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April/May 1984

Volume 1, Number 3

Microkids™

THE MAGAZINE FOR KIDS WHO LOVE COMPUTERS

FEATURE ARTICLES

DEPARTMENTS

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...Take on the world, toughen up your trigger finger and fire away...

Commodore is the best computer value in town...at home, at school and at work... with our exciting, easy to use, inexpensive VIC 20 and C64 computers.

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Vol. 1, No. 3 MICROKIDS MAGAZINE is published bimonthly by Microkids Publishing, Inc., 133 Fifth Avenue, New York, New York 10003. Published in affiliation with Warner Software, Inc. and Cloverdale Press, Inc.

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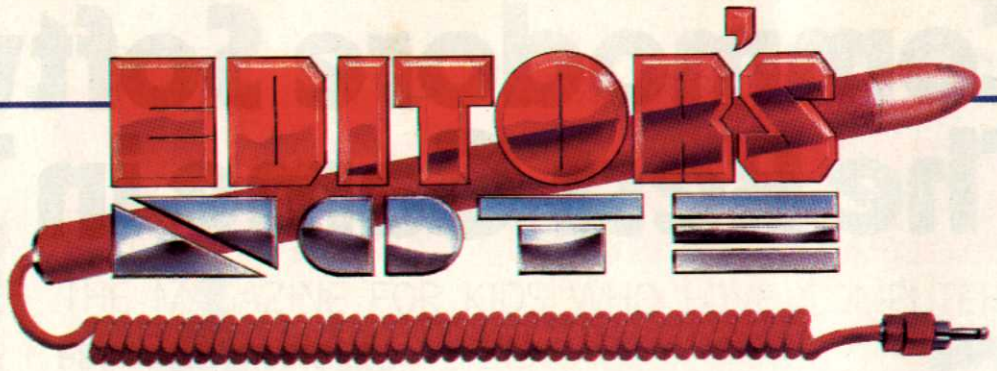


HOW *MICROKIDS* GOT ITS NAME

Since the first issue of *MICROKIDS* came out a number of people have asked us about the name of the magazine and how we chose it. In particular, some people thought, perhaps, that some kids might not like the word *kids*. In fact, the word *kids* doesn't distinguish some outside group from ourselves. *We* are the kids who produce *MICROKIDS* and we're proud to be.

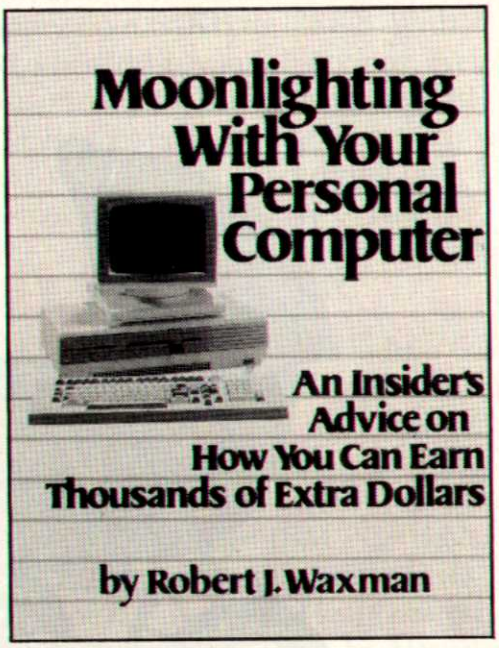
The name was first used in a Pulitzer Prize winning book called *The Soul of a New Machine*, by Tracy Kidder. The book is about a big computer company and the man who put together the team that built one of its big new computers. The man's name was Tom West, and he was something of a computer genius, not to mention a great team player. At the time West's company was trying to produce a newer, larger kind of computer called a supermini. He was working at the company's headquarters in Westborough, Massachusetts. Tracy Kidder himself describes the true meaning of being a Microkid:

> A number of Data General's rivals had produced 32-bit superminis, and the most important from West's point of view was the computer that DEC had recently sent to market, a machine called the VAX 11/780. Data General, meanwhile, had not yet produced a computer of this class. Many people, including West, believed that they must do so, and in fairly short order. . . . It had been painful for West and for a number of engineers working with him at Westborough to watch DEC's VAX go to market, to hear it described as "a breakthrough," and not to have a brand-new machine of their own to show off. . . . But by the fall of 1978 West had drawn around him a team of enthusiastic engineers and they were finally working on their own supermini, which they had nicknamed Eagle. . . .
>
> . . . around this time videotape was circulating in the basement (of the company's headquarters), and it suggested another approach. In the movie, an engineer named Seymour Cray described how his little company, located in Chippewa Falls, Wisconsin, had come to build what are generally acknowledged to be the fastest computers in the world, the quintessential number-crunchers. Cray was a legend in computers, and in the movie Cray said that he liked to hire inexperienced engineers right out of school, because they do not usually know what's supposed to be impossible. West liked that idea. . . . "Shall we hire kids?" said West.
>
> . . . Between the summer of 1978 and the fall of that year, West's team roughly doubled in size. To the dozen or so old hands—old in a relative sense—were added about a dozen neophytes, fresh from graduate schools of electrical engineering and computer science. These newcomers were known as "the kids." West was the boss, and he had a sort of adjutant—an architect of the electronic school—and two main lieutenants, each of whom had a sublieutenant or two. One lieutenant managed the crew that worked on the hardware, the machine's actual circuitry, and the members of this crew were called, and called themselves, "the Hardy Boys." The other main part of the team worked on microcode, a synaptic language that would fuse the physical machine with the programs that would tell it what to do. To join this part of the group . . . was to become one of "the Microkids."

The punchline? In the end the Microkids actually built the computer and got it to market in record time. And *we* are the kids who have built *MICROKIDS* for you.

B.D.M.

You Could Become a MILLIONAIRE Before You're 20



Well, maybe you won't make a million dollars before you're 20. . . then again, maybe you will.

You can start earning money right now, at home — in your spare time! And you don't have to be a computer whiz kid to do it. MOONLIGHTING WITH YOUR PERSONAL COMPUTER shows you (or even your parents) how to turn your "computer know-how" into money. It's the very first book of its kind.

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"Junior" is a powerful tool for modern times. Yet it's simple enough for a child to enjoy.

BRINGING HOME BABY

It's a big day when PC*jr* comes home. The surprises begin the moment you open the carton.

Surprise #1 is the IBM "Freeboard"—a keyboard that doesn't need a connecting cord. The Freeboard frees you to move around and relax.

Then there's the Keyboard Adventure—an instructional exercise for first-time users. It's built into the computer and explained step-by-step in the Guide to Operations. It will help anyone begin learning as soon as PC*jr* is hooked up to a TV set.

In systems equipped with a diskette drive, there's a program that lets you explore computer fundamentals at your own pace, with PC*jr* as your teacher.

And to get you off and running from the very first day, a sample diskette with eleven useful mini-programs (ranging from a spreadsheet for monthly expenses to a word game and a recipe file) is also included.

But there are still more surprises.

FAMILY COMPUTING MADE EASY

Many IBM software programs written for other IBM personal computers will run on PC*jr*. And inexpensive new ones written especially for PC*jr* are being released.

An easy-to-use diskette word processing program, for example, uses pictures as well as words to guide you along. A comprehensive IBM home budget program makes keeping track of money easier. There's also a selection of educational programs for children at home and at school.

And when the work is finished (or perhaps before), the fun can begin. Just slip in a game cartridge and stand back.

GROWING UP WITH JUNIOR

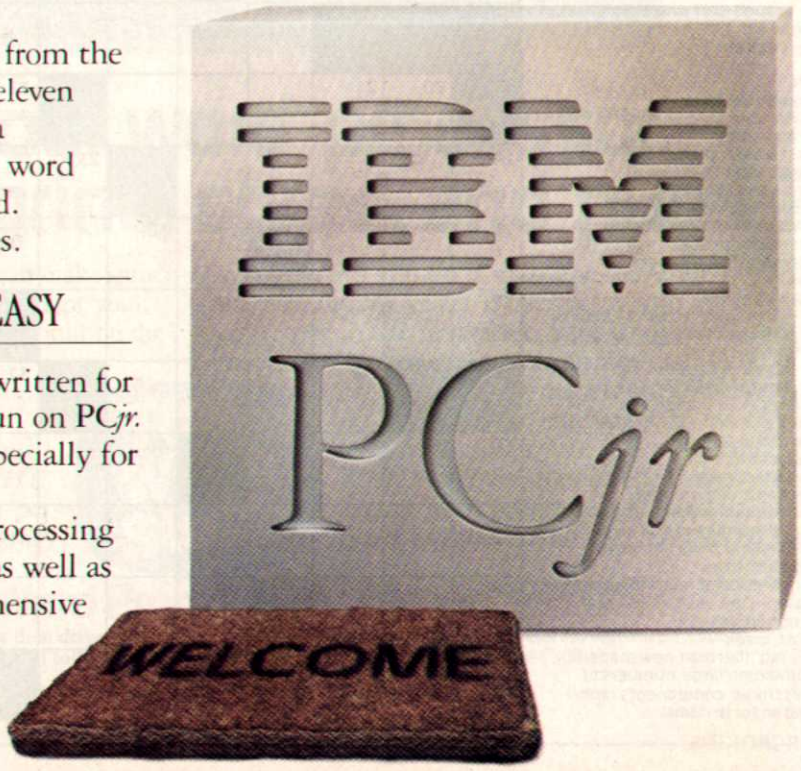
Add a printer. A diskette drive. An internal modem for telecommunications. Increase user memory from 64KB to 128KB. With these and other add-it-yourself options, even the lowest-priced PC*jr* can grow up *real* fast.

PC*jr* is a powerful tool for home, school or college. With its optional carrying case, it's a powerful tool anywhere you care to take it.

SEE JUNIOR RUN

Junior's starting model includes a 64KB cassette/cartridge unit and Freeboard for about $700. A 128KB model with diskette drive is about $1300. (Prices apply at IBM Product Centers. Prices may vary at other stores.)

Your local authorized IBM PC*jr* dealer proudly invites you to see this bright little addition to the family. For the store nearest you, just call 1-800-IBM-PCJR. In Alaska and Hawaii, 1-800-447-0890.



The Chaplin character licensed by Bubbles, Inc., S.A.

WORD TEST

BY LOUIS SABIN

ACROSS

1 Repeatable process
5 King Kong, for one
8 Ms. ---Man
11 Years, in Latin
12 Supplicate; beg
13 Western Indian
14 Paraphernalia
15 On-line customer
17 Take ----- (chance it)
19 Computer users share it
20 Measuring instrument
22 Quod---- demonstrandum
24 Omen identifier
25 Presentation
28 Picnic pest
29 ----- clown
31 Alley --- (cartoon character)
32 Computer pathway
34 Colors
36 Greek god of war
37 Sight, e.g.
38 Suffix with inter or pale
41 Spin
42 Insides
44 Inoperative
48 Prevaricate
49 Pen fillers
50 Combined data
51 --- around (carrying a digit)
52 Grow old
53 ---- Clapton

DOWN

1 Computer delay
2 Basic unit
3 Stop --- dime
4 Software copier
5 Circle segments
6 Groups of data
7 "--- in the Sky"
8 Locations of binary elements
9 Element particle
10 Memory (to old-timers)
12 Set
16 Male deer
18 ----- point (where restart begins)
20 ---- floppy (a small one)
21 Removed from
23 A coordinate used in computer graphics
24 Plant's fluid-holder
25 Took a chair
26 Dial-tone sound
27 Associations (abbr.)
30 Display showing contents of a program
33 Algonquian Indian
35 ------ procedure (a statement controlling program flow)
37 Knights' titles
38 A collection of related records
39 Have ---- (be well-connected)
41 Stopped sleeping
43 Inlet; creek
45 "--- Tag" (German newspaper)
46 Combining large numbers of electronic components (abbr.)
47 And so forth (abbr.)

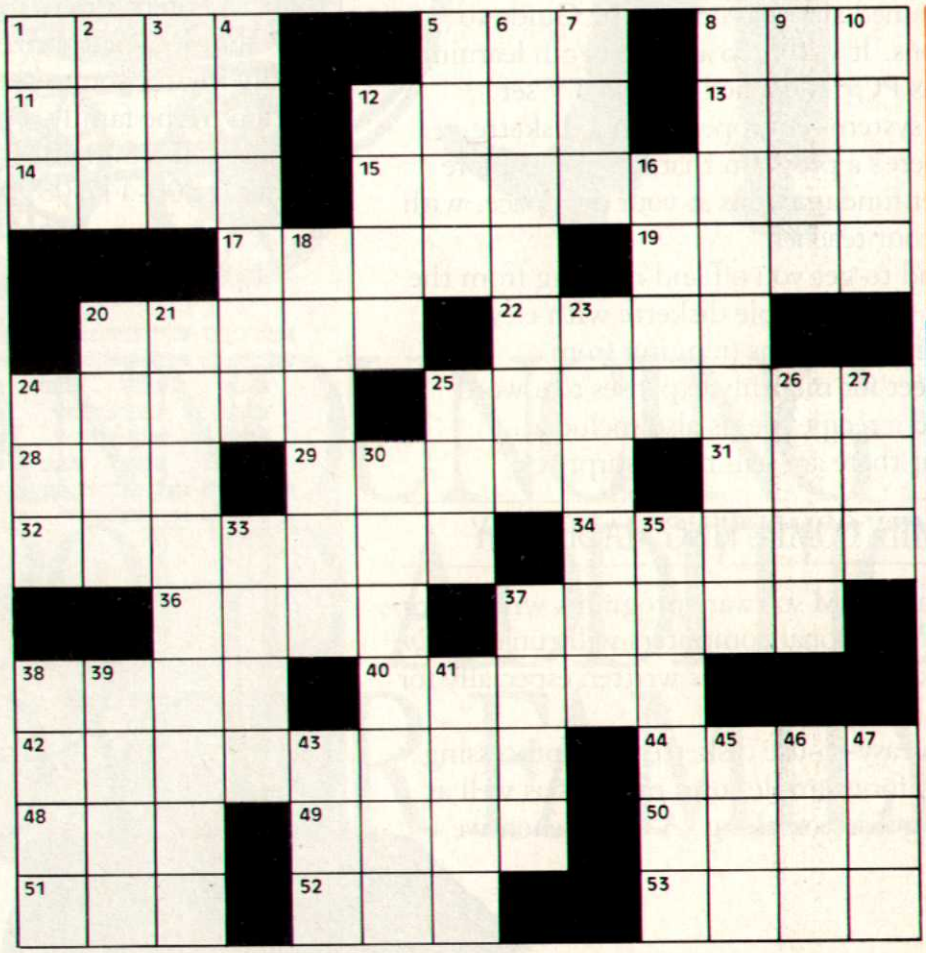
MIX AND MATCH

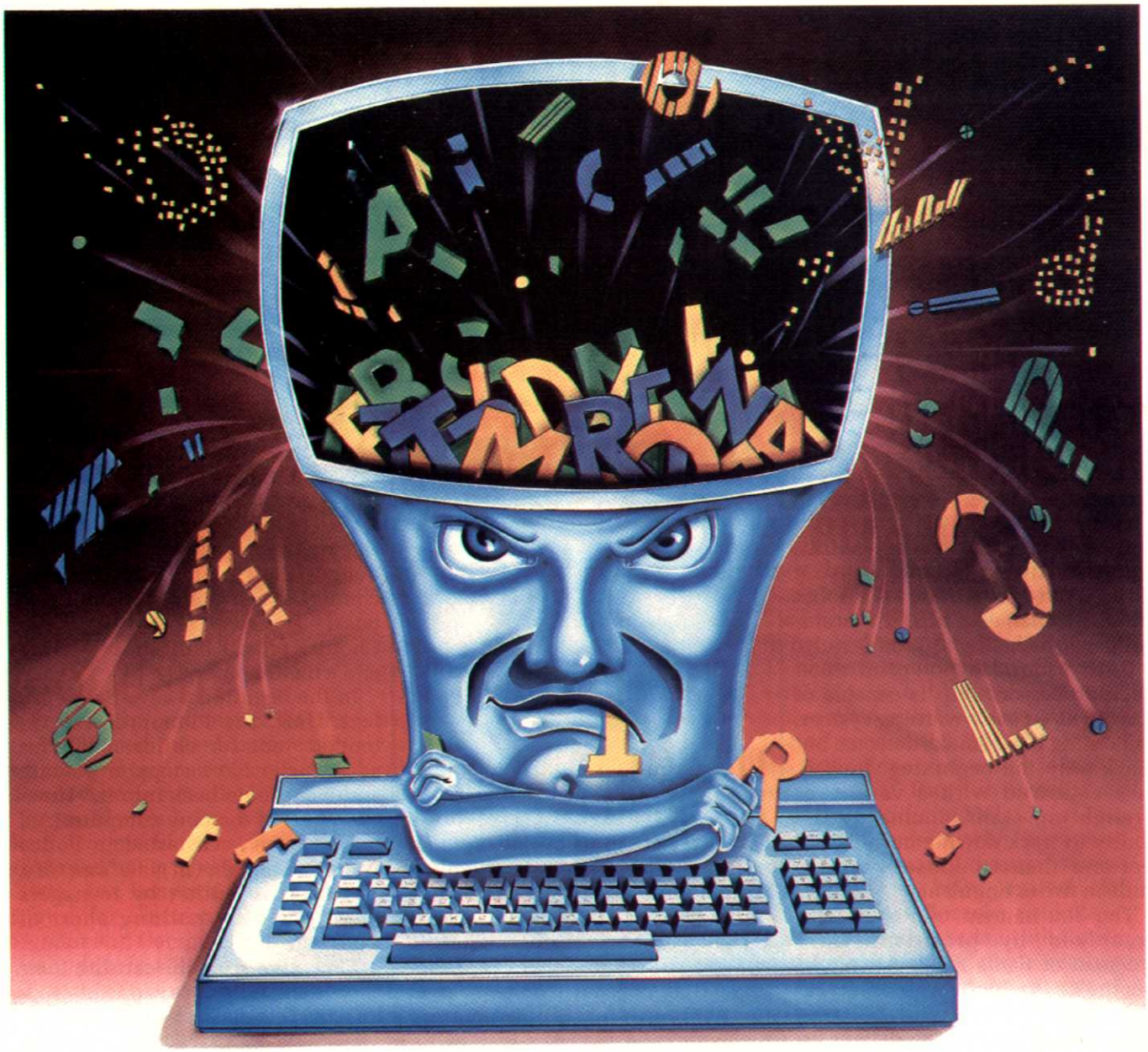
BY JOHN K. YOUNG

Hidden in the word box (right) are 28 words commonly used in computing. These terms may be printed forward or backward, as well as vertically or diagonally. Take a good, long look and see if you can find them all. Good luck!

Analog
Basic
Byte
Cassette
Character
Code
Controller
Data
Datapack
Debug
Disk
Field
Game
Graphic
Keyboard
Kilo
Memory
Modem
Module
Printer
Processor
Programmer
Pulse
Recorder
Retrieve
Speed
Store
Tree

P	H	O	N	E	C	A	M	E	M	O	R	Y
L	P	R	I	N	T	E	R	C	L	S	F	G
K	N	R	E	G	D	W	M	C	O	K	Y	U
E	I	E	O	O	R	O	H	A	C	D	R	B
V	K	L	M	G	P	A	E	A	G	E	E	E
E	N	L	O	N	R	S	P	F	I	E	L	D
I	G	O	L	A	N	A	Y	H	L	P	E	L
R	V	R	C	A	T	S	M	U	I	S	T	N
T	I	T	A	A	A	T	D	M	B	C	T	N
E	E	N	D	R	A	O	B	Y	E	K	E	E
R	D	O	C	T	M	R	T	A	S	R	S	A
R	E	C	O	R	D	E	R	I	S	L	S	L
I	F	O	R	E	N	I	D	A	U	I	A	T
R	O	S	S	E	C	O	R	P	H	I	C	S





Does your word processor chop, slice, grind, shred, and purée?

All too many word processing programs can make mincemeat out of your ideas. They force you to adapt your writing to the computer's needs, when it should be the other way around.

That's why you need *THE WRITE STUFF*,™ the word processing program designed for people who care more about words than processing. With *THE WRITE STUFF*, you don't have to relabel your personal computer keyboard or learn arbitrary symbols. All you do is *write* and leave the processing to us. Making life easier is the reason you got a personal computer in the first place, isn't it? Just tell the machine what you want: centering, justifying, paginating, underlining or boldface, finding and replacing words, moving sections of your text, or undoing your last command. *THE WRITE STUFF* does all the things you'd expect from programs that cost up to five times as much. And that's no sliced baloney.

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BITS AND BYTES

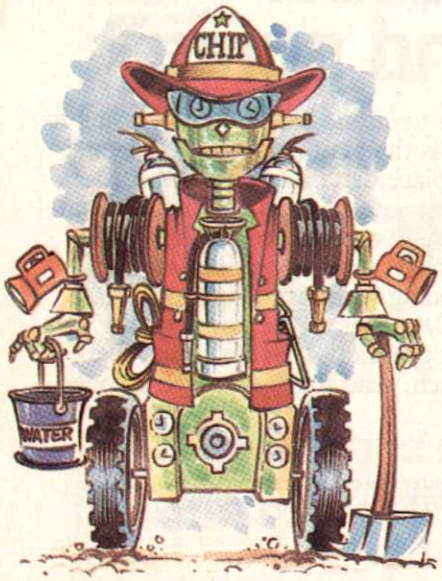
BY ROBERT CUBBEDGE

TOURNAMENT OF ROBOTS

From Santa Ana, CA, comes news of a recent Tournament of Robots, with entries judged on "overall ability, design, dexterity and maze-solving skill." And the winner — a robot "fireman" named Chip, the brainchild of local hobbyist Geoff Schulz.

Built around a powerful 6808 microprocessor, Chip is capable of serving as an early warning system, something like a smoke detector, but that's only the beginning. Indeed, he's endowed with a variety of firefighting skills, including the ability to track down a burning object and then to douse it with a built-in fire extinguisher.

The Tournament of Robots was organized by president Dave Freeman of Santa Ana's Advanced Computer Products, who observed: "Household robots will be commonplace in the not-too-distant future. We wanted to demonstrate the latest developments in this fascinating field."



TELSOL TELLS ALL

On a scale of 1 to 10, the job of truant officer probably rates about a −22. Although necessary, it's clearly one of the most thankless tasks around —right up there with dogcatcher. So at West Hill High School in Stamford, CT, they've turned the job over to a computer appropriately nicknamed Telsol.

Telsol (pronounced "tells all") keeps track of who's present and who's not, which is fairly simple. But it's also equipped with a recording device and a timer that allow it to place telephone calls to the parents of absent teenagers — in the daytime, if it's possible to reach them then, or in the evening when parents are more apt to be at home.

Telsol is, in fact, so efficient, it's reduced the school's absentee rate from 9 percent to 7 percent. It's also proven a hit with parents—but with students, hardly. Says Shawn White, 15: "It's a machine that calls your house and gets you in trouble."

But fellow 11th grader Tracey Marzullo notes there are ways to get around it, if necessary.

Says she: "I answer all the calls at my house. I can just say, 'Wrong number, Ma.'"

CHOPSTICKS, COMPUTER-STYLE

Tired of practicing your piano scales day after day after day? Looking for a shortcut to Carnegie Hall? Then Pianopro may be just the thing you've been waiting for. It's the world's first computerized piano, from the famed Baldwin Piano and Organ Co., whose officials claim it can turn you from a klutz into a virtuoso almost instantly.

How? Well, let's say you hit a middle C. From somewhere deep within the Pianopro, you'll also hear an assortment of chords and embellishments worthy of even a Liberace. Better still, the Pianopro can provide these enhancements in a variety of musical styles, including ragtime, waltz, swing, polka, boogie, latin and two speeds of country. If that's not enough, it also boasts a variety of so-called Fun Chords, plus a built-in key-finder and a metronome.

In the beginning, says Baldwin's Jack Huff, the Pianopro was intended "not for children but for adults who have stopped playing and want to go back into it." However, four of the new computerized pianos have been tested in Police Athletic programs in New York City, and their reception by teenagers there has been nothing short of amazing.

"The kids are still learning their chords and notes," says one instructor, "but this makes learning fun."

WHODUNIT?

For years, the invention of the world's first computer has generally been credited to a pair of University of Pennsylvania scientists, Dr. John W. Mauchly and Dr. J. Presper Eckert. The machine they invented, and on which they obtained a patent in 1964, was known as ENIAC (an acronym for Electronic Numerical Integrator and Computer).

But suddenly, after all these years, there's a new pretender to the crown. He's Dr. John Atanasoff, now 80, who claims to have developed a forerunner to ENIAC while a professor of physics at Iowa State College (now Iowa State University) in the mid-1930s.

Dr. Atanasoff claims that, in fact, Dr. Mauchly traveled to Iowa in the 1940s to see Dr. Atanasoff's pioneering computer, and the two men subsequently exchanged letters. "Is there any objection," Dr. Mauchly asked in one of those letters, "to my building some sort of computer which incorporates some of the features of your machine?"

Why has Dr. Atanasoff waited so long to bring all this to light? Because, he says, he really didn't care all that much about it—until now. "I haven't been given my due, but I might be partly to blame," he said. "To get ahead in the world, you have to make a lot of noise, and maybe I didn't make enough."

BEGINNING OF THE END?

Don't look now, but coin-operated video game arcades soon may be a thing of the past. Says who? Says the town of Marshfield, MA, which recently banned all video arcade games, thereby setting an example for anti-arcade forces throughout the nation.

Marshfield's reason for banning arcade games was simple: The citizens there were convinced that the arcades were falling under the influence of organized crime, and further that they were becoming centers of drug abuse. Marshfield's leading anti-arcade crusader, Tom Jackson (a retired narcotics investigator), has since received inquiries from towns all over the country who want to know how they can do the same.

Fear not, though, all you diehards out there. Coin-operated arcade games never die; they just fade away. To where? In this case, perhaps to the Middle East. Says one Marshfield game operator: "I had a call from some guy who has a company that ships machines to foreign countries where they haven't seen them much before. He said he had a big order from Egypt."

RUSSIAN APPLESAUCE?

Over the past few decades, the Russians have claimed that it was really they who invented just about everything, and now they're at it again. Their newest invention, the Russians say, is a personal computer called the Agatha, a device now rolling off production lines in a small plant at Zelenograd, which is said to be a sort of Russian version of California's Silicon Valley.

Western experts who have seen the Agatha insist, though, that it should have been called the Yabloka. Why? Because *yabloka* in Russian means apple, and there's nothing the new Agatha resembles so much, we are told, as a good old-fashioned Apple.

FEAR NO EVIL

Here's a new word to add to your vocabulary: *compuphobia*. It's a fear of using computers. Which brings us to a study recently undertaken by International Resources Development of Norwalk, CT.

Among people who work with computers, says IRD, there are three clear and distinct types of compuphobia. These incude: 1. a general fear of working with something new; 2. a fear of failure due in part to the feeling that somehow you're losing control of your work output; and 3. a fear of being replaced someday by a machine.

So the word may be new, but the condition is one that probably dates back to the invention of the wheel. You just have to learn to live with it, right? Right! ■

Like any other computer, the Atari works in a digital fashion. Letters and numbers that we understand are entered into the keyboard to be translated into a language that the computer understands. The ASCII (Amercian Standard Code for Information Interchange) system built into every existing computer changes numbers and letters into recognizable data for the machine's CPU to manipulate.

With an Atari BASIC cartridge in place, you can enter ASCII code numbers instead of keyboard characters with the use of the CHR$ function, or find out the ASCII code of a letter by using the ASC function. Since every key has its own ASCII code, there are over 127 different codes to choose from. For instance, the letters A, B and C are represented by ASCII numbers 65, 66 and 67. Enter the small program below, and you'll see how the ASCII numbers are used:

```
10 READ A:IF A=-1 THEN END
20 PRINT CHR$(A); : GOTO 10
30 DATA 65,84,65,82,73,32,67,79,77,
   80,85,84,69,82,83,-1
```

Then type RUN, and you'll see the words: ATARI COMPUTERS appear on the screen. Line 30 contained all the necessary ASCII numbers for those words. The instruction book that came with your computer contains the entire list of ASCII codes, and you can arrange them to create any phrase or number string that you wish.

Now, let's say you lost that instruction book. Don't worry; the computer will tell you the equivalent ASCII codes for any letters you want to know. All you have to do is type in the little program below. Now we wish to know the ASCII Numbers for A, B and C:

```
5 DIM X$(1), Y$(1), Z$(1)
10 X$="A":Y$="B":Z$="C"
20 PRINT "A = ";ASC(X$),
   "B = ";ASC(Y$)," C = ";ASC(Z$)
```

Now type RUN and you get: A=09 G=66 C=67. You can use this program to find any ASCII number easily, which is especially helpful if your instruction book was eaten.

NEW PRODUCTS

If you've ever had the chance to get involved with word processing, you know how important character generation is. Let's face it, most of the word processing programs available for the Atari 400/800 are limited to only 40 characters across.

Fortunately, a company called Bit 3 has solved the problem, and a more convenient 80 columns of text can be generated with the company's Full View 80-Column Board. Priced at $300, the board slips into the fourth expansion slot of the Atari 800 (unfortunately, the 400 has only one expansion slot, and so it cannot be used). Installation is a snap, and within five minutes you can type your programs out in the 80-column mode. To turn the board on, simply pop in a BASIC cartridge and type: A=USR (54818). To go back to the 40-column screen, just press the OPTION and RESET keys simultaneously.

Aside from being able to write programs in the 80-column mode, you can also use the board with a word processing program for convenient and professional screen editing. There is currently one such program designed to work with the board, and it's from LJK Enterprises, Inc. Called Letter Perfect ($99.95), the program is the most advanced word processor for the Atari line of computers. Every conceivable word processing feature is included, and the program automatically turns on the Bit 3 board for you.

NEW SOFTWARE

Since we've been talking about word processing, this month's new program is one that deals with words in a similar manner. LJK's Spell Perfect is a spelling checker program that is designed to work with LJK's Letter Perfect word processing program. Any file that was created with Letter Perfect can be instantly checked for spelling; a word count is also provided.

The Spell Perfect diskette is double-sided. One side is for use with the Bit 3 80-Column Board, the other is for 40 columns. A dictionary diskette also is included. It has an 18,000-word capacity, and you can add your own words as you go along. Although the program can work with a one-drive system, two drives are more practical. Interesting, though, is the fact that Spell Perfect is also capable of working with Percom double-density drives often used with Atari computers.

Spell Perfect's most welcome feature is one that should have been included on Letter Perfect a long time ago. Until now, backup copies of any Letter Perfect program or file could not be made easily . . . or at all. The user would have to purchase a utilities program from LJK for converting LJK DOS to the standard Atari DOS. Once the conversion of a file was made, the Atari Master Diskette could be used to make a copy. However, there was never any way to back up the actual Data or Letter Perfect program itself. Now there's a simple backup command that enables you to copy any LJK program or file, and it's about time. Spell Perfect is priced at $79.95.

—Dawn Gordon

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About the Author

Roger von Oech is a man who puts creative thinking into action for himself and others. He is the founder and president of Creative Think, a Menlo Park, California–based company that specializes in stimulating creativity in business. He provides consulting seminars, conferences and publications, and serves as an idea agency for entrepreneurs and companies such as Apple, ARCO, Colgate-Palmolive, DuPont, Federal Reserve Bank, GE, GTE, Hughes Aircraft, Hewlett Packard, IBM, ITT, Kaiser, NASA, Pizza Time Theatre, ROLM, Sears, Tektronix, Wells Fargo Bank, and Xerox, among many others.

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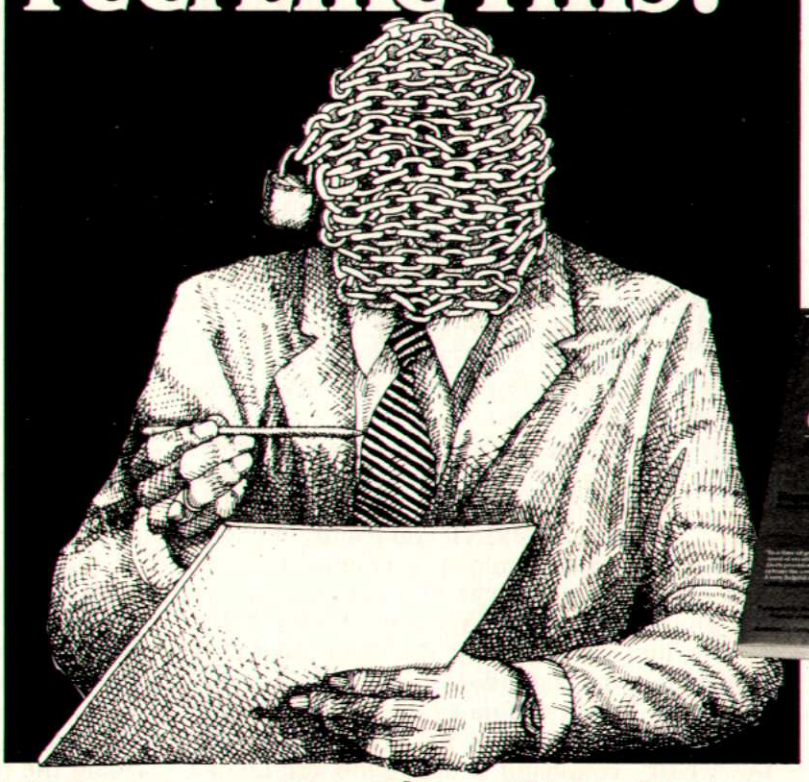

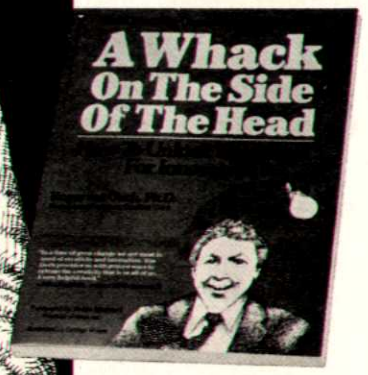

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*You Need A Whack on the Side of the Head

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APPLE

When you're planning your programs, do you think about how your words will look on the screen? The name used to describe putting the text in place is *formatting*. Applesoft BASIC allows you to move text around, or format it, using more than a half dozen commands.

