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COMPUTE!'s GAZETTE

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October 1984
Issue 16 Vol. 2, No. 10
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For Owners And Users Of **Commodore VIC-20**™ And **64**™ Personal Computers

BASIC Magic

A new column for beginners that explores BASIC with a fresh start—from former Commodore computer designer Michael Tomczyk.

Quiz Master

An easy-to-use multiple-choice quiz generator for parents and teachers. For the Commodore 64.

Trek

Look out for drones, craggy mountain peaks, and the deadly plasma cannon in this sci-fi action game for the 64.

Turtle Graphics Interpreter

Full turtle graphics capabilities without LOGO? Try this three-program package for the Commodore 64.

How GAZETTE Readers Are Using Their Computers

You may get some new ideas for using your VIC or 64 after seeing what other GAZETTE readers are doing with their computers at home, in school, and in business.

Also In This Issue:

Vocab Builder For The VIC And 64

Inside View: Tom Snyder, Educational Software Developer

VIC Music Tutor

Plus Reviews, Games, And New Products

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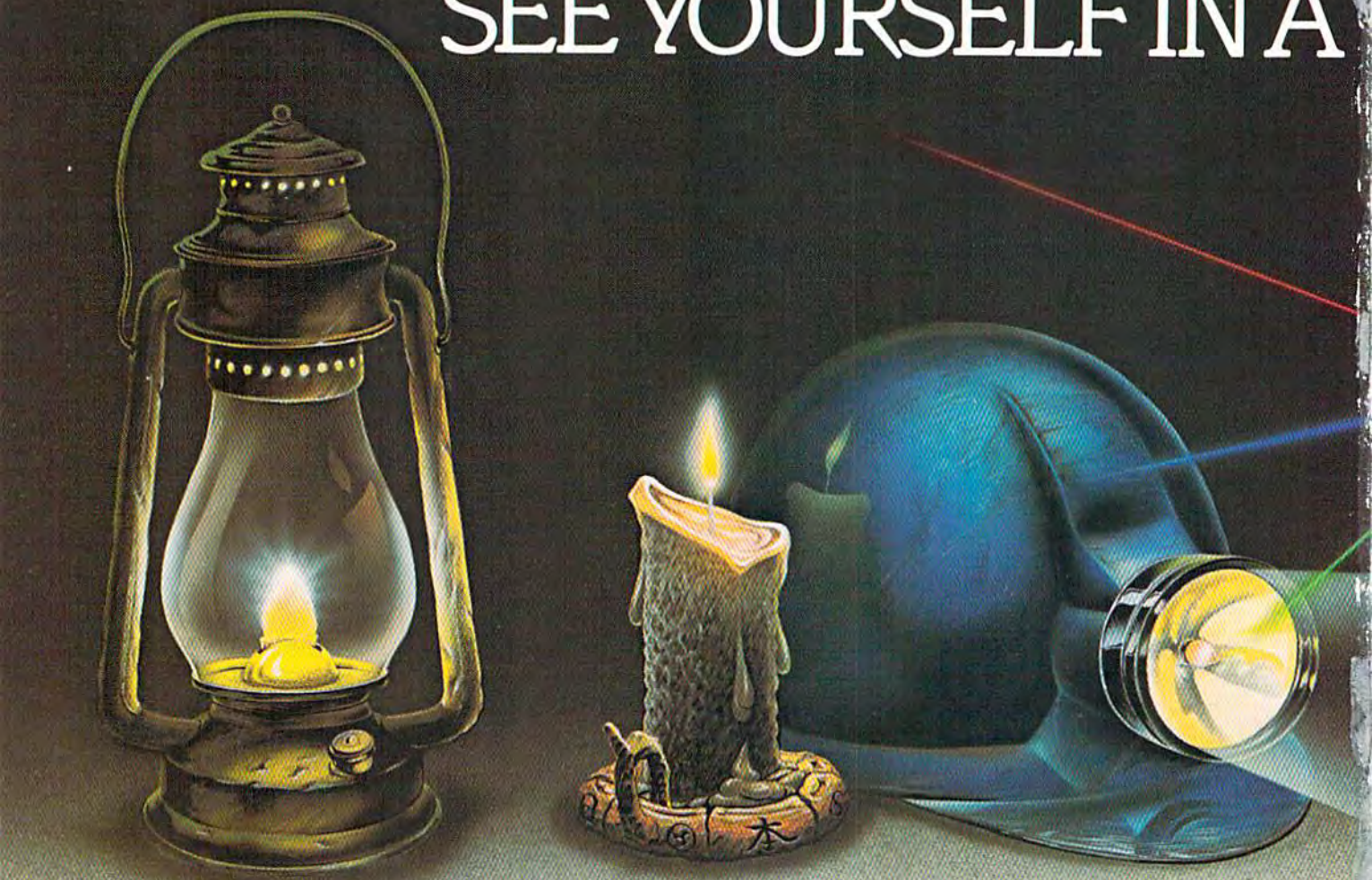

