMON 2.0 plays in accordance with the official rules of backgammon and is sure to provide many fascinating sessions of backgammon play.

CHESS MASTER (North Star and TRS-80 only) — **Price: $19.95 Cassette/$23.95 Diskette**
This complete and very powerful program provides five levels of play. It includes castling, en passant captures and the promotion of pawns. Additionally, the board may be preset before the start of play, permitting the examination of "book" plays. To maximize execution speed, the program is written in assembly language (by SOFTWARE SPECIALISTS of California). Full graphics are employed in the TRS-80 version, and two widths of alphanumeric display are provided to accommodate North Star users. See review in onComputing.

FOREST FIRE! (Atari only) — **Price: $14.95 Cassette/$18.95 Diskette**
Using excellent graphics and sound effects, this simulation puts you in the middle of a forest fire. Your job is to direct operations to put out the fire while compensating for changes in wind, weather and terrain. Not protecting valuable structures can result in startling penalties. Life-like variables are provided to make FOREST FIRE! very suspenseful and challenging. No two games have the same setting and there are 3 levels of difficulty.

BLACK HOLE (Apple only) — **Price: $14.95 Cassette/$18.95 Diskette**
This is an exciting graphical simulation of the problems involved in closely observing a black hole with a space probe. The object is to enter and maintain, for a prescribed time, an orbit close to a small black hole. This is to be achieved without coming so near the anomaly that the tidal stress destroys the probe. Control of the craft is realistically simulated using side jets for rotation and main thrusters for acceleration. This program employs Hi-Res graphics and is educational as well as challenging.

NEW

SPACE EVACUATION! (Apple, Atari and TRS-80 only) — **Price: $15.95 Cassette/$19.95 Diskette**
Can you colonize the galaxy and evacuate the Earth before the sun explodes? Your computer becomes the ship's computer as you explore the universe to relocate millions of people. This simulation is particularly interesting as it combines many of the exciting elements of classic space games with the mystery challenge of ADVENTURE.

MONARCH (Atari only) — **Price: $11.95 Cassette/$15.95 Diskette**
MONARCH is a fascinating economic simulation requiring you to survive an 8-year term as your nation's leader. You determine the amount of acreage devoted to industrial and agricultural use, how much food to distribute to the populace and how much should be spent on pollution control. You will find that all decisions involve a compromise and that it is not easy to make everyone happy. Runs in 16K Atari.

CHOMPELO (Atari only) — **Price: $11.95 Cassette/$15.95 Diskette**
CHOMPELO is really two challenging games in one. One is similar to NIM; you must bite off part of a cookie, but avoid taking the poisoned portion. The other game is the popular board game REVERSI. It fully uses the Atari's graphics capability, and is hard to beat. This package will run on a 16K system.

AVAILABILITY

DYNACOMP software is supplied with complete documentation containing clear explanations and examples. Unless otherwise specified, all programs will run within 16K program memory space (ATARI requires 24K). Except where noted, programs are available on ATARI, PET, TRS-80 (Level II) and Apple (Applesoft) cassette and diskette as well as North Star single density (double density compatible) diskette. Additionally, most programs can be obtained on standard (IBM 3740 single density/double density compatible format) 8" CP/M floppy disks for systems running under MBASIC or CBASIC (for example, Altos, Xerox 820 and many others). 5¼" CP/M diskettes are available for the North Star and Osborne computer systems.

**ATARI, PET/CBM, NORTH STAR, CP/M, IBM, OSBORNE, SUPERBRAIN and XEROX are registered tradenames and/or trade marks.*

***Except where noted, all TRS-80 Model I software is available on cassette (only) for the TRS-80 Model III. Exceptions: VALDEZ, CRIBBAGE, GRAFIX, CHESSMASTER. TRS-80 diskettes are not supplied with either DOS or BASIC.*

****For most North Star disk-based systems. DYNACOMP presently does not support the new North Star Advantage.*

*****For Altair systems having Microsoft BASIC.*

******For SUPERBRAIN systems running under MBASIC or CBASIC (state which).*

AND MORE...

STARTREK 3.2 (Available for all computers) — **Price: $11.95 Cassette/$15.95 Diskette**
This is the classic Startrek simulation, but with several new features. For example, the Klingons now shoot at the Enterprise without warning while also attacking starbases in other quadrants. The Klingons also attack with both light and heavy cruisers and move when shot at! The situation is hectic when the Enterprise is besieged by three heavy cruisers and a starbase S.O.S. is received! The Klingons get even! See the software reviews in A.N.A.L.O.G., 80 Software Critique and Game Merchandising.

NEW

LIL' MEN FROM MARS (Atari only) — **Price: $19.95 Cassette/$23.95 Diskette**
Defend yourself! The little men from Mars are out to get you if you don't get them first. This is a hilarious high resolution animated graphics (arcade) game which exercises much of the Atari's power. Requires one joystick.

SPACE TILT (Apple and Atari only) — **Price: $10.95 Cassette/$14.95 Diskette**
Use the game paddles to tilt the plane of the TV screen to "roll" a ball into a hole in the screen. Sound simple? Not when the hole gets smaller and smaller! A built-in timer allows you to measure your skill against others in this habit-forming action game.

NEW

ESCAPE FROM VOLANTIUM (Atari only) — **Price: $15.95 Cassette/$19.95 Diskette**
Bring the action and excitement of an arcade into your home with ESCAPE FROM VOLANTIUM! To escape you must maneuver your space ship around obstacles and laser blast the dragon (without being eaten). If he is killed with a direct shot (not just a leg lopped off), a door opens to the outside. However, the door does not stay open indefinitely. If you fail to escape in time, the door closes and a new dragon appears. Sometimes you can smash through the door by repeatedly chipping away at it. Other times it is impervious. At the higher levels of play more obstacles and dragons appear, adding to the excitement. Uses high resolution graphics and sound. Runs in 16K.

ALPHA FIGHTER (Atari only) — **Price: $12.95 Cassette/$16.95 Diskette**
Two excellent graphics and action programs in one! ALPHA FIGHTER requires you to destroy the alien starships passing through your sector of the galaxy. ALPHA BASE is in the path of an alien UFO invasion; let five UFO's get by and the game ends. Both games require the joystick and get progressively more difficult the higher you score! ALPHA FIGHTER will run on 16K systems.

THE RINGS OF THE EMPIRE (Atari only) — **Price: $14.95 Cassette/$18.95 Diskette**
The empire has developed a new battle station protected by rotating rings of energy. Each time you blast through the rings and destroy the station, the empire develops a new station with more protective rings. This exciting game runs on 16K systems, employs extensive graphics and sound and can be played by one or two players.

INTRUDER ALERT (Atari only) — **Price: $14.95 Cassette/$18.95 Diskette**
This is a fast paced graphics game which places you in the middle of the "Dreadstar" having just stolen its plans. The droids have been alerted and are directed to destroy you at all costs. You must find and enter your ship to escape with the plans. Five levels of difficulty are provided. INTRUDER ALERT requires a joystick and will run on 16K systems.

NEW

MIDWAY (Atari only) — **Price: $14.95 Cassette/$18.95 Diskette**
MIDWAY is an exciting extension of the game of Battleship. It mixes the challenges of strategy and chance. Your opponent can be another human or the computer. Color graphics and sound are both included. Runs in 16K.

TRIPLE BLOCKADE (Atari only) — **Price: $14.95 Cassette/$18.95 Diskette**
TRIPLE BLOCKADE is a two-to-three player graphics and sound action game. It is based on the classic video arcade game which millions have enjoyed. Using the Atari joysticks, the object is to direct your blockading line around the screen without running into your opponent(s). Although the concept is simple, the combined graphics and sound effect lead to "high anxiety".

GAMES PACK I (Available for all computers) — **Price: $10.95 Cassette/$14.95 Diskette**
GAMES PACK I contains the classic computer games of BLACKJACK, LUNAR LANDER, CRAPS, HORSERACE, SWITCH and more. These games have been combined into one large program for ease in loading. They are individually accessed by a convenient menu. This collection is worth the price just for the DYNACOMP version of BLACKJACK.

GAMES PACK II (Available for all computers) — **Price: $10.95 Cassette/$14.95 Diskette**
GAMES PACK II includes the games CRAZY EIGHTS, JOTTO, ACEY-DUCEY, LIFE, WUMPUS and others. As with GAMES PACK I, all the games are loaded as one program and are called from a menu. You will particularly enjoy DYNACOMP's version of CRAZY EIGHTS.

Why pay $7.95 or more per program when you can buy a DYNACOMP collection for just $10.95?

MOON PROBE (Atari and North Star only) — **Price: $11.95 Cassette/$15.95 Diskette**
This is an extremely challenging "lunar lander" program. The user must drop from orbit to land at a predetermined target on the moon's surface. You control the thrust and orientation of your craft plus direct the rate of descent and approach angle. Runs in 16K Atari.

SPACE TRAP (Atari only, 16K) — **Price: $14.95 Cassette/$18.95 Diskette**
This galactic "shoot'em up" arcade game places you near a black hole. You control your spacecraft using the joystick and attempt to blast as many of the alien ships as possible before the black hole closes about you.

NEW

CHIRP INVADERS (PET/CBM only) — **Price: $14.95 Cassette/$18.95 Diskette**
CHIRP INVADERS is an addictive game using action graphics. A Federation space station must be reached before the Chirps conquer the Earth. Stationary obstacles, moving meteors, and the attacking Chirps must all be avoided for a successful journey. Good luck.

NEW

SUPER SUB CHASE (Atari only) — **Price: $19.95 Cassette/$23.95 Diskette**
SUPER SUB CHASE simulates a search and destroy mission. Set your course and keep an eye on the sonar readings as you hunt for the hidden submarine. Set the depth charge explosion depth and watch them sink towards the sub. This is an addictive game which takes advantage of the Atari's graphics and sound capabilities. One or two players. Joystick(s) required.

ADVENTURE

CRANSTON MANOR ADVENTURE (North Star and CP/M only) — **Price: $19.95 Diskette**
At last! A comprehensive Adventure game for North Star and CP/M systems. CRANSTON MANOR ADVENTURE takes you into mysterious CRANSTON MANOR where you attempt to gather fabulous treasures. Lurking in the manor are wild animals and robots who will not give up the treasures without a fight. The number of rooms is greater and the associated descriptions are much more elaborate than the current popular series of Adventure programs, making this game the top in its class. Play can be stopped at any time and the status stored on diskette. Not available in 5¼" CP/M format.

GUMBALL RALLY ADVENTURE (North Star only, 48K) — **Price: $21.95 Diskette**
Take part in this outlaw race from the east coast to the west coast. The goal is to find your way to the finish line while maintaining the highest possible speed. You may choose one of five cars available at the garage. The choice will affect your speed and range. Remember to take spare parts and don't get caught speeding!

NEW

UNCLE HARRY'S WILL (North Star only, 40K) — **Price: $24.95 Diskette**
Uncle Harry has died and has left you everything. However, he has neglected to mention where everything is! Instead, his will consists of a poem which contains clues. You will have to travel all over the United States both by car and on foot to solve the puzzle, and there are over 300 locations to probe. Be careful and watch out for red herrings!

SPEECH SYNTHESIS

DYNACOMP is now distributing the new and revolutionary TYPE-'N-TALK™ (TNT) speech synthesizer from Votrax. Simply connect TNT to your computer's serial interface, enter text from the keyboard and hear the words spoken. TNT is the easiest-to-program speech synthesizer on the market. It uses the least amount of memory and provides the most flexible vocabulary available anywhere!

TYPE-'N'-TALK. List price $375. DYNACOMP'S price $319.95 plus $5.00 for shipping and handling.

TALK TO ME (T'N'T Atari only, 24K) — **Price: $14.95 Cassette/$18.95 Diskette**
This program presents a superb tutorial on speech synthesis using the Atari 800 and TYPE 'N TALK™. TALK TO ME will illustrate normal word generation as well as phoneme generation. The documentation includes many helpful programming tips. TALK TO ME has been demonstrated on network (CBS) TV!

MISCELLANEOUS

CRYSTALS (Atari only) — **Price: $ 9.95 Cassette/$13.95 Diskette**
A unique algorithm randomly produces fascinating graphics displays accompanied with tones which vary as the patterns are built. No two patterns are the same, and the combined effect of the sound and graphics are mesmerizing. CRYSTALS has been used in local stores to demonstrate the sound and color features of the Atari. Runs in 16K Atari.

NORTH STAR SOFTWARE EXCHANGE (NSSE) LIBRARY
DYNACOMP now distributes the 23 volume NSSE library. These diskettes each contain many programs and offer an outstanding value for the purchase price. They should be part of every North Star user's collection. Call or write DYNACOMP for details regarding the contents of the NSSE collection.
Price: $9.95 each/$7.95 each (4 or more)
The complete collection may be purchased for $149.95.

NEW

5¼" DISKETTES (soft sectored/ten sectored) — **Price: $39.95/20 Diskettes**
As you might imagine, DYNACOMP purchases diskettes in large quantities and at wholesale prices. We want to pass the savings along to you!

BUSINESS and UTILITIES

NEW

MAILMASTER (Atari diskette only) — **Price: $39.95 Diskette**

MAILMASTER is a very versatile software package for managing and manipulating mail lists and mini data bases. Each disk can hold over 600 customer entries containing name, address, 38 letter key words and a phone number. The display is marked so that entries may be made and edited with ease. The status (e.g., disk space left, options, etc.) is shown at all times. Labels may be printed 1,2 or 3 up, and all sorting (zip code and alphabetic) is performed by a fast machine language program.

PERSONAL FINANCE SYSTEM (Atari and North Star only) — **Price: $39.95 Diskette**

PFS is a single diskette, menu-oriented system composed of ten different programs. Besides recording your expenses and tax deductible items, PFS will sort and summarize expenses by payee, and display information on expenditures by any of 26 user defined codes by month or by payee. PFS will even produce monthly bar graphs of your expenses by category! This powerful package requires only one disk drive, minimal memory (24K Atari, 32K North Star) and will store up to 600 records per disk (and over 1000 records per disk by making a few simple changes to the programs). You can record checks plus cash expenses so that you can finally see where your money goes and eliminate guesswork and tedious hand calculations. Contains high speed machine language sort. PFS has been demonstrated on network (CBS) TV!

FAMILY BUDGET (Apple and Atari only) — **Price: $34.95 Diskette**

FAMILY BUDGET is a very convenient financial record-keeping program. You will be able to keep track of cash and credit expenditures as well as income on a daily basis. You can record tax deductible items and charitable donations. FAMILY BUDGET also provides a continuous record of all credit transactions. You can make daily cash and charge entries to any of 21 different expense accounts as well as to 5 payroll and tax accounts. Data are easily retrieved giving the user complete control over an otherwise complicated (and unorganized!) subject.

INTELINK (Atari only) — **Price: $49.95 Diskette**

This software package contains a menu-driven collection of programs for facilitating efficient two-way communications through a full duplex modem (required for use). In one mode of operation you may connect to a data service (e.g., The SOURCE or MicroNet) and quickly load data such as stock quotations onto your diskette for later viewing. This greatly reduces "connect time" and thus the service charge. You may also record the complete contents of a communications session. Additionally, programs written in BASIC, FORTRAN, etc. may be built off-line using the support text editor and later "uploaded" to another computer, making the Atari a *very* smart terminal. Even Atari BASIC programs may be uploaded. Further, a command file may be built off-line and used later as controlling input for a time-share system. That is, you can set up your sequence of time-share commands and programs, and the Atari will transmit them as needed; batch processing. All this adds up to saving both connect time and your time.

NEW

PAYFIVE (Apple II plus diskette, two drives required) — **Price: $149.95**

This is an enormously flexible employee payroll system with extraordinarily good human engineering features. PAYFIVE prints checks and compiles the required federal, state and local forms for up to 148 employees. The pay methods may be hourly, salary, commission or any combination. There are multiple options for pay periods, and they also can be used in any combination. PAYFIVE includes *many* other features and comes extremely well documented with a 200 page manual. The manual may be purchased separately for $30, and that payment later applied to the software purchase.

SHOPPING LIST (Atari only) — **Price: $12.95 Cassette/$16.95 Diskette**

SHOPPING LIST stores information on items you purchase at the supermarket. Before going shopping, it will remind you of all the things you might need, and then display (or optionally print) your shopping list and the total cost. Adding, deleting, changing and storing data is very easy. Runs with 16K.

TAX OPTIMIZER (North Star only) — **Price: $59.95 Diskette**

The TAX OPTIMIZER is an easy-to-use, menu oriented software package which provides a convenient means for analyzing various income tax strategies. The program is designed to provide a quick and easy data entry. Income tax is computed by all tax methods (regular, income averaging, maximum and alternate minimum tax). The user may immediately observe the tax effect of critical financial decisions. TAX OPTIMIZER has been thoroughly field tested in CPA offices and comes complete with the current tax tables in its data files. TAX OPTIMIZER is tax deductible!

NEW

UTIL (Apple only, 48K) — **Price: $19.95 Diskette**

UTIL is a disk-oriented utility system which permits examining and changing of the contents of DOS 3.2 and 3.3 diskettes at the bit (nibble or byte) level. With UTIL you can easily examine the contents of a diskette sector by sector, restructure the sector pointers, reallocate sectors (e.g. bad sectors may be "hidden"), and perform many other sophisticated operations. For the experienced programmer.

NEW

TURNKEY AND MENU (Atari only) — **Price: $17.95 Diskette**

TURNKEY is a utility program which allows you to create autoboot/autorun diskettes easily. Simply load and run TURNKEY, load the program diskette to be modified, and answer the questions! The TURNKEY diskette also comes with DOS 2.0 and includes another program, MENU. MENU lists the contents of your diskette alphabetically, and permits the running of any BASIC program on the diskette by typing a single key. TURNKEY and MENU provide you with the ability to run any program on your diskette by simply turning on the computer and pressing a single key.

NEW

STOCKAID (Atari only) — **Price: $29.95 Diskette**

STOCKAID provides a powerful set of tools for stock market analysis. With STOCKAID you can display point and figure charts, as well as bar charts with oscillators. You can also examine long term moving averages and on-balance volume features. STOCKAID allows you to input daily data with a single diskette storage capability of 239 days × 16 stocks. Included are stock dividend and split adjustment capabilities. A very professional package!

NEW

SHAPE MAGICIAN (Apple II, 48K, diskette only) — **Price: $29.95**

At last! An utility for painlessly creating graphics shapes for the Apple. Create, edit and save up to 30 shapes which can then be used to develop arcade games or to simply enhance your programs. Add that professional touch!

EDUCATION

HODGE PODGE (Apple only, 48K Applesoft or Integer BASIC) — **Price: $14.95 Cassette/$18.95 Diskette**

Let HODGE PODGE be your child's teacher. Pressing any key on your Apple will result in a different and intriguing "happening" related to the letter or number of the chosen key. The program's graphics, color and sound are a delight for children from ages 1½ to 7. HODGE PODGE is a non-intimidating teaching device which brings a new dimension to the use of computers in education. See the excellent reviews of this very popular program in INFOWORLD and SOFTALK.

NEW

TEACHERS' AIDE (Atari only) — **Price: $13.95 Cassette/$17.95 Diskette**

TEACHERS' AIDE consists of three basic modules contained in one program. The first module provides addition and subtraction exercises of varying levels of difficulty. The second module consists of multiplication problems in which the student may be tested both on the final answer and/or on the subtotal answers in the long hand procedure. Several levels of complexity are provided here as well. The third module consists of division problems; one particularly nice feature of the division module is that the long hand division steps can be displayed along with the remainder in order to clearly demonstrate the procedure by which the remainder is derived. Using TEACHER'S AIDE is not merely a drill, but rather a learning experience.

NEW

PHARMACOLOGY UPDATE (PET only) — **Price: $169.95 Cassette/$149.95 Diskette**

This is DYNACOMP's first educational software entry for the medical profession (more are coming!). PHARMACOLOGY UPDATE was written by a R.N. as a masters project, with the aid of a practicing pharmacologist and an electronics instructor. This package comes in two parts. The first part is a 200 page manual which is divided into 11 sections. Each of these sections provides both concise information and probing questions. The second part consists of 11 programs that are keyed to the text and which test the degree of your understanding of the text material. This package has great educational value for the beginning student as well as the professional interested in an efficient way to review and update his or her knowledge. Available on cassettes (11) or diskette.

NEW

TEACHER'S GRADEBOOK (Apple 48K dual/single drive) — **Price $49.95 Diskette**

TEACHER'S GRADEBOOK is a *complete* password protected record-keeping system for the classroom. It supports up to nine users, and each user may have data for up to nine classes on one disk (with up to 90 students per class). Typical information which can be entered, edited and processed includes rosters, absences and grades. Summary reports may be displayed (on the screen) or printed in various ways, with automatic weighted averaging and conversion to letter grades. This system has been tested ("goof-proofed") in the class environment and is both well-written and well-documented.

ORDERING INFORMATION

All orders are processed and shipped within 48 hours. Please enclose payment with order and include the appropriate computer information. If paying by VISA or Master Card, include all numbers on card. Purchase orders accepted.

Shipping and Handling Charges
Within North America: Add $2.00
Outside North America: Add 15% (Air Mail)

Delivery
All orders (excluding books) are sent First Class.

Quantity Discounts
Deduct 10% when ordering 3 or more programs. Dealer discount schedules are available upon request.

8" CP/M Disks
Add $2.50 to the listed diskette price for each 8" floppy disk (IBM soft sectored CP/M format). Programs run under Microsoft MBASIC or BASIC-80.

5¼" CP/M Disks
All software available on 8" CP/M disks is also available on 5¼" disks, North Star and Osborne format.