If you're in the middle of a program, you may want to skip one or more lines to make the text easier to read. To skip a line on the screen, you can't just put a line number in your program with nothing in it—the line will disappear. Instead, put PRINT in the line and give the computer nothing to print. Each time you do this, you will get a blank line on the screen. To keep down the number of program lines, you can put several PRINT commands on a line with colons between them. Each PRINT command will skip one line.

This program will show you how easy it is to format text by using just the PRINT command:

```
10 PRINT "THIS IS THE EASIEST"
20 PRINT
30 PRINT "WAY TO SKIP ONE LINE"
40 PRINT : PRINT : PRINT "OR EVEN
   TWO!"
]RUN
THIS IS THE EASIEST

WAY TO SKIP ONE LINE


OR EVEN TWO!
```

Using the PRINT command with nothing after it will move the cursor down from wherever it was. However, sometimes you will want to skip down more than a couple lines. Or you may want to put your words on a certain line on the screen. In both cases you can use the VTAB command. After this command, put the number of the line on which you want the words to appear.

The Apple has 24 rows or lines on the screen and the VTAB command sends the cursor to whatever line you say, from 1 to 24. If you enter this simple program, it will show you where the various lines are:

```
10 HOME
20 VTAB 1: PRINT "TOP AT VTAB 1"
30 VTAB 12: PRINT "MIDDLE AT VTAB
   12"
40 VTAB 22: PRINT "VTAB 22 NEAR
   BOTTOM"
```

Immediately after the program runs, the screen is pushed up so the cursor can appear again. If lines 1 and 24 have text, then line 1 will be pushed up when the cursor reappears. Line 40 in this program uses VTAB 22, so the PRINT statement in line 20 does not disappear when the program is run. Notice that VTAB and PRINT are separate commands and must be separated by a colon (:).

Using the VTAB command and using PRINT with a blank line are the two ways you can place your text vertically. If you want to place it horizontally, you have five commands to choose from. The easiest is the PRINT with a number of spaces inside the quotes but before the text. When the text appears on the screen, it will be moved over to the right the number of spaces inside of the quotes.

You can also move words across the line by using the SPC command. This command is used together with a PRINT command, but with no semicolons or colons. To move a word over six spaces, use the command this way: PRINT "SIX" SPC (6) "SPACES." The number in the parentheses shows how many spaces to move the word (not what column it's in). This is an easy command to use in the middle of a line because you can put it between words or numbers wherever you are.

You can also use SPC when you're making a list. If the first column has words or numbers of different lengths, it would not be practical to use SPC because you would be constantly counting and changing the number in the parentheses so the items in the second column would line up. However, for a list like this with ages (all two digits) and names, the command is handy:

```
10 HOME
20 PRINT "AGES" SPC (8) "NAMES"
30 PRINT
40 PRINT 14 SPC (10) "ANDREW"
50 PRINT 11 SPC (10) "MATTHEW"
60 PRINT 10 SPC (10) "SCOTT"
]RUN
AGES      NAMES
14        ANDREW
11        MATTHEW
10        SCOTT
```

You can also use the command SPC to insert spaces when you are generating a column of numbers:

```
10 HOME
20 FOR N = 3 TO 8
40 PRINT N SPC( 8)N + 100 SPC( 8)N +
   1000
60 NEXT N
]RUN
3    103      1003
4    104      1004
5    105      1005
6    106      1006
7    107      1007
8    108      1008
```

Another command you can use is PRINT TAB. It allows you to start text at a specific location across the line. This command, unlike VTAB, HTAB and SPC, is available in quite a few of the versions of BASIC. TAB is short for tabulation and it allows you to specify precisely on what column to begin writing text.

The left edge of the screen is TAB (1) and the right edge is TAB (40). You would enter: PRINT TAB (6)

"HERE" to have the word print in the sixth column (not to move over 6 spaces as with the SPC command). You can use variables in parentheses after TAB commands as long as these variables have been given values. This simple program will show you how the PRINT TAB command can work. Notice that the words PRINT and TAB are used together without a colon:

```
10 DATA 5,10,15
20 READ A,B,C
30 PRINT TAB( A)"CHANGE"
40 PRINT TAB( B)"THE"
50 PRINT TAB( C)"TAB"
]RUN
  CHANGE
    THE
       TAB
```

Note that the PRINT TAB command can move the cursor only to the right. If a TAB position is given to the left of the current position, the cursor will stay where it is and printing will go on from there.

The HTAB command works in a similar manner but you don't use parentheses. The number says what column the first symbol should be printed in. Put the number right after HTAB but separate this command from a PRINT command with a colon. To move six spaces from the left margin, use HTAB 6: PRINT "HERE." This program shows the HTAB command in action:

```
10 HOME
20 HTAB 1: PRINT "LEFT EDGE IS
   HTAB 1"
30 HTAB 15: PRINT "HTAB 15 IS HERE"
40 HTAB 25: PRINT "HTAB 25 IS HERE"
```

Another way to move text on a line is to use POKE 36. Add a comma and then another number to tell where the text is to be placed on the line. To place text starting six spaces from the left edge, use POKE 36,6: PRINT "HERE." Note that POKE, like HTAB, is a separate command from PRINT and that you need the colon (:) between the commands. Here's a short program to show you the command in action:

```
10 HOME
20 PRINT "DO YOU"
30 POKE 36,5: PRINT "LIKE TO"
40 POKE 36,10: PRINT "POKE YOUR"
50 POKE 36,18: PRINT "APPLE?"
]RUN
DO YOU
  LIKE TO
    POKE YOUR
      APPLE?
```

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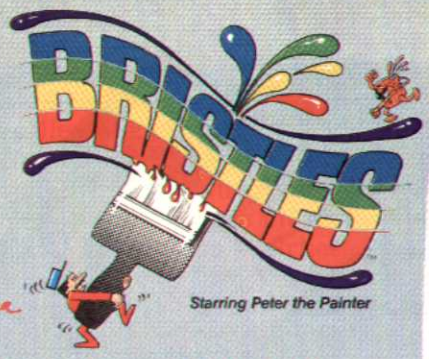

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designed by Fernando Herrera

C-64 conversion by Adam Bellin

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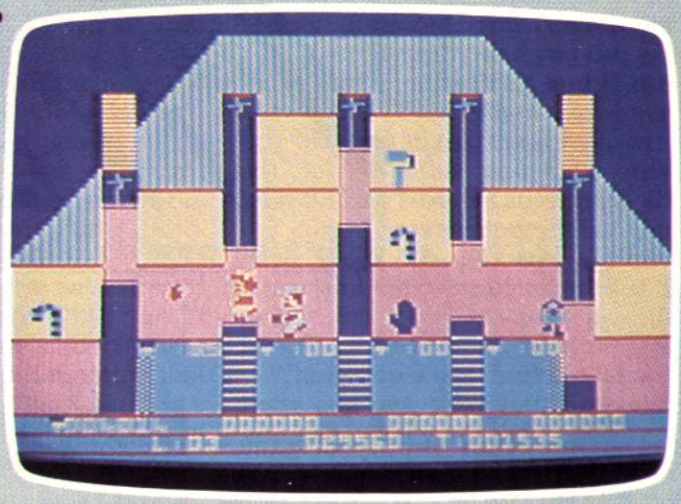

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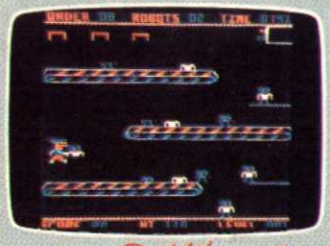

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After you've exhausted your supply of games and cartridges for the VIC-20, it's time to do some serious programming, or at least to learn how. One of the earliest things you learn about the VIC is that it has precious little free memory space to write those programs in.

When you first turn on the computer, the screen tells you this:

```
**** CBM BASIC V2 ****
3583 BYTES FREE
READY.
```

This means that you have 3,583 bytes of user RAM. That's not a whole lot of memory, and while it's enough for short programs, you'll need quite a bit more if you're going to do anything serious. You'll also need an expanded memory if you're going to load some of the more advanced game programs that come on cassette tape.

How do you it? That depends on how much you want to spend and if you plan to make the VIC your main computer. For all of its shortcomings, the VIC has an awful lot packed into its box and can be not only a lot of fun, but useful as well. If you decide to spend a little extra money on your system, the cash generally will be well spent.

You can easily add an 8K or 16K memory expansion module to the VIC simply by plugging a memory cartridge into the expansion bus — the edge-card connector at the right rear where you also plug in your game cartridges. These memory add-ons cost about $50 to $80 each.

There's just one problem with using this bus with a cartridge; when you plug something into it, that's it. You can't plug in anything else because you've used up the only expansion bus on the computer. If you do have to plug in something else—like Commodore's Programmer's Aid cartridge, or a word processing cartridge, you're out of luck unless you use a bus expansion card.

These cards are called various things. Most typically, the small ones that cost about $40 or $50 are called "mini-mothers" or "mini-motherboards" or something like that. These minis usually contain three plug-in cartridge slots. These expansion cards have another special feature: If you're tired of struggling to plug cartridges into that bus on the computer (it's always a very tight fit), plugging in is much easier when you use a mini-motherboard — even if you're using just one cartridge.

A lot of companies besides Commodore make special products like these for the VIC, and sometimes buying these third-party products is the only way to get a particular kind of gadget or program. Commodore, for example, doesn't even make a mini-mother. But you can get a mini-mother from Quantum Data or one with switching (called the Cardboard 3s) from Cardco. Some third-party companies are listed at the end of this article.

If you plug in an 8K RAM expansion cartridge, the screen shows you something different from the first display:

```
**** CBM BASIC V2 ****
11775 BYTES FREE
READY.
```

What you've done is add the expansion cartridge's 8,192 bytes to the 3,583 already available in the VIC's RAM. An 8K memory does not have just 8,000 bytes, but it has 8,192 (2 multiplied by itself 12 times). This is because computers count by twos. Try multiplying it out and you'll see. A handy way to keep track of the numbers is to remember that one K is really 1,024 bytes—not 1,000.

If you use a 16K cartridge, you're really using 16,384 bytes (2 multiplied by itself 13 times, or 16 x 1,024), so this is what the VIC screen will say:

```
**** CBM BASIC V2 ****
19967 BYTES FREE
READY.
```

Now wait. It's possible to add even *more* memory to the VIC, and, in fact, you can go as high as 28K of RAM. If you get a second memory cartridge of 8K and have the right kind of switch selection on your motherboard, you can get this display on the screen:

```
**** CBM BASIC V2 ****
28159 BYTES FREE
READY.
```

This is the total of the VIC's original 3,583 bytes plus one 16K cartridge's 16,384 bytes plus one 8K cartridge's 8,192 bytes.

You can't just stack these memory cartridges on top of one another. If you have a simple mini-motherboard with no switch selection, you may not be able to add the second memory cartridge. You'll need a mini-mother with switch selection, such as the Cardco Cardboard 3s, or, if you're really ambitious, a big, complex board like Compuscope's SM-200 Supermother—a $150 investment.

This last board has a total of *eight* expansion slots and looks a little bewildering at first with all its slots, switches, selectors and buttons to push. But it's not really hard to use if you give the instruction book half a chance.

The thing that's a little hard to grasp at first is that while you can

add 24K of RAM to the VIC, you have to be able to assign the last 8K to a special section called Block No. 3. The VIC has five memory block locations, and each one lives at its own special address. Each of these blocks can hold 8K of add-on memory.

Block Nos. 1 and 2 are easy; just plug in your 16K memory expansion cartridge, and the VIC will find it all. But to put something into Block No. 3, you have to set the selector switches either on the memory cartridge itself (be sure you buy a RAM cartridge that has selector switches on it) or on the expansion motherboard—or both.

If you buy Commodore's own 16K expansion RAM, be careful. The instructions tell you that there's a set of selector switches inside, but when you follow the directions and open the shell to set the switches—no switches! Then if you try to return it to the store where you bought it, they can say you "damaged" the cartridge by following the directions and opening it up.

The fourth block is what's already inside the VIC, and you can't get at it. It's already there and contains graphics and color information that the computer uses. Block No. 5 is a special secret address and you can put memory there, but it'll be invisible to the VIC. Anything you save in Block No. 5 (also 8K) is completely protected; you can't write over it accidentally, and you can get at it only by using PEEK and POKE commands. Even when you have this block in place, the screen will still tell you that you have only 28,159 bytes free, because that's all the *continuous* memory that you have. Block No. 5 is still a secret place, and the computer can't see it unless you tell it exactly where to look.

When you start looking at all these add-ons, take your time and buy only what you need.

—Walter Salm

THIRD PARTY EXPANSION PRODUCTS FOR THE VIC-20

Cardco, Inc.
313 Mathewson
Wichita, KS 67214
(Cardboard 3s, 16K memory expander)

Compuscope, Inc.
6400 Signal St.
Tillamook, OR 97141
(SM-200 Supermother)

Data 20 Corp.
23011 Moulton Pkwy., Suite B10
Laguna Hills, CA 92653
(Video Pak 40/80-column converter and add-on memory)

Interface Computerware
P.O. Box 862
Orem, UT 84057
(24K memory expander)

Precision Technology, Inc.
P.O. Box 15454
Salt Lake City, UT 84115
(Mini-motherboards)

Quantum Data, Inc.
3001 Red Hill Ave.
Costa Mesa, CA 92626
(Mini-mother, Video Combo 40/80-column converter and add-on memory)

If you've had Algebra in school, you're familiar with the idea of a variable. For example, in the statement "2x + 2 = 8," "x" is the numeric variable—that is, it stands for a number. (You should not need a computer to find the value of x.)

There also are such things as *string variables*, and they're important if you want to use your TI (or any computer) to full advantage. String variables represent words —which makes them good for making lists, catalogs, reminders of things to do, etc. The advantage they have over pencil and paper is that they allow you to quickly and neatly insert and delete new items while retaining the rest of what you've written.

Here's how you program a string variable on the TI:

```
10 CALL CLEAR
20 LET A$ = "GET NEW SKIS"
30 PRINT A$
```

Right away you see that a string variable is entered differently from a numeric variable. (A numeric variable would read something like: LET A = 2.) For a string variable you must use the dollar sign after the letter to show that that's what it is, and then the quotation marks to show what the variable stands for.

You can also input a number as a string variable. All you have to do is use the correct format: 20 LET B$ = "170 cm" is a perfectly legal string command. However, you cannot perform any mathematical functions with the number "170" as long as it's in string format. (A statement like: LET C = B$/2 will not work.)

To extract a number from a string program and then use it in a mathematical computation, you must use the VAL function (which has nothing to do with living in Encino and buying a lot of designer clothes):

```
30 X = VAL(B$)
40 C = X/2
50 PRINT C
```

When those steps are run, together with steps 10 and 20, the value "85" should appear on the screen (without the "cm"). Now you can perform any math function you want (like relating the size of the skis to your height, or their efficiency in powder, or their cost).

The VAL function is also useful in modifying the lists you create with string variables. Let's say you have a list of cities with their ZIP codes and you want to pull out a particular ZIP code to add the post office's new four-letter extension to it:

```
10 ALL CLEAR REM "LET" IS OPTIONAL
20 A$ = "Microkids 10003"
30 B$ = "Dave. Sunnyside 11104"
40 C$ = "Bill. Riverside 92507"
50 X = VAL (B$)
60 PRINT X
```

The computer prints out only the number 11104. You add on the numbers "1420," and the next time B$ is listed you'll find the ZIP code up to date (and the new listing will still have the words you entered the first time).

Avoiding Input Errors. While you can use any letter, number or character on the TI 99/4A keyboard as part of a string variable name (as long as it is enclosed in quotes), there are certain characters you cannot use when assigning the variable. Any statement, function or command in TI BASIC is no go because it will confuse the machine.

For example, CHR$, SEG$ and STR$ ("for," "relative" and "update," respectively) are reserved words in the TI BASIC character set that happen to end with dollar signs. Don't use them when assigning string variables; you'll get an error message. Also, don't use the word LIST unless you're sure to put the dollar sign after it, and don't put any commas in the string assignment. All of these actions could be confused with the TI BASIC character set.

Speed Through Looping. You can avoid having to constantly repeat the string format by using a prompting program:

```
10 CALL CLEAR
20 INPUT "TYPE IN YOUR STRING
   VALUES":A$
30 IF A$ = "A" THEN 40 ELSE 50
40 X = 1
50 IF A$ = "B" THEN 60 ELSE 70
60 X = 2
70 IF A$ = "C" THEN 80 ELSE 90
80 X = 3
90 IF A$ = "D" THEN 100
100 X = 4
110 FOR X = 1 TO 4
120 PRINT X
130 NEXT X
```

With this program you can make up your list as you go. The computer prompts you, so you don't have to think about composing the list beforehand. Also, you can change the assignment of string values each time you run the program.

ERROR MESSAGE

By the way, if you see the words "STRING NUMBER MISMATCH" flashed onto the screen you'll know you've made one or more of the following mistakes:

1. You assigned a number directly to a string variable without putting it in quotes.
2. You have a nonstring value where a string value should be.
3. You have a numeric value in an Open, Close, Input, Print or Restore statement.

—**David Weber**

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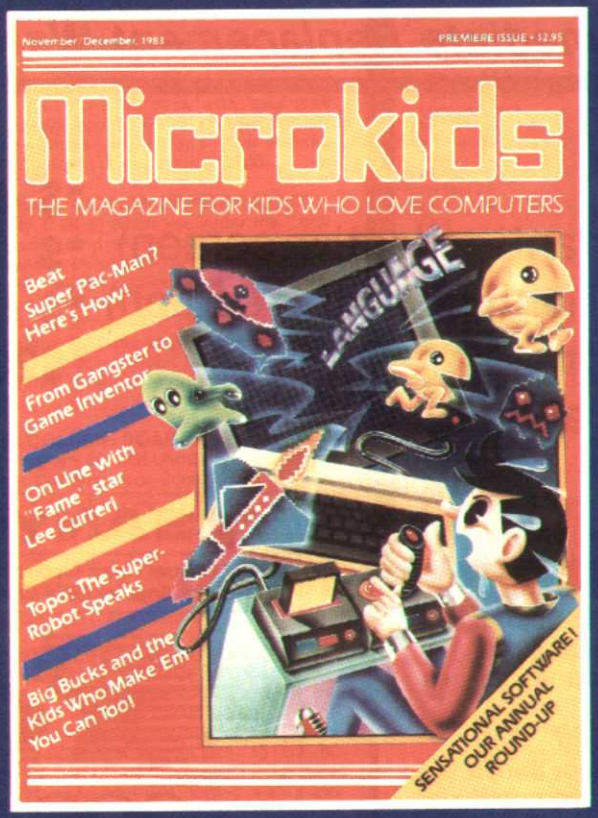

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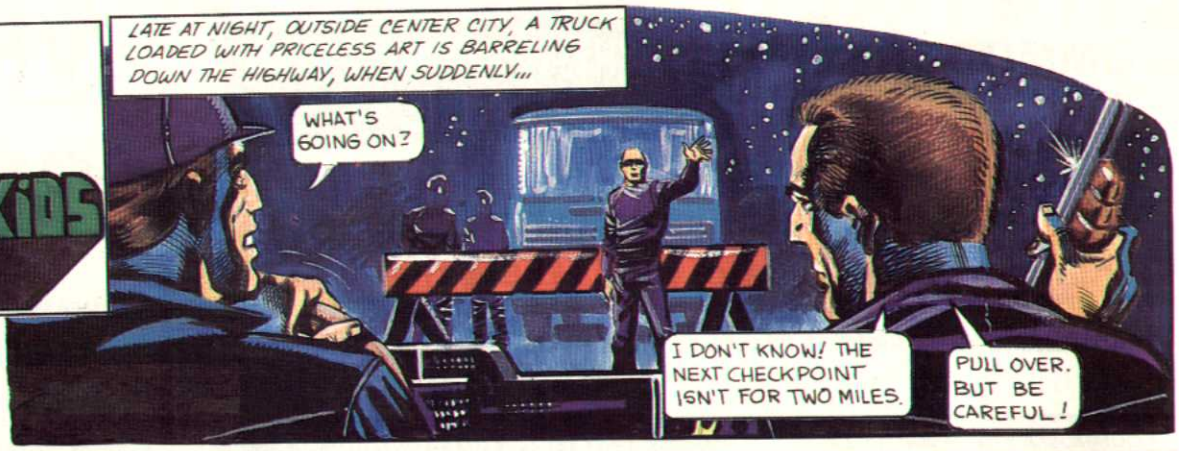

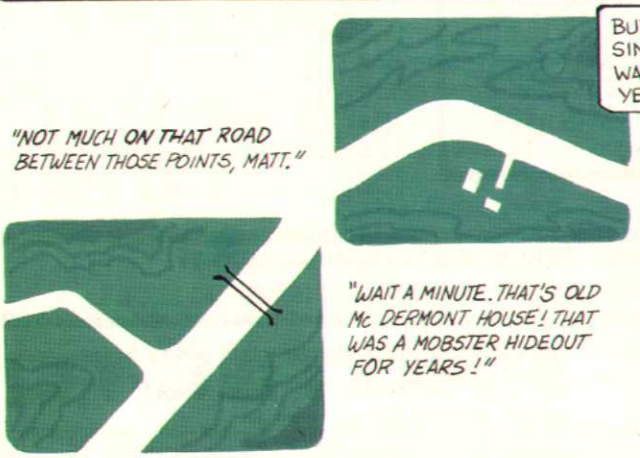


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COPS NOTHING! DON'T YOU SEE? HERE IS OUR CHANCE TO BE REAL DETECTIVES! WE'RE GOING TO INVESTIGATE THIS OURSELVES!
HU... SURE... REAL DETECTIVES... RIGHT...
THOSE PHONE LINES INDICATE A HEAVY COMPUTER SET UP.
THERE IS DEFINITELY SOMETHING GOING ON AT THAT HOUSE!
MAYBE WE SHOULD CALL THE COPS.
DESPITE THE NIGHT AIR, MATT FEELS THE SWEAT FORMING ON HIS FOREHEAD, AS THE BROTHERS RACE THROUGH THE NIGHT.
DEEPER INTO THE DARKNESS THEY RIDE, UNTIL...
LOOKS DESERTED.
GREAT! LET'S GO HOME!
COME ON! WE ARE GOING IN.
COULDN'T I JUST WAIT IN THE CAR?
INSIDE...
STAY CLOSE, AND FOLLOW ME UP THESE STAIRS.
SURE. I'M NOT STAYING DOWN HERE ALONE!
BUT AS STEVE REACHES FOR THE BANISTER...
CLIK!
HELP!
...THE FLOOR SUDDENLY OPENS BENEATH THEM...
... AND THEY PLUMMET INTO THE BLACKNESS BELOW!
NEXT ISSUE: A DATE WITH DEATH!

What should you look for in personal

Before you go looking for personal computer software, you should know what personal computer software looks like.

(You're not alone if you don't already know that software programs come in a package.)

Programs are "pre-recorded" on cartridges, tapes or diskettes. And, although you can't tell by looking at these cartridges, tapes or diskettes, the programs on them can be very different.

What you put in is what you get out.

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What the value is.

What are improved math skills worth? More efficient inventory control? Faster communications? What is accomplishment worth?

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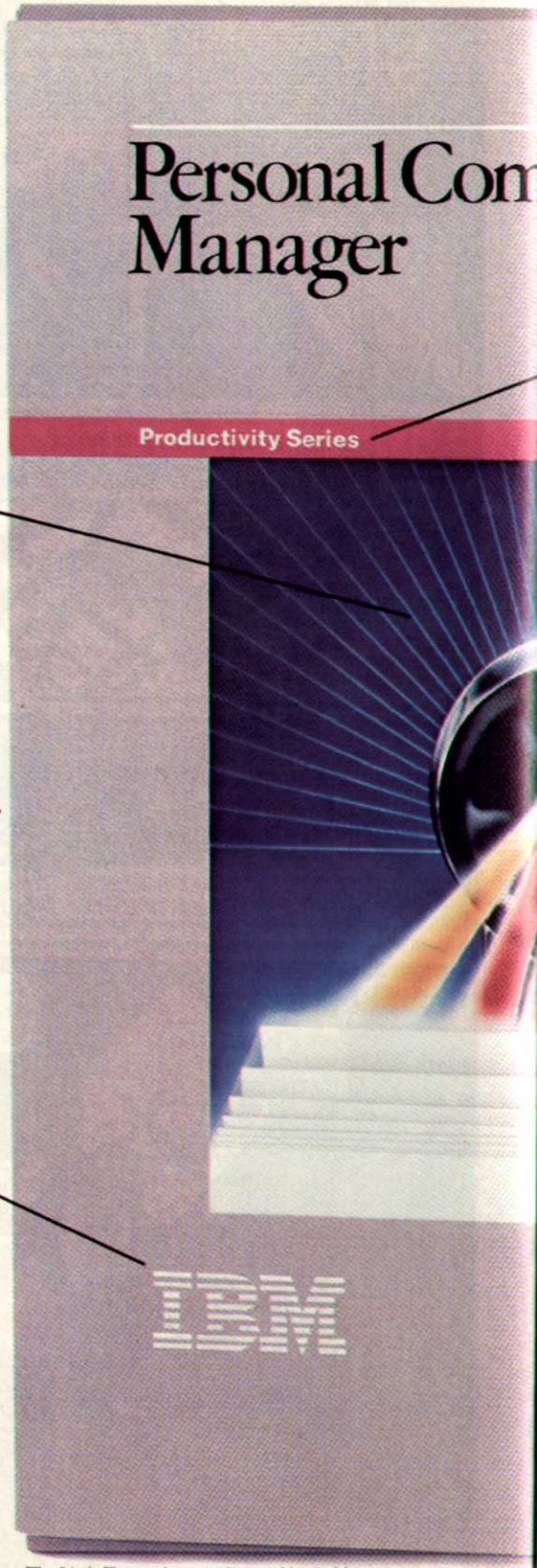

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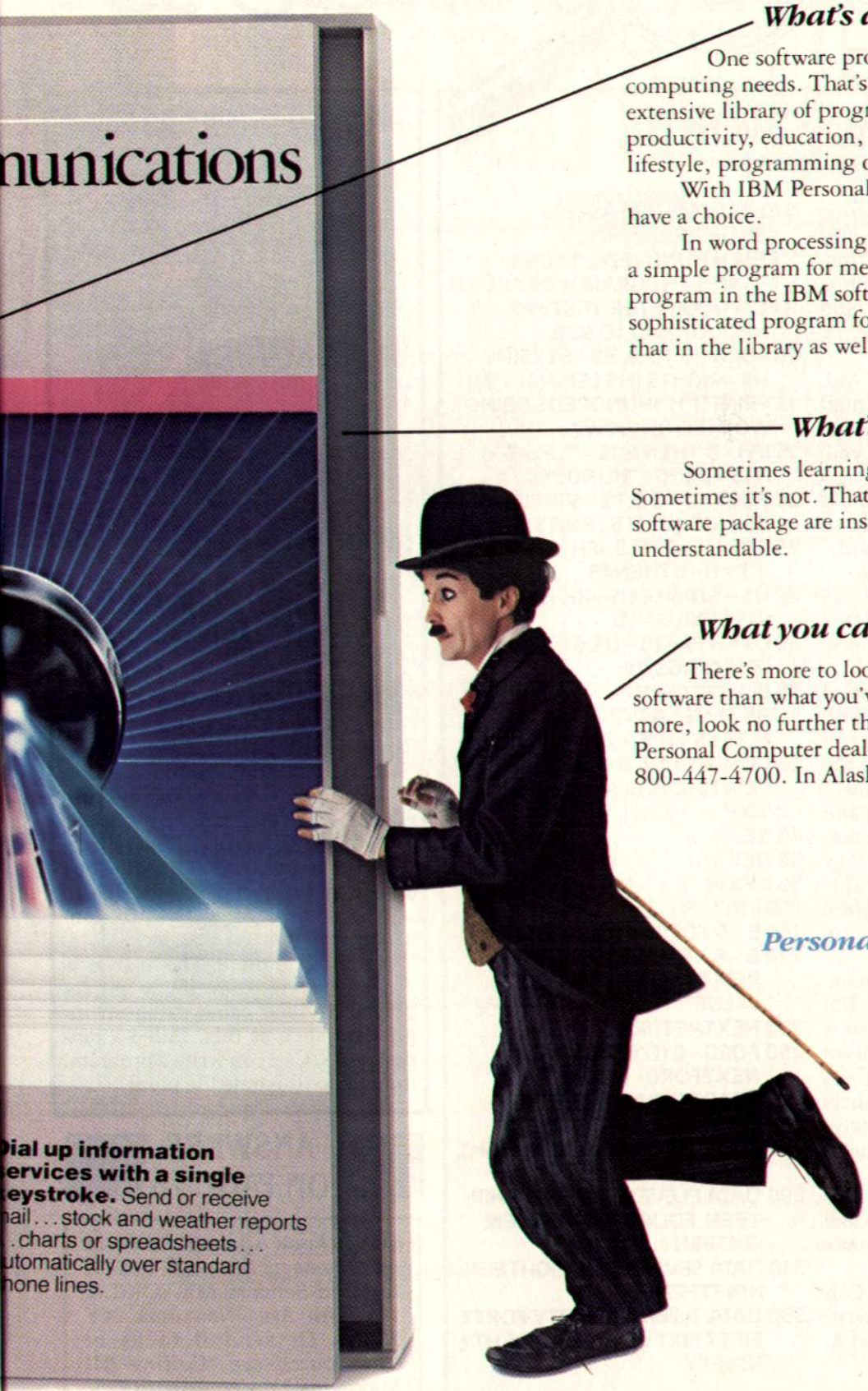

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One software program can't satisfy everyone's computing needs. That's why IBM has such an extensive library of programs. You'll find a series for productivity, education, business, entertainment, lifestyle, programming or communications.

With IBM Personal Computer Software, you have a choice.

In word processing, for example, you may want a simple program for memo writing. You'll find that program in the IBM software library. If you want a sophisticated program for report writing, you'll find that in the library as well.

What's inside.

Sometimes learning a program is easy. Sometimes it's not. That's why inside every IBM software package are instructions that are clear and understandable.

What you can do right now.

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Personal Computer Software

Mind Benders

A WORD'S WORTH

BY DAVID LEWIS

The old man appeared as if from nowhere, his long, gray beard spreading across the keyboard from A to L. He finished typing and then said with a sigh, "Ah, what I would have given for a word processor 200 years ago!"

"I recognize you," said Liz Ard, ace programmer for Starship Enterprises Inc. "You're the poet, William Wordsworth. How nice to meet you, Mr. Wordsworth."

"I'm very flattered," said the old man. "But 'Mr. Wordsworth' is so formal. Please call me 242 for short."

"I don't understand," said Liz.

"I do," said her companion, Luke Warm, another programmer. "It's a code we learned back in school. Look!"

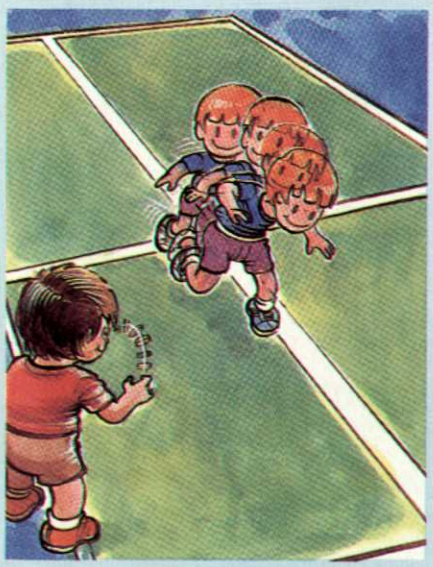
With that he ripped a sheet of paper out of his notebook and quickly wrote down the letters of the alphabet. He put a 1 next to the A, a 2 next to the B, a 3 next to the C and so on. Liz caught on quickly and helped to fill in the rest of the values up to 26 for Z. Using this scale, they then applied a corresponding value to each letter in William Wordsworth's name and came up with a total value of 242.

"Very good," said the old man. "That is truly *a word's worth*. But here's a problem that may prove a better test of your mettle. It involves the English names of the numbers from 1 to 999—that is, the numbers from *one* to *nine hundred ninety-nine*. The word's worth of *thirteen*, for example, is 99.

"Now the question: Are there any numbers in the range from 1 to 999 whose English names have word's worths of exactly 100?"