You leave the sun behind as you lower yourself down into the unexplored caverns beneath the Peruvian jungle. Deeper and deeper you go. Past Amazon frogs, condors, and attacking bats. Across eel-infested underground rivers. From cavern to cavern, level to level. Swimming, running, dodging, stumbling, you search for the gold, the Raj diamond and the thing you really treasure...adventure. Head for it. Designed by David Crane.

You have heard the elder speak of one central source and a maze of unconnected grey paths. As you connect each grey path to the central source, what was grey becomes the green of life. When all are connected, then you have achieved "Zenji." But beware the flames and sparks of distraction that move along the paths. You must go beyond strategy, speed, logic. Trust your intuition. The ancient puzzle awaits. Designed by Matthew Hubbard.

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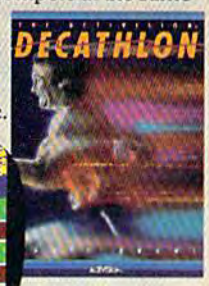

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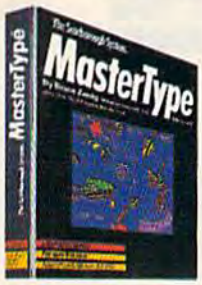

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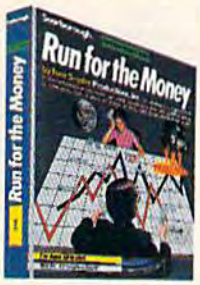

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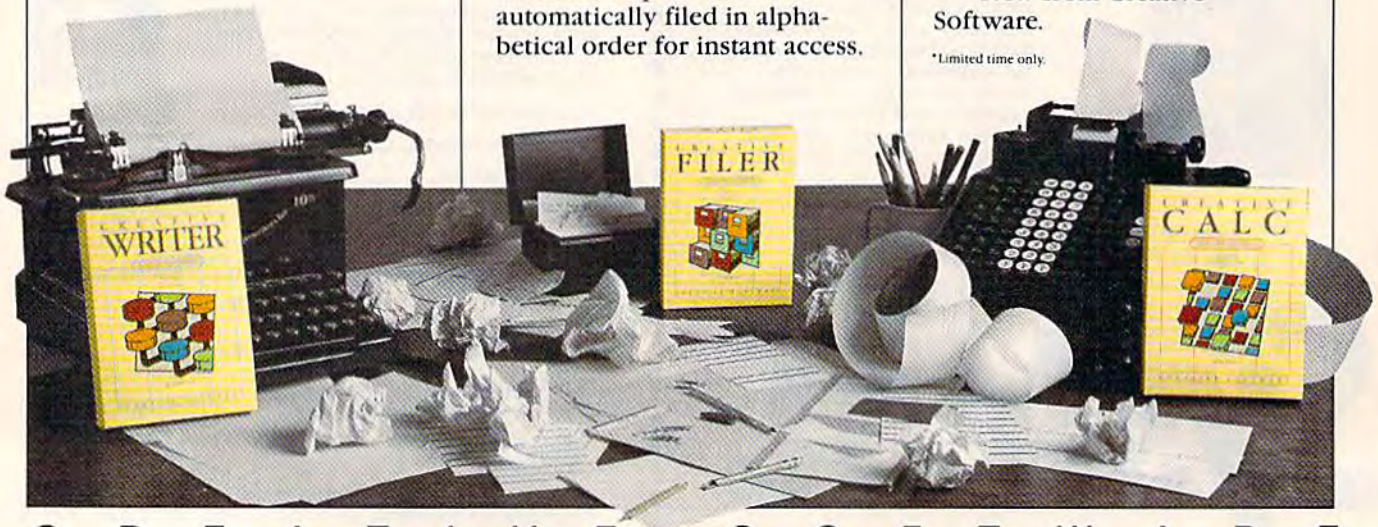

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October 1984 Vol. 2, No. 10

FEATURES

New Directions In Educational Software *Selby Bateman & Sharon Darling* ..... 22 *
Inside View: Tom Snyder, Educational Software Developer *Kathy Yakal* ..... 32 *
How GAZETTE Readers Are Using Their Computers *Bernie Ghiselin* ..... 44 *

