

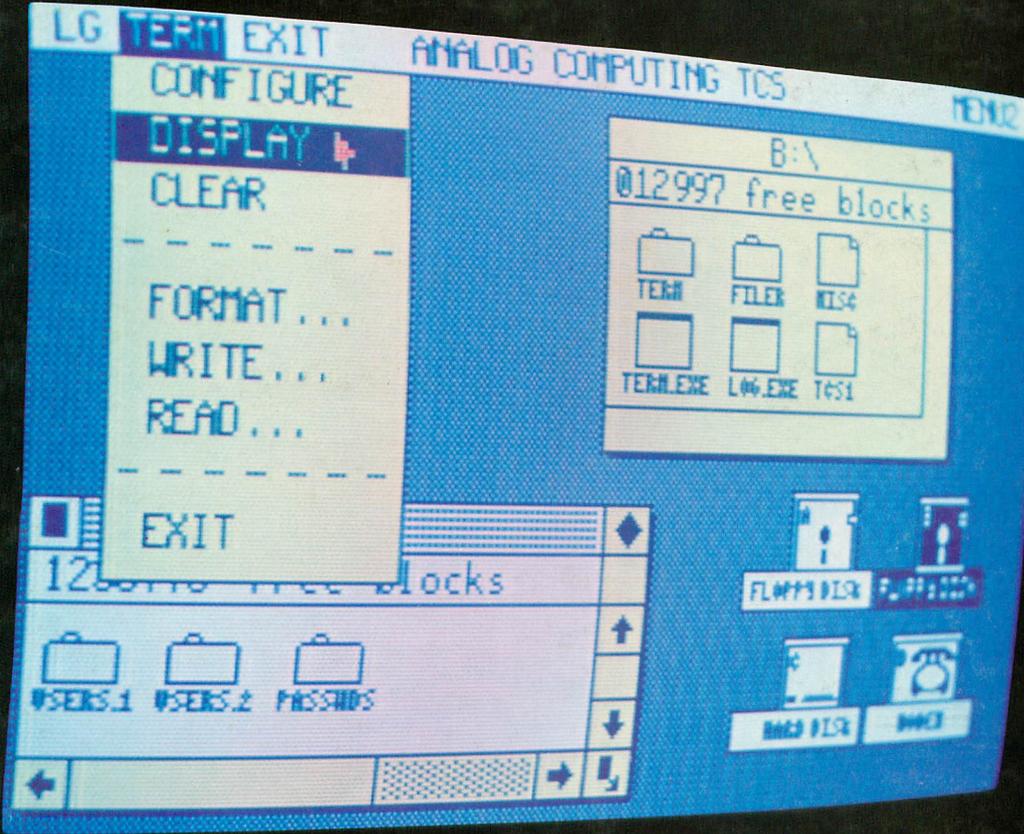
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MAY 1985

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THE #1 MAGAZINE FOR ATARI® COMPUTER OWNERS

ANALOG

COMPUTING



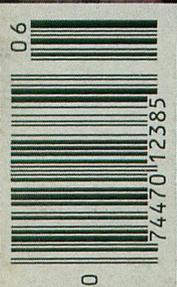
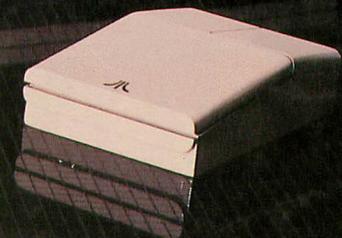
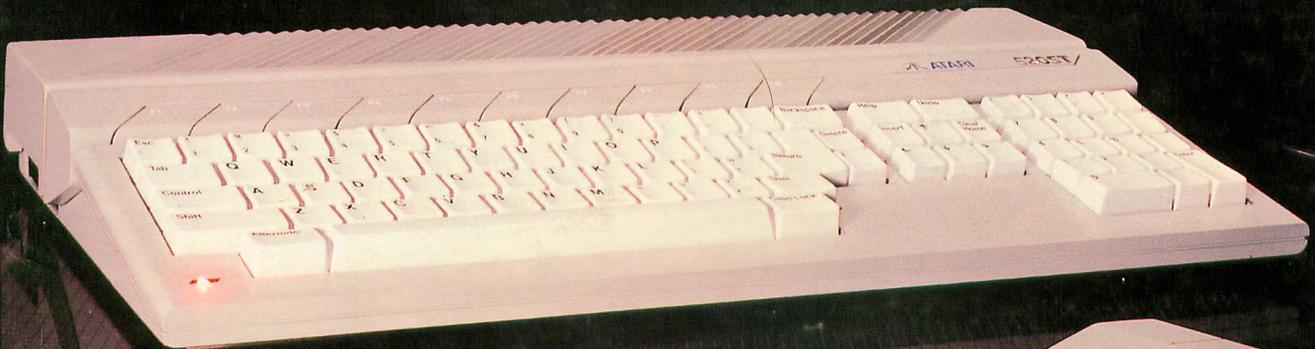
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The ANALOG
Computing
Telecommunications
System

Z-Plotter

Loan Shark

Basic Burger



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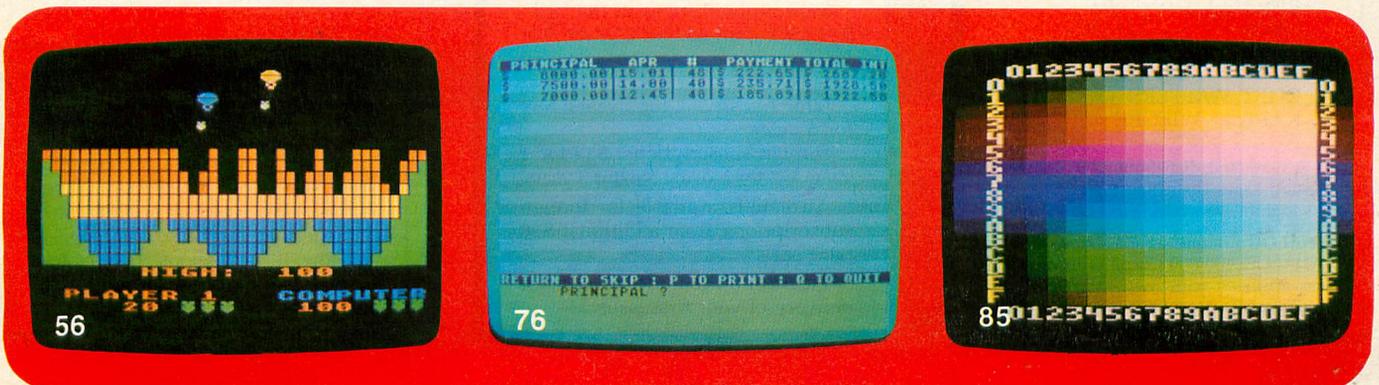
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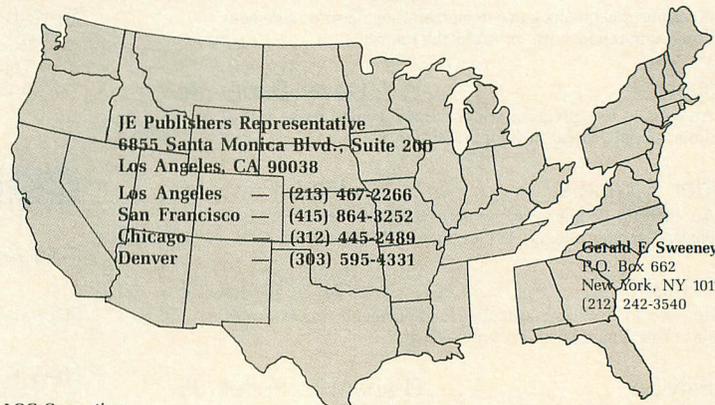
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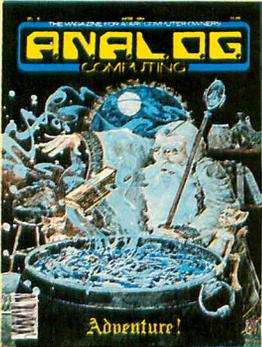
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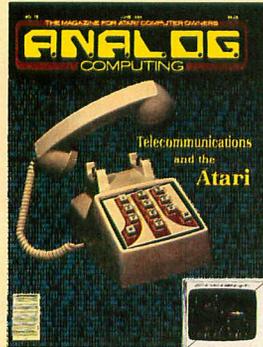
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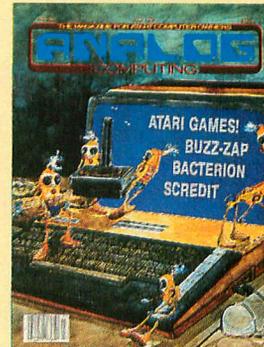
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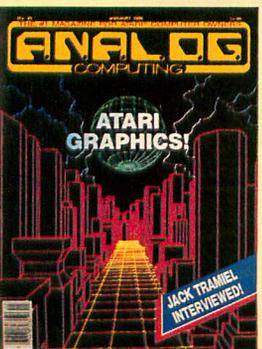
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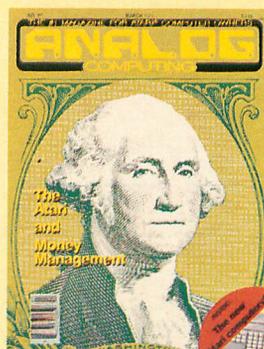
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EDITORIAL

Spring is in the air, and with it come changes at **ANALOG Computing**.

The first, and most obvious, is a new format for the magazine. At the top of each article page, you will see a heading and an "icon" which tell you what category the article falls under (utilities, home applications, and so forth). The new layout of the magazine is modeled somewhat after the new Atari ST line's graphic operating system, and is designed to help new readers (as well as old) to quickly locate the types of articles they're interested in.

We are open to your comments and suggestions about how we can further improve the new format and make **ANALOG Computing** even more useful to you.

The second change is less visible but just as important as the format change. It is **ANALOG Computing's** entry into the telecommunications field.

Over the last year or so, we at **ANALOG Computing** have been paying close attention to the area of telecommunications with Atari personal computers. We have made staff members available on the CompuServe Atari Special Interest Group (SIG), in order to answer questions and ask readers what they'd like to see in the magazine.

In this year, we've seen the number of user-to-user messages on the SIG grow past the 94,000 mark. This growth rate is constantly increasing, with no end in sight.

We've seen the tremendous power and potential of personal telecommunications as authors have submitted their articles electronically and our programmers have uploaded programs to the SIG for everyone to use.

In September of last year, **ANALOG Computing** publisher Lee Pappas and I began discussing the possibility of starting up a company-sponsored electronic

bulletin board system in early 1985. We didn't want an ordinary BBS (i.e., an Atari 800 with an 810 disk drive running public-domain BASIC software). Little did we know what we'd end up with.

As it stands now, the **ANALOG Computing Telecommunications System** (or **TCS**) is based in the programmers' area of the **ANALOG Computing** editorial offices, with four 48K Atari 400 computers, tied together with custom hardware, interfaced with an 11-megabyte hard disk system. All the computers are connected to phone lines with Anchor Mark XII 300/1200 baud modems.

Four people may use the system simultaneously, and this number will be expanded to seven in the near future, as demand dictates.

The software for the **TCS** was my department and has been developed over the past six months, to the exclusion of virtually all my other projects (including **HChess**, a chess-like game in machine language, which I promise will be in the pages of **ANALOG Computing** as soon as possible).

Developing the **TCS** software was an education in itself, and I have to give credit to the people at Optimized Systems Software, the creators of **MAC/65** and the **MAC/65 Toolkit**. Their products have been instrumental in the development of the **TCS's** software, which is 100% machine language.

Machine language was chosen for the **TCS** in order to get maximum speed, even in 1200 baud. Even with several users hacking away at their keyboards, downloading software and storing messages, the **TCS** will zip along at fantastic speed. Users of terminal programs with **XMODEM** protocol won't have the transmission timing problems they may have experienced on systems like CompuServe.

The key to the **TCS's** usefulness is

software and user support. We will be doing all we can to provide new programs on a regular basis, and Charles Bachand and I will be on-line daily to answer your questions. If you have original programs, subroutines, editorials, etc. that other users may be interested in, and you'd like to see them on the **TCS**, upload them! We will reimburse you in free **TCS** time if we accept your material. The more programs we have, the better **TCS** will be.

In the center of this issue, you will find a bound-in copy of the **ANALOG Computing TCS** user's guide. Carefully remove the staples, and you've got your ready-to-use **TCS** manual. I suggest you read through it before logging onto the **TCS**, in order to familiarize yourself with the system's operation.

I hope you enjoy both the new magazine format and the **TCS**. We've put a lot of effort into both, and will be expanding and improving them further in the future—to keep **ANALOG Computing** the #1 Atari users' magazine and telecommunications system.

Our thanks.

Finally, the staff of **ANALOG Computing** would like to thank Mr. Edmund Miarecki, who was kind enough to provide us with the Atari 520ST computer pictured on this issue's cover. □

Tom Hudson
Chief of Programming
ANALOG Computing



READER COMMENT

Disks to come.

I have recently noticed that back issues are available in magazine form. Are these same issues available on tape or disk? If so, how much per back issue?

Also, how much is the **Compendium** on disk?

Does **Solid States** work on the 800XL? I typed it in, but there were a lot of string/DIM errors.

Jim Kelly
Snellville, GA

Because of the huge number of letters we receive concerning back issues on disk, we will, in the near future, offer them for sale.

As far as the **ANALOG Computing Compendium** on disk, it is priced at \$35.00, which includes only the disks. To receive the **Compendium** disk set, you must use the order card in the book itself. The price for the **Compendium** is \$14.95 + \$2.00 shipping and handling.

And, yes, **Solid States** runs on the 800XL. It sounds as though you have a bad BASIC. —Ed.

Keyboard pals.

It is now, at the time of this writing, a miserable October day in the north of England. I have recently acquired the most recent issue of **ANALOG Computing** on these shores, which was a joyous moment, indeed!

Let me explain. Here in Britain, we simply do not have magazines that support the Atari (nor any machine) the way **ANALOG Computing** does. On top of that, the most recent issue available is the *April* issue! A sad state of affairs, I know, but at least we are getting the magazine—thank goodness.

But now, on to my real reason for writing. . . I am aiming to set up some kind of international “keyboard pal” service. Basically, the object is to “pair” Atari en-

thusiasts in (to begin with) America and Britain.

If it is at all possible, I would be grateful if you could let your readers know this hopeful “service” is aimed primarily at them. Anyone from the States who is interested should send full details of themselves, plus how often they would like to “write”—in fact, as many details as they can think of, on disk or cassette (or paper), to me at this address:

Paul Critchlow
29 Tudor Road
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No charge will be made, but (there's always a but!) two I.R.C.s (*International Reply Coupons*—available at your post office) will be warmly received and will, no doubt, hasten a reply.

Young or old, novice or expert—anybody is welcome. If this service is successful, I promise to keep **ANALOG Computing** informed as to the progress!

Yours in anticipation,
Paul Critchlow

Planetary Defense with Touch Tablet.

For all the readers who purchased the Atari **Touch Tablet**, instead of the **Koala Pad**, I thought you'd enjoy this modification to an earlier **ANALOG Computing** game.

This BASIC program will install a patch in (the assembled version of) **Planetary Defense** (issue 17), to allow it to work with either the **Touch Tablet** or a joystick.

This modification will only allow firing from the left button. If you would rather fire from the right, substitute 125 for 124 in Line 60. This program creates

a modified version (PLANETT.EXE) of the original (PLANET.EXE).

Best regards,
Forrest A. Blood IV
Willingboro, NJ

```
10 GRAPHICS 0: DIM OLD$(15)
.NEW$(15): ? "Place disk co
ntaining": ? "PLANETARY DEF
ENSE object file in": ? "Dr
ive 1."
15 ? : ? "Name of old objec
t file": INPUT OLD$: ? "Nam
e of new object file": INP
UT NEWS$
20 IF OLD$=NEWS$ THEN ? "Du
plicate file names!": GOTO
15
25 TRAP 55: C=0: OPEN #1,4,0
,OLD$: OPEN #2,8,0,NEWS$: ? :
? "Creating new program...
": TRAP 50
30 GET #1,A: C=C+1
35 IF C=116 THEN FOR I=1 T
O 8: GET #1,A: READ B: PUT #2
,B: C=C+1: NEXT I: READ A
40 IF C=3052 THEN FOR I=1
TO 12: GET #1,A: READ B: PUT
#2,B: C=C+1: NEXT I: READ A
45 PUT #2,A: GOTO 30
50 ? : IF PEEK(195)=136 THE
N ? "Done.": END
52 ? "ERROR in program!": E
ND
55 ? "ERROR IN FILENAME(S)
! (USE 'D:'):": CLOSE #1: CLO
SE #2: GOTO 15
60 DATA 116,111,117,99,104
,64,116,97,98,73,255,133,1
45,173,124,2,141,132,2,234
,234,234
```

Magic Palette graphics.

First, I would like to congratulate you on a “first class” magazine. It's really great!

Second, I really enjoyed the **Magic Palette** program, but I have made it even better.

Graphics modes 9 and 11 are good, but if you enter or change the program to graphics mode 30 or 31, you only get half a screen, but the pictures are much better.

If I am correct, graphics modes 14 (full screen) and 15 (full screen) are available only on the new XL computers (600XL must have memory expansion).

The following are the changes you'll need:

```
50 ? "Enter graphics mode
, please"
55 ? :? "1) single color
(enter ?)"
60 ? :? "2) mult. color
(enter 11)"
65 ? :? "3) med. resolutio
n (enter 30 or 31)"
70 INPUT AZ1
```

Change Line 240 to:

```
240 GRAPHICS AZ1:FOR I=0 T
O 30:COLOR I/2:PLOT I,0:DR
AWTO I,10:NEXT I:COLOR 7:P
LOT 0,10:DRAWTO 79,10
```

By the way, I use a 400 and an 800XL. Keep up the good work!

Jim Kelly
Snellville, GA

Mating your VCR with an Atari computer.

The current popularity of VCRs makes for an interesting equipment marriage with a computer.

I use my Atari 800XL with a Quasar (VHS) Video Cassette Recorder. You'll need a video monitor cable—which can be obtained from Comstar, 5120 Hollister Avenue, Santa Barbara, CA 93105 (805-964-4660); called a Data Spec, it is model CLC-VEC-5, at a cost of \$6.

There are three connectors on this unit. Plug the 5-pin metal connector into the monitor port at the back of your 800XL. Then plug the red-coded lead into your VCR video input on the back of the VCR, and the yellow-coded lead into the audio input (also on the back of the VCR). Turn on your VCR, fire up your computer system, and away we go!

Okay, but what can you do with this hookup? I use it in my work at school, to create graphs, pie charts and statistical information at home (with B/Graph), and then take the video tape to class to demonstrate procedures for my students. It sure beats setting up all the computer components, having to find the correct wires and enough electrical outlets, etc.

Other uses—you've probably thought of some already. Presentation of your computer artwork in a slide show video format is exciting. For the animation buffs, you're not limited to a few minutes but can piece together a longer segment, perhaps a full length movie!

The Atari's full sound and color come across on the video tapes. If you have more time (and money), you can mix computer material with video camera material, to produce some interesting programs.

If you have sound dubbing capability, music and voice can be added to your tapes. Lead-in and end credits are open to your artistic talents. Moving letters, different colors, sizes and designs are all possible. I use the **Displaymaker** program for many of these purposes.

Drawbacks or limitations—the Atari 400 does not work with the video cassette recorder (at least, not easily), nor with a monitor. Since I also have two 400s (I'm a member of the \$99 club), 400 owners have my sympathy.

Conrad Weiler
Santa Barbara, CA

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NEW PRODUCTS

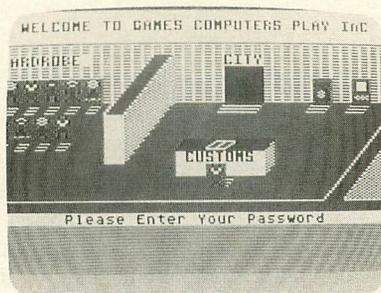
A ROBOT WORLD THROUGH TELECOMMUNICATIONS

Games Computers Play, Inc. is a new telecommunications service designed to make the most of Atari's graphics capability, in real time.

GCP is more like a world unto itself. What you see are buildings, corridors and, most importantly, tiny robots. You're here in the guise of one of these little mechanized marvels, as are the other users of GCP.

You can interact with them, by using the joystick to walk up to them and start up a conversation. By "walking" into the Post Office, you can check on "mail" from other users. . . or stop in at the conference room for a private (or crowded) discussion. Multi-player games are available, plus a bulletin board system.

Disk software supplied allows the use of Atari direct connect modems, MPP-1000C, or a modem connected through an 850. Initial

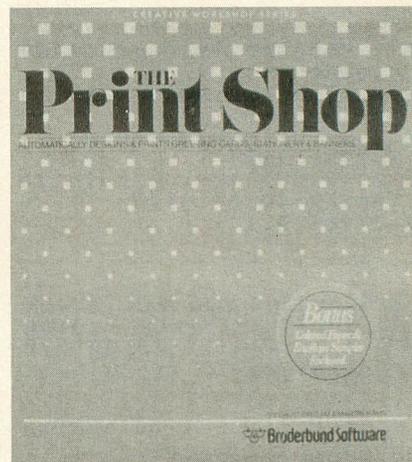


sign-up cost is \$30.00, which includes software and five hours of connect time (\$6.00/hour).

Games Computers Play, Inc., 112 East Market Street, York, PA 17401 — (717) 848-2660.

BRODERBUND'S PRINT SHOP

The Print Shop enables you to design, write and print your own stationary, letter-heads, banners and greeting cards, using easy text-editing features plus left and right justification. Eight type styles are supported in several solid, outline and three-dimensional fonts, along with nine different border designs, ten abstract patterns and several dozen pictures and graphics.

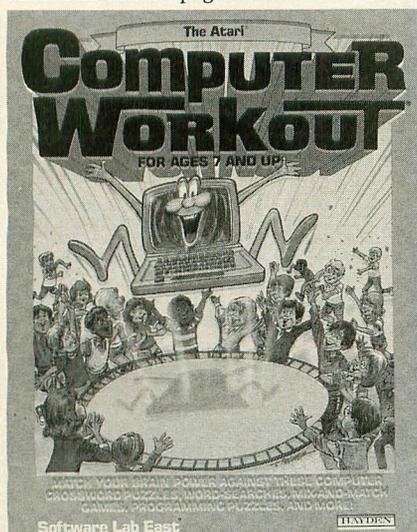


The Print Shop also includes a colorful variety of pin-feed paper and matching envelopes, along with an illustrated manual and reference card. Most printers with graphics ability are supported.

Price is \$44.95 through Broderbund Software, 17 Paul Drive, San Rafael, CA 94903 — (415) 479-1170.

COMPUTER WORKOUT FOR KIDS

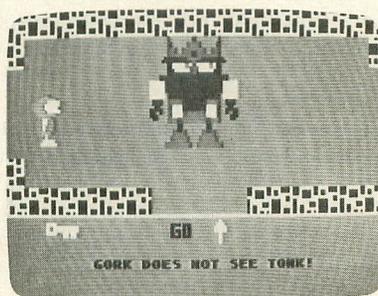
Haydon Books' latest Atari-oriented release, titled **The Computer Workout**, is aimed towards children 7 or older. Technical terms and computer operations are taught, using word games and "solve it" programs. More than forty different crossword puzzles, word-searches and mix-and-match games are included in this 62-page book.



Written by Jim Keogh and Software Lab East, the price is \$2.95 (specify Atari version); Haydon Book Co., 10 Mulholland Dr., Hasbrouck Heights, NJ 07604 — (210) 393-6306.

MINDSCAPE ADDS TO SPROUT

Two additional software titles have been entered in the Sprout software line by Mindscape.



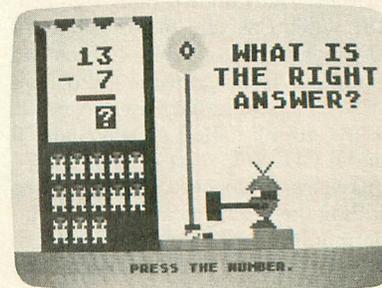
Castle Clobber.

Aimed at 4- to 8-year-olds, **Castle Clobber** assists in teaching children logic, concentration, memory and other skills, while putting them in a game-type scenario.

The child must help Tonk rescue toys from the evil Gork in TinkTonkLand. This graphics adventure is comprised of five distinct educational games.

In **Subtraction Fair**, a child maneuvers Tink to five different game booths: a Magic Show, Bear Dare, Ring the Bell, Witch's Brew and Dunk Gork. Each of these contests helps to teach basic mathematics, memory and concentration skills. Both games feature bright graphics, music and animation.

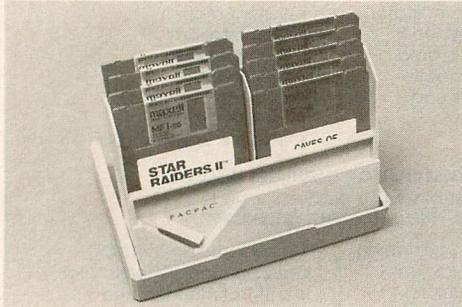
Priced at \$24.95 each, from Mindscape,



Subtraction Fair.

Inc., 3444 Dundee Road, Northbrook, IL 60062 — (312) 480-7667.

THE LATEST IN DISK STORAGE



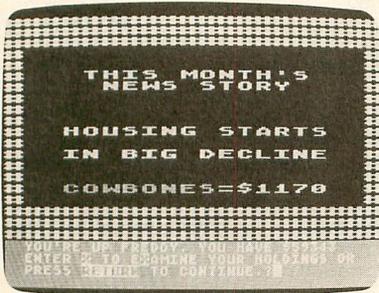
The FACPAC disk storage line is available in five different formats: for the 5 1/4" disks, there is a 5-, 10- or 50-pack disk holder; for the newer 3 1/2" disks, a 10- or 25-pack holder is manufactured.

The 10-pack containers feature a pivoting lever that opens the case and allows its use as a handy desktop disk holder. The 5 1/4" floppy holder that stores five disks is ideal for safely transporting disks.

FACPACs retail at: \$6.95 for the 3 1/2" 10-pack; \$19.95 for the 3 1/2" 25-pack; \$6.95 for the 5 1/4" 5-pack; \$6.95 for the 5 1/4" 10-pack; and \$24.95 for the 5 1/4" 50-pack. From Norwesco, Minneapolis, MN 55420.

AUNT PRUNELDA'S INHERITANCE

This game is designed to teach its players "the cause and effect relationships of current events and prices." The actions of each player effect the whole game, as good and bad fortunes are seen by all.



By investing in the stock market, trying your luck in the casino or sabotaging your opponents, you try to amass the largest fortune in the game, thus receiving all of Aunt Prunelda's money—and winning the game.

A game for one to four players; requires 48K and a disk drive; printer optional. The cost is \$27.95, Market Directions, 20 East Milwaukee St., P.O. Box 702, Janesville, WI 53547 — (608) 754-7818.

ST NEWS — PROGRAMS FOR GEM

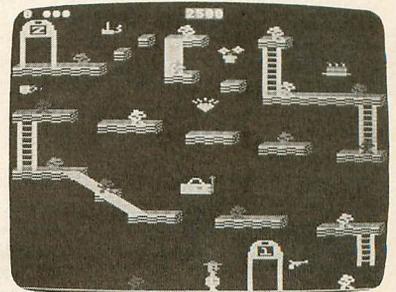
Lifetree Software has recently reached an agreement with Digital Research Inc. to develop application programs for Digital's GEM (the operating system in the new STs). Lifetree is known for their bestselling **Volkswriter** word processor.

The first translation in the works is said to be an enhanced version of **Volkswriter Deluxe**, with the GEM graphics added to increase its ease and power.

Digital Research is planning to handle the marketing of any programs thus developed.

BOUNTY BOB STRIKES BACK!

The long-awaited sequel to **Miner 2049er** is now available, and it features **Bounty Bob** in twenty-five new screens. Slightly improved graphics and new sound effects also add to this 40K ROM cartridge.



Bounty Bob's here.

New "hardware" is an attraction—things like suction tubes, a grain elevator and a gravity lift. Other additions include an extensive option list, which allows you to (semi-)tailor the game to your abilities, and an elaborate high-score screen. A colorful instruction sheet/poster is also included in the package.

Bounty Bob sells for \$49.95, from Big Five Software, P.O. Box 9078-185, Van Nuys, CA 91409 — (213) 782-6861.

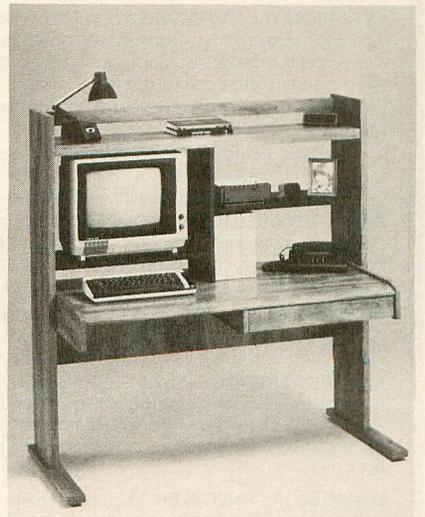
COMPACT COMPUTER DESK

The model **CT137**, an arborwood vinyl finish computer desk by Bush, is out. It features "vertical storage," designed for the computer user whose working area is limited . . . or for those who simply want the most efficient computer center possible.

With its dimensions—52" high, with a width of 49" and a depth of 24"—this attractive desk can easily support a wide variety of your computer equipment, while taking up the minimal amount of space in your home to do so.

The large desktop with its tapered front contains a drawer for convenient storage of paper or other supplies. Both the monitor and storage shelves are adjustable, while a very useful, fixed bookshelf can be found on top of the unit.

The model **CT137** is available at a cost of \$219.95. For more information, you should contact Bush Industries, Inc., Oak Street, Little Valley, NY 14755 — (800) 228-BUSH (in New York, call 800-248-BUSH).



The CT137 "vertical storage" desk by Bush.



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The Atari XL series computers represent power, sophistication, and flexibility virtually unrivaled in today's Home Computer Market.

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2. The XL "FIX"! is available in **DISK, CASSETTE,** and now **ROM!**
3. XL "FIX"! versions fix ALL THREE types of software (Disk - Cassette - and Cartridges!)
4. The XL "FIX"! (disk or cassette) adds **OVER 4K** of usable RAM to your computer (anyone using Data bases or Word processors will **really** appreciate this feature!)
5. You never have to hold the **OPTION** button down on 600XL or 800XL computers!
6. **VERY IMPORTANT!** You need to load the XL "FIX"! only **once**... you can **change** disks, cassettes, or cartridges **without** rebooting the XL "FIX"! each time (disk or cassette)!
7. The **ROM** version is instantaneous upon computer power up, has a high speed cursor, is instantly switchable to your original operating system, will work with 16K 600XL's, and more!

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REQUIREMENTS: The "IMPOSSIBLE" diskette, the 4K STATIC RAM pack, a 400 or 800 computer (please specify!) with 48K and "B" Rom's. NOTE! The very old ATARI computers were shipped with "A" Rom's which had some serious "Bugs". Even if you don't own an "IMPOSSIBLE," you should upgrade to "B" Rom's (simple to install!) We have them available at a very inexpensive price. CALL US! "XL" version available soon!

NOT A PIRATING TOOL: We at C.S.S. did not design The "IMPOSSIBLE" to put Software Manufacturers out-of-business overnight! Nearly all of our products have been "ripped-off" by industry parasite who have little or no ability to develop a product of their own so we can sympathize with their dilemma. All C.S.S. products have built-in safe guards which prohibit their use for flagrant pirating. The "IMPOSSIBLE" is no exception! While The "IMPOSSIBLE" backup-up the most heavily protected programs, it also checks to see that the 4K STATIC RAM pack is installed before allowing the backup copy to execute!

EXAMPLES: The "IMPOSSIBLE" has been tested on 300 of the most popular and heavily protected programs we could find. With nearly 4000 programs for Atari, we DO NOT guarantee that it will backup all programs in the past-present-and future! We will supply updates at \$6 each (non-profit!) if and when necessary. Programs we have successfully backed up include: Blue Max, Visi-cal, Archon, Mule, File Manager 800 +, Syn Calc, Syn File, One on One, 7 Cities of Gold, Super Bunny, Load Runner, Drol, and Gumball just to name a few!

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BASIC AUTORUN.SYS File

by Chet Walters

BASIC listing.

Yes! Another one. I know you've got BASIC AUTORUN.SYS filemakers coming out of your ears. But this one's different! Sure, sure. . . that's what they all say. No, really! Before you string me up, give a listen.

This one is very short (100 bytes or so) and it'll autoboot any BASIC program using any filename. But it does more than that.

For one thing, it won't leave you looking at any READY prompts or blank screens while the program loads. It prints *LOADING* then the filename to let you know just what's happening.

It'll also accept a filename up to twenty characters long. So, if you type your actual filename and leave a space (or any illegal filename character), you can have it print *LOADING SNAKE(?!)* or, perhaps, *LOADING MENU, PLEASE WAIT*.

It's a very short program to key in (should only take ten minutes or so), and if you check the trailing REMs, you can see that you have a few alternatives. Designed primarily for DOS 2.0, it works with any DOS that recognizes AUTORUN.SYS files.

Just type it in (don't change anything) and follow the directions on the screen when you run it. It creates the AUTORUN.SYS file in about four seconds, then you're ready to go!

Try it—you might like it. May all your boots be shining! □

```

5 REM D:RUNAUTO.BASiC
6 REM by CHET WALTERS (c) 84
7 REM
10 GRAPHICS 0:5C=PEEK(88)+256*PEEK(89)
:DIM A$(21),B$(21):? :? "EXISTING AUTO
RUN FILE WILL BE DELETED"
15 CLOSE #1:TRAP 60:~? :? "INSERT TARGE
T DISKETTE IN DRIVE #1":? :? "ENTER NA
ME OF FILE TO AUTORUN"
20 B$="D:":INPUT A$:B$(3)=A$:IF A$(1,2
)=B$(1,2) THEN B$=A$
25 IF LEN(B$)>20 THEN ? "FILENAME TOO
LONG":GOTO 15
30 OPEN #1,4,0,B$:CLOSE #1:~? "K":~POKE
85,0:~? B$
35 ? :? :? "CREATING FILE, DON'T INTER
RUPT":OPEN #1,8,0,"D:AUTORUN.SYS"
40 FOR I=0 TO 49:READ A:PUT #1,A:NEXT
I
45 FOR I=0 TO 20:PUT #1,PEEK(5C+I):NEX
T I
50 FOR I=0 TO 42:READ A:PUT #1,A:NEXT
I:CLOSE #1
55 ? "K+AUTORUN FILE FOR":? A$:? "IS N
OW":? " TO":? "R↑":~END
60 CLOSE #1:~? CHR$(253):ERR=PEEK(195):
IF ERR=170 THEN ? :? "FILE NOT FOUND!!
":GOTO 15
65 IF ERR=5 THEN ? "MUST BE AT LEAST 1
WO CHARACTER5":GOTO 15
70 IF ERR<>167 THEN ? ">>ERROR>>" :ERR
:GOTO 15
75 POKE 84,3:~? "EXISTING AUTORUN FILE
LOCKED!":? :? "PRESS >>RETURN<< TWICE
TO":? "REPLACE EXISTING FILE OR"
80 ? "TYPE DOS TO CHECK MENU":? :? :?
"XIO 36,#1,0,0,";CHR$(34);"D:AUTORUN.S
YS";CHR$(34);" :G.30":POKE 84,7:END
82 DATA 255,255,0,6,101,6,160,158,162,
36,142,197,2,142,23,208,142

```

BASIC AUTORUN.SYS *continued*

```
84 DATA 240,2,189,28,6,145,88,136,202,
16,247,169,13,141,74,3,96
86 DATA 56,29,53,51,50,8,17,22,16,17,9
,26,50,53,46,2
88 DATA 104,141,240,2,168,170,145,88,2
00,192,129,144,4,189
90 DATA 94,6,232,192,140,208,241,142,7
4,3,202,142,197,2,96
92 DATA 0,44,47,33,36,41,46,39,226,2,2
27,2,0,6
93 REM
94 REM FOR QUIET LOAD CHANGE-> 240,2
TO 65,0 IN LINE 88 (CURSOR WILL REMAIN
INVISIBLE)
95 REM
96 REM TO HAVE NO TEXT APPEAR CHANGE->
2 TO 6 IN LINE 90
97 REM
98 REM TO MAKE SYSTEM RESET CAUSE COLD
START CHANGE-> 197 TO 68 IN LINE 90
(THE TEXT WON'T APPEAR HOWEVER)
99 REM PROGRAM LOADED SHOULD ISSUE A
GRAPHICS STATEMENT TO RESTORE COLOR &
CLEAR THE SCREEN
```

CHECKSUM DATA.

(see page 34)

```
5 DATA 292,43,999,50,143,567,872,756,1
60,909,126,984,907,755,881,8444
70 DATA 457,920,458,702,683,681,289,27
4,63,276,8,282,284,288,241,5906
99 DATA 489,489
```

Chet Walters is president of Non-Standard Magic! in Girard, Ohio (producers of *Picture Plus* and *List-er Plus*) and an assembly technician for General Motors. He's been working with Atari for nearly four years and donates his time to local schools (with Atari systems). He has taught BASIC privately and in the classroom.

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GRIFFIN'S LAIR

by Braden E. Griffin, M.D.

In *ANALOG Computing's* issue 24, I reviewed an exceptional educational game from Sprout Software, called **Tonk in the Land of Buddy-Bots**. Now, two additional programs are available in the TinkTonk series of educational software designed for children of ages four to eight years. While maintaining the same high level of quality, these new games have an even greater educational thrust.

TINK'S ADVENTURE
Sprout Software
MINDSCAPE, INC.
3444 Dundee Road
Northbrook, IL 60062
(314) 480-7667
48K Disk \$24.95

Tink is the trusty leader of the Tink-Tonks and is about to embark on an adventure. As **Tink** arrives on foot at Tink-Tonk Lake, he has the choice of continuing the adventure by helicopter or boat. Having selected the means of transportation, one is given the chance to play a game or begin the adventure.