Liz and Luke found them. Can you? The following program, written for TRS-80 Models I, III and 4, may be of some help.

```
5 CLEAR200: DIM A$(19):
  GOSUB250
7 REM H:HUNDREDS. T:TENS.
  U:UNITS. PROGRAM WORKS LIKE
8 REM ODOMETER; IT STEPS
  THROUGH 000 TO 999.
10 FORH=0 TO 9: H$=STR$(H):
  H$=RIGHT$(H$,LEN(H$)-1)
12 PRINT"("H")HUNDREDS BEING
  WORKED ON NOW."
15 IFH=0 THEN H1$="" ELSE
  H1$=U$(H)+"HUNDRED"
20 FORT=0 TO 9:T$=STR$(T):
  T$=RIGHT$(T$,LEN(T$)-1)
25 FOR U = 0 TO 9: IFH
  +T+U=0THEN45
27 U$=STR$(U):U$=RIGHT$
  (U$,LEN(U$)-1)
30 G$=H1$+T$+U$:G=VAL
  (RIGHT$(G$,2))
35 IFG<20THEN
  B$=H1$+A$(G)
  ELSEB$=H1$+T$(T)+A$(U)
40 GOSUB190:IF B=100 THEN
  PRINTB$" HAS A WORTH OF
  100"
45 NEXT
50 NEXT
55 NEXT
170 END
190 B=0:FORC=1TOLEN(B$)
210 B=B+ASC(MID$(B$,C,1))-64:
  REM CALCULATE WORD'S
  VALUE
230 NEXT:RETURN
250 FORG=0TO19:READA$(G):
  NEXT:FORG=2 TO 9:
  READT$(G):NEXT:RETURN
270 DATA, ONE, TWO, THREE,
  FOUR, FIVE, SIX, SEVEN, EIGHT,
  NINE, TEN
290 DATA ELEVEN, TWELVE, THIR-
  TEEN, FOURTEEN, FIFTEEN,
  SIXTEEN
310 DATA SEVENTEEN, EIGHTEEN,
  NINETEEN
390 DATA TWENTY, THIRTY, FORTY,
  FIFTY, SIXTY, SEVENTY, EIGHTY,
  NINETY
```



RANDOM WALK

BY RICHARD AMYX

A boy is standing at the center of a tennis court, midway between the baselines, which are 78 feet apart. There is no net.

A friend stands beside the boy, flipping a coin. Every time the coin comes up heads, the boy takes a one-foot step forward. Every time the coin comes up tails, the boy takes a one-foot step backward.

Will the boy ever walk off the tennis court?

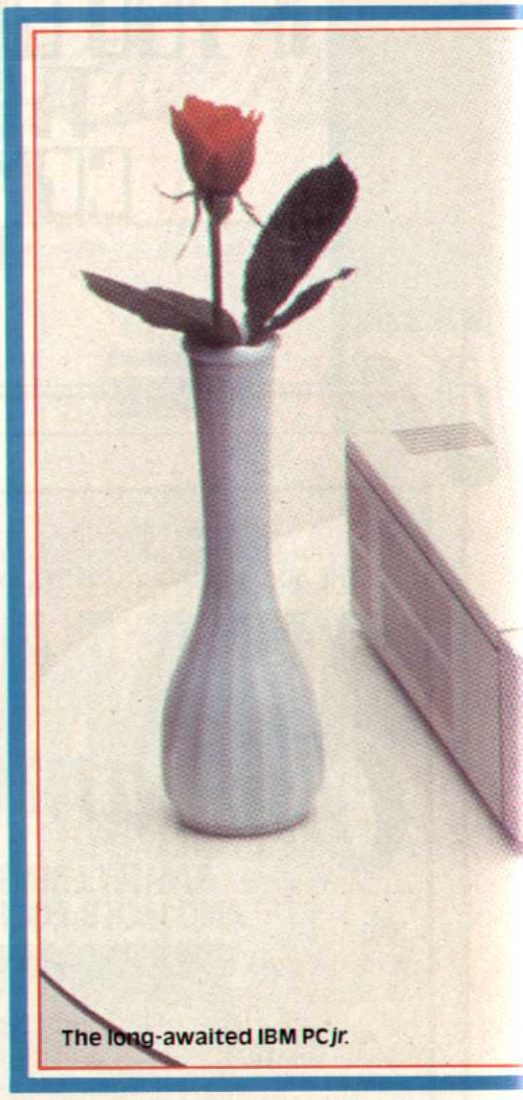
No problem there. The answer is yes, as you well know if you've ever played a video game using an ingredient such as this, called a random walk. Can you write a program, though, to illustrate the point?

ANSWERS ON PAGE 78

Do you know a puzzle, riddle, or word game for this page? Send it to: Mind-Benders, MICROKIDS, 133 Fifth Ave., New York, NY 10003. Or send it to us at The Source—see "Calling All Microkids." You could earn $25.

A Close Look At PCjr

BY WALTER SALM



The long-awaited IBM PC*jr*.

We'd been hearing about IBM's PC*jr* for so long, we really didn't know quite what to expect, except maybe a scaled-down PC. Well, we got a little of that, and got a few surprises, too, and not all of them were pleasant ones.

The first surprise was the name. Everybody we knew had been calling it the Peanut for so long, the official name, PC*jr*, was a real letdown. We thought a Peanut would be a natural to eat Elephant disks.

Our first look at this machine was at once exciting and disappointing. I guess we were expecting something a little closer to the "Big Blue" itself. The CPU box *looks* a lot like IBM-PC's box, but so do a lot of the copycat computers. And a lot of the copycats have keyboards that are the spittin' image of IBM-PC's keyset. But not so the PC*jr*. In fact, it's so different from the PC that you have to wonder if IBM has been taking some keyboard design lessons from Timex Sinclair. IBM's new keyboard definitely wasn't a pleasant surprise.

Okay, so what did they do right and what did they do wrong? PC*jr* is definitely *not* a business machine. It's a *home* computer, and there's no stretch of the imagination that could place it in your dad's business office.

But wait. There's also a very special magic about this new computer, magic that is all wrapped up in three enchanted letters: IBM. I guess we have to rethink our whole concept of IBM and what they're trying to do now. Sure, there are a lot of programs that run on both the PC and the PC*jr*, but there's also a lot of PC software that won't run on PC*jr* at all.

The most obvious reason why certain software won't run on PC*jr* is memory size. The most you can get in this machine is 128K, and there are business programs on the market that are designed for Big Brother PC with 256K or 512K of RAM storage. Programs like that are awfully RAM-hungry, and PC*jr* just doesn't have the memory for them.

Point by point, let's take a look first at PC*jr* and how it stacks up against other home computers that you've probably thought about buying—such as the Apple IIe, Atari 800XL, Commodore 64.

With the PC*jr*, for some reason, IBM has changed its policy of charging extra for *everything*. Mercifully, Big Blue has thrown in some of the necessaries as part of the PC*jr* package price. Either that, or the dealer muddies the price a little and then throws in some of the so-called extras into the mix as part of the deal. But be warned—many accessories still cost extra.

A bare-bones, no-frills PC*jr* can be yours for $669. For this amount of money, you get a basic computer with 64K of RAM (another 64K of ROM firmware is built in), the two plug-in cartridge slots and a cordless keyboard with tiny, square Chiclet (ugh!) keys. Batteries for the keyboard cost extra. So does a power-saving cord to connect the keyboard to the computer. PC*jr* gives you color output for a *monitor*; if you want to plug in a regular TV set, you have to buy a *modulator*, which costs extra. The graphics, by the way, are superb—absolutely the best we've seen on any home computer.

If you buy a bare-bones Apple IIe (about $750 as part of a larger package system), you get a full-stroke typewriter-style keyboard, 64K of RAM, a lot of firmware in ROM and two kinds of joyport jacks for joysticks and paddles. The Apple's color output, like PC*jr*, will drive a

monitor. If you want to use a regular TV set, you have to shell out for a modulator—just as with the PC*jr*. Graphics are okay but nothing spectacular.

An Atari 800XL, priced at about $350, also gives you a full-stroke keyboard, built-in BASIC firmware, two joystick ports, a plug-in ROM cartridge slot, 64K of RAM, self-test and diagnostics, full-color output for a monitor or a TV set with a separate sound channel and really excellent graphics and colors.

The Commodore 64 is a popular $200 machine that has a full-stroke keyboard, built-in BASIC, two joystick ports, a plug-in bus slot for ROM cartridges and 39K of user RAM built in. Color output can drive a monitor or a regular TV set and, as with the Atari, there's a separate sound channel for the monitor. The graphics on the 64 are okay, while the color is really good.

You can jump up to the next price level for the PC*jr* to $1,269, which adds a disk drive and boosts the RAM to 128K. That's the RAM ceiling, by the way. There's just no way you can cram any more memory into PC*jr*. But some day, some smart company will come along with a way to add more RAM.

A comparable Apple IIe system costs about $1,500 (including a monochrome monitor), comes with a disk drive, usually an 80-column character board with another 64K of RAM (expanding the Apple to 128K), and even more RAM can be added if you like. You also get a disk controller card, which will take a second disk drive. Apple dealers also are making up special packages with printers and software, and

Software for the PC*jr* covers a wide range of topics and styles.

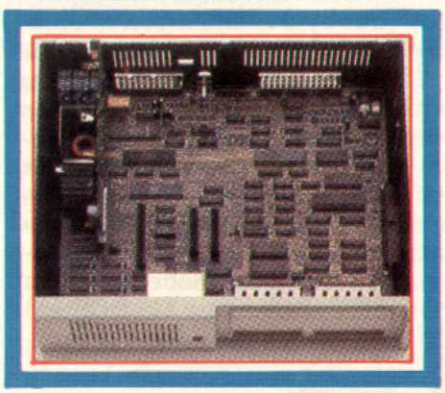
you even get a book of bonus coupons worth $1,000 toward software purchases.

A step up for the Atari 800XL includes a disk drive, a letter-quality printer and a word processor (AtariWriter plug-in cartridge), for about $1,100. There's no memory expansion for this 64K machine at the moment, and a monitor usually doesn't come with the package.

Adding to the Commodore 64 means a disk drive and a printer for a total system price of about $900. It can vary with the printer brand, quality and extras. Really good word processors are available for $65 to $90—in both cartridge and disk formats. You can add some memory with a small motherboard and a 16K plug-in for about $110 more, bringing the machine up to 53K of RAM—not a whopping big memory, but then, it's an economy system.

Point-by-point, the PC*jr* wins hands down in the color graphics department against any and all of these computers. It has a larger disk capacity, but you can add a second

The bare-bones PC*jr* has no disk drive, but a cassette recorder can be used.



PCjr

disk drive to each of the other three computers; you can't add one to the PCjr. However, *all four* will take cassette drives and hard-disk drives.

Unlike Big Brother, PCjr doesn't need all those fancy, expensive plug-in circuit cards; just a modem here and a TV modulator there and a . . . well, we're sure they'll come up with some other goodies to jack up the price. Even the joystick interface comes with the PCjr, but the joystick itself costs extra. Doesn't everything?

IBM is even pushing a low-cost (under $200) thermal printer—and the printed copy looks it. The monitor is extra no matter which way you turn, and the good color job is a bunch of bucks, selling for around $700. But what color! What graphics! What pizzazz! That monitor and the PCjr's color graphics are the best part of the whole deal, but by this time, you're looking at spending $2,000 or more.

The single disk drive that comes with the stepped-up PCjr, by the way, is double-sided, double-density and stores 368K. This translates into a ton of files and programs. The operating system is DOS 2.1—the same one used by the PC and enhanced version XT models. But the PC and XT also can use MS-DOS and CP/M-86, which the new PCjr can't.

Some of the new disk-based software for the PCjr will work only with the IBM BASIC cartridge plugged in—the same way some Atari BASIC programs must be run with the BASIC cartridge plugged in when you use the old Atari 800 computer. I guess IBM designers have spent a lot of time playing with their Ataris. Too bad they didn't learn how to design a keyboard while they were at it.

Okay, we may sound like a broken record by now, but that keyboard is a big, *big* mistake. For the casual home user, the keyboard may just be perfect. But if you have any thoughts about doing some heavy business-related work with this computer — even though it may be at home — or even typing more than a two-page report for your English class, forget it. The keys are modified Chiclets—squarish, smaller-than-normal keys with the middle a concave shape. Touch typists (like this reviewer) have lots of problems with this kind of keyboard, and nontypists may find it even harder at first.

None of the keys have letters or characters inscribed on them. Instead, these characters are printed on the metal between the keys. This can be more than a little confusing at first, and it's deadly to people who aren't touch typists. They're the ones who really need those letters smack on the tops of the key caps if they're going to find them.

Can you ever get used to it? We didn't, but we didn't have the time to live with the beast for several weeks before writing this report. We'd still prefer regular, full-stroke typewriter style keys.

The keyboard is color-coded to make it easier to find related keys. The "Fn" key has a green bar under it, and when you press this along with other green-barred keys, they become function keys. The ten numerals become ten numbered function keys, while other selected keys perform special operations, such as *pause, echo, scroll lock, break, print screen (screen dump), page up, page down, home* and *end*.

Blue-labeled keys work with a blue "Alt" key, and these provide special characters such as a colon, Spanish accents and a backslash—used in writing computer programs. The "Escape" key is clearly marked with a red underline so you can't miss it.

Some of the software that's specifically designed for PCjr comes with keyboard overlays—heavy cardboard cutouts that slip over the keys and provide special labels. This can work because the Chiclet keys have all that space between them. For a full-stroke typewriter style keyboard, the overlays would have to fit around the keys instead of between them.

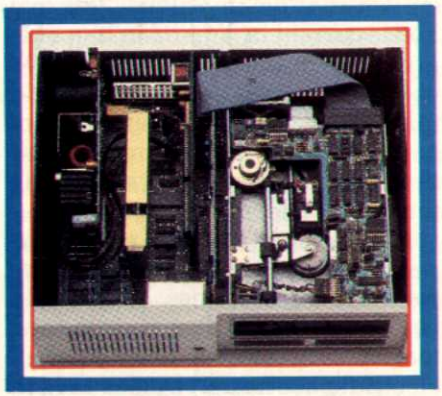
By the time you read this, there will be at least one alternate accessory or replacement keyboard for the PCjr from a non-IBM company. These keyboards will be more conventional, with true typewriter keys for touch typists and other heavy users.

One of the biggies about PCjr's keyboard is that it's cordless. Plug in four penlight-size batteries and you'll never have to hook it up to the computer. It uses an infrared beam to connect the keys to the computer box the same way wireless remote controls do for some TVs and stereos.

Why wireless remote? Because IBM thinks that lots of people will use PCjr in their living rooms playing through their main TV set—even large-screen projection TVs—and it's supposed to make some kind of sense to have the keyboard and its controls on the sofa or coffee table or wherever. For people who plan to use PCjr on a desk (of all places!), a battery-saving wire plugs into both the keyboard and the computer. As we said earlier, the wire costs extra.

The battery-powered keyboard uses an infrared beam instead of wires.

The main CPU box has a close family resemblance to the box that houses the grown-up PC, but there are differences. There's just one disk drive, a half-height drive that takes up less space; two of these could fit in the space taken up by one so-called normal-size disk drive, but there's no such extra space on the PC*jr*. In fact, there's absolutely no way you can add a second disk drive to this machine, except for an external hard disk (Winchester). You can also add a data cassette recorder if you want to.



PC*jr*'s built-in disk drive saves space.

Under the single disk drive are two side-by-side cartridge slots—right there in front. You don't have to search or fumble for them or open any barn doors. The first cartridge on the list of must-haves is IBM BASIC, which plugs into the left slot. This cartridge is needed for some of the disk software that's written in BASIC, and certainly will come in handy for such mundane things as writing and entering programs. We haven't figured out what the other cartridge slot is for. (For that matter, we still haven't figured out a use for the second cartridge slot in our old Atari 800—a machine that our family still loves dearly and uses every day. It's there and never gets used. Maybe the same thing will happen to the right-side slot in the PC*jr*.)

The first of the software we saw dazzled us with its fancy footwork. It's divvied up into four groups: Education, Entertainment, Productivity and Personal/Home. While programs are mostly on diskette, some of them, especially in the Entertainment Series (games), are on plug-in cartridges.

What we saw on the high-resolution color monitor was quite mind-blowing. It was intense, very, very well done and fun to use.

We tried out a mathematics/maze game called Adventures In Math, which takes one or two players. The game's 3-D maze graphics in a medieval castle are absolutely super. Correct answers to math problems open doors and add to your score.

One of the word processors we tried out is Sierra On-Line's new Homeword software, which comes with an overlay template for the keyboard. If you haven't heard about this particular word processor, it uses *icons*, or pictures, instead of words to make up a menu.

Other menu-driven programs for the PC*jr* also use icons for making selections. You select the icon with a gigantic rectangular colored cursor which surrounds the picture. It's a neat way to show menus, and it looks like PC*jr* will use a lot of icon-type menus in software that's still coming.

But who's going to buy PC*jr*? A bare-bones computer won't do an awful lot for you, and by the time you get up to a full-blown system, you're getting very close to the $2,000 mark, what with special software and a printer. If you go for that fantastic high-resolution color monitor, add a lot more bucks to the total.

Your dad might be persuaded to buy a PC*jr* so he can work with his office stuff when he's at home. And if he's stuck at home with the flu or stranded there by a snowstorm or something, PC*jr* has a modem that lets it talk to other IBM computers (or any other computer for that matter) using the telephone lines. Sounds like a pretty good reason for Dad to buy a system, doesn't it?

Then, when Dad's not using PC*jr* for business, you can use it for some really excellent high-resolution game-playing and doing homework, and Mom can do shopping lists, meal planning, filing recipes, addresses, phone numbers, even Christmas card lists!

With most of its bells and whistles in place, a PC*jr* will cost about $1,800 to $2,000 with a monochrome monitor. With a really good R-G-B hi-res color monitor (add $700), PC*jr* can put out some eyeball-dazzling graphics and displays.

The keyboard may be a sticky point; it certainly was for this reviewer, but this is really a matter of personal preference. We frankly would not buy a PC*jr* for our own use until a typewriter-style keyboard becomes available.

Of the other three computers we compared PC*jr* to before, we like the Commodore 64's keyboard the least, because of a rather "mushy" feel. The Apple keyboard also is a little sluggish, but much better, while the Atari 800XL has what we feel is an outstanding keyboard for touch-typing.

We think that the keyboard layout and key arrangement on both the Atari and Commodore stink, because symbol keys like apostrophes and quotes are in their old pre-1950s manual-typewriter locations instead of where they usually are on today's electric typewriters. But they're still light-years ahead of those modified chiclets on the PC*jr*.

When it comes down to whether or not to buy a PC*jr*, if you want one, get one (if you can). They're going to be in short supply for a while, but buy one with the idea that a new add-on keyboard will be coming from some non-IBM company. It's a gorgeous machine, no matter what. And it does some really gorgeous things, with graphics, colors and typeface.

And with just a little more time, somebody will figure out how to add that second disk drive and more memory and all those IBM-PC plug-ins. Those are for people who really wanted to buy a PC or XT to begin with but didn't want to spend all the money at once.

Remember, IBM wanted to make a

Color graphics are PC*jr*'s best feature.

home computer, and they've done a terrific job of it. But why did they put such harsh limits on the PC*jr*? They said it themselves: They don't want people buying PC*jr*s to use in the office. It was designed to be a *home* computer, and that's just what it is. ■

SETTING UP A COMPUTER

BY LAWRENCE GONZALEZ

Bringing a computer into your home is a little like bringing a pet home, in some important ways. You have to plan where to put it. You have to provide it with a special environment. You have to do a little thinking beforehand to make sure it will be incorporated into your life with the minimum of trouble and the maximum enjoyment and benefit. You would not, for example, want to bring a Great Dane into a one-room apartment in Manhattan. Or, if you did, you'd have to do a *lot* of planning. Maybe some remodeling, too.

But let's assume you're not going to bring the electronic equivalent of a Great Dane home, but only an Apple or IBM or Commodore. You'll need to create your own computer workstation. It can be a plain vanilla workstation or a deluxe one, but however you decide to proceed, it will be your computer's environment from now on.

The first thing to consider is electricity. There are two types of electricity you have to be concerned with. Your computer thrives on one kind and can be killed by the other. They are 110-volt a/c and static electricity.

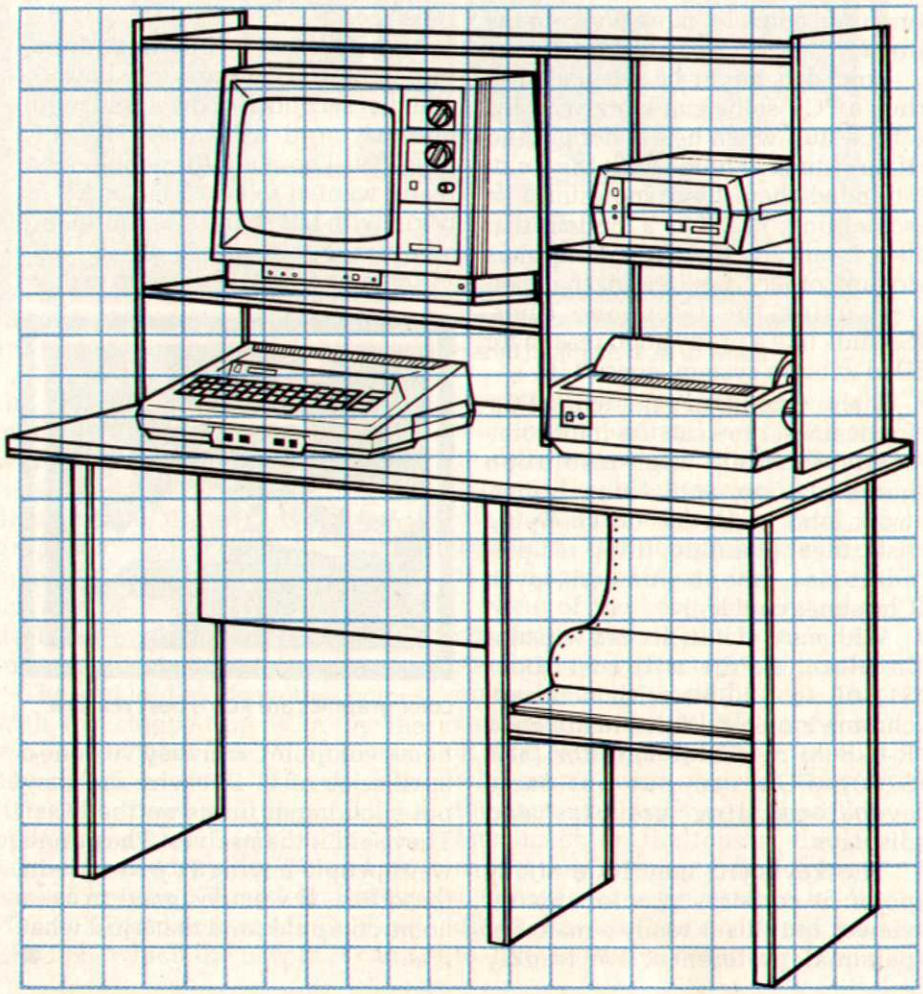
In the first case, you should make sure that you have an outlet near your workstation—near enough so you don't have cords trailing everywhere that you can trip on. Also, you don't want to use an extension cord if you can avoid it. This sometimes can cause problems. The computer will thrive on 110-volt a/c only if the current is steady and uninterrupted. (Incidentally, the requirements of different computers vary, but most computers can tolerate a variation in voltage. Normal house current in American homes is generally sufficient and is rated 115 volts or even 120 volts.) You should make sure your computer is not going to be connected on a circuit that also will be used for something that draws a lot of current.

For example, if your room happens to be near the room where someone irons clothes, you should be careful. Turning on an iron (or a toaster, or an electric blanket, or an electric space heater) causes a sag in the current. This could cause your computer to reset itself or to lose information—to crash.

If you can get your computer on a circuit all its own, that's best. If not, simply determine what else uses that circuit and make sure it's not going to be drawing so much current that it will interrupt your computer's operation.

Finally, make sure the outlet is grounded. All computers have three-prong plugs. Do not attempt to defeat this feature! It's there to protect your computer and your information (there's not really any danger to you from electric shock). If for some reason the outlet you've chosen is not grounded (that is, only two holes instead of three), you must do two things. First, make certain that the box the outlet is contained in is actually grounded. To avoid electric shock, get a qualified person to test for grounding. In some older homes the house wiring may not be grounded at all.

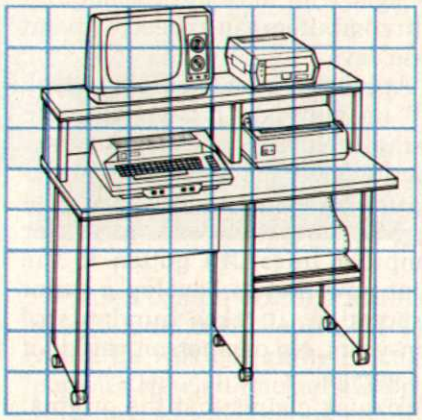
If the box is grounded (but the outlet isn't), all you have to do is buy a three-prong adapter at the hardware store for about a dollar and you're in business. If the box is not grounded, then you have to run a wire from the three-prong adapter's ground wire to something that is grounded. A water pipe generally is sufficient. A grounding clamp



WORKSTATION

can be bought at a hardware store. No. 14 wire can be used for this. It's a hassle to ground an outlet, but it's worth it to protect your computer and your data.

Speaking of protecting your computer, the other kind of electricity is the mortal enemy of computer components. A static spark, such as the kind you see jumping to the light switch when it's cold and dry, can carry tens of thousands of volts. It sounds amazing, but it takes thousands of volts to cause a spark to jump a fraction of an inch. The normal voltage going through computer components is no more than 5 volts. If you walk across a carpet and



build up enough of a static charge on your clothes or body to cause a spark to jump, you could literally fry your computer when you reach out to turn it on.

The solution? Well, you can buy antistatic mats for the floor, but they're expensive. Or you can have a humidifier in the house or in the room (don't turn it up too high), but that's also expensive. A third solution—and probably the best—is simply to treat your computer with a little caution.

If you suspect there may be static electricity, be sure you touch something grounded before you touch your computer. If you ever get a chance to watch a computer technician work on the guts of a machine, you'll see him wearing an odd band on his wrist. It has a wire coming off it with an alligator clip on the end. He attaches this to something grounded before touching the computer components. He's grounding his static electricity to protect the delicate circuits.

Now that you've got the crucial electrical problems solved, it's time to consider the computer workstation itself. For a computer of average size, such as an Apple, you'll need at least 10 square feet of desk or table space to be comfortable. The computer hardware itself (not counting a printer) may take up only half that or even less, but you'll need the extra space.

If you're going to set up a workstation yourself, it should be made out of wood and should be sturdy enough to support part of your own weight. Not only will your computer and other junk be on it, but as you sit typing at your keyboard, you'll be leaning on it without even knowing it. Drawers are useful, but if you're not an expert cabinetmaker, you can use boxlike storage spaces to good advantage.

A typewriter table generally is not large enough or sturdy enough for computers, though it might be perfect for a printer. If you're like most people, you'll use your printer a lot less than your computer. If you use a typewriter table with wheels, you can roll the printer out of the way when you're not using it.

You also can buy furniture specially made for computers, but you should keep in mind the realities of computer use. Most of the ads for computer furniture show a computer sitting neatly on a completely bare desk, or perhaps with a single box of floppies beside it. That's a fantasy. In real life you'll spread out and consume space. If you have a printer, you'll have paper to contend with. If your computer has disk drives, as most do, you'll use up a lot of disks and have to have some place to store them. Prepare for it.

One good way to prepare for the problem of disk storage is to get a flip-top plastic storage box. These come in various sizes and shapes.

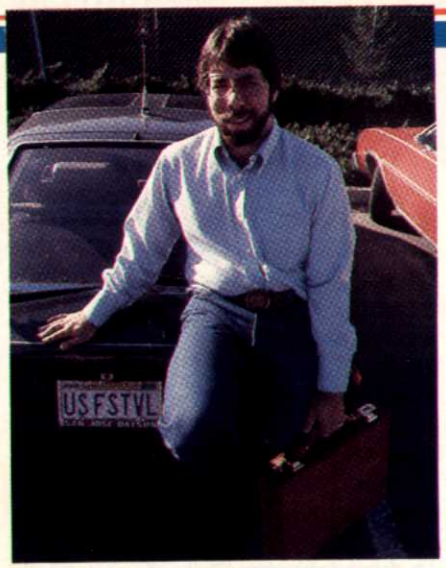
Keep the disks you use most frequently in there. Disks that you don't need ready access to you can put in disk boxes and store on bookshelves. This limits the amount of desk space taken up by your disks, keeps them protected and reduces clutter and confusion.

One final note about the computer environment: Unless you're rich or have an extremely good insurance policy on your computer, you should not allow any liquids in the computer room. That means no Coke, no milk, no water balloon fights. Computers are very, *very* hydrophobic — they don't like liquids. One cup of cocoa spilled in the wrong place could render the components of your computer as worthless as a week-old waffle. If you get thirsty slaving over a hot keyboard, do yourself a favor: Step out for a drink. And never let your friends set a glass of anything down on the computer table. ■

CHECKLIST FOR A COMPUTER WORKSTATION

1. One 110- to 120-volt grounded (three-hole) outlet.
2. At least 10 square feet of desk or table space.
3. Typewriter table or other similar space if you're going to have a full-size printer.
4. Boxes for storing disks if you have a disk drive.
5. A big sign that says, "No Liquids In the Computer Room!"

Steve Wozniak, Apple inventor.



THE WOZ LIVES!

BY JANE FERRELL

The Woz is back.

If you're like most people in the country, you might ask, "What's a Woz?" But if you're a computer fan, you know that Woz is not a "what" but a "who." He's Steve Wozniak, 32 years old and the co-founder of Apple Computer, Inc., in California.

Wozniak put together the Apple computer in 1976 in his garage because he wanted to have something to show off to the other people in his computer club. He had no idea his invention would signal the beginning of the microcomputer industry.

"I didn't know the time was right for a big company," he says as he sits in his small office in the corner of one of Apple's buildings in Santa Clara. Like other Apple employees, he's dressed casually. He wears blue jeans, a pressed white long-sleeve shirt, no tie, running shoes and a belt buckle with the Apple logo.

But after Steven Jobs, now chairman of the board of Apple Computer, approached Wozniak at the computer club and said, "Why don't we sell part of it—I think people would be interested in it," the rest is history. With a few hundred dollars and a year of working in a garage, a computer company was born.

Woz and Jobs put together a core group of people, which included a person who knew about manufacturing and another who knew all about marketing.

"We believed what we were doing was good," says Wozniak. "We didn't know where we were going, and we came close to folding. There's still a lot of that in the company—the motivation that comes from believing we're doing something good for people."

By the end of 1980, they had a profitable company. Woz and Jobs were millionaires, and other, larger companies were following Apple's lead in making microcomputers.

But Wozniak abruptly left the company in February 1981, when a plane he was piloting crashed on takeoff from a small airport near his home. He was injured, and suffered a case of anterograde amnesia (loss of memory of events after the accident). For five weeks, he couldn't remember anything. His wife, Candi, who was a passenger in the plane, has a stainless-steel cheekbone and no hearing in her right ear as a result of her injuries. She needed five hours of microsurgery to reconnect her left forefinger.

"After the plane crash, I was off work for a year," says Wozniak, "and since I had one year left to go on my (college) degree, it seemed like a good time to finish." He enrolled at the University of California at Berkeley under the name of Rocky Clark, so that his computer science teacher wouldn't treat him any differently from other students. Rocky is the name of Wozniak's Siberian husky, one of six dogs he and Candi romp with at their spacious home in the Santa Cruz Mountains.

While finishing school, he got sidetracked into the music business and produced the US Festivals, two giant rock concerts in Southern California during the summers of 1982 and 1983. Jessie John, Woz and Candi's 15-month-old son, was born during the last concert.

But now Woz has returned to his real love—computers. He's back at Apple. He's working on some new projects.

"Yeah, I've been here until midnight sometimes. It feels great," he says, and grins. "I still consider myself an inventor. I never got into management. I keep working with soldering irons and scopes and data sheets."

But tinkering with new ideas now is different from the days when Woz was inventing the Apple. It's not that those days were better, he points out. They were just different. He says Apple isn't typical of what a teenager who likes to mess around with computers can expect to invent these days.

"Apple is a poor example to look at," he claims. "It's an extreme example. Not a reasonable example. Hundreds of companies are springing up in garages around the country. Most make software for major computer lines. It's gotten to the point now that to develop a major corporation, it takes hundreds of man-years. No one person can do it in a garage."

Wozniak claims that the original Apple II took one year of his working alone in a garage. But Lisa, the company's $9,995 computer, took 200 staff-years and $50 million to develop.

Wozniak came to his tinkering naturally. He was a ham radio operator in the sixth grade, a top math and science student in high school. He became intrigued with computers and the "fantasy world of ones and zeros." At that time, he points out, "there was no one else around me who knew anything about computers. There was no one I could talk to about it."

He began designing computers that he could never build, because he could never get the parts for them. "The minicomputer I wanted then cost $20,000.

He left computers for a while and didn't look into them until 1975, when he was designing calculator parts for Hewlett-Packard Company. He joined a local computer club and discovered that an inexpensive microprocessor had been developed that made it possible for him to afford a computer.