REVIEWS

Software Disk Alignment For The 1541 *George Miller* 96 64
Two Flight Simulators For The 64 *David Florance* 100 64
Calc Result: A Spreadsheet For The 64 *Emily Herman* 106 64
Write Now! For The VIC-20 *Harvey B. Herman* ..... 108 V

GAMES

Trek *Andrew Beery* 54 64
The Tomb *Mike Scharland* 58 V/64
Cabby *Ken Jones* 60 V/64

EDUCATION/HOME APPLICATIONS

Computing For Families: A Journey Through The Land Of The Buddy-Bots *Fred D'Ignazio* ..... 64 *
Quiz Master For The 64 *George Miller* 80 64
Vocab Builder *William J. Treanor* 84 V/64
VIC Music Tutor *Howard Parnes* ..... 86 V
Turtle Graphics Interpreter *Irwin Tillman* 90 64
First Aid *Scott M. Huse* 95 64

PROGRAMMING

BASIC Magic: Getting Comfortable With The PRINT Statement *Michael S. Tomczyk* ..... 72 *
Machine Language For Beginners: Loops And Branches *Richard Mansfield* 120 V/64
Teaching Your Computer English *Michael A. Long* 126 V/64
Power BASIC: Hi-Res Screen Dump *Gregg Peele* 128 V/64
Hints & Tips: Recovering Scratched Programs *Daryl Biberdorf* 144 V/64

DEPARTMENTS

Editor's Notes *Robert Lock* ..... 6 *
GAZETTE Feedback *Editors & Readers* ..... 10 *
Home Telecommunications: All The Fun That's Fit To Print *Robert Sims* ..... 131 *
Simple Answers To Common Questions *Tom R. Halfhill* ..... 134 *
Horizons: 64 *Charles Brannon* 137 64
VICreations: Simulating Hi-Res Animation, Part 2 *Dan Carmichael* ..... 141 V
News & Products. ..... 145 *

PROGRAM LISTINGS

A Beginner's Guide To Typing In Programs ..... 147 *
How To Type In COMPUTE!'s GAZETTE Programs ..... 148 *
The Automatic Proofreader 149 V/64
Bug-Swatter: Modifications And Corrections 150 V/64
Program Listings 151 V/64

Product Mart ..... 182 *
Advertisers Index ..... 192 *

*=General, **V**=VIC-20, **64**=Commodore 64.

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THE EDITOR'S *notes*

GAZETTE *Editor Lance Elko contributes a guest editorial this month on current events at Commodore and welcomes a new* GAZETTE *columnist.*

Robert Lock, Editor In Chief

One can wonder where Commodore is now headed. After selling its Santa Clara manufacturing center and closing its Dallas research and development plant (speech technology, robotics, and sound), there's been more than a little speculation about Commodore selling out to a larger firm.

Amid rumblings that RCA, GE, ITT, and AT & T could be prospective buyers, only the AT & T rumor appears to have any substance. But, no immediate cause for alarm, says one Commodore source—although Commodore and AT & T have been talking, nothing significant has developed and probably won't over the next few months.

If this isn't enough to keep things buzzing at Commodore, there's also Jack Trameil's purchase of Atari. Although Trameil hired away Commodore's national accounts representative and vice-president of operations, among others, Commodore claims it doesn't feel threatened by its founder and former chairman. In response, several key Commodore staff persons have said they welcome the competition ("Jack is unpredictable") and the incentive.

The Plus/4s and Commodore 16s should be on the market as you read this. The manuals have been completed, and Commodore reports a lot of dealer orders, especially for the Plus/4.

Currently available is the Educator 64, which is a 64 and a monochrome (green screen) monitor housed in a PET case. It's available only through Commodore Education dealers.

Although Commodore announced that the MCS-801 dot-matrix printer was cancelled, they are moving ahead on the DPS-1101, a letter-quality printer which will sell in the $200–$300 range.

A New Column For Beginners

Since the GAZETTE's premier in July 1983, we've grown considerably in magazine size, readership, and in our reader-shared knowledge of computing. Our evolution has been a kind of mutual cause-and-effect relationship with our readers and will continue to be so. But what about our newer readers? We've heard from several who have just brought their first computer home and are understandably befuddled.