Ask for **DYNACOMP** programs at your local software dealer. Write for detailed descriptions of these and other programs from **DYNACOMP**.

DYNACOMP, Inc. (Dept. E)
1427 Monroe Avenue
Rochester, New York 14618
24 hour message and order phone: (716)442-8731
Toll free order phones: (800)828-6772
(800)828-6773
Office phone (9AM-5PM EST): (716)442-8960

VISA — MasterCard

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

STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) — **Price: $39.95 Cassette/$43.95 Diskette**

DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function or choose from a menu of filter forms. In the explicit design mode the shape of the frequency transfer function is specified by directly entering points along the desired filter curve. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to varying degrees according to the number of points used in the calculation. These filters may optionally also be smoothed with a Hanning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter functions. Also included are convenient data storage, retrieval and editing procedures.

DATA SMOOTHER (Not available for Atari) — **Price: $19.95 Cassette/$23.95 Diskette**

This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally spaced. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

FOURIER ANALYZER (Available for all computers) — **Price: $19.95 Cassette/$23.95 Diskette**

Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) — **Price: $19.95 Cassette/$23.95 Diskette**

This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) — **Price: $24.95 Cassette/$28.95 Diskette**

HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage/retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced or in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm.

FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of $51.95 (three cassettes) and $63.95 (three diskettes).

REGRESSION I (Available for all computers) — **Price: $19.95 Cassette/$23.95 Diskette**

REGRESSION I is a unique and exceptionally versatile one-dimensional least squares "polynomial" curve fitting program. Features include very high accuracy; an automatic degree determination option; an extensive internal library of fitting functions; data editing; automatic data, curve and residual plotting; a statistical analysis (eg: standard deviation, correlation coefficient, etc.) and much more. In addition, new fits may be tried without reentering the data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (PARAFIT) (Available for all computers) — **Price: $19.95 Cassette/$23.95 Diskette**

PARAFIT is designed to handle those cases in which the parameters are imbedded (possibly nonlinearly) in the fitting function. The user simply inserts the functional form, including the parameters (A(1), A(2), etc.) as one or more BASIC statement lines. Data, results and residuals may be manipulated and plotted as with REGRESSION I. Use REGRESSION I for polynomial fitting, and PARAFIT for those complicated functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) — **Price: $24.95 Cassette/$28.95 Diskette**

MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides easy to use data entry, storage, retrieval and editing functions. In addition, the user may interrogate the solution by supplying values for the independent variables. The number of variables and data size is limited only by the available memory.

REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for $51.95 (three cassettes) or $63.95 (three diskettes).

ANOVA (Not available on Atari cassette or for PET/CBM) — **Price: $39.95 Cassette/$43.95 Diskette**

In the past the ANOVA (analysis of variance) procedure has been limited to the large mainframe computers. Now DYNACOMP has brought the power of this method to small systems. For those conversant with ANOVA, the DYNACOMP software package includes the 1-way, 2-way and N-way procedures. Also provided are the Yates 2^{K-P} factorial designs. For those unfamiliar with ANOVA, do not worry. The accompanying documentation was written in a tutorial fashion (by a professor in the subject) and serves as an excellent introduction to the subject. Accompanying ANOVA is a support program for building the data base. Included are several convenient features including data editing, deleting and appending.

BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 (Not available for Atari)

DYNACOMP is the exclusive distributor for the software keyed to the popular texts *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* by F. Ruckdeschel (see advertisements in BYTE magazine). These subroutines have been assembled according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Volume 1

Collection #1: Chapters 2 and 3 - Data and function plotting; complex variables and functions.
Collection #2: Chapter 4 - Extended matrix and vector operations.
Collection #3: Chapters 5 and 6 - Random number generators (Poisson, Gaussian, etc.); series approximations.
Price per collection: $14.95 Cassette/$18.95 Diskette

All three collections are available for $39.95 (three cassettes) and $49.95 (three diskettes).

Volume 2

Collection #1: Chapter 1 - Linear, polynomial, multidimensional, parametric least squares.
Collection #2: Chapter 2 - Series approximation techniques (economization, inversion, reversion, shifting, etc.).
Collection #3: Chapter 3 - Functional approximations by iteration and recursion.
Collection #4: Chapter 4 - CORDIC approximations to trigonometric, hyperbolic, exponential and logarithmic functions.
Collection #5: Chapter 5 - Table interpolation, differentiation and integration (Newton, LaGrange, splines).
Collection #6: Chapter 6 - Methods for finding the real roots of functions.
Collection #7: Chapter 7 - Methods for finding the complex roots of functions.
Collection #8: Chapter 8 - Optimization by steepest descent.
Price per collection: $14.95 Cassette/$18.95 Diskette

All eight collections are available for $99.95 (eight cassettes) and $129.95 (eight diskettes).

Because the texts are a vital part of the documentation, *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* are available from DYNACOMP:

BASIC SCIENTIFIC SUBROUTINES, Vol 1 (319 pages): $19.95 + 75¢ postage
BASIC SCIENTIFIC SUBROUTINES, Vol 2 (790 pages): $23.95 + $1.50 postage

See reviews in KILOBAUD and Dr. Dobbs.

NEW

SOFTNET (Apple II, 48K, diskette only) — **Price $129.95**

SOFTNET may be used to create models of liquid pipeline systems to evaluate their flow performance. Up to 150 nodes with up to 150 connecting elements may be simulated, and models may be combined to form yet larger models. If you are involved in water distribution systems, chemical fluid flow problems, building plumbing, or similar situations, this is an ideal analysis tool.

NEW

MATCHNET (TRS-80 only) — **Price: $19.95 Cassette/$23.95 Diskette**

It often takes days to iteratively optimize an L, Pi or T matching network for a particular application. Take a few minutes with MATCHNET and you will have the Q, frequency response and reflection coefficients for any of twelve matching networks. You input the source and load impedance and MATCHNET calculates the R, C, (and L) values and plots (and/or prints) the frequency response and reflection coefficients for each configuration. The reviewer of this program remembers when he use to do this by hand and loves MATCHNET!

ACTIVE CIRCUIT ANALYSIS (ACAP) (48K Apple only) — **Price: $25.95 Cassette/$29.95 Diskette**

With ACAP you may analyze the response of an active or passive component circuit. The circuit may be probed at equal steps in frequency, and the resulting complex voltages at each component juncture examined; the frequency response of a filter or amplifier may be completely determined with respect to both amplitude and phase. In addition, ACAP prints a statistical analysis of the range of voltage responses which result from tolerance variations in the components. ACAP is easy to learn and use. Circuit descriptions may be saved onto cassette or diskette to be recalled at a later time for execution or editing. ACAP should be part of every circuit designer's program library.

LOGIC SIMULATOR (Apple only; 48K RAM) — **Price: $24.95 Cassette/$28.95 Diskette**

Test your complicated digital logic design with respect to given set of inputs to determine how well the circuit will operate. The elements which may be simulated include multiple input AND, OR, NOR, EXOR, EXNOR and NAND gates, as well as inverters, J-K and D flip-flops, and one-shots. Inputs may be clocked in with varying clock cycle lengths/displacements and delays may be introduced to probe for glitches and race conditions. A timing diagram for any given set of nodes may be plotted using HIRES graphics. Save your breadboarding until the circuit is checked by LOGIC SIMULATOR.

NEW

NUMBERKRUNCHER (TRS-80 only) — **Price: $69.95 Cassette/$73.95 Diskette**

This program is the most complete numerical analysis system available for the TRS-80. It can handle up to 255 data sets, each set having a six character name. It includes complete data editing facilities and convenient data input/output capability. The analyses available are multiple linear regression and correlation determination of residuals, data transformations and extensive graphics generation, including axis naming, and more. The supporting documentation is extremely well written and well organized, and includes appendices which describe the numerical procedures used in the program.

NEW

STATSORT (TRS-80 only) — **Price: $39.95 Cassette/$43.95 Diskette**

STATSORT consists of several menu selected programs which allow the user to create (build, edit, merge), format and print files, (machine) sort them on any field, and numerically analyze (maximum, minimum, average, variance, standard deviation) tabulated data. STATSORT is well documented and easy to use. The cassette version can also be employed to create a data type which can be read by the Radio Shack Advanced Statistical Package.

NEW

STATTEST (TRS-80 only) — **Price: $19.95 Cassette/$23.95 Diskette**

This is a statistical inference package which helps you make wise decisions in the face of uncertainty. In an interactive fashion you can build and edit data files and test the differences in means, variances and proportions. STATTEST will also perform data analysis as well as do linear correlation and regression. This menu-directed statistical workhorse is rounded out with a chi-square contingency test and a (uniform and normal) random sample generator. The documentation is written by a college professor who guides you through the various tests.

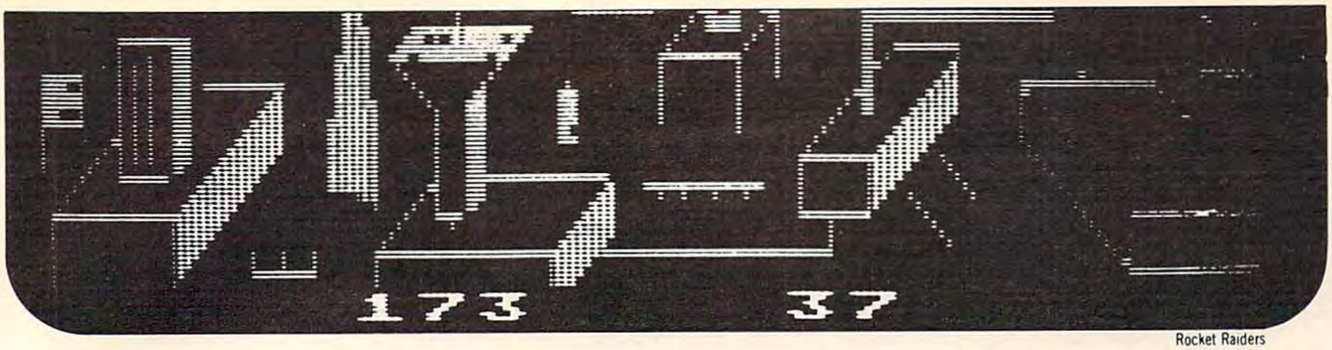
ABOUT DYNACOMP

DYNACOMP is a leading distributor of small system software with sales spanning the world (currently in excess of 50 countries). During the past three years we have greatly enlarged the DYNACOMP product line, but have maintained and improved our high level of quality and customer support. The achievement in quality is apparent from our many repeat customers and the software reviews in such publications as COMPUTRONICS, 80 Software Critique, A.N.A.L.O.G., Softalk, Creative Computing and Kilobaud. DYNACOMP software has also been chosen for demonstration on network television. Our customer support is as close as your phone. It is always friendly. The staff is highly trained and always willing to discuss products or give advice.

```
470 R=RND(1):DIR=40-(R<0.3)+(R>0.6):REM
DIR is 39 (left diagonal, 40 (down), or
41 (right diagonal)
480 FOR FALL=0 TO LENGTH
490 P=PEEK(SCREEN+START+DIR*FALL):REM Sa
ve current character
500 SCR=SCREEN+START+DIR*FALL:POKE SCR,S
TAR:REM Replace it with a "star"
510 SOUND 0,10+FALL*2,8,8:REM Falling so
und
520 REM PEEK(53770) returns a random num
ber from 0-255
530 POKE 709,PEEK(53770):POKE 710,PEEK(5
3770):POKE 711,PEEK(53770):REM Change co
lors rapidly for "flash" effect
540 POKE SCR,P:REM Restore background ch
aracter
550 NEXT FALL
560 REM If final character already taken
 by another star, burn up star and try a
gain:
570 IF P<>0 THEN GOSUB 1010:POKE SCR,P:G
OTO 440
580 REM M is screen position modulo 40.
 Determines if star is at the left or ri
ght margin
590 M=((SCR-SCREEN)/40-INT((SCR-SCREEN)/
40))*40:IF M<3 OR M>36 THEN GOSUB 990:GO
TO 440
600 IF RND(1)>0.9 THEN GOSUB 990:GOTO 44
0:REM Occasionally burn up a star
610 POKE SCREEN+START+DIR*LENGTH,STAR:RE
M Place star finally
620 NEXT I
630 SOUND 0,0,0,0
640 FOR W=15 TO 0 STEP -0.05:SOUND 0,10,
8,W:NEXT W:REM Explosion sound
650 REM Set colors for good contrast
660 SETCOLOR 1,INT(16*RND(0)),10
670 SETCOLOR 2,INT(16*RND(0)),6
680 SETCOLOR 3,INT(16*RND(0)),10
690 REM Start game
700 S=1:F=37:REM Laser scans left to rig
ht, 1 to 37 and 37 to 1
710 FOR X=S TO F STEP SGN(F-S)
720 POSITION X,22:? " {D}|{X}|{O} {LEFT}
";:REM Draw laser
730 IF PEEK(764)=33 THEN MS=1:SHOTS=SHOT
S+1:MY=0:MX=X+1:POKE 764,255:GOSUB 970:R
EM Shoot missile if space is pres
740 IF MS=0 THEN 850
750 REM Update missile
760 MY=MY+1:IF MY=22 THEN MS=0:GOTO 850
770 SCR=SCREEN+(21-MY)*40+MX:P=PEEK(SCR)
780 POKE SCR,124:REM Vertical line
790 SOUND 0,MY,2,8
800 REM If missile hits something, blow
it up, make "boing" sound, give credit,
update score line
810 IF P THEN GOSUB 990:HITS=HITS+1:GOSU
B 970:MS=0:FOR W=15 TO 0 STEP -1:SOUND 0
,50,10,W:NEXT W:GOTO 840
820 POKE SCR,P:SOUND 0,0,0,0
830 REM Check if all stars hit
840 IF HITS=STARS THEN 870
850 NEXT X
860 S=37-S:F=37-F:GOTO 710
870 REM End of game
880 REM Flash score, wait for START
890 POSITION 0,0:? "NEW GAME:PRESS start
"
900 T=PEEK(20):REM Time in sixtieths of
a second
910 IF T>20 AND T<40 THEN POSITION 20,0:
? "sh ";SHOTS;" |SCR|    |hts| ";HITS;"
"
920 IF T>40 THEN GOSUB 970:POKE 20,0:REM
 Reset time
930 POKE 53279,8:REM Reset console switc
hes
940 IF PEEK(53279)<7 THEN RUN :REM START
=6
950 GOTO 900
960 REM Following subroutine updates sco
re line
970 POSITION 20,0:? "sh ";SHOTS;" |SCR|
";INT(HITS*100/SHOTS);" |hts| ";HITS;"{L
EFT}{DELETE}";
980 SOUND 0,0,0,0:RETURN
990 REM OBLITERATE STAR
1000 REM POKE 53279,0 generates click on
 internal speaker
1010 FOR L=1 TO 10:POKE SCR,PEEK(53770):
POKE 53279,0:NEXT L:POKE SCR,0
1020 RETURN
```

Apple Version

```
100 REM APPLE SHOOTING STARS
110 REM
120 GR :  HOME
130 PRINT "**** SHOOTING STARS ****
    " : PRINT
140 INPUT "HOW MANY STARS? ";NS
150 IF NS = 0 THEN TEXT : HOME : EN
    D
160 HOME
170 FOR I = 1 TO NS
180 COLOR = INT ( 15 * RND ( 1 ) +
    1 )
190 X = INT ( 34 * RND ( 1 ) + 3 )
    : Y = INT( 30 * RND( 1 ) )
     : IF SCRN( X , Y ) THEN 1
```



Rocket Raiders

Our High Quality Software Is More Than A Stroke Of Genius... It's A Work Of Art.

☐ **PM EDITOR:** by Dennis Zander (Atari, 16K)
Create your own fast action graphics game for the Atari 400 or 800 using its player missile graphics features. By using player data stored as strings, players can be moved or changed (for animation) at machine language speed. All this is done with string variables (POS(Y)=SHIP4). This program is designed to permit creation of up to 4 players on the screen, store them as string data and then immediately try them out in the demo game included in the program. Instructions for use in your own game are included. PM EDITOR was used to create the animated characters in **ARTWORX** RINGS OF THE EMPIRE and ENCOUNTER AT QUESTAR IV.
PRICE .... **$29.95** cassette **$33.95** diskette

☐ **ROCKET RAIDERS** by Richard Petersen (Atari 24K)
Defend your asteroid base against pulsar bombs, rockets, lasers, and the dreaded "stealth saucer" as aliens attempt to penetrate your protective force field. Precise target sighting allows you to fire at the enemy using magnetic impulse missiles to help protect your colony and its vital structures.
PRICE .... **$19.95** cassette **$23.95** diskette

☐ **INTRUDER ALERT!** by Dennis Zander (Atari, 16K)
This is a fast paced action game in which you must escape from the "Dreadstar" with the secret plans. The droids are after you and you must find and enter your ship in order to escape. If you fail, the rebellion is doomed. **PRICE** .... **$16.95** cassette **$20.95** diskette

☐ **THE RINGS OF THE EMPIRE:** by Dennis Zander (Atari 16K)
The Empire has developed a series of battle stations protected by one or more rings of energy. You must destroy these weapons by attacking them in your Y-wing fighter armed with Zydon torpedoes. Each time you blast through the rings and destroy the station, the Empire develops a new station with more protective rings.
PRICE .... **$16.95** cassette **$20.95** diskette

☐ **FOREST FIRE!:** by Richard Petersen (Atari, 24K)
Using excellent color graphics, your Atari is turned into a fire scanner to help you direct operations to contain a forest fire. You must compensate for changes in wind, weather and terrain. Not protecting valuable property can result in startling penalties. Life-like variables make FOREST FIRE a very suspenseful and challenging simulation. **PRICE** .... **$16.95** cassette **$20.95** diskette

☐ **GIGA TREK** by John Shepard
(Atari (24K) Apple, North Star and CP/M (M-BASIC).
Giga Trek has features not found in other "Star Trek" games including movement and a trigonometric coordinate system for navigation. It is your task during play to destroy the combined fleet of Klingons and Romulons that are menacing the Federation throughout the galaxy.
PRICE .... **$14.95** cassette **$18.95** diskette

☐ **KALEIDOSCOPE** by Clinton Parker (Atari 16K)
Turn your computer into a color kaleidoscope of ever changing patterns. This assembly level program will generate sequences of patterns which will not repeat for days. A graphic spectacular!
PRICE .... **$14.95** cassette **$18.95** diskette

☐ **GIANT SLALOM:** by Dennis Zander (Atari, 16K)
Bring the Winter Olympics to your computer anytime of the year! Use the joystick to guide your skier's path down a giant slalom course consisting of open and closed gates. Choose from three levels of difficulty. Take practice runs or compete against from two to eight additional skiers.
PRICE .... **$15.95** cassette **$19.95** diskette

☐ **HODGE PODGE:** by Marsha Meredith (Apple 48K, Applesoft or Integer BASIC)
This captivating program is a marvelous learning device for children from 18 months to 6 years. HODGE PODGE consists of many cartoons, animations and songs which appear when any key on the computer is depressed. A must for any family containing young children and an Apple.
PRICE .... **$19.95** diskette

☐ **THE PREDICTOR** by Thomas Barker
(Apple, Atari, TRS-80, North Star and CP/M (M-BASIC).
This is a complete package that covers least squares fitting of parameters for two or more variables. THE PREDICTOR can be used for predicting sales and process behavior, trend analysis, model building and many other uses calling for multilinear regression techniques. Each option in the program is prompted with simple YES/NO commands making it **very** easy to use.
PRICE .... **$29.95** diskette

TYPE-'N-TALK*

ARTWORX is offering the fantastic TYPE-'N-TALK™ from Votrax®. This easy-to-use unit connects to your computer's serial port. Text is automatically translated into electronic speech enabling the TYPE-'N-TALK™ hobbyist to use and enjoy it immediately.
PRICE **$329.00**

The following **ARTWORX** programs are available for TYPE-'N-TALK:

STUD POKER (Atari, 24K)	**$16.95** cassette / **$20.95** diskette
TEACHER'S PET (Atari, 24K; North Star)	**$16.95/ $20.95**
BRIDGE 2.0 (Atari, 24K; North Star)	**$19.95 / $23.95**
NOMINOES JIGSAW (Atari, 24K)	**$17.95 / $21.95**

Please specify "TNT" version when ordering programs.