At various junctures, similar options appear, providing the opportunity to play one of seven games included in the adventure. Most of these games have educational value, but two of them, Pilot Boat and Fly Helicopter, are included just for fun.

Using the keyboard, one may pilot the boat around the islands in TinkTonk Lake or fly the chopper through the sky in front and back of islands, clouds and even stars. These activities have no bearing on the course of the adventure, but simply provide a pleasant little interlude.

The other five games are designed to help children learn ABC order and to familiarize them with the computer keyboard. In *Get Gas*, four consecutive letters of the alphabet are displayed with a blank at the beginning or the end of the sequence, depending on the option one has chosen.

The level of difficulty may be selected as hard, where ten correct answers are required to fill the helicopter's tank. This task is made easier with a display of the complete alphabet at the bottom of the screen. A harder level requires twenty correct answers without the benefit of the

alphabet display. There is no time limit, and incorrect answers are ignored and incur no penalty.

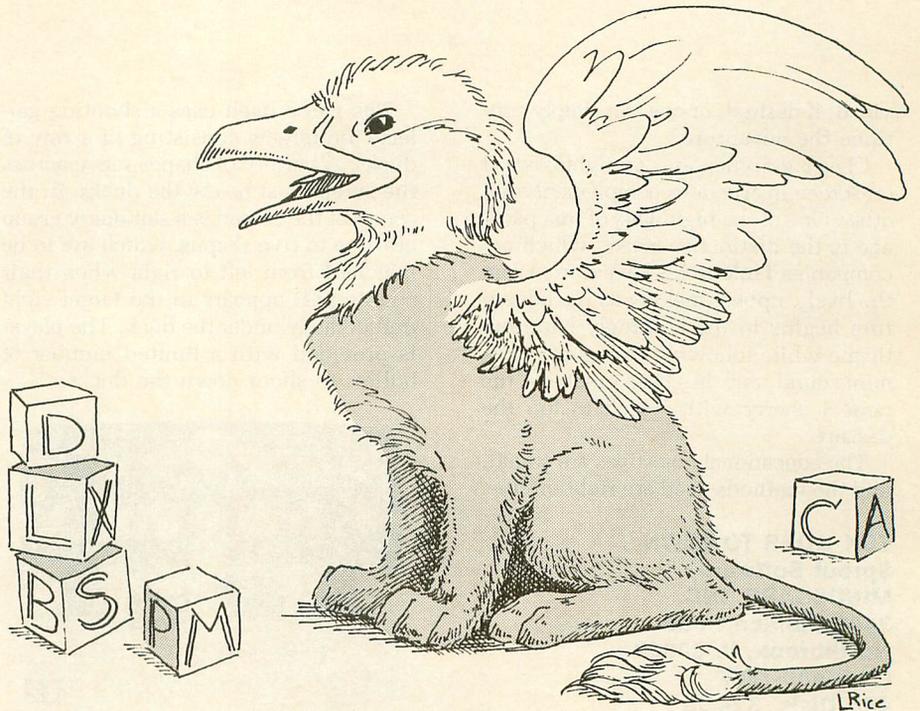
This game provides an opportunity for the young child to arrive at an answer, whether from the screen display or the time-honored "mental recitation," while exploring the keyboard without the pressure of time or the fear of being wrong. The development of speed and accuracy in the learning process is important, but before this can be achieved, the basic information must be assimilated without stress.

In *Go Fishing*, children get to know the computer keyboard. The keyboard is divided into four designated areas: the top row of numbers, and the left, center and right portions of the remaining keyboard area.

After a specific area is chosen, or the entire keyboard, if desired, the size of the fish is selected—from one to five characters long. Finally, one of three speeds is chosen, determining how fast the fish will swim.

As the combinations of characters pass beneath the boat, they are reeled in by reproducing them exactly as shown, be-

Educational Programs Review



fore they disappear from the screen.

All the necessary levels of progression are provided to establish proficiency on the keyboard. Anyone able to snag all twelve fish of the largest size (five characters) at the fastest speed is a whiz. I cannot come close to doing it.

While cruising around the lake, **Tink's** boat may spring a leak and can be saved only by playing Sinking Boat.

Another game emphasizing the keyboard, this one requires the player to type in the missing letter or number of a series of characters that are displayed in the same sequence as they appear on the computer keyboard.

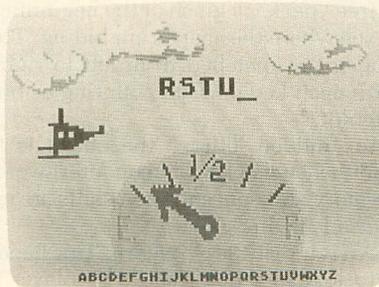
A trip to Davy Jones's locker can be avoided with five correct answers within one of three preselected time limits—fifty-five seconds, thirty-three seconds or ten seconds.

If the boat sinks, all is not lost, since further opportunities to play the game and save the boat are provided. Even total failure does not stop the adventure, but more on that later.

Eventually, **Tink** lands on a large island and, while exploring its secrets, suddenly finds himself being harassed

by a gorilla who's throwing coconuts from the top of a palm tree. Sounds like time to play Coconut Catch, eh?

Three-letter alphabet sequences are displayed on the screen with a blank in the middle. If the correct letter is supplied before the coconut hits the ground, it becomes part of a pyramid.



Tink's Adventure.

The first level gives one twelve tries to build a pyramid out of ten coconuts. The harder level requires one to build a fifteen-coconut pyramid with eighteen tries, and the hardest level gives twenty-five tries to assemble a pyramid from

twenty-one coconuts.

The last game is played when **Tink's** search leads him to Gork's Treasure. Here, one can practice ABC order alone, or ABC order and keyboard sequences mixed together.

A five-character sequence displays, with one of the spaces blank. With ten correct answers in a row, Gork disappears, and the treasure is won.

In the fast level, one has six seconds to enter the correct response. In the faster and fastest levels, this time limit is four seconds and two seconds, respectively.

The overall design of **Tink's Adventure** is excellent. The adventure theme adds a bit of excitement without the threat of danger. If the helicopter runs out of gas and plunges into the water, or if the boat sinks, **Tink**, the Indiana Jones of TinkTonk Land, laughs in the face of danger and prevails.

There always seems to be a raft or friendly whale around to get **Tink** to the island and continue the adventure. If one fails to accomplish a task the first time, additional opportunities are provided.
(continued on next page)

vided, if desired, or one can simply continue the adventure.

Clever graphics and straightforward on-screen instructions complement each other. One of the highlights of this package is the distinctive music which accompanies **Tuk** on his adventure. From the lively, upbeat melody as the adventure begins to the chillingly haunting theme while following Gork's tracks, a mini sound track has been created—the perfect cherry with which to top the dessert.

The educational objectives are sound, and the methods used are right on line.

TUK GOES TO TOWN
Sprout Software
MINDSCAPE, INC.
3444 Dundee Road
Northbrook, IL 60062
(314) 480-7667
48K Disk \$24.95

The basic format in this game is similar to **Tink's Adventure**. **Tuk**, the gardener in TinkTonk Land, makes a trip to town with plenty of stops along the way. During this excursion, any of seven games may be played.

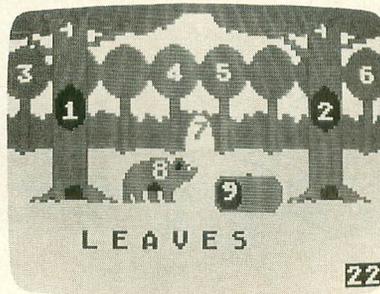
Tuk can travel to town by motorcycle, train, speedboat, or any one of eight possible modes of transportation. On his way, **Tuk** can travel through the farm, fair, forest or seashore, each with its own special game.

Once in town, visits to the three different stores provide additional games to be played. The educational objectives of the games comprising **Tuk Goes to Town** promote the development of visual discrimination skills, provide practice with spelling and help to build a larger vocabulary.

The Farm game requires the player to unscramble the letters of either animal names or farm words. A picture of the animal is displayed above each letter, and a correct response makes the animal jump into the pen. No penalty is assessed for incorrect keyboard entries, and an unlimited number of attempts is permitted.

The Fair game is described as "Just for fun," but, in fact, visual discrimination skills will be enhanced, particularly in younger children.

The game itself uses a shooting gallery, the targets consisting of a row of ducks. A variety of shapes move across the screen just below the ducks. In the center of the screen is a stationary group of three to five shapes, which are to be matched from left to right when their counterpart appears in the target sight immediately under the duck. The player is provided with a limited number of bullets to shoot down the ducks.



Tuk Goes to Town.

The Forest game is the most difficult and the most fun of all the games. Different shapes or letters are hidden in the forest. Numbers from one to nine are used to designate the hiding places.

In "hidden shapes," a series of different shapes is displayed on the screen. A number in the lower right-hand corner of the screen denotes the number of attempts allowed to match these shapes. A free "peek" is given at the beginning, to see where the shapes are hiding. The shapes are matched from left to right, with each key pressed counting as one attempt.

In "hidden letters," the object is to find the letters of a common forest word. Memory and concentration skills are exercised in this game.

Arriving at the Seashore, **Tuk** needs help to win a boat race. The player is presented with either a scrambled word or a word with missing vowels. In either case, with each correct entry, **Tuk's** boat moves closer to the finish line.

Another boat, the competition, moves steadily toward the finish at one of two selected speeds. If all of the necessary letters are entered quickly enough, **Tuk** will win the race. Increasing the player's

vocabulary and providing spelling practice are the goals of this game.

Once **Tuk** gets to town, there are three stores for him to visit. These are games which stress pattern and shape recognition.

In the Toy Store, a group of eight wrapped packages is displayed, with a letter beneath each one. One of the packages differs from the others, and when the corresponding letter is pressed, it fills one of the blank spaces of the Toy Store word being sought. The packages change after each entry.

The Market game consists of two activities which emphasize the development of similar skills. In "match the shapes," a series of shapes is displayed on the left side of a balance scale. At the bottom of the screen, several shapes are shown with letters in them. Matching a shape on the scale with the right one from the bottom places the respective letter on the right side of the scale. The scale is balanced when the correct market word is spelled out. As many tries as needed are permitted.

In "find the word," only half the shape to be matched is shown on the scale, making it a little more difficult.

The Clothes Store game is another of those just for fun. By selecting one of six styles of hats, pants, shirts and shoes, one can dress **Tuk** in a variety of fashionable tops.

As with **Tink's Adventure**, the design features of this program are superb. With a little more emphasis on spelling and vocabulary, **Tuk Goes to Town** is as stimulating for older children as it is for younger ones. The TinkTonks are quite capable companions for these adventures into education. □

Dr. Griffin, as Chief of Newborn Medicine at a perinatal center, spends most of his time in the newborn intensive care ward. Off-hours, he's been using an Atari 800 for four years. ANALOG Computing magazine is almost entirely subsidized by Dr. Griffin's health insurance reimbursement, for providing psychotherapy through writing—to cure his unbelievable attraction to cliches.

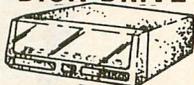


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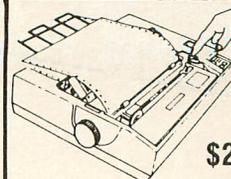
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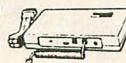
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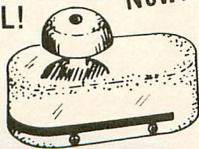
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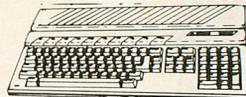
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ASK MR. FORTH

by Donald Forbes

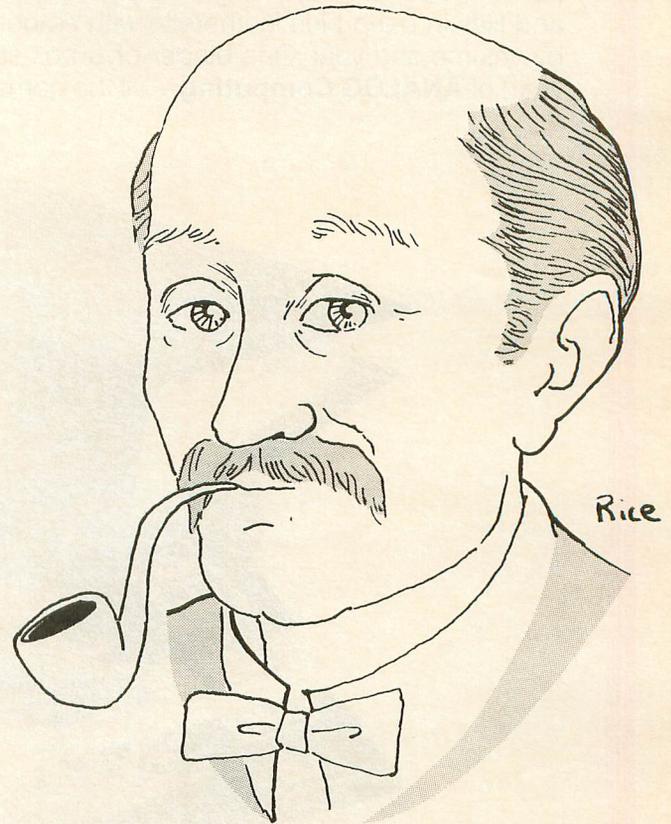
If the audiences at your FORTH demos ever wondered why a digital computer like Atari should be supported by a magazine whose unlikely name is embedded with dots, you can explain that it is short for Atari Newsletter And Lots Of Games.

Most of the games from the first ten issues have been collected in the **ANALOG Compendium**, which they can obtain for fifteen pieces of silver (actually \$14.95 plus \$2.00 postage and handling). For another thirty pieces of silver, they can mail the card enclosed in the **Compendium**, to get the games on six sides of three disks, and save themselves some typing.

The **Compendium** (an old ten-dollar word from the Latin for "that which is weighed together," now used to refer to a short, complete summary) also includes a dozen short programs in BASIC that show off Atari's graphic capabilities to good advantage.

The structure of some of these programs makes it easy to translate them to FORTH and thus show some of the similarities and differences between the two languages.

The first and shortest (**Compendium**, page 114) is a color demo in graphics 8 mode. Here is the BASIC code:



```
5 REM GRAPHICS 8 COLOR DEMO
10 GRAPHICS 8:SETCOLOR 2,0,15:SETCOLOR
  1,0,0:COLOR 1
20 FOR X=0 TO 200 STEP 2
30 PLOT X,0:DRAWTO X,10
40 NEXT X
50 FOR X=1 TO 201 STEP 2
60 PLOT X,20:DRAWTO X,30
70 NEXT X
80 FOR X=0 TO 200
90 PLOT X,40:DRAWTO X,50
100 NEXT X
```

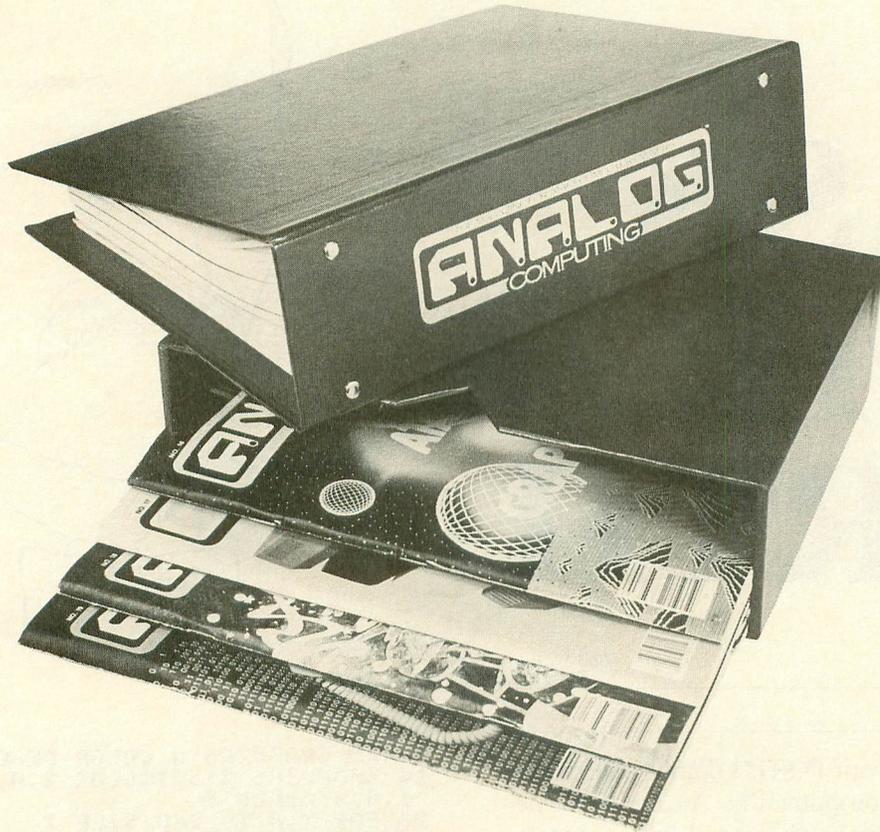
This program splits into four logical sections. We can mark these with a red pen and ruler after Lines 10, 40 and 70. Here is the line-for-line equivalent in FORTH:

```
: GR8COLOR
8 GR. 2 0 15 SETCOLOR
1 0 0 SETCOLOR 1 COLOR
201 0 DO
I 0 PLOT I 10 DRAWTO
2 +LOOP
202 1 DO
I 20 PLOT I 30 DRAWTO
2 +LOOP
201 0 DO
I 40 PLOT I 50 DRAWTO
LOOP ;
```

Note that the limit of the DO...LOOP in FORTH is one more than in BASIC, because FORTH quits when it reaches the limit. Furthermore, *the colon*

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ASK MR. FORTH *continued*

definition is too long, even though it will work. FORTH is easier to understand and debug in small bites. An improvement would be to break the program into four pieces by line numbers, then combine them into one colon definition this way:

```
: GR8COLOR
  LINE10 LINE20 LINE50 LINE80 ;
```

The second program (**Compendium**, page 57) is a Graphics 11 GTIA demo.

```
10 REM GRAPHICS 11 GTIA DEMO
20 REM
30 GRAPHICS 11
40 CI=1:C=0:SETCOLOR 4,0,2
50 FOR Y=0 TO 191
60 FOR X=0 TO 79
70 C=C+1:IF C=16 THEN C=0
80 COLOR C
90 PLOT X,Y
100 NEXT X
110 LC=LC+1:IF LC=16 THEN CI=-CI:LC=1
120 C=C+CI:IF C=16 THEN C=0
130 NEXT Y
140 GOTO 140
```

In this program, there is a logical break after Line 40, and another after Line 130, with a DO...LOOP in Lines 60 to 100 embedded in another DO...LOOP.

Since the inner loop invokes the counter for the outer loop, we will need a definition of J (a FORTH-79 word that is not included in fig-FORTH, even though it's found in both Team Atari FORTH and valFORTH). The outer loop index Y in the BASIC program becomes J, and the inner index X becomes I.

Furthermore, the three variables CI, C and LC, which are defined automatically in BASIC, must be defined separately in FORTH. Here again is the line-for-line version:

```
0 VARIABLE CI
0 VARIABLE C
0 VARIABLE LC
: J R> R> R> R R# !
  >R >R >R R# e ;
: GR11GTIA
  ( graphics 11 gtia demo )
  ( rem )
  11 GR.
  1 CI ! 0 C ! 4 0 2 SETCOLOR
  191 1 + 0 DO ( add 1 to limit)
  79 1 + 0 DO
  1 C +! C e 16 = IF 0 C ! THEN
  C e COLOR
  I J PLOT ( X = I, Y = J )
  LOOP
  1 LC +! LC e 16 = IF
  CI e MINUS CI ! 1 LC ! THEN
  CI e C +! C e 16 = IF
  0 C ! THEN
  LOOP
  BEGIN 0 UNTIL ;
```

This code, too, calls for comments. In the first place, the colon definition is too long and should be broken up. Second, the endless loop 140 GOTO 140 can be handled in other ways. One way is a time-

delay loop, or even an embedded loop:

```
: DELAY 3 0 DO 30000 0 DO LOOP LOOP ;
```

or wait for a return key press with:

```
: DELAY ." Press return"
  KEY DROP ;
```

Third, since we continuously need FORTH-79 words that are not in fig-FORTH, it makes sense to store them in a handy place. One way is to buy a set of alphabetic index tabs in a stationery store for about \$3 and save the words in a loose-leaf binder. Obvious candidates are J, PICK, ROLL, random number generators, and double number extensions (most of which appear in Leo Scanlon's *Forth Programming*).

The third program is a Moire demo (**Compendium**, page 122). The BASIC code is:

```
10 DEG
20 A=INT(1.9*160)
30 GRAPHICS 8+16
40 SETCOLOR 2,0,0
50 FOR I=0 TO 160 STEP 5
60 B=INT(I/2)
70 COLOR 1
80 PLOT 0,B
90 DRAWTO I,160
100 PLOT A,B
110 DRAWTO A-I,160
120 PLOT 0,160-B
130 DRAWTO I,0
140 PLOT A,160-B
150 DRAWTO A-I,0
160 NEXT I
170 IF PEEK(764)(<)255 THEN END
180 GOTO 170
```

This program has a beginning, a middle (the loop in Lines 50 to 160), and an end. In the FORTH translation, we need variables A and B. The DEG function is not necessary. The INT function isn't needed either, since we can use integer arithmetic. In Line 20, however, we must be careful to multiply 160 by 19 and then divide by 10.

```
0 VARIABLE A
0 VARIABLE B
: MOIRE
  ( deg)
  160 19 10 */ A !
  8 16 + GR.
  2 0 0 SETCOLOR
  160 1 + 0 DO
  I 2 / B !
  1 COLOR
  0 B e PLOT
  I 160 DRAWTO
  A e B e PLOT
  A e I - 160 DRAWTO
  0 160 B e - PLOT
  I 0 DRAWTO
  A e 160 B e - PLOT
  A e I - 0 DRAWTO
  5 +LOOP
  BEGIN 764 e 255 = NOT IF
  ." quit" QUIT THEN
  0 UNTIL ;
```

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E: Single Step Execution	-	-	-	-	-
F: Fill Program Buffer	-	-	-	-	-
G: Binary Load Directory	-	-	-	-	-
H: Hex Conversion	-	-	-	-	-
H: Hex Arithmetic	-	-	-	-	-
I: Install Ramdisk Handlers	-	-	-	-	-
J: Jump Subroutine (JSR)	-	-	-	-	-
L: Drive Selection Control	-	-	-	-	-
M: Move Block of Memory	-	-	-	-	-
N: Relocate 6502 Code	-	-	-	-	-
O: Operate from Program Buffer	-	-	-	-	-
P: Printer Control	-	-	-	-	-
R: Read Sectors from Disk	-	-	-	-	-
S: Search Memory for Sequence	-	-	-	-	-
T: Toggle Hex Char Display Mode	-	-	-	-	-
U: User's Custom Command	-	-	-	-	-
V: Verify 2 Blocks of Memory	-	-	-	-	-
W: Write Sectors to Disk	-	-	-	-	-
X: Disassemble Memory	-	-	-	-	-
Y: Line Assembler	-	-	-	-	-
Z: Exit Monitor	-	-	-	-	-
Lockup Recovers	-	-	-	-	-
Redirection of Printer I/O	-	-	-	-	-
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ASK MR. FORTH *continued*

This program, too, could be improved by breaking it into separate colon definitions, and by saving A and B on the stack. In the computer business, however, you learn early to be wary of the optimization trap: first, you make it work; then, if you still have time, you optimize.

The fourth program (**Compendium**, page 157) is called **Pretty Demo**, and it introduces some new features:

```
10 DEG
20 GRAPHICS 24
30 COLOR 1
40 SETCOLOR 2,0,0
50 FOR I=1 TO 360 STEP 5
60 X=319*I/360
70 Y=80+80*SIN(I)
80 IF I>270 THEN 100
90 PLOT 0,0
100 DRAWTO X,Y
110 IF I<90 THEN 130
120 DRAWTO 319,159
130 NEXT I
140 IF PEEK(764)<>255 THEN END
150 GOTO 140
```

The first thing to notice is that Line 60 calls for us to multiply 319 by I, which eventually becomes 360, giving 114,840 as the product. This total exceeds the limit for signed integers, so we must use */ instead of a multiplication followed by a division.

Furthermore, in Line 70, we need a SIN function to compute the sine of the loop index—and FORTH does not provide a built-in SIN function.

The elegant solution is to develop a formula for a polynomial curve which will approximate the sine curve as closely as we need for our application. The simple way is to incorporate a table of sines in our program, with one entry for each degree from 0 to 90. Such a table appears on page 134 of Leo Scanlon's book and has the added advantage that we can compute other trigonometric functions, such as the cosine, by a simple transformation.

Here are the two screens needed to load the sine table:

```
( trig table screen 1 )
DECIMAL
0 VARIABLE SINE
0698 , 0175 , 0349 , 0523 ,
1392 , 0872 , 1045 , 1219 ,
2079 , 1564 , 1736 , 1908 ,
2756 , 2250 , 2419 , 2588 ,
3420 , 3584 , 3746 , 3907 ,
4067 , 4226 , 4384 , 4540 ,
4695 , 4848 , 5000 , 5150 ,
5299 , 5446 , 5592 , 5736 ,
5878 , 6018 , 6157 , 6293 ,
6428 , 6561 , 6691 , 6820 ,
6947 , 7071 , 7193 , 7313 ,
7431 , --)
```

```
( trig table screen 2 )
7547 , 7660 , 7771 , 7880 ,
```

```
7986 , 8090 , 8191 , 8290 ,
8387 , 8480 , 8572 , 8660 ,
8746 , 8829 , 8910 , 8988 ,
9063 , 9135 , 9205 , 9272 ,
9336 , 9397 , 9455 , 9511 ,
9563 , 9613 , 9659 , 9703 ,
9744 , 9781 , 9816 , 9848 ,
9877 , 9903 , 9926 , 9945 ,
9962 , 9976 , 9986 , 9994 ,
9998 , 10000 ,
;5
```

We need some code to reference the table, as in this screen:

```
( trig table screen 3 )
: LOOKUP SINE SWAP 2 * + @ ;
: SIN
DUP 270 >
IF 360 SWAP - LOOKUP MINUS
ELSE DUP 180 >
IF 180 - LOOKUP MINUS
ELSE DUP 90 >
IF 180 SWAP - THEN
LOOKUP
THEN THEN ;
: COS
DUP 270 > IF 270 -
ELSE 90 +
THEN SIN ; ;5
```

(continued on next page)

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ASK MR. FORTH *continued*

What SIN does is to return the sine of any integer-valued angle between 0 degrees and 360 degrees. To use the result, you must divide it by 10,000. As Scanlon points out, "the cosine of any given angle is equal to the sine of an angle that is 90 degrees greater."

He also notes that "negative angles have the same sines and cosines as their positive counterparts. . . This means you can also use SIN and COS for angles between -1 degrees and -360 degrees, by supplying the angle's absolute value on the stack."

Here, then, is the FORTH code for the **Pretty Demo** to match the BASIC line for line (except that we must remember to divide the sine value by 10000).

```
0 VARIABLE X
0 VARIABLE Y
: PRETTY ( DEG )
  24 GR.
  1 COLOR
  2 0 0 SETCOLOR
  360 1 +1 DO
  I 319 360 */ X !
  I SIN RD 10000 */ 80 + Y !
  I 270 < IF
  0 0 PLOT THEN
  X @ Y @ DRAWTO
  I 90 > IF
  319 159 DRAWTO THEN
  5 +LOOP
  BEGIN 764 @ 255 = NOT IF
  ." quit" QUIT THEN 0 UNTIL ;
```

Both sine and cosine functions can be combined in this short program from page 23 of the **Compendium**, called **Circle Demo**.

```
10 XC=160: YC=80
20 RD=60:INC=10:Y5=0.75
30 GRAPHICS 8:COLOR 1
40 GOSUB 1000:END
1000 REM -----
1010 REM CIRCLE DRAWER ROUTINE
1020 REM -----
1030 REM
1040 REM XC: x-coord. of center
1050 REM YC: y-coord. of center
1060 REM RD: circle radius
1070 REM INC: drawing increment
1080 REM Y5: y-scaling factor
1090 REM
1100 DEG :PLOT XC,YC+RD*Y5
1110 FOR CIRCLE=0 TO 360 STEP INC
1120 XCOORD=XC+SIN(CIRCLE)*RD
1130 YCOORD=YC+COS(CIRCLE)*RD*Y5
1140 DRAWTO XCOORD,YCOORD
1150 NEXT CIRCLE:RETURN
```

This program consists of a subroutine which calls a loop, which in turn draws the perimeter of the circle in steps of 10 degrees at a time, using the sine and cosine functions to locate the X and Y coordinates each time. Here is the FORTH version:

```
{ circle demo 1 }
160 VARIABLE XC 80 VARIABLE YC
10 VARIABLE INC 60 VARIABLE RD
75 VARIABLE Y5 ( 0.75 )
0 VARIABLE XCOORD
0 VARIABLE YCOORD
```

```
: GOSUB1000 XC @ RD @ Y5 @ 100
*/ YC @ + PLOT
360 1 + 0 DO
I SIN RD @ 10000 */
XC @ + XCOORD !
I COS RD @ 10000 */
Y5 @ 100 */
YC @ + YCOORD !
XCOORD @ YCOORD @ DRAWTO
INC @ +LOOP ; -->
```

```
{ circle demo 2 }
: CIRCLE_DEMO 8 GR. I COLOR
GOSUB1000 ;
```

Notice that the program contains a scaling factor (0.75) that was set at 75 in the FORTH program and that later must be divided by 100. Furthermore, both the sine and cosine values must first be divided by 10,000. If the output looks more like an egg than a circle, you may want to experiment with the scaling factor.

You can write a program to draw circles without using sines and cosines. There is a fiendishly clever program to do just that on page 125 of the **Compendium**, and it takes only twenty-five short lines. This innocent-looking program with the simple title **Circle Radius Demo** looks easy:

```
10 XCENTER=310/2:YCENTER=192/2
100 GRAPHICS 8
110 COLOR 1
120 ? "ENTER RADIUS:";:INPUT RADIUS
130 LET RADIUS=RADIUS+3-1
140 LET X=0
150 LET Y=RADIUS
160 LET DIAMETER=3-2*RADIUS
170 IF X<=Y THEN GOSUB 1000: IF DIAMETER<0 THEN DIAMETER=DIAMETER+4*X+6:X=X+1:GOTO 170
180 IF X>Y THEN END
190 DIAMETER=DIAMETER+4*(X-Y)+10
200 Y=Y-1
210 X=X+1:GOTO 170
1000 REM
1010 PLOT XCENTER+X,YCENTER+Y
1020 PLOT XCENTER+Y,YCENTER+X
1030 PLOT XCENTER+Y,YCENTER-X
1040 PLOT XCENTER+X,YCENTER-Y
1050 PLOT XCENTER-X,YCENTER-Y
1060 PLOT XCENTER-Y,YCENTER-X
1070 PLOT XCENTER-Y,YCENTER+X
1080 PLOT XCENTER-X,YCENTER+Y
1090 RETURN
```

The structure of the program appears to be straightforward. You draw a red line after Line 160 and another after Line 210. Lines 10 through 160 are just sequential code, and all that is different is Line 120. It asks for input from the keyboard, which should present no problem in FORTH.

The subroutine at the end of the program is also clear-cut. It is only when you begin to translate the five statements in Lines 170 to 210 that you realize you've hit a booby trap. This is what is referred to as "spaghetti code" (IBM's Joan K. Hughes, in her

ASK MR. FORTH *continued*

book PL/1 *Structured Programming* called it "bowl-of-spaghetti code" or BS code), and the tip-off is right there: two GOTO 170 statements, one unconditional and one nested inside an IF statement.

Computer science advanced in the 1970s from a black art to an organized and systematic process, when the mischief of the GOTO statement was finally identified. Newer languages, such as PL/1, found substitutes, and Pascal banished it completely.

Structured programming at last made it possible to write programs that were free of logical errors and were relatively easy to debug and maintain.

Computer scientists demonstrated mathematically that any program could be built from a set of three simple building blocks with a common property: one input and one output. The SEQUENCE block has the trivial structure of one process performed after another. The IFTHENELSE block is merely a two-way branch. The third is the DOWHILE block, which tests for a true condition and then repeats an operation, as long as the test remains true (to exit from the

block, the operation itself must reset the flag).

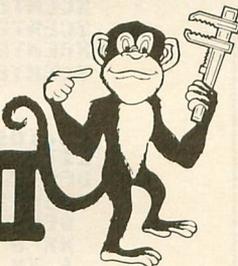
There are two additional variations in common use. The IFTHENELSE block can sometimes be replaced by the SELECT block (or CASE statement), which features a multiple-branch fork to avoid an awkward set of nested IF statements. A payroll program, for instance, could test immediately for single, married, widowed, divorced, separated, or never married.

The variation on the DOWHILE block is the DO-UNTIL block which places the logical test at the end, instead of the beginning—and thus creates a hidden trap. The loop will always be executed at least once, as you'll discover to your consternation, when your payroll program looks for end-of-file after the first record, but the operator mounts a tape that has only a header label and a trailer label, and no first record!

The details are given in *Top Down Structured Programming Techniques* by C. McGowan and J. Kelly, Petrochelli/Charter, New York, 1975. If your library doesn't have this, they can borrow it from another library. Anyone in your audience who writes pro-

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ASK MR. FORTH *continued*

grams for a living will appreciate the tip.

The logical structure of our spaghetti code, as the FORTH translation makes clear, is a pair of nested DOWHILE loops, with this structure in FORTH:

```
BEGIN condition WHILE
  FORTH words .....
REPEAT
```

The first condition tested is whether X is less than or equal to Y; the second is whether DIAMETER is less than 0, or negative.

You can ask for a number from the keyboard with the sequence QUERY ?TERMINAL INTERPRET. It will substitute for the INPUT statement in BASIC, and you may want to file it for reference.

The FORTH code below also takes some liberties with the BASIC code. The END has been replaced by ."quit" QUIT. By using INITIAL to reset the variables, shifting 8 GR., and then adding RERUN, you can use RADIUS_DEMO to draw the first circle, and then RERUN to draw more circles without clearing the screen.

```
( radius 1)
0 VARIABLE XCENTER
0 VARIABLE YCENTER
0 VARIABLE XX 0 VARIABLE YY
0 VARIABLE DIAMETER
0 VARIABLE RADIUS ( < 100 )
: INPUT# ." radius? " QUERY CR
?TERMINAL CR INTERPRET
SWAP DROP ;
: INITIAL INPUT# RADIUS !
155 XCENTER ! 96 YCENTER !
0 XX ! 0 YY ! 0 DIAMETER !
( 8 GR. ) 1 COLOR
2 RADIUS +! 0 XX !
RADIUS @ YY ! 3 RADIUS @
2 * - DIAMETER ! ; -->
```

```
( radius 2)
: GOSUB1000
XCENTER @ XX @ +
YCENTER @ YY @ + PLOT
XCENTER @ YY @ +
YCENTER @ XX @ + PLOT
XCENTER @ YY @ +
YCENTER @ XX @ - PLOT
XCENTER @ XX @ +
YCENTER @ YY @ - PLOT -->
```

```
( radius 3)
XCENTER @ XX @ -
YCENTER @ YY @ - PLOT
XCENTER @ YY @ -
YCENTER @ XX @ - PLOT
XCENTER @ YY @ -
YCENTER @ XX @ + PLOT
XCENTER @ XX @ -
YCENTER @ YY @ + PLOT ; -->
```

```
( radius 4)
: L170
BEGIN XX @ YY @ > NOT WHILE
GOSUB1000
BEGIN DIAMETER @ 0 < WHILE
XX @ 4 * 6 + DIAMETER +!
1 XX +! REPEAT
XX @ YY @ - 4 * 10 +
DIAMETER +!
-1 YY +! 1 XX +! REPEAT
." quit " QUIT ;
: RADIUS_DEMO 8 GR.
INITIAL L170 ;
: RERUN INITIAL L170 ; ;5
```

The ANALOG Compendium has half a dozen other short, graphic BASIC programs (especially the **Triangle** on page 29) which appear to be likely candidates for FORTH translations.

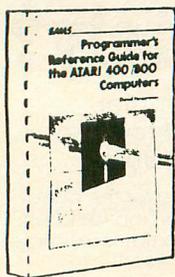
Next month you'll have an opportunity to upgrade the show-and-tell sessions you've conducted to date, and become a full fledged professor—by teaching a FORTH-79 class to beginners.

You will need one copy of the textbook for the class, which you may want to order right away (if you can't borrow a copy). The book costs \$16, so be prepared to pass the hat at this session and the next.

The text is *The Complete Forth* by Alan Winfield, Wiley Press, 605 Third Avenue, New York, New York 10158. You may find it at bookstores like Dalton's and

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ASK MR. FORTH *continued*

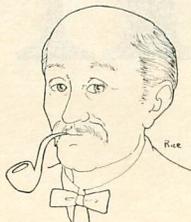
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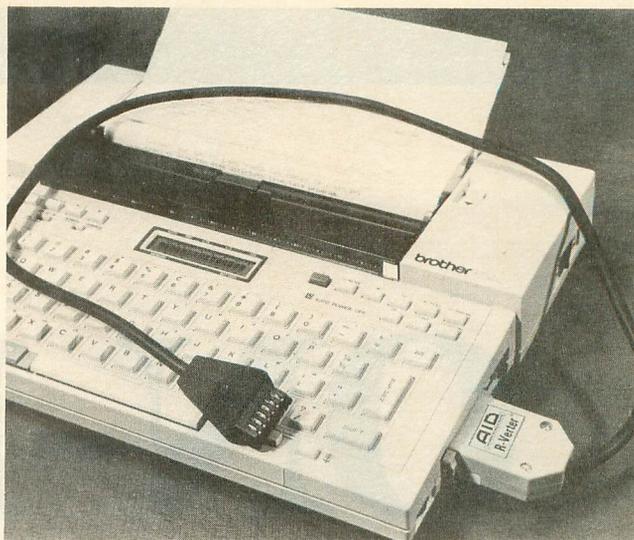
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CIRCLE #111 ON READER SERVICE CARD

ON-LINE

How the effects of software piracy are made readily apparent . . . to the pirates themselves

by Russ Wetmore

Please bear with me in this, my first column for *ANALOG Computing* magazine, while I use the time and space for a little soapbox ranting and raving. For those of you who don't know me, I run a software research and development firm called Star Systems Software, Inc. in Orlando, Florida. I wrote a (at one time) best selling game called **Preppie!** for Adventure International, and a couple other games for Atari computers.