Beginning this month, we have a new column, BASIC Magic, for beginners. Michael S. Tomczyk, a former Commodore product designer and writer, will be teaching BASIC from scratch and will offer a lot of simple one- and two-line programs so you can see what's going on inside your computer almost immediately. If you're new to computing, you'll find this column very helpful. It assumes you know only how to switch your computer on.

BASIC Magic will replace C. (Cheryl) Regena's Beginner's Corner. Cheryl will continue her association and work with the GAZETTE and all other COMPUTE! Publications.

Until next month, enjoy your GAZETTE.

Lance Elko
Editor

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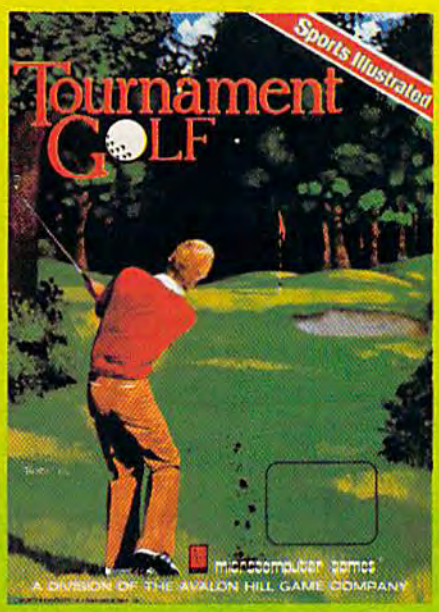

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Do you have a question or a problem? Have you discovered something that could help other VIC-20 and Commodore 64 users? Do you have a comment about something you've read in COMPUTE!'s GAZETTE? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403.

Note To Readers

Program 2("Change Disk ID") of last month's "Disk Tricks" does not work as expected. The article correctly described the difficulties caused by duplicate IDs. However, when a disk is newly formatted, using the NEW0: command, the ID is written to every track and sector. The Change Disk ID program changes only the header, which does not solve the problems of duplicate IDs. For more information, see this month's Bug-Swatter.

Incompatible Disk Drives

Members of our user group are experiencing problems when trading diskettes. Some disks will not run, save, etc. on different disk drives. I believe this is caused by different disk drive speeds.

Is there a program that will continuously display the disk drive speeds while it is running?

E2C ComCats

All 1541 disk drives should run at the same speed: 300 rpm. It's possible that a drive or two in your users' group is experiencing a hardware problem, but speed is probably not the cause of your incompatibility problem.

More than likely, the problem stems from differences between the drives in the READ/WRITE head's alignment. Earlier models of the 1541 had problems with the step-motor mechanism (which positions the READ/WRITE head) slipping out of adjustment.

A quick way to tell if your drive might be out of alignment is by watching the red light on the front of the drive. A good rule of thumb is that when loading a program, the red light should stay on without any blinking. If it starts to blink (other than the steady blinking caused by a DOS error), it could be having trouble reading the diskette. When you run this test, be sure to use a good quality commercial diskette. If your drive is out of alignment, take it to your local Commodore dealer for repairs. (Also see the review of CSM's 1541 disk drive alignment software elsewhere in this issue.)

Quick Diskette Erasing

I wish to erase a diskette with a bulk demagnetizer. Is it harmful to use this method to erase a diskette?

Also, what is the formula for figuring out how many bytes a program uses (in the computer) by the blocks used on the disk directory?

Michael Montgomery

According to a representative from a major diskette manufacturing company, using bulk erasers won't harm the diskette. He noted that each box of diskettes manufactured at this company is bulk erased (by exposure to a strong magnetic field) as it leaves the assembly line.

Theoretically, a diskette can be erased an infinite number of times. Wear is caused by the disk drive's READ/WRITE head making contact with the diskette, not by the changes in the magnetic fields.

To get an estimate of the amount of memory used by a program, divide the number of blocks used (to the left of the program name) by 4 to get the number of K used, or multiply by 254 to get the number of bytes.

Each sector on a 1540 or 1541 diskette has 256 bytes. Two of the bytes are used by the computer, and the other 254 are used to store the program. This is why you divide by 4 to give you the amount of memory in 1K blocks, or multiply by 254 to get the total number of bytes used. For example, a program that uses 50 blocks on a diskette is approximately 12.5K (50 ÷ 4) or 12,700 bytes long (254 × 50).

Dirty Cartridges

I have a few cartridges on which the gold contacts have turned black after a few uses. Is it safe to periodically clean the contacts? Would it be better to just let them get black? I've been told that this is harmful to the cartridge.