☐ **CRANSTON MANOR ADVENTURE:** by Larry Ledden (Atari, North Star and CP/M)
You must enter mysterious Cranston Manor and attempt to collect its many treasures. This extemely challenging program will provide you with many hours (days?) of adventure. The program may be interrupted at will and your status saved onto the diskette.
PRICE .... **$24.95** diskette

☐ **PILOT:** by Michael Piro (Atari, 16K)
Pilot your small airplane to a successful landing using both joysticks to control throttle and attack angle. PILOT produces a true perspective rendition of the runway, which is constantly changing. Select from two levels of pilot proficiency.
PRICE .... **$16.95** cassette **$20.95** diskette

☐ **TEACHER'S PET:** by Arthur Walsh (Atari, Apple, TRS-80, PET, North Star and CP/M (MBASIC) systems).
This is an introduction to computers as well as a learning tool for the young computerist (ages 3-7). The program provides counting practice, letter-word recognition and three levels of math skills.
PRICE .... **$14.95** cassette **$18.95** diskette

☐ **FORM LETTER SYSTEM:** (Atari, North Star and Apple)
This is the ideal program for creating personalized form letters! FLS employs a simple-to-use text editor for producing fully justified letters. Addresses are stored in a separate file and are automatically inserted into your form letter along with a personalized salutation. Both letter files and address files are compatible with **ARTWORX** MAIL LIST 3.0 and TEXT EDITOR programs.
PRICE .... **$39.95** diskette

☐ **TEXT EDITOR:** (Atari and North Star)
This program is very "user friendly" yet employs all essential features needed for serious text editing with minimal memory requirements. Features include common sense operation, two different justification techniques, automatic line centering and straightforward text merging and manipulation. TEXT EDITOR files are compatible with **ARTWORX** FORM LETTER SYSTEM.
PRICE .... **$39.95** diskette

☐ **MAIL LIST 3.0:** (Atari, Apple and North Star)
The very popular MAIL LIST 2.2 has now been upgraded. Version 3.0 offers enhanced editing capabilities to complement the many other features which have made this program so popular. MAIL LIST is unique in its ability to store a maximum number of addresses on one diskette (typically between 1200 and 2500 names!). Entries can be retrieved by name, keyword(s) or by zip codes. They can be written to a printer or to another file for complete file management. The program produces 1, 2 or 3-up address labels and will sort by zip code (5 or 9 digits) or alphabetically (by last name). Files are easily merged and MAIL LIST will even find and delete duplicate entries! The address files created with MAIL LIST are completely compatible with **ARTWORX** FORM LETTER SYSTEM.
PRICE .... **$49.95** diskette

☐ **THE VAULTS OF ZURICH:** by Felix and Greg Herlihy (Atari, 24K, PET)
Zurich is the banking capital of the world. The rich and powerful deposit their wealth in its famed impregnable vaults. But you, as a master thief, have dared to undertake the boldest heist of the century. You will journey down a maze of corridors and vaults, eluding the most sophisticated security system in the world. Your goal is to reach the Chairman's Chamber to steal the most treasured possession of all: THE OPEC OIL DEEDS!
PRICE .... **$21.95** cassette **$25.95** diskette

☐ **BRIDGE 2.0** by Arthur Walsh (Atari (24K), Apple TRS-80, PET, North Star and CP/M (MBASIC) systems)
Rated #1 by Creative Computing, BRIDGE 2.0 is the only program that allows you to both bid for the contract and play out the hand (on defense or offense!). Interesting hands may be replayed using the "duplicate" bridge feature. This is certainly an ideal way to finally learn to play bridge or to get into a game when no other (human) players are available.
PRICE .... **$17.95** cassette **$21.95** diskette

☐ **ENCOUNTER AT QUESTAR IV:** by Douglas McFarland (Atari, 24K)
As helmsman of Rikar starship, you must defend Questar Sector IV from the dreaded Zentarians. Using your plasma beam, hyperspace engines and wits to avoid Zentarian mines and death phasers, you struggle to stay alive. This BASIC/Assembly level program has super sound, full player missile graphics and real time action.
PRICE .... **$21.95** cassette **$25.95** diskette

☐ **THE NOMINOES JIGSAW PUZZLE:**
by C. Minns/B. Brownlee (Atari, 24K, TRS-80, and Apple)
We quote . . . "A brainteaser supreme. . . the concept of NOMINOES JIGSAW is brillant. . . this video jigsaw game is so clever and completely original that only the most hardhearted puzzle hater could fail to be charmed."—ELECTRONIC GAMES MAGAZINE.
PRICE $17.95 cassette (also available for TRS-80 color computer) **$21.95** diskette.

Artworx Highest Quality Software*, Guaranteed.

ARTWORX SOFTWARE COMPANY
150 North Main Street Fairport, NY 14450 (716) 425-2833

Call ARTWORX toll-free number to order direct:
800-828-6573 In New York, Alaska, Hawaii call: (716)-425-2833
All orders are processed and shipped within 48 hours.

Shipping and handling charges:
Within North America: Add $2.00
Outside North America: Add 10% (Air Mail)
New York State residents add 7% sales tax.
Quantity Discounts:
Deduct 10% when ordering 3 or more programs

Write for FREE Catalogue listing more information about these and other quality ARTWORX programs.

Ask for ARTWORX at your local computer store.

*ATARI, APPLE, TRS-80, PET, NORTH STAR, CP/M, and TYPE'N TALK are registed tradenames and/or trademarks.

```
    90
200 PLOT X , Y
210 NEXT I
220 REM MAIN LOOP
230 S = 1 : E = 36
240 FOR X = S TO E STEP SGN ( E - S
     )
250 COLOR = 1 : PLOT X , 39 : PLOT ~
    X + 2 , 39
260 COLOR = 2 : PLOT X + 1 , 39 : P
    LOT X + 1 , 38
270 COLOR = 0 : PLOT X - 1 , 39 :PL
    OT X + 3 , 39 :PLOT X , 38
     :PLOT X + 2 , 38
280 IF MS = 0 THEN 390
290 REM FIRE MISSILE
300 COLOR = 0 : PLOT MX , MY
310 Z = PEEK  (  - 16336 )
320 MY = MY - 1 : IF MY < 0 THEN MS
     = 0 : GOTO 390
330 P = SCRN ( MX , MY )
340 Z = PEEK  (  - 16636 )
350 IF P = 0 THEN COLOR = INT ( 15 ~
    * RND ( 1 ) + 1 ) : PLOT M
    X , MY : GOTO 390
360 H = H + 1 : GOSUB 490 : MS = 0 ~
    : COLOR = 0 : PLOT MX , MY

370 IF H = NS THEN 460
380 FOR J = 1 TO 10 : Z = PEEK (  -
     16636 ) : FOR W = 1 TO 2 ~
    :NEXT :Z = PEEK (  - 16636
     ) :NEXT
390 IF PEEK  (  - 16384 ) < 127 THE
    N 440
400 POKE  - 16368 , 0
410 IF MS THEN COLOR = 0 : PLOT MX ~
    , MY
420 MS = 1 : MX = X : MY = 37 : SH ~
    = SH + 1
430 GOSUB 490
440 NEXT
450 S = 37 - S : E = 37 - S : GOTO ~
    240
460 HOME : PRINT "SCORE : ";INT ( H
     * 100 /  SH )
470 PRINT "  PRESS "; : FLASH : PRI
    NT " RETURN"; : NORMAL
480 GET A$ : RUN
490 HOME
500 PRINT " SHOTS FIRED :  "; : INV
    ERSE : PRINT SH; : NORMAL
510 PRINT " SCORE :  "; : FLASH : P
    RINT INT ( H * 100 /  SH )
    ; : NORMAL
520 PRINT "  HITS :  "; : INVERSE :
     PRINT H : NORMAL
530 RETURN
```

PET Version

```
100 REM PET/CBM SHOOTING STARS
110 REM
120 GOTO 180
130 REM SOUND SUBROUTINE
140 POKE S1,K1:POKE S2,K2:POKE S3,S
    V
150 POKE S1,K0:RETURN
160 REM PET/CBM SHOOTING STARS
170 REM
180 PRINT "{CLEAR}**** SHOOTING STA
    RS ****{DOWN}"
190 S1=59467:S2=59466:S3=59464:K1=1
    6:K0=0:K2=51
200 INPUT "HOW MANY STARS";NS
210 IF NS=K0 THEN PRINT "{CLEAR}":E
    ND
220 PRINT "{CLEAR}":CRT=32768:LL=40
    :REM LL=80 FOR 8032
230 FOR I=1 TO NS
240 X=INT((LL-5)*RND(1)+3):Y=INT(20
    *RND(1))
250 IF PEEK(CRT+X+LL*Y)<>32 THEN 24
    0
260 POKE CRT+X+LL*Y,42
270 FOR W=100 TO K0 STEP-10:SV=W:GO
    SUB 130:NEXT W
280 NEXT I
290 S=1:E=LL-4:CH=E+1
300 SHIP$=CHR$(172)+CHR$(177)+CHR$(
    187)
310 FOR X=S TO E STEP SGN(E-S)
320 PRINT"{HOME}{23 DOWN}";
330 PRINT TAB(X);" "SH$" ";
340 IF MS=K0 THEN FOR W=1 TO 10:NEX
    T:GOTO440
350 REM FIRE MISSILE
360 POKE CRT+MX+LL*MY,32
370 SV=200:GOSUB130
380 MY=MY-1:IF MY<K0 THEN MS=K0:GOT
    O 440
390 P=PEEK(CRT+MX+LL*MY)
400 IF P=32 THEN POKE CRT+MX+LL*MY,
    93:GOTO440
410 H=H+1:GOSUB 540:MS=K0:V=K0
420 FOR J=1 TO 9:SV=50:GOSUB130:POK
    ECRT+MX+LL*MY,32+128*V:SV=
    80:GOSUB130:V=1-V:NEXT
430 IF H=NS THEN 500
440 GET K$:IF K$="" THEN 480
450 IF MS THEN POKE CRT+MX+LL*MY,32
460 MS=1:MX=X+1:MY=22:SH=SH+1
```

Enter The UMI Dimension of Mind

The Dimension of Mind is an extension of sight and sound. A dimension whose only boundary is imagination. These same characteristics are inherent in the extraordinary line of hardware and software products manufactured by UMI for Commodore's VIC, PET, and other micro-computers.

UMI offers micro-computer users unique, innovative entertainment, educational, and professional programs on tape cassette or on UMI's own durable cartridges. UMI also provides memory expansion devices, communications programs, as well as programmer and hobbyist aids.

Please send me the
UMI 1982 CATALOG
UNITED MICROWARE IND.,INC.
3503 TEMPLE AVE., SUITE C
POMONA, CA 91768
NAME ____________
ADDRESS ____________
CITY ________ STATE ________
ZIP ________ COMPANY ________

To begin your journey into The Dimension of Mind, please mail attached coupon to receive UMI's 1982 Catalog or call (714) 594-1351.

umi

united microware industries, inc. • 3503 temple avenue • suite c • pomona, california • 91768

```
470 GOSUB 540
480 NEXT
490 S=CH-S:E=CH-E:GOTO310
500 PRINT "{CLEAR}SCORE: {REV}";INT
    (H*100/SH)
510 PRINT "{DOWN}PRESS {REV}RETURN{
    OFF} TO PLAY AGAIN:";
520 GET A$:IF A$="" THEN 520
530 RUN
540 PRINT"{HOME}{24 DOWN}";
550 PRINT " SHOTS FIRED:";SH;" SCOR
    E:{REV}";INT(H*100/SH);"{O
    OFF} HITS:";H;
560 RETURN
570 END
```

©

DON'T ASK Presents the new, fast-moving dictionary game for all ages:

WORDRACE

FOR THE ATARI 400/800
AND THE APPLE II/II+

- for 1-4 players
- requires SPEED and STRATEGY
- 2000 words and definitions
- competitive, exciting, fun

Beat the clock! Outsmart your friends!
And while you're at it, build an impressive vocabulary.

3 LEVELS OF PLAY ON ONE DISK:

Beginner — for ages 9-14
Regular — for older teens and adults
Challenge — for anyone who dares!

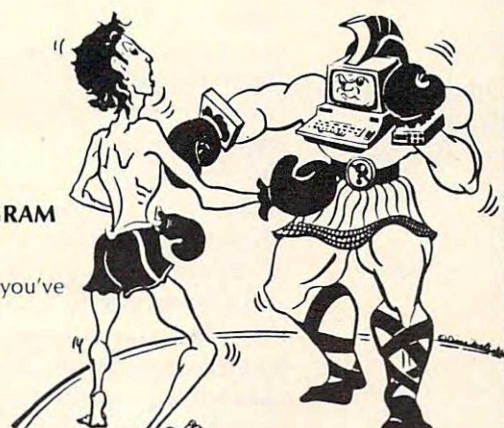
WORDRACE boosts your verbal I.Q. for college entrance exams and civil service tests. Great for giving school children a head start.

The challenge and pleasure of WORDRACE are irresistible.
At last, an educational game that's really fun to play!

ATARI 400/800 32K DISK/BASIC $19.95
APPLE II/II+ 48K DISK/APPLESOFT $19.95

ALSO FROM DON'T ASK:

ABUSE



THE ORIGINAL INSULT PROGRAM

- **Millions** of **different** insults.
- Guaranteed to call you something you've never been called before.

ATARI 400/800 40K DISK/BASIC $19.95
APPLE II/II+ 48K DISK/APPLESOFT $19.95

At your computer store
or send $19.95 +$2.00 shipping for each program to **DON'T ASK**.
California residents add 6% tax.

ATARI is a trademark of ATARI INC.
APPLE is a trademark of APPLE COMPUTER INC.
Dealer inquiries welcome

DON'T ASK
COMPUTER SOFTWARE

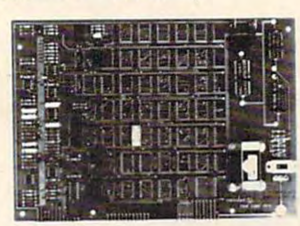
2265 Westwood Blvd. B-150
Los Angeles, CA 90064
(213) 397-8811

AUTO-MATIC TELE-PHONE CONNECTOR

TNW'S
IEEE-488 Bus 103 Modem

An auto-dial/auto answer Bell-103 compatible modem for use with the Commodore PET/CBM, HP-85, Osborne-1 and other IEEE-488 computers. Connects directly to the phone system via DAA and provides access to The Source, Telenet, Tymnet, local Bulletin Boards, others.

Features: Pulse-dial or answer with TNW software. Software selectable baud rate (110-600 bps), character size (5-8 bits), parity, and stop bits. Also, space disconnect (long or short), transmit break, error detection, status byte and SRQ enable.
Options: DAA with modular plug. Standard IEEE-488 cable. (IEEE-488 cable for PET or Osborne-1 included.)



TNW's 103 Modem comes complete with cabinet, full documentation, and one-year warranty. *Details from George Masters:*

TNW™ CORPORATION

Dept. C-2, 3444 Hancock Street,
San Diego, CA 92110
(714) 296-2115 • TWX 910-335-1194
VISA/MasterCard
Dealer Inquiries Welcome

The World Inside The Computer

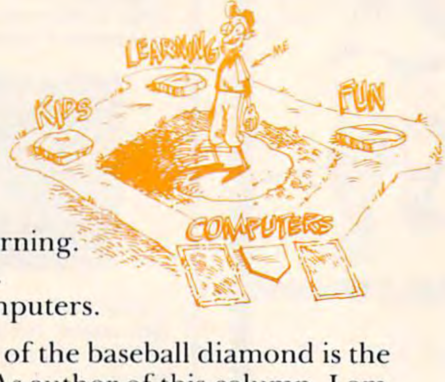
COMPUTE! welcomes Fred D'Ignazio, whose The World Inside The Computer column will appear each month. Fred is a computer enthusiast and author of several books on computers for young people, including: *Katie and the Computer; The Creative Kid's Guide to Home Computers; Small Computers: Exploring Their Technology and Future; Working Robots;* and *Electronic Games.* He is presently working on two major projects. He is writing a series of books on how to create graphics-and-sound adventure games. He is also working on a computer mystery-and-adventure series for young people.

As the father of two young children, Fred has become concerned with introducing the computer to children as a wonderful tool rather than as a forbidding electronic device.

Santa Claus, Subways, And Penguins

Fantasy And The Four Bases

Close your eyes and imagine the baseball diamond at Yankee Stadium. The diamond has four bases. This column also has four bases. What do the four bases represent?



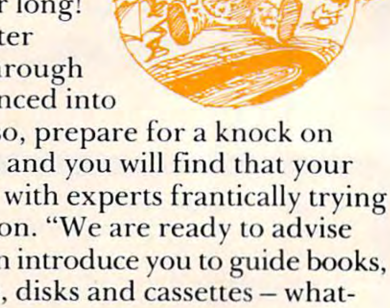
First base is Fun.
Second base is Learning.
Third base is Kids.
Home plate is Computers.

In the middle of the baseball diamond is the pitcher's mound. As author of this column, I am like the pitcher. My ball isn't made out of cork or cowhide. It's pure fantasy. It is the world inside the computer.

This column will explore the many ways kids can use computers to learn and have fun at the same time. And on their own. It will focus on ways computers can be used to foster self-directed learning for each kid's own benefit and enjoyment.

Santa And The Penguins

Our society is feeling the impact of a computer *implosion.* It's as if Santa Claus' bag burst as he flew across the world, and the presents are tumbling to the earth, ending magically under everyone's Christmas tree. And all the presents are small computers. And it is Christmas all year long!



Has your computer just dropped down through the chimney and bounced into your living room? If so, prepare for a knock on your door. Answer it, and you will find that your front lawn is overrun with experts frantically trying to attract your attention. "We are ready to advise you," they say. "We can introduce you to guide books, cook books, checklists, disks and cassettes – whatever you need to operate your home computer."

By all means, let the experts in. And listen to what they have to say.

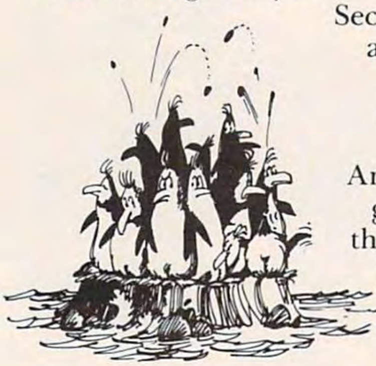
But don't expect to find an expert here in this column. I'm no expert. I'm not an educator. I'm not a psychologist or a game whiz or a scientist.

Who am I?

I'm a writer, and a storyteller. I'm also a parent – of a little boy (Eric) who's almost three, and a not-so-little girl (Catie) who's just turned six.

If I'm no expert, why do I think I can climb on my soapbox and tell you things about computers?

First, because of what I love. I love kids, fantasy, fun, learning, and computers. I think I can build a column around these five loves, a column that will be interesting to anyone who shares my affections.



Second, have you ever seen a penguin rookery? It's a small island or hunk of rock near the bottom of the world, on or near Antarctica. Its most distinguishing characteristic is that it is crowded, packed, jammed with penguins.

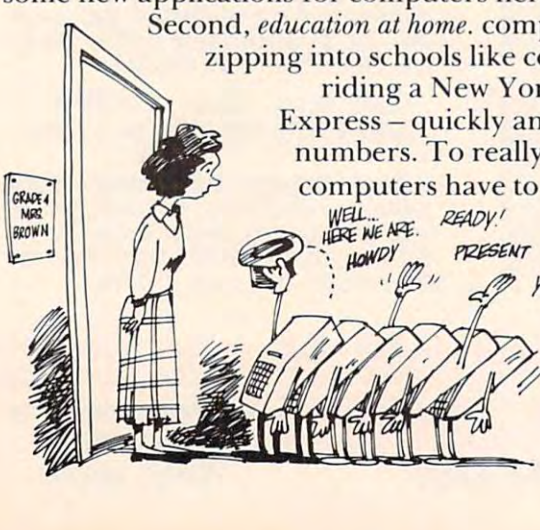
Certain applications of small computers resemble a penguin rookery. There are experts and so-called experts crawling all over, bumping into each other, stealing each other's rocks (for nests), and occupying all the free space.

A penguin rookery is a good place to read about, but I have no intention of visiting one and pretending to be just another penguin (as Jacques Cousteau once did). The same goes for this column. In this column, we (you and I) will search for islands that are less crowded. We will look for computer applications which are vital, but which have not yet received a great deal of attention.

Uncrowded Islands

What are some areas we might explore?

First, *computers for little kids*. Let's say, arbitrarily, from age two up to age eight. We have all seen articles, games, and programs aimed at this group. But not so many as at other groups. As a father and lover of small children, I'd like to explore some new applications for computers here.



Second, *education at home*. computers are zipping into schools like commuters riding a New York Subway Express – quickly and in great numbers. To really fit in, the computers have to adhere to the schools' curriculum. That means, programmed learning, by the experts.

But how about education at home? Self-motivated and self-directed education? Education without a formal curriculum. Education without a game plan or an expert peering over the learner's shoulder. Education that is not just alphabets, multiplication, memorization, and drill. This is another area that fascinates me. I'd like to focus on it in this column.

Third, *fantasy*. The computer playground. A place for kids to act like monkeys and develop bulging muscles of the imagination.

Fantasy is the world of kids. It remains their world until they have heard enough facts and enough drivel to drive fantasy back – back into their mind's back burners and dark corners.