Our current slant is towards personal productivity products, such as **HomePak**, a trademark of Batteries Included, which we recently completed for that company. I've been involved in all facets of the home computer software industry almost from its very inception, from programming to advertising to publishing to . . . you name it; I've done it. Our firm currently makes products for a wide gamut of machines, including those of Apple, Commodore, Tandy and IBM, but the Atari is my first love.

A true story.

The following might not seem relevant to computer software, but please patronize me for a moment while I get around to making my point.

One of my favorite things is going to the movies. I decided to take in *2010* the other evening, anxious to see the sequel to one of my favorite movies of all time, *2001: A Space Odyssey*. The theatre we

would be attending had recently been remodeled, and the evening promised to be an enjoyable one.

Diana and I had just sat down when we were asked (politely) by a young couple with two small children if we could move in from the aisle. Their children could see the movie better there, and would be less likely to fidget. "Fine," I said, and we moved over.

The next two hours proved to be eventful ones.

One of the little monsters spilled my Coke. The parents were constantly trying to explain the story to the monsters, though it was way over their heads (the parents', too) and based on the premises laid down in a movie made many years before they were even born.

The parents put their feet all over the backs of the chairs in front of them. Obviously imitating their parents, the monsters did likewise. I asked the parents if they did that at home, and their (not-so-polite, this time) response was, "Sure, don't you?"

All four of them were constantly talking (obviously never having heard of the word *whisper*) about which monster's turn it was to go to the rest room, and how much better a movie *Star Wars* had been. Both monsters spilled their popcorn (battered) all over the floor of the nicely renovated theatre.

To beat the traffic, they left five minutes before the movie was over. If you've seen the movie, you know that the last

People tend not to have much respect when damaging someone else's property, or otherwise infringing on someone else's rights, if the effect of their disrespect is not immediately obvious to them.

few minutes is where they explain not only what's happening, but the reason for both 2001 and 2010. What they possibly could have gained from the movie, except for some dazzling special effects ("not nearly as good as *Star Wars*' were") is beyond me.

As I got up to leave, I looked around the theatre. It was a shambles. . . There were footprints all over the chairs. Empty popcorn boxes and soft drink cups (along with their contents, in many cases) were strewn over the floor. People all around me had talked incessantly throughout the entire movie.

My VCR and the local rent-a-movie store are looking more and more inviting all the time.

Getting down to it.

The point of all this? People tend not to have much respect when damaging someone else's property, or otherwise infringing on someone else's rights, if the effect of their disrespect is not immediately obvious to them. If I were to invite any of my fellow theatre patrons into my home, I'd make sure that they'd go to great lengths to keep their feet off of my furniture and food/beverages in their respective containers.

They would not interrupt conversations and would, generally, be as polite as they've been taught to be while someone's guest. Put those people in a movie theatre, and all manners go to hell in a handbasket.

Also, people tend to do as they've seen others do. . . "monkey see, monkey do." If everyone else is having food fights with their popcorn, why shouldn't you? If you want to hold a loud conversation about what Ethel wore to your dinner last night—and want to do it in the middle of an engrossing movie—surely your right to talk outweighs someone else's right to enjoy an artistic experience they've paid \$4.50 or so for, right?

These are the same people we expect to have respect for the rights of programmers and their work. If everyone around you is pirating (the last time I'll use that word; it really should be called *stealing*) software, why shouldn't you? The way that it hurts programmers like myself is not immediately obvious, so there is very little guilt inherent in stealing software.

The arguments for stealing software.

"The programmer will never miss the sales from this one program I've stolen. He's rich enough, anyway."

I've got news for you. I make enough from programming to make a living at it, but I'm far from rich. I won't lose my mortgage over one stolen program, but surely you're not naive enough to believe that you're the only person in the whole world who thinks the way you do. If I make \$2.00 from the sale of a single program, and just a thousand people think as you do, then I've lost \$2,000.

I say "just a thousand" for argument's sake—I'd estimate that, for a best selling program, the number would be more inclined to reach into the tens (or even hundreds) of thousands. If someone stole \$20,000 from you, could you in good conscience tell me that you wouldn't care one way or the other?

"The program's too expensive. They're trying to rip me off."

Maybe. A Porsche 944 is too expensive for me, but I'd like to have one. Maybe I should complain to my local Porsche dealer that the price is too high, and rip one off from his lot.

"I don't know if the company is going to be around a year from now."

Nice try. A couple of years ago (to use the automobile analogy again) there was serious concern as to whether Chrysler was going to be around much longer. So, obviously, the thing to do was to go out and heist a few Dodge trucks, right?

"All my friends do it."

Again, nice try. Like being a lemming, huh? San Quentin is just plumb full of criminals and friends of same, who all have similar "hobbies."

C'mon, people. Stealing is stealing, and programmers like me aren't the only people you're hurting. I almost left the industry last year because of piracy, and I'm sure I'm not alone.

To help combat the problem, we just

(continued on next page)

completed a package called **HomePak** that is: (1) low in price and (2) not copy-protected. If the program doesn't sell, and if I can attribute those lost sales to theft, then I doubt that I'll do another program for commercial sale.

If you want us to continue writing programs, then you've got to support us by *buying* the software you want or need, and by *not condoning* software theft among your friends.

One last true story.

I frequently stop by local software merchants to watch from the sidelines, to see what people are buying and what kind of difficulties they have getting software to run. It helps me to determine what's important to novice users and to put features users want in my programs.

One day, a kid (about 15, I'd guess) sidled up next to me with a box full of disks. We got to talking about the latest games, and he asked me if I'd seen this "great new game" called **Sea Dragon**, which he'd just gotten a copy of (and which I'd written).

"No," I said enthusiastically, "what does it look like?" He whipped out a disk (not an original, of course) and booted up the program. I watched passively for a few minutes, then reached into my wallet, pulled out \$3.00 and put it on the table in front of him.

Thinking I wanted to buy a copy from him, he said, "Hey, no problem. Just give me a disk, and I'll copy it for you."

"No, I don't want to buy it. You see, I wrote the program. I lost about \$3.00 because you stole it. I just wanted to save you the trouble for the next program of mine you steal, and let you take the \$3.00 ahead of time."

He laughed for a bit, then realized I was serious. He turned white as a sheet, silently packed up his box of disks and left. I've been told that he refuses to take stolen programs now, but, one way or another, I made an impression on him by graphically showing him the harm he'd done to me.

I find it very hard to believe that people would knowingly hurt me (and my

family—I have others to support besides myself) by stealing my programs, if they really knew what they were doing.

I hope I've made an impression on at least one of you out there. All I want is to be paid for my efforts. It's a shame that, in an industry as fast-growing and potentially important as home computer software, I have to plead for something which would be considered as a matter course anywhere else. Sigh.

A call to arms.

Or should I say "a call to letters?" This column doesn't have any preplanned format. It will be part gossip, news, programming tips (and, as in this issue, soapbox tirades). If there's something particular you'd like, please write to this column c/o **ANALOG Computing**, P.O. Box 23, Worcester, MA 01603.

I'm open to most any subject, from Action! to "how do I get a program published?"—so fire away. I can't individually answer all letters, but will take the more interesting or representative ones for inclusion here. □

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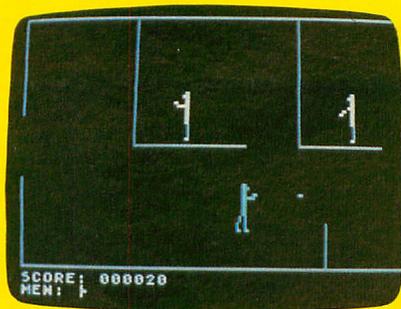
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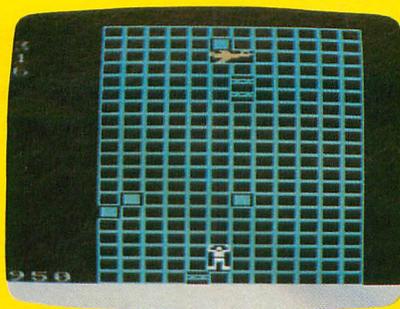
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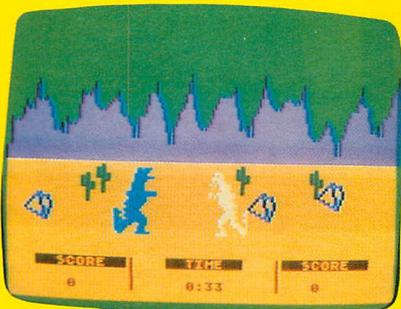
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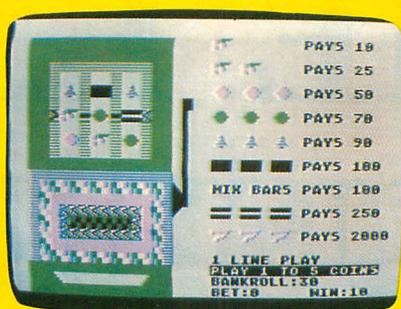
Stuntman



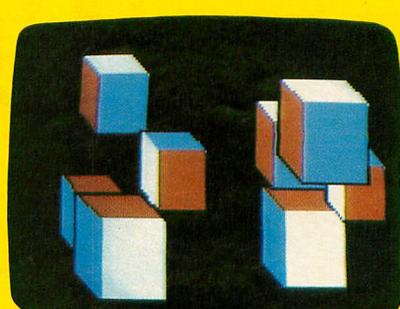
Fill 'Er Up



Dino Battle



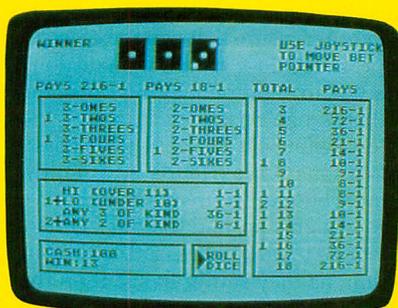
Color Slot Machine



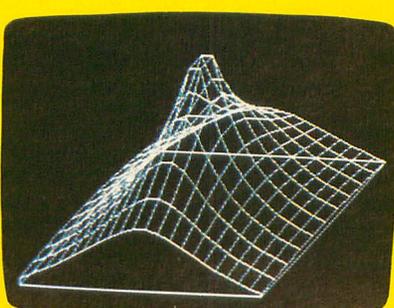
Cubes

Where can you get all of these programs (and dozens more!) for only \$14.95?

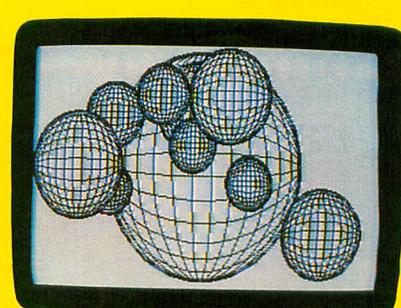
See page 55 to find out.



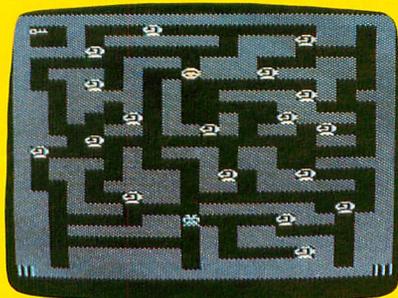
Triple Threat Dice



3-D Graphs



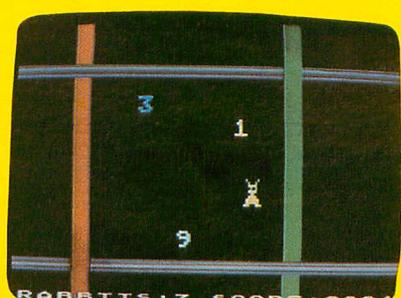
Sphere Demo



Leprechaun King



Sketch Pad



Harvey Wallbanger

THE END USER

THIS MONTH:

Taking perfect pictures of Atari computer graphics

Arthur Leyenberger is a human factors psychologist living in New Jersey. He does free-lance writing and microcomputer consulting, and has been an Atari enthusiast for over three years.

by **Arthur Leyenberger**

Welcome back, all of you **End Users**. One thing that's undoubtedly true about this great Atari adventure that we've all embarked on is that, regardless of who we are, we're all **End Users**. Therefore, we share a common need to learn to get the most out of our Atari computers. That's why we're here.

This month, the column is devoted to discussing how to take pictures of your video monitor or television...and a very brief mention of a book that you may find interesting reading.

The book.

Since July of 1984, Jack Tramiel and his three sons have owned Atari—and have held our collective fate in their hands. At the Winter Consumer Electronics Show, an impressive line of new computers was unveiled. Tramiel and sons are betting that these machines will make Atari profitable in 1985, also making it the number one low-end computer maker.

If Jack Tramiel is able to pull off the big turnaround for Atari, I predict that he will be a candidate for *Time* magazine's Man of the Year Award. We'll have to wait and see what happens. But, in the meantime, there is a book you ought to be aware of.

Described as a "benevolent dictator," there is no question that Jack Tramiel is a brilliant, controversial businessman.

In order to learn more about the man and the future of Atari, I highly recommend that you read *Home Computer Wars* by Michael Tomczyk. Published by COMPUTE! Books (at \$15 hardcover, \$10 softcover), this account of the man who just may be the greatest name in the microcomputer business makes fascinating reading.

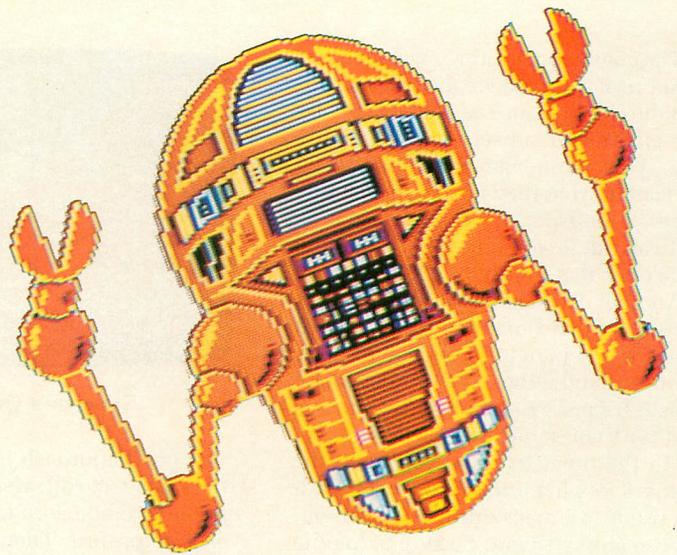
Screen pictures — getting ready.

There's nothing quite like the satisfaction of creating your own graphics programs. Seeing the results on the video screen is a pleasure that can only be truly appreciated after spending many long hours writing and debugging the code. But there's one hassle.

In order for you to share your colorful creations with friends and family, you must boot up your system and have everyone gather around the tube. Others may not be totally impressed with your creation, as they squint to see it on the small screen. And your Atari system isn't that portable.

What's the solution? Why, take a picture of the screen. Then, matte finish 3-by-5-inch prints can be mailed like postcards, and slides can be shown onto a projection screen. What a thrill! Here's how you do it.

There are a few things you need to take pictures of your television or monitor screen: a camera, a tripod and some film. Just about any camera will work, but the best results come from a single-lens reflex (SLR) type, with a lens be-



tween 50 and 100mm. With an SLR, less guesswork is required to obtain excellent shots, because what you see is what you get.

A tripod provides a steady support for the camera. Normally, most people cannot hand hold a camera when using a shutter speed of $\frac{1}{60}$ second or slower. When photographing a screen, I normally use a $\frac{1}{2}$ second shutter speed.

If you don't have a tripod, an improvised camera support like a chair or table will do fine. To avoid bumping the camera while the shutter is open, it's best to have an inexpensive (about \$3) shutter release cable. If your camera has a self-timer, you can use that in place of the cable release.

Finally, you'll need some film. For slides, I generally use Kodachrome 64. For prints, I use Kodacolor 100. It doesn't have to be Kodak film, but the ASA film speeds of 64 and 100 are important. Now for the fun part.

Getting it on film.

Line up your camera so that the back of the camera is parallel with the front of the TV or monitor. With a 50mm lens, the camera will probably need to be about two to three feet from the screen. Make sure that the lens is pointed at the center of the screen.

With the image that you're going to photograph on the screen, adjust the TV or monitor controls for the best possible picture. Get the color and tint balanced first, then adjust the brightness, and fi-

nally, use the contrast control for the crispest image you can get.

Now, set the camera to an f-stop of 5.6. This will be the aperture setting that you'll always use. Any variation in the exposure will be done by adjusting the shutter speed.



Graphs and charts look impressive.

Each marking on the shutter speed dial is either one-half or twice the previous marking, so it's easy to use and understand. Initially, set the shutter speed to $\frac{1}{4}$ second.

Focus the camera lens and adjust the distance from the camera to the screen, so that you can see two inches on all sides of the video screen. This is important, because, when the pictures are developed, part of the photo around the edges is lost.

To take the picture, turn off all the lights in the room and press the cable

release. If you are using a self-timer, you might want to activate it first, then turn off the room lights until the shot is completed.

If this is your first time taking pictures off of your screen, it would be wise to bracket your shots. To bracket your shot, take two additional pictures with everything exactly the same except the shutter speed. Take one shot at $\frac{1}{6}$ second (a little faster) and another shot at $\frac{1}{2}$ second (a little slower). These two settings will allow the film to receive less light and more light, respectively.

If you're using print film, it is imperative that you tell whoever is doing the developing that you have CRT shots. If you forget to do this, I can tell you from experience that your prints will come back with washed out, often strange-looking colors.

ROW	REVENUE	COL 2	COL 3
ROW 1	2500.00		
ROW 2	2500.00		
ROW 3	2500.00		
ROW 4	6500.00		
ROW 5	4500.00		
ROW 6	2300.00		
ROW 7	1500.00		
ROW 8	5500.00		

Syntrend from Synapse.

(continued on next page)

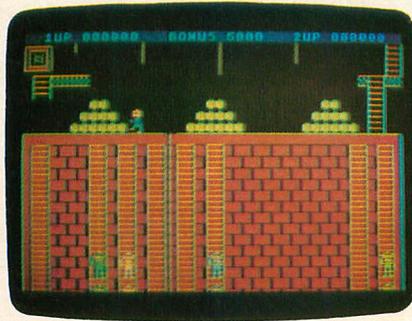
E THE END USER *continued*

The automatic printing machines that film processors use are designed to adjust the color balance as if you were taking pictures of sunsets and the family dog. This is understandable, since 95 percent of what they process is just this type of snapshot. Slide film is not as critical, but it would not hurt to tell the developer that you have CRT shots.

Another decision you have to make is whether to have matte or glossy prints made. If you plan to send them as postcards or handle them a lot, order matte finish. It's more resistant to fingerprints and will not scratch as easily.

On the other hand, if you want the sharpest looking print, or if you're sending prints to a magazine for publication, choose glossy finish. Be sure to handle the prints carefully, along the edges if possible.

I usually use $\frac{1}{2}$ second shutter speed for slides and $\frac{1}{8}$ for prints. But you'll have to experiment with various exposures until you find the right speed.



Synapse's Quasimodo.

A good approach is to shoot a roll of film as a test roll. Use different shutter speeds and be sure to keep a record of each exposure. Then, when your film comes back, pick out the best shot, determine what exposure was used, and you'll be all set. You can continue to use these same settings as long as you don't change the contrast and brightness controls on your TV or monitor.

When to say it in pictures.

There are dozens of reasons why you will want to take pictures of your TV or monitor screen. Here are just a few.

How about capturing that high game score that you'll want to show friends—or send to a software company for patches or other prizes? Maybe you'd like to take a picture of your special graphics creation. Whether from a touch tablet, BASIC program or light pen, saving pictures is fun.

Screen shots often look quite nice when enlarged to 5x7 or 8x10-inch size. Matting and framing these make them into very attractive wall hangings, perfect for original, creative gift giving.

Regardless of what you do with your screen shots, if you follow these simple instructions and experiment a little, I think you'll be pleasantly surprised with the results. And so will your friends and family. Happy shooting!

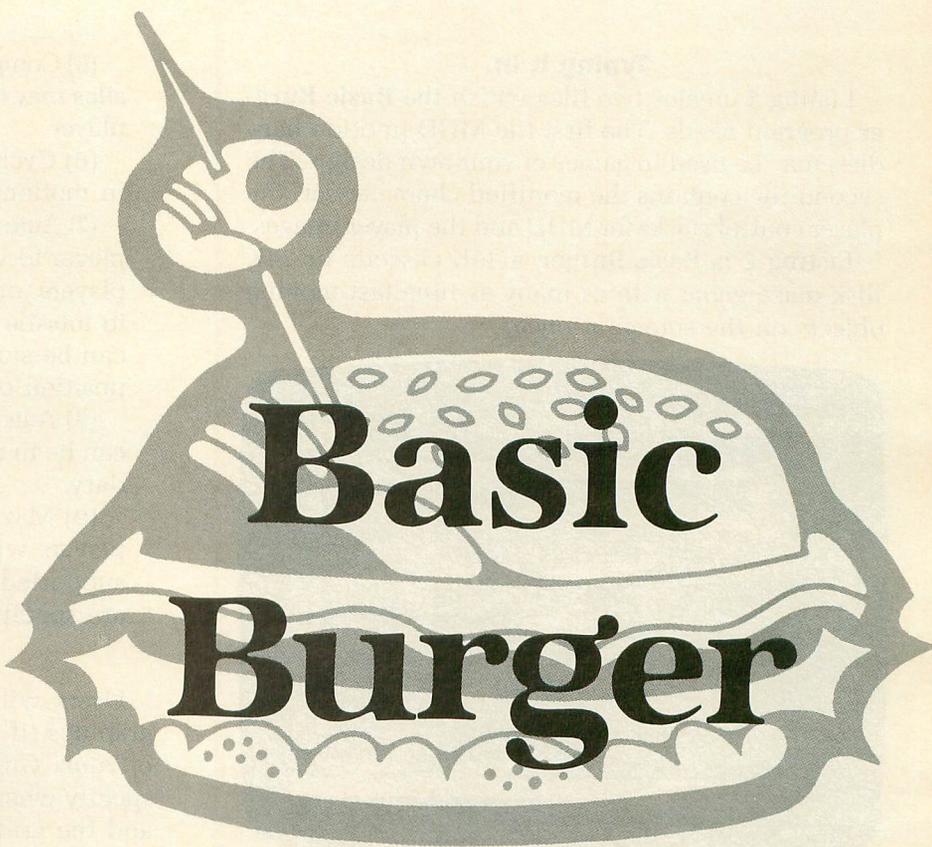
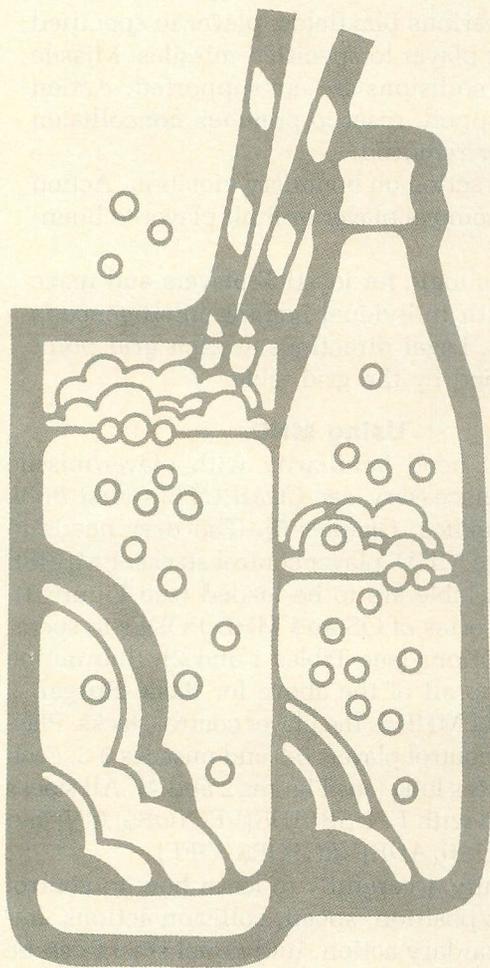
Next month: control a robot with your Atari computer!

WHAT IS CHECKSUM DATA?

Most program listings in **ANALOG Computing** are followed by a table of numbers appearing as DATA statements, called "CHECKSUM DATA." These numbers are to be used in conjunction with **D:CHECK** and **C:CHECK** (which appeared in **ANALOG Computing** issue 16 and the **ANALOG Compendium**) or with **Unicheck** (from issue 24).

D:CHECK and **C:CHECK** (written by Istvan Mohos and Tom Hudson) and **Unicheck** (by Tom Hudson) are designed to find and correct typing errors when readers are entering programs from the magazine. For those readers who would like copies of these articles, you may send for back issue 16 or 24 (\$4.00 each) or the **ANALOG Compendium** (\$14.95 plus \$2.00 shipping and handling from:

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Holmes, PA 19045



A commercial quality game demonstrating MHD, the ultimate machine language player/missile handler for Atari computers

by David H. Butler

You have opened a new restaurant called **Basic Burger**. However, jealous competitors have contaminated your food. Your three chefs must assemble **Basic Burgers** while avoiding contaminated food. The contaminated food moves faster than your chef, but can be killed by falling burger parts or flying peppers (your trigger).

Your pepper shaker contains only five flying peppers. To renew them, you must catch the bouncing pepper shaker which occasionally travels through the maze.

Assembling burgers, killing contaminated food and collecting bouncing money earns points. For each 10000 points, you earn a new chef.

The contaminated food comes in from the sides. By listening to their entering sound, you can tell which side the food will enter from.

At the start of each round, a random maze is generated with up and down ladders. The speed of all players increases from rounds 1 to 7.

Pressing START will restart **Basic Burgers** at level 1. Pressing the SPACE BAR will pause/resume the game.

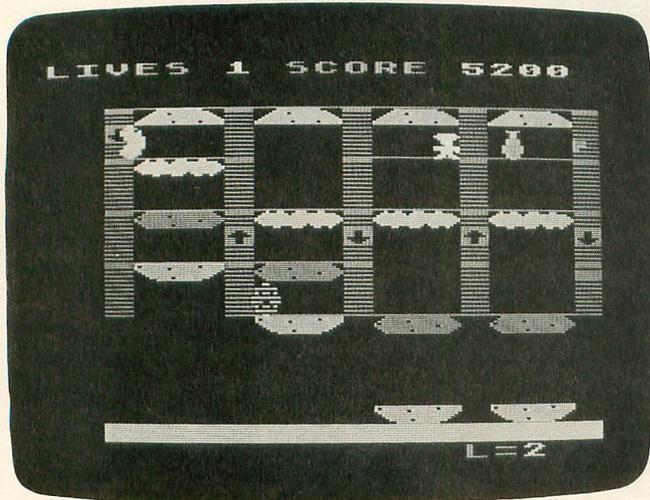


Basic Burger *continued*

Typing it in.

Listing 1 creates two files which the **Basic Burger** program needs. The first file MHD (motion handler) may be used in games of your own design. The second file contains the modified character set, the player control stacks for MHD and the player images.

Listing 2 is **Basic Burger**, a 16K cassette or 24K disk maze game with as many as nine fast-moving objects on the screen at once.



Basic Burger.

This program illustrates many of the features of MHD (i.e., cyclic action, maze logic with variable homing logic, auto action on collision, auto action on boundary violation, adjustable player speeds, missile support, joystick and trigger support).

Cassette users must add Listing 2C to Listing 2. When **Basic Burger** is RUN, cassette users will be asked to mount the tape created by Listing 1 and press RETURN. After debugging **Basic Burger**, the program plus the two files it uses may be placed on a single tape by typing `GOTO 25000`.

MHD design.

This section is for programmers wishing to incorporate MHD into their own games. Maze games or simple shoot-'em-up games can be handled. MHD is a 1K machine language program that runs concurrently with Atari BASIC via deferred VBI (vertical blank interrupt). Its features are:

- (1) The position of player/missiles may be POKEd.
- (2) The velocity of player/missiles may be POKEd.
- (3) Player/missiles may be controlled via joystick/trigger.
- (4) User may specify number of bullets.

(5) Complete missile logic is supported, or missiles may be automatically grouped to form fifth player.

(6) Cyclic action is supported when player is in motion.

(7) Auto action on specified collisions between player to various playfields, player to specified players, or player to specified missiles. Missile to missile collisions are not supported. Action can be stopped, reset to previous noncollision position or removed.

(8) Auto action on boundary violation. Action can be to remove player or limit player to boundary.

(9) Maze logic for joystick players and maze players with individual homing intelligence is supported. Legal directions at each grid point are specified by the grid table.

Using MHD.

Users will need familiarity with player/missile graphics (if necessary, see *COMPUTE!'s First Book of Atari Graphics*, Chapter 5). The user needs to specify where MHD, player control stacks, PMBASE and the grid table are to be loaded (see Figure 1). There are a series of OS and MHD POKEs to specify various options (see Tables 1 and 2). Subroutine 20000 sets up all of the above for **Basic Burger**.

The heart of MHD is the player control stacks. Player stacks 0-7 control players 0-3 and missiles 0-3. Each stack is 32 bytes long (see Figures 2 and 4). All stacks are turned on with `I=USR(ADR(VECTOR$),ON)` and off with `I=USR(ADR(VECTOR$),OFF)`.

Study Figure 4 carefully to learn how to control your player's position, speed, collision actions, images and boundary action. Individual stacks can be turned off by POKeing X to 0. To remove image from screen, POKe X to 2, a boundary violation. MHD will remove player and turn the stack off.

Negative numbers.

DX and DY may be negative. To POKe in a negative number, add 256 to it and POKe in the result. For example, -2 becomes 256 - 2, or 254.

Maze design.

The following equation, called the grid equation, states that there are grid points every B steps in the X direction, and every A steps in the Y direction.

$$\text{Displacement} = 16 * (Y/A) + (X/B) - C$$

Constant C is used to place the grid's corner at a given location (i.e., $C = 16 * (Y_0/A) - (X_0/B)$), where (X₀, Y₀) is the upper left-hand corner of the grid. Y₀/A and X₀/B must be integers.



Basic Burger *continued*

The grid table is a 256-byte table which defines legal directions for the players to move at each grid point. The grid equation yields a displacement from the start of the table. The value at the displacement defines legal directions for the grid point (i.e., 1 = up, 2 = down, 4 = left, 8 = right). For example, if down and left are the legal directions, then the value of the grid point is 2 + 4, or 6.

MHD code.

MHD options are selected by changing MHD directly (see Table 2). Listing 3 gives the source code for MHD, allowing special patches to be added. The source code is for the BASM assembler, a subset of the BASM compiler. MHD and the player control stacks must lie on a page boundary.

Table 1.

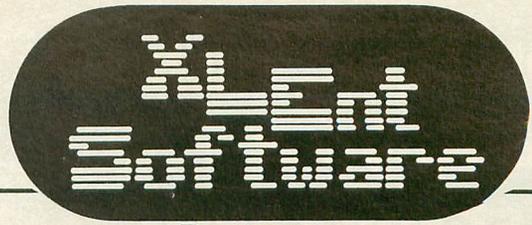
OS POKES FOR PMG		
Register	Description	Content
559	Resolution	46=Double, 62=Single ¹
623	Priority	(1 P0-P3,PF0-PF3, 2 P0, P1,PF0,PF1,P2,P3, PF2,PF3, 4 PF0-PF3,P0-P3, 8 PF0,PF1,P0, P1,PF2,PF3,P2,P3)+16 if missiles have own color (register 71).
704-707	Player color	Hue * 16+intensity
53256-53259	Player width	0=Normal, 1=Double, 3=Quadruple
53260	Width of missiles	Two bits for each missile specify width
53277	Enable player/missile	3=Enable ¹
53278	Hit clear	0 clears collision registers 53252-53255 (player to playfields) 53260-53263 (player to player) 53256-53260 (missile to players)
53279	Page of player/missile area	PEEK(106)-8=Double resolution, PEEK(106)-16=Single resolution ¹

¹Most common POKE(s) to this register.

Table 2.

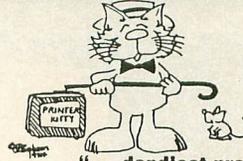
MHD POKES		
POKE	CONTENT	DEFAULT VALUE
ON+1011	Page address of MHD	100
ON+2	Page of player control stack	152
ON+132	Page of player/missile base	152
ON+1006	Grid table address	(0,6) page 6
ON+31	MHD exit address, user VBLANK	(98,288) XITVBV
ON+63	0=Rapid fire	203=Life trig between shots
ON+100	26=Limit bullets	30=Don't limit bullets
ON+102	Bullet limit	255
ON+435=4	Enable missiles as	8
and	5th player i.e.	
ON+951=0	Stack player 4	252
ON+574	2=Continuous cyclic action	20=Cyclic action when moving.

RESULT OF POKES	GRID EQUATION POKES
A=8 default	POKE ON+987,10:POKE ON+988,234:POKE ON+941,7
A=16	POKE ON+987,234:POKE ON+988,234:POKE ON+941,3
A=4	POKE ON+987,10:POKE ON+988,10:POKE ON+941,3
B=16 default	POKE ON+994,74:POKE ON+934,15
B=8	POKE ON+994,234:POKE ON+934,7
C	POKE ON+1003,C



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Figure 1.

MEMORY LAYOUT FOR BASIC BURGER		
Displacement from		
PMBASE	PGS	CONTENT
-512	-2	Modified character set
0	0	Player control stack
256	1	Player images
768	3	Missiles
1024	4	Player 0 Chef
1280	5	Player 1 Hot Dog
1536	6	Player 2 Pickle
1792	7	Player 3 Chicken
2048	8	MHD 1012 Bytes; Screen memory 960 bytes
4096	16	Top of memory

Figure 2.

INDIVIDUAL PLAYER CONTROL STACKS		
Player stack	Displacement from start	Controls
0	0	Player 0 Chef
1	32	Player 1 Hot Dog
2	64	Player 2 Pickle
3	96	Player 3 Chicken
4	128	Missile 0 Left Pepper
5	160	Missile 1 Right Pepper
6	192	Missile 2 Bouncing Pepper
7	224	Missile 3 Bouncing Money

Figure 3.

IMAGE LOCATIONS	
Displacement from start	Images
0	Two hot dog images
32	Two pickle images
64	Two chicken images
96	Six chef images
192	Flying peppers
200	Four bouncing pepper images
232	Four bouncing bill images

Figure 4.

PLAYER CONTROL STACK			
Displacement from start	Content	Displacement from start	Content
0	X Horizontal position	16	XMIN Lower horizontal limit
1	Y Vertical position	17	XMAX Upper horizontal limit
2	DX Change in X per change	18	YMIN Lower vertical limit
3	DY Change in Y per change	19	YMAX Upper vertical limit
4	IJIFFIES Jiffies per image change	20	ICNT MHD counter used with IJIFFIES
5	XJIFFIES Jiffies per X change	21	XCNT MHD counter used with XJIFFIES
6	YJIFFIES Jiffies per Y change	22	YCNT MHD counter used with YJIFFIES
7	PPFC Player to playfields collision command	23	PX Prior X without collision
8	PPC Player to players collision command	24	PY Prior Y used to reset on collision
9	PMC Player to missiles collision command	25	LY Last Y used to remove old image
10	#IMAGES Number of images to cycle	26	CONTROL 26-31 control special functions
11	IMSZ Image size	27	Dx Defines DX,DY for stick or maze players
12	IMPTR Image pointer used by MHD	28	Dy For trigger add to CPLR's X,Y to form missile's X,Y.
13	LSBIM Image address, least significant byte	29	CPLR Player to home in on (CONTROL 16)
14	MSBIM Image address, most significant byte	30	HX or BULLET COUNT
15	HI + BFLG Homing intelligence + boundary flag	31	HY or Last trigger position
Collision command (0 = Stop, 64 = Reset, 128 = Remove on collision) + WITH (bits 0-3)		CONTROL (255 = None, 0-3 = Trigger, 4-7 = 4-way stick, 8-11 = 8-way stick, 16 = Maze player with homing logic, 20-23 = Maze stick)	
HI (2,4,6...254) Random to hot dog.		Maze player has intelligence HI and homes in on CPLR.	
BFLG (0 = Remove on violation, 1 = Stop on boundary)		If CPLR = 255, then maze player homes in on HX, HY.	
1 Jiffy = 1/60 of a second		Note: If player stack is not used, set X = 0 and CONTROL = 255.	

Programmers should keep this article to incorporate MHD into their own games. □

David H. Butler is a CEO of the Hendry Corporation, which determines—without going into the market—what would happen if marketing strategies were changed on new or mature products. He has twenty years of computer experience.