Terry Kulchyski

It's a good idea to keep the contacts clean, and this

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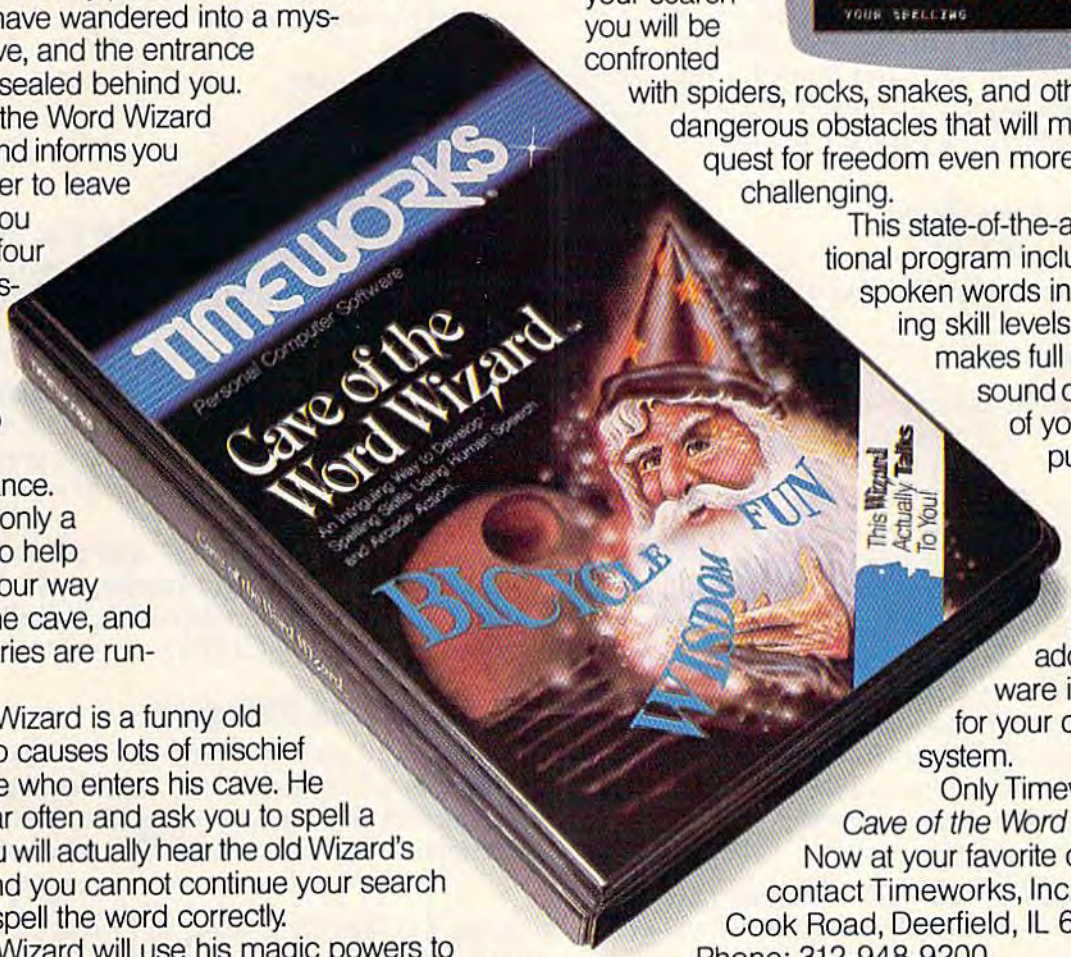

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can be done a number of ways. You can use a cotton swab lightly moistened with a mild solvent such as alcohol. But be sure to use a solvent that won't damage the plastic.

You could also use a pencil eraser. Lightly rub the eraser across the metal contacts, then brush and blow any residual particles away before using the cartridge.

Colorful LISTings

I have a commercial game written in BASIC which LISTs parts of the program in various colors. How is this done?

Lyle H. Shaw

Producing colorful listings is done with a REM statement followed by a quotation mark and color tokens. To see this in action, follow these steps:

1. Find out which token represents the color you want in your listing. Do this by typing a quote then holding down the CTRL key and typing the color key you want. The character printed is the token for the color. For example, typing "CTRL-WHITE will print a reverse E. This is the token for the color white.

2. Enter the following line:

```
10 PRINT "HELLO"
```

3. Type the following line but do not press RETURN:

```
20 REM ""
```

After typing the second quote, press the DEL key once to delete it. This makes sure you're not in quote mode.