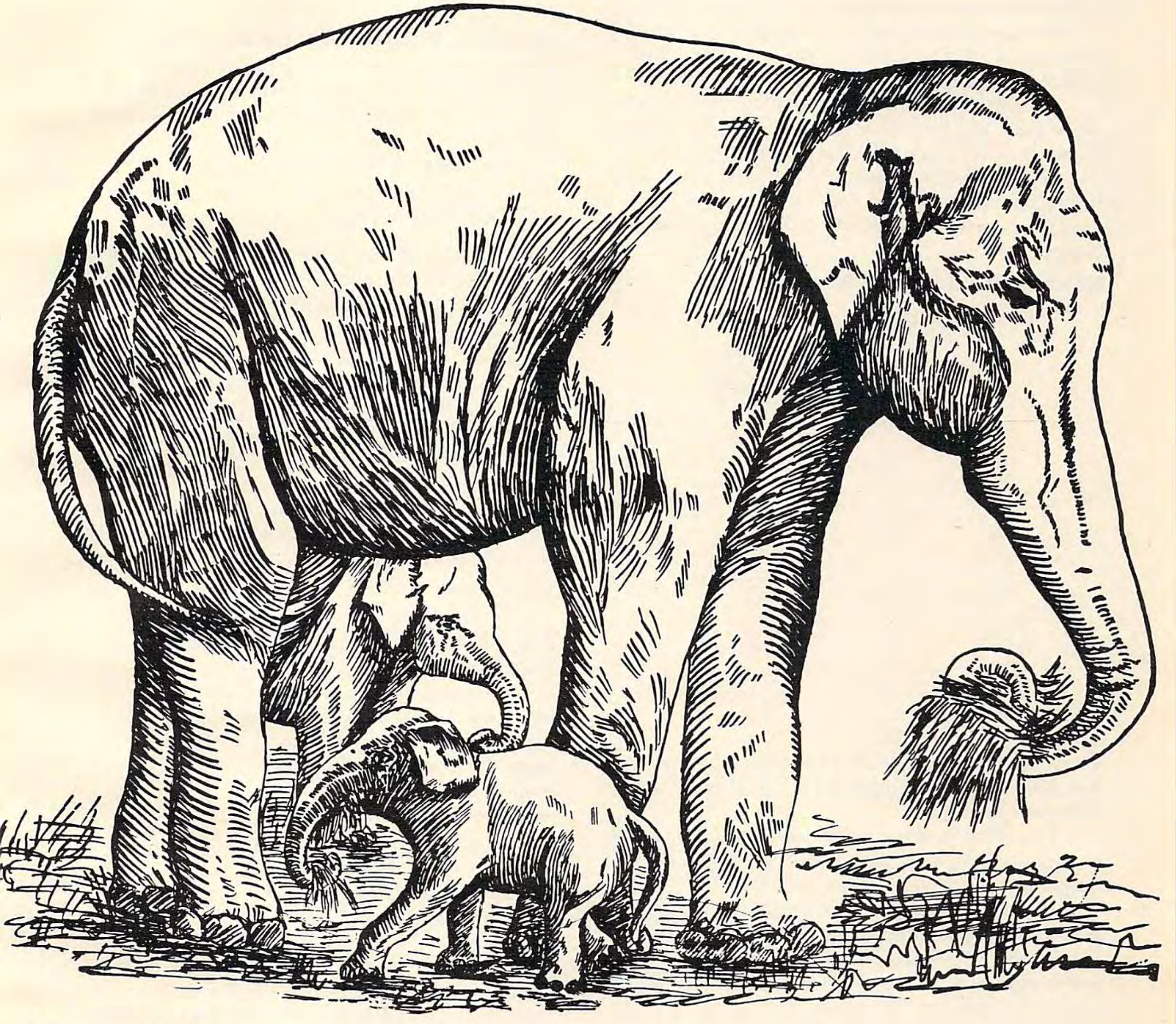
Computers are an immensely powerful tool of directed, solo, or group-oriented fantasy. Just witness the enormous popularity of electronic games.

Fantasy is natural for the child. It has a galvanizing, emotive, and energizing effect on whatever the child does.

A personal computer is like a wizard's staff, a magician's wand. It is a powerful tool for fantasy. It is a tool for the gods, and the gods within us. It is creativity unbounded. According to computer philosopher Greg Yob:

> If you can program your computer, here is a tiny universe in which you can be God. Within the realms of expression that the computer can provide, you can build a world, define its laws, and watch the universe unfold. As your whim dictates, you can intervene at any time, and if you desire, the history of the universe can be changed and rewritten at will. Such a power this is!*

Micro-Ed is EXPANDING!



Send for free educational catalogs *

* Specify: Pet • Vic • TI • Apple • TRS-80
color computer

you can telephone us
at
612-926-2292

Micro-Ed, Inc.
PO Box 24156
Minneapolis, MN 55424

Yet, as they become increasingly popular, small computers are also becoming more focused, more regimented. They are becoming big business. They are becoming standardized and institutionalized.

But they are still ripe for fantasy. Safe in the confines of your own home, where you and your kids are the kings and queens of the realm.

A large dose of fantasy can make your child's use of the computer more playful, his or her learning more creative, more effective and long-lasting.

Fourth, and last, *games*. What kind of games? It doesn't matter, just so they're fun and produce a positive, constructive effect on the young game player.

Welcome to D'Ignazio's Game Arcade

I have eight programmable computers in my home. Running on those computers are over two hundred different games.

I have opened the doors of my home to neighborhood youngsters. As a result, my home has become the local videogame arcade.

It's an offer the kids can't refuse: they get to play games, hour after hour, and it doesn't cost them a single quarter. Needless to say, the parents are delighted with this arrangement. And I get lots of contact with young people, which I enjoy and which helps me with my books.

On any afternoon, there are usually three or more young people present, playing "canned" games or inventing new ones. The young people range in age from two years old (my son) to seventeen years old. Most, however, are between eleven and fourteen.

Afternoons are noisy in the D'Ignazio Arcade. There are squeaks, giggles, beeps, and booms. In the midst of all the silliness and fierce competition, though, two things are apparent. First, the kids are having fun. Second, they are learning.

During the course of this column, I'd like to write about the many ways kids can use computer games to learn and have fun. I think it will make interesting reading.

Adventure, Oracles, Picturebooks & Turtles

So now you have it. I've emptied my pockets and dumped the contents into your lap. As a result, you probably have some idea of this column's flavor and slant.

But where is it going?

In the next few months, here are some of the topics I'd like to explore:

If Your Teacher Were a Turtle

Using Turtle robots to teach young children reading, writing, programming, directionality, etc.

Alice in Computerland

A visit to the world inside the computer. How the youngest children can learn the basics of computer hardware and software. Computer literacy for toddlers. Computers as a second language. Computers as a new mythology.

Robots, Games and Learning

A special chapter on using robots and robot games to teach things to kids. Kids love robots. I'll bet you do, too.

Special Games for Kids with Special Needs

If your child has a physical, emotional, or learning disability, this chapter is for you.

Toddler Adventure

How to wean your toddler from her blanket or bottle and turn her loose on a computer. How to launch your young children on their first adventure – an exciting, educational experience.

The Computer Picturebook

The electronic book is on its way. It will come in the form of a microchip, ready to plug into your *book player*. But until it arrives, you can create your own books on your home computer. This column will show how you and your kids can create electronic picturebooks.

The Computer Oracle

What are your kids' favorite questions? Mine are: Why? What? How? Who? Where? This chapter shows you how you can turn your kids' questions – and your answers – into a game and a growing data base of information pertinent to your children's blossoming interests and knowledge of the world.

Building Models

Kids can fire questions endlessly at you. You try to answer them, but you suspect that your answers flit like butterflies into their ears, ricochet around a bit, then flit back out, only a moment later.

We all learn things best by doing them. How did you first learn about people and their bodies? Did you have a dolly or a teddy bear? How did you first learn about automobiles, monsters, trains, airplanes, and spaceships? The way I learned was by building models.

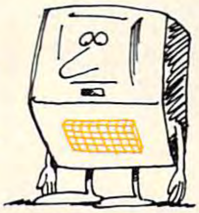
You can answer your kids' questions with models – *computer* models. You don't build them using paper, plastic, or glue, but by creating simulations – miniature replicas of creatures, things, processes, or events pulled from the real world.

But why stick to the real world? Why not copy something directly from your child's dreams or imagination? With a little ingenuity, you can probably build a model of it on your computer. Then your child can run the model, change it, or add to it. Or replace it with something else.

A New Member of Your Family

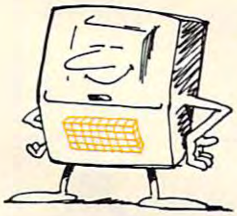
Our family computer (the oldest one) is named 'Ged,' after the wizard hero of Ursula LeGuin's Wonderful Earthsea Trilogy.

When Ged first arrived on our doorstep, he was a dull and simple-minded character. He knew how to edit text, save and copy files, things like that. But that was about all.



So my kids began to teach him. They imagined what kind of personality he ought to have (wise but mischievous and tricky), and we gradually breathed life into what was once a dry and pedestrian computer.

Now we treat Ged like a member of the family. He has his own jokes, his own riddles, tricks, favorite expressions, and peculiarities. He is very much like a real person. That means he is constantly learning – and my children are his teachers.



This column will offer suggestions on how to turn your computer into a member of your family. Or several members, After all, just like a real person, he or she can have many faces.

On the way, I guarantee you, your children will learn many things about computers, programming, intelligence, and personality. And about themselves. In a sense the computer becomes a mirror – it reflects the kids, you, and your entire family.

Making Your Computer More Real

Have you ever read the *Velveteen Rabbit*? It's a story about a nursery toy – a little stuffed bunny – who becomes real to the child who loves him.

Kids tend to anthropomorphize everything. They see a person, a spirit, a gremlin, or creature inside or behind everything that exists. Ironically, this fantasy image of the world seems to make the things in it more real.

Computers can easily become more human-like and more real. We can program a personality into them. We can add a voice synthesizer. We can attach a speech-recognition device. There are many other options.

This column continues the discussion of the previous column: how to make computers more human-like and real. This process can be educational and a lot of fun.

Software And Reviews

Each month, I hope to come up with some original software, usually written in BASIC, and written so you can use it on one of the popular, low-cost computers, such as the Commodore VIC, the Atari 400, or the TI 99/4A.

In addition, I will often review books, magazines, and software that are relevant to that month's column. I want to awaken your curiosity and spark your imagination. I want to startle you and surprise you. But I also want to inform you.

Feedback

Well, that's it. Welcome aboard the column. And while you're reading it each month, I'd like you to ask yourself one question, over and over:

WHAT WOULD *I* BE WRITING ABOUT IF *I* WERE DOING THIS COLUMN?

Then, if answering that question gets you all fired up, drop me a line:

Fred D'Ignazio
c/o **COMPUTE!**
P.O. Box 5406
Greensboro, NC 27403

I promise to write back, and I promise to listen carefully to your suggestions. There's a good chance I can use them in an upcoming column. And, of course, I'll give *you* the credit.

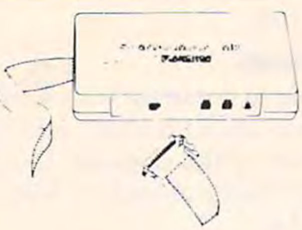
**Gregory Yob, "The Computer as a Gun: Personal Computers and Personal Autonomy," NCC'79* Personal Computing *Proceedings, NY: American Federation of Information Processing Societies (AFIPS), p. 9, 1979.*

The author, his daughter Catie and "Ged" the home computer. Like his namesake in Ursula LeGuin's *Earthsea Trilogy,* Ged is wise. Unlike his namesake, Ged is mischeivous and tricky. Catie is Ged's teacher and is responsible for his personality. ©

SPECIALS on INTEGRATED CIRCUITS

6502	7.45	10/6.95	50/6.55	100/6.15
6502A/6512A	8.40	10/7.95	50/7.35	100/6.90
6520 PIA	5.15	10/4.90	50/4.45	100/4.15
6522 VIA	6.45	10/6.10	50/5.75	100/5.45
6532	7.90	10/7.40	50/7.00	100/6.60
2114-L200		3.75	25/3.50	100/3.25
2114-L300		3.15	25/2.90	100/2.65
2716 EPROM		7.00	5/6.45	10/5.90
2532 EPROM				14.50
6116 Hitachi 2K x 8 CMOS RAM				**14.50**
4116				**8 for 17**
Zero Insertion Force 24 pin Socket				2.00
6550 RAM (PET 8K)				12.70
S-100 Wire Wrap Socket				2.40

A P Products 15% OFF
A P Hobby-Blox 15% OFF



MODEM SPECIAL $99

SIGNALMAN Mk1 from Anchor Automation

DIRECT CONNECT Modem with RS232 Cable and Connector included. Fully compatible with all Bell 103 modems. 0 to 300 bps, full duplex, frequency shift keyed modulation, automatic ANSW/ORIG selection, direct connect, audible tone carrier detect indicator, self-contained battery powered.

PET/CBM Version (Mk1P) $169

For Commodore Computers, the Signalman Mk1P includes connector, cable, and machine language software

STAR MODEM Prentice/Livermore Data Systems

RS232 MODEM	**SALE**	**$128**
IEEE 488 MODEM	**SALE**	**$199**
RS232 CCITT		**$170**
IEEE 488 CCITT		**$270**

We carry Apple II+ from Bell & Howell

fullFORTH+ for Apple II $75

A full-featured FORTH with enhancements. Conforms to FORTH Interest Group standards.

REVERSAL (Spracklen) 32K Apple	28.00
Data Manager (Lutus) 24K Apple	40.00
Energy Miser - PET, Apple, Zenith	24.50
Histo-Graph (Boyd) 48K Apple	24.50
Data-Graph (Boyd) 48K Apple	40.00
Apple II User's Guide (Osborne)	12.00
Introduction to Pascal (Sybex)	10.30
Pascal Handbook (Sybex)	12.00
Musical Applications of Micros (Chamberlin)	20.00
Basic FORTRAN (Coan)	7.25
CP/M Handbook (with MP/M) Zaks	11.85
Programming the 6502 - Zaks	10.00

commodore

CBM-PET SPECIALS

	list	SALE
8023 Printer – 136 col, 150cps bi-directional	(995)	775
8300 Daisy Wheel – 40 cps bi-directional	(2250)	1750
8032 80 x 25 CRT, business keyboard	(1495)	1100
Super Pet	(1995)	1650
8096 Board (extra 64K RAM for 8032)	(500)	400
8050 Dual Disk Drive - 1 megabyte	(1795)	1345
8250 Dual Disk Drive - 2 megabyte	(2195)	1760
CBM IEEE Modem	(395)	199
4016 full size graphics keyboard	(995)	795
4032 full size graphics keyboard	(1295)	999
4040 Dual Disk Drive - 330,000 bytes	(1295)	999
2031 Single Disk Drive - 165,000 bytes	(695)	550
4022 Tractor Feed Printer	(795)	630
C2N External Cassette Deck	(75)	65
Used CBM/PET Computers		CALL

WE WILL MATCH ANY ADVERTISED PRICE

***** EDUCATIONAL DISCOUNTS *****

Buy 2 PET/CBM Computers, receive 1 FREE

VIC 20 Color Computer	259
VIC 1515 Graphics Printer	335
VIC 3K RAM	36
VIC 8K RAM	54
VIC 16K RAM	112
VIC 1540 Disk Drive	525
VIC Avengers (Invaders)	24
VIC Jupiter Lander	24
VIC Superslot	24
VIC Super Alien	24
VIC Maze (Victory Software)	12
VIC Cosmic Debris (Victory Software)	9
VIC Amok (UMI)	17
TNW 1000 Serial Interface	110
TNW 488/103 with DAA	450
Compute!'s First Book of PET /CBM	11
WordPro 3 Plus - 32K CBM, disk, printer	195
WordPro 4 Plus - 8032, disk, printer	300
OZZ Data Base System for CBM 8032	335
VISICALC for PET, ATARI, or APPLE	190
SM-KIT - PET ROM Utilities	**40**
Programmers Toolkit - PET ROM Utilities	35
PET Spacemaker II ROM Switch	36
2 Meter PET to IEEE or IEEE to IEEE Cable	40
Dust Cover for PET	8
IEEE-Parallel Printer Interface for PET	110
IEEE-RS232 Printer Interface for PET	120
The PET Revealed	12
Library of PET Subroutines	12

4 PART HARMONY MUSIC SYSTEM for PET

The Visible Music Monitor, by Frank Levinson, allows you to easily enter, display, edit, and play 4 part harmony music. Includes whole notes thru 64ths (with dotted and triplets), tempo change, key signature, transpose, etc. The KL-4M unit includes D to A converter and amplifier ready to hook to your speaker.

KL-4M Music Board with VMM Program $60

DISK SPECIALS

SCOTCH (3M) 5"	10/2.45	50/2.35	100/2.30
SCOTCH (3M) 8"	10/2.60	50/2.45	100/2.40
Verbatim 8" Doubled Dens	10/3.65	50/3.55	100/3.40
Verbatim 5" Datalife	10/2.65	50/2.60	100/2.55
(Add 1.00 for Verbatim 5" plastic storage box)			
BASF 5" soft	10/2.10	20/2.00	100/1.90
Wabash 5"	10/2.30	50/2.25	100/2.15
Wabash 8"	10/2.40	50/2.35	100/2.25

WE STOCK MAXELL DISKS

Diskette Storage Pages		10 for 3.95
Disk Library Cases	8" - 2.85	5" - 2.15
Disk Hub Rings	8" - 50 @ 7.50	5" - 50 @ 6.00

CASSETTES - AGFA PE-611 PREMIUM

High output, low noise, 5 screw housings.

C-10	10/.56	50/.50	100/.48
C-30	10/.73	50/.68	100/.66

All other lengths available. Write for price list.

SPECIALS

EPSON MX-80 Printer	
EPSON MX-80 F/T Printer	
EPSON MX-70 Printer	
EPSON MX-100 Printer	
Centronics 739 Printer with dot graphics	575
STARWRITER Daisy Wheel Printer	**1445**
Zenith ZVM-121 Green Phosphor Monitor	119
Amdek Color Monitor	355
DC Hayes Smartmodem	240
Watanabe Intelligent Plotter	1195

ALL BOOK and SOFTWARE PRICES DISCOUNTED

OSBORNE/McGraw-Hill, HAYDEN, SYBEX,etc.

Synertek Systems

SYM-1 Microcomputer SALE	**199**
SYM BAS-1 BASIC or RAE 1/2 Assembler	85
KTM-2/80 Synertek Video and Keyboard	349
KTM-3/80 Synertek Tubeless Terminal	385

ZENITH data systems

Z90-80 64 K	2170
Z90-82 64K, 1 double dens. drive	2395
Z89-0 48K	1950
Z89-1 48K, 1 drive	2150
Z67 10 Megabyte + Floppy Drive	4495
Z37 1.3 Megabyte Dual Floppy	1495
Z25 High Speed Printer	1195
Z19 Video Terminal (VT-52 compatible)	670
ZVM-121 Green Phosphor Monitor	119
All Zenith Software discounted	

ATARI® SPECIALS

800 Computer	695	Microsoft BASIC	72
400 - 16K	339	**MISSILE COMMAND**	**32**
810 Disk Drive	449	**ASTEROIDS**	**32**
825 Printer	629	**STAR RAIDERS**	**32**
850 Interface	175	Space Invaders	36
822 Printer	359	Music Composer	45
Paddle Pair	19	Chess	30
Joystick Pair	19	Super Breakout	30
16K RAM	85	**PAC-MAN**	**36**
Assembler/Editor	46	**CENTIPEDE**	**36**
Pilot	68	First Book of Atari	11

Write for prices on other Atari items.

252 Bethlehem Pike
Colmar, PA 18915

215-822-7727

A B Computers

WRITE FOR CATALOG

Add $1.25 per order for shipping. We pay balance of UPS surface charges on all prepaid orders. Prices listed are on cash discount basis. Regular prices slightly higher. Prices subject to change.

The Microsoft version of this program contains REM statements showing the necessary changes for Apple, CBM/PET where specific commands are machine specific. Program 2 is for the Atari.

Grading Exams On A Microcomputer

Kenneth J. Freese
East Meadow, NY

There is certainly nothing new about grading a short answer test with a computer. With the first programs I wrote for this purpose, however, I was frustrated by two problems. I found the usual serial input prompt method for entries much too slow and was unable to look back at previous entries to keep my place and check for accuracy. I developed this program primarily to correct these shortcomings. It is designed for exams with one-character answers. Multiple choice and true-false questions are ideally suited since all input (i.e. A B C D E, T F) can be done with the left hand when touch typing and full advantage of the speed of the program can be taken.

First an overview. The correct answers are placed in the string KEYANS$. Each student's answers are then entered into the string STUDANS$ and compared to KEYANS$ one element at a time. Errors for each student are then displayed and a score is generated. A tally is kept of the number of students getting each question wrong and then displayed after all exams are graded. A "#" is entered to end the answer sequence and, if you get things all fouled up and find yourself at the wrong place on an answer sheet, entering a "&" allows you to start that entry sequence all over again.

The following explains the important routines in the order they are implemented.

LINE 100 – Opens the Keyboard (K:) for an input operation.

SUBROUTINE 3000 – Formats the screen.

SUBROUTINE 4000 and LINE 220 – Reads the keyboard without requiring depressing the RETURN key (see **COMPUTE!**, September-October, 1980, #6 "Reading the ATARI Keyboard on the Fly") and creates the answer string ANS$.

SUBROUTINE 5000 – Places the answers entered onto the screen in the correct position.

LINES 340-380 – Allows correction of erroneous entries one at a time.

LINES 390-580 – Creates STUDANS$ and allows for corrections just as done for KEYANS$ above.

LINES 630-680 – Compares STUDANS$ to KEYANS$ one element at a time.

SUBROUTINE 7000 – Called each time an incorrect answer is encountered. Prints the student's incorrect answer and the correct answer on the screen.

LINE 640 – When the total answer display will cause scrolling of the screen SUBROUTINE 8000 is called and allows the user to view blocks of data on command.

LINE 690 – Calculates and displays student's grade.

SUBROUTINE 6000 – Utilized when "END" is entered for student's name. Displays on the screen the number of students getting each question wrong and prevents scrolling of the screen as above.