Listing 1.

```

5 REM PROGRAM CREATES TWO FILES FOR BA
51C BURGER
10 REM LOAD MHD IN MEMORY
20 PGTOP=PEEK(106):PG=PGTOP-8:LINE=100
00:GOSUB 1000
30 REM LOAD PLAYER STACKS IN MEMORY
40 ? CHR$(253):PG=PGTOP-11:LINE=10700:
GOSUB 1000
50 REM LOAD PLAYER IMAGES IN MEMORY
60 ? CHR$(253):PG=PGTOP-10:LINE=11000:
GOSUB 1000
70 REM MODIFY CHARACTER SET IN MEMORY
80 ? CHR$(253):PG=PGTOP-13:LINE=11300:
GOSUB 1000: ? CHR$(253)
90 B=PG*256:A=PEEK(756)*256:FOR I=128
TO 511:POKE B+I,PEEK(A+I):NEXT I:FOR I
=256 TO 263:POKE B+I,255:NEXT I
96 A=B+512:RESTORE 97:FOR I=0 TO 7:REA
D B:POKE A-272+I,B:POKE A-257-I,B:NEXT
I
97 DATA 255,231,195,129,231,231,231,25
5
99 DIM F1$(20),F2$(20):F1$="C":F2$=F1
$:SP=128
100 ? "MAKE CASSETTE (0), OR DISK(1)":;
INPUT CD:IF CD THEN F1$="D:MHD.ML":F2$
="D:BURGER.BIN":SP=0
105 IF CD=0 THEN ? "INSERT CASSETTE, P
USH PLAY AND": ? "RECORD AND PRESS RETU
RN"
110 IO=2:PG=PGTOP-8:OPEN #IO,8,SP,F1$:
NUM=1012
120 GOSUB 20110

```

(continued on next page)



Basic Burger *continued*

```

130 REM WRITE CHSET STACK AND IMAGES
140 PG=PGTOP-13:NUM=1023:POKE 764,12:0
PEN #10,8,5P,F25
150 GOSUB 20110:POKE (PGTOP-8)*256,0:END
1000 REM SUBR LOAD DATA IN MEMORY
1010 RESTORE LINE:B=PG*256:SUM=0:TRAP
1030
1020 FOR J=0 TO 15:READ A:POKE B,A:SUM
=SUM+A:B=B+1:NEXT J
1030 IF LINE<>PEEK(183)+256*PEEK(184)
THEN ? LINE;" MISSING":END
1040 READ A:IF SUM<>A5(A) THEN ? "CHECKSUM
ERROR LINE ";LINE:END
1050 ? LINE:LINE=LINE+10:IF A>0 THEN 1
020
1060 TRAP 40000:RETURN
9999 REM MHD.ML
10000 DATA 216,169,152,133,204,169,255
,133,0,133,209,230,0,165,0,201,2369
10010 DATA 8,208,14,165,209,208,3,141,
30,208,160,8,162,0,76,98,4067
10020 DATA 228,10,10,10,10,133,203,
160,0,177,203,208,85,160,26,5700
10030 DATA 177,203,201,4,176,213,170,1
60,31,189,132,2,209,203,240,203,8213
10040 DATA 145,203,168,208,198,165,204
,133,206,160,29,177,203,10,10,10,10442
10050 DATA 10,10,133,205,160,0,177,205
,240,177,160,30,177,203,24,105,12458
10060 DATA 1,145,203,160,30,201,255,20
8,4,169,255,145,203,160,27,177,14801
10070 DATA 203,160,0,24,113,205,145,20
3,160,28,177,203,160,1,24,113,16720
10080 DATA 205,145,203,169,152,133,208
,165,0,201,4,144,2,169,255,24,18899
10090 DATA 105,4,74,170,169,0,106,133,
207,138,101,208,133,208,165,0,20820
10100 DATA 73,4,170,160,7,177,203,61,0
,208,208,56,200,177,203,61,22788
10110 DATA 8,208,208,48,169,1,133,205,
165,0,201,4,176,81,170,200,24765
10120 DATA 177,203,240,75,133,206,202,
48,4,6,205,144,249,160,0,70,26887
10130 DATA 206,144,7,185,8,208,37,205,
208,8,200,192,4,208,240,24,28971
10140 DATA 144,45,160,9,177,203,10,144
,14,169,0,133,209,160,0,145,30693
10150 DATA 203,32,187,103,76,11,100,10
,144,18,160,23,177,203,160,0,32300
10160 DATA 132,209,145,203,160,24,177,
203,160,1,145,203,76,174,101,160,34573
10170 DATA 21,177,203,24,105,1,145,203
,160,5,209,203,144,43,160,21,36397
10180 DATA 169,0,145,203,168,177,203,1
60,23,145,203,24,160,2,113,203,38495
10190 DATA 160,16,209,203,176,10,160,1
5,177,203,41,1,240,171,208,9,40494
10200 DATA 200,209,203,176,241,160,0,1
45,203,160,22,177,203,24,105,1,42723
10210 DATA 145,203,160,6,209,203,144,4
4,160,22,169,0,145,203,160,1,44697
10220 DATA 177,203,160,24,145,203,24,1
60,3,113,203,160,18,209,203,176,46878
10230 DATA 10,160,15,177,203,41,1,208,
11,240,193,200,209,203,176,241,49166
10240 DATA 160,1,145,203,160,20,177,20
3,24,105,1,145,203,160,4,209,51086
10250 DATA 203,144,27,160,20,169,0,145
,203,160,12,177,203,24,105,1,52839
10260 DATA 145,203,160,10,209,203,144,
6,160,12,169,0,145,203,166,0,54774
10270 DATA 160,0,224,8,208,17,202,138,
73,3,10,234,234,113,203,157,56758
10280 DATA 4,208,202,16,242,48,5,177,2
03,157,0,208,160,12,177,203,58780
10290 DATA 170,136,169,0,24,202,48,4,1
13,203,208,249,160,13,24,113,60616
10300 DATA 203,133,205,200,169,0,113,2
03,133,206,160,1,177,203,72,160,62954
10310 DATA 25,209,203,240,3,32,187,103
,104,160,25,145,203,24,101,207,64925
10320 DATA 133,207,160,11,177,203,168,
136,166,0,189,179,103,170,138,49,67114
10330 DATA 207,17,205,145,207,136,16,2
46,160,26,177,203,48,108,201,4,69220
10340 DATA 144,104,201,12,176,103,133,
205,41,3,170,169,0,160,2,145,70988
10350 DATA 203,200,145,203,189,120,2,7
3,15,133,206,208,8,160,20,169,73042
10360 DATA 0,145,203,240,69,70,206,144
,10,160,28,169,0,241,203,160,75090
10370 DATA 3,145,203,70,206,144,8,160,
28,177,203,160,3,145,203,70,77018
10380 DATA 206,144,10,160,27,169,0,241
,203,160,2,145,203,70,206,144,79108
10390 DATA 8,160,27,177,203,160,2,145,
203,165,205,201,8,176,11,160,81119
10400 DATA 2,177,203,240,5,200,169,0,1
45,203,76,11,100,201,16,240,83107
10410 DATA 112,41,3,170,32,161,103,240
,13,169,12,192,0,240,2,169,84766
10420 DATA 3,133,206,24,144,50,32,215,
103,160,2,177,203,48,10,165,86441
10430 DATA 206,41,8,208,12,145,203,240
,8,165,206,41,4,208,2,145,88283
10440 DATA 203,200,177,203,48,10,165,2
06,41,2,208,12,145,203,240,8,90354
10450 DATA 165,206,41,1,208,2,145,203,
189,120,2,73,15,37,206,133,92100
10460 DATA 206,208,12,160,2,177,203,20
0,17,203,208,12,76,61,102,169,94116
10470 DATA 0,160,2,145,203,200,145,203
,169,4,133,205,76,69,102,208,96140
10480 DATA 137,160,21,177,203,208,248,
32,161,103,208,243,32,215,103,240,9863
1
10490 DATA 222,160,2,177,203,240,14,48
,6,165,206,41,11,208,25,165,100524
10500 DATA 206,41,7,208,19,200,177,203
,48,8,240,14,165,206,41,14,102321
10510 DATA 208,6,165,206,41,13,240,183
,133,206,160,15,173,10,210,209,104499
10520 DATA 203,144,17,173,10,210,41,3,
170,189,175,103,37,206,240,243,106663
10530 DATA 133,206,208,155,160,29,177,
203,48,27,10,10,10,10,133,108192
10540 DATA 207,165,204,133,208,160,0,1
77,207,160,30,145,203,160,1,177,110529
10550 DATA 207,160,31,145,203,160,30,1
77,203,160,0,209,203,240,12,48,112717
10560 DATA 4,169,8,208,2,169,4,37,206,
208,197,160,31,177,203,160,114660
10570 DATA 1,209,203,48,4,169,2,208,2,
169,1,37,206,208,177,240,116544
10580 DATA 162,160,0,177,203,41,15,208
,5,200,177,203,41,7,96,1,118240
10590 DATA 2,4,8,0,0,0,0,252,243,207,6
3,166,0,189,179,103,119656
10600 DATA 133,1,160,11,177,203,170,16
0,25,177,203,168,177,207,37,1,121666
10610 DATA 145,207,200,202,208,246,96,
160,1,177,203,10,234,133,206,136,12423
0
10620 DATA 177,203,74,74,74,74,24,101,
206,56,233,0,168,185,0,6,125885
10630 DATA 133,206,96,100,0,0,0,0,0,0,
0,0,0,0,0,-126420
10690 REM PLAYER CONTROL STACKS ***
10695 REM CHEF
10700 DATA 0,0,0,0,10,4,5,0,143,0,2,16
,0,160,145,1,486
10710 DATA 60,196,40,137,0,0,0,0,0,2
0,1,1,0,0,0,941
10715 REM HOT DOG

```



Basic Burger *continued*

```

10720 DATA 0,0,0,0,10,3,4,139,0,131,2,
16,0,0,145,150,1541
10730 DATA 10,250,16,250,0,0,0,0,0,1
6,1,1,0,0,0,2085
10735 REM PICKEL
10740 DATA 0,0,0,0,10,3,4,139,0,131,2,
16,0,32,145,150,2717
10750 DATA 10,250,16,250,0,0,0,0,0,1
6,1,1,0,0,0,3261
10755 REM CHICKEN
10760 DATA 0,0,0,0,20,3,4,139,0,131,2,
16,0,64,145,150,3935
10770 DATA 10,250,16,250,0,0,0,0,0,1
6,1,1,0,0,0,4479
10775 REM RIGHT FLYING PEPPER
10780 DATA 0,0,1,1,0,1,1,139,142,0,1,5
,0,192,145,0,5107
10790 DATA 32,216,16,200,0,0,0,0,0,0,0
,4,255,0,0,0,5830
10795 REM LEFT FLYING PEPPER
10800 DATA 0,0,255,1,0,1,1,139,142,0,1
,5,0,192,145,0,6712
10810 DATA 32,216,16,200,0,0,0,0,0,0,0
,2,255,0,0,0,7433
10815 REM BOUNCING P
10820 DATA 0,0,0,0,4,5,6,0,1,0,4,8,0,2
00,145,1,7807
10830 DATA 32,240,40,137,0,0,0,0,0,0,1
6,1,1,1,0,0,8275
10835 REM BOUNCING MONEY
10840 DATA 0,0,0,0,4,5,6,0,129,0,4,8,0
,232,145,0,8808
10850 DATA 32,240,40,137,0,0,0,0,0,0,1
6,1,1,1,0,0,-9276
10990 REM IMAGES FOR PLAYERS ****
10995 REM TWO HOT DOG IMAGES
11000 DATA 48,120,180,252,252,126,126,
62,62,126,126,252,252,120,48,2404
11010 DATA 12,30,45,62,62,126,126,252,
252,126,126,62,62,30,12,3851
11015 REM TWO PICKEL IMAGES
11020 DATA 0,24,0,126,0,90,0,255,0,231
,0,90,0,126,0,24,4817
11030 DATA 0,0,0,0,0,126,255,126,0,0
,0,0,0,0,5324
11035 REM TWO CHICKEN IMAGES
11040 DATA 0,0,24,60,60,126,126,126,12
6,60,60,60,24,24,24,60,6284
11050 DATA 0,0,60,24,24,24,60,60,60,12
6,126,126,126,60,60,24,7244
11055 REM 2 MV LEFT, 2 MV RT, 2 CLIMBING
CHEF IMAGES
11060 DATA 0,0,0,0,62,127,62,28,28,12,
63,127,92,28,54,54,7981
11070 DATA 0,0,0,0,62,127,62,28,28,12,
127,127,29,28,54,99,8764
11080 DATA 0,0,0,0,62,127,62,28,28,24,
63,127,92,28,54,54,9513
11090 DATA 0,0,0,0,62,127,62,28,28,24,
127,127,29,28,54,99,10308
11100 DATA 0,0,0,0,0,124,254,124,56,56
,126,254,254,252,108,12,11928
11110 DATA 0,0,0,0,0,124,254,124,56,56
,252,254,254,126,108,96,13632
11115 REM FLYING PEPPER, 4 BOUNCING P
11120 DATA 15,0,15,0,15,0,0,0,48,48,48
,32,32,32,0,0,13917
11130 DATA 0,48,48,48,32,32,32,0,0,0,4
8,48,48,32,32,32,14397
11135 REM , 4 MONEY IMAGES
11140 DATA 0,48,48,48,32,32,32,0,0,0,0
,0,192,192,192,192,15405
11150 DATA 0,0,0,192,192,192,192,0,0,0
,192,192,192,192,0,0,16941
11160 DATA 0,0,0,192,192,192,192,0,0,0
,0,0,0,0,0,0,-17709
11290 REM 16 REDEFINED CHARACTERS ***

```

```

11300 DATA 0,0,0,0,0,0,0,0,255,255,0,2
55,0,255,0,255,1275
11310 DATA 3,7,15,31,63,127,255,255,25
5,255,191,255,255,255,223,255,3975
11320 DATA 192,240,248,252,254,255,191
,255,0,255,0,255,0,255,0,255,6882
11330 DATA 19,63,127,255,255,127,63,6,
96,252,254,255,255,254,252,200,9615
11340 DATA 255,191,255,127,63,31,15,3,
255,191,255,254,252,248,240,192,12442
11350 DATA 0,0,0,0,0,0,0,255,31,63,127
,191,255,127,63,31,13585
11360 DATA 248,252,254,255,191,254,252
,248,28,191,255,255,255,255,253,56,170
87
11370 DATA 0,0,0,0,0,0,24,60,24,24,60,
36,36,44,110,126,-17631
20110 REM IO=(1=READ,2=WRITE)
20120 REM PG=PAGE, NUM=# OF BYTES
20130 IOCB=832+IO*16:POKE IOCB+2,3+4*I
0:POKE IOCB+4,0:POKE IOCB+5,PG
20140 I=INT(NUM/256):POKE IOCB+8,NUM-I
*256:POKE IOCB+9,I
20150 I=USR(ADR("hhhLV"),IO*16):CL05
E #IO:RETURN

```

CHECKSUM DATA.

(see page 34)

```

5 DATA 771,738,722,884,34,857,16,424,3
49,88,667,293,346,991,751,7931
110 DATA 123,4,909,25,65,590,547,424,9
24,502,1,910,182,723,185,6114
10020 DATA 412,553,26,530,574,696,807,
730,415,486,309,502,327,405,15,6787
10170 DATA 491,587,509,525,462,777,568
,446,453,457,307,340,464,752,530,7668
10320 DATA 65,626,500,716,498,266,707,
484,242,414,286,236,464,460,722,6686
10470 DATA 454,887,514,289,804,762,747
,44,783,276,236,178,849,599,821,8243
10620 DATA 274,852,632,889,617,375,251
,892,579,460,175,578,328,199,598,7699
10775 DATA 11,875,874,214,901,853,757,
305,579,438,431,836,363,70,733,8240
11010 DATA 86,771,4,369,26,699,712,503
,578,397,576,571,130,132,222,5776
11120 DATA 987,284,310,368,844,897,922
,886,567,339,810,885,360,194,414,9067
20110 DATA 736,579,477,205,172,2169

```

Listing 2.

```

1 REM ** BASIC BURGER **
2 REM BY DAVID H. BUTLER
4 K1=1:K2=2:K3=3:K4=4:K5=5:K6=6
5 DIM UP$(K1),VECTOR$(11),FOOD$(18),B$(
(12):LIFE=K3:BPNT=10000:B$=""
":LEVEL=PEEK(1750)
10 RESTORE 1600:FOR I=K1 TO 11:READ A:
VECTOR$(I)=CHR$(A):NEXT I:FOR I=K1 TO
18:READ A:FOOD$(I)=CHR$(A):NEXT I
90 GRAPHICS 17:POKE 77,K0:GOSUB 20000:
POKE 756,PGCHSET:PFLG=K0:GOSUB 7800:BF
LG=PFLG:SOUND K1,20,12,8:POKE 764,255
163 IF PEEK(53279)=K6 OR NOT STRIG(K0
) THEN GOSUB 550:RUN

```




Basic Burger *continued*

```

8170 POSITION I,J: ? #K6;FOOD$(FD,FD+K2
);:FD=FD+K3
8180 GRID=1536+16*(J-K3)+(I+K5)/K2:POK
E GRID,PEEK(GRID)+8:POKE GRID+K2,PEEK(
GRID+K2)+K4
8190 NEXT J:NEXT I
8200 REM ADD ONE WAY LADDERS
8210 FOR I=K3 TO 19 STEP K4
8220 UP= NOT UP:UP$="0":IF UP THEN UP$
="1"
8230 J=K4+K3*INT(RND(K0)*K4):GRID=1536
+16*(J-K4)+(I+K5)/K2
8240 B=GRID+48*( NOT UP):IF PEEK(B)-UP
=K1 THEN 8230
8250 POKE B,PEEK(B)-UP-UP-( NOT UP)
8260 POSITION I-K1,J: ? #K6;UP$;NEXT I
8270 POSITION K2,21:FOR I=K1 TO 17: ? #
K6;CHR$(96);NEXT I:POSITION K2,22:FOR
I=K1 TO K5: ? #K6;" ";CHR$(14);NEXT I
8280 POSITION K0,23: ? #K6;" / / / /
/ ";
8285 IF PNT AND NOT PFLG THEN RETURN
8290 B=A+128:POKE PEPPER,K0:POKE B+26,
K0:POKE PEPPER+32,K0:POKE B+32+26,K0:R
ETURN
9000 POKE 764,255:I=USR(ADR(VECTOR$),0
FF):GOSUB 9220
9010 IF PEEK(764)(>)33 THEN 9010
9020 POKE 764,255:I=USR(ADR(VECTOR$),0
N):RETURN
9100 REM KILL CHEF SOUND
9110 LIFE=LIFE-K1:FOR D=15 TO K0 STEP
-K1: SOUND K0,255*RND(K0),10,D:NEXT D:P
FLF=D:BFLG=D:RETURN
9200 REM END ROUND SOUND
9210 FOR I=160 TO 80 STEP -K1: SOUND K0
,I,10,K6:NEXT I: SOUND K1,60,14,K6: SOUN
D K2,96,14,K6
9220 POKE 53761,K0:FOR I=K1 TO 150:NEX
T I: SOUND K1,K0,K0,K0: SOUND K2,K0,K0,K
0:RETURN
9300 FOR I=K1 TO 10: SOUND K0,20*RND(K0
),10,8:NEXT I:POKE 53761,K0:RETURN
9390 DATA 38,32,26,20,32,26
9400 REM BONUS CHEF
9410 LIFE=LIFE+K1:BPNT=BPNT+10000:REST
ORE 9390:FOR I=K1 TO K6:READ B: SOUND K
0,B,10,K6:FOR B=K0 TO 10:NEXT B:NEXT I
9420 POKE 53761,K0:RETURN
20000 REM ONE TIME SET UP
20015 REM ASSIGN COLORS TO PLAYERS
20020 POKE 704,14:POKE 705,70:POKE 706
,PEEK(709):POKE 707,24:POKE 711,22
20025 REM LOAD IN MHD IF NOT LOADED
20030 PGTOP=PEEK(106):PGCHSET=PGTOP-18
:PG=PGTOP-8:LET ON=PG*256:NUM=1012
20035 IF PEEK(ON)=216 THEN 20090
20040 IO=K1:OPEN #IO,K4,K0,"D:MHD.ML":
GOSUB 20110:GOSUB 20160
20045 REM MHD RET.=DEFERRED VBLANK
20050 POKE ON+31,PEEK(548):POKE ON+32,
PEEK(549):LEVEL=K0:POKE 1750,LEVEL
20055 POKE ON+100,26:POKE ON+102,K5:RE
M LIMIT PEPPERS TO 5.
20060 POKE ON+146,24:REM SINGLE RESOLU
TION.
20065 POKE ON+951,240:POKE ON+952,240:
REM CHANGE MISSILE KEEP MASK.
20070 POKE ON+1003,80:REM GRID EQUATIO
N=2Y+X/16-80 .
20075 REM LOAD IN CHSET+STACKS+IMAGES
20080 OPEN #IO,K4,K0,"D:BURGER.BIN":NU
M=1032:PG=PGCHSET:GOSUB 20110:POSITION
K2,10: ? #K6;"CLEARING PM AREA";
20085 B=(PGTOP-16)*256:FOR I=768 TO 20
47:POKE B+I,K0:NEXT I:REM CLEAR PM ARE
A

```

```

20090 A=PGTOP-16:POKE 54279,A:POKE ON+
132,A:POKE 559,62:POKE 53277,K3:POKE 0
N+K2,A:POKE 623,17:POKE 53260,208
20095 A=A*256:FOR I=K0 TO 7:POKE A+I*3
2+14,PGTOP-15:NEXT I:REM PG ADDRESS OF
IMAGES
20100 OFF=PEEK(ON+31)+PEEK(ON+32)*256:
RETURN
20110 REM IO=(1=READ,2=WRITE)
20120 REM PG=PAGE , NUM =# OF BYTES
20130 IOCB=832+IO*16:POKE IOCB+K2,K3+K
4*IO:POKE IOCB+K4,K0:POKE IOCB+K5,PG
20140 I=INT(NUM/256):POKE IOCB+8,NUM-I
*256:POKE IOCB+9,I
20150 I=USR(ADR("hhhhLUV"),IO*16):CLOS
E #IO:RETURN
20155 REM MAKE MHD RELOCATABLE
20160 RESTORE 20170:FOR I=K1 TO 14:REA
D A:POKE ON+A,PEEK(ON+A)-PEEK(ON+1011)
+PG:NEXT I:POKE ON+1011,PG:RETURN
20170 DATA 243,246,270,503,524,652,662
,680,750,766,777,782,843,959

```

CHECKSUM DATA.

(see page 34)

```

1 DATA 150,445,59,972,42,311,590,285,4
99,481,318,484,332,324,920,6212
184 DATA 222,626,598,651,401,10,899,50
2,323,354,344,511,660,642,508,7251
993 DATA 998,967,775,317,837,739,469,8
01,488,390,677,954,898,833,780,10923
1075 DATA 176,730,186,496,55,681,224,7
99,797,361,227,104,201,119,895,6051
7810 DATA 722,778,104,143,5,491,313,25
,989,142,673,586,173,352,619,6115
8045 DATA 512,769,77,233,45,369,765,79
5,262,939,914,724,391,777,367,7939
8180 DATA 785,514,987,397,53,96,496,29
8,959,919,538,949,605,842,882,9320
9020 DATA 347,339,428,462,70,941,118,6
6,915,464,343,511,44,592,606,6246
20030 DATA 798,896,751,843,894,481,889
,814,665,406,834,714,396,496,954,10831
20110 DATA 736,579,445,205,172,246,683
,42,3108

```

Listing 2C.

```

20036 REM ADD TO BASIC BURGER FOR CASS
ETTE SYSTEMS
20037 POSITION 2,10: ? #6;"MOUNT TAPE H
IT KEY";
20040 IO=1:OPEN #IO,4,128,"C":GOSUB 20
110:GOSUB 20160
20080 POKE 764,12:OPEN #IO,4,128,"C":N
UM=1032:PG=PGCHSET:GOSUB 20110:POSITIO
N 2,10: ? #6;"CLEARING PM AREA ";
25000 REM MAKE TAPE BACKUP
25010 IF PEEK(ON)(>)216 THEN ? "RUN BAS
IC BURGER BEFORE SAVING":END
25020 TRAP 25030:LPRINT :REM LPRINT BE
FORE SAVE
25030 TRAP 40000: ? "MOUNT TAPE. HIT RE
TURN"
25040 CSAVE :IO=2:NUM=1012:POKE 764,12
:OPEN #IO,8,128,"C":PG=PGTOP-8:GOSUB 2
0110

```



Basic Burger *continued*

25050 NUM=1032:PG=PGCHSET:POKE 764,12:
OPEN #10,8,128,"C":GOSUB 20110

Assembly listing.

```

REM MHD MOTION HANDLER BASM ASM
*=$63F0
CLD
ADR=203
CMASK=205
AIMAGE=205
AFPL=205
APM=207
HPL=207
CFLG=209
INDEX=0
STICK0=632
TRIG0=644
GRIDTB=1536
CPLF=53248
CPL=53256
RANDOM=53770
HITCLR=53278
XITUBV=58466
*=$6400
ENTER CLD : LET ADR+1 = 152
LET 255 -> INDEX -> CFLG
REM TEST FOR END
L1 INC INDEX
IF INDEX <> 8 GOTO L0
LDA CFLG : BNE EXIT
STA HITCLR
EXIT LDY #8 : LDX #0
GOTO XITUBV
REM ADR=32*INDEX
L0 ASL A : ASL A : ASL A : ASL A
ASL A : STA ADR
REM IS STACK ON ?
LDY #0 : LDA (ADR),Y : BNE ON
LDY #26 : REM TEST FOR TRIG
IF (ADR),Y >= 4 GOTO L1
REM TRIG HANDLER LATCH LOGIC
TAX : LDY #31
IF TRIG0,X = (ADR),Y GOTO L1
STA (ADR),Y : TAY : BNE L1
THD LET AFPL+1 = ADR+1
LDY #29 : LDA (ADR),Y : ASL A
REM AFPL =32*(ADR),Y
ASL A : ASL A : ASL A : ASL A
STA AFPL : REM IS AFPL ON
LDY #0 : LDA (AFPL),Y : BEQ L1
LDY #30 : REM BULLET LIMIT
LET (ADR),Y = (ADR),Y + 1
LDY #30 : REM FOR LIMIT LDY #26
IF = 255 THEN LET (ADR),Y = 255
REM X=DELTA X + XF
LDY #27 : LDA (ADR),Y : LDY #0
LET (ADR),Y = + (AFPL),Y
REM Y=DELTA Y + YF
LDY #28 : LDA (ADR),Y : LDY #1
LET (ADR),Y = + (AFPL),Y
REM COMPUTE PM AREA ADDRESS APM
ON LET APM+1 = 152 : LDA INDEX
IF < 4 GOTO L1A : LDA #255
L1A LET + 4 : LSR A : TAX
REM SINGLE RES POKE LSR TO CLR
LDA #0 : ROR A : STA APM : TAX
ADC APM+1 : STA APM+1
REM TEST FOR COLLISIONS
TCOL LET INDEX XOR 4 : TAX
LDY #7 : LET (ADR),Y AND CPLF,X
BNE COL : INY
LET (ADR),Y AND CPL,X : BNE COL

```

```

LET CMASK = 1
IF INDEX >= 4 GOTO NCOL : TAX
REM TEST FOR PLAYER TO MISSILES
INY : LDA (ADR),Y : BEQ NCOL
STA CMASK+1
L2 DEX : BMI L3 : ASL CMASK
BCC L2
L3 LDY #0
L4 LSR CMASK+1 : BCC L5
LET CPL,Y AND CMASK
BNE COL-2
L5 INY : CPY #4 : BNE L4
CLC : BCC NCOL : LDY #9
REM WHAT ACTION ON COLLISION?
COL
LDA (ADR),Y : ASL A : BCC COL1
REM TURN STACK OFF
OFF LET CFLG = 0
LDY #0 : STA (ADR),Y
GOSUB CLRY : GOTO L1
COL1 ASL A : BCC COL2
REM RESET POSITION
LDY #23 : LDA (ADR),Y : LDY #0
STY CFLG : STA (ADR),Y
LDY #24 : LDA (ADR),Y : LDY #1
STA (ADR),Y
COL2 GOTO P9 : REM SKIP UPDATE
NCOL : REM UPDATE X
LDY #21
LET (ADR),Y = (ADR),Y + 1
LDY #5 : IF < (ADR),Y GOTO UPY
REM CLEAR XCNT LET PX=X
LDY #21 : LET (ADR),Y = 0
TAY : LDA (ADR),Y
LDY #23 : STA (ADR),Y : CLC
REM X=X+DX
LDY #2 : ADC (ADR),Y
LDY #16 : REM IS X IN BOUNDS ?
IF >= (ADR),Y GOTO UPX1
OUTX LDY #15 : LET (ADR),Y AND 1
TOFF BEQ OFF : BNE UPY
UPX1 INY
IF >= (ADR),Y GOTO OUTX
REM STORE X
LDY #0 : STA (ADR),Y
UPY LDY #22 : REM UPDATE Y
LET (ADR),Y = (ADR),Y + 1
LDY #6 : IF < (ADR),Y GOTO UPI
REM CLEAR YCNT LET PY=Y
LDY #22 : LET (ADR),Y = 0
LDY #1 : LDA (ADR),Y
LDY #24 : STA (ADR),Y : CLC
REM Y=Y+DY
LDY #3 : ADC (ADR),Y
LDY #18 : REM IS Y IN BOUNDS
IF >= (ADR),Y GOTO UPY1
OUTY LDY #15 : LET (ADR),Y AND 1
BNE UPI : BEQ TOFF
UPY1 INY
IF >= (ADR),Y GOTO OUTY
REM STORE Y
LDY #1 : STA (ADR),Y
UPI LDY #20
LET (ADR),Y = (ADR),Y + 1
LDY #4 : IF < (ADR),Y GOTO P9
LDY #20 : REM IMAGE CHANGE
LET (ADR),Y = 0 : LDY #12
LET (ADR),Y = (ADR),Y + 1
LDY #10 : IF < (ADR),Y GOTO P9
LDY #12 : LET (ADR),Y = 0
P9 LDX INDEX : REM POKE X
LDY #0 : CPX #8 : BNE PX
DEX : REM 5TH PLYR CPX #8 TO #4
PZ TAX : EOR #3 : ASL A : NOP
NOP : ADC (ADR),Y
STA CPLF+4,X
DEX : BPL PZ : BMI PX1
PX LET CPLF,X = (ADR),Y

```



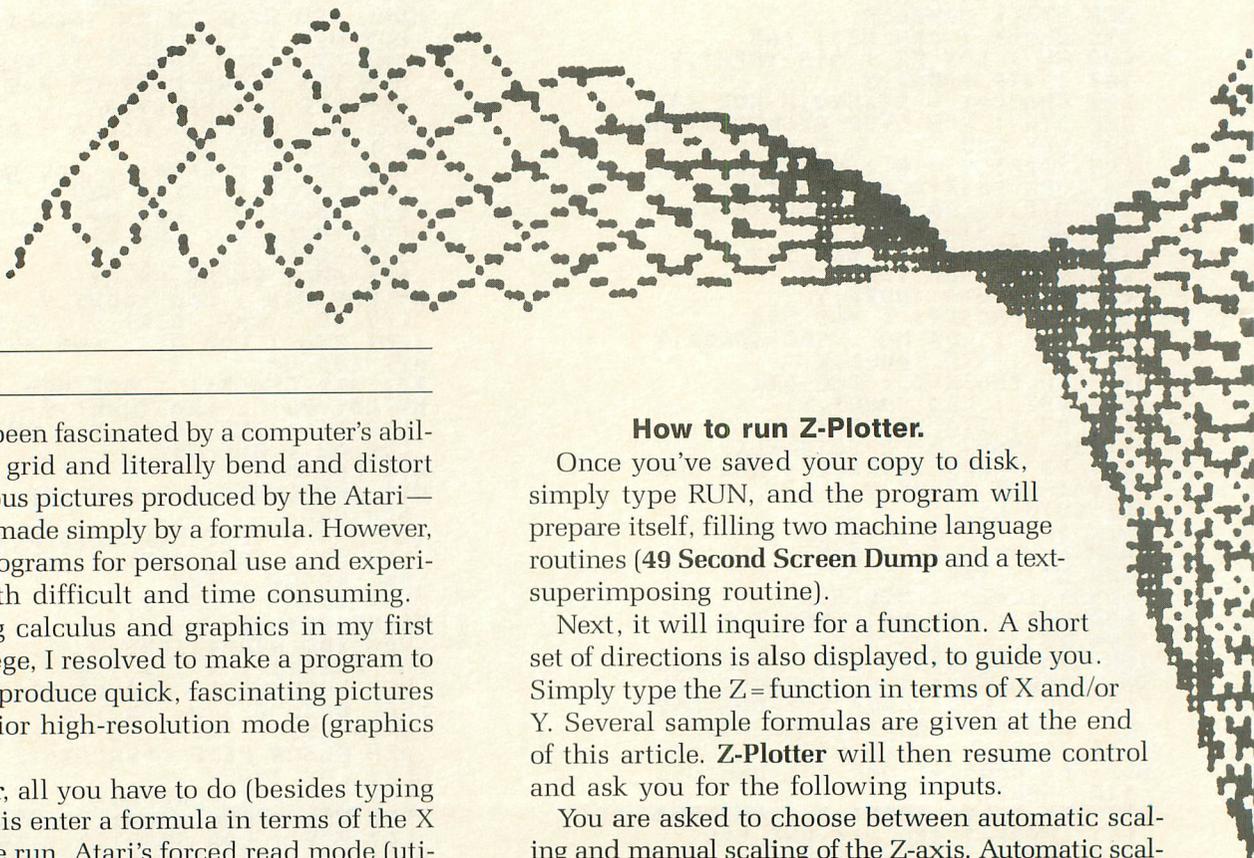
Basic Burger *continued*

```
REM COMPUTE IMAGE LOAD AREA
REM AREA=IM ADR + IM # * IM SZ
PX1 LDY #12 : LDA (ADR),Y
TAX : DEY : LDA #0 : CLC
IM1 DEX : BMI IM2 : ADC (ADR),Y
BNE IM1
IM2 LDY #13
LET AIMAGE = + (ADR),Y : INY
LDA #0 : ADC (ADR),Y
STA AIMAGE+1 : LDY #1
REM CLEAR Y IF Y<>LY
LDA (ADR),Y : PHA : LDY #25
CMP (ADR),Y : BEQ I3 : JSR CLRY
REM LY=Y
I3 PLA : LDY #25 : STA (ADR),Y
LET APM = + APM
LDY #11 : LDA (ADR),Y : TAY
DEY : REM LOAD IMAGE
LDX INDEX : LDA KEEP,X : TAX
LOAD TXA : AND (APM),Y
LET (APM),Y = OR (AIMAGE),Y
DEY : BPL LOAD
REM TEST FOR STICK
LDY #26 : LDA (ADR),Y : BMI TL1
IF < 4 GOTO TL1
IF >= 12 GOTO GSTK
REM STICK HANDLER
STA CMA5K : AND #3 : TAX
LDA #0 : LDY #2 : STA (ADR),Y
INY : STA (ADR),Y
LET CMA5K+1 = STICK0,X XOR 15
BNE ST0 : REM STOP CYCLIC ACTION
STOP LDY #20
LET (ADR),Y = 0 : BEQ TL1
ST0 LSR CMA5K+1 : BCC ST1
LDY #28 : LDA #0 : SBC (ADR),Y
LDY #3 : STA (ADR),Y
ST1 LSR CMA5K+1 : BCC ST2
LDY #28 : LDA (ADR),Y
LDY #3 : STA (ADR),Y
ST2 LSR CMA5K+1 : BCC ST3
LDY #27 : LDA #0 : SBC (ADR),Y
LDY #2 : STA (ADR),Y
ST3 LSR CMA5K+1 : BCC ST4
LDY #27 : LDA (ADR),Y
LDY #2 : STA (ADR),Y
ST4 IF CMA5K >= 8 GOTO TL1
LDY #2 : LDA (ADR),Y : BEQ TL1
INY : LET (ADR),Y = 0
TL1 GOTO L1
GSTK IF = 16 GOTO GRID
REM 4 MAY GRID STICK
AND #3 : TAX
GOSUB TGRID : BEQ G51
LDA #12 : CPY #0 : BEQ TG5
LDA #3
TG5 STA CMA5K+1 : CLC : BCC G55
G51 GOSUB GPNT : REM REMOVE ILL
LDY #2 : LDA (ADR),Y : BMI G52
LET CMA5K+1 AND 8 : BNE G53
STA (ADR),Y : BEQ G53
G52 LET CMA5K+1 AND 4 : BNE G53
STA (ADR),Y
G53 INY : LDA (ADR),Y : BMI G54
LET CMA5K+1 AND 2 : BNE G55
STA (ADR),Y : BEQ G55
G54 LET CMA5K+1 AND 1 : BNE G55
STA (ADR),Y
G55
LET STICK0,X XOR 15 AND CMA5K+1
STA CMA5K+1 : BNE G57
REM STOP CYCLIC ACTION ?
LDY #2 : LDA (ADR),Y
INY : ORA (ADR),Y : BNE G56
GOTO STOP
G57 LDA #0 : LDY #2
STA (ADR),Y : INY : STA (ADR),Y
G56 LET CMA5K = 4 : JMP ST0
```

```
G58 BNE TL1
REM SELECT GRID DIRECTION
REM FOR GRID PLAYER
GRID
LDY #21 : LDA (ADR),Y : BNE G58
GOSUB TGRID : BNE G58
GOSUB GPNT : BEQ G57
REM REMOVE DIRECTION FROM
LDY #2 : LDA (ADR),Y : BEQ GR2
BMI GR1 : LET CMA5K+1 AND 11
BNE GR4
GR1 LET CMA5K+1 AND 7
BNE GR4
GR2 INY : LDA (ADR),Y : BMI GR3
BEQ GR4+2
LET CMA5K+1 AND 14 : BNE GR4
GR3 LET CMA5K+1 AND 13
BEQ G57
GR4 STA CMA5K+1 : LDY #15
REM HOME IN ON TARGET OR RANDOM
IF RANDOM < (ADR),Y GOTO HOME
REM CHOOSE RANDOM DIRECTION
GR5 LET RANDOM AND 3 : TAX
LET TBL,X AND CMA5K+1
BEQ GR5
GR6 STA CMA5K+1 : BNE G57
HOME REM HOME IN ON TARGET
LDY #29 : LDA (ADR),Y
BMI XY : REM TARGET IS PLAYER?
REM YES STORE PLAYERS X,Y
REM HPL = 32*PLAYER
ASL A : ASL A : ASL A : ASL A
ASL A : STA HPL
LET HPL+1 = ADR+1 : LDY #0
LDA (HPL),Y : LDY #30
STA (ADR),Y : LDY #1
LDA (HPL),Y : LDY #31
STA (ADR),Y
REM HOME IN ON HX,HY
XY LDY #30 : LDA (ADR),Y
LDY #0 : CMP (ADR),Y : BEQ HY
BMI XY0 : LDA #8 : BNE XY1
XY0 LDA #4
XY1 AND CMA5K+1 : BNE GR6
HY LDY #31 : LDA (ADR),Y
LDY #1 : CMP (ADR),Y : BMI HY0
LDA #2 : BNE HY1
HY0 LDA #1
HY1 AND CMA5K+1 : BNE GR6
BEQ GR5
TGRID REM TEST FOR GRID POINT
LDY #0 : LET (ADR),Y AND 15
BNE NOTGR : INY
LET (ADR),Y AND 7
NOTGR RETURN
REM TBL DIRECTIONS
TBL DATA 1 , 2 , 4 , 8
REM KEEP MASKS PLAYER/MISSILES
KEEP DATA 0 , 0 , 0 , 0
DATA 252 , 243 , 207 , 63
REM CLEAR KEEP APPROPRIATE BITS
CLRY LDX INDEX
LET INDEX+1 = KEEP,X
LDY #11 : LDA (ADR),Y : TAX
LDY #25 : LDA (ADR),Y : TAY
CLR1 LET (APM),Y AND INDEX+1
STA (APM),Y : INY : DEX
BNE CLR1 : RETURN
GPNT REM LOAD LEGAL DIRECTIONS
LDY #1 : LDA (ADR),Y : ASL A
NOP : REM 2*Y+X/16-0 GRID EQU.
STA CMA5K+1 : DEY : LDA (ADR),Y
LSR A : LSR A : LSR A : LSR A
LET + CMA5K+1 - 0 : TAY
LET CMA5K+1 = GRIDTB,Y
RETURN
DATA >ENTER
```



Z-Plotter



by David Bader

I have always been fascinated by a computer's ability to take a flat grid and literally bend and distort it. I've seen various pictures produced by the Atari—hats and spirals made simply by a formula. However, altering these programs for personal use and experimentation is both difficult and time consuming.