"That's just when the hobby interests started," says Woz, whose dark brown beard is clipped close to his face. His hair, which grows down to his collar, is neatly cut. (Wozniak, who has never smoked marijuana and whose favorite strongest beverage is Red Zinger tea, was kicked out of Mexico once because of his long hair.) "About a million people around the country started getting interested in what I had stumbled onto ten years before when you had to know the right engineer to get a manual."

Wozniak thinks that the young people starting to write software now will be the creative pioneers for the next 20 years. But he knows that the creative inventors, the ones who come up with new ideas that can be used and that people want, will develop on their own. He doesn't think schools can teach it.

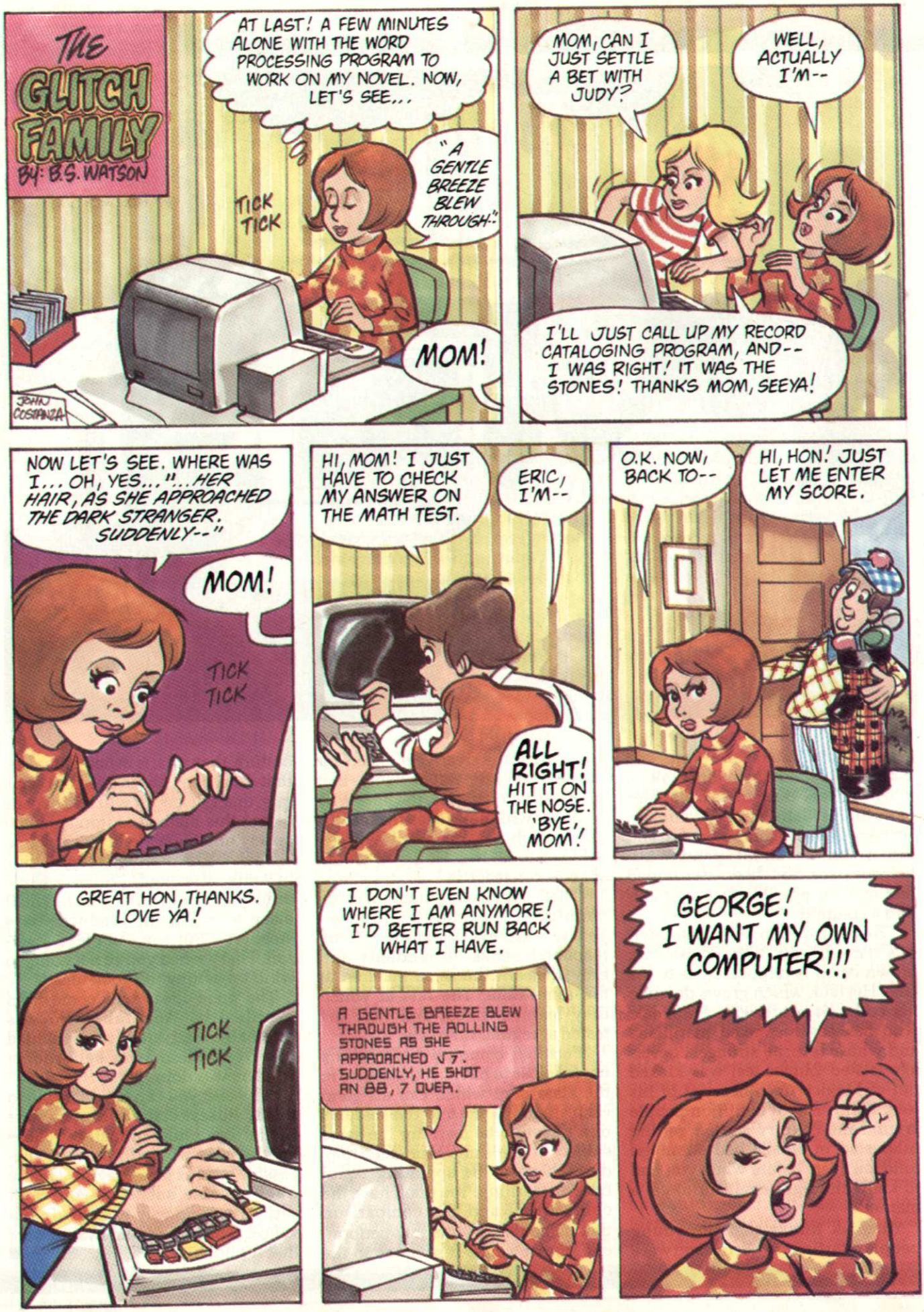
"There's been one paradigm in the country for a couple hundred years," claims Wozniak. "One teacher teaches 30 students and they all learn the same material at the same time. The rate at which they learn is fixed, and they get tested at regular intervals.

"Personal computers are getting us real close to having 30 teachers in the classroom which can all go at each student's rate and the students don't have to be learning the same subject at the same time, and they don't have to be spending equal time on learning. You don't have the competition and the comparison that demotivates some low performers. But we've got it so much in the culture that this is what school is, that everybody has to go at the same rate, that I suspect it will be a decade before this method is implemented on any notable scale."

So new inventors will come along in spite of school. "Some people think you can direct a guy and he'll make a successful product," says Wozniak. "But you can't lead a person. That's when you're not going to wind up getting the good ideas."

The good ideas will come from people like Wozniak, who was internally motivated, who pursued his dreams and who believed in what he was doing.

"The best you can be is a friend to them," he says of the upcoming stars in the computer industry. "Those are the ones who will be more successful. And as far as having a really huge notable success—you can't say. There's no way to know in advance. And nobody knows for sure that it's not him." ■


THE GLITCH FAMILY
BY: B.S. WATSON
AT LAST! A FEW MINUTES ALONE WITH THE WORD PROCESSING PROGRAM TO WORK ON MY NOVEL. NOW, LET'S SEE...
TICK TICK
"A GENTLE BREEZE BLEW THROUGH..."
MOM!
JOHN COSTANZA
MOM, CAN I JUST SETTLE A BET WITH JUDY?
WELL, ACTUALLY I'M--
I'LL JUST CALL UP MY RECORD CATALOGING PROGRAM, AND-- I WAS RIGHT! IT WAS THE STONES! THANKS MOM, SEEYA!
NOW LET'S SEE. WHERE WAS I... OH, YES..."...HER HAIR, AS SHE APPROACHED THE DARK STRANGER. SUDDENLY--"
MOM!
TICK TICK
HI, MOM! I JUST HAVE TO CHECK MY ANSWER ON THE MATH TEST.
ERIC, I'M--
ALL RIGHT! HIT IT ON THE NOSE. 'BYE, MOM!
O.K. NOW, BACK TO--
HI, HON! JUST LET ME ENTER MY SCORE.
GREAT HON, THANKS. LOVE YA!
TICK TICK
I DON'T EVEN KNOW WHERE I AM ANYMORE! I'D BETTER RUN BACK WHAT I HAVE.
A GENTLE BREEZE BLEW THROUGH THE ROLLING STONES AS SHE APPROACHED $\sqrt{7}$. SUDDENLY, HE SHOT AN 88, 7 OVER.
GEORGE! I WANT MY OWN COMPUTER!!!

WHIZ KIDS:

Getting Serious With Games

BY JANE FERRELL

Mark Cerny has a job that many computer game fanatics dream about. He designs arcade video games for Atari, Inc., in California. The company hired the 19-year-old computer genius two years ago. Atari wasn't interested in hiring Cerny just because he was the first person to score more than a million points on Defender, one of the company's games. It was interested in him because he wanted to design games that were harder and more fun to play . . . and had the ability to do it.

Cerny is an Associate Microprocessor Programmer. This means he designs and writes the computer programs for Atari's coin-operated games. He is 6-foot-1 and weighs 130 pounds—he describes himself as a "bunch of pipe cleaners stuck together." He works in a building in Atari's sprawling complex in Milpitas, California, a community at the lower end of Silicon Valley that still has farm fields.

Because the work done by Atari's game division is very secret, all employees and visitors must sign in and out and wear plastic tags on their shirts. In the lobby, a stern security guard standing with his big arms folded across his chest scrutinizes all visitors.

But inside there are no doors marked "Secret Games Room," just a bunch of ordinary-looking offices. The secrets of Atari's games are kept in the heads of the engineers and computer programmers who walk through the halls.

Cerny has an office with a big window that looks into a common room where his team meets to talk about its project. One team member is an engineer who designs the computer chips on the boards. Another is a technician who keeps the game running and gets it ready for test marketing. The last member is the project leader who supervises the game and does the paperwork.

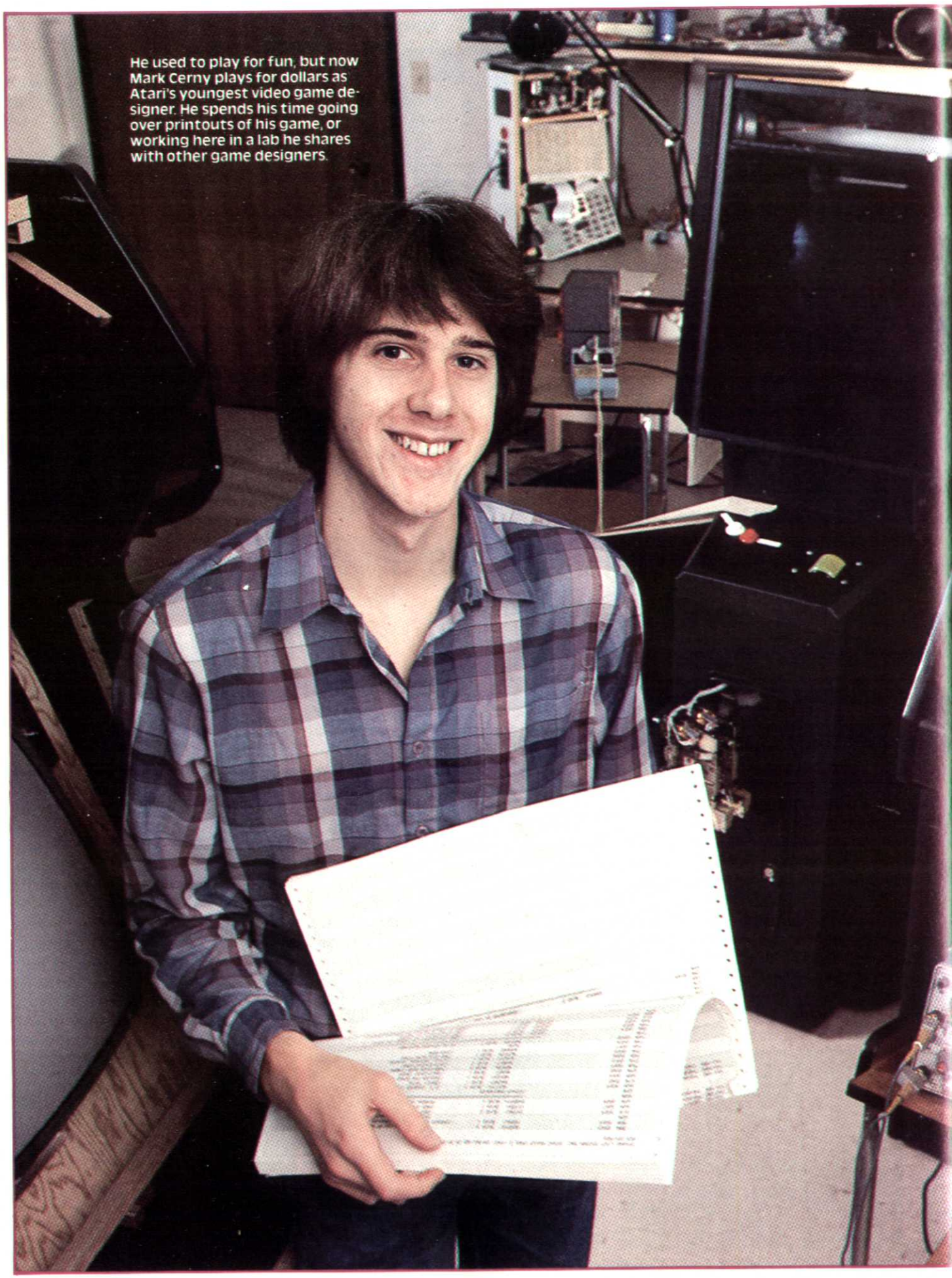
The teenager spends about 40 percent of his time in his office reading the computer printouts of his game. The rest of the time he works in a huge windowless room across the hall—a laboratory he shares with other dreamers of games. The room is packed with torn-apart games, Atari home computers and mysterious-looking electronic test equipment.

Cerny sits on a brown chair in a corner of the room. Next to his workbench, which is strewn with computer printouts, game boards and wires, is his arcade game. It's unplugged, so that a visitor can't see what he's designing.

He might spend six hours a day in here, working out his game. Some days it's ten hours, even on weekends. "I've been here long enough to get caught in the morning rush-hour traffic—on my way home," says Cerny. "But not too often."

Making a game takes a long time. But Cerny's patient. In two years, he hopes to see his fantasy game in arcades across the nation. In five years, he thinks he'll be working on something different. "Games may not be the same by then," he says. Already the live-action animated video games are getting popular, and may be the beginning of another

Playing a human opponent takes Mark Cerny's mind off work—designing video games.



He used to play for fun, but now Mark Cerny plays for dollars as Atari's youngest video game designer. He spends his time going over printouts of his game, or working here in a lab he shares with other game designers.

WHIZ KIDS

generation of games. "They may not even be called video games. The machine's programming is getting more and more powerful, with more graphics."

You can call Cerny a whiz, and maybe you can get away with calling him a kid. But don't call him a whiz kid. He doesn't like it.

"The idea of 'computer whiz kids' has the tendency to display kids with glasses," says Cerny, who doesn't wear glasses. "They're asked if they have friends. That's not very fair. If the stereotype does exist, I don't think he'd be very good at designing video games. We don't have computer geeks here. I'm beginning to doubt their existence."

It wasn't his education that got Cerny to his job at Atari, he says. "What I'm doing came out of personal motivations," he emphasizes. "I'm not your typical teenager."

Cerny began fiddling with computers in his father's laboratory at the University of California at Berkeley when he was 12. They didn't have personal computers then, so his father, a nuclear chemist, let him play with the university computer. "I tried to achieve every child's dream by programming Dungeons and Dragons into the computer," Cerny says.

He was smart in school, too. He skipped two grades in private schools in Oakland and Berkeley. He began going to the university when he was 16 years old. But he became bored. He started playing video games three hours a day and, after a while, conquered Defender.

"I came to the conclusion that I'm a somewhat better video player than average," he says. He wanted to do something with this talent. The university wasn't the place for him, he figured. He thought long and hard about what he could do, and first considered exploring the psychology of video games, hopefully at a company that designed them.

"I wondered whether this was a physical ability or a mental ability. That focus didn't last long, although it was the focus of my interview with Atari."

Now that his hobby has become his work, Cerny is learning how to play table tennis, because he needed something to take his mind off his work. "I like table tennis because I'm playing against a human opponent for one thing, and that's a lot of fun. It also involves the whole body, which video games don't do."

According to the best guess from people who know about jobs like Cerny's, the teenager makes about $25,000 a year. Neither Atari nor he will say how much money he makes. To him it doesn't make much difference. It's just something to keep him going while he works for the jackpot—the royalty money he'll receive if his game makes it big. (For some perspective on the size and potential of the video industry in 1982, manufacturers sold $900 million of arcade games. Into these, Americans dropped $7 *billion* in quarters.)

Although school doesn't interest him now, he doesn't rule out going back. "If I need to know about engineering someday, for instance, then I'll go to a school that offers what I need. Despite the fact that I dropped out of college, I don't feel like I never heard of Europe. I'm having a very good time here. If I'd known it was going to be this much fun, I would've dropped out a year earlier."

Cerny thinks it's important for kids to know that just being smart won't get you a good job. Atari didn't hire him just because he was smart, Cerny points out. "It's important to know whether you can work with other people. If I hadn't looked like a nice person as well, I wouldn't have gotten hired."

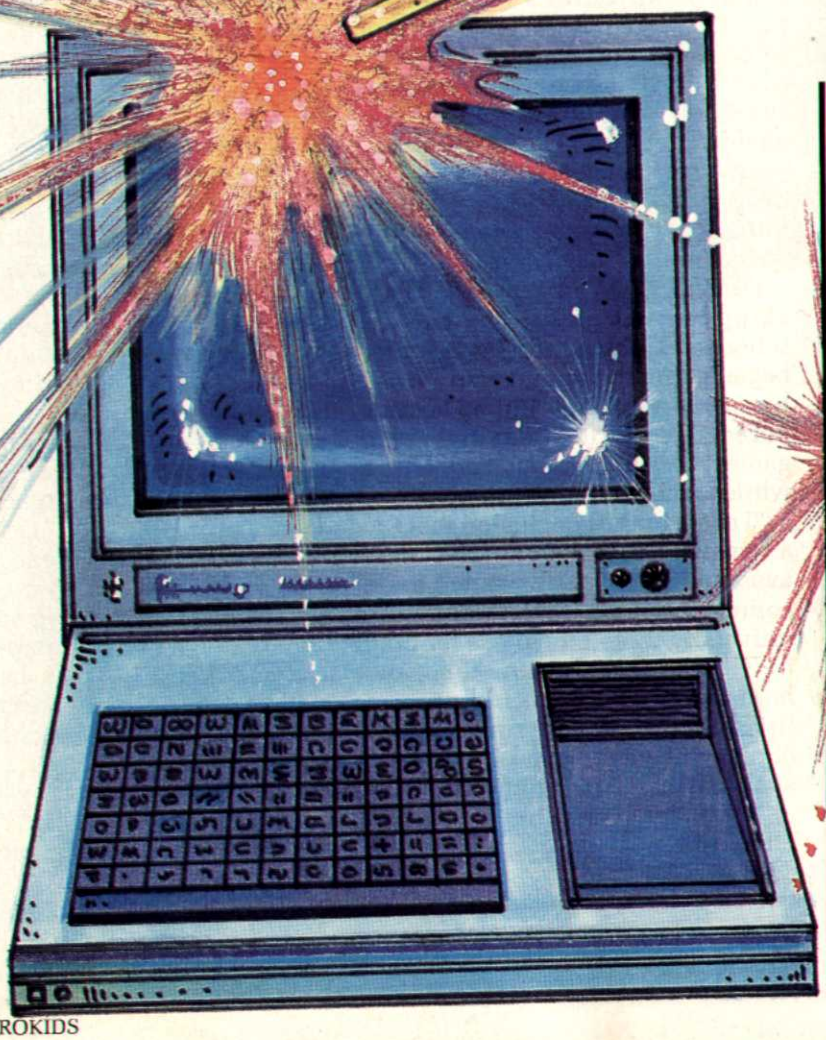
But Atari doesn't require a college education of all its employees, either. "They're willing to take a chance on people here," Cerny says, "because the payoffs are so large."

If Cerny and his team come up with a good game, it will mean millions of dollars to the company.

And what about his being the youngest employee in the games division? "I get a little bit of teasing," Cerny chuckles. "I think it's fun. I'm not treated any differently than any other programmer, though. The fact that I'm a video games player affects people around here more than my age. I always make their games look too easy." ■

GRAPHICS MAGIC

In this regular feature, MICROKIDS offers programs that anyone—even beginners—can type into their computers and run immediately. So type in the program that applies to your machine and watch the fireworks! Or, try rewriting some of the other programs so they'll run on your machine. You may not succeed, but you'll learn an awful lot!



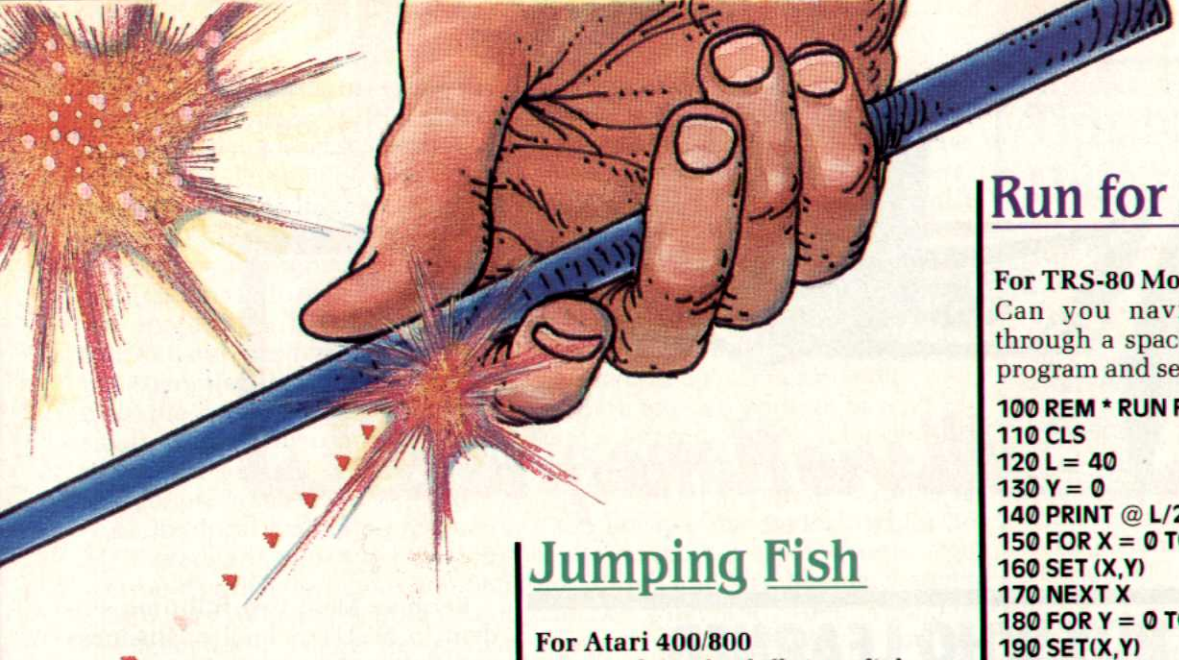
Surprise Package

For Apple

It's fun to be surprised once in a while, and here's your chance. Just punch in the program below, written for the Apple computer, and get set for a real "spectacular."

```
5 HOME
6 GR
10 COLOR=INT(16*RND(1))+1:HLIN
    0,39 AT INT(13*RND(1))+1
20 HLIN 0,39, AT 0
25 COLOR=INT(16*RND(1))+1
30 HLIN 0,39 AT INT(13*RND(1))+26
40 COLOR=INT(16*RND(1))+1:VLIN
    0,39 AT INT(13*RND(1))+1
50 COLOR=INT(16*RND(1))+1:VLIN
    0,39 AT INT(13*RND(1))+26
60 COLOR=INT(16*RND(1))+1:HLIN
    0,13 AT INT(13*RND(1))+13
70 COLOR=INT(16*RND(1))+1:HLIN
    27,39 AT INT(13*RND(1))+13
80 COLOR=INT(16*RND(1))+1:VLIN 27,
    39 AT INT(13*RND(1))+26
90 COLOR=INT(16*RND(1))+1:VLIN 0,13
    AT INT(13*RND(1))+13
100 COLOR=INT(16*RND(1))+1:PLOT
     INT(13*RND(1))+
     13,INT(13*RND(1))+13
110 GOTO 10
```

—Michael Graves II



Missile!

For VIC-20

Your position is under attack by enemy aircraft. You have three missile bases capable of launching preemptive strikes. Press any key and the left-hand base fires. Press another key and the center base fires. Press a third key and the right-hand base fires. How many planes can you bring down?

```
10 PRINT CHR$(147)CHR$(5);
20 POKE 36879,8
60 DIM Y(3),F(3)
70 N=1:MS=2
90 P=INT(RND(1)*9+2)*2
110 FOR I=I TO 21 STEP RND(1)/2+.5
120 GOSUB 300
130 GET F$
140 IF F$="" OR N>3 THEN 170
150 F(N)=-1
160 N=N+1
170 FOR J=1 TO 3
180 IF F(J)=0 THEN 220
190 POKE 8164+j*5-Y(j)*22,32
200 IF Y (J)=22 THEN 240
210 Y(J)=Y(J)+1
220 POKE 8164+J*5-Y(J)*22,30
230 IF ABS (I-J*5) <=1 and P=Y(J)
    THEN 280
240 NEXT
250 NEXT
260 PRINT CHR$(147); "MISSED!!!!"
270 END
280 PRINT CHR$(147); "HIT!!!!"
282 POKE 36877,220 : POKE 36878,15
284 FOR K=1 to 500 : NEXT
286 POKE 36877,0 : POKE 36878,0
290 END
300 POKE 8163+I-P*22,32
310 POKE 8164+I-P*22, 121
320 RETURN
```

—Daniel Isaaman and Jenny Tyler

Jumping Fish

For Atari 400/800

You've heard of flying fish, no doubt, but have you ever heard of a jumping fish? Well, now you've not only heard of it, you can actually see it. Just copy the program below, written for the Atari 400 or 800 computer.

```
100 GRAPHICS 8
110 COLOR 1: SETCOLOR 1,1,1
120 SETCOLOR 2,8,12
130 X=65: Y=140
145 REM ***DRAW WATER
150 COLOR 1: PLOT 0,80:DRAWTO
    319,80
155 REM ***MOVE ACROSS
160 FOR X=65 TO 165 STEP 10
170 COLOR 1: PLOT X,Y:GOSUB 350
180 COLOR 0:PLOT X,Y:GOSUB 350
190 NEXT X
195 REM ***JUMP UP
200 FOR Y=140 TO 40 STEP -5
210 COLOR 1:PLOT X,Y:GOSUB 350
220 COLOR 0:PLOT X,Y:GOSUB 350
230 NEXT Y
235 REM ***JUMP DOWN
240 FOR Y=40 TO 140 STEP 5
250 COLOR 1:PLOT X,Y:GOSUB 350
260 COLOR 0:PLOT X,Y:GOSUB 350
270 NEXT Y
275 REM ***REDRAW FISH & WATER
280 COLOR 1:PLOT X,Y:GOSUB 350
290 COLOR 1:PLOT 0,80:DRAWTO
    319,80
295 REM ***MOVE ACROSS
300 FOR X=175 TO 265 STEP 10
310 COLOR 1:PLOT X,Y:GOSUB 350
320 COLOR 0:PLOT X,Y:GOSUB 350
330 NEXT X
340 GOTO 145
350 REM ***DRAW FISH
360 DRAWTO X+31, Y-10:DRAWTO
    X+45, Y
370 DRAWTO X+31, Y+8:DRAWTO
    X-3, Y-5
380 DRAWTO X,Y:PLOT X+38, Y-2
390 RETURN
```

—Susan Drake Lipscomb and Margaret Ann Zuanich

Run for It

For TRS-80 Models I, III and 4

Can you navigate a spacecraft through a space junkyard? Try this program and see how far you get.

```
100 REM * RUN FOR IT *
110 CLS
120 L = 40
130 Y = 0
140 PRINT @ L/2 + 2,"LEVEL";L/8
150 FOR X = 0 TO L
160 SET (X,Y)
170 NEXT X
180 FOR Y = 0 TO 47
190 SET(X,Y)
200 SET(X - (L = 1),Y)
210 NEXT Y
220 X = L/2
230 Y = 2
240 A$ = INKEY$
250 IF A$ = "N" Y = Y - 1
260 IF A$ = "S" Y = Y + 1
270 IF A$ = "W" X = X - 1
280 IF A$ = "E" X = X + 1
290 SET(X,Y)
300 IF Y = 47 GOTO 450
310 IF POINT(X + 1,Y) = - 1 GOTO 400
320 IF POINT(X - 1,Y) = - 1 GOTO 400
330 IF POINT(X,Y + 1) = - 1GOTO 400
340 IF POINT(X,Y - 1) = - 1GOTO 400
350 RESET(X,Y)
360 A = RND(L)
370 B = RND(47)
380 SET(A,B)
390 GOTO 240
400 CLS
410 PRINT CHR$(23)
420 FOR C = 1 TO 300
430 PRINT "BOOM ";
440 NEXT C
450 CLS
460 PRINT "RANGE:";Y*1000;"MILES";
470 IF Y = 47 PRINT "SAFELY" ELSE
    PRINT
480 IF Y > W THEN W = Y
490 PRINT "BEST AT
    LEVEL:";W*1000;"MILES"
500 PRINT "RANK:";
510 IF Y = 47 B$ = "COMMANDER"
520 IF Y < 47 B$ = "EXPERT"
530 IF Y < 40 B$ = "CO-PILOT"
540 IF Y < 30 B$ = "ROOKIE"
550 IF Y < 15 B$ = "SCRUBBED"
560 PRINT B$;"AT LEVEL";L/8
570 PRINT
580 IF Y = 47 AND L = 8
    PRINT "YOU'RE TOPS!": END
590 IF Y = 47 PRINT "IT GETS
    TOUGHER": L = L - 8:W = 0
600 IF Y < 47 PRINT "TRY AGAIN"
610 FOR D = 1 TO 2000
620 NEXT D
630 CLS
640 GOTO 130
```

—Richard Ramella

THE BOY WHO LEARNED TO SELL COMPUTERS

BY AMY A. HELLER

It's 3:00 in the morning in New York City and even Greenwich Village is almost deserted. On Fifth Avenue, only an occasional car or taxi drives past New York University's Rubin Hall dormitory. But upstairs, in Suite 704, Marc Mandel is wide awake . . . and working.

While his roommates try to sleep, the six-foot freshman sits at the keyboard of his Epson QX 10, typing rapidly. Marc isn't up late writing a paper or a program for class, he's preparing invoices for his mail-order computer company. And Marc doesn't mind losing a little sleep for OmniSoft Computers, because in the past year his brainchild has grossed over $100,000 in sales.

At 18, Marc may not look like the average executive, but he's no newcomer to the computer business. Marc started his first computer mail-order company when he was 14, and over the years he has developed the system that has made OmniSoft so successful.

Marc describes OmniSoft as a "no frills" company. He buys all the computers, peripherals and software at wholesale prices and sells them for "substantially less" than the stores. Marc is able to undersell the competition by keeping his costs low. By working out of his dorm room and by storing his inventory in his parents' basement, Marc's main expense is the approximately $5,000 a month he spends to advertise OmniSoft's bargains in a variety of computer publications. But Marc doesn't begrudge the cost of the ads. "They've paid off very nicely," he reports. "My first national ad cost me $185 and ended up grossing over $20,000 in new sales."

Don't let his casual appearance fool you. Marc Mandel is a businessman.

Because Marc is a full-time student in NYU's School of Business and Public Administration, he has to find time for business after he's finished his classes and his homework. Most nights he doesn't get around to processing orders until after midnight. Since NYU doesn't hold classes on Fridays, Marc usually travels to his parents' home in Huntington, Long Island, and ships out the week's orders then.

Growing up in surburban Huntington, Marc first became intrigued with computers in his seventh grade computer club, when he learned to write a program to print a Christmas tree. Marc started saving the money he made delivering newspapers and trading rare baseball cards, and within a year he bought his first micro, a Radio Shack TRS-80 Model I. Marc taught himself programming, and soon he was completely gung ho about computers. By the time he was in high school he was president of the computer club, taught computer classes and even tutored new computer users in their homes.

At the same time, Marc started to explore the sales end of the computer business. As a consumer, he visited trade shows and local stores and got a chance to meet and talk with hundreds of computer pros. Many of the younger dealers Marc met were making good money selling computers by mail, and he decided to try it himself. So, in ninth grade, Marc and a friend pooled their life savings and formed a mail-order company, Millennium Software. It didn't last a millennium; it lasted just three months, and when it failed, they lost all of their money—$3,000 each. As Marc

puts it, he and his partner were running their business by trial and error, "and we made a lot of errors."

Marc decided that he would earn the money he had lost and would try again. This time, however, he worked as a programmer to make enough money to start up. Within a few months he had earned about $10,000 and was ready to start selling computers again. Marc learned from his past mistakes and started small. At first, his company had no name and he sold only to friends and people in his town.

As his local business prospered, Marc gradually expanded the company and gave it the name OmniSoft Computers. When classified ads in the local Long Island newspaper paid off, Marc started advertising nationally and sales skyrocketed. Today, OmniSoft has salesmen in Canada and Greece and has shipped to as far away as Tokyo, Japan.

While Marc built up OmniSoft, he continued to work as a computer consultant, doing programming for companies such as Hearst Publishing and Cornell Computers. Marc began to realize that he didn't like "being chained to a computer eight hours a day. I like writing programs to turn around and sell," he explains, "but I don't like writing programs on demand for someone else." And although Marc wrote almost half the programs in his new software catalog, he now thinks of programming as a sideline.

While Marc's determination and optimism rarely flagged, his family didn't always share his enthusiasm. Marc's parents, who he says "know nothing about computers," worried that the time he spent on OmniSoft would take away from his studies. Not even Marc's younger brother shared his interest in computers. Today, although his parents still worry, Marc's father recently asked his son for some private computer lessons. And now Marc's brother is following in his entrepreneurial footsteps, selling polo shirts and sweaters at a local flea market.

Marc and his parents haven't always agreed on how he should spend his money either. Marc complains that his parents' motto is "the cheaper the better," while he believes that people should "go for it!" Mr. and Mrs. Mandel weren't thrilled when Marc spent $1,800 to lease a 1927 Rolls Royce for the night of his high school prom. And they aren't too happy when Marc talks about replacing his 1980 Cadillac Coupe DeVille with a Porsche. But easygoing Marc likes to enjoy his earnings.