Program 1. Atari Version

```
100 REM *** GRADING EXAMS WITH THE ATARI

110 REM *** by KENNETH FREESE
120 OPEN #2,4,0,"K:"
130 POKE 752,1
140 DIM ANS$(101)
150 DIM A$(1),NAME$(10)
160 ? CHR$(125):? :? :? :? "FIRST ENTER
ANSWER KEY"
170 ? :? "WHEN FINISHED ENTER '#'"
180 ? :? "ENTER '&' TO START ENTRY ANEW"

190 ? :? :? :? "PRESS RETURN TO CONTINUE
";:INPUT A$
200 GOSUB 3000
210 GOSUB 4000
220 IF D=0 THEN GOTO 210
230 GOSUB 5000
240 ? ANS$(B,B)
250 IF ANS$(B,B)="#" THEN GOTO 280
260 IF ANS$(B,B)="&" THEN 200
270 B=B+1:GOTO 210
280 NO=B-1
290 POSITION 2,22:? "PRESS RETURN TO CON
TINUE";:INPUT A$
300 DIM KEYANS$(NO),STUDANS$(NO)
```

```
310 DIM TOTAL(NO)
320 FOR X=1 TO NO:TOTAL(X)=0:NEXT X
330 KEYANS$=ANS$
340 ? CHR$(125):? :? :? "ARE THERE ANY C
ORRECTIONS (Y OR N)";:INPUT A$:IF A$<>"Y
" THEN 390
350 ? CHR$(125):? :? :? "QUESTION #";:IN
PUT Q
360 ? :? "CORRECTED ANSWER  ";:INPUT A$
370 KEYANS$(Q,Q)=A$
380 GOTO 340
390 ? CHR$(125):? :? :? "THE STUDENT'S A
NSWERS WILL NOW"
400 ? "BE ENTERED"
410 ? :? :? "ENTER THE STUDENT'S LAST NA
ME"
420 ? "('END' IF ALL ENTERED)":? :? "
     ";:INPUT NAME$
430 IF NAME$="END" THEN 6000
440 GOSUB 3000
450 GOSUB 4000
460 IF D=0 THEN 450
470 GOSUB 5000
480 ? ANS$(B,B)
490 IF ANS$(B,B)="#" THEN 520
500 IF ANS$(B,B)="&" THEN 440
510 B=B+1:GOTO 450
520 POSITION 2,22:? "PRESS RETURN TO CON
TINUE";:INPUT A$
530 STUDANS$=ANS$
540 ? CHR$(125):? :? :? "ARE THERE ANY C
ORRECTIONS (Y OR N)";:INPUT A$:IF A$<>"Y
" THEN 590
550 ? CHR$(125):? :? :? "QUESTION #";:IN
PUT Q
560 ? :? "CORRECTED ANSWER  ";:INPUT A$
570 STUDANS$(Q,Q)=A$
580 GOTO 540
590 C=0
600 ? CHR$(125):? NAME$:?
610 ? "QUESTION #   STUDENT ANSWER   ANS
WER"
620 ?
630 FOR X=1 TO NO
640 IF PEEK(84)=20 THEN GOSUB 8000:? "QU
ESTION #   STUDENT ANSWER   ANSWER":?
650 IF KEYANS$(X,X)<>STUDANS$(X,X) THEN
670
660 C=C+1:GOTO 680
670 GOSUB 7000
680 NEXT X
690 ? :? ,,"GRADE:",,INT(100*C/NO+0.5);
"%"
700 ? " PRESS RETURN TO CONTINUE";:INPUT
 A$
710 GOTO 390
3000 B=1:? CHR$(125):POKE 82,1
3010 Z=1
3020 FOR X=1 TO 33 STEP 8:FOR Y=0 TO 19
3025 IF Z=100 THEN POSITION X-1,Y:GOTO 3
035
3030 POSITION X,Y
3035 ? Z:Z=Z+1
3040 NEXT Y:NEXT X
3050 FOR X=3 TO 35 STEP 8:FOR Y=0 TO 19
3060 POSITION X,Y:? ":"
3070 NEXT Y:NEXT X
3080 FOR X=7 TO 31 STEP 8:FOR Y=0 TO 19
3090 POSITION X,Y:? CHR$(2)
3100 NEXT Y:NEXT X
3110 RETURN
4000 D=0
4010 IF PEEK(764)<>255 THEN GET #2,D:ANS
$(B,B)=CHR$(D):POKE 764,255
4020 RETURN
5000 IF B<21 THEN POSITION 5,B-1:RETURN

5010 IF B<41 THEN POSITION 13,B-21:RETUR
N
5020 IF B<61 THEN POSITION 21,B-41:RETUR
N
5030 IF B<81 THEN POSITION 29,B-61:RETUR
N
5040 IF B<101 THEN POSITION 37,B-81:RETU
RN
5050 RETURN
6000 ? CHR$(125):? :? :? "DO YOU WANT A
"
6010 ? "SUMMARY OF ANSWERS (Y OR N)";:IN
PUT A$:IF A$<>"Y" THEN END
6040 ? CHR$(125):? :? "         ANSWER SUM
MARY":?
6050 ? "    QUESTION #",,"# WRONG":?
6060 FOR X=1 TO NO
6065 IF PEEK(84)=20 THEN GOSUB 8000:? "
   QUESTION #",,"# WRONG":?
6070 ? ,X,,TOTAL(X)
6080 NEXT X
6090 END
7000 ? "    ";X,,,STUDANS$(X,X),,,:? "
";KEYANS$(X,X)
7010 TOTAL(X)=TOTAL(X)+1
7020 RETURN
8000 POKE 84,22:? "PRESS RETURN TO CONTI
NUE";:INPUT A$:? CHR$(125)
8010 RETURN
```

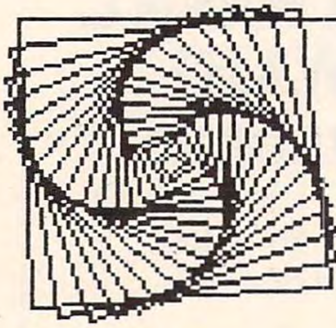
Program 2. Microsoft Version

```
100 REM GRADING EXAMS: MICROSOFT VE
    RSION
145 POKE 59468,12:REM THIS LINE ONL
    Y FOR PET/CBM
```

```
150 GOSUB 9000:PRINT:PRINT:PRINT:PR
    INT "FIRST ENTER ANSWER KE
    Y"
160 PRINT:PRINT"WHEN FINISHED, ENTE
    R '#'"
180 PRINT "ENTER '&' TO START ENTRY
     ANEW"
190 PRINT:PRINT "PRESS RETURN TO CO
    NTINUE"
195 REM FOLLOWING LINE WILL WORK ON
     PET OR APPLE
197 GET A$:IF A$="" THEN 197
200 GOSUB 3000
210 GOSUB 4000
220 IF D=0 THEN 210
230 GOSUB 5000
240 PRINT MID$(AN$,B,1)
250 IF MID$(AN$,B,1)="#" THEN 280
260 IF MID$(AN$,B,1)="&" THEN 200
270 B=B+1:GOTO 210
280 NO=B-1
290 PRINT "PRESS RETURN TO CONTINUE
    ..."
295 GET A$:IF A$="" THEN 295
300 DIM TTL(NO)
330 KEY$=AN$
340 GOSUB 9000:INPUT"ARE THERE ANY ~
    CORRECTIONS (Y OR N) ";A$:
    IFA$<>"Y"THEN390
350 GOSUB 9000:INPUT "QUESTION # ";
    Q
360 PRINT:INPUT "CORRECTED ANSWER "
    ;A$
370 KEY$=LEFT$(KEY$,Q-1)+A$+MID$(KE
    Y$,Q+1)
380 GOTO 340
390 GOSUB 9000:PRINT "THE STUDENT'S
     ANSWERS WILL NOW"
400 PRINT "BE ENTERED."
410 PRINT:PRINT "ENTER THE STUDENT'
    S LAST NAME"
420 PRINT"('END' IF ALL ENTERED)":P
    RINT:INPUT "       ";NAME$
430 IF NAME$="END" THEN 6000
440 GOSUB 3000
450 GOSUB 4000
460 IF D=0 THEN 450
470 GOSUB 5000
480 PRINT MID$(AN$,B,1)
490 IF MID$(AN$,B,1)="#" THEN 520

500 IF MID$(AN$,B,1)="&" THEN 440
510 B=B+1:GOTO 450
520 PRINT "PRESS RETURN TO CONTINUE
    ";
525 GET A$:IF A$="" THEN 525
530 SA$=AN$
540 GOSUB 9000:INPUT"ARE THERE ANY ~
    CORRECTIONS (Y OR N) ";A$:
    IFA$<>"Y"THEN590
550 GOSUB 9000:INPUT "QUESTION # ";
    Q
560 PRINT:INPUT "CORRECTED ANSWER "
    ;A$
570 SA$=LEFT$(SA$,Q-1)+A$+MID$(SA$,
    Q+1)
580 GOTO 450
590 C=0
600 GOSUB 9000:PRINT NAME$:PRINT
610 PRINT"QUESTION #  STUDENT ANSWE
    R  ANSWER"
620 PRINT:L=0
630 FOR X=1 TO NO
640 IF L=20 THEN GOSUB 8000:L=0:PRI
    NT"QUESTION #  STUDENT ANS
    WER  ANSWER"
650 IF MID$(KEY$,X,1)<>MID$(SA$,X,1
    ) THEN L=L+1:GOTO 670
660 C=C+1:GOTO 680
670 GOSUB 7000
680 NEXT X
690 PRINT:PRINT,"GRADE:",INT(100*C/
    NO+.5);"%"
700 PRINT "PRESS RETURN TO CONTINUE
    "
705 GET A$:IF A$="" THEN 705
710 GOTO 390
3000 B=1:GOSUB 9000:PRINT
3010 FOR X=0 TO 19
3020 FOR J=0 TO 4
3030 PRINT TAB(J*8);J*20+X+1;
3040 NEXT J
3050 PRINT:NEXT X
3060 RETURN
4000 GET D$:IF D$="" THEN 4000
4010 D=ASC(D$):AN$=LEFT$(AN$,B-1)+D$
    +MID$(AN$,B+1)
4020 RETURN
5000 REM THIS SUBROUTINE POSITIONS A
    N ABSOLUTE CURSOR
5005 REM IT WILL NEED TO BE CHANGED ~
    FOR YOUR COMPUTER
5007 REM

5010 MY=B-INT((B-1)/20)*20
5020 MX=INT((B-1)/20)*8+5
5030 PRINTLEFT$("{HOME}{24 DOWN}",MY
    +1);TAB(MX);:REM FOR PET
5040 REM POKE 37,MY+1:PRINT TAB(MX);
    :REM FOR APPLE
5050 RETURN
6000 GOSUB 9000:PRINT:PRINT:PRINT"DO
     YOU WANT A"
6010 INPUT "SUMMARY OF ANSWERS (Y OR
     N) ";A$:IF A$<>"Y" THEN E
    ND
6040 GOSUB 9000:PRINT:PRINT "ANSWER ~
    SUMMARY":PRINT
```

```
6050 PRINT "QUESTION #","# WRONG":L=
     0
6060 FOR X=1 TO NO
6065 L=L+1:IF L=20 THEN GOSUB 8000:L
     =0:PRINT"QUESTION #","# WR
     ONG"
6070 PRINT X,TTL(X)
6080 NEXT X
6090 END
7000 PRINT"     ";X,,MID$(SA$,X,1),MI
     D$(KEY$,X,1)
7010 TTL(X)=TTL(X)+1
7020 RETURN
8000 PRINT "PRESS RETURN TO CONTINUE
     "
8005 GETA$:IF A$="" THEN 8005
8010 RETURN
8999 END
9000 REM CLEAR SCREEN SUBROUTINE
9010 REM USE "HOME" OR "CALL-936" FO
     R APPLE
9020 REM USE "FOR I=1 TO 32:PRINT:NE
     XT" FOR OSI
9030 PRINT CHR$(147);:REM FOR PET
9040 RETURN
```

©



Friends Of The Turtle

P.O. BOX 1317
LOS ALTOS, CALIFORNIA 94022

David D. Thornburg
Los Altos, CA

I want to thank all of you who have taken the time to write me letters in support of Friends of the Turtle. I am busy sending answers to your questions. If you haven't heard from me, please be patient – I answer all my letters personally, so it takes me a while to catch up.

Many of the letters expressed the hope that turtles really are for everyone – expert and neophyte alike.

They are.

My interest in turtle graphics (and in the computer languages LOGO and PILOT) comes from the success I have had teaching programming to audiences as diverse as second graders and professional artists.

Friends of the Turtle is becoming international in scope, with members writing from places as far away as England and Argentina. Horacio Reggini wrote from Argentina to tell me of his work with LOGO and children. As a sign of their level of interest, he sent me a brochure describing the Spanish translation of Papert's Mindstorms (called "Desafio a la mente").

If you don't have Atari PILOT, TI LOGO, or one of the other languages which supports turtle graphics, then watch this column for announcements of new languages – there is a lot of activity in this area.

Several owners of the new IBM computer wrote me for information. While I don't know of any commercial turtle graphics packages for that machine yet, several programmers wrote to tell me they are working on the problem. Any computer with a graphics display should be able to support this graphics environment as long as someone is willing to create the language. I remember back in 1978 when WSFN was released as a turtle graphics language for the PET by the Peninsula School Computer Project (Peninsula Way, Menlo Park, CA 94025). It shouldn't be too hard to get this language to run on the VIC, or on the forthcoming $150 Commodore Ultimax. If you enjoy writing languages, keep me informed of any turtle languages you create.

Visible Vs. Invisible Turtles ...

Some of the more sophisticated languages give the user the option of a visible turtle whose orientation can be seen as it moves around the screen. While experienced programmers usually don't use this feature, it can be quite valuable as a training tool.

Those of you using Atari PILOT know that this language does not contain a visible turtle. Since there wasn't room to incorporate this feature into the language, I decided to create one of my own called VISITURT.

VISITURT is an example of a PILOT-based turtle graphics program which illustrates some important ideas. If you have Atari PILOT, you may want to use this program to introduce turtles to your friends. If you use other languages, you might want to try converting this program to work on your system. In addition to generating a visible turtle, this program automatically alternates between DRAW and TURN commands to allow first-time users to create pictures by entering the distance or angle for each command. While the program itself is designed to be used by beginners, I will assume that those of you who are going to enter this program already understand enough about PILOT to follow the listing.

VISITURT uses three procedures: *ERASE, *ACCEPT, and (of course) *TURTLE. Since these procedures are needed by the main program, we will describe them first.

The ERASE procedure clears the screen, moves the turtle to the origin, makes it turn straight up and draws a fresh copy of the turtle's picture. Here is its listing:

```
*ERASE
GR: GOTO 0,0; TURNTO 0; CLEAR
U: *TURTLE
E:
```

The ACCEPT procedure does two things. It accepts input from the keyboard and places the numeric value of the input in the variable #A. If

the user enters the letter E, this procedure will use the ERASE module to reset the screen. Here is its listing:

```
*ACCEPT
A: #A
M: E
UY: *ERASE
E:
```

The TURTLE procedure has one task – to draw a picture of the turtle on the screen. As you can see from its listing, this procedure is made from a combination of commands which TURN, which GO (move without drawing), and which DRAW. Except for small movements to insure proper centering of the figure, this procedure works this way. First the turtle is moved straight ahead by four units to the edge of a 30-sided body. The body is then drawn by the command 30(DRAW 1; TURN 12). This is the Atari PILOT short hand for "thirty times draw 1 unit and turn 12 degrees." Next, the turtle is repositioned and the head is drawn with a 10-sided polygon. Finally, the turtle is returned to its starting position and orientation. If we didn't make this last step, our turtle wouldn't be very useful. Our goal is to draw a picture of a turtle around the turtle's starting location and to leave the turtle in the same place it was when we started. The listing for this procedure is shown below:

```
*TURTLE
GR: GO 4; TURN -90; GO 1; TURN 180
GR: 30(DRAW 1; TURN 12)
GR: GO 1; TURN 180
GR: 10(DRAW 1; TURN 36;
GR: TURN 90; GO -4
E:
```

Finally we are ready for the main procedure – *VISITURT. Here is its listing:

```
*VISITURT
U: *ERASE
T:  WELCOME TO THE VISIBLE TURTLE
T:
J: *STARTHERE
*MASTERLOOP
T: TURN\
U: *ACCEPT
GR: PEN ERASE
U: *TURTLE
GR: TURN #A
*STARTHERE
GR: PEN YELLOW
U: *TURTLE
T: DRAW\
U: *ACCEPT
GR: PEN ERASE
U: *TURTLE
GR: PEN RED
GR: DRAW #A
GR: PEN YELLOW
U: *TURTLE
J: *MASTERLOOP
E:
```

The idea behind this program is that the turtle is first drawn on the screen. Once the user indicates how much to draw or turn (since these commands appear alternately), the turtle is then erased (by drawing it again with the ERASE pen), a line is drawn, or the turtle is turned, and the picture of the turtle is drawn in its new location with the yellow pen.

If you use Atari PILOT, you might want to enter this program by keying in the *VISITURT procedure first. This way, when you type RUN, the correct procedure will be started first. If you key the procedures in any other order, you will have to *use* the VISITURT procedure (by typing U: *VISITURT) in order to start the program properly.

Those of you who are familiar with PILOT should recognize most of the commands used in this program. The following figures show

Figure 1.

Figure 2.

Figure 3.

the VISITURT display during the creation of a 5-pointed star.

While this program was written in Atari PILOT, those of you familiar with other turtle languages should be able to convert it for your system.

Next month we will cover some basic ideas about turtle paths. That topic applies to all turtle implementations and should be of interest to turtle users of all ages.

Until then, please feel free to write me with your programs and pictures. I hope to be able to share your efforts with your fellow readers.

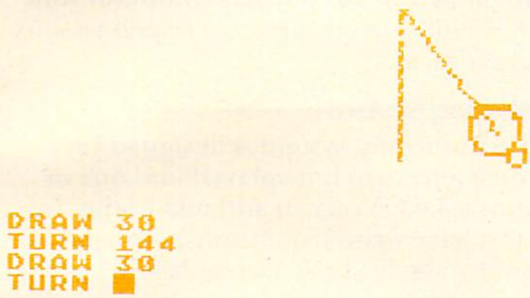


Figure 4.

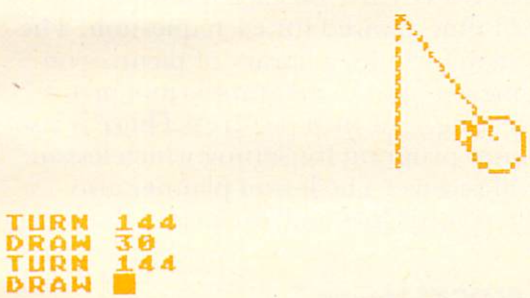


Figure 5.

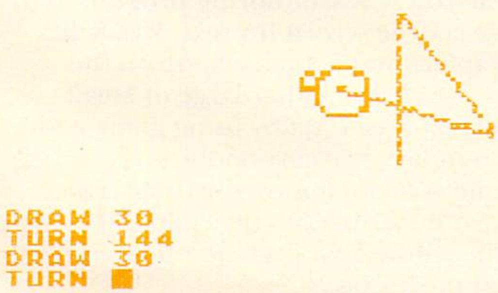


Figure 6.

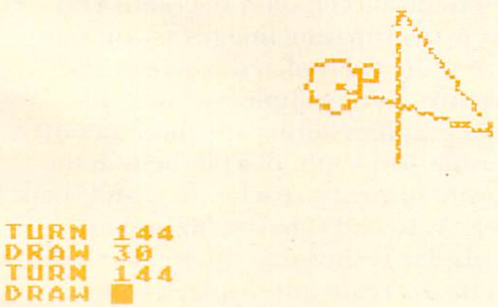


Figure 7.

Figure 8.

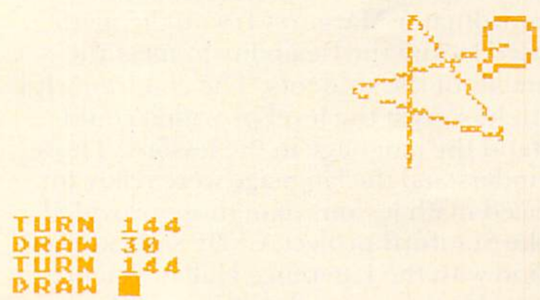


Figure 9.

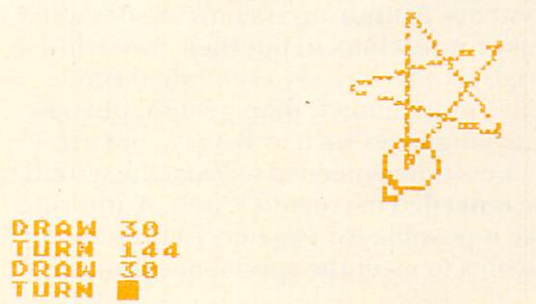


Figure 10.

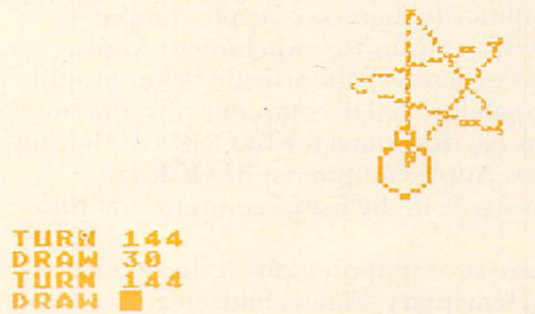


Figure 11.

©

Learning With Computers

Glenn Kleiman and Mary Humphrey
Teaching Tools: Microcomputer Services
Palo Alto, CA

The California School For The Deaf

We recently visited the California School for the Deaf at Fremont, California (CSDF). The School serves 500 hearing impaired students, ranging in age from 4 to 21 years. It uses a total communication approach to teaching deaf children, encouraging both sign language and oral language.

CSDF has been using computers to teach students for 12 years. Their first experience was as part of a Stanford University math computer assisted instruction project. According to CSDF computer coordinator Margaret Irwin, the math programs used lacked the flexibility to meet the individual needs of the students. The children who needed math lessons at the level provided could not understand the language in the lessons. Those who could understand the language were ready for more advanced math lessons than those provided.