After studying calculus and graphics in my first semester of college, I resolved to make a program to allow anyone to produce quick, fascinating pictures on Atari's superior high-resolution mode (graphics 24).

With **Z-Plotter**, all you have to do (besides typing in the program) is enter a formula in terms of the X and Y during the run. Atari's forced read mode (utilized with location 842) will install the formula in all the appropriate line numbers.

There are no loops, IF/THENs, or special circumstances to enter for each formula. This program simply won't graph out of specified domains, which prevents errors. If you wish, **Z-Plotter** will scale the Z-axis, so that the function won't even extend beyond the bounds.

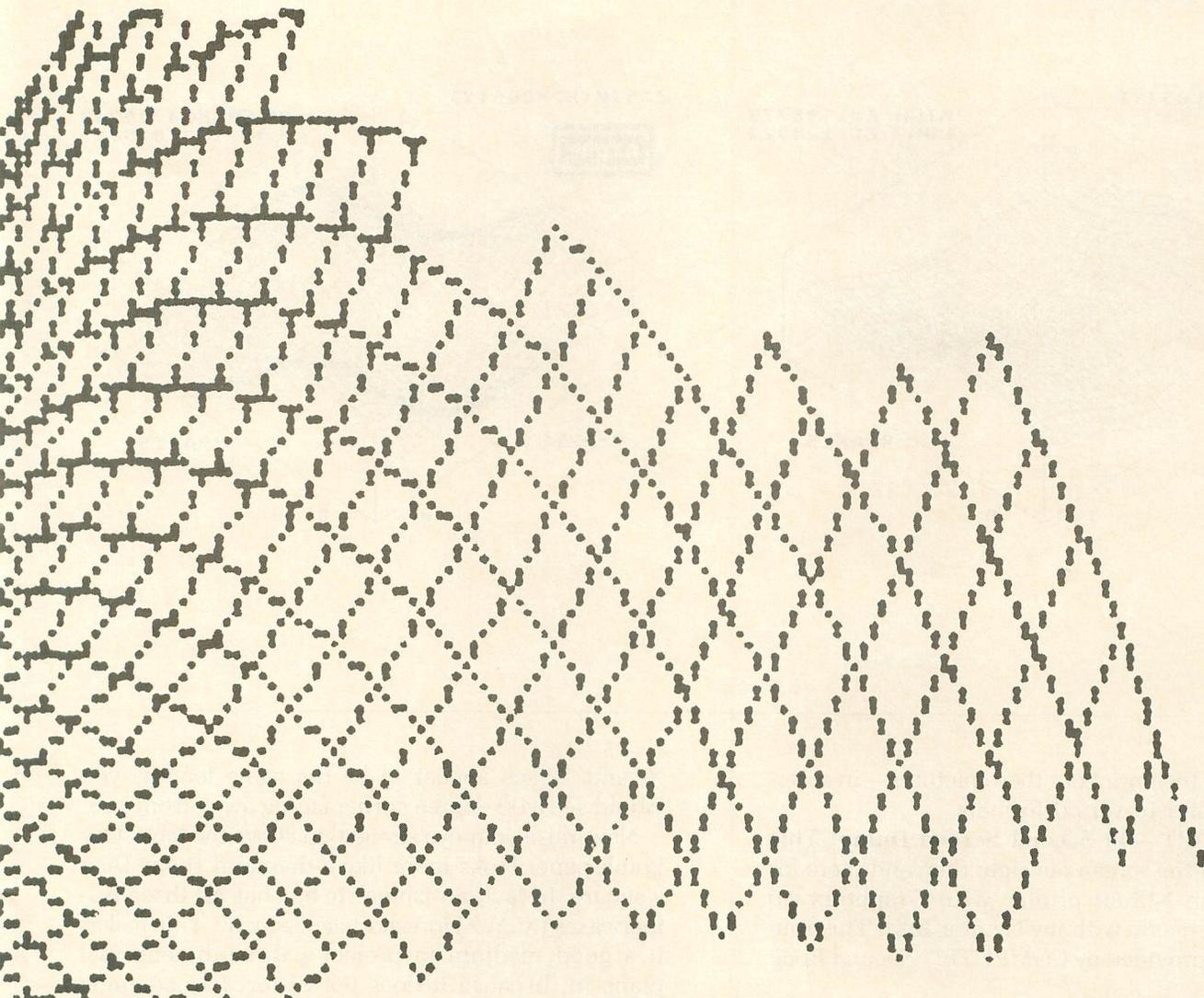
How to run Z-Plotter.

Once you've saved your copy to disk, simply type RUN, and the program will prepare itself, filling two machine language routines (**49 Second Screen Dump** and a text-superimposing routine).

Next, it will inquire for a function. A short set of directions is also displayed, to guide you. Simply type the Z=function in terms of X and/or Y. Several sample formulas are given at the end of this article. **Z-Plotter** will then resume control and ask you for the following inputs.

You are asked to choose between automatic scaling and manual scaling of the Z-axis. Automatic scaling will determine the maximum and minimum Z values for the function in the intervals specified. Although it's very tempting to be lazy and just select the autoscaling feature, you will find that many functions are far more stimulating and exciting when they are graphed in part.

The autoscale will force a function to be squeezed into the isometric box drawn on the screen. If you



select manual scaling, you'll be asked to enter the lowest and highest points on the Z-axis to be displayed. The graph will not be plotted outside of the Z-axis range. Note: when manual scaling, the limits must be set so that the point $Z=0$ is either on or between the upper and lower bounds. Examples of acceptable limits: Z lower = -2, Z upper = 2 or Z lower = 0, Z upper = 3.

X/Y lower limit: this will be the leftmost point on the X-axis, and the number also serves as the lowest point for the Y-axis.

X/Y upper limit: opposite of above. Note: just as with the Z-axis, $Y=0$ and $X=0$ must be within or on the box. Picture a perfect square; the Y-axis will have the same length as the X-axis has width.

Desired resolution (1=high, 10=low): I use 4 for most graphs. It's a good balance between BASIC's speed and performance resolution. Note: odd num-

bers may cause problems if your formula is undefined somewhere in the box.

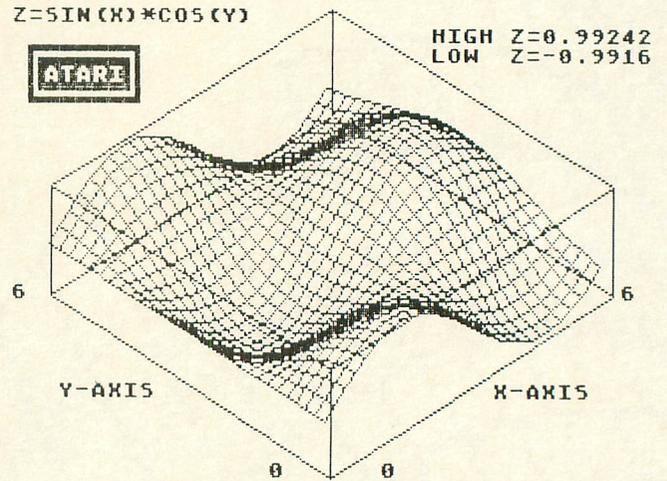
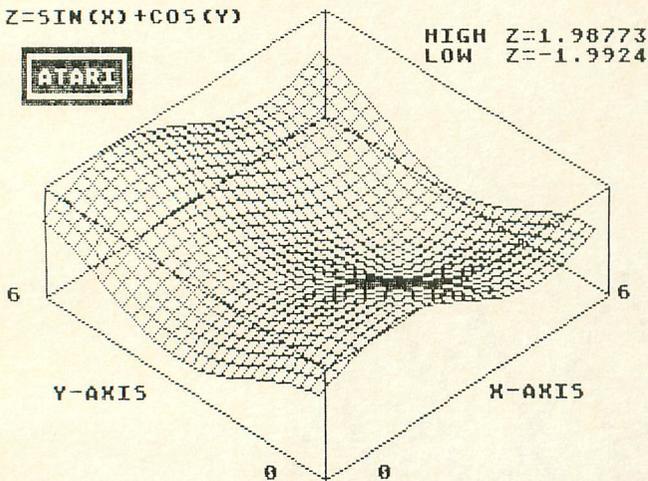
The next input can be surpassed by just pressing RETURN. Here, you're asked for the eight-character name that can be used if you wish to save to disk (in **Magniprint** format) the screen, once it has been displayed.

That's all! **Z-Plotter** can let almost anyone dream up equations to dazzle the computer screen. When it's finished, it will sound off, telling you that you can now render the following options!

(1) OPTION—adds borders (the isometric box) and labels superimposed over the graphics screen for an impressive technical display.

(2) SELECT—saves the picture as a data file that can be redisplayed with the program **Magniprint** by Alpha Systems. The lines used to perform this duty are provided by **Magniprint** for use in all BASIC programs. By the way, **Magni-**

ATARI Z-Plotter *continued*



print can then print out these pictures—in several sizes and in varied formats.

(3) **START—49 Second Screen Dump!** This will print the screen out right then and there for the Epson MX-80 printer with Graphtrax 80 (works perfectly with my Gemini 10X). This routine was provided by *COMPUTE!'s Second Book of Atari*.

(4) **ESC**—will erase the screen and rerun the program without going through initialization again.

What's an isometric projection?

Imagine a sheet of square graph paper lying perfectly flat on a table top. One side, say the depth, is the X-axis. The height is the Y-axis, but we'll call it the width, instead.

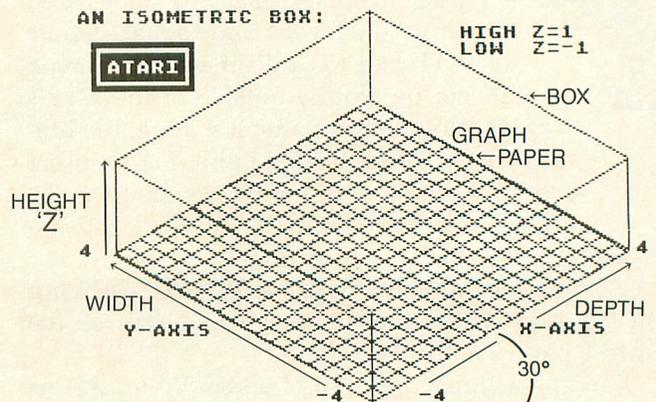
If we raised a line perpendicular to each corner of our graph paper to a certain height, called Z, and joined the top of the lines to each other, we would create a box. If $Z=Y=X$, then we have a cube, with our graph paper as the bottom.

Let's look at this box from the top. You see the grid and recognize the pattern as a typical coordinate plane (X,Y). If we look at the box perpendicular to the X-axis, we see X, the depth, and Z, the height. The Y-axis is just a point at the left lower corner.

Looking perpendicular to the Y-axis, the X-axis would look like a point in the lower right corner. If $X=Y$, and you look at this corner so that both the

X- and Y-axes appear to be the same length, you would see a 90 degree corner facing away from you.

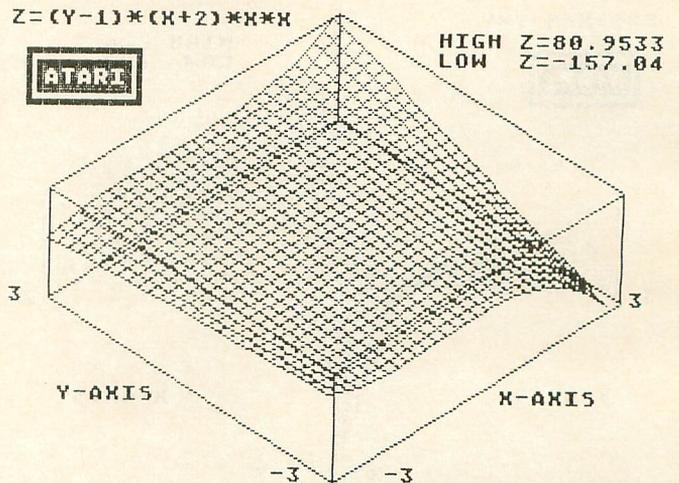
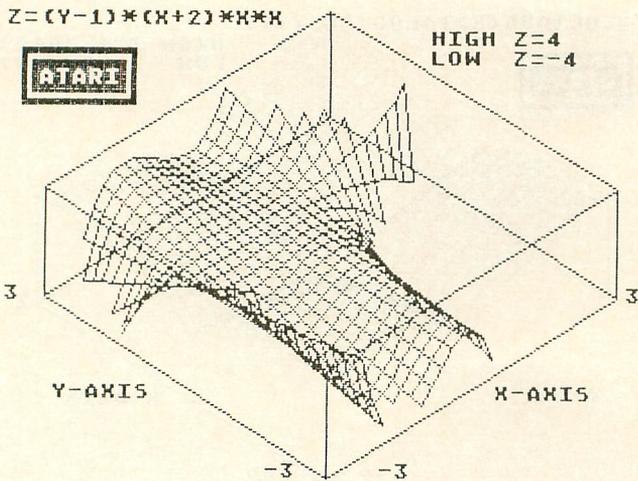
Now, raise your eye straight up above the table. Our graph paper looks more like a diamond shape than a square. In fact, an isometric box has all three primary axes (X, Y, Z) foreshortened equally. This makes it a good medium to project a three-dimensional plane in, because it does not distort like common oblique projections.



Isometric projection.

If we put a transparent plane perpendicular to your line of sight and etched the borders of the box on it

Z-Plotter *continued*



the way they appear to you, that plane would show a three-dimensional box. An isometric projection shows the X- and Y-axes to be raised 30 degrees above the lowest point.

How do you plot the height (Z) of any point on the grid at any place, given its X and Y coordinates? Just use a formula such as: $Z = \text{SIN}(X) + \text{COS}(Y)$.

Program breakdown.

Lines 10-34 — Main loop to draw lines parallel to the X-axis isometrically on the screen.

Lines 36-60 — Main loop to draw lines parallel to the Y-axis isometrically on the screen.

Lines 100-110 — Autoscale feature. These lines will determine the Z maximum and minimum values for the entered function before graphing.

Line 200 — This sound indicates that the program has finished drawing the display and is ready to perform any of the console key commands.

Lines 202-210 — This loop reads the console keys. Note: because all these console key options do not erase the screen, you can perform all of them in any order from a single run!

Lines 300-306 — 49 Second Screen Dump.

Lines 400-432 — Magniprint saving routine supplied verbatim by Magniprint on disk.

Lines 600-900 — Routine to draw isometric box over projection and label the axes.

Lines 1000-1004 — Initialize and load machine

language routines. One is POKEd into page 6, and the other is stored by a string.

Lines 1008-1012 — These lines provide *in run* entry of your formula. The actual function is entered as an input statement. The program will then create Lines 14, 40 and 104 using the forced read mode.

Lines 1013-1040 — Prompts for boundaries and screen saving name. Note: if no name is entered for screen saving, it will accept the default name, SCREEN.MP.

Line 1042 — Sets up primary variables and scaling values used in the main routines for converting a set of (X, Y, Z) points to the 320 by 192 screen display used in graphics 24.

Line 1044 — Sets up display screen.

Lines 1100-1110 — Data for 49 Second Screen Dump.

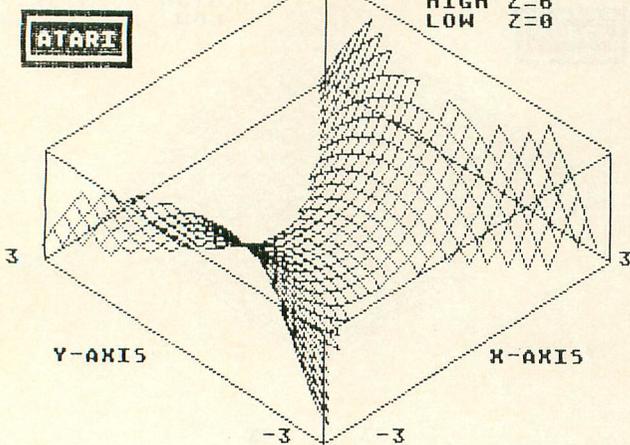
Lines 1120-1180 — Data for the routine to superimpose text over the graphics 24 screen.

Dave Bader is a first-year, dean's list student in Mechanical Engineering. For close to two years now, he has been enthusiastically hacking his way through BASIC, to create both adventure games and programs for mathematics (the original inspiration for Z-Plotter). He's a firm believer in the Atari—as the best home computer on the market.

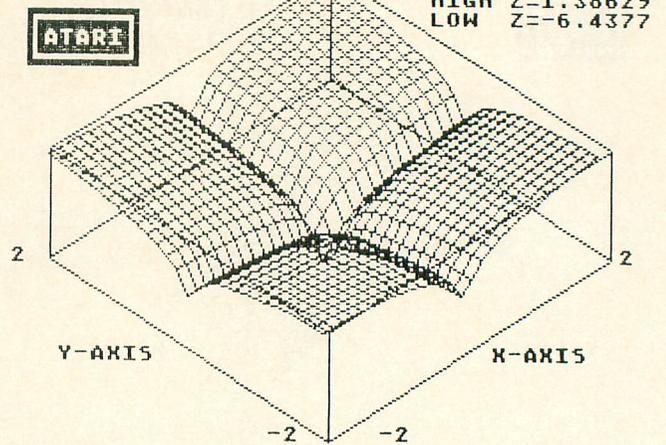
(Listing starts on next page)

Z-Plotter *continued*

$$Z=1+X*X-Y*Y$$



$$Z=\text{LOG}(\text{ABS}(X))+\text{LOG}(\text{ABS}(Y))$$



Here are some samples. Hint: rather than using powers such as X^3 , BASIC will perform the configuration $X*X*X$ much faster.

FORMULA	AUTO-SCALE?	Z		X/Y	
		LOWER	UPPER	LOWER	UPPER
$Z=1+X*X-Y*Y$	NO	0	6	-3	3
$Z=\text{SIN}(X)$	YES	(-1)	(1)	0	6
$Z=\text{SIN}(X)+\text{COS}(Y)$	YES	(-2)	(2)	0	6
$Z=\text{SIN}(X)*\text{COS}(Y)$	YES	(-1)	(1)	0	6
$Z=\text{ABS}(X)-\text{ABS}(Y)$	YES	—	—	-3	3
$Z=-\text{ABS}(X)-\text{ABS}(Y)$	NO	-3	0	-3	3
$Z=(Y-1)*(X+2)*X*X$	NO	-4	4	-3	3
$Z=\text{COS}(X)*X*(Y-1)$	NO	-3	0	-4	4
$Z=X*X/1+X*X+Y*Y/1*Y*Y$	YES	—	—	-4	4
$Z=\text{INT}(X)+\text{INT}(Y)$	YES	(0)	(6)	0	3.9
$Z=X*X+Y*Y$	YES	(2)	(0)	-1	1
$Z=\text{LOG}(\text{ABS}(X))+\text{LOG}(\text{ABS}(Y))$	YES	—	—	-2	2

Listing 1.

```

0 GOTO 1000
10 FOR Y=YU TO YL STEP -RES*(YU-YL):B=
K0
12 FOR X=XL TO XR STEP RES*(XR-XL)
14 REM FORMULA (ENTERED DURING RUN)
16 IF Z>H OR Z<HL THEN B=K0:GOTO 34
18 XX=XX*INC
20 YY=XX*ISO
22 XX=XX-Y*YINC
24 YY=YY+Y*YINC*ISO
26 YY=YY+Z*ZINC
28 YY=191-YY-DBG
30 XX=XX+159:IF B THEN DRAWTO XX,YY:GO
TO 34
32 PLOT XX,YY:B=K1
34 NEXT X:NEXT Y
36 FOR X=XL TO XR STEP RES*(XR-XL):B=K
0
38 FOR Y=YU TO YL STEP -RES*(YU-YL)
40 REM FORMULA (ENTERED DURING RUN)

```

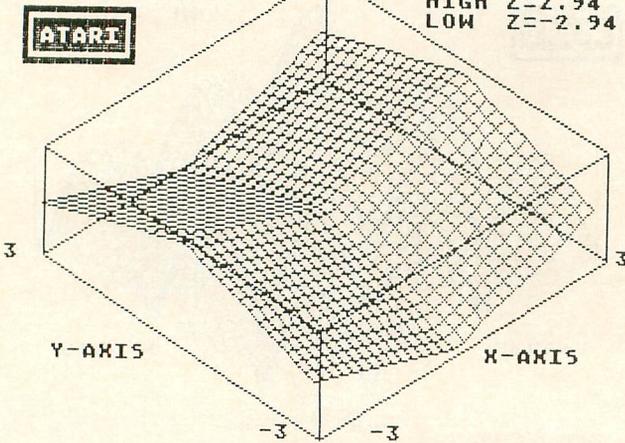
```

42 IF Z>H OR Z<HL THEN B=K0:GOTO 60
44 XX=XX*INC
46 YY=XX*ISO
48 XX=XX-Y*YINC
50 YY=YY+Y*YINC*ISO
52 YY=YY+Z*ZINC
54 YY=191-YY-DBG
56 XX=XX+159:IF B THEN DRAWTO XX,YY:GO
TO 60
58 PLOT XX,YY:B=K1
60 NEXT Y:NEXT X:GOTO 200
100 H=K0:HL=K0:FOR Y=YU TO YL STEP -RE
5*(YU-YL)
102 FOR X=XL TO XR STEP RES*(XR-XL)
104 REM FORMULA (ENTERED DURING RUN)
105 IF Z>H THEN H=Z
106 IF Z<HL THEN HL=Z
107 NEXT X:NEXT Y
108 IF HL>K0 THEN HL=K0
109 IF H<K0 THEN H=K0
110 RETURN
200 SOUND K0,100,10,14:FOR T=K0 TO 100
:NEXT T:SOUND K0,K0,K0,K0:POKE 764,255
202 S=PEEK(53279):IF S=6 THEN GOSUB 30
0:GOTO 202
204 IF S=5 THEN GOSUB 400:GOTO 202
206 IF S=3 THEN GOSUB 600:GOTO 202
208 IF PEEK(764)=28 THEN ? "K":GOTO 10
08
210 GOTO 202
299 REM "49 SECOND SCREEN DUMP"
300 CLOSE #5:OPEN #5,8,K0,"P:"
302 ? #5:CHR$(27);"A";CHR$(8):FOR X=DM
TO DM+39
304 A$=CHR$(K0):A$(192)=A$:A$(2)=A$
306 H=USR(1536,X,ADR(A$)):LPRINT CHR$(
27);"K";CHR$(192);CHR$(K0);A$:NEXT X:R
ETURN
400 REM #400-432 IS 'A5 I5' SUBROUTINE
SUPPLIED BY MAGNETPRINT TO SAVE A GR.2
45SCREEN
402 RW=8:IO=K1:CLOSE #IO:OPEN #IO,RW,K
0,F$

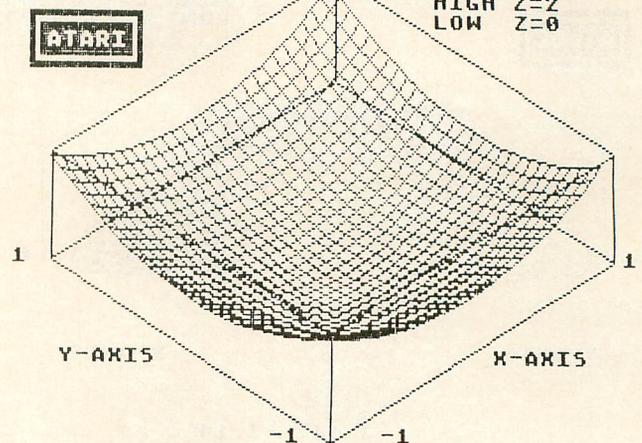
```

Z-Plotter *continued*

$$Z = \text{ABS}(X) - \text{ABS}(Y)$$



$$Z = Y * Y + X * X$$



```

404 PUT #10,24:FOR I=704 TO 712:PUT #I
0,PEEK(I):NEXT I
406 RAMTOP=PEEK(106)*256
408 DLIST=PEEK(560)+256*PEEK(561)
410 ADDRESS=DLIST
412 NUMBER=RAMTOP-DLIST+K1
414 IO=16*IO
416 IOCB=832+IO:POKE IOCB+2,RM+3
418 ADRHI=INT(ADDRESS/256)
420 ADRLO=ADDRESS-ADRHI*256
422 POKE IOCB+4,ADRLO:POKE IOCB+5,ADRHI
424 NUMHI=INT(NUMBER/256)
426 NUMLO=NUMBER-256*NUMHI
428 POKE IOCB+8,NUMLO:POKE IOCB+9,NUMHI
430 I=USR(ADR("hhh[LV]"),IO)
432 CLOSE #10/16:RETURN
600 D=K0:F=K0:Q$=FC$:GOSUB 900
601 PLOT 159,191:DRAWTO 20,117:DRAWTO
159,44:DRAWTO 300,117:DRAWTO 159,191:D
RAWTO 159,147
602 PLOT 20,117:DRAWTO 20,73:PLOT 159,
44:DRAWTO 159,K1:PLOT 300,117:DRAWTO 3
00,73
604 DRAWTO 159,147:DRAWTO 20,73:DRAWTO
159,K1:DRAWTO 300,73
606 D=K1:F=2:Q$="":GOSUB 900:F=
3:Q$="ATARI":GOSUB 900:F=4:Q$="
":GOSUB 900
608 D=K0:F=14:Q$=STR$(YU):GOSUB 900:Q$
=STR$(XR):D=39-LEN(Q$):F=14:GOSUB 900
610 D=16:F=23:Q$=STR$(YL):GOSUB 900:D=
23:Q$=STR$(XL):GOSUB 900:D=26:F=K1:Q$=
"HIGH Z":GOSUB 900
611 D=33:Q$=STR$(H):IF LEN(Q$)>7 THEN
Q$=Q$(K1,7)
612 GOSUB 900:D=26:F=2:Q$="LOW Z":GO
SUB 900:D=33:Q$=STR$(HL):IF LEN(Q$)>7
THEN Q$=Q$(K1,7)
614 GOSUB 900:D=3:F=19:Q$="Y-AXIS":GOS
UB 900:D=30:Q$="X-AXIS":GOSUB 900:RETU
RN

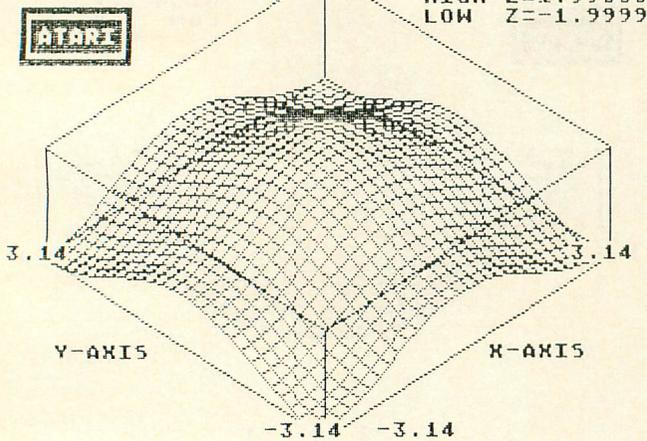
```

```

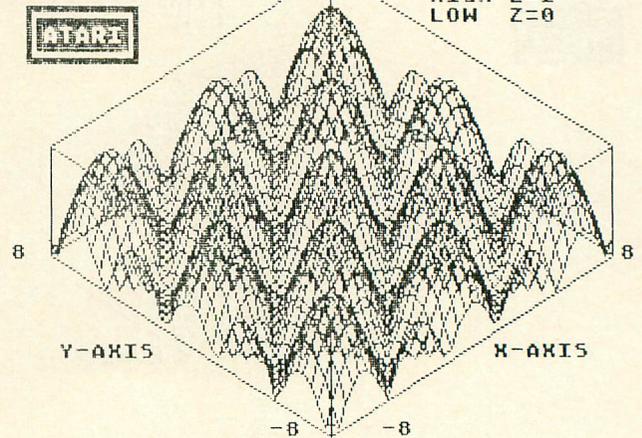
900 Q=USR(ADR(Z$),D,F,ADR(Q$),LEN(Q$))
:RETURN:REM *SUB.T0 ADD TEXT TO GR.24
1000 K1=1:GRAPHICS 24:RESTORE 1000:FOR
T=K1 TO 61:READ Q:POKE 1535+T,Q
1001 NEXT T:DM=PEEK(88)+PEEK(89)*256:D
M=DM+40*191
1002 T=K0:DIM Z$(169),Q$(40),A$(193),F
$(20),FC$(40):ISO=0.523598775
1004 RESTORE 1120:FOR T=K1 TO 168:READ
Q:Z$(LEN(Z$)+K1)=CHR$(Q):NEXT T
1008 POKE 82,K0:GRAPHICS K0:POKE 712,1
48:? "DAVE BADER'S ZPLOTTER!":? "30
ISOMETRIC PLOTTER PROGRAM":?
1009 ? "INPUT FORMULA AS... Z=(IN TERM
S OF X&Y) MAKE SURE THAT SYNTAX IS COR
RECT.":? "(eg. PAIRS OF PARENTHESES)"
1010 INPUT FC$:? "K":POKE 559,K0:POSIT
ION K0,7:? "14 ";FC$:POSITION K0,11:?
"40 ";FC$
1011 POSITION K0,15:? "104 ";FC$:POSIT
ION K0,21:? "CONT":POSITION K0,K0:POKE
842,13:STOP
1012 POKE 559,34:POKE 842,12:? "K ZP
LOTTER! PARAMETERS ENTRY SCREEN"
1013 ? "NOTE: ALL THREE PRIMARY AXIS (
X,Y,Z) MUST BE IN SPECIFIED DOMAINS
!"
1014 ? :? FC$:? :? "AUTOMATIC BOUNDS 5
ELECTION ENSURES FULL PLOTTING BUT TAK
ES MORE TIME...":T=K0
1015 ? :? "PLEASE CHOOSE [1] AUTOMATIC
SCALING Z-AXIS BOUNDS [2] MANUAL
SETTINGS.":INPUT T:IF T=K1 THEN 1020
1016 ? :? "INPUT LOWER [X] LIMIT":INPUT
HL:? "INPUT UPPER [X] LIMIT":INPUT H
1018 IF HL>H OR HL>K0 OR H<K0 THEN ? "
WOOPS!":GOTO 1016
1020 ? :? "[X] LOWER LIMIT":INPUT XL:
YL=XL
1022 ? "[X] UPPER LIMIT":INPUT XR:YU=
XR
1024 IF XL>XR OR XL>K0 OR XR<K0 THEN ?
"WOOPS!":GOTO 1020

```

Z=COS (X) +COS (Y)



Z=ABS (COS (X) +COS (Y))



```

1026 ? :? "DESIRED RESOLUTION (1=HIGH;
10=LOW)";:INPUT RES:RES=RES+3:RES=RES*
5.0E-03
1028 F$="D":? :? "INPUT TITLE OF SAVE
D SCREEN (IF SAVED) IN MAGNIPRINT FOR
MAT (8 CHARACTERS MAX)"
1030 INPUT Q$:IF Q$="" THEN F$="D:SCRE
EN.MP"
1032 F$(LEN(F$)+K1)=Q$
1035 ? :? " OPTION ADD LABELS & BORDE
RS":? " SELECT SAVE IN MAGNIPRINT FOR
MAT!"
1036 ? " START 49 SECOND SCREEN DUMP
!"
1038 ? :? "PRESS ANY KEY TO BEGIN...":
POKE 764,255
1040 IF PEEK(764)=255 THEN 1040
1041 IF T=K1 THEN ? :? " AUTO SCALIN
G SEQUENCE IN ACTION!":GOSUB 100
1042 XINC=140/(XR-XL):YINC=140/(YU-YL)
:ZINC=43/(H-HL):DBG=ABS(HL*ZINC)+ABS(X
L*XINC*ISO)+ABS(YL*YINC*ISO)
1044 GRAPHICS 24:POKE 710,156:POKE 709
,K0:COLOR K1:GOTO 10
1100 DATA 104,104,141,21,6,104,141,20,
6,104,141,27,6,104,141,26,6,160,193,17
3,255,255,136,240,35,141,255,255,238
1110 DATA 26,6,240,21,173,20,6,56,233,
40,141,20,6,144,4,24,76,19,6,206,21,6,
76,19,6,238,27,6,76,33,6,96
1120 DATA 104,201,4,240,9,170,240,5,10
4,104,202,208,251,96,104,133,215,104,1
33,214,104,104,168,104,133
1130 DATA 217,104,133,216,104,104,240,
236,133,212,24,165,214,101,88,133,214,
165,89,101,215,133,215,152,240,15
1140 DATA 165,214,105,64,133,214,165,2
15,105,1,133,215,136,208,241,132,221,1
60,0,132,220,177,216,160,0,170
1150 DATA 16,1,136,132,213,138,41,96,2
08,4,169,64,16,14,201,32,208,4,169,0,1
6,6,201,64,208,2

```

```

1160 DATA 169,32,133,218,138,41,31,5,2
18,133,218,169,0,162,3,6,218,42,202,20
8,250,109,244,2,133,219
1170 DATA 164,221,177,218,69,213,164,2
20,145,214,200,132,220,196,212,208,102
,24,165,214,105,40,133,214,144,2
1180 DATA 230,215,230,221,169,8,197,22
1,208,159,96,207,96

```

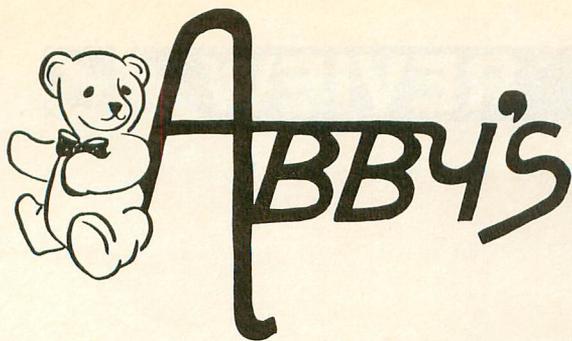
CHECKSUM DATA.

(see page 34)

```

0 DATA 406,678,112,865,723,946,48,418,
131,441,537,255,624,615,608,7407
38 DATA 852,859,711,940,70,440,125,435
,531,272,646,700,318,630,774,8303
105 DATA 783,959,524,78,800,584,562,21
7,506,510,263,692,164,702,650,7994
304 DATA 801,518,565,687,912,176,213,5
63,772,680,159,434,840,363,675,8358
426 DATA 679,469,621,293,833,939,67,31
3,747,393,748,947,93,108,673,7923
1000 DATA 41,185,534,222,99,788,260,96
5,349,943,12,930,164,979,778,7249
1022 DATA 537,928,941,166,248,771,187,
35,997,841,910,266,426,553,639,8445
1120 DATA 342,204,918,307,85,956,100,2
912

```



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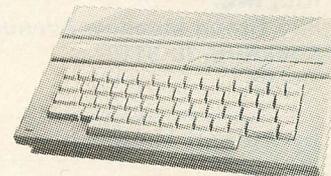
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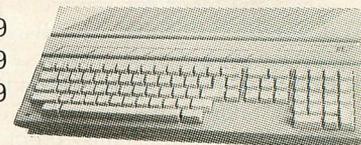


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by Russell Hauptert

When I purchased a disk drive for my computer system, there were several important considerations—price, features and reliability. Though several alternatives to the Atari 1050 disk drive were in existence, the final factor in my decision was reliability. It was a trade-off, but I'd heard too many tales of trouble with the other drives. I've always had Atari equipment, and I've never had a single repair call.

Safe in the knowledge that, if something *did* go wrong, I could bring it right down the block for service, I plunked down the cash and carried it away. This was my second drive; the joy of freedom from disk swaps overshadowed all else.