Now hold down CTRL and press the RVS ON key (since you're not in quote mode, you should not see a reversed R). This turns on the reverse character mode. Press SHIFT/M. The reverse graphics character that is printed is the token for RETURN. Now press the key to get the token for the color you want. If you wanted the listing color to change to white, for example, you would press E while in the reverse mode. Now press RETURN to enter the line. This REM line will force the color change when the program is listed. Type and enter:

```
30 PRINT"HELLO"
```

Press RUN/STOP–RESTORE and LIST the program. Lines 10 and 20, when listed, will be blue. Line 30, which is after the color change, will be white. (VIC users have to change the screen color from white to see line 30.) Any of the 16 colors (8 if you have a VIC) can be used.

This technique can also serve as a form of program protection. If you change the character color to match the background color, the program will appear to be LIST proof. And this technique is not limited to color changes; you can insert tokens for cursor movements, delete characters, or even clear the screen (using a reversed heart) when a user tries to list the program.

PEEKing Function Keys

I have a 64 and have read many articles on how to program the function keys. Most of these use the GET statement. Is there another way to detect when a function key is pressed? Is there a location I can PEEK?

Steve Stepleman

Yes, memory location 197 in both the VIC and 64 indicates the current key pressed. Enter and RUN this one-line program:

```
10 PRINT PEEK(197):GOTO 10
```

While the program is running, press the function keys. As you can see, each time a key is pressed, the value in memory location 197 changes. When no key is pressed, the value is 64. Here are the values for each of the function keys:

KEY PRESSED	VIC	64
f1	39	4
f3	47	5
f5	55	6
f7	63	3

A drawback to this method is that the values displayed are the same whether the keys are SHIFTed or not. This means you receive values for only four function keys.

However, this can be circumvented by PEEKing another memory location, 653, which indicates whether the SHIFT, CTRL, or Commodore keys have been pressed. When the SHIFT key is pressed, bit 0 will be on, the Commodore key will set bit 1, and the CTRL key bit 2.

A PEEK at locations 197 and 653 can give you more than the usual eight function keys. You can distinguish between unshifted-f1, shifted-f1, Commodore-f1, and CTRL-f1.

Unwanted Files

Is there any way to scratch an unwanted file from one of my diskettes? The filename is ",". I have tried erasing it by using the SCRATCH command, but to no avail. Can you help?

Andrew Hansen

Sorry, but that file is going to be tough to get rid of. The computer processes a comma as a delimiter—a character used to separate two parts of a command. For example, when you want to read a sequential disk file, you have to open it first: OPEN 2,8,2, "filename,S,R" (note how the commas separate the filename from the S for Sequential and R for Read). As the disk drive sees it, the commas are not characters in the filename. They perform a special function. Your disk drive sees your file "," as

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Total Capacity	174848 bytes per diskette
Sequential	168656 bytes per diskette
Relative	167132 bytes per diskette 65535 records per file
Directory Entries	144 per diskette
Blocks	683 total per diskette 664 available per diskette
Tracks	35 per diskette
Sectors	17 to 21 per track
Bytes	256 per sector
Diskettes	Standard 5¼", single sided single density

*NOTE: The SD-2 contains two disk drive mechanisms and can therefore handle two times the above capacities (one for each diskette).

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"[delimiter/end of filename]". This renders the SCRATCH and RENAME commands useless.

In general, when you're naming a disk file, stick to letters and numbers. Avoid punctuation marks like commas, colons, and asterisks (although certain characters—periods, slashes, and dashes—are OK). One particularly troublesome character is the SHIFT-SPACE, which is used by disk drives to pad out names of less than 16 characters and marks the end of the filename.

However, there is a solution to your problem. If you have a disk editor (a program that can change a byte directly on the diskette), you can change the "," on the directory to, say, an "a", then scratch the program using the new filename.

The other alternative is to copy any files or programs you wish to save to another diskette, then simply reformat the diskette with the bad file.

INPUTing The TI$

Is there a way to set the TI$ variable with the use of an INPUT command within a program?

Chris McDonough

Yes, and it's easily done. Use this BASIC line in your program:

```
10 INPUT TI$
```

When the program runs and the INPUT prompt is displayed, enter your response in this format: HHMMSS, where HH=hours, MM=minutes, and SS=seconds. For example, inputting "123456" will set TI$ to read 12:34:56. If you try to enter a time with more than 23 hours, 59 minutes, or 59 seconds, your computer will figure out what the time should have been. Input "123499" and the 99 seconds will be changed to 1 minute 39 seconds, resulting in 12:35:39.