After the Stanford project, CSDF staff worked in conjunction with the Lawrence Hall of Science in Berkeley to develop more flexible ways of using time-sharing computers for education. The main emphasis of the project was the development of authoring systems. Authoring systems are designed to make it easy for teachers to put their own educational materials into an already established framework. They are more limited than general purpose programming languages such as BASIC, but are easier to use. Less time is needed to learn the system, and less time is needed to create a lesson. Authoring systems make it possible for teachers to prepare computer lessons to meet the special needs of their students.

In the last few years CSDF has changed from using terminals connected to the Lawrence Hall of Science computer to their own Apple computers. There were two reasons for switching to Apples: They are less expensive and provide better graphic and color capability. CSDF computer programmer Linda Slovick has developed the BLOCKS Authoring Language for Apple computers. BLOCKS now plays a central role in the use of computers at the School.

There are two computer labs at the School, one for the elementary school children and one for the junior high and high school students. About half of the teachers actively use these labs with their classes. There is a much greater demand for computer time than can be met by the available facilities.

In the elementary lab, about half of students' computer time is spent on lessons teachers have authored using the BLOCKS language. The rest of the time is spent using math and problem solving activity programs. In the other lab, the older children spend about two-thirds of their computer time with BLOCKS, either using already created lessons or creating their own.

BLOCKS Authoring System

The BLOCKS authoring system is designed for lessons in which a picture is displayed and one or more questions asked. You can add text to the pictures, or just have written questions if you prefer. The questions can be in short answer, fill-in, multiple choice or true-false formats. BLOCKS lets you design many aspects of a lesson, such as the feedback to be given for correct and incorrect answers, the number of tries to give on each question, and the amount of time allowed for each question. The BLOCKS system includes a library of pictures on disks and some very powerful graphic tool programs for creating your own pictures. There is also a lesson planner program for setting which lesson each child will receive. The lesson planner also automatically records how well each child does on the lessons.

Creating a BLOCKS Lesson

We will describe what is involved in writing a single question of a lesson on states and maps. The first step in using the BLOCKS authoring program is to set a certain area of the screen for text. BLOCKS lets you put graphics and text anywhere on the screen and lets you choose either large or small type fonts. The text area is set by using game paddles to move boundary markers on the screen. Once this is done, a menu appears, letting you easily select the number of tries the child is to receive, the time allowed for each question and other aspects of the lesson.

Next you create a picture on the screen. You select an image from the graphics library disks and use the paddles to position it on the screen. You can combine as many separate images as you want into one picture. When completed, you can add labels to the picture. For example, we took the images from the graphics library for the states of California, Nevada and Utah, placed them in the appropriate positions next to each other, and then added the labels A, B, and C to the three states. The resulting display is shown in the figure. It took about one minute to create this display.

Once the picture is formed, BLOCKS prompts you for a question. Our first question was (prompts

TRANSFORM GRANDPA "PET™" INTO A YOUNG VIBRANT "PET™" BY UPGRADING TO 4.0 BASIC

Socketed P.C. Board that will plug into your ROM Sockets and accepts Commodore's 24 Pin ROMS 4.0 BASIC Interpreters (ROMS not included). When used with I.C. Clip, requires no soldering. Please check number of pins on your ROMS before ordering.

RB-4 (for 28 Pin ROM "PET™")	$49.95
RB-4 with I.C. Clip	69.95
RB-4A (for 24 Pin ROM "PET™")	49.95
RB-4A with I.C. Clip	69.95

Please include $1.50 each for shipping and handling.
California residents, please include 6% Sales Tax.

10% User Group Discount for Purchase of 5 or More Units.
Send S.A.S.E. For Free Catalog.

BETTER SOLUTIONS

1163 PETERLYNN DRIVE • SAN DIEGO, CALIFORNIA 92154

"PET" is a trademark of Commodore Business Machines, Inc.

© 1982 BETTER SOLUTIONS
ALL RIGHTS RESERVED

EXPAND YOUR ATARI 400* TO 32K!

FOR ONLY $119.95

Now with the Mosaic Expander and your own Atari 16K RAM board you'll have 32K RAM. Plus all the famous Mosaic quality features: **Four year warranty, bus-compatability, highest quality components, complete instructions. All for $119.95.** Call toll free for your nearest Mosaic dealer.

FOR NOW AND INTO THE FUTURE.

MOSAIC
ELECTRONICS
1-800-547-2807
P.O. Box 748, Oregon City, Oregon 97045 503-655-9574

*Trade Mark of Atari Inc.

SOFTWARE
FOR YOUR 16K TRS-80 COLOR, MODEL I, III ATARI 400/800, APPLE II

NOW YOUR COMPUTER CAN ACT LIKE A COMPUTER SHOULD.... WITH OUR MAGNETIC MAGAZINES, YOUR MICRO WILL ENTERTAIN, EDUCATE, AND CHALLENGE YOU.

appletree™ MAGATARI™ TRC™

On cassette or diskette*, you will receive 6-10 programs every month ranging from games, home entertainment, and personal finance, to more of our unique "teaching" programs.
Our next issue will include:

1. **Haunted House Adventure**
2. **Income Averaging (Schedule G)**
3. **Hangman with graphics**
4. **Cryptoquote Game**

Plus two of our teaching programs:

5. **Writing Utility Programs**
6. **More on Graphics**

You've already missed Stock Market Analysis, Concentration, Checkers, Golf, Algebra and Geometry Tests and Football. ☆ Later issues will include Backgammon, Chess, all Tax Schedules, Baseball, and many more. So don't let another issue pass you by! Remember MAGATARI is for the ATARI 400/800; APPLETREE is for the APPLE II +; and TRC is for the MODEL I, III, and the TRS-80 COLOR, so be sure to order the right one. Subscription price for cassette is $50 per year, $30 per ½ year and $10 for a trial issue; for diskette $62 per year, $36 per ½ year, and $11 for a trial issue. ☆ (Back issues available on request)

THE ÇOLOR ACCOUNTANT™

With our complete home accounting system, keeping track of your finances can be as easy as PI.
Included in this set of programs are:

1. Chart of Accounts Maintenance
2. Complete Checkbook Maintenance
3. Tax Deduction Flags
4. Net Worth Statement
5. Income Less Expense Statement
6. Complete Graph Package (graphs any files)
7. Payments and Appointments Calendar
8. Home Budget Analysis
9. Mailing List

All programs are menu-driven and allow add/change/delete. Also, all files and statements can be listed to screen or printer, and saved to cassette or diskette. The cost of THE COLOR ACCOUNTANT is $75 for cassette and $80 for diskette. This package requires 16K for the TRS-80 COLOR, Model I, III, and Apple II +. However the ATARI 400/800 requires 24K for cassette and 32K for diskette. THE COLOR ACCOUNTANT also comes with 40 pages of documentation.

the programmer's program

Do you know all the innovative ways of using BASIC commands? The staff at the Programmer's Institute have designed a set of programs explaining everything the manuals omit.
The Programmer's Program leads you step by step through the fundamentals of programming your computer. Then you explore the finer points . . . multiple loops, queues, stacks, game programming, sorts, trees, boolean logic, and memory savers. All these methods make your programming tasks easier and more efficient.
Difficult (and very useful) programs are created before your eyes, and designed so you learn at your own speed! **The Programmer's Program is a must for every owner of a microcomputer ($50 cassette, $55 diskette).**

Order both The Programmer's Program and 1 year's subscription, and the total cost is only $75 cassette, $87 diskette. If you order now, you will receive a football program and computerized telephone directory ABSOLUTELY FREE with any $75 order. So don't wait . . . order today!

THE PROGRAMMER'S INSTITUTE

A Futurehouse Company
P.O. Box 3191 Dept. C
Chapel Hill, N.C. 27514
(919) 489-2198

MC & Visa Welcome

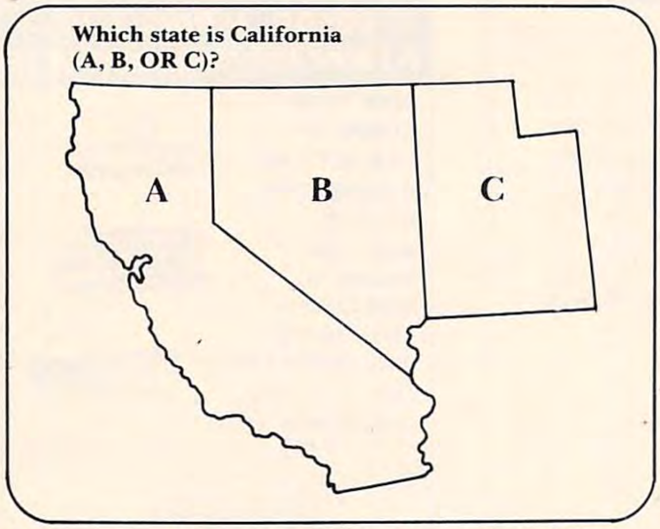
Name ____________
Address ____________
City/St. ____________

☐ Programmer's Program ☐ Year Subscription
☐ ½ Year Subscription
☐ Color Accountant ☐ Trial Issue

Type of Computer ____________
☐ Cassette ☐ Diskette

ATARI, TRS-80, and APPLE are trademarks of the Atari, Tandy, and Apple Corp.
Programmer's Program, TRC, Appletree, and Magatari are trademarks of the Programmer's Institute.

*All software available on cassette for ATARI 400/800, APPLE II +, MODEL I, III, COLOR. On Diskette for the APPLE II +, MODEL III, ATARI 400/800.



displayed by the computer are shown in italics):

Question #1: Which state is California (A, B, or C)?

BLOCKS now prompts you to specify the correct answers and the feedback to give. You can easily set the programs to accept as correct one particular word, any one of a list of words, or any answer which contains a given word. For our example lesson we entered:

Correct answer: A
Correct feedback: That's right.

BLOCKS also lets you check for expected incorrect answers so you can give useful feedback. It prompts you for as many expected wrong answers as you would like to check and the appropriate feedback for each. For example, we entered:

Wrong answer #1: B
Wrong feedback #1: No, that's the state known for gambling.
Wrong answer #2: C
Wrong feedback #2: No, that's the state with the Great Salt Lake.

You can also provide a default feedback to appear if none of the expected answers are given. For our example, we used:

Wrong answer #3: (space signifies any other answer)
Wrong feedback #3: Answer A, B or C only.

You can then add more questions about this picture or go on to another picture. When you have finished the lesson, you save it on disk.

A student begins using a lesson by typing his name, his teacher's name, and the lesson name (if not set with the lesson planner). If our lesson was chosen, the display shown in the figure would appear on the screen and the program would wait for the student's answer. If a student types: "I think it is the one on the left," the program will display:

Answer A, B, or C only.

If the student now types: "B" the program will show the message:

No, that's the state known for gambling.

When the student types the correct answer the computer will display:

That's right.

The program will then display the next question or picture. When all the pictures and questions in a lesson are completed, the student is told the number of correct answers and the total time working. This information is automatically recorded on disk by the lesson planner program.

Graphic Tools

Several programs for creating your own pictures are included in the BLOCKS system. These programs are also useful on their own to explore the graphic capabilities of the Apple or to create graphics for use in other programs. Edu-Paint, created by Steve Dompier, is one of the graphic programs which provides a number of options. With the draw option, you use the game paddles like an Etch-A-Sketch to draw on the screen. With the circle option, you use paddles to move a marker to where you want the center of the circle, and to mark any point on the circumference. The program then completes drawing the circle. Similar options let you easily draw lines and boxes. A Fill option lets you fill any shape with any color.

Shaper, created by Linda Slovick, is another graphic tool program. You create shapes from the keyboard using four keys, one to move in each direction. With Shaper, you can almost trace a shape onto the screen point-by-point. Shaper also lets you change the shape's size, rotate it, change colors and relocate it on the screen. The third graphic tool program, Paint Chip, was created by Pete Rowe to let you combine images into a single picture and add text in either large or small type fonts.

BLOCKS Is Available

BLOCKS is a well designed authoring system which makes good use of the capabilities of Apple computers. Like all authoring systems, it is limited in what it can do, but it is an excellent tool for creating picture-question-answer lessons. The graphic tools are fun, whether or not the pictures are to be used in lessons. Since BLOCKS makes it easy to get the computer to do interesting things, it can be used to introduce students to controlling a computer and to some programming concepts. Students can learn to create lessons for their classmates or for younger children. Even the youngest students can work with the graphic tool programs with only a small amount of supervision.

The current version of BLOCKS requires an Apple with Integer BASIC, 48K RAM, two disk drives, and game paddles. Another version is being developed at CSDF which will be compiled so it will run with either Integer or Applesoft BASIC. The new version will require two disk drives for creating lessons, but only one for using them.

The BLOCKS system, with sample lessons, the classroom management system, some useful utility programs, a sample of the graphics library and the three graphic tool programs, is available for \$100.00. Not a bad price for 10 disks with comprehensive and clear documentation. The three graphic tool disks are available alone for \$30.00 – definitely a best buy. (Edu-Paint, which can be used by itself, is written in Applesoft BASIC.) Groups of disks from the graphics library (which contains 24 disks) can be ordered separately.

Softswap

Where can I get BLOCKS? For the current version, Softswap is the answer. And what is Softswap? We're glad you asked.

Softswap is a distribution center for public domain educational software. In addition to the BLOCKS system they have a large number of programs developed by educators and donated for distribution. They have many disks available for PET, Apple, TRS-80, and Atari computers. Each disk costs \$10.00. Two Apple disks of math and logic programs used at the California School for the Deaf are also available.

Softswap is a service of the Microcomputer Center run by the San Mateo County Office of Education and a California group called Computer-Using Educators. For those in Northern California, there is also a center for on-site previewing of commercial software and a collection of books, magazines and other useful materials. This is a very successful resource center: It can serve as a model for others interested in starting one.

For more information about the Microcomputer Center and Softswap please send \$1.00 to:

Ann Lathrop, Coordinator
Microcomputer Center
San Mateo County Office of Education
333 Main Street
Redwood City, CA 94063

For more information about the California School for the Deaf Computer Project and future versions of BLOCKS contact:

Margaret Irwin
Computer Project Coordinator
California School for the Deaf
39350 Gallaudet Drive
Fremont, CA 94538

©

Using The VIC Game Paddles

David Malmberg
Fremont, CA

In addition to being able to use the Atari joystick (as described in my article in the Fall, 1981 issue of *Home and Educational COMPUTING!*), the Commodore VIC can use the Atari game paddles. This article provides a tutorial on how these paddles work with the VIC by giving a detailed discussion of a Pong game. This version of Pong can have two human players against one another, or one player against the VIC which has nine skill levels. A game paddle version of the classic game Breakout with three skill levels is also presented. After studying these two programs the reader should be a game paddle "expert" and be capable of easily incorporating game paddles into his own programs.

How Game Paddles Work

For those readers who are unfamiliar with the Atari game paddles, a brief description is in order. These game paddles are included when you buy an Atari home video computer system (the game machine), or may be purchased separately as a peripheral device for the Atari personal computer. The price for a pair of paddles varies between $15 and $20. There are two separate paddle units which attach to a single connector that plugs directly into the VIC game port. Each paddle unit consists of a red "fire" button and a knob that may be turned freely in either direction. The knob is attached to a potentiometer which varies a voltage fed into the VIC's game port. After converting this voltage to a digital value, the VIC is able to know the exact position to which the knob has been turned.

To see how the VIC can read the paddles, plug your paddles into the game port and enter the following short program:

```
 10 DD=37154:P1=37151:P2=37152
 20 PX=36872:PY=36873
 30 POKE DD,127:P=PEEK(P2)AND128
 40 FR=-(P=0):POKE DD,255
 50 P=PEEK(P1):FL=-((PAND16)=0)
 60 VL=PEEK(PX):VR=PEEK(PY)
 70 PRINT"CLEAR"FL;VL;FR;VR
200 GOTO30
```

When you RUN this program you should see four numbers in the first row of the screen. The first two numbers correspond to the left paddle and the last two values to the right paddle. FL and FR will be either one or zero depending upon whether the left or right "fire" button is pushed or not. VL and VR will correspond to the knob settings for the left and right paddles respectively. Both VL and VR will vary between 255 and zero as the knobs are turned clockwise from their leftmost position to their rightmost position. You will notice that the knobs are more sensitive than their wide arc would imply, i.e. there is a large band of arc at either extreme of the knob's movement where the values stay at 255 or zero. The actual arc where the values change linearly from zero to 255 is only about one-quarter of a full turn. Although this is a little more sensitive than you might wish, you will find that this will still be enough arc to produce some exciting games.

The reason why this short program actually works is beyond both the scope of this article and the interest level of most readers. I will leave it to Commodore to explain more fully when they issue their documentation on the game paddles. Suffice it to say, it does work!

Controlling Screen Motion

To see how the game paddles can be used to control motion on the VIC's screen, *add* the following lines of code to the above program:

```
  2 POKE 36879,27:PRINT"CLEAR":C=4
  4 S=256*PEEK(648):A=30720:LL=S
  6 IF PEEK(648)=16 THEN A=33792
 70 X=21-INT(VL*21/255):Y=22-INT(VR*22/255)
 80 NL=S+X+22*Y:CL=NL+A
 90 IF FR OR FL THEN C=C+1
100 IF C=8 THEN C=2
110 IF NL=LL THEN 30
120 POKE LL,32:POKE LL+A,1
130 POKE NL,81:POKE CL,C
140 LL=NL
```

You will notice that line 70 above replaces line 70 in the previous program. All of the other lines are new additions.

When you run this program, you will find that the game paddles will move a ball graphic character around the screen at a very rapid pace. Specifically, the left paddle will move the ball from left to right horizontally, and the right paddle will cause vertical movement from top to bottom. Pushing either one of the fire buttons will change the ball's color.

Let's look at this short program in more detail. It not only demonstrates how the game paddles can control motion (and will make following the logic of Pong and Breakout easier) but also contains several useful techniques that will help improve any "action" game you may write. Line 2 sets the border color to cyan and the background color to white, and clears the screen. The variable "C" contains the color of the ball and is initialized to purple.

Lines 4 and 6 will be a useful addition to any program that POKEs characters to the screen. As

you may have read or even experienced, when memory modules (8K or more) are plugged into the VIC, the location of the screen memory and the color matrix move. When you run a program which assumes the screen is in its "normal" position of 7680 and the screen has actually moved (to 4096), the results are frequently a disaster. Line 4 and 6 determine the correct locations for the screen and the color matrix — regardless of the amount of memory that has been added to the VIC. In line 4, the variable "S" will be the starting location of the screen and will be either 7680 or 4096. The variable "A" is the value that must be added to a particular screen location to get its corresponding color matrix location. For example, if we POKE location S with 81 (a ball character), and we POKE location S + A with 4, we would get a purple ball in the "home" corner of the screen. For a "normal" 3.5K VIC, "A" is 30720, i.e., the start of the color matrix is 7680 + 30720 or 38400. *If* the screen moves to 4096, the color matrix will move to 37888 and the value of "A" changes to 33792 — this is the condition given in line 6.

The logic of the Pong program actually starts on line 280 which defines a group of variables that will be used repeatedly later. R is the number of rows. C is the number of columns. NA$(1 and 2) contain the two players names. SP$(1 and 2) contain strings with the cursor control characters needed to position the cursor where each player's name is printed. SC(1 and 2) contain the scores for the two players. In lines 290 and 300 more useful variables are defined. E and F are values used in the calculation of the paddle location. By making these calculations once at the start of the program, and just referencing their variable names later, the speed of the game is increased. The other variables in these lines are either identical to those used in the previous example or their purpose will be obvious when you see how they are used. Line 300 determines the starting locations for the screen, S, and color matrix, S + A.

Line 320 defines three very useful functions. FNA will return the current screen location corresponding to row Y and column X. This will normally be the ball's location. FNB will return the color matrix location corresponding to FNA. FNR(Z) will return a random integer between 0 and Z. Lines 330 to 470 ask the player(s) to specify the options for the play of the game. The variable N is the number of players. If N = 1 then the VIC will play the part of the player on the right side of the screen. The variable D is the skill level for the VIC. A value of 1 will play a very poor game. A value of 9 will never miss a shot.

Lines 480 to 520 begin the game by zeroing both scores, randomly deciding who serves first, clearing the screen, drawing the border in row 1, and printing the names and scores in row 0. Line 530 tests the variable SV (which will either be 1 for the left player's serve or 2 for the right player's serve) and branches accordingly.

Lines 540 to 580 handle the left player's serve. Specifically, line 550 reads the status of the left fire button and allows the left paddle and the right paddles to move by the GOSUB's to 120 and 190 respectively. Line 560 jumps back to 550 unless the fire button has been pushed and the serve has been made. Line 570 randomly causes the serve to go upward (DY = -1) or downward (DY = + 1). Line 580 puts the ball in front of the current position of the left paddle, sets its forward direction toward the right (DX = + 1), sounds a "hit", and branches to line 670 which is the actual play loop.

Lines 590 to 650 are the right player's serve routines. Line 600 tests N for the number of players. If N = 1 and the VIC is playing the right side, line 610 waits a random amount of time and then serves. Lines 620 to 650 handle a human player on the right side almost identically to the way that lines 550 to 580 handle the left side player.

Line 670 is the start of the play loop and moves the ball one position in its current direction, via the GOSUB70. Line 690 allows the left paddle to move. Line 700 tests whether it is possible that the ball is about to hit a paddle because it is either in column 2 or column 19, i.e., one column from the paddles. If the answer is no, the ball is allowed to move one more position. This "extra" move in the playing loop makes the game considerably faster – to see how much faster try the game with line 700 deleted.

Line 710 to 790 handle the right player's paddle move. Lines 730 to 760 are for the VIC playing the right paddle. Based on whether a random integer from zero to 9 is greater than the skill level, the VIC will move. If the VIC moves, it moves so its paddle is even vertically with the current position of the ball. Obviously, if the skill level is 9, then the VIC will always move and will never miss the ball. Line 780 makes the paddle move for a human player on the right side.