But, after a time, the joy of it all began to fade, and jealousy crept into my heart. You see, there are several friends who threw caution to the wind and got one of those *other* drives. You know, the double density ones. Oh, I hid my jealousy, but I had thoughts of selling that 1050 and picking up a *real* drive.

As fate would have it, another road opened up. While looking through an issue of **ANALOG Computing**, I saw an ad for the **US Doubler**. It promised the ability to write in any format—single, one-and-a-half, or true double density . . . for about \$69. I grabbed the phone and ordered one on the spot. A few days later, I received a package. The promise of greater storage in my hand, I set to work.

Opening the package reveals two replacement ICs, two manuals and a disk. Though I didn't know it when I ordered *the Doubler*, it comes with a free copy of **SpartaDOS**, which—among other things—allows the 1050 to read and write three times faster (when using a drive enhanced with **US Doubler**).

The DOS is very rich in features and great pleasure to use. In fact, a separate review would be necessary to cover it

in the depth it deserves. The manuals are very clear, giving step-by-step directions for the entire installation. At each point, the manual tells you what you should see—and exactly what to do.

I have a bit of experience with kit assembly, which may have helped. But, if you give yourself a large work space and keep track of all your parts, there will be no problem. If the idea of taking a screwdriver to your drive makes you weak in the knees, ICD will install the chips for only \$15.00, including UPS ground shipping one way.

I usually glance at the manual and tear right into such a project, but that technique has, more than once, caused me heartache. I needed someone to keep me following the directions. For this reason, I enlisted the aid of my brother (a man with years of experience in telling me what to do). With his help, the installation took only thirty-five minutes, from removal of the first screw to powering up for the test.

In tests, the **UltraSpeed I/O** worked as stated, with the increase in speed quite noticeable. Load and save times of a 100-sector file were cut to nearly a third of the unmodified drive. The old bleep-bleep of POKEY is replaced by a staccato rush that sounds more like machine gun fire. Far from annoying, this sound brought a smile to my face, as well as to the faces of my friends.

I've tested the **US Doubler** in all three formats and am happy to report that it performs as promised. Single density and Atari double density work as they did before. Most importantly, using the true double density afforded by this enhancement, I've attained compatibility with my friends' disks, as well as reducing my disk count by half.

With the new low prices of the Atari 1050, and the addition of this product, an Atari owner can now enjoy true dou-

The old bleep-bleep-bleep of POKEY is replaced by a staccato rush that sounds more like machine gun fire.

ble density operation at a price lower than the double density drives now on the market. For those of you who've already bought a 1050, this new ICD enhancement will upgrade your drive to match the current crop of high tech, high storage drives. □

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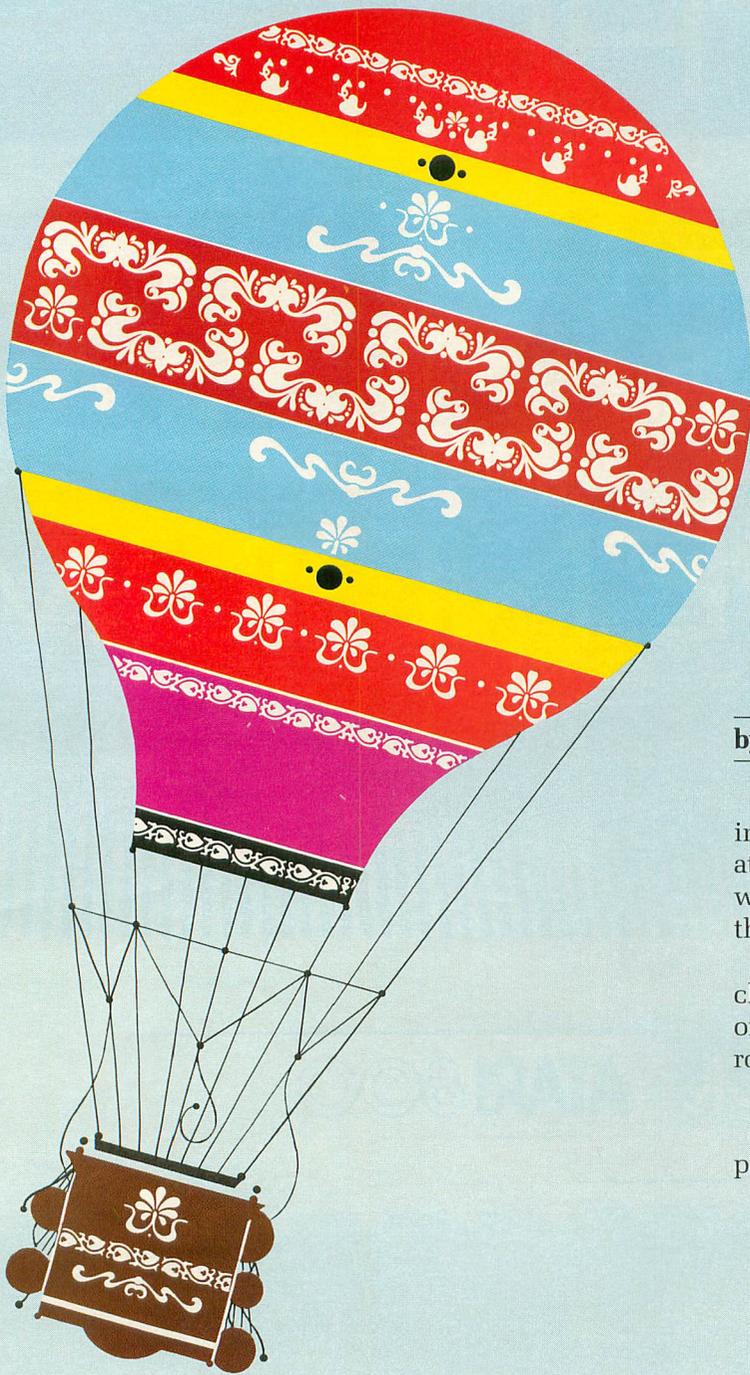
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by Mark Price

Unnaturally heavy rainfall has caused a landslide in the area of Boulder, Colorado. The debris has created an effective earth dam, which is keeping the water from the storm from flowing away. . .thereby threatening to flood the town.

Boulder has hired your demolition company to clear away the rubble. Because of the unsure footing on the pile, it has been decided to clear away the rocks with bombs dropped from aircraft flying above.

Typing it in.

Before typing anything, look at the listings accompanying this article.

Listing 1 is the BASIC data and data checking routine. This listing is used to create both cassette and disk versions of **Boulder Bombers**. The data statements are listed in hexadecimal (base 16), so that the program will fit in 16K cassette systems.

Listing 2 is the assembly language source code for the game of **Boulder Bombers**, created with the OSS MAC/65 assembler. You *don't* have to type this listing to play the game! It is included for readers interested in assembly language.

Boulder Bombers



Follow the instructions below to make either a cassette or disk version of **Boulder Bombers**.

Cassette instructions.

1. Type Listing 1 into your computer using the BASIC cartridge and verify your typing with **Unicheck** (see page 34).

2. Type *RUN* and press RETURN. The program will begin and ask:

MAKE CASSETTE (0) OR DISK (1)?

Type *0* and press RETURN. The program will begin checking the DATA statements, printing the line number of each as it goes. It will alert you if it finds any problems. Fix any incorrect lines and re-RUN the program, if necessary, until all errors are eliminated.

3. When all of your DATA lines are correct, the computer will beep twice and prompt you to *READY CASSETTE AND PRESS RETURN*. Now, insert a blank cassette in your recorder, press the RECORD and PLAY buttons simultaneously and hit RETURN. The message *WRITING FILE* will appear, and the program will create a machine language boot tape version of **Boulder Bombers**, printing each DATA line number

as it goes. When the *READY* prompt appears, the game is recorded and ready to play. *CSAVE* the BASIC program onto a separate tape before continuing.

4. To play, rewind the tape created by the BASIC program to the beginning. Turn your computer OFF and remove all cartridges. Press the PLAY button on your recorder and turn ON your computer while holding down the START key. If you have a 600 or 800XL computer, you must hold the START and OPTION keys when you turn on the power. The computer will "beep" once. Hit the RETURN key, and **Boulder Bombers** will load and run automatically.

Disk instructions.

1. Type Listing 1 into your computer, using the BASIC cartridge and verify your typing with **Unicheck** (see page 34).

2. Type *RUN* and press RETURN. The program will ask:

MAKE CASSETTE (0) OR DISK (1)?

Type *1* and press RETURN. The program will begin checking the DATA lines, printing the line

(continued on page 59)

GIVE YOUR FINGERS A BREAK!



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Boulder Bombers *continued*

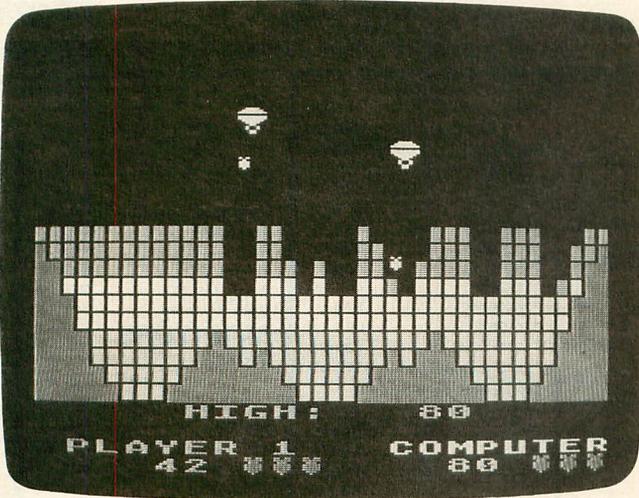
number of each statement as it goes. It will alert you if it finds any problems. Fix incorrect lines and re-RUN the program, if necessary, until all errors are eliminated.

3. When all the DATA lines are correct, you will be prompted to *INSERT DISK WITH DOS, PRESS RETURN*. Put a disk containing DOS 2.0S into drive #1 and press RETURN. The message *WRITING FILE* will appear, and the program will create an AUTORUN.SYS file on the disk, displaying each DATA line number as it goes. When the READY prompt appears, the game is ready to play. Be sure the BASIC program is SAVED before continuing.

4. To play the game, insert the disk containing the AUTORUN.SYS file into drive #1. Turn your computer OFF, remove all cartridges and turn the computer back ON. **Boulder Bombers** will load and run automatically.

Playing Boulder Bombers.

Boulder Bombers is a cooperative/competitive game for one or two players. The number of players is chosen using the SELECT key.



Boulder Bombers.

You start the game in a hot air balloon, flying high above the rock-filled canyon. Bombs are dropped by pressing the joystick trigger buttons. When half of the rocks are gone, you will automatically switch to quicker planes. When the entire canyon is cleared of rocks, you advance to the next level, where everything goes faster.

At the start of **Boulder Bombers**, you are allotted three bombs, shown next to your score at the bottom of the screen. You are penalized bombs when-

ever you make a miss or fail to attempt a drop on a pass over the canyon.

Extra bombs are awarded at 1000, 3000, 5000, 7000 and, finally, at 9000 points. Up to three bombs will be shown on the screen at a time, but extras earned will be kept in reserve. When you miss with your last bomb, the game ends.

The worth of rocks cleared varies, depending upon their original depth: red-2, yellow-4, blue-6.

Boulder Bombers may be paused by hitting the space bar. Play is resumed by moving either joystick. Commence earth-moving operations! □

At twenty-one, Mark Price has been working with computers for five years. He currently attends college in Southern California, where he is working on a degree in computer science. A member of S.B.A.C.E., his interests include programming, speech synthesis and graphics development.

Listing 1. BASIC listing.

```
10 REM *** BOULDER BOMBERS ***
20 TRAP 20:?"MAKE CASSETTE (0), OR DI
5K (1)";:INPUT D5K:IF D5K>1 THEN 20
30 TRAP 40000:DATA 0,1,2,3,4,5,6,7,8,9
,0,0,0,0,0,0,0,10,11,12,13,14,15
40 DIM DAT$(91),HEX(22):FOR X=0 TO 22:
READ N:HEX(X)=N:NEXT X:LINE=990:RESTOR
E 1000:TRAP 120:?"CHECKING DATA"
50 LINE=LINE+10:?"LINE:";LINE:READ DA
T$:IF LEN(DAT$)<>90 THEN 220
60 DATLIN=PEEK(183)+PEEK(184)*256:IF D
ATLIN<>LINE THEN ? "LINE ";LINE;" MISS
ING!":END
70 FOR X=1 TO 89 STEP 2:D1=ASC(DAT$(X,
X))-48:D2=ASC(DAT$(X+1,X+1))-48:BYTE=H
EX(D1)*16+HEX(D2)
80 IF PASS=2 THEN PUT #1,BYTE:NEXT X:R
EAD CHKSUM:GOTO 50
90 TOTAL=TOTAL+BYTE:IF TOTAL>999 THEN
TOTAL=TOTAL-1000
100 NEXT X:READ CHKSUM:IF TOTAL=CHKSUM
THEN 50
110 GOTO 220
120 IF PEEK(195)<>6 THEN 220
130 IF PASS=0 THEN 170
140 IF NOT DSK THEN 160
150 PUT #1,224:PUT #1,2:PUT #1,225:PUT
#1,2:PUT #1,0:PUT #1,32:CLOSE #1:END
160 FOR X=1 TO 104:PUT #1,0:NEXT X:CLO
SE #1:END
170 IF NOT DSK THEN 200
180 ? "INSERT DISK WITH DOS, PRESS RET
URN";:DIM IN$(1):INPUT IN$:OPEN #1,8,0
,"O:AUTORUN.SYS"
190 PUT #1,255:PUT #1,255:PUT #1,0:PUT
#1,32:PUT #1,111:PUT #1,40:GOTO 210
200 ? "READY CASSETTE AND PRESS RETURN
";:OPEN #1,8,128,"C"::RESTORE 230:FOR
X=1 TO 40:READ N:PUT #1,N:NEXT X
210 ? :?"WRITING FILE":PASS=2:LINE=99
0:RESTORE 1000:TRAP 120:GOTO 50
220 ? "BAD DATA: LINE ";LINE:END
```

(Listing continued on next page)



Boulder Bombers *continued*

230 DATA 0,18,216,31,255,31,169,0,141,
47,2,169,60,141,2,211,169,0,141,231,2,
133,14,169,56,141,232,2
240 DATA 133,15,169,0,133,10,169,32,13
3,11,24,96
1000 DATA A26FBDFC279D002CCA10F7A9008D
0ED4A9348D16D0A9288D17D0A9848D18D0A9C4
8D19D0A9008D1AD0A2039D08,415
1010 DATA D0CA10FAA9288D12D0A9848D13D0
A9C88D14D0A9C88D15D0A9308D07D4A93E8D00
D4A9038D1DD0A070B900E099,358
1020 DATA 002CC8D0F7B900E199002DC8D0F7
A92C8D09D4A900A0229912008810FAA02799FC
298810FA204B25A9008D08D2,550
1030 DATA A9038D0FD2A938852DA948852EA9
2C852BA9CC852CA9008D00D48D05D285158D07
D2207925A9AE8D02D4A9258D,475
1040 DATA 03D4A9FF8513A90185148519A900
8518A93E8D00D4A9038512AD1FD02903C901D0
15AD1FD02902F0F9A51A4901,76
1050 DATA 851A1869118D2926D004C902F015
A518D00BAD0AD22901AABDAC258517201D244C
CD20AD1FD02901F0F9A90385,502
1060 DATA 13A90085198D00D4A2029D59269D
6326CA10F7A9108D5C268D6626A202A9CD9D5E
269D6826CA10F7A903852985,215
1070 DATA 2AA91185278528A51A0A0A0AA207
A8B99A259D4F26C8CA10F6A9D18D02D4A9258D
03D4A93E8D00D4204B25A903,855

1080 DATA 85178512A90185148532A92A8531
207925A90085188D06D2A92C852BA9CC852C8D
1ED0A908851BA513C9AFF005,394
1090 DATA 38E9048513A201851FD0034C3423
BD06D0D0034CE7222907D0034CBD22A9008534
B51F38E96729F88533063306,595
1100 DATA 33263418653385339002E634B52B
38E92F4A4A18653385339002E6341869FC8533
A53469298534A000B133F004,765
1110 DATA C9049022C8B133F004C9049019A0
28B133F004C904900FC8B133D0034CE722C904
90034CE7220A8516A9009133,433
1120 DATA A53138E9018531B002C632A9FE85
15BCAA25A51618795926995926A9038516B959
26F023C91A901A38E90A9959,108
1130 DATA 2688C6163014B95926D002A91018
6901995926D00DC8E616D008A9598533A92685
348AF00BA90A186533853390,898
1140 DATA 02E634A000B133D93A26F004B009
9011C8C004D0F0F00AA003B133993A268810FB
BCAA25B95626D527D014F629,78
1150 DATA B529C904B00A187DAA25A8A9CD99
5A26F627F62FB52FC51BD02A8A1869368534B5
1F8533A005A90091338810FB,985
1160 DATA 8A0AA8A9009900D29901D2951FB5
2FD04D2062254C2E238A1869368534B51F8533
A900A00591338810FBF625B5,513
1170 DATA 254A4A4A4A851618751FC9C4B0C5
951F8533A005B9602C91338810FB8A0AA8A516

WHITE HOUSE COMPUTER

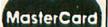
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Boulder Bombers *continued*