Non-Relocatable Tape Loads

When using tape, why do you have to *LOAD "filename",1,1* when just typing *LOAD "filename"* will work just as well?

Ian Ball

Although both commands will successfully load a program into memory, they are significantly different. LOAD "filename" will load a program into memory at the start of BASIC wherever the start of BASIC may be. It is called a relocatable LOAD.

LOAD "filename",1,1 is a non-relocatable tape load, sometimes called an absolute load (the equivalent disk command is LOAD "filename",8,1). This means that the program will load itself into memory at the same address from where it was saved. This is used mainly for machine language programs that must load somewhere other than the start of BASIC.

For example, in the Commodore 64 you can place machine language programs in a 4K block of memory starting at address 49152. If you loaded this program with the LOAD "filename" format, it would load into memory at 2049, the start of BASIC.

ML SAVEs With BASIC?

I have a few machine language subroutines I would like to save as a BASIC program with the BASIC line: 10 SYS 2061. I have tried saving it with Supermon using:

```
.S "filename",08,0800,0900
```

But when I load this program back in, it looks like a mess. Can you explain why?

Also, could you list the Commodore 64 BASIC ROM routines ($A000-$BFFF) and all of the Kernal routines ($E000-$FFFF)?

Leonard Spasiano Jr.

Your machine language program looks funny (and probably won't run) because you have it shifted down in memory by one byte.

Although the start of BASIC in the 64 is listed as address 2048, programs are actually loaded into memory starting at location 2049. Byte 2048 is always a 0, and signals the start of BASIC.

If you want your programs to load correctly using the LOAD "filename",8 (disk) or LOAD "filename" (tape) format, start your SAVEs at address $0801, not $0800 ($1001 on an unexpanded VIC, or $1201 for a VIC with 8K or more expansion memory). When using this method on a 64, the first twelve bytes should be (in decimal) 11, 8, 10, 0, 158, 50, 48, 54, 49, 0, 0, 0 (the equivalent of SYS 2061, the beginning of your ML program). The first two bytes are the line link, the next two the line number (10). 158 is the BASIC token for SYS, followed by four ASCII numbers that spell out 2061. The three zeros are crucial because they mark the end of the short BASIC program. When you use a relocatable LOAD (see above), BASIC automatically relinks all the lines until it reaches the end of the program. If you omit the zeros, your ML routines will be treated as program lines, with potentially disastrous results.

The advantage to this method (used in "SpeedScript," "Campaign Manager," and "Screen-80") is that the user does not have to remember the SYS number—it is built into the program. You simply load the program and type RUN.

BASIC and Kernal ROMs are each 8K for a total of 16,000 bytes—much too lengthy to be listed here. However, for a good explanation of both the VIC and 64 ROMs, try Mapping The VIC *or* Mapping The 64, *both published by COMPUTE! Publications.*

Out Of Memory Errors

When loading a program from disk or tape, I occasionally get an OUT OF MEMORY error. This happens even when I type NEW before the