Marc runs his OmniSoft Computers company with the help of an Epson QX-10.

Despite his busy schedule, Marc still finds time for his personal interests. During the baseball season he's an avid Yankee fan. He also enjoys writing short stories and poetry. This year Marc is also working for the Presidential campaign of Gary Hart, setting up the candidate's New York State mailing lists and financial reports on his computer.

Marc has big plans for his future — he wants to expand OmniSoft worldwide, attend law school and eventually act as legal counsel for the nation's leading computer companies. But for now, he has to cram for an economics final, process a batch of new orders and catch up on his sleep—if he can find the time. ■

Tips on Getting Started

Marc had to learn the ins and outs of starting a mail-order microcomputer company the hard way, but you can profit from his experience. Here are a few tips:

- You don't need a lot of money to start a company—if you can scrape up $60, you can get going. You'll need between $20 and $40 to file your company with the local authorities (call your town hall or county clerk for information); the rest of your funds will go for inexpensive advertising.
- Go to the retail computer stores in your area and tell them you're planning to sell computers by mail and that you'd like to find out about their wholesale price breakdowns. Try to collect price lists for all the computer systems you'll want to sell. But be discreet—no salesman will want to take time away from a potential customer to talk to you about wholesale prices.
- While you're researching prices and computers, get to know the people in the business and *make sure they know you.* Go to trade shows and find time to talk with computer fans in your neighborhood. If people get to know and respect you, they'll help you out if you have a problem.
- When you're ready to start selling, let all your friends, neighbors and computer contacts know that you're in business. Word of mouth is the cheapest advertising.
- At first, don't stock *anything.* If a customer comes to you for a certain computer, tell him it will take a couple of days and then go out and buy it. That way you don't have to invest your money in inventory and you can't get stuck with a discontinued model.
- Place a small classified ad in your neighborhood newspaper or pennysaver. This probably will cost less than $10, but it can bring in a lot of orders.
- If you need to borrow money, try your parents first. It's hard to borrow small amounts from a bank, and parents usually don't charge interest.
- Offer your customers advice in choosing a system, then help them set it up. This gives people another reason to buy from you. But make sure you know what you're talking about. Familiarize yourself with the different micros and software on the market.

GETTING STARTED

A BEGINNER'S GUIDE TO COMPUTERS

If you don't know anything about computing but think you'd like to try it, this is the place to get started.

A computer is not a single unit but a system. Like the instruments in an orchestra, the parts work together to obtain the desired effect. The physical devices which make up a computer system are called *hardware*; in contrast, the set of instructions which tells the hardware what to do is called *software*.

A computer system has four basic operations: It accepts (or inputs) information, processes it, stores it and outputs it. In order to perform these operations it must have an input device like a keyboard to accept data, a central processing unit (CPU) to process it, memory to store it and a device like a monitor or TV to output the information processed. Therefore, the main parts of a computer system are the CPU, the memory and the input and output devices.

Today *integrated circuit chips* are used in making all of these devices. A chip is a thin wafer made of silicon, one of the most abundant elements in the universe. It is not found in purified form in nature, but it is refined through many steps to be pure enough to use for a computer chip. The chip is only about one or two tenths of an inch square. Diffused into the silicon are the elements which make up an integrated circuit.

The name *chip* is given to both the square piece of silicon on which the circuits are fabricated and to the chip and its packaging. The silicon chip is enclosed in a rectangular piece of black plastic or ceramic with metallic pins sticking out the side or bottom. The black plastic is a protective cover. The pins allow you to plug the chip into a computer board so that the circuit can communicate with the rest of the computer.

If you examine one of these chips with a magnifying glass, you may see patterns on the silicon which are the connectors between the transistor elements. These very tiny circuits weave in and around each other. Since these circuits are connected, or integrated, with one another, the chips are called *integrated circuit chips*.

Not all chips are the same; in fact, there are thousands of different ones, including memory chips, disk controller chips, etc. Each different chip performs a certain job.

The chips range from very simple with only a few parts up to those with 500,000 transistors. One of the largest integrated circuit chips in the computer is a *CPU*, or *central processing unit*.

The CPU is in what is called "the computer." It's usually housed in a metal box along with a power supply, memory chips and other chips, depending on the computer.

The CPU, or microprocessor, is the so-called brain of the computer. It's not a real brain because it doesn't think, but it does compute; that is, it works by numerical methods. A computer chip works in terms of two states, one and zero. Since it handles only two numbers, it works in binary. The ones or zeros are called bits. A string of four bits is a nibble and a string of eight is a byte. A byte is usually thought of as representing a single letter, number or symbol.

The CPU translates every piece of information it works with into binary, which may seem a long and tedious process. It is, but the computer can do its calculations at blinding speed. Its operations are measured in nanoseconds—*billionths* of a second.

The CPU has three main parts: an arithmetic unit, a control unit and registers. The arithmetic unit does all of the computer system's calculating. It can add, subtract, do logic and do other mathematical operations. It's usually capable of performing between 50 and 500 different instructions. The registers are part of the arithmetic unit. They hold numbers while they're being operated on.

The control unit directs the flow of information through the computer like a police officer directing traffic. It sends information to the memory to be stored and it takes the information to be processed from the memory and sends it to the arithmetic logic unit to be calculated and compared. When informa-

Dot matrix printers are popular.

tion has been processed, it sends it to an output device to be displayed.

Many companies make integrated circuit chips that could be used as a computer's CPU. Several of these chips are very popular, like the 6502, which is used in Apple, Commodore and Atari computers. The Z80 and the 8080 are also popular and are used in some Radio Shack models and in the Timex Sinclair.

Because a computer works with so much information, the memory is very important. Computers have several different types of memory. Inside the computer are integrated circuits called *memory chips*, which work with the CPU to control and store thousands of bytes of information. These chips, which may be on a circuit board along with the CPU, are of two different types.

The first is the *ROM*, or *read-only memory* chip. Information stored on this type cannot be changed. The second type, the *RAM*, or *random-access memory* chip, has information in it while the computer is on, but the information is lost when the computer is turned off.

The information on ROM chips is programmed into them at the factory. In addition to ROMs there are *PROMs*, or *programmable read-only memory* chips, which can be programmed after manufacture. *EPROMs* (*erasable* PROMs) can be erased and programmed again. They have a window at the top through which the information can be erased with ultraviolet light. After this is done, new information can be put onto the chip.

RAM is the memory which changes each time you use your computer. When people speak of how much memory a computer has, they're usually talking about RAM. Computers today have a minimum of 4K of memory, but many have 64K and some have even more. The *K* comes from the word "kilobyte," which means "one thousand bytes" (actually, 1,024 bytes). If a computer has 64K of memory it has approximately 64 thousand bytes or characters.

Another type of memory which a computer really needs is *mass storage*. Information you type into the computer is in the RAM, and when you turn off the system, this information is lost. However, it can be saved through a mass storage memory device like a disk drive or cassette recorder. These allow you to store information which was in the RAM and load it back there later when you want to work with it again.

The amount of information that can be stored in ROM chips is limited. The amount that can be stored on a potentially endless supply of cassettes or disks is unlimited.

The CPU could calculate all day but it would do no good if you had no way to communicate with it. *Input/output devices* are the pieces of equipment attached to the computer which allow you to give it information and allow it a way of responding to you.

As a group, these pieces of equipment may be called I/O devices. However, some of them are only input devices, some are only output devices and the rest are both.

The most common input device is the *keyboard*, which looks like a typewriter. But instead of immediately printing letters or numbers on paper, it puts them in the RAM memory of the computer and


Disk drives provide random access.


Many users start with tape recorders.

on the screen of the monitor.

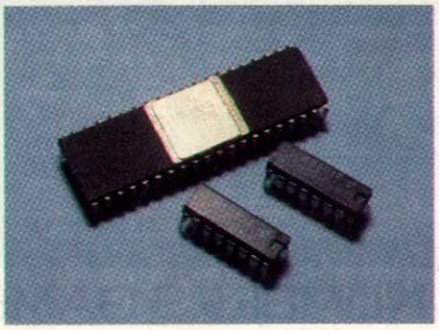
The most common output device is the *monitor*, a CRT (or cathode-ray tube). It's a screen on which information can be displayed. Monochrome monitors are available including those having a black background behind white, green or amber symbols.

If you'll be using your computer for graphics or are eager to see the colorful designs or patterns in many commercially available programs, then you'll want a color monitor. You could use a color TV set, but the image is not as clear as with a monitor.

The *printer* is an output device which lets you make printed copies on paper (called "hard copy") of the information in the computer. Two popular types are sold for use with personal computers. The *dot-matrix printer* forms symbols with dots, while the *daisywheel printer* uses a circular plastic or metal disk. On spokes around the outside edge of the disk are letters, numbers and symbols, like those on a typewriter.

Among the devices which allow for both input and output are cassette recorders, floppy disk drives, hard disk drives and modems. The *cassette recorder* is a memory I/O device. It's also called a *read/write device* because you can use it to "write" (or store) information on regular cassette tapes and "read" (or retrieve) the information back at will.

Access to data stored on a cassette tape is *serial*; that is, one bit comes after the other along the tape. Moving through the tape to the program or data needed can be time-consuming. A cassette recorder is much less expensive than a disk drive but so inconvenient that most people who use their computers



Chips come in different sizes.

regularly soon upgrade to a disk drive, and perhaps even two.

A *floppy disk drive* is a mechanical device which allows the recording of the same kind of data as that recorded by a cassette tape recorder, only the disk drive puts the information on a flat disk. This disk looks like a small, floppy record, but its surface is identical to that of a cassette tape. It's enclosed in a square, plastic protective holder.

The disk drive puts information on thin concentric rings on the floppy disk as it spins inside its jacket. You can select the program you want to use by accessing any part of the disk immediately, much like a phonograph record, without going through the beginning (outer rings) of the disk. The disk drive can choose where to start reading information so it has random and therefore fast access to the data on the disk.

A *modem* is a device which allows your computer to communicate with others. It converts the data from your computer to audible sounds which can be sent over telephone lines. It also reconverts the telephone tones it receives from other computers back into data which is then stored in the memory of your computer and which you can read on your monitor.

A *computer system* is made up of devices that work together as a functioning unit. You can buy either a complete system or a component system. A complete system usually includes the computer, a keyboard, a disk drive, a monitor and perhaps a printer and other pieces of hardware—and even some software—all in a single package and for one price. It is sold as one unit under the name of a single company, although all the parts may not have actually been made by the same company. If you find a complete system which fills your needs, then all you have to do is to make the single decision whether to buy it or not.

With a complete system you have little choice. If you don't like the printer that comes with it, you may not be able to choose another. A way around that, however, is to work with a computer retailer to select the components of a computer system so that it's just what you need. You may purchase components made by only one manufacturer, but you're free to make other selections. It's possible to combine devices made by different manufacturers, but this requires you to know a great deal about computers.

You may choose to buy a basic computer system and add onto it a little at a time, according to your interest and budget restrictions.

Before you start putting together a system, you must become aware of compatibility, which is the biggest problem in microcomputer hardware today. Even though all computers speak binary, most cannot speak to each other. Even though two computers, like the Apple and Commodore PET, are based on the same 6502 microprocessor chip, and have the same instruction set or calculating capabilities, they are not compatible because of differences in other parts of the computer.

The most popular personal computers are not compatible with each other; nor are the peripheral devices for each interchangeable. A disk drive which works an Atari, for example, will not work with a TRS-80 computer. And different peripheral models may be incompatible with the same brand of computer. So pay particular attention to compatibility when filling out your system.

After you select a computer—but before you buy—find out what software is available for it. A computer is not very useful if you don't have good software to run it. In fact, the software is so important that many people advise you to choose the software you want to be able to run and *then* buy a computer that can run it. ■

Glossary

Bit: The smallest piece of information a computer handles: a zero or a one.

Byte: A string of eight bits which signifies a single letter, number or symbol.

Cassette Tape Recorder: A storage device which uses magnetic tape.

Central Processing Unit (CPU): The central part of the computer that can do math and make logical decisions.

Chip: A thin wafer of silicon which has electronic circuits on it. Chips are used throughout a computer system.

Disk Drive: A storage device which allows you to record information on disks and to read from them.

Disk: The flexible, round magnetic piece of plastic on which programs and data are stored (also called *diskette*).

Hardware: The devices or equipment which make up a computer.

Input/Output (I/O) Device: Any piece of hardware which puts information into the computer and/or allows it to be transferred out.

K: The unit of measurement used for the memory size. It is equal to approximately one thousand (actually 1024) bytes.

Keyboard: The "typewriter" that allows you to put information into the computer.

Memory: That part of the computer which can store programs and information.

Modem: A device which converts computer data into audible sounds which can be sent over telephone lines. It also reconverts tones back to data.

Monitor: The screen or cathode ray tube (CRT) used to display data from the computer.

Peripheral: Any device attached to the computer which enhances its capabilities.

PROM: Programmable read-only memory. It can be reprogrammed after the manufacture of the chip.

RAM (Random-Access Memory): The working area of the computer where instructions and data are stored while a program is being run.

ROM (Read-Only Memory): Permanent memory. It can be altered only by changing the physical structure of the chip.

X-PERT

THE NUMBERS GAME

BY ELISE HOWARD

When you begin to work with a computer, whether you are writing your own programs or using programs someone else has written, it may seem as though the computer can do anything you ask of it—solve algebra problems, write English papers, compose music, play Super PacMan or what seems like an infinite number of other tasks.

The computer, by itself, can't do any of those things, however. In fact, it needs a great deal of help. Without human help, a computer can't even count to ten. All the power of a computer to add, subtract, multiply, divide, write about Shakespeare, play Beethoven or the Beatles or swallow energizers can be reduced to a network of tiny—microscopic—switches. Those switches can be on or off. That means a computer can detect two numeric values: zero—represented by an OFF switch, and one—represented by an ON switch. In other words, a computer can count to one.

But if that seems limiting, look at the counting system we use every day. We use ten numeric digits: zero, one, two, three, four, five, six, seven, eight and nine. It's only by combining those digits that we're able to create any number larger than nine. When we want to discuss a quantity larger than nine, we use the representation 10. In the decimal system, which is what we call our counting system (to indicate that it is based on ten numeric values), 10 represents a quantity one larger than the greatest single-digit number.

The decimal system seems logical and natural to us for several reasons. First, it is the system we learn from the very beginning. Second, we have ten fingers and ten toes, and they're sometimes very useful aids in counting. It's probably because of our ten fingers that the decimal system first originated. Third, the words we use to represent numbers correspond logically to the decimal system. So, *nineteen* sounds like 19, or one ten and nine ones. *Forty-three* sounds like four tens and three ones.

But the decimal system is no more logical, really, than any other number system. Some ancient societies used systems based on five or twenty. Ancient Babylonians used a counting system based on sixty—imagine memorizing *those* multiplication tables!

The important thing to remember is this: It doesn't really matter how many different numerals you use to create your counting system, as long as you can combine those digits to represent additional numbers. Even a system that uses only zero and one, like a computer's counting system, can count endlessly.

The counting system computers use is called the binary system, *bi* meaning the base of the system is two. The binary system, with its two values, is what makes computing possible. If we use the same rules to create binary numbers as we use to create decimal numbers, there is no limit to how high we can count. And, more important, we will have created a number system that can be represented by two symbols, such as the on and off of our computer switches. So as long as our computer can distinguish between 1 (on) and 0 (off), it can count as high we like, depending on how many switches it contains.

Let's take a closer look at some of those rules for creating numbers. In the decimal, or base ten, system, we can count to nine using single digits. When we want to go beyond nine, we create the tens column and write 10. We understand that to mean "one ten and zero ones." We can then count to 99, only to run out of digits again, when we move to another column, write 100, and think, "one hundred, zero tens and zero ones." The tens column represents ten ones (10 x 1), the hundreds column represents ten tens (10 x 10, or 10^2), the thousands column will represent ten hundreds (10 x 10 x 10, or 10^3) and so on:

10^9	10^8	10^7	10^6		10^5	10^4	10^3		10^2	10^1	ones
1	3	4	5	,	8	4	6	,	3	7	3

What about the binary, or base two system? We already know that we can count only to one in the ones column. So we must move to the next column to represent two. In base two, 10 still represents one more than the highest number we can count in the ones column. But the number it now stands for is 2, and we must think, "one two and no ones." If we write 11, we think, "one two and one one," which we know is 3.

But we have already used up all our digits again, so we must move to another column, which will repre-

sent two twos, or 4. So 100 in binary numbers makes us think, "one four and no twos and no ones." We saw that in the decimal system, each new column stands for ten times the previous column.

In the binary system, each new column equals *two* times the previous column. Let's count it out:

Numeral	Stands For
1	one
10	two, or two times one ($2 \times 1 = 2^1$)
11	three
100	four, or two times two ($2 \times 2 = 2^2$)
101	five
110	six
111	seven
1000	eight, or two times four ($2 \times 2 \times 2 = 2^3$)

If we continue counting, we will find that 10000 represents sixteen (2^4), 100000 represents thirty-two (2^5), and so on.

Here's where many people become confused by the binary system, or by any system besides decimal. In decimal, when we see "374," for example, we think, "three hundred seventy-four," which sounds a lot like three hundreds and seven tens and four ones. In binary, when we see 1111, we think, "fifteen," which sounds nothing like "one eight and one four and one two and one one." Some scientists think we should change from the decimal system to another number system and that we should rename our numbers so that the names reflect the base number.

That probably won't happen. But if it helps binary numbers make sense to you, you might want to do a little renaming yourself. If it helps to think of 1111 as "eightee-fourtee-twotee-one," which sounds like "eight and four and two and one," which you know is fifteen, then go right ahead and think of it that way.

There are some other tricks that will make binary numbers a little more easy to use when you are computing. When you program a computer, you're giving it instructions to perform tasks. The programming languages we use usually involve words and decimal numbers. But we already know that the computer understands nothing but binary numbers. For the computer to understand your program written in words, it must use yet another program—an assembler or compiler—to translate your program into what is called *machine language*. Machine language uses nothing but binary numbers to feed instructions to the computer. Assemblers and compilers also rely mostly on numbers to do their work. You also will use numbers in many other references to the computer, as when you need to identify a location in the random access memory.

Binary numbers get very long very fast. And because they use only o and 1, it is very difficult to find mistakes in a list of binary numbers. But a machine language program can be many lines of nothing but binary numbers, like this:

```
10010101
11010011
10101110
01001010
11111011
etc.
```

You can see that it would be very hard to spot a mistake in a program like that. You could translate the numbers into decimal numbers to make them easier to read, but we've already seen that it's not quick or easy to move back and forth from decimal to binary numbers.

It's quite easy, though, to move back and forth between hexadecimal and binary numbers. The hexadecimal system is based on sixteen. It uses all the numbers of the decimal system, plus these:

A for ten
B for eleven
C for twelve
D for thirteen
E for fourteen
F for fifteen

In the hexadecimal system, 10 represents 16^1, or sixteen; 100 represents 16^2, or 256; and so on. Watch what happens when we translate a binary number to hexadecimal:

2^7	2^6	2^5	2^4	2^3	2^2	2^1	ones
1	1	0	1	0	0	1	1

We know we can have up to 15 ones in the hexadecimal ones column. We also know that the highest number that can be represented in the first four columns of a binary number is 15 (1111 = eight plus four plus two plus one). So any time we want to find out how many to place in the ones column of a hexadecimal number, we can simply separate the first four columns of the binary number. In this case, we can divide our number like so:

0011

and

1101

Looking at the first number, we know that we can put a 3 in the ones column of the hexadecimal number. Now, we know that the second column of the hexadecimal number will tell us how many sixteens we have, up to 15 sixteens, or 240. The second four digits of our binary number taken together also represent how many sixteens we have.

If this isn't clear to you, look at a decimal number example. Take the number 476,498. Not only does that tell us that we have four hundred-thousands, seven ten-thousands, six thousands, etc., it also tells us we have 476 thousands, or 4764 hundreds, or 47,649 tens, or 476,498 ones. So if we group the second four digits of a binary number, we know how many sixteens are in that number, which is what we need to know to find the second digit of a hexadecimal number. In the above example, the second four digits represent 13 sixteens. The hexadecimal numeral for thirteen is D, so our complete hexadecimal number is D3.

Let's check the math. (Notice that when we mix bases, we use subscripts to identify each base.) Converting binary to decimal, we get $11010001_2 = 128_{10} + 64_{10} + 16_{10} + 2_{10} + 1_{10} = 211_{10}$. Converting the hexadecimal number, we get $D3_{16} = 208_{10} + 3_{10} = 211_{10}$. So we can make a list of binary numbers much easier to read:

10010101	95h
11010011	D3h
10101110	ADh

and so on.

Because a hexadecimal number is easy to mistake for a decimal number, it is often followed by an *h* if more than one number system is being used.

And that's all you need to know to be able to count like a computer. In fact, that's really all you need to know to count anything—in three different number languages. Next month, we take a closer look at how a computer can use binary numbers to add, subtract, multiply, divide and do a whole range of computer tasks. ■

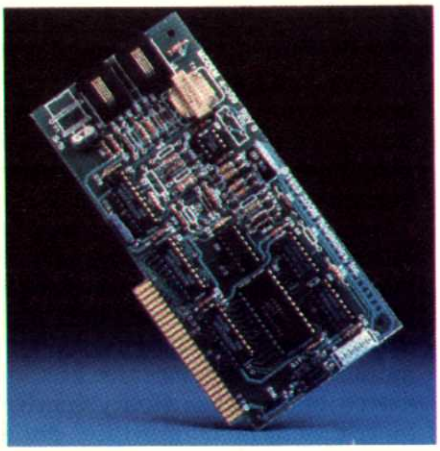
MODEM MAGIC

PUTTING YOU IN TOUCH WITH THE WORLD

BY MARC STERN
AND LAWRENCE GONZALEZ

When you first get your computer and begin using it, it is plenty of fun just playing games, writing programs, designing graphics, and generally testing the limits of a new machine. And, in fact, with the amount of software out there, you could probably make a career of just playing games. But to all of us, sooner or later, comes the need to get out of our shell and communicate with the world out there. It is then that we begin taking a little more interest in that most amazing of computer peripherals, the modem.

Aside from a printer, a modem is perhaps the most important accessory you can add to a home computer system. It puts your system in touch with the world by letting you use your telephone to receive and send information not only all over your city and state, but all over the country if you want . . . or the world!



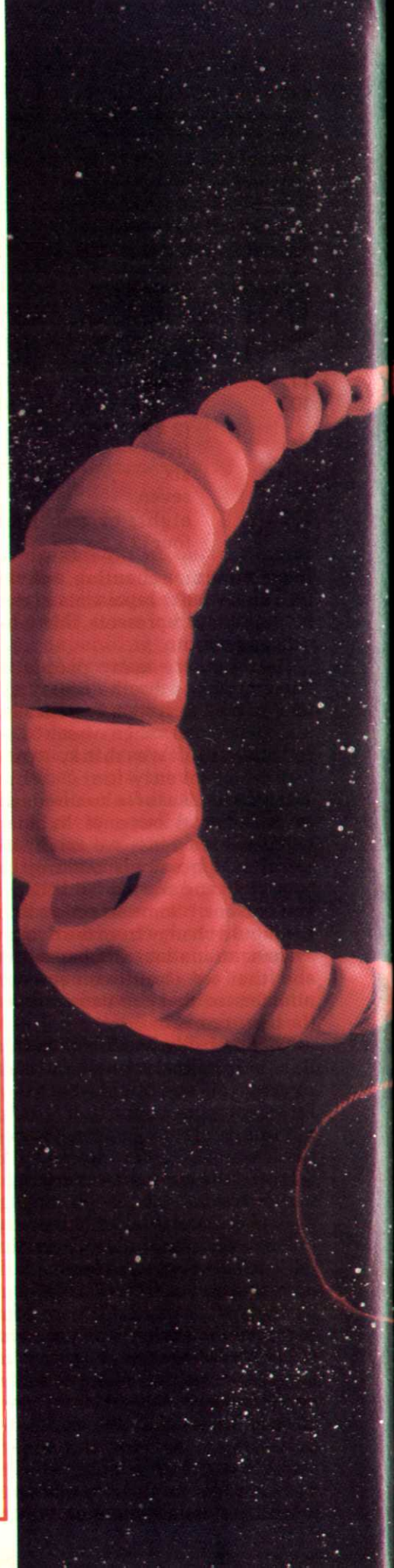
The Networker Modem for Apples.

You can use the modem to dial into remote libraries and look for information you need for a school report. You can send messages to friends. Send programs to them. Even play long-distance games, one of the most exciting things about using modems. Imagine being able to dial into a game service thousands of miles away and play Zaxxon! A modem will let you do that.

Many modems today plug directly into the wall where the phone jack goes. If we set up our modems and computers correctly, whatever I type on my computer appears on your screen (or printer). Or we can tap into one of the big computer networks, such as The Source or CompuServe. Modems require special software—programs that tell the computer what to send out and how to read what's received.

How does the modem—short for MOdulator/DEModulator—do this? Simple. A computer operates in a digital language of 1s and 0s, while a phone system needs to hear some sort of audible tone. The modem acts as a translator, turning 1s or 0s into tones so the computer can communicate over the phone lines.

Inside the modem, special circuitry generates a series of tones which represent the computer's 1s and 0s. The 1s are represented by a high tone and the 0s are represented by low tones. They are known as analogs of the original information, or representations of it.



MODEM MAGIC

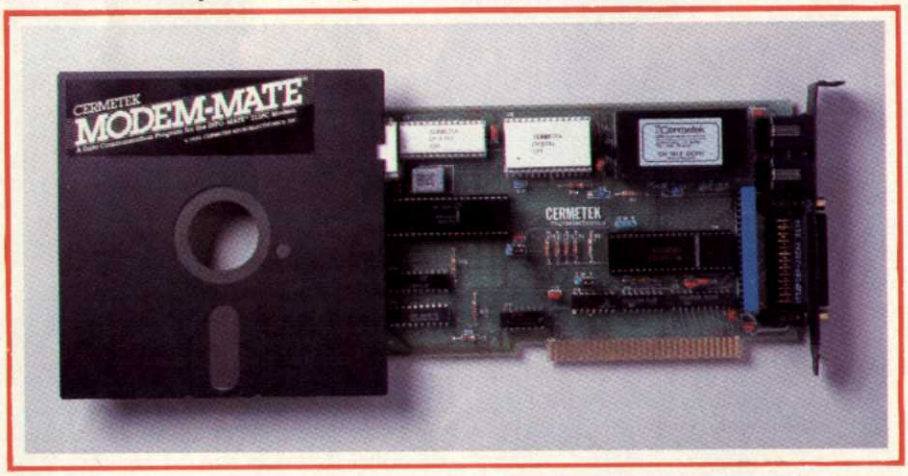
But the modem also generates a carrier tone. It is this whistle that keeps the attention of the phone system and holds a line open so the other tones can be passed down the line. The carrier tone doesn't interfere with the high and low tones. If you've used a CB radio much you're familiar with this concept.

The phone system doesn't care what the tones represent. All it wants is to hear a continuous noise. But to a computer, those tones mean something. They are representations —in 1s and 0s—of letters and numbers and written in a special code called ASCII (American Standard Code for Information Interchange), which all home computers and modems understand. Sometimes computers communicate in binary language, the 1s and 0s, without any translating code such as ASCII. But most telecommunication is in ASCII.

When you dial into another line, the first thing you hear is the whistle—if you have an acoustically coupled modem—from both computers. This means contact has been made and you can talk. When you hit the first key on your computer, it sends its information out to the modem, which translates it into tones. If you listen to those tones carefully, you hear what sounds like a chirp. Each chirp represents a computer word. A computer must hear computer words in order to "talk" intelligently.

If you are sending over great distances you will sometimes use what is called *error-checking*. You do this because phone lines can be noisy with static and other sounds which can actually change the information being exchanged. If the information is not error-free it is re-sent. This keeps on until the information is sent perfectly.

Using a modem, you must know certain things. You must know the speed of your system and of the computer to which you are sending. And you must know the type of *protocol* used. Most home computer systems are geared to run at speeds ranging from 300 baud to 1,200 baud. A baud is a bit per second, and is a measure of the speed of transmission of information the computer is sending. Three hundred baud means 300 bits per second and 1,200 baud means 1,200 bits per second, etc. This translates to about 30 to 120 words a minute. The baud rate of computer systems must match or they can't talk with each other.



Cermetek's Modem-Mate software for its Info-Mate modems.

Although there are many protocols for computer systems, the one used by most home computers is *asynchronous*. This has to do with timing and it means a computer can send the information when it wants to. This might seem somewhat loose, but there's more to it than meets the eye.

For your system to communicate, its settings must match those at the other end. Not only must the speed match, but also the *word length*, *parity* and *stop/start bits*. For example, if your system is set for 300 baud, 8-bit words, even parity and one stop-bit, the other system must be, too. This is the protocol under which the systems communicate.

Most of these functions are under software control. That is, they are set by a special program needed to run the modem. You can change the functions as you need to. They work with a wide variety of modems.

Although there are many modems on the market, there are only three basic types: acoustically coupled, direct-connect and plug-in. The most common type is the acoustically coupled modem. You may already be familiar with it . . . it is the small box with "earmuffs" into which you have to put the phone's handset. These units usually operate up to 300 baud.

The direct-connect modem is usually a small box that plugs right into the phone line and sits under or beside the phone. There are models available which can run up to 1,200 baud. With a direct-connect modem all you have to do is dial the number you want and—when contact is established—put the handset down. When you are finished, the modem hangs up.

The plug-in modem actually sits inside your computer and you never see it. It plugs right into the system and the phone line runs right to it. In a way, it makes your home computer part of the phone system.

Some modems can do more than others. Some are *answer-only*—they only take incoming calls, although they can respond once prompted. Others are *originate/answer* modems—you can use them not only to receive calls but to originate calls. The most expensive type is the *smart* modem. With it, you don't even have to lift the phone. You just tell your computer what number to dial and the system does the rest. It even tells you when contact has been established.

The smart modem can answer calls for you when you are away from the computer. It can set up a phone directory, continue dialing a busy line, report on the length of the phone call and remember the various settings you need for different dial-in systems. This kind of modem is expensive—like $600—but worth it if you need the features.

Expense is the big disadvantage of using modems. The rates the phone company charges for long-distance service are quite high during the daytime. So call during the evening when rates are lower.

And game lines can be very expensive. On some systems the daytime rate can be $20 an hour, with the night rate $5, not to mention the fee needed to tie into the system for the first time. It's best to find a low-cost, local, metropolitan game bulletin board. ■

OBSERVING PROTOCOL

AN INSIDER'S LOOK AT MODEM SOFTWARE

BY WALTER SALM

So you want to telecommunicate. All you have to do is plug a modem into your computer and you're ready to start, right? Not quite.

Most modems are just as dumb as your computer. Maybe dumber, even. A modem is only a communications device; you have to tell it *everything* — who, what, how and when. That's where communications software comes in, and these special programs are just as important as the modem itself.

Programs come in all flavors and prices. Some are cheap as can be; others are expensive. Some software will work with a lot of different modems; other software will run with only one or two specific makes and models. And the software must be in the right *format* to run on your computer. Finally, some modems come with so-called free software. If that's the kind of modem you buy, then the software will be just right—up to a point.

All that may sound like a bit much, but first-time setups are always a pain. Once you get on line and percolating, it'll all be a breeze and lots of fun.

How do you know if the modem and software are right for your particular computer? Easy. It'll say so on the packages.

The VICMODEM is a quick-and-easy package that's ready to run on your Commodore computer. This and the Anchor Volksmodem are about the dumbest (and the cheapest) modems we've seen. But darn it, they work! The Commodore unit comes with its own software—called VICTERM — on a cassette tape, and it simply converts your VIC into a terminal. The software will not work with a memory expansion cartridge plugged into the computer, so there's very little storage available, unless you're running the Commodore 64.

If you want to use a business-type microcomputer — like maybe the portable Kaypro or Osborne or Compaq that your dad or mom lugs home from the office on weekends — you really have to tiptoe over those broken potato chips when you pick out your software. Business-type computers are very finicky and superjealous. They just won't talk to each other unless they each get a special program disk. Sure, they all use that same CP/M operating system, but they also all use different formats for their disks.

When it comes time to buy, go to a real computer store—one that sells the same kind of computer you're running. They'll know what you're talking about and will order it if they don't have it. It shouldn't take long — maybe a day or two. Just remember one thing: If your computer isn't named on the label(s), you probably can't use the goodies.

We mentioned free software (such as VICTERM, which comes with the VICMODEM). It works, but it's really no-frills software, and you'll discover how really bare-minimum it is the first time you use it. Most no-frills software is of comparable quality.

One unusual piece of free software was included as part of an advertising insert in the November-December issue of *Pro-Files* — the Kaypro user's magazine. It's a disk put out by BCN (Business Communications Network), and it has a

PROTOCOL

lot of excellent features. Its main purpose, though, is to get you to sign up for BCN's service at $5 a month or $50 a year. It's really good software, superfriendly. It lets you get on line immediately (with Dad's American Express card). At the moment, this software works only with the Kaypro computer, but BCN says other formats are on the way.

Some modem makers make extra-cost software, and sometimes they're your best bet, at least at the beginning. Later on you may decide to buy some other software that works better.