Line 790 again tests whether the ball is possibly going to hit a paddle because it is in a column next to a paddle. If the answer is no, then the program branches back to the start of the play loop at line 670. If the answer is yes, the ball is either just about to hit the paddle or to miss it. Lines 810 and 820 determine the values for ZZ, the index for the player who will win the point if there is a mix, and ZC, the screen PEEK/POKE character for the paddle. Line 830 slows any "fast" ball down to normal speed.

Lines 840 and 850 test if the ball would hit the paddle if it moved one more position. The variable

"Probably the best-documented programs I've seen for the PET/CBM."

- Robert Baker, Sept. 1981 KILOBAUD/Microcomputing

HESBAL : Assembler/editor for PET and VIC
HESCOUNT, HESLISTER : Debugging tools for PET and VIC
HESPLOT : Hi-res graphics subroutines for VIC
HESCAT : Disk cataloging system for PET
HESCOM : Exchange data, programs between PET and VIC

Also, many games for the VIC

VIC

Write today for your free catalog

HES

Human Engineered Software
3748 Inglewood Blvd. Room 11
Los Angeles, California 90066

(213) 398-7259
24 HOURS
SOURCE ID: TCK308

Dealer Inquiries invited

PET, CBM, and VIC are trademarks of Commodore

---

nüfekop

Games for VIC 20 available now

RESCUE FROM NÜFON - A GRAPHICS/ADVENTURE GAME THAT HAS OVER 100 ROOMS SPREAD OVER 5 FLOORS. YOUR JOB IS TO RESCUE ALL THE HUMANS FROM A HOSTILE ALIEN BUILDING. YOU WON'T BELIEVE WHAT YOUR 5K CAN DO. AVAILABLE IN KEYBOARD VERSION ONLY.

IT'S A LIVING - YOU'RE AN ASSEMBLY LINE WORKER IN A NUCLEAR WEAPONS FACTORY. THE ACTION GOES FASTER AND FASTER AS THE GAME PROGRESSES. THIS GAME HAS GREAT GRAPHICS AND IS VERY HARD TO STOP PLAYING.

VIKMAN - MUNCH YOUR WAY AROUND A MAZE EATING DOTS AND DEALING WITH MONSTERS. AN INTERESTING OPTION IS CHOOSING HOW MANY MONSTERS YOU WANT TO FIGHT.

ALSO - KRAZY KONG, DODGE CARS, BANK ROBBERS, ALIEN PANIC, ESCAPE AND MANY MORE.

SEND $.50 FOR COMPLETE CATALOG OF ALL OUR GAMES. A FREE GAME LISTING IS INCLUDED.

$9.99 EACH
(Includes Postage & Handling)
SEND ORDER TO: *nüfekop
P.O. BOX 156, SHADY COVE, OREGON 97539-0156
C.O.D. ORDERS CALL (503) 878-2113

VIC-20 is a registered trademark for Commodore Bus. Machines

ALL GAMES ARE ON CASSETTE, RUN ON 5k VIC 20, AND UNLESS OTHERWISE NOTED, ARE AVAILABLE IN EITHER KEYBOARD OR JOYSTICK VERSIONS.

Your VIC-20 Will Smile . . .

VIXEL™

Volume One

Fire

Fly a water-dropping helicopter, and try to put out the high-rise fire before it spreads.

Draw

Be an artist! This high-resolution drawing program makes it easy to create pictures on the screen, and then save them on tape.

Race

Race the computer, head-on! Simple but fun.

The VIXEL #1 cassette costs only $12.95 in the US and Canada. Foreign orders please add $3.00 for shipping. CA residents add 6% tax. Visa and MasterCard welcome.

VIXEL is a trademark of The Code Works
VIC-20 is a trademark of Commodore Business Machines, Inc.

The Code Works
Box 550, Goleta, CA 93116 805/683-1585

Q in line 840 is the screen location of the position next (in the same row) to the ball's current position. If the screen character at location Q is equal to ZC, the appropriate paddle character, the ball is about to hit the middle of the paddle and the program branches to 960. Line 850 performs the same type of test, but for a possible "corner" hit.

If the ball failed both of these tests, it is just about to miss the paddle. In this case lines 870 to 940 move the ball off the field, sound a "miss," update the score, determine the next server (the loser), and branch back to serve again or asks about a new game if that was the winning point.

If the ball is hit by the paddle, line 960 will change its direction, sound a "hit," and move it one position on its flight path. Line 970 will randomly make it a "fast" ball by doubling the ball's X movement, DX. This not only doubles the speed, but also changes the angle of flight. These "fast" balls make the game much more exciting.

After having gone through the previous example, the subroutines used in Pong should be very straightforward. The subroutine at line 70, checks if the ball is about to hit a wall and, if the answer is yes, it causes the ball to bounce. Then this subroutine erases the current ball location and draws it at its new location. The subroutines at 120 and 190 move the left and right paddles respectively. They first check to see if the paddle has moved since the last reading. If the answer is no, they RETURN. If yes, these subroutines erase the last paddle, and draw a paddle at the new location. The subroutine at 260 sounds a "hit" and the subroutine at 270 a "miss."

Breakout

The version of Breakout here also uses the game paddles. You will find it much faster and more exciting than versions which use a joystick or the keyboard and can only move the paddle a column at a time. It has three skill levels and the highest will challenge even the most seasoned arcade malingerers.

The overall program flow and even the variable names are almost identical to Pong. The program is well commented and self-documenting.

Breakout

```
10 REM VIC BREAKOUT USING GAME PAD
   DLE
20 REM BY DAVID MALMBERG
30 REM 43064 VIA MORAGA
40 REM FREMONT, CALIFORNIA 94538
50 GOTO200
60 REM SUB TO MOVE BALL ONE POSITI
   ON
70 IFX=0ORX=21THENDX=-DX:GOSUB190:
   REM BOUNCE IF WALL
80 POKEFNA(0),32:POKEFNC(0),1:REM
   ERASE CURRENT BALL LOCATIO
   N
90 X=X+DX:Y=Y+DY:POKEFNA(0),81:POK
   EFNC(0),4:REM DRAW NEXT BA
   LL LOCATION
100 RETURN
110 REM SUB TO UPDATE PADDLE
120 VL=PEEK(PX):REM READ PADDLE
130 NL=E-INT(VL*F):IFNL=LLTHENRETUR
    N:REM SAME AS LAST LOCATIO
    N
140 Z=S+461+LL:FORI=1TOD:POKEZ+I,32
    :POKEZ+I+A,1:NEXT:REM ERAS
    E OLD PADDLE
150 Z=S+461+NL:FORI=1TOD:POKEZ+I,22
    6:POKEZ+I+A,6:NEXT:REM DRA
    W NEW PADDLE
160 LL=NL:REM UPDATE PADDLE LOCATIO
    N
170 RETURN
180 REM SUB TO SOUND HIT
190 POKEV,15:POKES1,220-3*Y:FORI=1T
    O50:NEXT:POKEV,0:POKES1,0:
    RETURN
200 POKE36879,27:C=22:HI=0:X=RND(-T
    I)
210 REM INPUT PADDLE WIDTH (DIFFICU
    LTY)
220 PRINT"{CLEAR}  WELCOME TO BREAK
    OUT"
230 PRINT"{DOWN}DO YOU WANT A"
240 PRINT"{DOWN}   {REV}1{OFF} - DI
    FFICULT"
250 PRINT"   {REV}2{OFF} - AVERAGE,
     OR"
260 PRINT"   {REV}3{OFF} - EASY GAM
    E ?"
270 A$="":GETA$:IFA$=""THEN270
280 D=VAL(A$):IFD<1ORD>3THEN270
290 E=C-D:F=E/255
300 V=36878:S1=36876:PX=36872:LL=8
310 S=256*PEEK(648):A=30720:IFPEEK(
    648)=16THENA=33792
320 DEF FNA(Z)=S+X+C*Y : DEF FNC(Z)
    =FNA(Z)+A : DEF FNR(Z)=INT
    (Z*RND(1))
330 SC=0:BA=9
340 REM DRAW BRICKS
350 NN=0:PRINT"{CLEAR}":Y=1:FORX=0T
    O21:POKEFNA(0),160:POKEFNC
    (0),3:NEXT
360 FORY=5TO8:FORX=0TO21:POKEFNA(0)
    ,160:POKEFNC(0),Y-1:NEXTX,Y
```

www.commodore.ca

```
370 PRINTCHR$(144)"{HOME}BA";BA;" H
    I";HI;" SC";SC
380 TT=FNR(300):ZZ=TI
390 IFTI-ZZ<TTTHENGOSUB120:GOTO390:
    REM RANDOM START
400 X=5+FNR(10):Y=9:DY=1:DX=-1:IFFN
    R(9)>4THENDX=1:REM NEW BAL
    L DIRECTION
410 POKEFNA(0),81:POKEFNC(0),4:REM ~
    DRAW NEW BALL
420 REM START OF MAIN LOOP
430 GOSUB70:REM MOVE BALL
440 GOSUB120:REM ERASE OLD PADDLE A
    ND DRAW NEW ONE
450 REM TEST FOR PADDLE HIT OR MISS
460 IFY<>20THEN610:REM NOT NEAR PAD
    DLE
470 Z=FNA(0)+C:IFPEEK(Z)=226THEN590
    :REM STRAIGHT HIT
480 IFPEEK(Z+DX)=226THENDX=-DX:GOTO
    590:REM CORNER HIT
490 REM MISS PADDLE
500 GOSUB70:GOSUB70:POKEFNA(0),32:P
    OKEFNC(0),1
510 POKEV,15:FORI=1TO30:POKES1,200-
    2*I:NEXT:POKEV,0:POKES1,0
520 BA=BA-1:PRINT"{HOME}BA";BA;" HI
    ";HI;" SC";SC
530 IFBA<>0THEN380:REM NEXT BALL
540 PRINT"{HOME}{10 DOWN}      PLAY ~
    AGAIN ?"
550 A$="":GETA$:IFA$=""THEN550
560 IFA$<>"Y"THENEND
570 IFSC>HITHENHI=SC
580 GOTO330
590 GOSUB190:DY=-DY:GOSUB70:GOTO430
    :REM SOUND HIT AND MOVE
600 REM TEST FOR BRICK AREA
610 IFY<4ORY>9THEN710
620 REM IN BRICK AREA
630 IFPEEK(FNA(0)+C*DY+DX)<>160THEN
    430:REM NO BRICK NEXT - SO
     NORMAL MOVE
640 REM HIT BRICK NEXT
650 GOSUB70:GOSUB190:SC=SC+9-Y
660 NN=NN+1:IFNN>70THEN350:REM DRAW
     NEW BRICKS
670 PRINT"{HOME}BA";BA;" HI";HI;" S
    C";SC
680 IFFNR(Y+10)>4+3*DYTHENDY=-DY:GO
    TO430:REM BOUNCE BACK
690 GOTO610
700 REM TEST FOR TOP
710 IFY=2THENDY=-DY:GOSUB190:REM BO
    UNCE OFF TOP
720 GOTO430:REM END OF MAIN LOOP
```

Pong

```
10 REM VIC PONG USING GAME PADDLES

20 REM BY DAVID MALMBERG
30 REM 43064 VIA MORAGA
40 REM FREMONT, CALIFORNIA 94538
50 GOTO280
60 REM SUB TO MOVE BALL ONE POSITI
   ON
70 IFY=2ORY=22THENDY=-DY:GOSUB240:
   REM BOUNCE IF WALL
80 POKEFNA(0),32:POKEFNC(0),1:REM ~
   ERASE CURRENT BALL LOCATIO
   N
90 X=X+DX:Y=Y+DY:POKEFNA(0),81:POK
   EFNC(0),4:REM DRAW NEXT BA
   LL LOCATION
100 RETURN
110 REM SUB TO UPDATE LEFT PADDLE
120 VL=PEEK(PX):REM READ PADDLE
130 NL=E-INT(VL*F):IFNL=LLTHENRETUR
    N:REM SAME AS LAST LOCATIO
    N
140 Z=S+45+LL*C:FORI=0TO2:POKEZ+I*C
    ,32:POKEZ+I*C+A,1:NEXT:REM
     ERASE OLD
150 Z=S+45+NL*C:FORI=0TO2:POKEZ+I*C
    ,225:POKEZ+I*C+A,6:NEXT:RE
    M DRAW NEW
160 LL=NL:REM UPDATE PADDLE LOCATIO
    N
170 RETURN
180 REM SUB TO UPDATE RIGHT PADDLE
190 VR=PEEK(PY):REM READ PADDLE
200 NR=INT(VR*F):IFNR=LRTHENRETURN:
    REM SAME AS LAST LOCATION
210 Z=S+64+LR*C:FORI=0TO2:POKEZ+I*C
    ,32:POKEZ+I*C+A,1:NEXT:REM
     ERASE OLD
220 Z=S+64+NR*C:FORI=0TO2:POKEZ+I*C
    ,97:POKEZ+I*C+A,6:NEXT:REM
     DRAW NEW
230 LR=NR:REM UPDATE PADDLE LOCATIO
    N
240 RETURN
250 REM SUB TO SOUND HIT
260 POKEV,15:POKES1,220-3*Y:FORI=1T
    O50:NEXTI:POKEV,0:POKES1,0
    :RETURN
270 POKEV,15:FORI=1TO30:POKES1,200-
    2*I:NEXTI:POKEV,0:POKES1,0
    :RETURN
280 POKE36879,27:R=23:C=22:X=RND(-T
    I):DIMNA$(2),SP$(2),SC(2)
290 E=R-5:F=E/255:DD=37154:P1=37151
```

```
    :P2=37152:SP$(1)="{HOME}":
    SP$(2)="{HOME}{12 RIGHT}"
300 V=36878:S1=36876:PX=36872:PY=36
    873:LL=8:LR=8
310 S=256*PEEK(648):A=30720:IFPEEK(
    648)=16THENA=33792
320 DEF FNA(Z)=S+X+C*Y : DEF FNC(Z)
    =FNA(Z)+A : DEF FNR(Z)=INT
    (Z*RND(1))
330 PRINT"{CLEAR} WELCOME TO VIC PO
    NG"
340 PRINT"{DOWN} DO YOU WISH TO PLA
    Y"
350 PRINT"{DOWN} {REV}1{OFF} - THE ~
    VIC, OR"
360 PRINT"{DOWN} {REV}2{OFF} - ANOT
    HER PLAYER ?"
370 A$="":GETA$:IFA$=""THEN370
380 N=VAL(A$):IFN<1ORN>2THEN370
390 PRINT"{DOWN}ENTER NAME(S)"
400 FORI=1TON:PRINT"{DOWN}PLAYER";I
    ;:INPUTNA$(I):NEXTI
410 IFN<>1THEN490
420 NA$(2)="VIC":PRINT"{CLEAR}HOW H
    ARD SHOULD I PLAY"
430 PRINT"{DOWN}        {REV}1{OFF} - E
    ASY"
440 PRINT"{DOWN}          TO"
450 PRINT"{DOWN}        {REV}9{OFF} - I
    MPOSSIBLE"
460 A$="":GETA$:IFA$=""THEN460
470 H=VAL(A$):IFH<1ORH>9THEN460
480 REM BEGINNING SERVE AND GAME
490 B$="              ":NL=9:NR=9:SC(1)
    =0:SC(2)=0:SV=1:IFFNR(9)>4
    THENSV=2
500 PRINT"{CLEAR}":Y=1:FORX=0TO21:P
    OKEFNA(0),160:POKEFNC(0),3
    :NEXTX
510 FORJ=1TO3:PRINTSP$(SV)"SERVICE"
    :GOSUB270:PRINTSP$(SV)B$:G
    OSUB260:NEXTJ
520 PRINT"{HOME}";NA$(1);SC(1);SP$(
    2);NA$(2);SC(2)
530 ON SV GOTO550,600
540 REM LEFT SERVE
550 POKEDD,255:P=PEEK(P1):JL=-((PAN
    D16)=0):GOSUB120:GOSUB190
560 IFJL<>1THEN550
570 DY=1:IFFNR(9)>4THENDY=-1
580 Y=NL+3:X=2:DX=1:GOSUB260:GOTO67
    0
590 REM RIGHT SERVE
600 ON N GOTO610,620
610 NR=FNR(19):GOSUB210:GOTO640:REM
     VIC'S SERVE
620 POKEDD,127:P=PEEK(P2)AND128:JR=
    -(P=0):GOSUB190:GOSUB120:R
    EM HUMAN SERVE
630 IFJR<>1THEN620
640 DY=1:IFFNR(9)>4THENDY=-1
650 POKEDD,255:Y=NR+3:X=19:DX=-1:GO
    SUB260
660 REM START OF PLAY LOOP
670 GOSUB70:REM MOVE BALL
680 REM LEFT MOVE
690 GOSUB120
700 IFX<>2ANDX<>19THENGOSUB70
710 REM RIGHT MOVE
720 ON N GOTO730,780
730 IFH<FNR(9)THEN790:REM COMPUTER ~
    MOVE
740 NR=Y-3:IFNR<0THENNR=0
750 IFNR>18THENNR=18
760 GOSUB210:GOTO790
770 REM HUMAN RIGHT MOVE
780 GOSUB190
790 IFX<>2ANDX<>19THEN670
800 REM TEST FOR PADDLE HIT OR MISS

810 IFX=2THENZZ=2:ZC=225
820 IFX=19THENZZ=1:ZC=97
830 IFABS(DX)=2THENDX=DX/2
840 Q=FNA(0)+DX:IFPEEK(Q)=ZCTHEN960
    :REM STRAIGHT HIT
850 IFPEEK(Q+C*DY)=ZCTHENDY=-DY:GOT
    O960:REM CORNER HIT
860 REM MISS PADDLE
870 GOSUB70:GOSUB70:POKEFNA(0),32:P
    OKEFNC(0),1
880 SC(ZZ)=SC(ZZ)+1:SV=2:IFZZ=2THEN
    SV=1:REM UPDATE SCORE, LOS
    ER SERVES
890 IFSC(ZZ)<>15THEN510:REM NEXT SE
    RVE
900 FORJ=1TO10:PRINTSP$(ZZ)"WINNER!
    ":GOSUB270:PRINTSP$(ZZ)B$:
    GOSUB260:NEXTJ
910 PRINT"{HOME}{11 DOWN}        PLAY ~
    AGAIN ?"
920 A$="":GETA$:IFA$=""THEN920
930 IFA$<>"Y"THENEND
940 GOTO490:REM NEW GAME
950 REM HIT PADDLE
960 DX=-DX:GOSUB260:GOSUB70:REM SOU
    ND HIT AND MOVE
970 IFFNR(9)>4THENDX=2*DX:REM DOUBL
    E X-SPEED
980 GOTO670
```

©

This program is an expansion of a popular Atari, 3-D drawing program which first appeared in **COMPUTE!**, *April, 1981, #11. Here, a number of new commands are added to the original (you don't need to have the earlier version to use this one). Type it in and create some beautiful screen displays.*

Ultracube: Supercube Revisited

David N. Benson
Auburn, IN

If there is one area in which Atari computers shine above all others it is in the field of graphics. Star Raiders is a good example of this. Another good example of this is Steve Steinberg's Supercube (**COMPUTE!**, April '81, #11). For the newer readers who missed it, Supercube enabled the user to make three-dimensional drawings with the joystick. The following program, Ultracube, also enables the user to make three-dimensional drawings, but many new commands have been added and some minor improvements have been made along the way.

When the "new and improved" version is run, a menu appears explaining the commands that are uses in the program. Skip this as the commands will be explained later. After the menu, the computer asks for a dimension for the cube. The larger the number the larger the cube. For now use a number between four and twelve. The computer then asks for the color of the cube. This is two numbers: the first is the hue and the second is the luminance. A table of hue values can be found on page fifty of the Atari Basic Reference Manual.

You are now ready to draw. A cursor of the color you chose will appear on the upper left of the screen and can be moved by the joystick. If you push the joystick button a cube will appear. Notice that if you let go of the button the cursor does not return to the upper left of the screen, or draw an erasing line as it does in Steve's program. However, when the cursor moves into a cube the cursor changes to the background color and back to the cube color when it leaves the cube. So unless there is very little contrast between the color of the cube and the color of the background, the cursor should always be seen.

All of this is fine and good, but eventually you will want to change cube size, colors, correct a mistake or see your creation full screen. If you want to change the size of the cube, type "R" and input the new dimension. To change the color of the cube hit the C and input the new hue and luminance values. Hitting the B will have the same effect on the background. If you wish to clear the screen, hit the W and all graphics shall be banished from the screen. The size and color of the cube will remain the same. If you just want to erase a portion or a mistake in your creation, move the cursor to the undesired part and hit E. The computer will ask you for the size of the eraser. The eraser is a square the size of the number inputted, that, when moved by the joystick, will obliterate all trace of anything that had the misfortune of being in its path. The square is the color of the background; it will not be seen. When finished with the eraser, hit any key and you may begin drawing again. All of this should bring many hours of pleasure. When you eventually finish drawing, hit Q and your masterpiece shall be displayed full-screen.

The magic of the commands is the OPEN statement in line 50 which opens the keyboard for input. The first number is the device code and may be any number from one to five. The next number tells what kind of operation is to be performed; here, the four means input. The third number is required but means absolutely nothing here. The fourth character which must be enclosed in quotation marks tells what is being opened; K means keyboard.