Assembly listing.

```

*****
;* 'BOULDER BOMBERS' *
;*   by *
;*   Mark Price *
;* *****
;
; ZERO-PAGE VARIABLES
;
; == #12
;
; CLOCK .DS 1
; DELYVAL .DS 1
; DIR .DS 1
; EXPLODE .DS 1
; HOLDIT .DS 1
; MASK .DS 1
; ONSCR .DS 1
; PLAY .DS 1
; PLAYERS .DS 1
; RKILL .DS 1
; TDIR .DS 1
; XCOUNT .DS 1
; YCOUNT .DS 1
; BMBDRP .DS 2
; BRUN .DS 2
; DRPFREQ .DS 2
; DRPRATE .DS 2
; FREMEN .DS 2
; BOMBS .DS 2
; PLYRX .DS 2
; PLYRY .DS 2
; ROCKHIT .DS 2
; ROCKS .DS 2
; SCRPTTR .DS 2
;
; KEYBOARD VARIABLES
;
; CH = #02FC
; CH1 = #02F2
;
; PMAREA = #3000
; PL0 = PMAREA+1024
; PL1 = PL0+256
; PL2 = PL1+256
; PL3 = PL2+256
;
; ROMCH = #E000 ;ROM CHR SET
; CHARS = #2C00 ;MY CHR SET
;
; SYSTEM EQUATES
;
; AUDCTL = #D200
; AUDC1 = #D201
; AUDC2 = #D203
; AUDC3 = #D205
; AUDC4 = #D207
; AUDF1 = #D200
; AUDF3 = #D204
; AUDF4 = #D206
; CHBASE = #D409
; COLBAK = #D01A
; COLPF0 = #D014
; COLPF1 = #D017
; COLPF2 = #D01B
; COLPF3 = #D019
; COLPM0 = #D012
; COLPM1 = #D013
; COLPM2 = #D014
; COLPM3 = #D015
; CONSOL = #D01F
; DLIST = #D402
; DMAPCTL = #D400
; SDMCTL = #D22F
; BRACTL = #D01D
; HITCLR = #D01E
; HPOSP0 = #D000
; HPOSP1 = #D001
; HPOSP2 = #D002
; HPOSP3 = #D003
; NHLEN = #D40E
; PL2PF = #D006
; PMBASE = #D407
; PORTA = #D300
; RANDOM = #D20A
; SIZEP0 = #D008
; SKCTL = #D20F
; TRIG0 = #D010
;
; == #2000
;
; INIT
; MYCHRS LDX #111 ;COPY MY CHARS
; LDA MYCHRS,X
; STA CHARS,X
; DEX
; BPL MYCHRS
; LDA #0 ;DISABLE VBI
; STA NHLEN
; LDA #34 ;SET COLORS
; STA COLPF0
; LDA #28
; STA COLPF1
; LDA #84
; STA COLPF2
; LDA #C4
; STA COLPF3
; LDA #0
; STA COLBAK
;
; STWIDTH LDX #3 ;INIT PLAYERS
; STA SIZEP0,X
; DEX
; BPL STWIDTH
; LDA #28
; STA COLPM0
; LDA #84
; STA COLPM1
; LDA #CB
; STA COLPM2
; LDA #CB
;
; COLPH3 LDA #>PMAREA
; STA PMBASE
; LDA #3E
; STA DMAPCTL
; LDA #3
; STA BRACTL
; LDY #12 ;INIT CHR SET
; LDA ROMCH,Y
; STA CHARS,Y
;
; INY
; BNE SETCH1
; LDA ROMCH+256,Y
; STA CHARS+256,Y
;
; INY
; BNE SETCH2
; LDA #>CHARS
; STA CHBASE
; LDA #0
; LDY #SCRPTTR+1-CLOCK
; STA CLOCKS,Y
; DEY
; BPL ZER0VAR
; LDY #27 ;SET SCREEN DISP
; STA CANYON,Y
; DEY
; BPL CLRTOP
; JSR SETSCRN
; LDA #0 ;INIT SOUND
; STA AUDCTL
; LDA #3
; STA SKCTL
; LDA #56
; STA PLYRY ;SET PLAYER
; STA PLYRX ; LANES
; LDA #72
; STA PLYRY+1
;
; RESTART LDA #44 ;SET PLAYER
; STA PLYRX ; START
; LDA #204 ; POSITIONS
; STA PLYRX+1
; LDA #0 ;TURN OFF SCREEN
; STA DMAPCTL
; STA AUDC3 ; EXPLOSIONS,
; STA EXPLODE ; AND BKB SOUND
; STA AUDC4
; JSR PMCLR ;CLEAR PLAYERS
; LDA #<DLIST1 ;SET TITLE
; STA DLIST ; SCREEN
; LDA #>DLIST1
; STA DLIST+1
; LDA #FF ;SET GAME SPEED
; STA DELYVAL ; FOR TITLES
; STA DIR ;SET START DIR
; STA PLAY
; STA PLAY ;SET PLAY FALSE
; LDA #0 ;PLAYERS NOT
; STA ONSCR ; ON SCREEN
; LDA #3E ;TURN SCREEN
; STA DMAPCTL ; BACK ON
; LDA #3
; STA CLOCKS ; INIT CLOCK
; LDA CONSOL
; AND #3 ;CHECK CONSOL
; AND #1 ;SWITCHES
; BNE CHKSTRT ; NO, TRY START
; LDA CONSOL ; YES, WAIT FOR
; AND #2 ; KEY RELEASE
; BEQ SELECT
; LDA PLAYERS ;CHANGE # OF
; EOR #1 ; PLAYERS
; STA PLAYERS
; CLC
; ADC #11 ; & SET ON SCREEN
; STA SCNOPLR
; BNE MOVET ; (MOVE PLAYERS)
; CMP #2 ; IF START THEN
; BEQ STRT ; START GAME
; LDA ONSCR ; IF ON SCREEN,
; BNE MOVIT ; THEN MOVE
; LDA RANDOM ; ELSE, PICK OUT
; AND #1 ; NEW 'SHIP TYPE
; TAX
; LDA MASKS,X
; STA MASK ; & SET IT
; JSR MOVEPLR ; MOVE PLAYERS
; JMP GTCNSL ; DO CHECK AGAIN
;
; START LDA CONSOL ;WAIT FOR KEY
; AND #1 ; RELEASE
; BEQ STRT
; LDA #3
; STA DELYVAL ;SET GAME SPEED
; LDA #0 ; TO #FF+#04
; STA PLAY ;SET PLAY TRUE
; STA DMAPCTL ;TURN OFF SCREEN
; LDX #2 ;SET SCORES TO
; STA SCORE1,X ; ZERO
; STA SCORE2,X
; DEX
; BPL ZEROSCR
; LDA #10
; STA SCORE1+3
; STA SCORE2+3
; LDX #2 ;SET BOMBS LEFT
; LDA #CD ; TO THREE
; STA BOMB1,X
; STA BOMB2,X
; DEX
; BPL STBMB
; LDA #3
; STA BOMBS
; STA BOMBS+1
; LDA #11 ;SET NEXT FREE
; STA FREMEN ; BOMB AT 1000
; STA FREMEN+1
; LDA PLAYERS ;SET SECOND
; ASL A ; PLAYER MESSAGE
; ASL A ; TO 'PLAYER 2'
; ASL A ; OR 'COMPUTER'
; TAX
; LDA P2COMPT,Y
; STA P2MBS,X
;
; INY
; BPL STP2MS
; LDA #<DLIST2 ;SET DLIST
; STA DLIST ; TO GAME
; LDA #>DLIST2 ; SCREEN
; STA DLIST+1
; LDA #3E ;TURN ON SCREEN
; STA DMAPCTL
;
; NEWSOCR JSR SETSCRN ;SET CANYON
; LDA #3 ;SET TYPE TO
; STA MASK ; BALLOON
; STA CLOCKS ;AND BEGIN CLOCK
; LDA #1
; STA DIR ;DIR = RIGHT
; STA ROCKS+1 ; ROCKS IN
; LDA #42 ; CANYON=298
; STA ROCKS
; JSR PMCLR ;CLEAR PLAYERS
; LDA #0 ;SET PLAYERS ON
; STA ONSCR ; SCREEN=FALSE
; STA AUDF4
; LDA #44 ;SET START
; STA PLYRX ; POSITIONS
; LDA #204 ; ANYTHING?
; STA PLYRX+1 ; OF PLAYERS
; STA HITCLR ;CLEAR HITS
; LDA #8 ;#ROCKS PER BOMB
; STA RKILL ; (MAX) =8
; LDA DELYVAL ;SPEED UP THE
; CMP #AF ; GAME JUST A BIT
; BEQ BMBLOOP ; (UNLESS ALREADY
; SEC ; AT MAX SPEED)
; STA DELYVAL
;
; BOMB MOVEMONT, HIT CHECKS,
; SCORE AND HIGHSCORE SET
;
; BMBLOOP LDX #1 ;GET PLAYER INDEX
; BMBNLOP LDA BMBDRP,X ; IF BOMB NOT
; BNE CHKHITS ; DROPPED
; JMP CHKDRP ; CHECK TRIG
; LDA PL2PF,X ; BOMB HIT
; BNE CKHRK ; ANYTHING?
; JMP LWRBMB ; NO, MOVE BOMB
; AND #7 ; IF HIT ONLY
; BNE BHITRK ; COLOR 3, IT
; JMP KILLBMB ; BETS ERASED
; LDA #0 ;SET POINTER
; STA SCRPTTR+1 ; INTO SCREEN
; LDA BMBDRP,X ; RAM WHERE THE
; SEC ; ROCK HIT IS.
; SBC #103 ; 1ST, GET BOMB'S
; AND #FB ; Y-POS TRANS-
; STA SCRPTTR ; LATED INTO
; ASL SCRPTTR ; ROW NUMBER
; ASL SCRPTTR ;AND MULTIPLY IT
; ROL SCRPTTR+1 ; BY 40
; CLC
; ADC SCRPTTR
; STA SCRPTTR
; BCC GTP0
; INC SCRPTTR+1
; LDA PLYRX,X ; THEN, CHANGE
; SEC ; X-POS INTO THE
; SBC #47 ; COLUMN NUMBER
; LSR A
; LSR A
; CLC ;AND ADD IT ON
; ADC SCRPTTR
; STA SCRPTTR
; BCC GTPA
; INC SCRPTTR+1
; CLC ; ADD SCREEN
; ADC #<CANYON ; START
; STA SCRPTTR ; ADDRESS
; LDA SCRPTTR+1
; ADC #>CANYON
; STA SCRPTTR+1
; LDY #0
; LDA (SCRPTTR) ; GET CHAR
; BEQ GTP1 ; IF IT'S BLANK
; CMP #4 ; OR ABOVE 4
; BCC GOTCHR ; THIS ISN'T IT.
; INY ; TRY AGAIN, ONE
; LDA (SCRPTTR),Y ; RIGHT
; BEQ GTP2
; CMP #4
; BCC GOTCHR
; LDY #28 ; IF WE STILL
; LDA (SCRPTTR),Y ; DON'T GET IT
; BEQ GTP3 ; TRY 1 DOWN
; CMP #4
; BCC GOTCHR
; INY ; THEN, BOTH AT
; LDA (SCRPTTR),Y ; ONCE
; BNE GCKRCK
; JMP LWRBMB ; IF BY THIS
; CMP #4 ; TIME, WE DONT
; BCC GOTCHR ; HAVE, IT, THEN
; JMP LWRBMB ; GIVE UP,
; ASL A ; HOLD SCORE=
; STA HOLDIT ; CHAR # 2
; LDA #0 ;ERASE ROCK ON
; STA (SCRPTTR) ; SCREEN
; LDA ROCKS ; LOWER # OF
; SEC ; ROCKS LEFT
; SBC #1
; STA ROCKS
; BCC GOT1
; DEC ROCKS+1
; LDA #FF ;START EXPLOSION
; STA EXPLODE ; SOUND
;
; ADD ON TO SCORE
;
; LDY SCRNDX,X ;GET BASE INDEX
; LDA HOLDIT ; TO SCORES,AND
; CLC ; ADD TO SCORE
; ADC SCORE1,Y
; STA SCORE1,Y
; LDA #3 ;SET DIGIT # FOR

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Boulder Bombers *continued*

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ADDSCR  STA HOLDIT  ; ROLLOVER PROT.
        LDA SCORE1,Y ; DONE?
        BEQ CHKHI   ; YES, CHECK HIGH
        CMP #26    ; DIGIT >10?
        BCC SCUNDX ; NO, GO RIGHT
        SEC
        SBC #10   ; SUB 10 FROM
        STA SCORE1,Y ; THIS DIGIT
        DEY
        DEC HOLDIT ; POINT TO NEXT
        BMI CHKHI  ; ROLLOVER! LEAVE
        LDA SCORE1,Y ; GET DIGIT
        BNE SCBRK  ; IF BLANK, SET
        LDA #10   ; TO ZERO
        CLC
        ADC #1
        STA SCORE1,Y ; AND SAVE IT
        BNE ADDSCR ; CHECK THIS DIGIT
        INC INY    ; BO RIGHT ONE
        BNE ADDSCR ; DIGIT

; CHECK FOR HIGH SCORE
CHKHI   LDA # <SCORE1
        STA SCRPTR ; SET POINTER
        LDA >SCORE1 ; TO SCORE FOR
        STA SCRPTR+1 ; PLAYER 1
        TXA
        BEQ CHKSCR ; PLAYER 1 THEN
        LDA #10   ; ADD TO GET
        CLC
        ADC SCRPTR ; POINTER FOR
        STA SCRPTR ; PLAYER 2
        BCC CHKSCR
        INC SCRPTR+1
CHKSCR  LDA #0
CHECKSC LDA (SCRPTR),Y ; COMPARE 'EM
        CMP HISCOR,Y
        BEQ CKNXDB ; IF SAME, DO NEXT
        BCS STHISC ; IF PLAYER > SET
        BCC CHKFRM ; IF HIGH > SKIP
        INY
        CPY #4
        BNE CHECKSC ; THEN IT'S THE
        BEQ CHKFRM ; SAME, SKIP

; SET HIGH SCORE
STHISC  LDA #3
SETDIBT LDA (SCRPTR),Y ; COPY THE
        STA HISCOR,Y ; SCORE INTO
        DEY
        BPL SETDIBT ; HISCOR

; CHECK FOR GETTING EXTRA BOMBS
CHKFRM  LDY SCRNDX,X ; GET SCORE
        LDA SCORE1-3,Y ; IN THOUSANDS
        CMP FREMEN,X ; IF NOT FREE
        BNE STRKHT  ; BOMB YET, SKIP.
        INC BOMBS,X ; ELSE, UP BOMBS
        LDA BOMBS,X ; BY 1
        CMP #4
        BCS UPDTFM ; IF BOMBS >= 4
        BCS UPDTFM ; KEEP IN RESERVE
        CLC
        ADC SCRNDX,X ; IF BOMBS LESS
        TAY
        LDA #CD   ; SET EXTRA
        STA BOMB1-4,Y ; ON SCREEN
        INC FREMEN,X ; SET FOR NEXT

UPDTFM  INC RCKHIT,X ; IF NEW # OF
        LDA RCKHIT,X ; ROCKS HIT =
        CMP RKILL  ; MAX KILL BOMB
        BNE LWRBMB ; ELSE, LOWER IT
        TXA
        CLC
        ADC # >PL2 ; SET POINTER TO
        STA SCRPTR+1 ; BOMB
        LDA BMBDRP,X
        STA SCRPTR
        LDY #5
        AND ERASE IT
        LDA #0
ERABOMB STA (SCRPTR),Y
        DEY
        BPL ERABOMB ; TURN OFF SOUND
        TXA
        ASL A
        TAY
        LDA #0
        STA AUDF1,Y
        STA AUDC1,Y
        STA BMBDRP,X ; SET FLAG OFF
        LDA RCKHIT,X ; IF IT DIDN'T
        BNE DONXBMB ; HIT ANYTHING,
        JSR LWRMISB ; LOWER # BOMBS
        JMP DONXBMB ; & DO NEXT

; LOWER THE BOMBS
LWRBMB  TXA
        CLC
        ADC # >PL2 ; SET POINTER TO
        STA SCRPTR+1 ; BOMB
        LDA BMBDRP,X
        STA SCRPTR
        LDA #0
        AND ERASE THE BOMB
        LDY #5
        STA (SCRPTR),Y
        DEY
        BPL ERBOMB
        INC DRPRATE,X ; UP DROP SPEED
        LDA DRPRATE,X
        LSR A
        LSR A
        LSR A
        STA HOLDIT
        CLC
        ADC BMBDRP,X
        CMP #194
        BCS KILBOMB ; OUT OF RANGE?
        BCS KILBOMB ; YES, KILL IT
        STA BMBDRP,X ; ELSE, SET
        STA SCRPTR ; THE BOMB
        LDY #5
        LDA CHARS+94,Y
        STA (SCRPTR),Y
        DEY
        BPL SETBOMB
        TXA
        ASL A
        TAY
        LDA HOLDIT
        CLC
        ADC DRPFREQ,X ; UPDATE SOUND
        STA DRPFREQ,X ; OF DROPPING
        STA AUDF1,Y ; & BOMB
        LDA #0
        SEC
        SBC HOLDIT
        STA AUDC1,Y
        DEY
        BMI DOPLMV ; IF BOTH NOT
        JMP BMBLOOP ; DONE, DO NEXT

; CHECK & DROP BOMBS
CHKDRP  LDA BOMBS,X ; IF NO BOMBS LEFT
        BEQ DONXBMB ; THEN DO NEXT
        CLC
        SBC PLAYERS ; COMPUTER, CHECK
        BNE CHKTRG ; IT'S PLAYER!
        LDA DIR
        BMI GOINGR ; GOING LEFT?
        LDA PLYRX,X ; GET COMPUTER X
        CMP #44
        BCC DONXBMB ; YES!
        BCS TRYDRP ; NO, TRY DROP!
        LDA PLYRX,X ; GET COMP. X
        CMP #88
        BCS DONXBMB ; TOO FAR RIGHT?
        LDA RANDOM ; COMPUTER DROPS
        AND #15
        BEQ DROPT  ; RANDOM SAYS TO
        BNE DONXBMB ; ELSE DO NEXT
        LDA TRIG0,X ; TRIG PUSHED?
        BNE DONXBMB ; NO, DO NEXT
        LDA PLYRY,X ; DROP: SET
        CLC
        ADC #8
        STA BMBDRP,X ; PLAYER Y+8
        LDA #0
        STA DRPRATE,X ; CLEAR DROP RATE
        STA RCKHIT,X ; AND ROCKS HIT
        INC BRUN,X ; UP BOMBS DROPPED
        LDA #50
        STA DRPFREQ,X ; SET THE SOUND
        BNE DONXBMB ; AND DO NEXT

DOPLMV  STA HITCLR ; CLEAR HITS
        JSR MOVEPLR ; MOVE PLAYERS
        LDA EXPLODE ; EXPLOSION GOING?
        BEQ CKRSTRT ; NO, SKIP
        DEC EXPLODE ; UPDATE EXPLOSION
        DEC EXPLODE ; SOUND
        EOR #BF
        STA AUDF3
        LSR A
        LSR A
        LSR A
        EOR #BF
        STA AUDC3
        LDA CONSOL ; ANY CONSOLE
        CMP #7
        BEQ CKNSCR ; IF YES, THEN
        JMP RESTART ; RE-START
        LDA ROCKS ; # OF ROCKS LEFT
        BNE CKPAUS ; = ZERO?
        LDA ROCKS+1 ; IF YES, THEN
        BNE CKPAUS ; SET UP A
        JMP NEWSCRN ; NEW SCREEN
        CH
        CMP #33
        BNE CKDRRCK ; NO, CONTINUE
        LDA #0
        STA AUDC1 ; TURN OFF MAIN
        STA AUDC2 ; SOUNDS
        STA AUDC3
        LDA PORTA ; WAIT FOR STICK
        CMP #FF
        BEQ HLDPTRN ; MOVEMENT
        LDA #FF
        STA CH
        STA CH1
        LDA CLOCK ; TIME TO DROP
        AND #15
        BEQ DRPROCK ; ROCKS?
        JMP BMBLOOP ; NO, DO BOMBS
        LDA #39
        STA XCOUNT ; SET COLUMN TO 39
        LDA #8
        STA YCOUNT ; ROW TO 8
        LDA # <CANYON+360 ; AND SET POINTER
        STA SCRPTR ; PLUS CANYON
        CLC
        ADC XCOUNT ; START
        STA SCRPTR
        LDA # >CANYON+360
        ADC #0
        STA SCRPTR+1
        LDY #0
        LDA (SCRPTR),Y ; ROCK FALL LOOP:
        BEQ DONXRCK ; Y NOTHING THERE
        TXA
        LSR A
        LDA (SCRPTR),Y ; & LOOK UNDERNEATH
        BNE DONXRCK ; NOT BLANK-DO NEXT
        TXA
        STA (SCRPTR),Y ; BLANK, MOVE ROCK
        LDY #0
        STA (SCRPTR),Y
        LDA SCRPTR ; & GO UP ONE
        SEC
        SBC #28
        STA SCRPTR ; WON'T FALL AT
        STA SCRPTR ; ONCE

NOVER   DEC SCRPTR+1
        DEC YCOUNT ; LAST ROW DONE?
        BMI DONXCOL ; YES, DO NEXT COL
        LDA SCRPTR ; BO UP ONE
        SEC
        SBC #28
        STA SCRPTR
        BCS NOVER2
        DEC YCOUNT ; LAST ROW DONE?
        BPL RK2DRP ; YES, DO NEXT COL
        DEC XCOUNT ; LAST COL DONE?
        BPL DSTYCNT ; NO, DO NEXT
        JMP BMBLOOP ; DO BOMBS AGAIN

; MOVE PLAYER, CHECK FOR LEAVING
; SCREEN, END GAME CHECK, SWITCH
; SHIP TYPES
MOVEPLR LDA ONSCR ; IF NOT ON
        BNE ADDCLK ; SCREEN, SET SOUND
        LDA MASK ; AND PLAYERS
        CMP #3
        BEQ STBLNSD ; YES, DO THAT
        LDA #24
        STA AUDF4 ; SET PLANE SOUND
        STA AUDC4
        BNE ADDCLK ; & BOTO CLOCK ADD
        LDA #0
        STA AUDF4 ; SET WIND SOUND
        LDA #2
        STA AUDC4
        LDX #1
        STA PLYRX,X ; SET BALLOON
        STA SCRPTR
        TXA
        CLC
        ADC # >PL0
        STA SCRPTR+1
        LDY #15
        STA CHARS+80,Y
        STA (SCRPTR),Y
        DEY
        BPL SETBALN
        DEX
        BPL STBLNS
        INC CLOCK ; ADD TO CLOCK
        LDA CLOCK ; IF CLOCK AND
        AND MASK ; MASK <> 0 THEN
        BNE DODELAY ; DON'T MOVE
        LDA PLYRX ; MOVE THE PLAYERS
        CLC
        ADC DIR
        STA PLYRX
        STA HPOSP2
        LDA DIR
        EOR #FE
        CLC
        ADC PLYRX+1
        STA HPOSP1
        STA HPOSP3
        LDA MASK ; IF ON PLANES
        CMP #1
        BNE DODELAY ; THEN CHECK IF
        AND #2 ; TIME TO ANIMATE
        BNE DODELAY ; PROPS
        AND #2
        BNE DODELAY ; NO, SKIP THIS
        LDA DIR ; SET TEMP DIR
        STA TDIR ; (WILL BE KILLED)
        LDX #1
        STA PLYRX,X ; SET POINTER
        STA SCRPTR ; TO PLAYER
        TXA
        CLC
        ADC # >PL0
        STA SCRPTR+1
        LDA CLOCK ; GET IMAGE INDEX
        AND #4 ; FROM CLOCK
        ASL
        STA HOLDIT ; AND HOLD IT
        LDA TDIR ; GET DIRECTION
        AND #10 ; INDEX FROM
        CLC ; DIR
        ADC HOLDIT ; & ADD 'EM TO GET
        STA HOLDIT ; INDEX
        TXA
        LDY #0
        LDA CHARS+48,X ; SET PLAYER
        STA (SCRPTR),Y
        INX
        INX
        CPY #8
        BNE ANISET ; REVERSE TDIR
        LDA TDIR
        EOR #FE
        STA TDIR
        LDX #1
        LDA HOLDIT ; GET PLAYER #
        AND #1 ; & ANIMATE NEXT
        BPL ANILOOP
        LDY #15
        LDA DELVAL ; WAIT FOR A
        DEY ; WHILE TO MAKE
        BNE DELAY2 ; GAME PLAYABLE
        DEX
        BNE DELAY1
        LDA #1
        STA ONSCR ; PLAYERS ARE NOW
        LDA PLYRX ; ON SCREEN
        CMP #44
        BEQ OFFSCR ; BUT CHECK TO
        CMP #204 ; SEE IF THEY
        BNE MP00BAK ; AREN'T
        STA AUDC3 ; IF ON, RETURN
        STA AUDC4 ; ELSE, TURN OFF
        STA EXPLODE ; EXPLOSIONS AND
        STA ONSCR ; & BKB SOUND
        LDX #1
        LDA BMBDRP,X ; SET ONSCR FALSE
        BEQ CKBRN ; IF A BOMB IS
        ; IN THE AIR, AND

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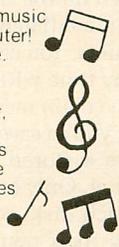
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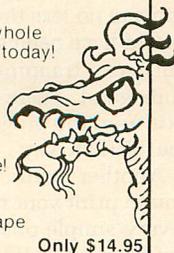
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by Karl E. Wiegers

Preparing tax returns isn't most people's idea of a great hobby. The good news is that there are several tax preparation programs for the Atari on the market. The bad news is that you get what you pay for, and sometimes you'll wish you had paid a little more. **Tax Command** is one of the less expensive tax programs available, and while it does accelerate the completion of your Federal tax return, it has some limitations.

My individual income tax return is fairly involved, with itemized deductions and dividend income, some capital gains and the continual hope of a tax break, thanks to income averaging. I got **Tax Command** hoping it would speed up the lengthy computations involved with income averaging, making it easy to add new deductions if I discovered them after the initial pass through the program. These expectations were only partially realized.

Tax Command for the Atari comes in two different versions. The older version is obtainable on cassette or disk and is designed for 16K computers. I regard this program as a barely adequate tax preparation tool. It lacks the ability to store data on the tape or disk for additional future processing, and it cannot provide any printouts of your results.

Essentially, all this version does is arithmetic. The new program requires at least 40K of RAM and is considerably more useful. Program files for both versions are present on the single cassette or disk you get when you purchase **Tax Command**. Both are written in Atari BASIC.

Tax Command comes with a 16-page, typeset user's guide, with a table of contents and index. The program is available for seven models of home computer besides the Atari, and the user's manual comes in the "one size fits all" cate-

gory. Little information in it pertains specifically to the Atari version. However, the general procedures described for entering data and performing calculations are useful.

A sample set of mythical financial information is supplied with instructions, to use for practice before you tackle your own return. Instructions for the more sophisticated, long version of **Tax Command** do not appear in the user's guide. The input prompts in the program itself are very cryptic, so it will help to keep your tax forms in front of you.

Data is entered through a series of menus pertaining to different sections of Form 1040 and other schedules. The lines in each menu are labeled with the line number to which they correspond on Form 1040.

One character per line is highlighted in inverse video. To select a menu option, simply press the key corresponding to the highlighted letter. You can then enter numeric information such as salaries, medical deductions, and so on.

The main menu lets you move to sub-menus for making different kinds of entries, so changes are readily made if you uncover a new deduction or get a late W-2 statement. Movement among menus is very easy and rapid.

Some options, such as "other income" or "tax payments," involve lists of items. Numbers must be entered for all items in a list, even if the entry is zero, as already shown on the screen. Changing an entry here involves retyping all items in the list. If you just press RETURN at unchanged items to try to save time, you'll see a reminder to enter only numeric values. To my irritation, this message remained on the screen for nearly ten seconds.

As you make entries in the various displays, the dollar (and cents) values are

The lines in each menu are labeled with the line number to which they correspond on Form 1040.

shown on the the menu lines. Changes are immediately reflected in new total amounts. You can calculate your tax due at any time with a couple of keystrokes.

The main menu in the long version allows you to save your data on disk or retrieve a stored file for additional processing. Only one data file can be stored on each disk, so tell all your friends to bring their own data disks.

Users of the short form are out of luck: no storage of intermediate results is possible. This is a major limitation in the short version of **Tax Command**.

Something odd happens if an error occurs during the data save step. A display asking if the drive is on and the data disk is in appears, erases and reappears no less than forty times! Twice would have been sufficient. Other than this, error trapping in **Tax Command** is quite good. There is no apparent way to exit from the program short of pressing the BREAK key.

Another main menu option allows you to print your results. This produces a very simple one-page printout showing Form 1040 line numbers, short line descriptions and the numeric values to be filled in on your Form 1040.

Due to a small bug in the program, the line which should show your refund due



Review *continued*

doesn't appear on the printout. As with all inexpensive tax return programs, these numbers must be entered manually onto your own tax forms.

No itemizations are provided for any other schedules, another limitation of **Tax Command**. Individual subtotals for Schedule A (itemized deductions), such as medical, taxes, interest, etc., are displayed on the computer screen but not on the printed report.

Income averaging is a nice way to try to reduce the amount of Federal tax you owe. At least, it's usually worth checking to see if it makes a difference. **Tax Command** lets you enter the income from your four base years (again, the prompts are so abbreviated that you really have to know what you're doing) and, in just a few seconds, calculates your averageable income and the tax due using income averaging.

Still, no intermediate calculations, which must be entered on Schedule G to satisfy the IRS, are shown. Therefore,

if you do income average, you must perform the computations by hand to get these necessary intermediate results. This practically negates the benefit of having the computer carry out the math, except to see if income averaging will reduce your tax liability.

As with virtually all tax preparation programs for home computers, **Tax Command** does not supply tax advice or information about tax laws. On the plus side, the purchase price is tax deductible.

In summary, **Tax Command's** long form is a useful aid for the preparation of your Federal income tax return if you have a disk drive and at least 40K or RAM in your Atari. The 16K version is too limited to be of much use, unless your tax return is so simple that it's easily done by hand anyway.

The program is easy to use, although the user's manual provides little assistance. Data entry is rapid, and the tax calculations take only a few seconds.

The result for my 1983 tax due came out \$2 off the result I got using another, more expensive tax program, but I'm not sure which is in error.

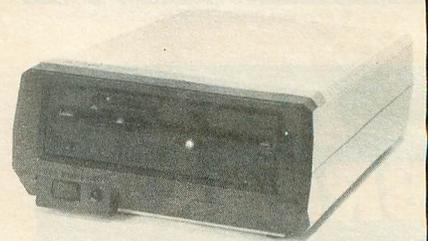
With a little more attention to detail and utility, this could be a fine tax preparation program. However, I don't recommend **Tax Command** for anyone who uses income averaging or wants a printed itemization of data for schedules besides the basic Form 1040.

In those cases, a program like the **Tax Advantage** from Continental is a better choice, although close to three times the list price of **Tax Command**. Remember, you get what you pay for. □

With his B.S., M.S. and Ph.D. degrees in chemistry, Karl E. Wieggers is a Senior Research Chemist at Eastman Kodak Company. He has worked with mainframe and microcomputers for fourteen years and has written for several computer magazines, with a number of applications programs published.



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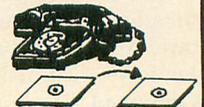
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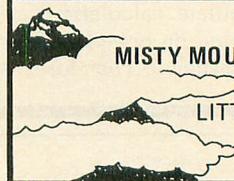
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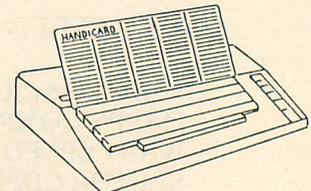
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PANAK STRIKES!

Reviews of the latest software

by Steve Panak

I just finished my latest battery of games. As so often before, they were slid under the giant wooden door, alongside some lukewarm water and black, moldy bread. It's very cold here. . . dark and damp. But at least now I get some light, even if only from the cathode ray tube implanted in the dank dungeon wall. Sometimes I think I see things in the pitch black emptiness of my cell. The tube is so much less terrifying.

REALM OF IMPOSSIBILITY

by Mike Edwards
ELECTRONIC ARTS
2755 Campus Drive
San Mateo, CA 94403
48K Disk \$35.00

Did you ever have a nightmare where you were running from a terror so blood-curdling that your frenzied mind would not allow it around that last corner? Well, I have, when I'm *lucky*. The **Realm of Impossibility** is a return to those happier times, but it is merciless, allowing your antagonist—much to your horror—around that last bend.

The evil cleric Wistrik has stolen the seven crowns of the Middle Kingdom, hiding them in his vast network of dungeons. As you may now have surmised, you must set foot in the caves, face the peril, find the crowns, and flee with your life (and don't forget the crowns).

At the start of a round, you enter any of 13 dungeons. Some are locked and cannot be entered without the key secreted in another. While 129 rooms may sound impressive, the dungeons themselves are similar, and after the first couple, there are few surprises. It's just in and (if you can survive) out. Also disappointing was the predictability. The dungeons did not form a maze, having only one obvious way in and out. I could never get lost, one of my favorite nightmares.

Indeed, the action is fast and furious, and you're never able to stop and catch your breath. Just run, run, run; dropping crosses to repel the evil creatures chasing you. Like vampires, they are unable to pass over the crosses; but, alas, the crosses evaporate in only four seconds, so hurry.

You also have, from infrequent time to time, one of three spells to thwart your antagonists. CONFUSE won't help you much, but PROTECT and FREEZE are mighty effective. That's if you can

successfully cast the spell.

Your problem is that you must be perfectly immobile to cast your spell, and in this game you can't afford to stand still too often, or for very long. If you don't believe me, just ask the spider who is stomping on your still and lifeless body. However, this wasn't my only difficulty with **Realm**.

I wanted to zap those zombies and slaughter those spiders. Laying down crosses and running was just too good for them. I wanted a weapon. A rapid fire laser cannon. *Anything*. Probably the similarity to **Bezerk** got to me. The spells were impotent. I was never able to destroy my adversaries—my best hope was a temporary escape from their relentless attacks.

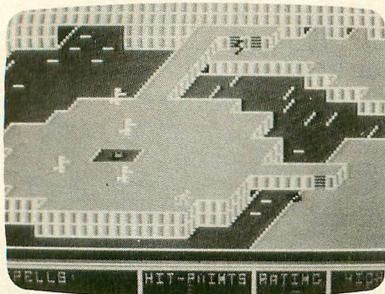
The one-player game is standard fare, but the two-player mode has a few surprises. You and your partner must cooperate, rather than oppose each other. To make it more entertaining, only together can you leave the dungeon, and trying to leave your former friend behind will only strand you at an invisible barrier, where you'll quickly be surrounded by spiders.





PANAK STRIKES! *continued*

These spiders have only one thing on their minds... and it's not your health. When this happens, wait for your companion—or dash back and revive him, if dead—then, perhaps, you can both escape, but I doubt it. Four levels of difficulty keep the challenge fresh.



Realm of Impossibility.

There is no manual; instead, a pre-game option displays the instructions on the screen. Using the space bar, you page through them at your leisure. This will work nicely, but I still missed the superb instruction manual I'm used to from Electronic Arts. Just another disappointment in the **Realm**.

So, while the **Realm of Impossibility** fails on many levels, it is still not bad enough to make me lose faith in Electronic Arts. But I cannot recommend it sight unseen, like so many of their other offerings. The **Realm** is a fair game from a fine company.

THE SCROLLS OF ABADON

by Frank Cohen
ACCESS SOFTWARE, INC.
925 East 900 South
Salt Lake City, UT 84105
48K Disk \$34.95

The **Scrolls of Abadon** contain spells, but you'll need more than magic to successfully master this new machine language mediocrity.

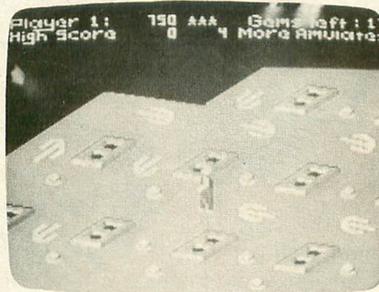
Not that **Abadon** is the worst game that I've ever seen. It's just that it re-trashes some familiar themes which I hoped I'd seen the last of.

Abadon's creator, Frank Cohen, is not completely unknown to me. He authored a game (**Cohen's Towers**) under the Data-most label, which, unfortunately, fell into my hands a few months back. Not even intense psychotherapy could return me to normalcy after that one. And, although **Abadon** has not cured him of lack of originality, it does at least prove

him capable of producing a visually interesting product.

In the world of **Abadon**, the Wizard transports you onto the game grid and curses you with the task of collecting the four pieces of his magic amulet. The game is basically a variation on the **Pac-Man** theme, which I never did find very appetizing. The twist is that gathering up a gem leaves an arrow in its place, an arrow that, later, cannot be passed over in the wrong direction. This is referred to as the "Rule of the Arrows" and makes it child's play to trap yourself in a corner with a hideous creature. When this happens, there is only one hope: a spell.

Scattered throughout the grids you'll find scrolls containing spells to change some condition of the game, giving you an advantage. For example, the WALK spell allows you to cross over the arrows in the wrong direction, while the ICE spell freezes your foes in their tracks.



The Scrolls of Abadon.

However, spell is limited in duration or number of uses. Casting the spells is difficult; you must abandon the joystick and type the name from the keyboard, a clumsy task. I could rarely get the spells off fast enough to survive.

Although the outer packaging states "Full instruction manual included," the manual itself is little more than a slip of paper. But the pamphlet does let you quickly start playing the game, and that is the important factor. The background story is best ignored.

Visually, the game is interesting and reminiscent of **Zaxxon**. The field is constantly scrolling, displaying only a portion of the current grid at any one time. A peculiar sound accompanies the arrival of one of your enemies, and if you don't pay attention, one of them is likely to drop in right on top of you. You are trapped on the game grid until you've collected all the gems, whereupon a

power disk will appear to carry you on to the next screen. Once you've obtained the four amulets, you may move on to the next level. Tapping the space bar shows an overhead view of the grids completed, allowing you to plan future strategy.

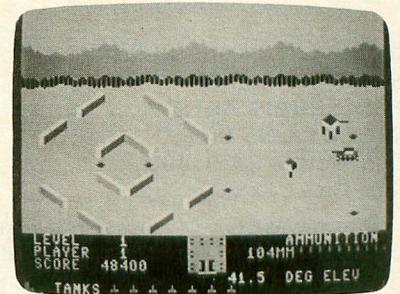
Overall, the **Scrolls of Abadon** is an interesting game which you can play for a fair amount of time before mastering, the main problem being that there is little motivation to do so.

BEACH-HEAD
by Bruce Carver
ACCESS SOFTWARE, INC.
925 East 900 South
Salt Lake City, UT 84105
48K Disk \$34.95

Beach-Head is billed as the ultimate war game, and is also self-proclaimed as destined to be a video game classic. Although this boast goes unfulfilled, **Beach-Head** is a bit more original than **Abadon**—a good starting point for any game. Unfortunately, **Beach-Head** goes little further and falls far short of the finish line.

The war is comprised of a number of battles utilizing air, sea and land forces. You pass through multiple screens on your way to the final conflict.

In the Aerial Reconnaissance phase, you are shown an overhead map of the enemy territory. At this point, you decide upon either a sneak attack or a full frontal assault.



Beach-Head.

While the sneak attack catches the enemy by surprise, you must navigate a heavily-mined, narrow channel to circle the enemy, and this strategy usually costs you a few ships. However, chancing the channel will lessen the number of enemy crafts you must battle in the following phase.

In the second stage, you battle enemy fighter squadrons, while moving back



PANAK STRIKES! *continued*

and forth and controlling range of fire with the joystick. The problem here is getting used to three-dimensional battle. Once you do get used to it, you will advance to the next stage.

Enemy battleships and cruisers are now attacking, and control is similar to the last stage, except that you lob your bombs at the enemy, mortar style. A readout shows you how far you over- or undershot your enemy, the trick being to home in—in time. Succeed and you will be ready to land.

Land your tanks on the beach and fight your way through the island defenses to the fortress of Kuhn-Lin. The road is lined with mines, bunkers, and enemy tanks, so only a few of your tanks will reach their final destination.

Kuhn-Lin. The fortress must be hit by ten shells, in the right order, before it will fall. Here, you'll need all your boot camp training to survive. Once the huge defense cannon gets you in its sights, it's curtains—it never misses. The more tanks you get through, the better your chances are.

But, although the format seems great, the complexity seems to breed some rather unpleasant side effects. The joystick is sluggish, and not only because I use the old Atari CX80. No, sometimes, particularly on the second stage, it controls like a BASIC game—slow and frustrating.

Graphics are also far below average, wasting the power of your Atari. The instruction pamphlet does describe the game adequately, but is as exciting as a mess hall meat loaf recipe. Much time is spent waiting for the disk to load new information into the memory, and some of these loads were so slow I thought the program had crashed.

In fact, the entire game is lacking in overall quality, to such an extent that its originality cannot compensate. **Beach-Head** would be best suited to burial at sea.

SPY VS SPY

by Mike Riedel

FIRST STAR SOFTWARE

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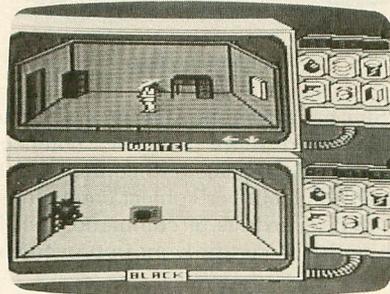
48K Disk \$29.95

This game is the official video version of *MAD* magazine's "Spy vs Spy" feature. Thus, to understand **Spy vs Spy**, you have to understand *MAD* magazine, which is quite a task in and of itself.

While I'm not sure whether I should

admit that, on occasion, I have not only understood but also enjoyed *MAD*, I am sure that those won't understand *MAD* are much more likely to enjoy this game—because, as we all have learned by now, few artistic achievements survive the translation to another medium.

The video version places the distinctive black and white spys onto your display, utilizing a process called Simulvision. Using a split screen, the two spies Simulplay at the same time, white on top, black on bottom. Your mission is to escape the embassy with the top secret briefcase.



Spy vs Spy.

As each spy moves through the building independently, each display shows a three-dimensional view of each spy's current room. Moving with the joystick, you search the room for needed items.

Using the Trapulator, you can set and defuse traps, as well as generally keep track of your progress. The Trapulator is simply a visual icon menu located to the right of each spy's room display. Using an arrow controlled by the joystick, you make selections of traps, remedies, or a map of the complex.

The fun begins when both spies occupy the same room. Both spies appear on one display and battle with clubs (or run, depending on your courage).

Before you begin play, you choose a difficulty level, which sets both the number of rooms in the embassy and a time limit. The embassy varies from six to seventy-two rooms, sometimes on multilevels. You can also choose whether to have the exit door hidden until the end, or marked throughout play.

However, your most important choice is whom you choose as your opponent. If you choose the computer as your adversary, while you can set its IQ from imbecile to genius, the resulting play is the usual video fare—basically a hunt and hide-and-seek game with little ex-

citement. This game cannot be recommended.

But, when two play, the program becomes more enjoyable. It's a *MAD*cap mission, with the other spy taking on the personality of your soon-to-be-enemy. It becomes a fight between two old enemies, both aware of the other's strengths and weaknesses. Will he fight or run? Where would he be most likely to hide that bomb? The tension is oftentimes *MAD*dening.

However, there are drawbacks. Due to the fact that the potential display size is halved, thanks to Simulvision, resolution is below average, and some smaller objects are tough to distinguish.

The rules of play are complex, and time must be invested to learn them. Also, while control is good in hand-to-hand combat, it takes a long time to learn to efficiently set traps and defuse them. . . often, the game simply becomes one of "chase and fight," rather than one of stealth, cunning and trickery—the true essence of **Spy vs Spy**.

The manual fully and completely describes game play, but, while trying to duplicate the spirit of the magazine, it fails to achieve the requisite level of *MAD*ness.

So, as a one-player game, **Spy vs Spy** cannot be recommended, but, when two play, it becomes a game combining both fast reflexes and a little insight and strategy, rising from a poor game to a fair one.

THE SERPENT'S STAR by Jeff Johanningman BRODERBUND

17 Paul Drive

San Rafael, CA 94903

48K Disk \$39.95

The *Serpent's Star* returned me to the world of graphic adventure, a genre that combines puzzle solving with colorful, high-resolution graphics, whisking the player away to strange new worlds.

Almost two years ago I tackled my last graphic adventure, S.A.G.A.'s **Adventure**, and since then I have chosen Infocom exclusively for my adventures. Happily, during my abstinence, they've begun to rectify some of the problems inherent in games of this type—some, but not all.

You, as Mac Steele, Archeologist and Finder of Lost Treasures, have discovered that, after months of searching, the sacred scrolls were to be in your hands for only a night before being stolen again



PANAK STRIKES! *continued*

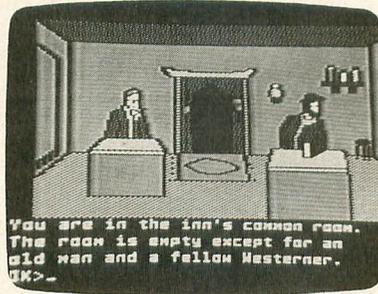
... But not before a partial translation revealed to you the existence of the **Serpent's Star**, a miraculous gem which bestows upon its owner immortality, as well as great monetary potential.

So you set out, again, in search of the scrolls, which rumor places in a glass case in a sacred monastery. After finding the scrolls, completing the translation will lead you to your final goal, the **Serpent's Star**—but only after solving riddles and avoiding a premature termination of the game, and your life.

When graphics are used to enhance an adventure, a number of distinctive problems arise. Plot and character development are subordinated to colorful images; long disk loads slow play; the simplicity of the game (usually only a search for items, rather than an integrated story with places to go, people to meet and worlds to conquer) makes for boring play.

Fortunately, **Star** has remedied some of these deficiencies. First, while the lengthy disk loads are necessary, usually

many images are loaded at once, lessening the total loads and allowing rapid successions of images to flash on the screen.



Serpent's Star.

Star has also improved its program to allow use of more complete sentences than simple subject/verb commands. It accepts subject/verb/object commands, as well as strings of commands. Still, while this is certainly an improvement

over **Adventure**, the program structure comes nowhere near the complexity of an Infocom adventure. Also, some commands which should work, according to the manual, simply don't.

Finally, although the game does have a plot, it isn't much more than the usual search plot. It's true that there are riddles to solve and people to meet, but the riddles aren't very challenging, and the people are less than two dimensional.

The manual explains all versions of the game for the various systems (Apple, Atari, and so forth). While allowing you to start play, and answering some of the basic questions, it lacks depth and supplies little background story or helpful hints.

Call the exterminator! The program is full of bugs, probably due to inadequate testing. There isn't room to mention all the bugs I found, but they are both annoying and deadly.

Some commands cause objects in your possession to be dropped, and often you cannot exit a certain position—the program tells you that it doesn't even recognize **RESTART GAME**, a very important express command. When this happens, you must reboot the game and start anew.

So, while **Serpent's Star** shows great improvement in the graphic adventure, it is still not enough to win me back from Infocom. However, if colorful images are more important to you than strong plot and characters, then the **Serpent's Star** is for you.

Well, that just about rounds it up for this time, but before I power down, I'd like to thank Perfect Computers of Niles, Ohio for their assistance in the creation of this article. □

Steve Panak is a banking computer operator and free-lance writer living in northeastern Ohio. He holds a B.S. in B.A. and currently attends law school, where he develops software to teach complex legal concepts. In his spare time, he enjoys computer games.

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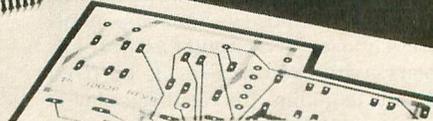
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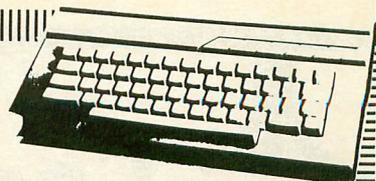


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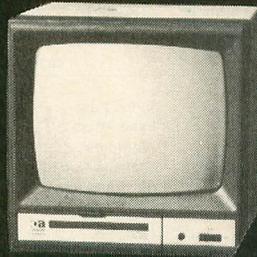
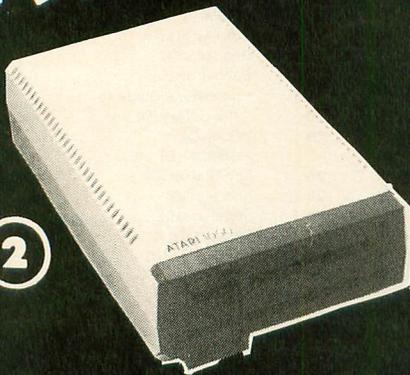
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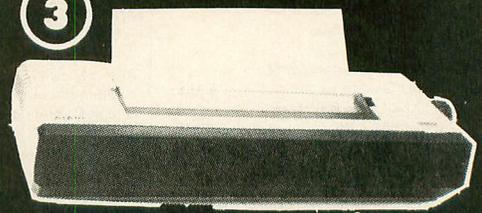
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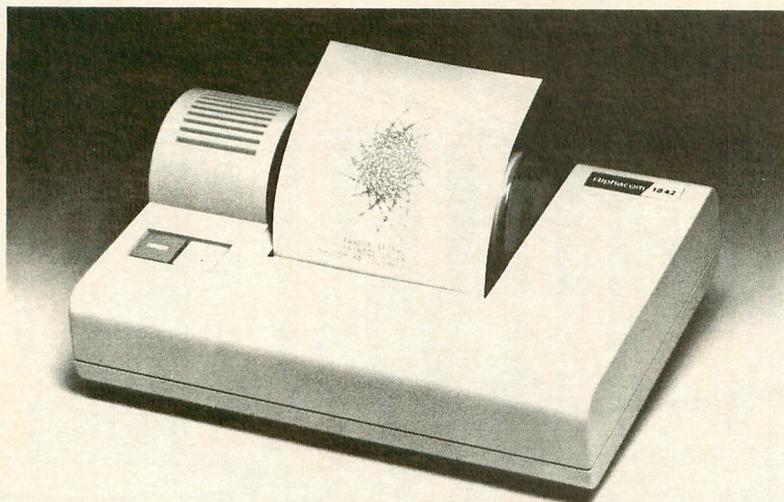
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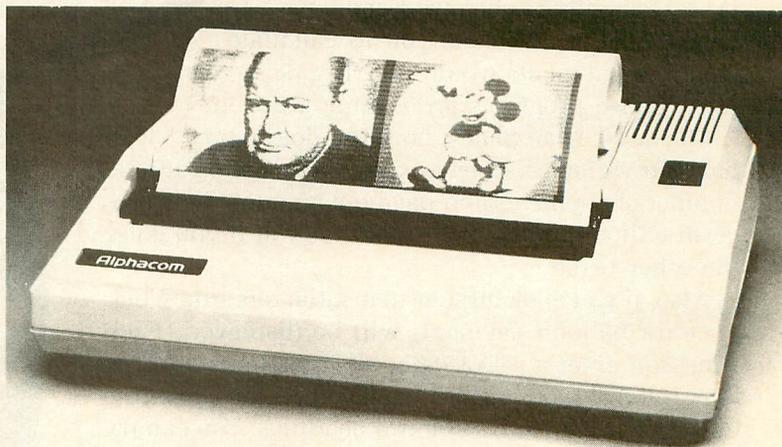
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CIRCLE #129 ON READER SERVICE CARD



Loan Shark

A payment calculator for home use

by Marty Schmidt

Almost everyone has, at one time or another, borrowed money. **Loan Shark** will enable you to calculate what the payments would be. "Big deal," you say, "Those programs are a dime a dozen."

Maybe so. **Loan Shark**, however, does more. A loan has four variables. They are: principal, interest rate, number of payments and payment amount. This program will compute *any* of them for you if you enter the other three.

Also, if you enter all four items, the remaining balance (or balloon payment) will be displayed. Each time you enter a set of data, all four items and the total interest paid will be displayed on the same line under their respective column headings. You can try many different combinations and compare results, since all data will remain on the screen.

Using Loan Shark.

To use the program, simply enter the values as they are requested at the bottom of the screen. Press RETURN without an entry to skip the unknown item. When entering the principal and number of payments data, you can enter two values separated by a plus, minus, multiplication or division sign.

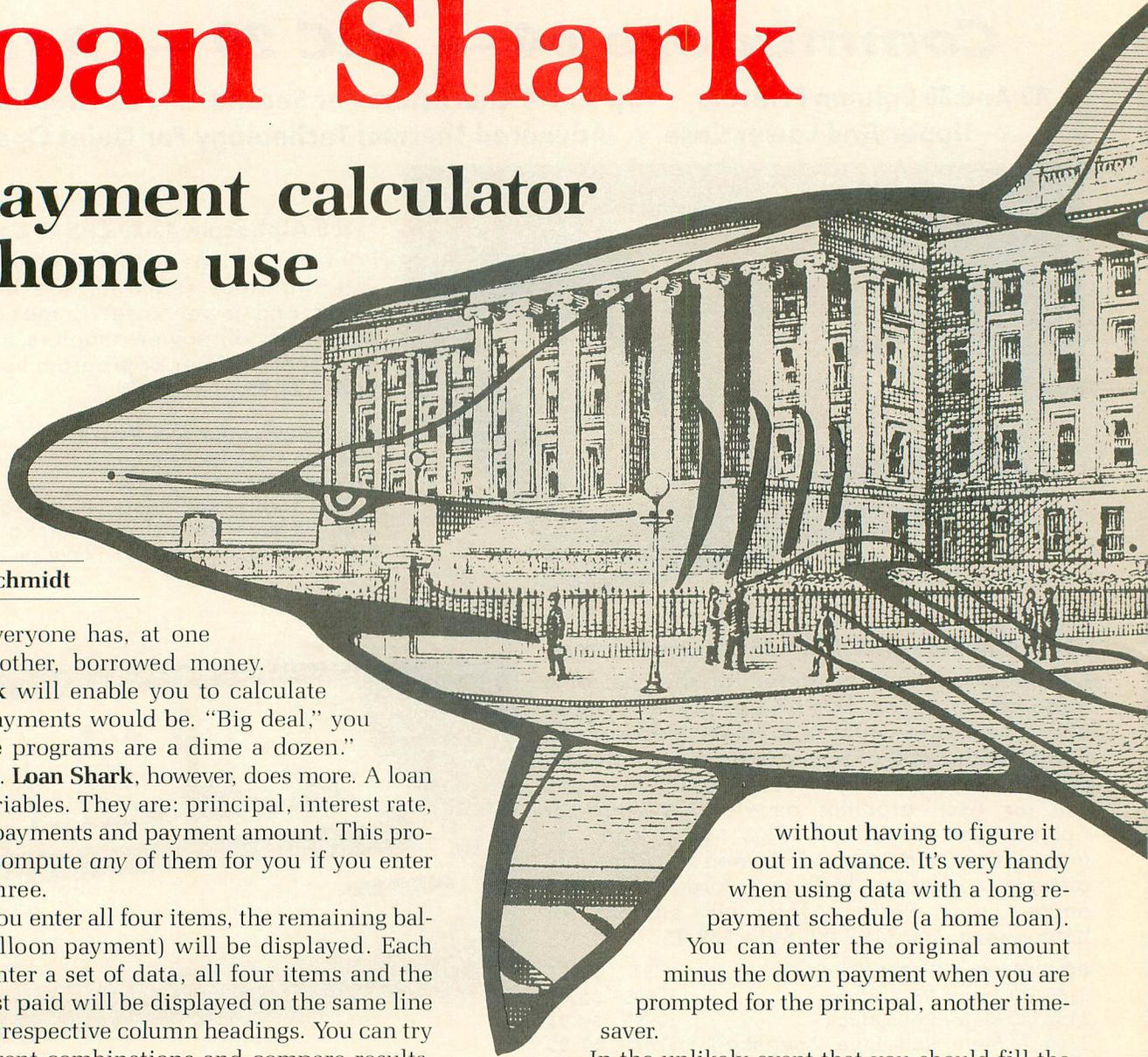
This can save time, as you can enter the number of years times twelve for the number of payments,

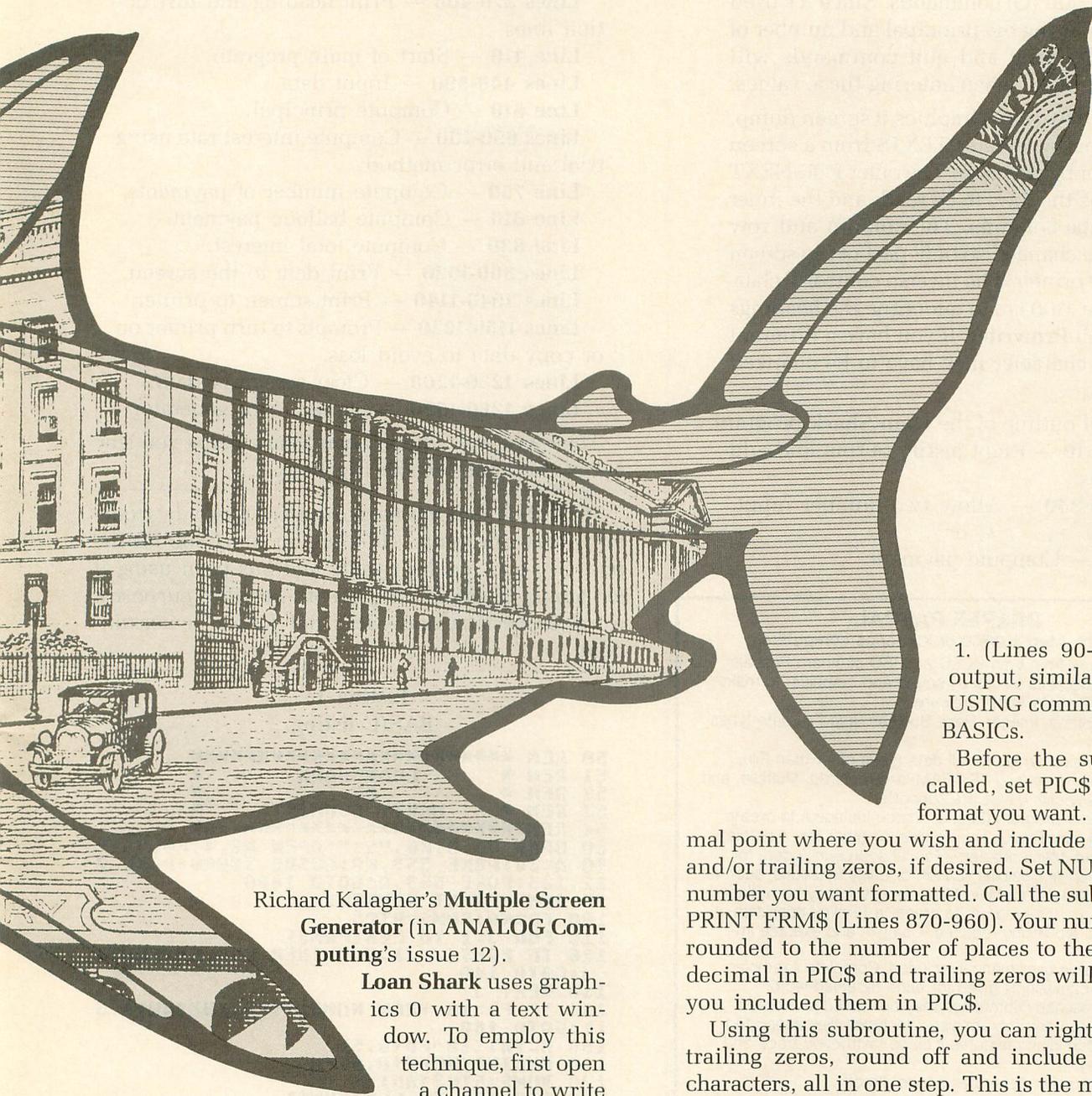
without having to figure it out in advance. It's very handy when using data with a long repayment schedule (a home loan). You can enter the original amount minus the down payment when you are prompted for the principal, another time-saver.

In the unlikely event that you should fill the screen and then enter more data, you will receive a prompt to turn your printer on, if you have one—or else copy the numbers you want to save. When you proceed, the screen will clear. If you do have a printer, the column headings and all data will be printed. The data can be printed at any time by entering *P* when prompted for the principal or number of payments.

The program.

The colors for the display were generated using





Richard Kalagher's **Multiple Screen Generator** (in **ANALOG Computing's** issue 12).

Loan Shark uses graphics 0 with a text window. To employ this technique, first open a channel to write to the screen (*OPEN*

#6,8,0,"S:"), then you can *POKE 703,4*. When you print to the upper twenty lines, use a *PRINT #6* command. The top lines will not scroll with the bottom four lines, but will remain on the screen. The text window can then be used for input prompts and other instructions, and cleared with a simple clear screen command.

Following are three subroutines from this program which can, with minor changes, be incorporated into your programs.

1. (Lines 90-210) Format output, similar to a *PRINT USING* command in some BASICs.

Before the subroutine is called, set *PIC\$* equal to the format you want. Put the decimal point where you wish and include a dollar sign and/or trailing zeros, if desired. Set *NU* equal to the number you want formatted. Call the subroutine and *PRINT FRM\$* (Lines 870-960). Your number will be rounded to the number of places to the right of the decimal in *PIC\$* and trailing zeros will be added if you included them in *PIC\$*.

Using this subroutine, you can right justify, add trailing zeros, round off and include any special characters, all in one step. This is the most versatile formatting routine I have seen for the Atari.

2. (Lines 230-340) Two number input.

The BASIC on my pocket computer enables me to enter a series of numbers separated by arithmetic operators, all in one step. For instance, you can enter *247-119*, and the value *128* will be entered. Atari BASIC does not allow this, so I wrote a simple subroutine enabling entry of a sign (+, -, *, /) between two numbers. You input to *Q\$*, call the subroutine, and the variable *X* contains the result.

This subroutine, as used here, also checks for the

print (P) and quit (Q) commands. Since it's used only when entering the principal and number of payments, the print and quit commands will only be recognized when entering these values.

3. (Lines 1040-1140) Graphics 0 screen dump.

This subroutine creates TEXT\$ from a screen line, character by character. The outer FOR-NEXT loop contains the rows to be read, and the inner loop reads the columns. The column and row values can be changed so only part of the screen is sent to the printer. The inverse control T characters in Line 1100 are to underline the headings using a C.Itoh **Prowriter**. If you have a different printer, this character may have to be changed accordingly.

Here's a brief outline of the **Loan Shark** program.

Lines 90-210 — Right justify output and add trailing zeros.

Lines 230-340 — Allow two-number input, separated by +, -, *, or /.

Line 360 — Compute payment.

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CIRCLE #130 ON READER SERVICE CARD

Lines 370-400 — Print heading and instruction lines.

Line 410 — Start of main program.

Lines 440-590 — Input data.

Line 610 — Compute principal.

Lines 650-730 — Compute interest rate using trial and error method.

Line 750 — Compute number of payments.

Line 810 — Compute balloon payment.

Line 830 — Compute total interest.

Lines 860-1020 — Print data to the screen.

Lines 1040-1140 — Print screen to printer.

Lines 1150-1220 — Prompts to turn printer on or copy data to avoid loss.

Lines 1230-1260 — Clear screen of data.

Lines 1280-1520 — Screen color generator.

There you are. I hope **Loan Shark** helps you stay out of the hands of the Big Boys. □

Marty Schmidt has been a pattern maker by trade, for twenty-one years. He's had an Atari 800 for the past two and one-half years and has been using it for family financial and record-keeping purposes, word processing and—let's not forget—entertainment.

Listing 1. BASIC listing.