A good example of this is the Networker for Apple II series computers from Zoom Telephonics. The Networker software disk that comes with this plug-in modem card does the job, but has its limitations. You get the modem *and* the software for $119, which is bargainsville in any computer language. For another $79, you get Netmaster, which makes the modem work a whole lot better. You can get other Apple modem software that works with this same modem (or others like it) that may have some features you can't get on freebie programs.

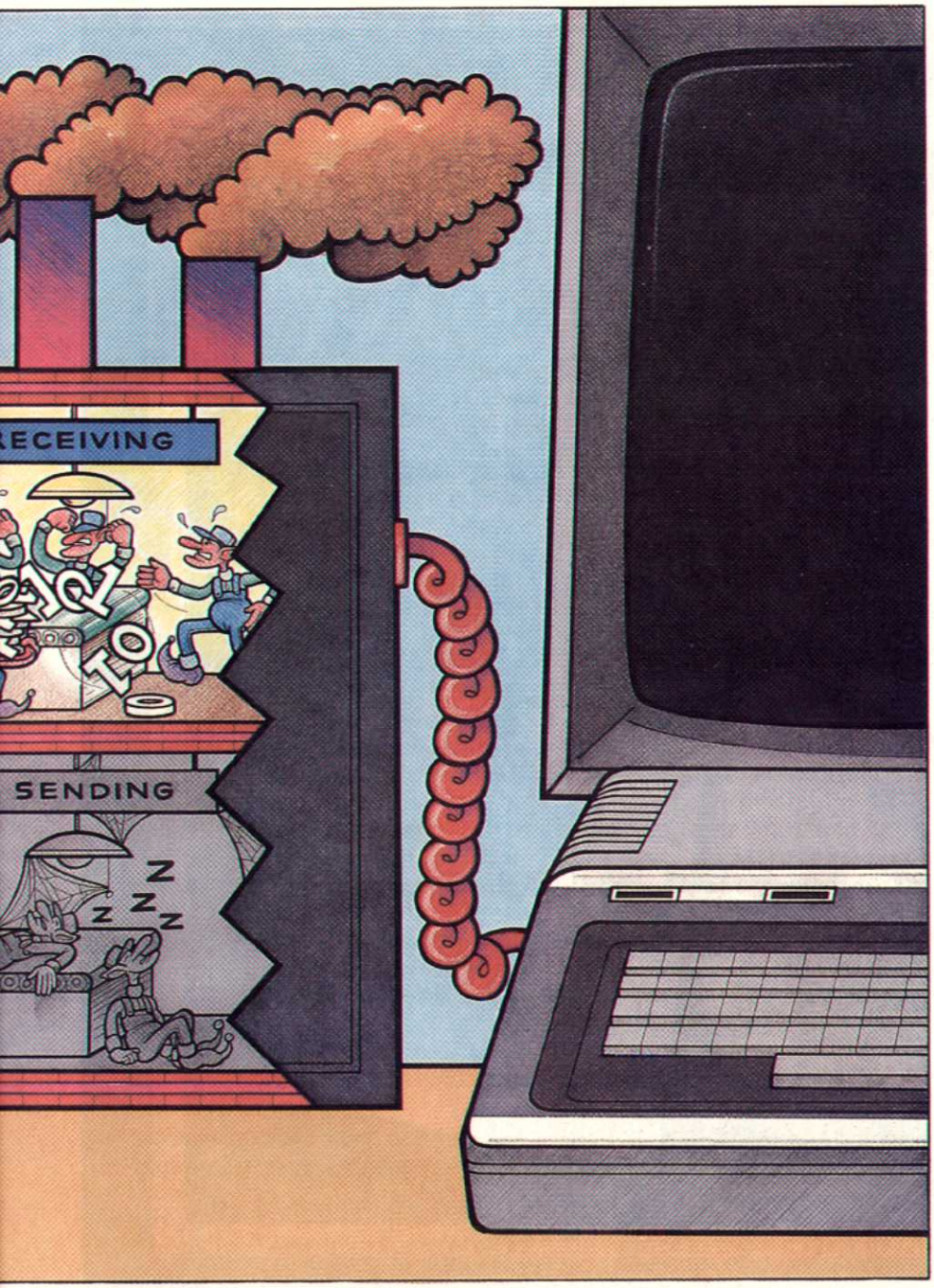
If you *didn't* get any software with your modem, that really may be a blessing. So now you've got to start shopping.

The most important thing your software does is turn your computer into a *terminal*. A terminal is usually a simple keyboard and screen that's connected to a computer someplace else. In those really big maxi-computer setups at banks and insurance companies, they have these terminals scattered all over the building. Everybody's got one on his desk. When you hook into the telephone line with a modem, you want your computer to act like one of those terminals, but connected to the computer at the other end of a telephone line.

When you first log on (making the connection with a distant computer), your own computer and the distant host have to get acquainted, since computers won't talk to strangers. This introduction is called *handshaking*, and it establishes such things as the number of bits in a word, whether or not stop bits are being used, baud rate, etc. You set this with your software in advance, with the most commonly used *protocol* settings. The software manual will tell you what these are. "Protocol" just means "handshaking," but no matter what it's called, your computer has to be able to send the right signals to the other computer.

Because you're using a phone line, your computer (now a terminal) can't talk to the host computer as fast as it could if it were in the same room. In fact, most modems work at only 300 baud (bits per second), which can really make the time drag. It's this slow because telephone lines are full of pops and squeals and noises that can louse up the computer language. This is why most software has to keep stopping to take a breath and check back with the host computer to make sure the data received is correct. This all takes time.

Higher priced modems operate at 1,200 baud, which can mean a big saving for you in toll telephone charges and hookup time if you're using a time-charge subscription network service. These 1,200-baud modems cost from about $500 up. Most of them have special so-called smart features built in, and in fact one of the industry standards is the Hayes Smartmodem 1200, which comes with lots of bells and whistles, but no software. If you do a lot



of telecomputing, one of these will pay for itself very quickly in the time charges it saves you.

A smart terminal is what you get most of the time when you hook up a microcomputer to a modem. Your computer can store or trap data that comes in, it can transfer it to a disk and store it there, it can print out all or part of it and it can send stored files to the host computer at the other end.

One of the most useful features of communications software is the *RAM buffer*, which your software may call a trap. This buffer is a part of your computer's RAM memory that is set aside to store stuff from the modem or from your files. When you call up a bulletin board, for example, you might want to store everything that shows up on the screen so you can save it to disk or print it out later on. You do this by turning the buffer on with a software command of some kind.

The buffer isn't unlimited; somewhere on the computer screen the software will have a display that tells you that you have a limit of 32K or something like that. Some programs display a *status line* at the bottom or top of the screen that shows you how much you've used up and how much is left.

When you're all done receiving, you can save the buffer to disk, print it out or view it all on the screen. Then you can clear it (erase it) so it can capture something else.

Some communications programs have a simple word processor built in to make it easier to create messages to send to another computer. This way, you don't have to clear the RAM and load a word processing program, write your message, save it to disk and then clear the RAM again so you can load your communications program. If you've received a message, you can use your text editor to make changes in the message and then send it out again somewhere else.

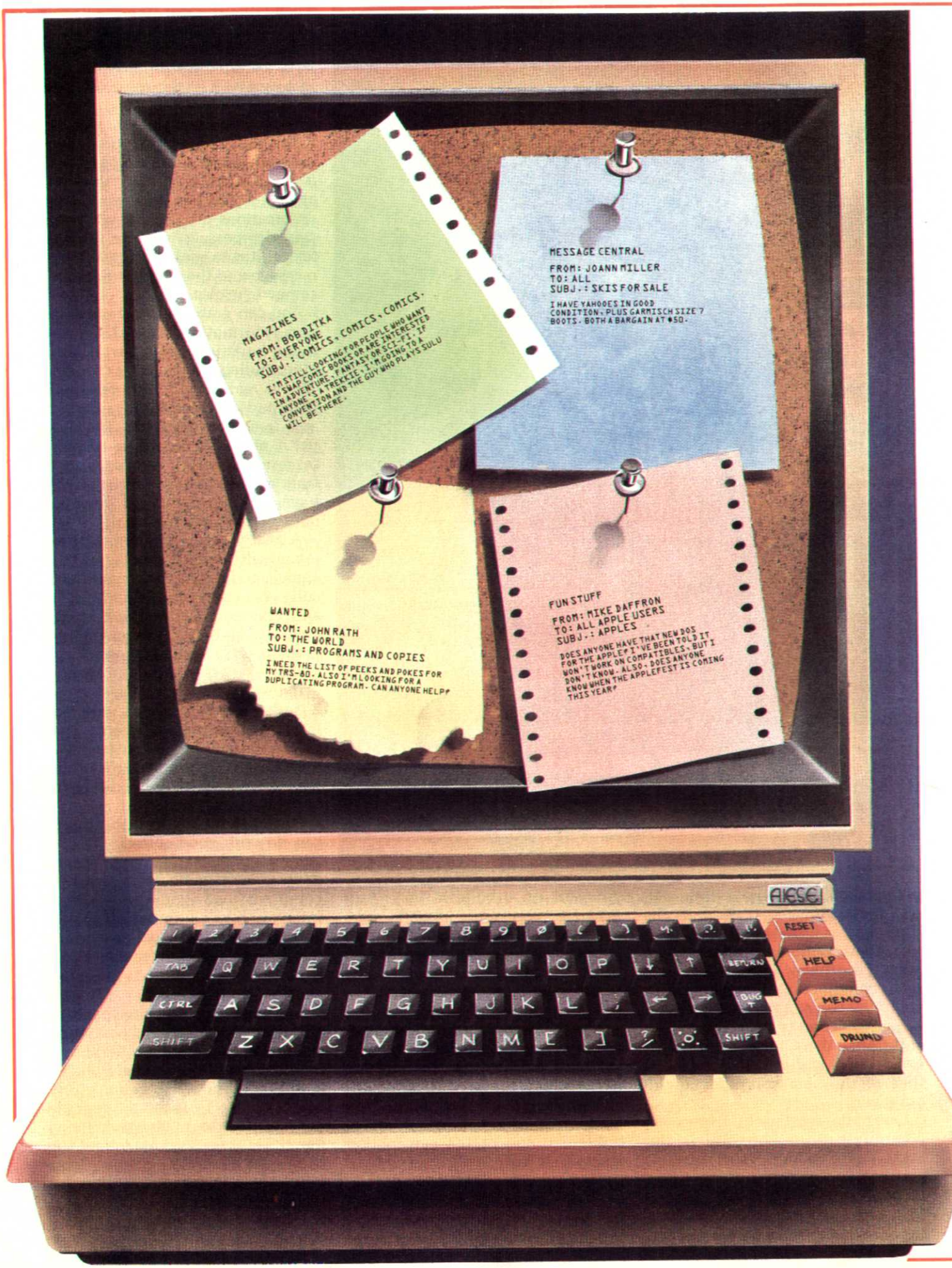
You can grab and hang onto lists and information from databases. Some bulletin boards have lists of other bulletin boards, for instance. This is really handy information to grab and save for future reference and free telecomputing. If you've got a report to do and need some research material, you can get it from an information service, if you have a subscription and your dad doesn't mind paying the bill.

A really good program will automatically dial for you, detect busy signals and redial, log-on automatically, control your printer, buffer and commands directly from the keyboard and may even let you program in some *macros*—special programs—into some function keys.

If the host computer's software has the same protocol, you can transfer files and programs from one machine to the other. It'll even check for errors and make sure that any goofs in the sending are corrected.

One of the really neat things you can do with good software is play games over the phone lines. You can *download* a game from the host computer (load a game from the host into your own computer's RAM), or you might decide to play a game by telecomputing with someone else at a computer thousands of miles away.

One last thing: If you're spending a lot of money for a good communications software package, make sure it will support high-speed (1,200 baud) operation. At some point, you're going to want to upgrade your modem to 1,200 baud. Being four times as fast as the standard 300 baud rate, it helps keep your phone bill down and lets you get what you need from time-limited bulletin boards and databases before they cut you off. ■


MAGAZINES
FROM: BOB DITKA
TO: EVERYONE
SUBJ.: COMICS, COMICS, COMICS.
I'M STILL LOOKING FOR PEOPLE WHO WANT TO SWAP COMIC BOOKS OR ARE INTERESTED IN ADVENTURE, FANTASY OR SCI-FI. IF ANYONE'S A TREKKIE, I'M GOING TO A CONVENTION AND THE GUY WHO PLAYS SULU WILL BE THERE.
MESSAGE CENTRAL
FROM: JOANN MILLER
TO: ALL
SUBJ.: SKIS FOR SALE
I HAVE YAHOOES IN GOOD CONDITION, PLUS GARMISCH SIZE 7 BOOTS. BOTH A BARGAIN AT $50.
WANTED
FROM: JOHN RATH
TO: THE WORLD
SUBJ.: PROGRAMS AND COPIES
I NEED THE LIST OF PEEKS AND POKES FOR MY TRS-80. ALSO I'M LOOKING FOR A DUPLICATING PROGRAM. CAN ANYONE HELP?
FUN STUFF
FROM: MIKE DAFFRON
TO: ALL APPLE USERS
SUBJ.: APPLES
DOES ANYONE HAVE THAT NEW DOS FOR THE APPLE? I'VE BEEN TOLD IT WON'T WORK ON COMPATIBLES, BUT I DON'T KNOW. ALSO, DOES ANYONE KNOW WHEN THE APPLEFEST IS COMING THIS YEAR?
RESET
HELP
MEMO
DRUMS
TAB
CTRL
SHIFT
RETURN
SHIFT

THE COMPUTER WORLD'S LOVE AFFAIR WITH Bulletin Boards

BY WALTER SALM

The computer bulletin board is rapidly becoming an important part of the American way of life—at least for people who have modems hooked up to their computers. A bulletin board (BB) can be many things to many people, but to the computerist it's like a free supermarket of goodies, messages, games, programs, schedules, open letters, classified ads, display ads for stores—anything that can be shown on a computer screen.

Bulletin boards are run by computer clubs, by private parties who are deeply into their own computers, by colleges and universities and by special-interest groups. The best part of using a bulletin board is that most of them are free—except for the cost of the telephone call if you're dialing outside of your free calling area.

When you dial, you'll get a busy signal 95 percent of the time, because most of these freebies have only one or two telephone lines coming in. There's no such thing as a short call to a BB, something which we discovered very early in our experience with telecommunicating. Typical is the message we got from a private BB in Metuchen, New Jersey:

REMINDER TO ALL:
TBBS OF METUCHEN OPERATES WITH ONE PHONE LINE AND THIS LIMITS THE NUMBER OF CALLS THAT CAN BE RECEIVED ON THIS SYSTEM. I HAVE NOTICED SOME CALLERS CALLING MANY TIMES A DAY. I WOULD ASK THAT YOU BE CONSIDERATE AND LIMIT YOUR CALLS TO OFF HOURS IF YOU MUST CALL BACK MORE THAN ONCE A DAY. MANY PEOPLE WORK DURING THE DAY AND CAN ONLY CALL FROM 7-11 PM. IF YOU CAN CALL OTHER THAN THESE HOURS PLEASE DO AND DON'T TIE UP THE LINE SO THAT THESE CALLERS CAN GET THRU.

SOME PEOPLE CALLING LONG DISTANCE HAVE INFORMED ME THEY HAVE HAD TO WAIT TWO WEEKS JUST TO GET THROUGH.

SO IN SUMMARY IF YOU POSSIBLY CAN—CALL BEFORE 7 PM AND AFTER 11 PM SO OTHERS CAN GET ON WHO CAN ONLY CALL DURING THOSE PERIODS.

So be considerate of others, since computer time is limited. Learn how to use a particular bulletin board, do your stuff and get out. This one in Metuchen—as are others—also is self-limiting—allowing you 15 computer-timed minutes. When your time is up, the computer cuts you off, even if you're in the middle of doing something.

While most of these bulletin boards are free, many ask for donations to help keep them running. Others may charge a membership fee, and when they receive the fee, will assign you a secret password that lets you get into the service.

Some bulletin board operators use the service to make money by charging these fees. But if you want to set up a fee bulletin board, you have to be ready to put in some time each week updating lists and services and erasing material that's out of date or has been sitting in a bulletin board slot too long. Otherwise, people won't use the service and you'll end up using a lot of computer disk storage space for messages and bulletins that are no good to anyone.

Finding free bulletin boards in your local calling area may take a few phone calls to people you know who already have modems, visiting computer club meetings or sending away for a list. One bulletin board in New Jersey maintains a list of free BBs all over the country, and even has lists for Canada and overseas. Information on getting copies of this list are in a box accompanying this article.

Any of these free (to use) bulletin boards cost money to operate and keep running. So very often you'll see on your screen an opening message asking for donations. Considering that these people have gone to a lot of time and trouble to make their services available to you, it's not a bad idea to send them *something* if you want to see that service continue. After all, if all these neat freebies weren't out there, you'd have to subscribe to one of the commercial services, and they cost a whole lot more than the dollar or two you might send to the bulletin board operator.

Another good place to look for free bulletin boards is any college computer department. It may take some doing getting the switchboard operator to give you the right phone number but these numbers do exist. You might even find the right number in Ed Gelb's Data Base. That's where we found the Bulletin Board listings for Rutgers University, which is a local call for us.

Check out local computer stores for information. If you bought a modem from the store, the sales clerk should be able to give you at least a handful of numbers to call—or at least the numbers of some local computer clubs or user groups. Most clubs try to maintain a bulletin board of some kind.

Because time is really limited on these bulletin board connections, it's a good idea to set up your computer in advance to store and save the BB listings to disk. Your modem's software will have some kind of special command for this. Some of them simply have something called a *trap*, which will load up whatever part of your computer's RAM isn't being used.

Bulletin Boards

The software may have a register in the status line telling you how much space is left in the *buffer*—another name for the memory that's being loaded from the BB. As the screen fills up with data, that number runs down like a high-speed countdown. Sometimes, watching the buffer register running down can be more interesting than the material that's running across the screen. The problem with saving all of this is that the buffer is limited, no matter what, and any fairly long BB listing will fill it up so fast it'll make your head spin.

Some bulletin boards offer you a choice of baud rate (bits per second transmission speed). Generally, the choice is between 300 and 1,200 baud. The higher speed loads data into your buffer at four times the so-called normal speed, which not only saves the bulletin board computer time, but also can cut down on your phone bill.

If you don't have 1,200 baud available, don't feel too bad. That higher speed is awfully expensive,

and can run the cost of your modem up to $500 or more. A person would spend that kind of money only if he planned to do a lot of business calls or if he just had a lot of extra cash under the mattress.

One of the things we've found is that it's much easier to get into free bulletin boards during the day on weekdays, up until about 2 p.m. That's when all of your buddies start coming home from school and get on the network with their modems. You'll collect busy signals until after midnight, and if the next day's a school day, that can be pretty late.

Early in the morning will work in a lot of places. If you want to get to the BB nice and easy, try it about 6 or 7 a.m., before you leave the house. You'll hardly ever get a busy signal at that time of day.

Getting into the BB is no great problem if the line isn't busy. Many of them are on line 24 hours a day, while others operate only during certain times of day, depending on the SYSOP's schedule. The SYSOP (SYStem OPerator) is the person responsible for the bulletin board, and in the case of private owners, this is usually the person who has set up and runs it.

As with any telecommunications service, the bulletin board computer answers the phone with a *carrier*—a high-pitched electronic tone that acts as the recognition signal between computers using the phone lines. The tone is part of what's called the handshaking between the computers, in which they recognize each other, do a bow from the waist and say, "Pleased to meet you," or whatever it is that two computers say when they first meet each other.

FREE BULLETIN BOARD NUMBERS

The list of free bulletin board numbers (called Ed Gelb's Data Base) is available by region from: Ed Gelb's Data Base System, c/o Tower Systems, 196 Main St., Lincoln Park, NJ 07035. The data base contains 13 regional and sorted files. For each one, send 50 cents and a stamped, self-addressed envelope. Following are the files and the areas they cover:

NEWENGLD.BBD	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
MIDATL01.BBD	New Jersey, New York, Pennsylvania
MIDATL02.BBD	Indiana, Michigan, Ohio
SOEASTRN.BBD	Delaware, Washington DC, Florida, Georgia, Kentucky, Maryland, North Carolina, South Carolina, Tennessee, Virginia, West Virginia
NOCENTRL.BBD	Illinois, Iowa, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin
SOCENTRL.BBD	Alabama, Arkansas, Kansas, Louisiana, Mississippi, Missouri, Oklahoma, Texas
MOUNTAIN.BBD	Arizona, Colorado, Idaho, Montana, New Mexico, Utah, Wyoming
NPACIFIC.BBD	Alaska, Oregon, Washington
SPACIF01.BBD	California area codes 209, 408, 415, 707, 916; Nevada
SPACIF02.BBD	California area codes 213, 619, 714, 805; Hawaii
CANADA.BBD	All of Canada regardless of time zone
OVERSEAS.BBD	All overseas countries and U.S. territories and possessions
HANDICAP.BBD	Baudot teletype systems nationwide, regardless of time zone, that operate exclusively for the benefit and assistance of the deaf and/or mute

The bulletin board will answer with whatever the SYSOP has plugged in, such as:

WELCOME TO THE RUTGERS UNIVERSITY MICROLAB ACGNJ APPLE GROUP PUBLIC MESSAGE SYSTEM NEWS UPDATES — PLEASE DELETE ANY OLD MESSAGES YOU DO NOT NEED ANYMORE. * DO NOT * LEAVE MSGS AROUND FOR MONTHS THAT ONLY SAY "HI, HOW IS YOUR COMPUTER?"

Most BBs start with some kind of

generalized message or plea like this. In the case of private BBs, there's also usually a request for donations to keep the system running.

Many bulletin boards offer you the opportunity to use a password or ID code so you don't have to type in your name, address, phone number and other information every time you log on with the BB computer. This is a real time (and money) saver, so use the chance to get ID codes whenever possible. Besides, having a special password makes the whole operation more interesting.

By the way, there's one other very important reason for calling bulletin boards. Because they're free, you can start telecommunicating immediately without waiting for special subscriptions to come through for CompuServe or The Source or any of the other commercial networks. And since they're free, what are you waiting for? Start telecommunicating now! ■

MICROKIDS ON-LINE

CALLING ALL MICROKIDS!

WIN MONEY!
SEND US PROGRAMS! TELL US OFF!
GIVE US A WAVE!

NOW YOU CAN LEAVE US A MESSAGE ON THE *MICROKIDS* BULLETIN BOARD

Calling all Microkids! Turn on, boot up and talk to us! If you have a subscription to The Source (or know someone who does), you now can communicate through it with *MICROKIDS*. We are now on line and you can leave messages in our electronic mailbox.

Before you set up your communications link, figure out what you want to say. You can tell us how you feel about the magazine. What do you like about it? What don't you like? Tell us if we've made any mistakes. Suggest a subject for us to write about.

You can contribute to any of our departments through The Source. If you have a tip to share with fellow owners of the computer you use, why not send it to Hands On?

Have you written any programs which you would like to have printed in the magazine? By all means, let us see them. Be sure to tell us what computer runs your program, and send a list and a run of the program.

At the end of your message, be sure to put your name, address and telephone number. If your question, suggestion or program is used, you'll receive a check for $25 from *MICROKIDS*. Besides your address, also give your access number on The Source so that we can reply if necessary.

To reach *MICROKIDS*, sign on The Source according to the instructions in your Source manual. You can call any time of day or night or on the weekend. It's a good idea not to call during the business day because the rates charged for The Source are much higher than they are during off-hours.

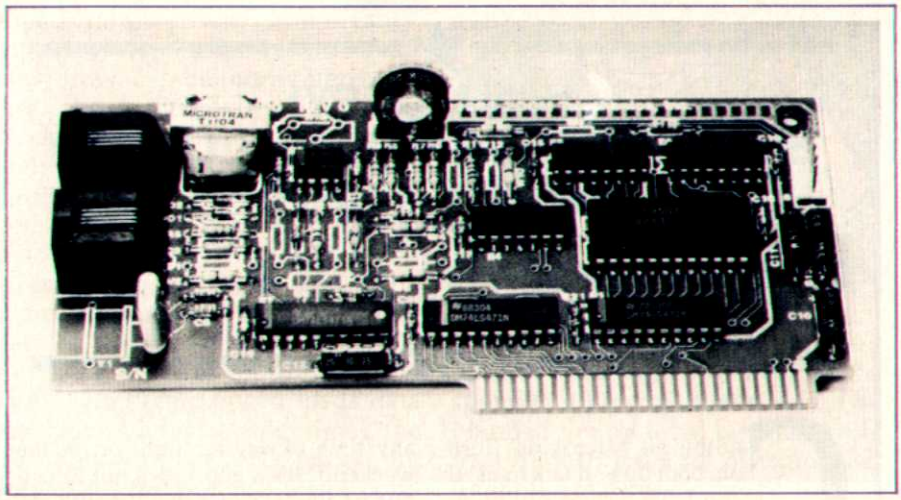
Once you reach the Command level on The Source, type "MAIL" and then "SEND." The prompt "TO:" will appear and you have to give the account number of *MICROKIDS*, which is BBK483. The next prompt to appear is "SUBJECT:" and you can tell us what your message will be about. The next prompt is "TEXT:" after which you type your message. The text can be as long as you like, but press RETURN before you reach 120 characters. Don't forget to sign your message and give information on how we can contact you.

When your message is ready, type ".S" and it will be on its way. The system will signal you that the message has been sent. You can send another letter or type "QUIT" and go back to the Command level.

Sending messages to *MICROKIDS* is, of course, only one thing you can do with a modem. You may want to get into bulletin boards also. If you don't have a modem, and you're an Apple owner, you can buy the Networker Modem and at the same time get a free subscription to The Source. The subscription usually costs $100, but that modem, with a free subscription, costs only $129. See our modem reviews for more information on this modem. ■

DEAN'S LIST

QUICK LOOK AT



The Networker modem includes a subscription to The Source.

Modems can be expensive. But like a lot of computing equipment now, their prices are coming down a bit. And one of the more interesting of this group is a modem called Networker, by Zoom Telephonics, made for the Apple II family of computers. At $129, it is pretty inexpensive when you consider all you get with it, one item being a free subscription to The Source (which usually costs $100 itself).

The Networker is a single-slot, 300-baud, direct-connect modem that comes with everything you need for communicating with your Apple. In the package with the modem board (which plugs into the motherboard inside your machine) comes a control switch, a modular phone cord, a floppy disk containing the Networker software, and a manual with complete instructions for installation and use.

The unit uses the computer's power, so it requires no external power supply.

The Networker can be used without a disk drive, but it can do much more with one. It is easy to install. The board is connected to the phone line with modular connectors. It has a cable with a switch control box which has three positions—originate, off, answer. The switch has a small red light which goes on to let you know when you have made contact with another computer.

Place the switch box near the keyboard so you can get at it easily. Data communication cannot take place unless one modem is in the originate mode and the other in the answer mode. When the switch control is off, you can use the phone normally.

We found the Networker easy to install. The suggested slot is No. 2, the traditional one. But you can use any one except slot 0 or the expansion slot (on the IIe).

To connect up, unplug your telephone line at the wall jack and plug it into one of the black modular connectors on the board. Connect one end of the seven-foot cord that came with the board into the other black modular connector on the board and the other end into the phone jack.

Mount the switch box on the side of the computer near the keyboard using the sticky tape on the switch box. Put the cover back on the computer and your hardware has been installed.

You will be concerned about two types of data communication—conversation and file transfer. A conversation is two way. In file transfer, data is sent from one computer to the other. The Networker modem and software provide for both of these.

If you have a disk drive, you use software from a disk to run your modem. If you don't, you can use firmware stored in ROM chips on the modem board. Directions in the manual tell you how to use the firmware.

The Networker does quite a bit for an inexpensive modem, but it does not have all the features of a more expensive modem. For example, it

The battery-powered Volksmodem is

SIX MODEMS

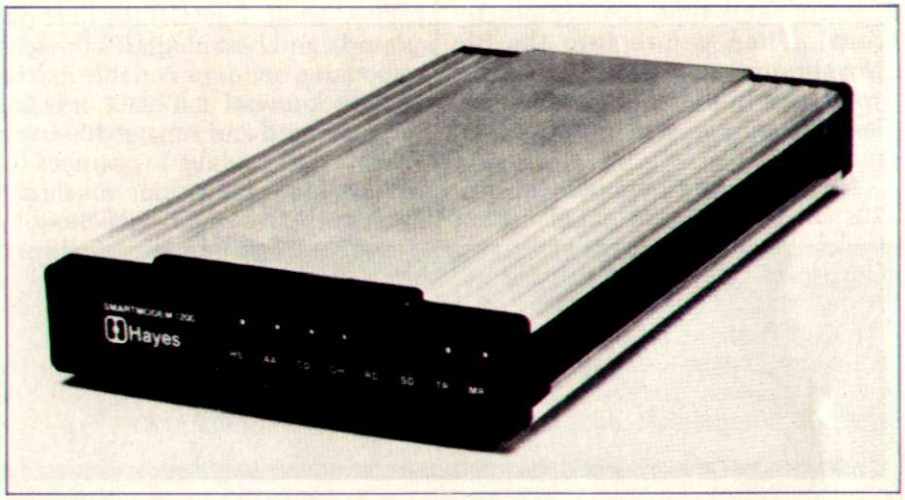
does not have autodialing, which would have raised the price. The fact that this modem, which really does its job, is very low in price is its greatest virtue.

Also, more expensive modems do not have to rely on switch boxes like the one required for the Networker. These other modems can answer the phone automatically and can be used for bulletin boards. Because you have to use the switch on the Networker when a call comes in, it cannot answer the phone automatically and therefore cannot be used as a bulletin board.

The Networker modem comes with its own Networker communications software, but the hardware is compatible with many other software packages.

Another good line of modem products comes from Novation Inc.,

the least expensive.



The Smartmodem is a high-performance device. It has an audio monitor.

of Chatsworth, California. Novation has been in the communications business since 1967 and now makes a full line of modems, which range in price from $149 for their little starter unit to $725 for their big top-of-the-line 212 Apple-Cat II System.

The Apple-Cat II turns an Apple computer virtually into a computing telephone. A direct-connect modem, it is installed directly inside the chassis of the computer and then plugged into the wall where your phone would be. The handset then hangs by a switch hook from the side of the computer. The handset/switch-hook setup is an additional $29. The package turns your workstation into a 1,200-baud communications station. With the 212 Apple-Cat II you can set your computer to run automatically, placing and receiving calls in the middle of the night when phone charges are less. If you're set up to communicate with your friends via modem, you can set the computer to hold all incoming messages for you until you're ready. Messages you send out can be stored until you are ready to send them, and then they can be sent automatically anytime you like. Or if you want to make or take a telephone call, all you do is pick up the phone—you never lose information going out or coming in.

The 212 Apple-Cat II also comes with a standard serial port for a printer, and a fully outfitted version of the 212 (including add-on options) has a BSR Remote Controller that will allow you to control anything electrical that you can imagine. Put a real-time clock into your Apple, and you can have it turn on anything you like. The package, of course, comes with all the software necessary to operate it. And if you want to start small and build up, you don't have to buy the complete 212 Apple-Cat II. You can buy a basic system and upgrade it from time to time as you get the money.

On the other end of the spectrum is the humble but powerful J-Cat at $149. This modem is one-fifth the size of normal modems, just five inches long, and two inches wide. You can simply stick it on the side of your computer. And this one will work with any computer that has an RS-232 interface. It will run at 300 baud and full duplex, which means

6 MODEMS

that it will send roughly 300 characters per second and can talk and listen at the same time. It is a good basic modem to start out your communications.

Novation also offers a handy service for anyone wishing to test a modem. Simply dial 213/881-6880, wait for the LOGON PLEASE prompt, and type CAT (press return). Then you're into the big Novation system, which will allow you to get information on modems, leave messages, and test your own modem.

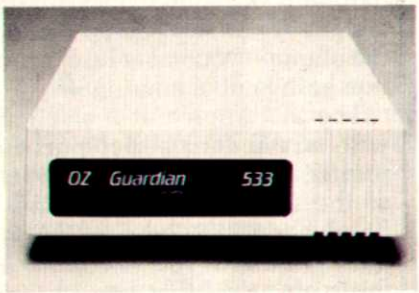
If you're into Commodores, VIC-20s, or Ataris, you might also want to know about Microperipheral Corporation's new product, the Auto-Print Microconnection. Like the Novation J-Cat, it costs under $150 and is quite small — 5x6x2 inches (though it weighs a hefty 2 pounds compared with J-Cat's 4.2 ounces!). It's a 300 baud modem and will communicate in full duplex through either a Touch Tone or regular phone. It has the added advantage of a printer port that automatically prints out what's being received. For more information write or call the company at 2565 152 Ave. N.E., Redmond, WA 98052, 206/881-7544.

A sleek new modem called Volksmodem has been put out by Anchor Automation, Inc., in Van Nuys, California. It's small (7.5 inches long), lightweight (just one pound), and best of all, it's the least expensive modem on the market that we know of at $79.95. It is battery powered and runs at 300 baud. Anchor sells cables to connect the Volksmodem to various machines, such as the Atari and TRS-80 Color Computer. Computers with RS-232 ports require only an RS-232 cable. Anchor's cables cost $12.95 each, considerably cheaper than most.