Working hand-in-hand with the OPEN statement is the GET statement in line 74. Whenever a key is hit its ATASCII number is stored in the variable at right. The device code at left may also be any number from one to five but it must be the same number used in the OPEN statement. The next line 75 checks to see if the key pressed is one of the command letters, in which case the computer goes to subroutine 2000.

There are three memory locations used in this program: 77, 752, and 764. The number stored in location 77 increases by one every four seconds a key is not pressed. Pressing a key will reset the value to 0, but if the value reaches 128 the computer goes into the random color switching that we all know and love. Location 72 monitors the status of the cursor: POKEing a one will turn the cursor off and a zero back on again. Location 764 monitors whether a key has been pressed; 255 means that no key has been pressed and anything else means that

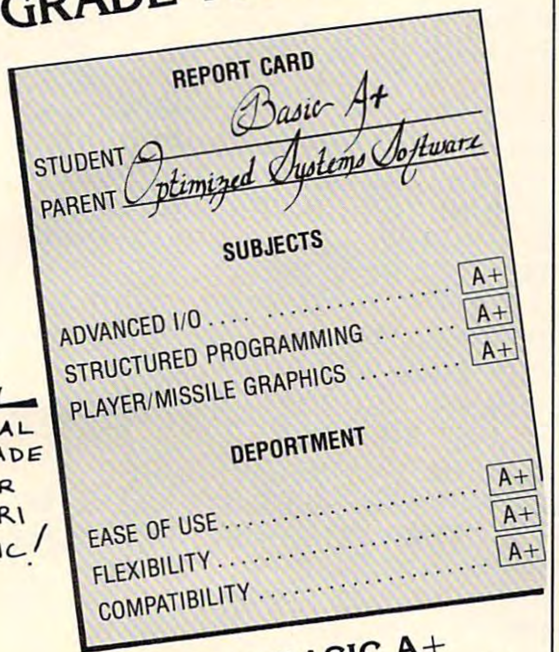
a key has been pressed.

Here is the line-by-line explanation:

8 Sets graphics mode to zero; sets the colors of both the foreground and the background to blue and turns off the cursor.
10-28 Prints menu; anything underlined should be in inverse video.
30 Waits for user to hit a key to continue.
40 Clears character so that it will not appear later.
50 Goes into graphics mode 7; opens keyboard for input.
55 Turns off cursor.
60 Asks user for cube size.
70 Asks user for cube color.
72 Clears screen (to create this character hit ESC and hold CTRL and push CLEAR).
73-75 Checks if user entered a command.
73 Checks if a key has been pressed.
74 The ATASCII value is stored in R.
75 Checks to see if R is one of the command letters; if so, then it goes to subroutine 2000 which processes the command.
80 Checks to see if the joystick button has not been pressed – in which case it goes first to see whether the cursor is in a space occupied by a cube or the background, and then to move the cursor; and second, to a subroutine that checks if the joystick has been moved, and which way.
110 Clears the screen.
120 Resets location 77 to zero. If this location ever reaches 128, the Atari goes into the random color switching (see text).
130 If the joystick button has been pressed, control passes into the cube drawing sequence.
140 Goes to a subroutine that figures out if the joystick has been moved, and which way.
150 Updates x-y coordinates.
200-210 Makes sure that the new x-y coordinates are not out of range.
400 Starts entire procedure over again.
500-520 This subroutine plots the cursor and sets the color of the cursor.
500 The LOCATE statement stores the contents of plot position X,Y in L. This will be a number from 1 to 4 equal to the color register. If this number is 0 or a 4, the cursor is in the background as opposed to being in a cube; the color of the cursor will be the color of the cube.
510 If the cursor is not in the background, then it is in a cube; the color of the cursor will be set to the color of the background.
520 This line plots the cursor on the screen.
600-630 This subroutine is called whenever the color of the cube is changed.
600 If the luminance is below 4, then it is set to 10. This is done so that the front face of the cube is always the darkest.
610 This line calls the subroutine that updates the color of the screen.
700-830 This subroutine draws the cube.
700 The TRAP statement will send control to line 80 if the cube goes off the screen.
710-740 These lines draw the first face of the cube.
750-780 These lines draw the second face of the cube.
790-830 These lines draw the third face of the cube.
1000-1180 This subroutine checks which way the joystick has been moved. For more information on the numbers returned by the joystick, see pages 59-60 in the *Basic Reference Manual.*
2000-2060 These lines process any commands that have been entered by the user.
2000 This line clears the text window.
2010 This line checks to see if the R has been pressed – in which case, the computer asks for the new cube size. The TRAP 2000 sends control back to line 2000 to start the whole procedure over again if the user enters illegal input, and the TRAP 40000 resets the TRAP statement.
2020 If the B has been pressed, the computer asks for the new hue and luminance values for the background color.
2030 If the C has been pressed, the computer asks for the new color of the cube.
2040 If the Q has been pressed, the computer goes into graphics mode 7 + 16 + 32. The 7 is self-explanatory, the 16 means full-screen (no text window), and the 32 keeps the screen from going blank. The next instruction, GOSUB 4100, resets the colors to the ones the user chose instead of the default colors. Line 3000 is an endless loop that prevents the computer from going into graphics 0 and wiping out all graphics.
2050 If the W has been pressed, the computer reenters graphics 7, which clears the screen at the same time, surpresses the cursor, and resets the colors.
2060 This is the eraser routine. After the user inputs the size of the eraser, the computer goes to subroutine 4000 which plots the eraser on the screen.
3000 See line 2040 for explanation.
4000-4040 This subroutine plots the eraser on the screen, moves it, and looks for the user to hit a key to disengage it.
4000 This line plots the eraser on the screen and goes to subroutine 1000 to see if the joystick has moved.
4010-4020 See lines 200-210 for explanation.
4030 If a key has not been pressed, the procedure

Atari is a reg. ™ of Atari, Inc.

UPGRADE YOUR ATARI®



THE ONLY LOGICAL UPGRADE FOR ATARI BASIC!

GRADUATE TO BASIC A+ FROM THE AUTHORS OF ATARI BASIC!

BASIC A+

BASIC A+ will rate an A+ from any Atari user! Upward compatible with Atari Basic, it adds statements and features that enhance the Atari 800's real power, flexibility, and ease of use: Superior I/O features for business and other applications. Additional file manipulation commands. Significant help in program development and debug. Structured programming aids. And MORE! A partial list of the enhancements of BASIC A+ includes:

RPUT/RGET (record I/O) **BPUT/BGET** (binary I/O) **ERASE PRINT USING SET TAB INPUT"..." DIR PROTECT RENAME TRACE WHILE...ENDWHILE IF...ELSE...ENDIF**
SUPERB PLAYER/MISSILE GRAPHICS

BASIC A+ requires a disk and 32K bytes of RAM. Since no cartridge is used, BASIC A+ will take advantage of all the RAM (48K bytes) in a maximum Atari 800 system (recommended) $80

OS/A+

Completely compatible with Atari's DOS (version 2), but with an advanced, command-driven console processor. Simple. Flexible. Powerful. With an easy-to-use **BATCH** capability. OS/A+ **INCLUDES** all the following utilities (and more):

EASMD (**E**ditor/**AS**se**M**bler/**D**ebug) is our upgraded all-in-one assembly language development package for the 6502 microprocessor. The editor — with such features as FIND and REPLACE — can even edit BASIC A+ programs. The assembler can include multiple source files in a single assembly.

DUPDSK and FORMAT create master or slave disks. Make sector by sector copies of any OS/A+ disk.

COPY a simple, single file copy utility.

All of this power is included in our OS/A+ package $80

For the utmost in capability and flexibility, our combination system — **BASIC A+** and **OS/A+** — is available $150

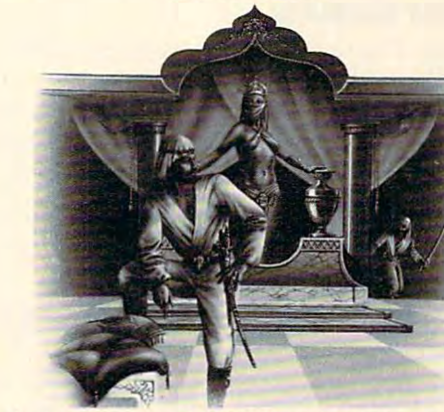
SOFTWARE IN A CLASS BY ITSELF
AVAILABLE NOW THROUGH LOCAL DEALERS

Optimized Systems Software, Inc.
10379 Lansdale Ave., Cupertino, CA 95014,
(408) 446-3099

Fantasy for your ATARI

Ali Baba and the forty thieves

By Stuart Smith



Guide your alter ego, Ali Baba, through the thieves' mountain den in an attempt to rescue the beautiful princess. Treasure, magic, and great danger await you! One or more human players can guide up to seventeen friendly characters through the many rooms, halls, and caves. Some characters wander around randomly, making each adventure a little different.

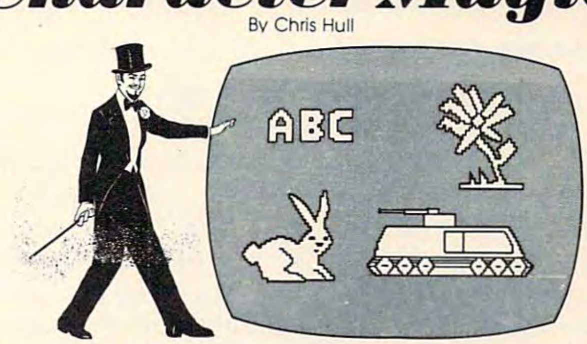
ALI BABA AND THE FORTY THIEVES is written in high resolution color graphics and includes music and sound effects. Adventures can be saved to disk and resumed at a later time. Requires 32K.

On Diskette Only — $32.95

Graphics for your ATARI

Character Magic

By Chris Hull



It's easy to create your own character sets and save them to diskette or cassette with CHARACTER MAGIC. But this is not just another character editor. CHARACTER MAGIC helps you use all the character types that the Atari is capable of, including descending characters (8 x 10 dots) and two types of five-color character graphics not supported by Atari's Operating System. Documentation includes examples of display lists that let you use these "secret" graphics modes. Requires 32K.

Cassette or Diskette - $29.95

FOR OUR COMPLETE LINE OF ATARI SOFTWARE PLEASE WRITE FOR OUR CATALOG

ASK FOR QUALITY SOFTWARE products at your favorite computer store. If necessary you may order directly from us. MasterCard and Visa cardholders may place orders by calling us at (213) 344-6599. Or mail your check or bankcard number to the address above. California residents add 6% sales tax. *Shipping Charges:* Within North America orders must include $1.50 for shipping and handling. Outside North America the charge for airmail shipping and handling is $5.00. Pay in U.S. currency.

QS QUALITY SOFTWARE

6660 Reseda Blvd., Suite 105, Reseda, Ca. 91335 (213) 344-6599

*Indicates trademarks of Atari

is done over again.

4040 If a key has been pressed, it is then cleared along with the text window.

4100-4140 This subroutine updates the colors of the cube and background.

The Bug That Got Away

The variable E is used to represent two different things in Ultracube: the luminance value of the background, and the size of the eraser. So, if the user uses the eraser and then changes the color of the cube, the color of the background will change. The solution to this problem is to change the variable E to ERASER in lines 2060 and 4000. The author apologizes for this inconvenience.

The Cube, The Whole Cube, And Nothing But The Cube

For the most part, whenever the joystick button is pressed, a cube will appear. However, there are exceptions, such as when part of the cube runs off the screen and leaves only two faces completed, and the third to the viewer's imagination. This is due to the TRAP 80 in line 700 which sends control to line 80 if an error occurs. If the TRAP 80 statement was not there and an error occurred, the program would come to a grinding halt and a beautiful ERROR 3 (value error) or ERROR 141 (cursor out of range) would appear at the bottom of the screen. To see a full cube everytime, make the following changes:

Change 700 TRAP 745
Add 745 TRAP 790
Change 810 TRAP 820:PLOT X + SQ + I,Y-I: DRAWTO X + SQ + I,Y + SQ-I + 1:TRAP 40000

I hope that you have enjoyed this program as much as I have enjoyed improving it. However, there were some things that I would have liked to have added but couldn't, because of lack of expertise. An eraser that can be seen would be nice and so would a machine language subroutine to help speed up the joystick. Any help that anyone could give would be appreciated.

```
8 GRAPHICS 0:SETCOLOR 2,8,0:SETCOLOR 4,8
,0:POKE 752,1
10 POSITION 10,0:PRINT "| ULTRA CUBE MEN
U |":POSITION 5,3:PRINT "|JOYSTICK|":POS
ITION 7,4:PRINT "JOYSTICK:"
12 POSITION 17,4:PRINT "USE TO MOVE CURS
OR":POSITION 7,5:PRINT "BUTTON   : USE TO
 DRAW CUBE":POSITION 5,8
14 PRINT "|KEYBOARD|":POSITION 7,9:PRINT
 "<B> |BACKGROUND COLOR| INPUT HUE":POSI
TION 11,10:PRINT "AND LUMINANCE"
16 POSITION 25,10:PRINT "TO CHANGE COL-"
:POSITION 11,11:PRINT "OR OF BACKGROUND"
:POSITION 7,12:PRINT "<C> |CUBE COLO|"
18 POSITION 20,12:PRINT "|R| INPUT HUE A
ND LU-":POSITION 11,13:PRINT "MANINCE TO
 CHANGE CUBE COLOR":POSITION 7,14
20 PRINT "<E> |ERASE| INPUT SIZE OF ERAS
ER":POSITION 11,15:PRINT "TO ERASE UNDES
IRED PORTIONS":POSITION 7,16
22 PRINT "<R> |REDEFINE| INPUT NEW DIMEN
SION":POSITION 11,17:PRINT "TO CHANGE SI
ZE OF CUBE":POSITION 7,18
24 PRINT "<Q> |QUIT| WHEN PRESSED CREATI
ON":POSITION 11,19:PRINT "WILL BE SEEN F
ULL SCREEN":POSITION 7,20
26 PRINT "<W> |WIPE OUT| USE TO ERASE EN
-":POSITION 11,21:PRINT "TIRE SCREEN":PO
SITION 8,23:PRINT "HIT ANY KEY";
28 POSITION 20,23:PRINT "TO CONTINUE";:P
OKE 764,255
30 IF PEEK(764)=255 THEN 30
40 POKE 764,255
50 GRAPHICS 7:OPEN #1,4,0,"K"
55 POKE 752,1
60 LET R=82:GOSUB 2000
70 LET R=67:GOSUB 2000
72 PRINT "{CLEAR}"
73 IF PEEK(764)=255 THEN 80
74 GET #1,R
75 IF R=82 OR R=66 OR R=67 OR R=81 OR R=
87 OR R=69 THEN GOSUB 2000
80 IF STRIG(0)<>0 THEN GOSUB 500:GOTO 14
0
110 PRINT "{CLEAR}"
120 POKE 77,0
130 IF STRIG(0)=0 THEN GOSUB 700
140 GOSUB 1000
150 X=X+XDIF:Y=Y+YDIF
200 LET X=X+(X<0)-(X>159)
210 LET Y=Y+(Y<0)-(Y>95)
400 GOTO 73
500 LOCATE X,Y,L:LET L1=L:IF L=0 OR L=4
THEN LET L=1:GOTO 520
510 LET L=4
520 COLOR L:PLOT X,Y:FOR I=1 TO 5:NEXT I
:COLOR L1:PLOT X,Y:RETURN
600 IF B<4 THEN B=10
610 GOSUB 4100
620 IF X<10 THEN 120
630 RETURN
700 TRAP 745
710 COLOR 1
720 FOR I=0 TO SQ
730 PLOT X,Y+I:DRAWTO X+SQ,Y+I
740 NEXT I
745 TRAP 790
```

```
750 COLOR 2
760 FOR I=1 TO INT(3*SQ)/5
770 PLOT X+I,Y-I:DRAWTO X+I+SQ,Y-I
780 NEXT I
790 COLOR 3
800 FOR I=1 TO INT(3*SQ)/5
810 TRAP 820:PLOT X+SQ+I,Y-I:DRAWTO X+SQ
+I,Y+SQ-I+1:TRAP 40000
820 NEXT I
830 RETURN
1000 LET WHAT=STICK(0):XDIF=0:YDIF=0
1100 IF WHAT=15 THEN RETURN
1110 IF WHAT=14 THEN YDIF=-1:RETURN
1120 IF WHAT=13 THEN YDIF=1:RETURN
1130 IF WHAT=11 THEN XDIF=-1:RETURN
1140 IF WHAT=10 THEN XDIF=-1:YDIF=-1:RET
URN
1150 IF WHAT=9 THEN YDIF=1:XDIF=-1:RETUR
N
1160 IF WHAT=7 THEN XDIF=1:RETURN
1170 IF WHAT=6 THEN YDIF=-1:XDIF=1:RETUR
N
1180 IF WHAT=5 THEN XDIF=1:YDIF=1:RETURN

2000 PRINT "{CLEAR}":PRINT
2010 IF R=82 THEN PRINT "ENTER NEW DIMEN
SION FOR CUBE";:TRAP 2000:INPUT SQ:TRAP
40000:RETURN
2020 IF R=66 THEN PRINT "INPUT BACKGOUND
 COLOR, LUM.";:TRAP 2000:INPUT D,E:TRAP
40000:SETCOLOR 4,D,E:RETURN
2030 IF R=67 THEN PRINT "INPUT NEW COLOR
 FOR CUBE";:TRAP 2000:INPUT A,B:TRAP 400
00:GOSUB 600:RETURN
2040 IF R=81 THEN GRAPHICS 7+16+32:GOSUB
 4100:GOTO 3000
2050 IF R=87 THEN GRAPHICS 7:POKE 752,1:
GOSUB 4100:RETURN
2060 IF R=69 THEN PRINT "INPUT SIZE OF E
RASER";:TRAP 2000:INPUT ER:TRAP 40000:PO
KE 764,255:GOSUB 4000:RETURN
3000 GOTO 3000
4000 COLOR 4:FOR P=0 TO ER-1:FOR P1=0 TO
 ER-1:PLOT X+P,Y+P1:NEXT P1:NEXT P:GOSUB
 1000
4010 LET X=X+XDIF:LET X=X+(X<0)-(X>159)
4020 LET Y=Y+YDIF:LET Y=Y+(Y<0)-(Y>80)
4030 IF PEEK(764)=255 THEN GOTO 4000
4040 POKE 764,255:PRINT "{CLEAR}":RETURN

4100 SETCOLOR 1,A,B
4110 SETCOLOR 2,A,B-2
4120 SETCOLOR 0,A,B-4
4130 SETCOLOR 4,D,E
4140 RETURN
```

©

Micros With The Handicapped

Marshall Curtis and Susan Semancik
The Delmarva Computer Club

Inability to communicate means isolation from people and experiences which otherwise would help a person develop intellectually, socially, personally, and vocationally. Most nonverbal people without motor-impairment can communicate through handwritten or typewritten messages, or by finger spelling and hand signs. Those with some motor skills can typically communicate by pointing at letters or symbols until a word or concept is understood by the person with whom communication is desired. The letters or symbols are generally arranged on a *communications board*, and pointing can be achieved by the hand or other part of the body, by a mouth-stick or similar device held in the mouth, or by using a flashlight or pointer attached to the user's head.

Besides being a time consuming means of communication, the use of a communications board also requires concentration by both the sender and receiver in order to remember the previous letters and symbols indicated in the message, since no record is automatically kept of the message unless the receiver writes it down as it is formed. These communications boards can be expensive and are not easily modified for individual needs. This is a natural area in which to use a microcomputer since menus of words, statements, or characters can be user-determined and placed in an arrangement determined by individual preference or frequency of use. Also, alternative input devices can be used to take advantage of whatever motor skills the person has. For example, eye-switches, sip-and-puff switches, tongue-switches, cheek-switches, and light sensors can all be similarly connected through the input port of a microcomputer.

The Delmarva Computer Club has developed a communications program for the PET/CBM computer that uses both the keyboard and an alternative input device. The device is a light sensor that can be interfaced to the PET's parallel user port with items purchased from a local electronics store. This allows someone with limited motor control, such as someone with cerebral palsy, to move some part of his/her body over the sensor, which creates a shadow on the sensor. This shadow changes the voltage input to the computer, thus signaling a response which the computer will interpret just as if someone had hit the computer's keyboard.

The Figure shows the current words and characters list used in our program. Note that the characters list includes the alphabet, so that words can be formed even though they do not appear in the words list. Also note that a message has been formed and placed in reverse-field within the bottom four lines of the screen. The computer scans the menu by reverse-fielding or highlighting each column for a period of time determined by the user's initial response time. When an input signal is received on either the keyboard or an alternative device attached to the user port, the computer scans the choices within the current column being highlighted. An input received when a word or character of that column is highlighted causes that word or character to become part of the message being formed at the bottom of the screen.

Three other options besides the selection option are implemented in this current version of the program: one is used to erase the last entry in the message formed at the bottom of the screen; a second one is used to switch between the words list and the characters list so that time isn't wasted waiting for the computer to reach the desired part of the menu by the normal scanning sequence; and a third one is used to interactively increase or decrease the response time in which a selection can be made.

Developing An Individual Program

Certainly we could just publish this communications program and tell how to use it. But, because each potential user of the program has individual needs and requirements for communication, we feel that a single program could not have enough flexibility for widespread use. We will be exploring in a sequence of related articles how such a computer communications program can be developed. We've identified five fundamental areas in this communications program:

1) How to pick a words list, statements list, and/or characters list, from which selections will be made to allow the level of communication desired. Also, how to place this list or lists on the computer's screen.

2) How to indicate which element of the list is selected, including consideration of flexible response times.

3) How to pick an alternative method of input, either using the keyboard differently, or selecting a device to match the motor skills of