```

50 REM *****
51 REM *      LOANSHARK      *
52 REM *          BY          *
53 REM *      MARTY SCHMIDT  *
54 REM *****
80 OPEN #6,8,K0,"S":OPEN #2,4,K0,"S:"
90 A=34:POKE 559,K0:GOSUB 3000:POKE 7
12,186:POKE 559,A:GOTO 1000
95 REM FORMAT NUMBERS
100 FD=K0:FRM$=PIC$
110 FOR J=1 TO LEN(FRM$)
120 IF FRM$(J,J)="" THEN FD=LEN(FRM$)
-J:GOTO 140
130 NEXT J
140 IF FD=K0 THEN NUM$=STR$(INT(NU+0.5
)):GOTO 180
150 H=INT(10^FD+0.5)
160 NU=INT(NU*H+0.5)/H
170 NUM$=STR$(NU)
180 FOR K=1 TO LEN(NUM$)
190 IF NUM$(K,K)="" THEN 210
200 NEXT K
210 FRM$(J-K+1,J-K+LEN(NUM$))=NUM$
220 RETURN
300 REM INPUT ROUTINE
310 FOR L=1 TO LEN(Q$):W=ASC(Q$(L,L))
320 IF W=46 THEN 350
330 IF W=81 THEN POP:GRAPHICS K0:POKE
82,2:NEW
335 IF W=80 THEN TRAP 5300:GOSUB 5010:
POP:GOTO 1040
340 IF W<48 OR W>57 THEN 370
350 NEXT L
360 X=VAL(Q$):RETURN
370 Y=VAL(Q$):Z=VAL(Q$(L+1,LEN(Q$)))
380 IF W=43 THEN X=Y+Z:RETURN

```



Loan Shark *continued*

```

390 IF W=45 THEN X=Y-Z:RETURN
400 IF W=42 THEN X=Y*Z:RETURN
410 IF W=47 THEN X=Y/Z:RETURN
490 REM FIGURE PAYMENT
500 TEST=(P-B*(1+I)^-N)/((1-(1+I)^-N)/I):RETURN
600 POSITION K0,K0:? #6;" PRINCIPAL
APR # PAYMENT TOTAL INT";:RETURN
700 POSITION K0,19:? #6;"RETURN TO SKI
P : P TO PRINT : Q TO QUIT";:RETURN
1000 POKE 82,K0:POKE 703,4:POKE 755,K0
:GOSUB 600:GOSUB 700
1010 DIM PIC$(15),FRM$(15),NUM$(15),Q$(30),TEXT$(1000)
1030 REM INPUT DATA
1040 P=K0:Q=K0:N=K0:M=K0:TRAP 1300:GOSUB 700:POSITION K0,20:? "K PRINCIPAL";
1045 POKE 85,20:INPUT Q$:IF Q$="" THEN X=K0:GOTO 1060
1050 GOSUB 300
1060 P=X:B=K0
1070 TRAP 1080:? " ANNUAL % ";:POKE 85,20:INPUT Q:I=Q/1200
1080 TRAP 1300:? "NO. OF PAYMENTS ";:POKE 85,20:INPUT Q$:IF Q$="" THEN X=K0:GOTO 1100
1090 GOSUB 300
1100 N=X:TRAP 1200:? " PAYMENT";:POKE 85,20:INPUT M
1200 TRAP 1300:? "K";:COLOR 32:PLOT K0,19:DRAWTO 39,19:IF P=K0 THEN 1400
1210 IF Q=K0 THEN 1500
1220 IF N=K0 THEN 1600
1230 IF M=K0 THEN 1700
1240 GOTO 1800
1300 ? "K} IMPROPER VALUE!":FOR I=1 TO 400:NEXT I
1310 ? :? " } PLEASE TRY AGAIN.":FOR I=1 TO 400:NEXT I
1320 GOTO 1040
1390 REM FIGURE PRINCIPAL
1400 P=M*((1-(1+I)^-N)/I)+(B*(1+I)^-N)
1410 GOTO 1900
1490 REM FIGURE INTEREST RATE
1500 POKE 559,K0:Q=Q+1:I=Q/1200:GOSUB 500:IF TEST=M THEN POKE 559,A:GOTO 1900
1510 IF TEST>M THEN Q=Q-1:GOTO 1530
1520 GOTO 1500
1530 Q=Q+0.1:I=Q/1200:GOSUB 500:IF TEST=M THEN POKE 559,A:GOTO 1900
1540 IF TEST>M THEN Q=Q-0.1:GOTO 1560
1550 GOTO 1530
1560 Q=Q+0.01:I=Q/1200:GOSUB 500:IF TEST=M THEN POKE 559,A:GOTO 1900
1570 GOTO 1560
1590 REM FIGURE NUMBER OF PAYMENTS
1600 N=LOG((M-I*B)/(M-I*P))/LOG(1+I)
1610 GOTO 1900
1700 GOSUB 500:M=TEST
1710 GOTO 1900
1800 B=(P-M*((1-(1+I)^-N)/I))/((1+I)^-N)
1810 FLAG=1
1900 INT=M*N-(P-B)
1990 REM PRINT DATA TO SCREEN
2000 LINE=LINE+1:IF LINE>(18-(FLAG=1)) THEN GOSUB 5000:LINE=K0:GOSUB 6000:GOTO 2000
2005 POSITION K0,LINE:PIC$=""$ .0
0":NU=P:GOSUB 100
2010 ? #6;FRM$;
2020 PIC$=""| .00":NU=Q:GOSUB 100
2030 ? #6;FRM$;
2040 PIC$=""| ":NU=N:GOSUB 100
2050 ? #6;FRM$;
2060 PIC$=""|$. .00":NU=M:GOSUB 100
2070 ? #6;FRM$;

```

```

2080 PIC$=""|$. .00":NU=INT:GOSUB 100
0
2090 ? #6;FRM$;
2100 IF FLAG=1 THEN 3000
2170 GOSUB 700:GOTO 1040
3000 FLAG=K0
3010 PIC$=""$ .00":NU=B:GOSUB 100
3020 LINE=LINE+1:POSITION K0,LINE:? #6;"PAYOFF AMOUNT FOR ABOVE IS ";FRM$;
3040 GOTO 2170
4990 REM PRINT DATA TO PRINTER
5000 TRAP 5200
5010 POKE 54286,64:FOR ROW=K0 TO 18:POSITION PEEK(82),ROW
5020 FOR COL=1 TO 40:GET #2,CHAR:TEXT$(COL,COL)=CHR$(CHAR)
5030 NEXT COL:GET #2,COL
5035 IF TEXT$(1,2)="" THEN 5100
5040 LPRINT TEXT$
5045 IF ROW=K0 THEN LPRINT "*****"
*****":GOTO 5050
5046 LPRINT
5050 NEXT ROW
5100 POKE 54286,192:RETURN
5200 POSITION K0,19:? #6;" PRESS ANY KEY TO CONTINUE. ";
5205 POKE 54286,192:? "K THERE IS NO PRINTER ON LINE!":? " IF YOU PROCESSED WITHOUT A PRINTER THE DATA NOW ON THE SCREEN WILL BE LOST."
5220 OPEN #3,4,K0,"K":GET #3,KEY:CLOSE #3
5230 TRAP 5100:GOTO 5010
5300 POSITION K0,19:? #6;" PRESS ANY KEY TO CONTINUE. ";
5310 ? "K} TURN YOUR PRINTER ON":? " IF YOU WANT THE ABOVE DATA PRINTED!!"
5320 POKE 54286,192:GOTO 5220
6000 FOR ROW=1 TO 18
6010 COLOR 32:PLOT K0,ROW:DRAWTO 39,ROW
6020 NEXT ROW
6030 RETURN
30000 REM INITIALIZE SCREEN
30005 RESTORE 30170:FOR N=K0 TO 99:READ X:POKE 1664+N,X:NEXT N
30010 COLTAB=1712:LUMTAB=COLTAB+24
30014 X=D5R(1693)
30030 POKE 512,128
30040 POKE 513,6
30060 DSTART=PEEK(560)+256*PEEK(561)
30070 FOR N=DSTART+6 TO DSTART+28
30080 POKE N,130
30090 NEXT N
30100 POKE DSTART+3,194
30120 POKE 54286,192
30125 PRINT CHR$(125)
30140 POKE 710,PEEK(COLTAB)
30150 POKE 709,PEEK(LUMTAB)
30160 RETURN
30170 DATA 72,138,72,174,156,6,189,176,6,141
30180 DATA 10,212,141,24,208,189,200,6,141,23
30190 DATA 208,238,156,6,104,170,104,6,4,14,104
30200 DATA 169,7,160,168,162,6,32,92,2,28,96
30210 DATA 169,1,141,156,6,76,98,228,1,62,170
30220 DATA 156,170,156,170,156,170,156,170,156,170,156,170
30230 DATA 156,170,156,170,156,170,156,162,204,204
30240 DATA 204,204,14,0,0,0,0,0,0,0,0

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Loan Shark *continued*

30250 DATA 0,0,0,0,0,0,0,0,0,0
30260 DATA 0,14,0,0,0,0,0,0,0,0

CHECKSUM DATA.

(see page 34)

50 DATA 275,615,999,968,287,293,752,15
2,741,140,177,739,486,511,5,7140
170 DATA 235,189,389,734,411,589,79,77
0,498,391,776,749,753,56,550,7169
380 DATA 222,233,196,219,385,964,575,5
47,405,235,892,444,582,724,963,7586
1070 DATA 581,693,728,938,565,932,933,
936,714,393,513,715,799,212,718,10370
1490 DATA 95,523,442,718,544,948,727,5
80,735,924,328,724,847,727,278,9140
1810 DATA 419,338,958,247,676,812,97,8
14,957,816,289,818,653,820,939,9653
2170 DATA 14,679,113,79,722,213,681,43
8,525,241,714,383,200,811,87,5900
5100 DATA 485,966,555,836,66,963,969,9
93,428,645,327,86,792,878,847,9836
30010 DATA 738,173,237,201,593,575,213
,687,991,348,788,544,595,57,670,7410
30180 DATA 830,76,821,689,247,241,637,
233,497,4271

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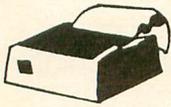
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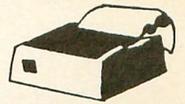
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by **Bob Curtin**

I have friends who own (dare I say it?) that *other* computer. They poke fun at Atari BASIC with its lack of string arrays and its snail-like math package.

"Why don't you get yourself a *real* computer?" they scoff.

"Your mama," I retort. My quick wit is legend in these parts.

Those of us who've been with Atari BASIC for any length of time know pretty much how to work around these limitations. Besides, with its error checking, graphics and sound commands, plus its easy interface with assembly language subroutines, its benefits far outweigh its detriments.

Still, there are times when I've looked wistfully at some of the neat commands and functions available in CP/M's M-BASIC and in versions of BASIC for the Atari other than Atari BASIC.

When you need such things as renumbering, block delete, trace, renaming variables, accessing DOS functions, and so on, the lack of these fosters a study in frustration. True, there are external programs which will accomplish these things, but it involves saving the program you're working on, loading up the utility, reloading your program and then doing it to it. Not exactly the epitome of efficiency. In fact, it's a royal pain.

A company called First Byte now produces **Enhancements to BASIC: A Better BASIC for Your Atari**. It is just that. A better BASIC. It's a program which creates a boot disk with all of the above (and more) integrated into Atari BASIC, so that the additional functions are available on command—without changing disks or loading programs.

To use it, simply boot it up without the BASIC cartridge or by holding down OPTION on the XLs. **ETB** takes the place of the BASIC cartridge or the built-in BASIC in the XL machines.

ETB supports forty new commands, only two of which are program mode commands. The other thirty-eight are immediate mode commands, which are used for help in programming. Some perform functions available elsewhere, but which require external programs to implement.

A number of the commands supported are: NUM-automatic line numbering; REN-renumber program lines; DEL-is to delete a block of program lines; LVAR-list the variables in a BASIC program; SVAR-search for lines containing a specific variable; CVAR-change a variable name; DUMP-send anything which goes to the screen editor to the printer instead; and SCREEN-cancels the DUMP command.

In addition to the above, there are commands which allow you to access DOS functions directly through BASIC, instead of having to load in the DUP.SYS as you would normally. All of the DOS functions are available except the duplicating, binary functions, writing DOS files and, of course, run cartridge. (How many times have you wanted to check out the disk directory on a disk during a heavy programming session?) This alone is worth the price of **ETB**, but there's a lot more.

What makes this such a great little program is that it's both upward and downward compatible. Since the new commands, with the exception of TRON (trace on) and TROFF (trace off) are immediate mode, there's no trouble at all with using **ETB** with old or new programs, and then running them either with **ETB** or Atari BASIC.

One of the nifty features available to CP/M and M-DOS users is the ability to program individual keys to perform certain functions. **ETB** sort of provides the same feature.

I say "sort of" because, in essence,

It's a program that creates a boot disk (with enhancements) built into Atari BASIC, so that additional functions are available on command.

you can assign strings to some of the number keys (4 through 0). There are default values assigned to these keys to start with, but they can be redefined to any string up to thirty characters long. (The 0 key can be defined as a string of up to sixty-two characters).

For instance, CTRL-4's default value is LOAD "D:", and the default value for SHIFT CTRL-7 is POSITION. Simply pressing the appropriate key(s) will print the command to the screen at the cursor position.

I always hated typing a lot of PRNT #6 or OPEN #1,4,0,"WITCHES.DAT", so I just assigned them to keys. When I need either one, I press the appropriate key and *presto!* Believe me, the saving in keystrokes in a coding session is enormous.

Another great feature is the TRON command. Again, this is one of the two program mode commands, TROFF be-



ing the other. TRON, when implemented, will trace through the program line by line, and you can choose from a variety of displays, as well as dumping the trace to a printer.

This last option is invaluable if you've got a particularly knotty bug in a program and need a hard copy of the program flow. Multiple nested loops with outside subroutines—or, for that matter, any convoluted algorithm—benefit a great deal from this feature.

ETB is not perfect. There are a number of commands which take up valuable memory space and are of rather limited value. For instance, **ETB** provides you with the ability to adjust the keystroke and repeat timing. Also, for those of you with XLs, you can shut off the keyclick.

There's more, but I'm sure you get the idea. **ETB** does provide you with the option to use differing levels of the commands available, thereby freeing memory if you need it. This is definitely a smart feature.

ETB comes with a program disk and documentation which, though complete, reminds me of the old APX documentation. Let's just say it's without frills.

The reason for this is probably the same reason that **ETB** impressed me so much. You get this professional-level program and the no-frills documentation for a measly \$14.95, including shipping and handling! I don't care who you are; that's a deal in anyone's book.

If you want to make your life easier, save yourself countless hours of programming time, and can part with the price of a bottle of Scotch, **Enhancements to BASIC** is for you. □

Bob Curtin is a machinist who got into computing in 1982, when he bought an Atari 800. He uses his computer for writing, programming, telecommunications, and the more cerebral games. His ambition is to write the definitive computer baseball game.

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- links programs so that one program can provide subroutines to several other programs that are also LOAded in an provides several powerful subroutines itself for other programs to use,
- has several flexible built-in commands and a batch mode,
- supports ATARI 850 RS-232 interface module and has a useful terminal program with upload/download capability.

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- has four variable types: BYTE, BINARY, FLOAT, and STRING, each of which can have up to three dimensions,
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Dr. Quick Explains Buying
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Q. Doctor Quick, your PDQ Disks are double-density. Will they work in my single-density disk drive?

A. Ja. Oh, ja, they work so good, I am telling you, yes! They work like a chum.

Q. Aren't your PDQ Disks better than I really need?

A. I should hop so! We make *sure* it is better, not just this much, but *this* much, and then some. Double density, ja, and 48 tracks per inch, certified. And people is using them right now at 96 TPI, is that better yet? You betcha my life!

Q. So why should I pay for quality I don't need?

A. I can't believe what my ears are telling me! You don't know of the buying on margin? You got *always* to buy on margin. Everything!

Q. Buy on margin?

A. I am drawing you a hyperethical case. You are going to put a steering column in your car, okay? For ten dollars you can get one that will last you two, maybe three years. Then one day it turns to peanut butter while you're driving, and *blooey!*

For twelve bucks, let's say it, you can buy a steering column to last five years. For thirteen fifty you could get one to last 24 zillion years, give or take a zillion. Which one do you go for?

Q. You're talking about a margin of safety, then.

A. You got it. A margin. You like to live dangerous, maybe? Go for the cheapie, save a buck or two. You got better smarts than that? You buy on margin when you get a steering column. Or a disk.

Q. I see your point.

A. No, that is before the point. Now I tell you the point. You ready?

You buy on margin and get better than you need; you smile more, right? Fewer wrinkles in the forehead. Your food goes down nicer. All those tension backaches, they go away. Your doctor looks you over and says, "It's a miracle! I can't believe such perfection in a human person!"

So, you going to chisel? Or do you show is nicht so empty up here, and buy on margin?

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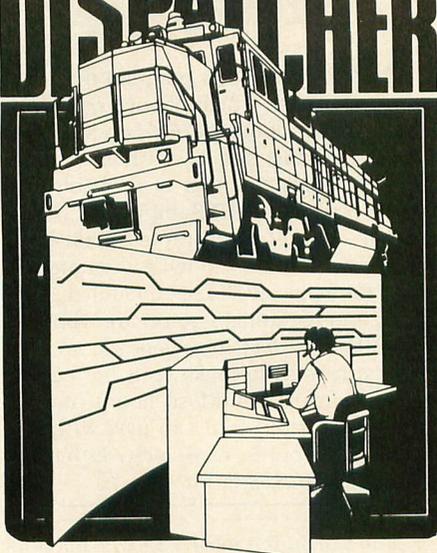
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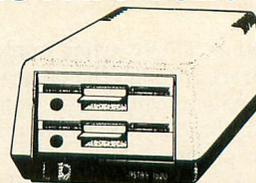
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FIFTY-
SIX

by **Graham L. Potter**

Ever since the first model 400 rolled off the assembly line, salespeople have touted Atari computers as colorful machines. Fascinating graphics demonstrations display brilliant rainbows, and even word processors include the variety and friendliness of multi-colored screens. With a simple BASIC command, any user can change the hue and luminance of his screen to any of 128 available combinations.

The more knowledgeable users are aware that certain GTIA graphics modes support twice as many different shades, for a total of 256. With such a selection, how is a programmer to know what color he wants to use? No doubt, many have experienced the lengthy process of trying one color value after another, until the proper display is reached.

Two-Fifty-Six comes to the rescue. It will exhibit

all of Atari's 256 colors on the screen simultaneously. Cast aside the myth that only 5 colors are allowed at one time! A beautiful display is achieved by the demonstration of more color than most computer users can imagine.

At the end of the rainbow . . .

When **Two-Fifty-Six** is RUN, it will display a simple title screen while it sets up the color chart. After a wait of about twenty seconds, the view will switch to a dazzling grid pattern of all 256 colors in the Atari spectrum.

The chart is arranged in sixteen rows of sixteen columns, with one color across each row and one luminance down each column. The hexadecimal numbers at the sides, top and bottom tell the internal values corresponding to each color.

Select colors for use in a program, or merely admire the power that your computer is demonstrating!

Two-Fifty-Six *continued*

When you're satisfied, press START, SELECT or OPTION to exit **Two-Fifty-Six**.

... Lies a pot of treasure.

For programmers, **Two-Fifty-Six** will reveal the POKE and SETCOLOR values that correspond to each hue and luminance. The hexadecimal values appearing at the sides, top and bottom of the chart give the necessary values, depending on the method to be used.

For use in SETCOLOR commands, take a number from the left or right side and convert it to decimal (A = 10, B = 11, C = 12, D = 13, E = 14, F = 15) for the color, and use one from the top or bottom for luminance.

For use in POKE commands to color registers (for player/missile graphics, perhaps), convert the color value to decimal, multiply it by 16 and add the luminance value.

For machine language programming, the hexadecimal values themselves can be used, with

the color value as the first digit and the luminance value as the second.

Remember that the odd numbered luminances will look no different from the even ones, except in GTIA modes.

How it works.

Two-Fifty-Six uses screen flipping, a technique seen frequently on other computers but rarely employed on the Atari. The title screen is displayed on a text screen that the user watches while the computer sets up the color chart on a graphics screen in memory.

After setting up the title screen in Lines 620-710, RAMTOP (location 106) is changed to "protect" that display while the grid is being set up on a graphics 9 screen. Lines 160-290 plot the numbers and arrange the display list interrupts that allow the extra colors. Special codes for the character graphics are stored in Lines 300-610. Finally, Line 230 will "flip" the display to the newly formed graphics screen.

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CIRCLE #138 ON READER SERVICE CARD

The final word.

Even for non-programmers, Two-Fifty-Six is a magnificent demonstration of the graphics capabilities of the Atari computers. It also serves as an invaluable utility for all Atari users. Unfortunately, it will not operate on Atari 400s and 800s that contain no GTIA chip. □

Graham L. Potter of began programming in the fourth grade and now operates a private business, Cyberphenia International, designing software to suit his clients' needs. A senior in high school and member of the Greater Richmond Atari Support Program, he enjoys writing, math and poetry.

Listing 1.
BASIC listing.

```

100 REM *****
110 REM * ATARI COLOR CHART *
120 REM * by Graham Potter *
130 REM *****
140 REM
150 GOSUB 620
160 FOR A=0 TO 15:COLOR 15:X=A*4+8:Y=5
:GOSUB 250:Y=176:GOSUB 250:Y=A*10+15:X
=4:GOSUB 250:X=73:GOSUB 250
170 COLOR A:FOR I=A*4+8 TO A*4+11:PLOT
I,16:DRAWTO I,175:NEXT I:NEXT A
180 DATA 216,72,173,19,6,24,105,16,141
,19,6,141,10,212,141,26,208,104,64,0
190 RESTORE 180:FOR I=1536 TO 1555:REA
D A:POKE I,A:NEXT I:POKE 512,0:POKE 51
3,6
200 DL=Z3+Z4*256:D=DL+3
210 FOR I=0 TO 175:IF (I-5)/10=INT((I-
5)/10) AND I>20 THEN POKE D+I,PEEK(D+I
)+128
220 IF PEEK(D+I)=79 OR PEEK(D+I)=207 T
HEN D=D+2
230 NEXT I:POKE 54286,192:POKE 559,0:P
OKE 560,Z3:POKE 561,Z4:POKE 623,64:SET
COLOR 4,0,0:POKE 559,34:POKE 53279,8
241 IF PEEK(53279)=7 THEN POKE 77,0:GO
TO 241
242 POKE 106,PEEK(106)+16:GRAPHICS 0:E
ND
250 RESTORE 310+A*20:FOR I=0 TO 2
260 READ J:PLOT X+I,Y+INT(ABS(J)):IF J
<0 THEN 280
270 READ J:DRAWTO X+I,Y+INT(J)
280 IF J=INT(J) THEN 260
290 NEXT I:RETURN
300 REM 0
310 DATA 2,8.5,-1,-9.5,2,8.5
320 REM 1
330 DATA -2,-9.5,1,9.5,-9.5
340 REM 2
350 DATA -2,7,9.5,-1,5,6,-9.5,2,4,-9.5
360 REM 3
370 DATA -1,-5,-9.5,-1,4,5,-9.5,1,3,6,
8.5
380 REM 4
390 DATA 1,5.5,-5.5,2,9.5
400 REM 5
410 DATA 1,5,-9.5,-1,-5,-9.5,-1,6,8.5,
0
420 REM 6
430 DATA 2,8.5,-1,-5,-9.5,-2,6,8.5
440 REM 7

```

```

450 DATA -1.5,-1.5,9.5,1,5.5
460 REM 8
470 DATA 2,4,6,8.5,-1,-5,-9.5,2,4,6,8.
5
480 REM 9
490 DATA 2,4,-8.5,-1,-5,-9.5,2,8.5
500 REM A (10)
510 DATA 3,9.5,1,3,-7.5,3,9.5
520 REM B (11)
530 DATA 1,9.5,-1,-5,-9.5,2,4,6,8.5
540 REM C (12)
550 DATA 2,8.5,-1,-9.5,-2,-8.5
560 REM D (13)
570 DATA 1,9.5,-1,-9.5,2,8.5
580 REM E (14)
590 DATA 1,9.5,-1,-5,-9.5,-1,-9.5
600 REM F (15)
610 DATA 1,9.5,-1,-5.5,-1.5
620 GRAPHICS 17:SETCOLOR 0,0,0:SETCOLO
R 1,0,0:SETCOLOR 2,0,0:SETCOLOR 3,0,0:
Z1=PEEK(560):Z2=PEEK(561)
630 POSITION 1,1:? #6;"analog computi
ng":POSITION 6,3:? #6;"proudly":POSITI
ON 4,5
640 ? #6;"presents";CHR$(14);CHR$(14);
CHR$(14)
650 DL=Z1+Z2*256:POKE DL+14,7:POKE DL+
17,2:POKE DL+24,2
660 POSITION 2,9:? #6;"Two fifty ";CHR
$(14);"Six":POSITION 9,12:? #6;"By
Graham L. Potter"
670 POSITION 4,16:? #6;"PLEASE WAIT":P
OSITION 0,20:? #6;"Press START, SELECT
, or OPTION to Exit"
680 POKE 106,PEEK(106)-16:GRAPHICS 9:Z
3=PEEK(560):Z4=PEEK(561):POKE 623,0
690 I=PEEK(16):IF I>127 THEN I=I-128:P
OKE 16,I:POKE 53774,I
700 POKE 560,Z1:POKE 561,Z2:SETCOLOR 0
,7,4:SETCOLOR 1,1,6:SETCOLOR 2,0,0:SET
COLOR 3,4,3:SETCOLOR 4,0,0
710 RETURN

```

CHECKSUM DATA.

(see page 34)

```

100 DATA 838,713,456,847,86,985,57,217
,591,45,920,509,660,147,368,7439
242 DATA 50,201,424,224,235,763,70,357
,78,112,86,33,94,361,102,3190
390 DATA 86,82,231,90,939,98,344,106,2
40,114,951,807,166,816,776,5846
540 DATA 825,385,834,378,843,689,824,7
1,728,398,363,39,53,662,205,7297
690 DATA 292,128,596,1016

```

256!

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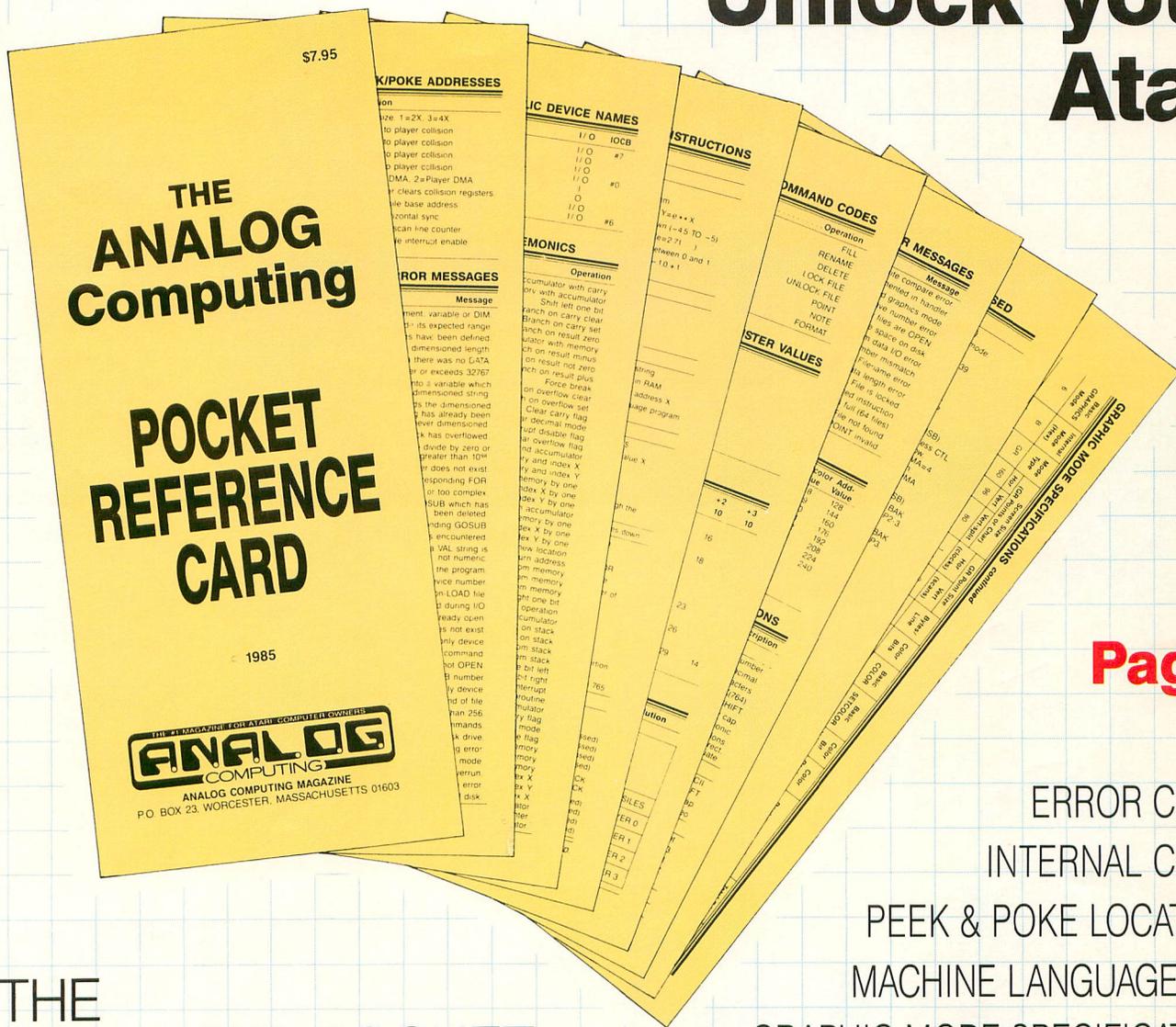
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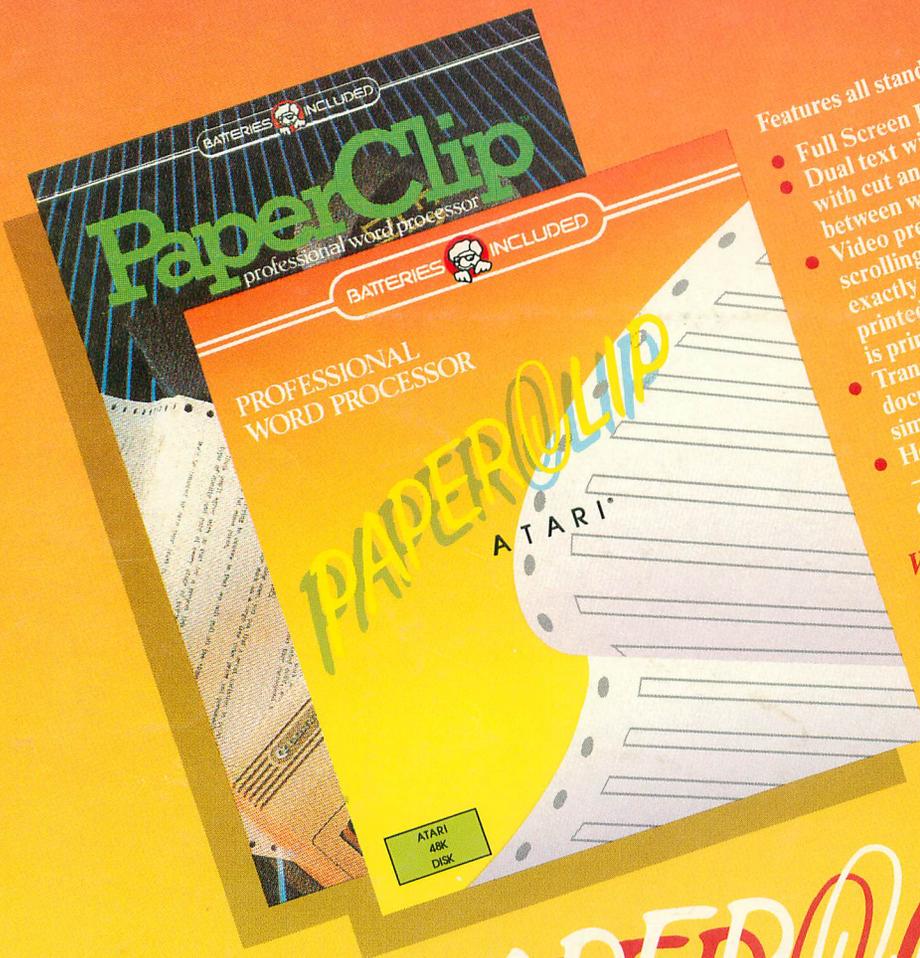
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