And for those of you who want to go pro on modems, there is the Hayes Smartmodem 1200. Typically costing around $500, it is a high-performance device built for professional use and capable of communicating in many different ways. It can be programmed in any language by using ASCII characters. It then processes the commands you give it and sends out the results in English or in numbers. It can use a Touch Tone phone or a dial phone. It has an audio monitor so that you can actually hear what's going on (you will know if you've gotten a wrong number, for example). And of course, it automatically dials a number and answers the phone when you receive a call.

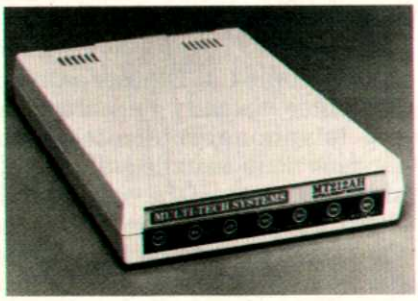
If you get a busy signal, the Smartmodem automatically redials the number. You decide how fast it dials, how many rings it waits before answering, and so on. Unlike most computer products, which come with 30- or 90-day warranties, the Smartmodem comes with a full two-year warranty. It comes with power pack to plug into any grounded outlet, a telephone cable and a comprehensive manual. ■

...AND 6 MORE MODEMS



Oz Guardian 533. For RS-232. Up to 1,200 baud. Auto features, safeguards. Directs local network. $750. Tri-Data, Mountain View, CA.

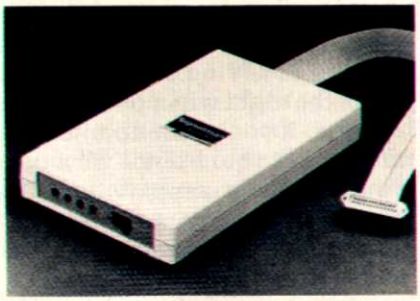
Multi-Model MT212AH. For RS-232. Up to 1,200 baud. Half- or full-duplex. Auto features. $549. Multi-Tech Systems, New Brighton, MN.



Info-Mate 212A. For RS-232. 110, 300 and 1,200 baud. Autodial and answer; other auto features. $595. Cermetek, Sunnyvale, CA.

Info-Mate 212PC. For IBM PC and XT. 110, 300 and 1,200 baud. Auto features. Modem-Mate software. $495. Cermetek, Sunnyvale, CA.

Signalman Mark XII. For RS-232. 110, 300 or 1,200 baud. Autoanswer and other auto features. $399. Anchor Automation, Van Nuys, CA.



VICmodem. For VIC-20 and Commodore 64. CompuServe subscription, Commodore national board. $99. Commodore, West Chester, PA.

The VID KID NEWS & VIEWS

BY RAWSON STOVALL

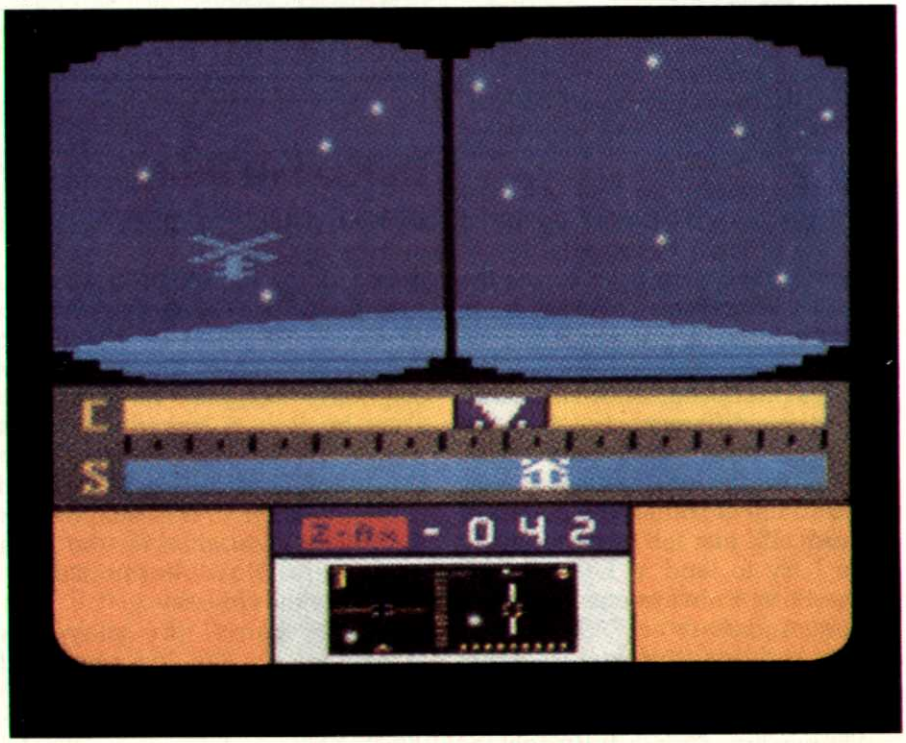
SPACE SHUTTLE

Atari 2600 owners can blast off with one of Activision's new games: **Space Shuttle — A Journey Into Space.** The game was designed by Steve Kitchen with the cooperation of the National Aeronautics and Space Administration (NASA).

The player is the commander of the 101st shuttle mission of the Space Transportation System. The commander's mission at the helm of the space shuttle Discovery is to launch, rendezvous and dock with the satellite as many times as possible using as little fuel as possible, and then return safely to earth.

The game comes with a 31-page flight manual (instruction booklet), a card with a summary of the six maneuvers (launch, stabilizing orbit, docking, de-orbit burn, reentry and final approach) and a flight deck console overlay that matches the switches on your game system.

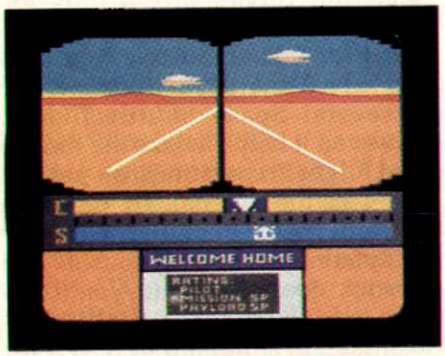
No one should begin a mission without being prepared. I think there's no way you can be fully prepared for this one unless you happen to be Richard Truly, commander of several Space Shuttle flights. However, it helps to take the time to read Flight Preparations, on pages 3 and 4 of the manual. By doing so you will become familiar with your equipment (flight deck console and joystick controller) and you'll decide which of three flights (autosimulator, simulator or 3 STS 101 —full-fledged flight) to select. Don't choose Flight 3 at first. Every good astronaut spends time practicing before the real thing.



Space Shuttle, for Atari 2600

Here is what the play is like: You launch from Cape Canaveral at dawn and all systems are go. First shut off the primary and backup engines, then close the cargo doors and check to see that the landing gear is up. Soon the countdown will be activated and you must make sure that the switches on the primary engines are at MET 15 (mission elapsed time). Then ignite the main engines at MET 4 — then liftoff.

Once the Discovery is off the launching pad, you must stay on the correct course and pay close attention to the fuel/thrust panel. At 26



Space Shuttle

nautical miles, you should separate from the solid rocket boosters and then soon from the main external tank. At about 205 nautical miles, you must quickly shut down all the engines, because the closer the Space Shuttle is to the satellite's orbit, the greater the risk of floating too far out in space.

When the Shuttle first achieves orbit, the nose is pointed up out of the line of sight of the satellite. In order to dock, you have to see the satellite. Therefore, it's necessary to bring the nose down, which is done by adjusting the pitch of the Shuttle. Besides pitch, you control the Shuttle on three different axes—X, Y and Z. After docking with the satellite, it's time for the long descent home.

I won't give you all the details of descent; I'll just tell you that every time I try to land at Edwards Air Force Base, I always crash into the desert. And that's at Flight No. 1—autosimulator, the easiest game level!

Needless to say, I haven't earned my wings yet. Successfully docking the Shuttle five times and landing with 4,500 units of fuel makes you worthy of Pilot status and earns you a pilot patch. If you make the sixth and final satellite docking with at least 7,500 fuel units in your tank, you'll be one of the few, the proud, the elite—Space Shuttle Commanders.

Space Shuttle is not for everyone. If you're the impatient type who likes to sit down and immediately begin playing a game, you probably won't like it. However, if you have dreams of being an astronaut, this game is probably the next best thing to being in the real Space Shuttle.

REPORT CARD	
TYPE	SPACE ADVENTURE
GAME PLAY	A
ORIGINALITY	A
GRAPHICS	A
SOUND	A
AGE LEVEL	11 and up
DIFFICULTY LEVEL	very hard
OVERALL RATING	**A**

DEMON ATTACK

Demon Attack by Imagic caused quite a stir when it was first introduced for the Atari 2600. It won The 1982 Best Video Game of the Year, an Arkie award given by Electronic Games Magazine. The game was originally designed for the Atari 2600 by Rob Fulop (designer of Atari's Missile Command and Night Driver and Imagic's Cosmic Ark and Fathom). Then it was adapted for the Intellivision, then for the Atari computers. Now there's Demon Attack for the Odyssey 2.

In this game, the player is marooned on the ice planet of Krybor and must shoot down screaming waves of demons before they get him. In later waves, the demons split into two. The player begins with three bunkers and a new one is added each time the player survives a wave without getting hit.

Demon Attack, for Odyssey 2

There are ten variations to Demon Attack for the Odyssey. Three of the variations are a tracing laser fire. Another interesting one is a special cooperative version where two players take turns every four seconds.

The game play in Demon Attack for the Atari 2600 and Odyssey is almost the same. In the Atari 2600 version there are 84 waves. I know because I survived all of them! I'm not sure if there are that many waves in the Odyssey version because I haven't made it that far. Also, in the Odyssey version there aren't lasers coming down from the demons as there are in the 2600 version. The game is best played with the volume turned down because the sounds are scratchy and can become annoying.

REPORT CARD	
TYPE	SHOOT-EM-UP
GAME PLAY	B
CLOSENESS TO ATARI VERSION	B-
GRAPHICS	B
SOUND	D
AGE LEVEL	8 and up
DIFFICULTY LEVEL	Medium to hard
OVERALL RATING	**C+**

ARMOR ATTACK

A jeep makes its way through the streets and alleys of a bombed out town, watching for enemy tanks that are behind buildings with the mission to "seek and destroy." No place seems safe from the treacherous enemy. No, this isn't a scene from the movie, *Patton*, but the story line behind **Armor Attack**, for the Vectrex, licensed from Cinematronics, makers of the arcade game.

In Armor Attack, the player controls a jeep by using the joystick and buttons 1 and 2 to fine-tune his movements. The third button applies thrust and the fourth fires a missile.

At the start of the game, the player's jeep appears in the center of

VID KID

the town. Once the player is in range of an enemy tank, he fires a missile. If it hits the tank, it dismantles it; but it takes a second shot to destroy it. As the player destroys tanks, additional ones are dispatched, followed by missile-firing helicopters. There is no hiding place from the evil chopper. The player's only chance for survival is to hit it first. A word of advice: When a helicopter arrives on the scene, move away from the aim of the tanks' fire and concentrate on the copter.

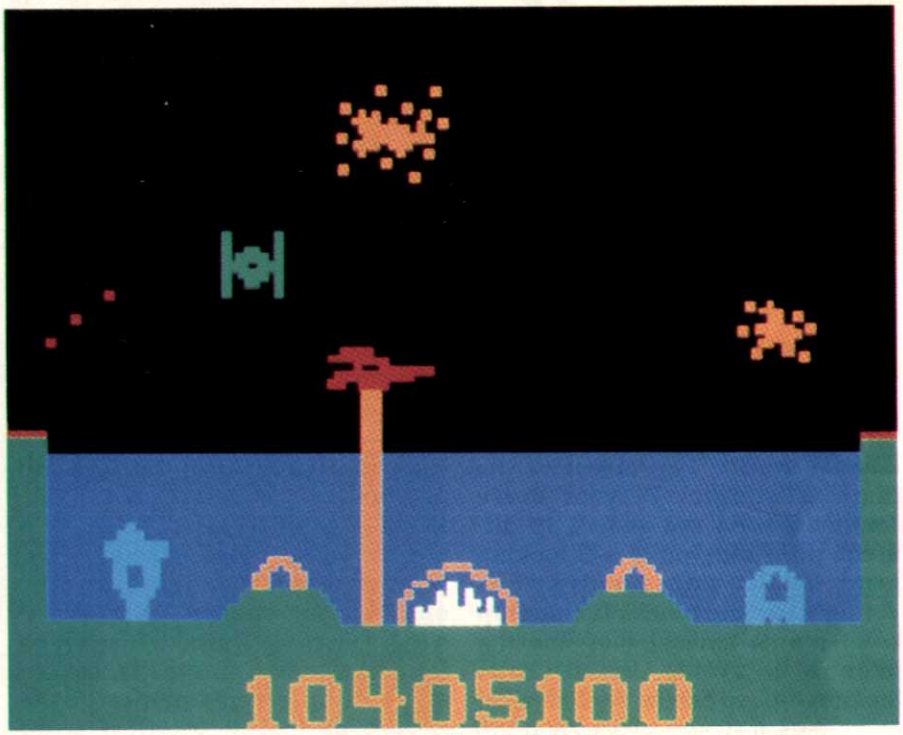
REPORT CARD	
TYPE	COMBAT/MAZE
GAME PLAY	B
CLOSENESS TO ARCADE VERSION	B
GRAPHICS	B
SOUND	A
AGE LEVEL	8 and up
DIFFICULTY LEVEL	Medium to very hard
OVERALL RATING	**B**

ATLANTIS

Imagic's **Atlantis** for the Atari 2600 also caused quite a stir in 1982. It was originally designed by Dennis Koble (who did Atari's hand-held Touch Me and the arcade Spring I and II and Imagic's Trick Shot); now it has been adapted for the Intellivision and Odyssey systems.

The title of this game immediately tells you that you're doomed! It's an impossible game to win, for Atlantis is an ancient civilization beneath the sea that has already met its watery grave! Just the same, it's fun to see how many points you can score before the city meets its fate.

Your mission is to defend Atlantis against different types of Gorgon vessels. You must protect parts of the city such as the People Pyramid, the Doomed Palace and the Generator. The player protects the various parts by shooting diagonally left and right from sentry posts located on either side of the screen.



Atlantis, for Intellivision and Odyssey

A secret weapon — a Blitz Bomb, which will disintegrate all Gorgon vessels that appear on the screen — may be used when the action gets really tough! And you can be sure it will, with this game.

Atlantis is the best game I've played on the Odyssey because of its bright, colorful graphics and fast, challenging and interesting game play. It flat out doesn't look like a typical game for the Odyssey 2!

REPORT CARD	
TYPE	SHOOT-EM-UP
GAME PLAY	B
CLOSENESS TO ATARI VERSION	B
GRAPHICS	A
SOUND	C
AGE LEVEL	8 and up
DIFFICULTY LEVEL	Medium to very hard
OVERALL RATING	**B+**

FROGGER

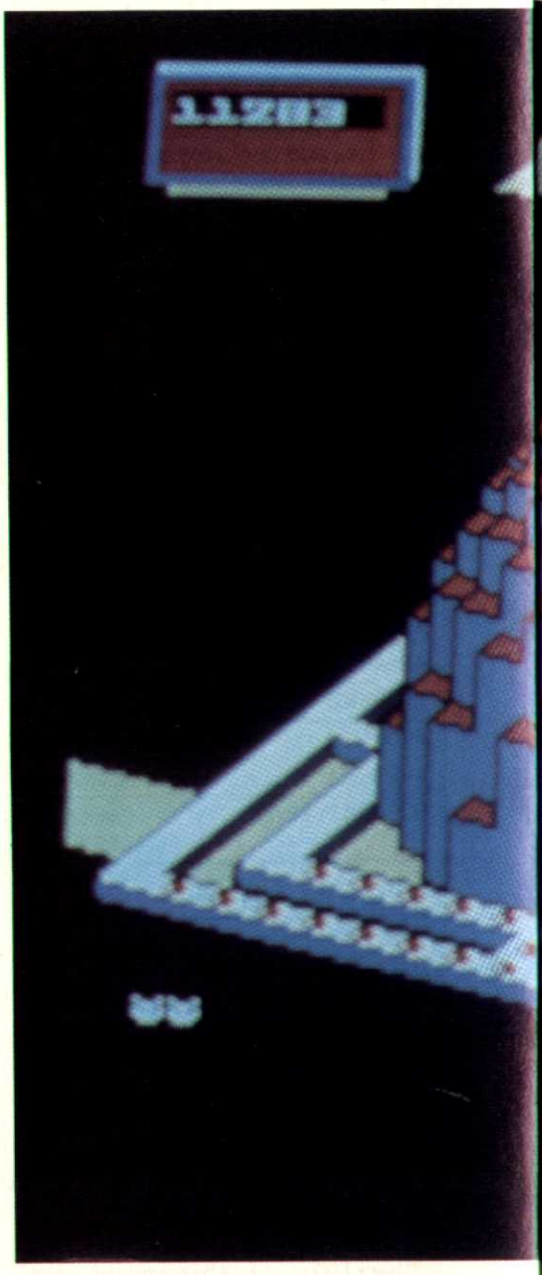
One of my favorite games for the ColecoVision is the arcade game **Frogger**, by Parker Bros., licensed from Sega. In Frogger, the player is an unfortunate little frog who must get to his house by jumping across a freeway and hopping on logs and alligator tails in order to get over a treacherous river. When the player is on the last log, his timing has to be just right to get his frog in one of the five notches that are the froggie houses.

Getting across the river is easy at first, but soon becomes very difficult. The player has the choice of either a fast or a slow game or the choice of a game with or without music. Now tell me how to get those options on the arcade game!

REPORT CARD	
TYPE	CLIMBING/ACTION
GAME PLAY	A
CLOSENESS TO ARCADE VERSION	A
GRAPHICS	A
SOUND	A
AGE LEVEL	All ages
DIFFICULTY LEVEL	Medium to hard
OVERALL RATING	**A+**

Mastering CRYSTAL CASTLES

BY ABBOT NEIL SOLOMON



Bentley Bear, the star of Atari's new coin-operated game Crystal Castles, is the sweetheart of the video world. The object of the game is simple: Players move Bentley around the game's 16 different playfields on a 3-D-looking board. Bentley earns points by collecting ruby gemstones (valued up to 99 points apiece) that line the paths as he avoids Crystal Castle enemies—Gem Eaters, crystal balls, nasty trees, a swarm of bees and the mean witch, Berthilda. On various boards Bentley also must walk through tunnels, run up ramps and even take a few elevator rides.

Bentley is controlled by a lit and sometimes flashing Trak-Ball. The faster Bentley is moving as the jump button is pressed, the longer the jump. Beginning players should take time to master the Trak-Ball because it can be tricky. For example: It's not wise to spin the ball when trying to get Bentley out of trouble. Spinning the ball seems to cause Bentley to move sideways, often into an enemy.

The way to master Crystal Castles is to study the actions of the game's opening boards. After learning the tricks of beating these boards, it's time to attack the more difficult playfields.

BOARD 1: BENTLEY BEAR. This board is easy because Bentley has only a few gems to collect and only one type of enemy—the crystal balls. The three crystal balls, which look like brown meatballs, appear on the upper right corner of the screen and slowly roll toward Bentley. They are easy to avoid. Beginning players should use them to get accustomed to dodging the enemy. It's also a good board to use to practice with the Trak-Ball and jump button. To score a bonus on the board, Bentley has to get the last gemstone. Just move him around the board and soon the last gemstone is collected. The bonus is worth 1,000 points.

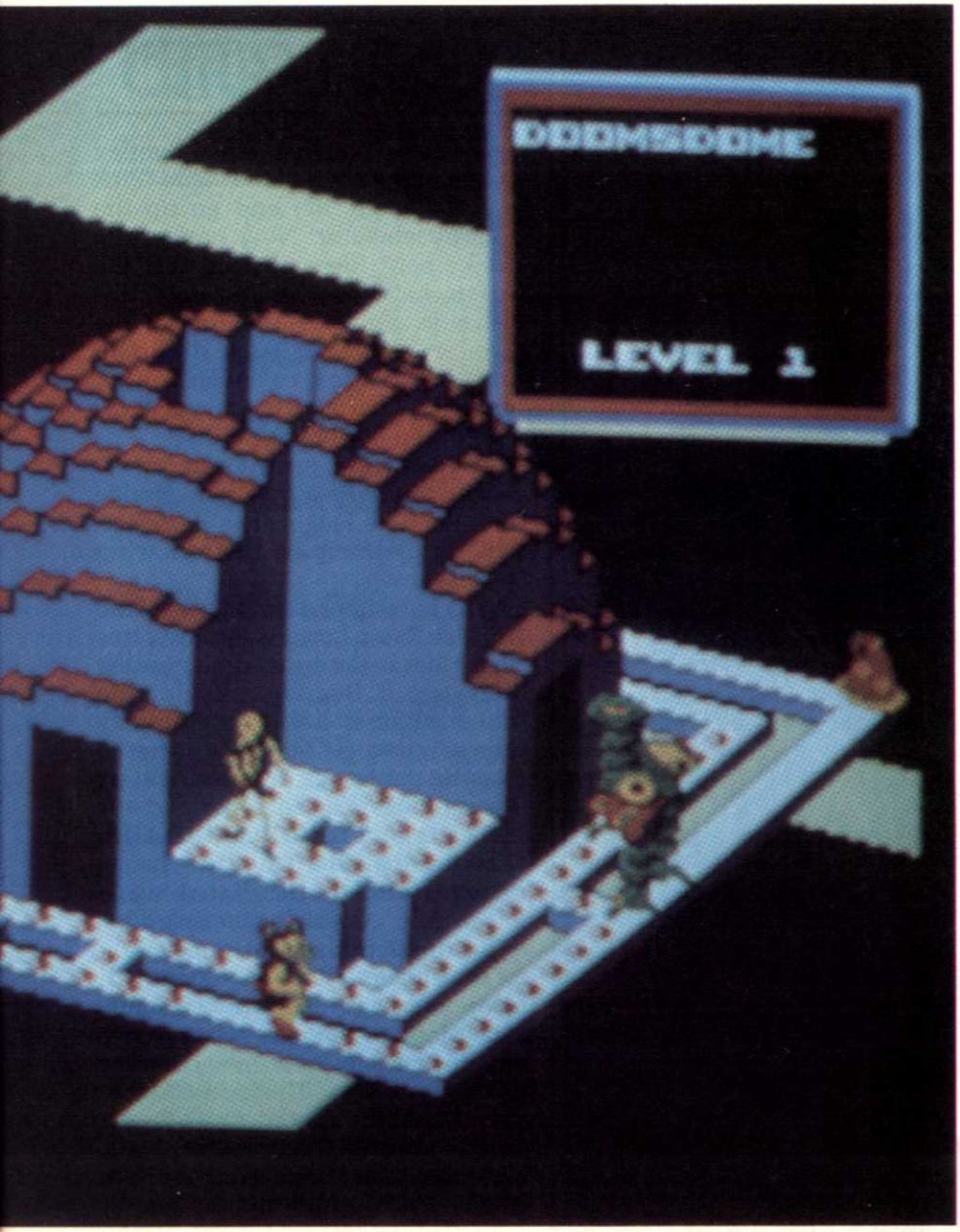
Crystal Castles features Warp Tunnels that allow Bentley to score a quick 70,000 points, the amount needed for an extra gamelife. In the first board, Bentley must be moved to the tunnel in the middle of the castle's walls. Once there, press the jump button and Bentley skips to the next level. Since warping earns 70,000 points, the extra gamelife is earned and Bentley advances to the higher level.

BOARD 2: TREE WAVE. This board introduces the first real threat—the nasty trees. The trees appear in the back row of the castle. The nasty trees always take the quickest path to Bentley. The trick here is to trap the trees behind some barrier like a wall. Once the trees are trapped, they just move parallel to the direction of Bentley and become harmless.

If one of the nasty trees gets too close, move Bentley toward it and push the jump button. Not only does Bentley jump over the enemy, but the tree shrinks and stays still for a few seconds.

Another addition to the second board is the Honey Pot. Located in the upper left of the board, the Honey Pot is worth 1,000 points if Bentley eats it.

Another enemy makes its first game appearance—the swarm of bees. Designed to keep the game moving, the swarm is released if Bentley is slow getting around the board. The only advice to give a player is to try to keep Bentley ac-



tive and dodge the swarm of bees.

If Bentley collects the last gemstone, the bonus is now worth 1,100 points.

BOARD 3: DOOMSDOME. Named after the reddish dome that appears on the screen, this board introduces two new enemies—the Gem Eaters and the dancing skeleton. The skeleton dances on the raised platform directly in front of Bentley. When Bentley takes the elevator to the platform, the secret is not to panic. The skeleton moves slowly enough to allow Bentley to carefully collect all the gems before taking the elevator back down.

The Gem Eaters present a different problem. Here we meet Bentley's chief competition for the gemstones. Released from various locations on the boards, the Gem Eaters wander around eating gemstones. As they swallow, the red gems slowly rise up their bodies. That's when Bentley must strike. If Bentley runs through a Gem Eater as a red gem is moving up, the Gem Eater dies and Bentley earns 500 points. As you develop your skills at Crystal Castles, you'll soon be able to time Bentley's movements to pick up all those 500-point Gem Eaters. Also keep in mind that if Bentley jumps over a Gem Eater, it momentarily slows down.

The Doomsdome board also introduces the magic hat. The magic hat always appears on the far right of the board. Move Bentley through the hat and he becomes invincible for about five seconds.

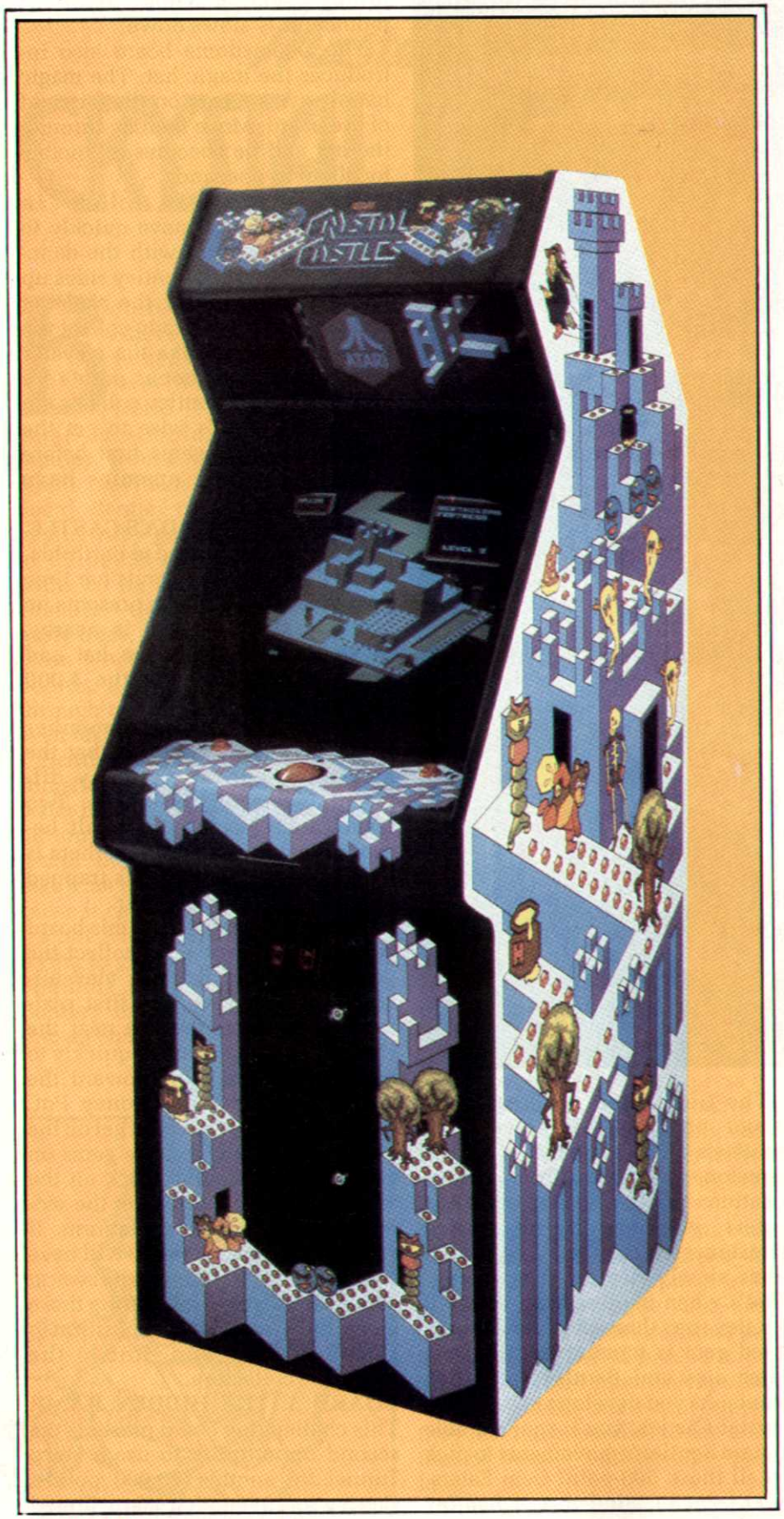
One strategy to follow in Doomsdome is to move quickly to the raised platform with the dancing skeleton. After Bentley rides up the elevator, look for the skeleton and move around him to collect the gemstones. Then take the elevator back down. Since bonus points are awarded only if Bentley collects the last gemstone, it's wise to get the hardest to reach gems first before all of the game's enemies have surfaced.

BOARD 4: BERTHILDA'S CASTLE. Now we are introduced to Berthilda, the evil witch. She spends her time near the magic hat. She presents no problem since the hat is nearby. Move Bentley under the hat and then kill Berthilda for the 3,000 points.

The main thing to remember about Berthilda's Castle is that the gemstones appear on many different levels on the board. Two levels are especially difficult because the only way to reach them is by elevator. If Bentley gets trapped on those levels he's a goner.

The secret to mastering this board is to first get Bentley to collect the gemstones from the two elevator-accessed platforms. The first platform to go for is the one near the Honey Pot. Move Bentley quickly to the left and then turn toward the Honey Pot. Grab the Honey Pot, move one step to the right, get on the elevator and collect those gems on top. Then get Bentley back on the elevator, descend and go to the second elevator-accessed platform. If you move quickly Bentley will have completed his task before the swarm of bees descends. After getting those gems, move Bentley into position to kill Berthilda and finish the gemstone collecting.

BOARD 5: THE HIDDEN RAMP. This challenging board presents the second opportunity to use a Warp Tunnel for another 70,000 points. Getting to this hidden Warp Tunnel



CRYSTAL CASTLES

takes some practice. Move Bentley to the upper right of the board. Pick up the magic hat and go up the nearby elevator. Now comes the tricky part. Remembering that the magic hat's powers last only five seconds, run to the bottom of the hidden ramp and push the jump button. If you've been quick enough, Bentley gets warped ... and the 70,000 bonus points.

It takes a few turns to get accustomed to the Hidden Ramp. Notice that the Gem Eaters are still detectable in the ramp by their glowing red eyebrows.

The only other difficult part of the Hidden Ramp board is the nasty tree that hides in the upper right near the elevator. If Bentley takes a ride down on the elevator, a tree quickly jumps out to get him. The secret to beating the tree is to move Bentley forward before it can strike.

BOARD 6: THE CROSSROADS. This board gives a player the chance to wipe out all the Gem Eaters in one clean gulp. As soon as the board begins, run Bentley to the upper right of the screen. Five Gem Eaters will drop and begin to eat a gemstone. The moment the gem starts to rise on the first Gem Eater, move Bentley through all five. The result is that Bentley kills all the Gem Eaters and is rewarded with 2,500 points. Once the Gem Eaters are gone, have Bentley take a ride up the nearby elevator and proceed down the crossroads, collecting gemstones along the way.

After you've mastered the first few boards of Crystal Castles, the rest of the game screens are just variations. Atari seems to have a winner with Crystal Castles. Despite its simple structure, Crystal Castles presents so many different ways of mastering it that no two games are ever alike. Study the tips and soon you'll be helping Bentley Bear gather all those precious gemstones—on the way having all sorts of adventures with trees, bees and Berthilda, the evil witch. ■

GAME REVIEWS

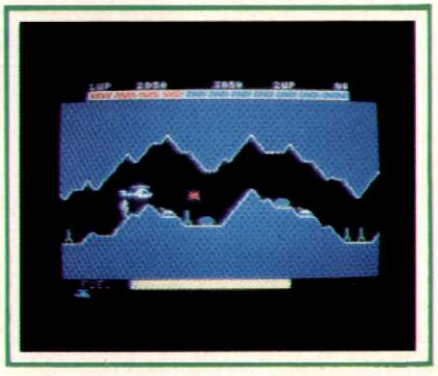
Fun and Games for Your Computer
A Quick Look at Some of the Most Popular Games Around

BY WALTER SALM

COBRA

This Parker Brothers cartridge for the Atari 400/800/XL computers has all the action and grabbing power of its remote arcade ancestor, Scrambler. Instead of flying a rocket-powered fighter-bomber, you're flying a heavily armed combat copter into the enemy's lair.

Cobra neatly solves the problem of needing two firing buttons to shoot the ship's forward-mounted cannon and to drop bombs; the one Atari joystick button does *both*, by shooting and dropping bombs with alternate pushes on the button. You have to keep that button going quickly to get off your shells and drop your bombs; and you have to watch out for that ground fire and the laser shots from the saucers and ground-to-air missiles. And just when you've finished congratulating yourself on having gotten past the enemy, you crash into a cavern overhang or run out of fuel and crash.

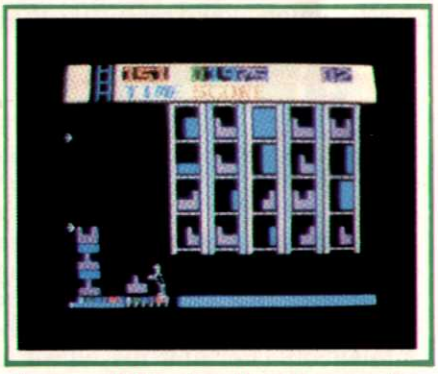


This game is captivating, action-packed and hard as the dickens once you reach the tenth level. There are no skill levels; you just keep playing until you run out of gas or patience. And you can compete for points against a friend in the two-player version.

HIGH RISE

When is an educational game so much fun to play that you keep coming back for more? In this case, it's Micro Fun's **High Rise**, a game where you play with blocks. These blocks come in a variety of shapes and sizes, and the idea is to pile them on top of one another to build a stable structure high enough for Barnaby — your hero and master builder — to be able to climb to the next level.

Sound easy? Sound like kid stuff? It's neither, because the key to this game is building a *stable* structure. Get a few odd-shaped blocks in the wrong place and the whole thing collapses and you start all over again. You work against the clock in this Apple II game, which now is also available for the Commodore 64, Atari and IBM-PC computers. It's instructive; higher levels get more and more difficult, and it's a grabber.



SPARE CHANGE

The first thing you notice about **Spare Change**, a Broderbund game for the Apple, Atari and Commodore 64, is that it's *funny*. You can play it from the keyboard or with a joystick. You are a nameless human in an arcade trying to outwit two mischievous Zerks — characters who have escaped from an arcade game and are trying to save enough tokens to escape from the arcade once and for all and retire. They're funny-looking creatures — a pair of legs topped by a flat box.

The Zerks keep stealing tokens from the dispensing machines and

GAME REVIEWS

from a bin you try to fill up with tokens to get points. If you catch a Zerk with a token you can grab it back, and the Zerk jumps up and down in frustration.

You can distract the Zerks by putting a token in the juke box. They can't resist the music and start dancing, freeing you to run more errands with your tokens. You can also call them on the coin telephone (using a token, naturally) and start a popcorn machine, both of which the Zerks can't resist.

If you like, you can change the Zerks' behavior patterns and set your own levels of difficulty. The game ends when the Zerks get their piggy bank filled with tokens and can retire. Spare Change is fun and funny, and even while you're laughing, you develop skills at outwitting the mischievous Zerks. Underneath it all, though, you'd really like to see them retire. They deserve it.

B.C.'s QUEST FOR TIRES

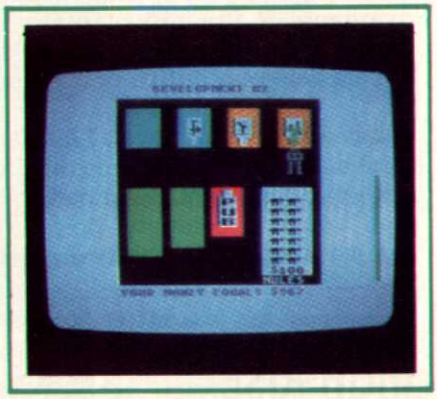
If you read the comics (and who doesn't?), you probably have been laughing over *B.C.* and a strange caveman character named Thor who is forever riding around on his uniwheel. Thor and his wheel are the stars of **B.C.'s Quest for Tires**, a new game from Sierra On-Line for the Apple II and Atari, also available in ROM cartridge for the Coleco Adam and ColecoVision machine.

Thor rolls through the countryside dodging low tree branches, jumping over rocks and holes, stepping-stone across a river on turtle-backs, while avoiding a bop from Fat Broad's club—on his way to try to rescue Cute Chick who is being held a prisoner by a dinosaur, who we assume wants her for his dinner.

The game is cute, funny and delightful—probably because we like the characters in the comic strip so much. As games go, it's not a *great* game, but it's good fun, as you help Thor dodge volcanic eruptions, hitch a ride by hanging onto Dooky Bird's feet, jump across a ravine and finally rescue Cute Chick (if you get that far).

M.U.L.E.

If you like Monopoly and other investment and strategy board games,



you'll *love* **M.U.L.E.** It's an Atari 800 game from Electronic Arts that can handle up to four players at a time with four joysticks, something that's possible with only the Atari 800. As board games go, this one is exciting, different and a lot of fun.

You first get to choose your color and your token from a collection of weird but cute extraterrestrial creatures. One of them, called a Gollumer, looks an awful lot like E.T. When your transport ship lands on the new planet, you participate in a land grant and pick a homestead site. There are *always* four players. If you're playing alone, the computer plays the other three; two humans means two computer players, etc.

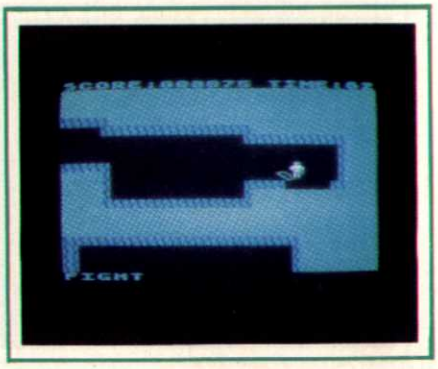
Then you go to the trading post and buy a M.U.L.E. (Multiple Use Labor Element), a robotlike machine for working your land grant. You outfit the M.U.L.E. for farming, energy production or Smithore mining, take him back to your land and install him there. In the remaining time in your turn, you can go back to town to the saloon, where you win some money playing poker. The amount of money depends on how much time is left in your turn.

You then have a status report of your production, surpluses and shortages, and an auction. You try to sell your surplus and buy to fill in for your shortages. A tote board shows your total status at the end of each turn. This game, like Monopoly, can keep you going for many hours and has many very imaginative chance happenings, such as an acid rain storm, an earthquake, a gift package from your uncle on another planet, or whatever.

And by the way, the computer takes no unfair advantages. The computer's players have the same problems, shortages, losses at auction, etc., that you do. That's part of the fascination of this game. It's great!

GATEWAY TO APSHAI

This plug-in ROM cartridge for the Atari and Commodore 64 is the latest in EPYX's Apshai series of maze/action/adventure games. In **Gateway to Apshai**, you use both the joystick and keyboard to explore eight levels of underground dungeons and try to find your way to the lost Temple of Apshai. You find trea-



sures to earn points, fight off monsters and avoid traps to stay alive, all the while trying to explore as much of each level as you can. You have 6½ minutes maximum to explore each level; if you're too slow, you're automatically teleported to the next lower level.

A special screen display shows your status when you want to see it and lists your points for strength, agility, luck, health, score, number of lives you have left and the level you're on. If you get wounded in battle with a monster or by getting stuck in a trap, you lose health points. Hit zero and you lose a life (you start with five). Lose all five lives and you're done.

Another screen tells you what you're carrying—keys, search spell, trap locator, etc. Still another screen lists your equipment, such as a dagger and armor.

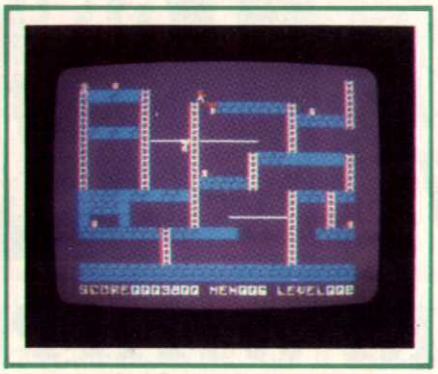
Each level has 16 dungeons and each dungeon has about 60 rooms. That's a total of 7,500 rooms to look at before you find your way through the maze and discover the lost Temple of Apshai. There are a total of 128 dungeons and each one has a different floor plan. If you're into maze/adventure-type games, check this one out.

LODE RUNNER

This game's a bit unusual—it's both a game and a make-your-own-game disk. From Broderbund, **Lode Runner** is for the Apple II, Atari 800 and XL series and the Commodore 64. In its fresh-from-the-carton format, you are Galactic Commando in enemy territory. You have to infiltrate each of 150 different treasury rooms, evade the guards and recover chests of gold.

The guards try to grab the gold and move it, and if one touches you, you lose a life. You can stop the guards temporarily by using your laser drill pistol to drill pits in the floor. The guards fall into the pits and take a few seconds to get out. While they're stuck in the pits, you can run over their heads (eccch!) to get away and grab more gold chests.

Some of the treasure is buried in vaults and you have to drill to get to



it. This is tricky, because you can end up getting trapped or cornered by a guard. All holes fill in again after a few seconds, so you have to move fast. When you finish collecting all the gold on one level, a ladder appears that you can climb (usually just one step ahead of the guards) to the next level or to the treasury room. Each one gets more complicated, and each room has its own variety of pitfalls and traps.

Good game? You bet! And you can design your own treasury rooms and scenarios to make it rea unending.

RENDEZVOUS

Ever get a yen to fly a Space Shuttle? Here's your chance, with **Rendezvous,** an Apple and Atari simulation/game from Edu-Ware. You are at the Shuttle's controls as the flight goes through four phases: lift-off, orbital rendezvous, approach and alignment and docking. Sound like fun? It's hard as the dickens, and takes so much practice and patience that you'd better read the manual *thoroughly* before you start.

Just getting the Shuttle into a decent orbit takes quite a few attempts

and corrections, let alone actually meeting up with the already orbiting satellite. You have to keep track of such things (shown on the control panel at the bottom of the screen) as elapsed time, altitude, distance downrange, vertical velocity, horizontal velocity, angle of pitch, amount of fuel remaining and, most of all, where your present orbit will take you.

The computer plots trajectories for you so you can try out different fuel-burn combinations. But your fuel is limited, and the key to the success of the mission is in the lift-off itself — getting just the right angle at just the right moment—and all this takes practice and good seat-of-the-pants flying skill. It's a great simulation, but may frustrate some would-be astronauts. ■

SUPER SEVEN

What makes a computer game a classic? We've picked seven of our all-time favorites; what are yours? *MICROKIDS* is now giving you a chance to vote for your favorite computer games and maybe win a free subscription. *MICROKIDS* will award a free year's subscription to the first 100 persons to vote in our Super Seven poll. Just call The Source and send a letter to *MICROKIDS* (Account No. BBK483) and tell us your choice of the seven best computer games of all time. Or mail your list to Super Seven, *MICROKIDS*, 133 Fifth Ave., New York, NY 10003. If you dial us on-line, please be sure to give us your name and number; if you mail us your list, include your name and return address. We'll publish the list of the top seven computer games—as voted by you, our readers—in the next issue of *MICROKIDS*.

1. PAC-MAN
2. DEMON ATTACK
3. FROGGER
4. ZAXXON
5. MISSILE COMMAND
6. SUBMARINE COMMANDER
7. GORF

START WITH PRINT

BY LORETTA HOLZ

BASIC is the name of a computer language written for beginners. It's very easy to learn and it's probably the most popular language among computer users today. BASIC is short for Beginners All-purpose Symbolic Instruction Code. It was written in 1964 by Dartmouth professors Thomas Kurtz and John Kemeny.

BASIC was written to allow you and your computer to understand each other. It was meant to be a language all students could learn. You'll find it much easier learning BASIC than learning to speak or write a language like German or Spanish.

The men who wrote BASIC wanted it to be used by those studying science and math, and by those majoring in literature, history and other subjects as well. They felt that every educated person should know something about computers, and that by learning BASIC, people would understand their computers better.

BASIC has become so popular that it's available for every popular personal computer. Many provide it free with the machine. BASIC is probably ready for you to use on your computer. If not, check in the computer's manual or with the one who sold you the computer to see if you can get BASIC working on it.

There are many different versions or dialects of BASIC. They have been written especially for specific computers to use the special capabilities of each machine.

If you have a program written in one version of BASIC you may be able to change it into another so you can use it on a different brand of computer. This language lab will present the commands of BASIC that are used on the most popular personal computers. Differences in the commands will be discussed as necessary.

When it's using BASIC, the computer does not understand the whole English language. Instead it uses about one hundred words, like PRINT, NEXT, FOR and END. These words have special meanings, and you'll learn to use them as BASIC commands.

You can learn how to talk to your computer in BASIC by just reading this information. However, you can learn much more by actually trying the suggested experiments and writing your own programs.

Before you begin, look at the keyboard. If your computer has both uppercase (capitals) and lowercase (small letters), push down the CAP LOCK. When you type the commands, they should be in capitals.

Be careful to use the numeral zero (located in the number line at the top of the keyboard) and not the letter "O" when you want a number. The zero on your screen should have a slash through it so you know it is not the letter "O." Also, never use the letter "L" for the number "1." If you make a mistake, just back up with the left arrow or delete and start typing again.

A language lab is a place where you learn to speak a language by experimenting with it. That's what this is all about. Why not take these pages with you and sit down at your computer?

Try using your computer in the direct mode; that is, tell it to do something and watch while it does it. The first program command most people learn is PRINT. After this command you'll often see some words in quotes. The command just says to print these words on the screen exactly as they appear within the quotes. Some versions of BASIC allow you to type a question mark in place of PRINT to make entering your program faster. Experiment with this on your computer.

Type PRINT (or ?) and then put your name in quotes right after it. Push the RETURN or ENTER or CR (carriage return) key. The computer should print your name:

```
PRINT "CHRIS"
CHRIS
```

Experiment with other names and phrases in quotes. Now type PRINT and your name, but this time forget the quotes. The computer put a zero, not because it thinks you are a big zero but because it was trying to give your name a number value. Tell it your name and say it equals your age. Then tell it to print your name again:

```
CHRIS = 12
PRINT CHRIS
12
```

The computer will remember that CHRIS is equal to 12 until you turn it off.

So far you've been telling the computer what to do and it has done it right away. Usually you want to write a longer list of instructions

and have the computer be able to follow them more than once. To do that you must write a program which is just a list of commands you wish the computer to carry out in order.

To keep track of each step you want the computer to take, BASIC uses line numbers. The computer reads your program starting with the smallest number, then going to the next and on up. If you enter the lines out of order, the computer puts them in order for you.

Most people who write BASIC programs number their lines 10, 20, 30 and so on. If they forget a line between 10 and 20, for example, they can put in a line 15 or any other number from 11 to 19. If you number by 10s, this leaves nine possible lines between your original lines to put in what you have forgotten. Don't worry about running out of line numbers.

Start each line of your program with a line number. Next comes the command and finally you must hit the RETURN or ENTER or CR (carriage return) key so the computer knows that the line is finished. If a line is long, the computer will go to the next line on the screen by itself. You are still working on the same program line. Don't hit RETURN until you have finished the whole line. Your first program might look something like this:

```
10 PRINT "BASIC IS"
20 PRINT "EASY"
```

After you have typed in your program, nothing happens. When you just said PRINT "CHRIS," the computer did this as soon as you hit RETURN or ENTER. Now you have a program and the computer will not run it until you command it to. Just type RUN, push the RETURN or ENTER key and the program which is now in the computer's memory will run, or be executed:

```
BASIC IS
EASY
```

You can run this program over and over by using the RUN command (remember when you used PRINT as a direct command, it did it only once). Now add a line:

```
15 PRINT "NOT"
```

Run the program:

```
BASIC IS
NOT
EASY
```

You can see the computer put the line you added between the other two. To check this, use the command LIST. This will give you the steps in the program in order:

```
LIST
10 PRINT "BASIC IS"
15 PRINT "NOT"
20 PRINT "EASY"
```

Since BASIC really *is* easy, get rid of line 15 by typing the line number and pressing RETURN (or ENTER). When you LIST the program again, this line should be gone. Whenever you want to get rid of a line, type the line number and just hit the RETURN or ENTER key. If instead you want to rewrite a line, type the line number and what the new line should say. The new line will be put in the place of the old line automatically.

You can learn how to talk to your computer in BASIC by following this feature.

You have entered a program and may want to save it to run later. You can do this if you have a disk drive or cassette recorder attached to your computer. The command used on many computers is SAVE, followed by the name you want to give to the program. This command works on an Apple, Commodore PET, TI 99/4 and other computers. Use CSAVE to save on a cassette tape for Atari and Radio Shack. After the program is saved, type NEW to clear the memory of the computer so it is ready for a new program.

When you use the PRINT command, everything you put inside the quotes, even a space, is important. Enter this program changing the words in quotes if you wish. Be sure that you put spaces between the opening quotes and the word to be printed in lines 20, 30 and 40:

```
10 PRINT "I"
20 PRINT "   DO"
30 PRINT "      LIKE"
40 PRINT "         BASIC"
RUN
I
   DO
      LIKE
         BASIC
```

When you run the program, notice that the second, third and fourth words are printed to the right the exact number of spaces you put inside the quotes. The spaces inside the quotes are just as important as letters to BASIC. Put them in when you need them.

When you tell your computer to PRINT a number, you do not need to put quotes around it. The computer will just print the number. The computer knows math so when you tell it to PRINT an addition problem it will give you the answer. Write a program to do an addition problem like this one:

```
10 PRINT "3 + 4 = "
20 PRINT 3+4
RUN
3 + 4 =
7
```

When the numbers are inside quotes, the computer will print them exactly as you have written them. If they are out of quotes, then the computer does the addition and gives the answer.

The computer also can do subtraction, multiplication and division. The subtraction sign is the one you always use, but multiplication and division are different. For multiplication it uses an asterisk (*). For division it uses the slash (/). Try running this program or make up a program with the numbers you want to use:

```
10 PRINT 6-3
20 PRINT 6*3
30 PRINT 6/3
RUN
3
18
2
```

To write a more interesting program, you need to learn another command: GOTO. The GOTO command sends the computer to another line, whatever line you say. You can make something happen over and over again with the GOTO command. Type in this program using your name:

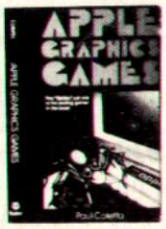
```
10 PRINT "HELLO"
20 PRINT "DANA"
30 GOTO 10
```

When you tell the computer to run this program, your computer will greet you over and over and over. When the screen is full it will look as though the words are flickering at the bottom. Actually, new

(Continued on page 78)

Microkids T.M. Bookstore

A computer is not too smart all by itself. Only you can educate it and you're going to need some books and software to do the job right. Order what you need from MICROKIDS' list of recommended titles and get your computer into training!



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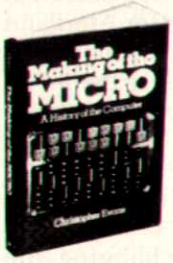

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Answers

Mind Benders

A WORD'S WORTH

There are two numbers in the range from 1 to 999 each of whose values, when written in English according to the code used here, add up to exactly 100. They are *thirty* and *fifty-one*.

RANDOM WALK

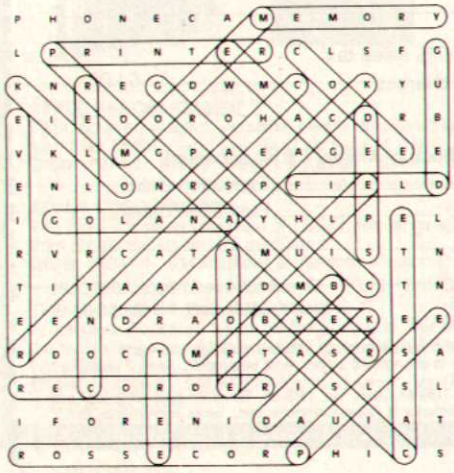
```
100 REM *** RANDOM WALK
    PROGRAM ***
110 DEFINT B-Z
120 REM INTEGERS MAKE IT GO A
    LITTLE FASTER
130 RANDOM
140 REM RANDOM GIVES AN
    UNPREDICTABLE SERIES
150 N=0:F=0:B=0
160 REM INITIALIZE VARIABLES; N =
    TOTAL FLIPS OF COIN;
170 REM F = NO. OF STEPS FORWARD;
    B = NO. OF STEPS BACKWARD
180 A=RND(0):N=N+1
190 REM THIS IS THE FLIP OF THE COIN
200 REM WE'LL CALL A<.5 HEADS;
    A>.5 TAILS
210 IF A>.5 THEN 280
220 F=F+1:B=B-1
230 REM HEADS - THE BOY TAKES A
    STEP FORWARD
240 IF F>39 THEN 340
250 REM IS HE OFF THE COURT
    FORWARD?
260 GOTO 180
270 REM IF NOT, FLIP AGAIN
280 B=B+1:F=F-1
290 REM TAILS - THE BOY TAKES A
    STEP BACKWARD
300 IF B>39 THEN 350
310 REM IS HE OFF THE COURT
    BACKWARD?
320 GOTO 180
330 REM IF NOT, FLIP AGAIN
340 PRINT "THE BOY LEAVES THE
    COURT FORWARD ";:GOTO 360
350 PRINT "THE BOY LEAVES THE
    COURT BACKWARD ";
360 PRINT "AFTER";N;"STEPS."
370 END
```

SAMPLE RUNS:

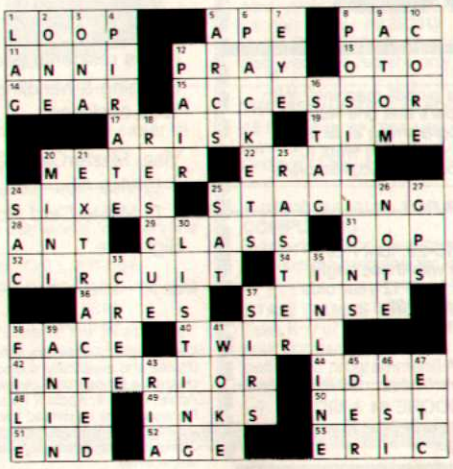
```
THE BOY LEAVES THE COURT
FORWARD AFTER 132 STEPS.
THE BOY LEAVES THE COURT
FORWARD AFTER 696 STEPS.
THE BOY LEAVES THE COURT
BACKWARD AFTER 986 STEPS.
THE BOY LEAVES THE COURT
BACKWARD AFTER 934 STEPS.
THE BOY LEAVES THE COURT
FORWARD AFTER 644 STEPS.
THE BOY LEAVES THE COURT
BACKWARD AFTER 772 STEPS.
```

Pencil Powered

MATCH GAME



WORD TEST



(Continued from page 75)

lines are being printed, pushing up the previous ones. The computer goes from line 10 to line 20 to line 30. This sends it back to 10, then on to 20 and so on, over and over again.

You have to stop this program from running because it will keep repeating all day. You can do this on most computers by pushing down, at the same time, CTRL (or CONTROL key) and "C."

Now you can experiment with this program. The simplest way to change a line is to type the line number and the new line. The old line will be gone and the new line will take its place. Your computer may allow you to correct a line without retyping it. Since each computer is different, you will need to check your computer's manual for the editing procedure—or just retype the line. Change line 10 by putting a semicolon (;) at the end. Run the program again and see what happens. Your name should print in a different place.

Change line 20 by putting a semicolon at the end of it. Run the program again. When you use a semicolon in a PRINT statement, it tells the computer to put whatever comes next right beside what is already printed. You can have fun changing the words and the numbers of spaces inside of the quotes to make interesting designs on the screen when you run the program.

Change line 10 by putting a comma at the end. Run the program and see what happens. Change line 20 by putting a comma at the end and run the program again. You will find that the comma directs the computer to put what follows into the next column. The words will print down the screen in columns.

Write a program that prints your name and underneath it says that you love BASIC. Have these two lines repeat down the side of the screen. Change only one line and have the words read across. Write another program to say "THIS IS SO SILLY!" with the words under each other. Make the four S's come out in a column. Check your programs with the suggested answers in the next issue of this magazine. ■

Language Lab

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1. What is your age? _____
2. Are you male ..... ☐ 5-1 or female ..... ☐ -2
3. Where do you live?
   City _____ State _____ Zip _____ 6-
4. Do you live:
   with your parents ☐ 7-1 away at school ... ☐ -3
   on your own ..... ☐ -2 other ..... ☐ -4
5. What is your total annual household income?
   less than $15,000 ☐ 8-1 $35-$50,000 ..... ☐ -4
   $15-$25,000 ..... ☐ -2 $50-$75,000 ..... ☐ -5
   $25-$35,000 ..... ☐ -3 over $75,000 .... ☐ -6
6. What is the occupation of your head of household? _____ 9-
7. Do you have a computer in your home?
   yes ..... ☐ 10-1 no ..... ☐ -2
8. Do you have a separate game machine in your home?
   yes ..... ☐ 11-1 no ..... ☐ -2
9. If you do have a computer in your home, is it primarily:
   your own ..... ☐ 12-1 a sibling's ..... ☐ -3
   your parents' ..... ☐ -2 everybody's ..... ☐ -4
10. If you have a computer, what kind is it?
    Apple ..... ☐ 13-1 TRS ..... ☐ -5
    Atari ..... ☐ -2 TI ..... ☐ -6
    Commodore ..... ☐ -3 Timex/Sinclair ... ☐ -7
    IBM ..... ☐ -4 Other ..... ☐ -8
11. If you do not have a computer, are you planning to get one?
    yes ..... ☐ 14-1 no ..... ☐ -2
    If yes, which one are you leaning towards?
    Apple ..... ☐ 15-1 TRS ..... ☐ -5
    Atari ..... ☐ -2 TI ..... ☐ -6
    Commodore ..... ☐ -3 Timex/Sinclair ... ☐ -7
    IBM ..... ☐ -4 Other ..... ☐ -8
12. Were you consulted (or will you be consulted) in the purchase of your home computer?
    yes, to a great extent ..... ☐ 16-1
    yes, somewhat .... ☐ -2 no, not at all ..... ☐ -3

13. How many hours per week do you spend with your home computer? _____ 17-18

14. Do you belong to a computer club or a user group?
yes ☐ 19-1 no ☐ -2

15. Which of the following computer peripherals do you have at home?
Separate Monitor ☐ 20-1
Special Furniture ☐ -2
Expanded Memory ☐ -3
Disk Drive(s) ☐ -4
Graphic peripherals ☐ -5
Controllers ☐ -6
Modem ☐ -7
Printer ☐ -8
Other ☐ -9

16. Do you subscribe to an on-line computer service such as CompuServe or The Source?
yes ☐ 21-1 no ☐ -2

17. Which of the following are the principal ways in which you use your computer?
games ☐ 22-1
word processing ☐ -2
schoolwork ☐ -3
music ☐ -4
networking ☐ -5
graphics ☐ -6
paid work ☐ -7
other ☐ -8

18. When computing for fun, do you do programming?
yes ☐ 23-1 no ☐ -2

19. Which of the following members of your household most frequently use your home computer?
you ☐ 24-1
father ☐ -2
mother ☐ -3
sister ☐ -4
brother ☐ -5
other ☐ -6

20. How much do you spend (or expect to spend) per year on software?
under $100 ☐ 25-1
$100 to $250 ☐ -2
$250 to $500 ☐ -3
$500 to $750 ☐ -4
$750 to $1000 ☐ -5
over $1000 ☐ -6

21. What kind of software did you buy for your home computer in the last year?
games ☐ 26-1
high-level languages ☐ -2
educational software ☐ -3
finance management ☐ -4
spread sheet ☐ -5
telecommunications software ☐ -6
music or art software ☐ -7
word processing ☐ -8
data base management systems ☐ -9
other ☐ -0

22. How much do you spend (or expect to spend) per year on books about computers, not including magazines?
under $25 ☐ 27-1
$25 to $50 ☐ -2
over $50 ☐ -3

23. How much do you spend per year on computer magazines?
under $25 ☐ 28-1
$25 to $50 ☐ -3
over $50 ☐ -2

24. From which of the following sources do you usually buy software?
local store ☐ 29-1
direct from maker ☐ -2
club purchase ☐ -3
mail order ☐ -4
department store ☐ -5
stereo store ☐ -6

25. What hardware do you expect to buy in the next year?
computer ☐ 30-1
printer ☐ -2
monitor ☐ -3
disk drive ☐ -4
tape recorder ☐ -5
RAM expansion ☐ -6
modem ☐ -7
graphics pad ☐ -8
speech chip ☐ -9
other ☐ -0

26. Do you use a computer at school?
yes ☐ 31-1 no ☐ -2

27. If so, do you use it as a part of your supervised classwork?
yes ☐ 32-2 no ☐ -3

28. How many hours per week do you spend using the computer at school? _____ 33-34

29. Where did you acquire this copy of *MICROKIDS*?
newsstand ☐ 35-1
subscription ☐ -2
a friend ☐ -3
at school ☐ -4
other ☐ -5

30. How long have you spent (or will you spend) reading this issue of *MICROKIDS*?
under 1 hour ☐ 36-1
1 to 2 hours ☐ -2
3 to 4 hours ☐ -3
over 5 hours ☐ -4

31. Do you read other computer magazines regularly?
yes ☐ 37-1 no ☐ -2

If yes, list the ones you read:
_____ 38-
_____ 39-

32. Which 3 articles in this issue did you like the most?
_____ 40-
_____ 41-
_____ 42-

33. Which 3 articles in this issue did you like the least?
_____ 43-
_____ 44-
_____ 45-

34. What type of articles would you like to see more of in future issues of *MICROKIDS*?
_____ 46-
_____ 47-
_____ 48-

35. Tell us in your own words what you like or dislike about *MICROKIDS*:
_____ 49-
_____
_____
_____
_____
_____
_____

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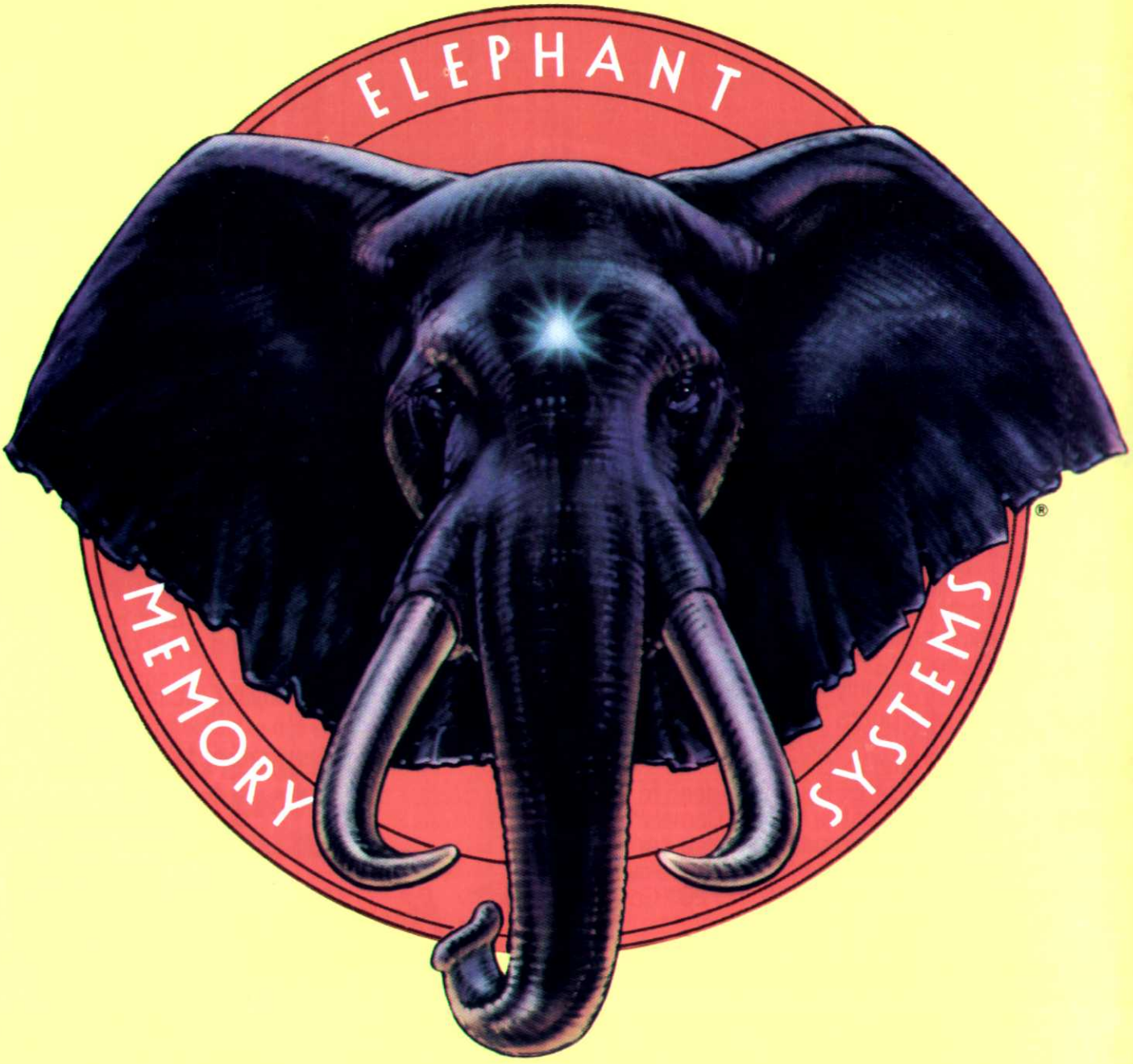

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