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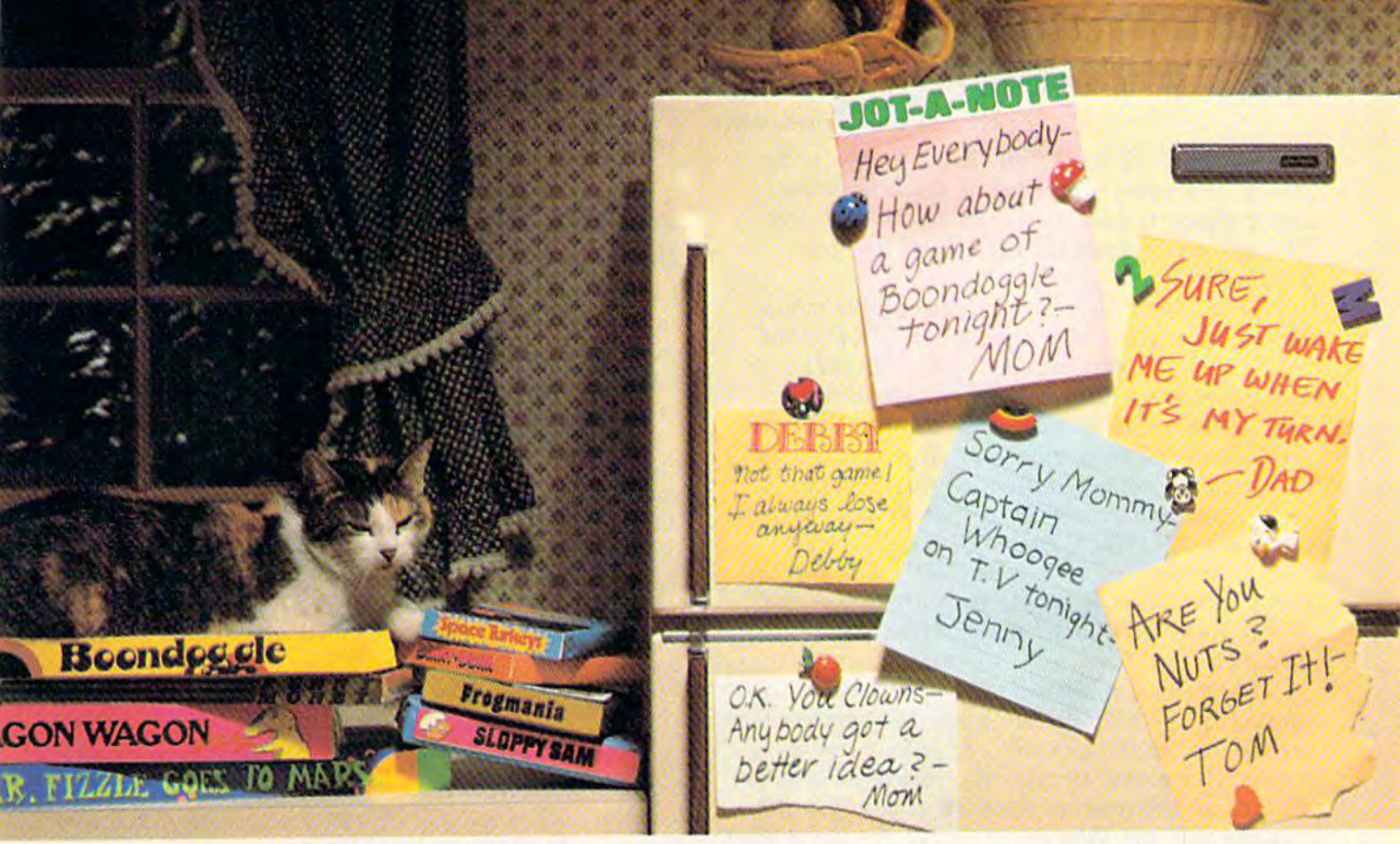

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LOAD or turn the computer off then on.

Lyle Shoemaker

You may actually have programs too large to be loaded into memory, but this is unlikely unless you're trying to load a program for an expanded VIC into an unexpanded VIC. There are four possibilities.

First, when there is a hardware error while loading a program from tape, an OUT OF MEMORY error will often be displayed. This isn't actually a memory error, but a hardware or tape (cassette) error. In this case, try cleaning your cassette tape head or moving your cassette drive away from your television, and reload the program.

The second possibility is that on a 64, an absolute load (LOAD "filename",8,1) changes the BASIC pointers, causing false OUT OF MEMORY errors. After loading an ML program, it's a good idea to type NEW, to set the pointers back to normal.

Third, most programs which put custom characters in BASIC RAM change the pointers to the top (or bottom) of BASIC, to protect the redefined characters. In this case, typing NEW does not free up the reserved memory. If you turn the computer off and then on, or SYS to the warm start vector (64738 on a 64, 64802 on a VIC), the memory will be available for loading other programs.

*Finally, some cartridges (*Simons' BASIC *is one) use part of BASIC memory, which may cause problems when loading very long programs. If this is the case, your only option is to unplug the interfering cartridge.*

Modem Interrupts

Here's a tip for all you modem users. When using a modem, outside sound must not invade the phone line during transmissions. If sound intrudes, the modem can "hang-up" and data might be lost.

Unfortunately, the *Call Waiting* option available in some areas causes just this problem. The tone which signals that a call is waiting causes the terminal program to crash. However, there is a way around this. To prevent the crashes, you can use *Call Forwarding*, which turns off the tone produced by call waiting.

One drawback is that people who are calling you will not get a busy signal. If you forward your calls to an automated service such as *Time of Day*, at least callers will know your phone is tied up.

D. Martin

Thanks for the tip. It's a good idea. However, we don't advocate using an automated public service like Time of Day. *Perhaps users could forward calls to a phone they know won't be tied up, such as the office or school during nonbusiness hours. Also consider that some phones are equipped with answering machines or tie in to automatic answering services.*

A New *SpeedScript* Character Set From *Ultrafont+*?

I am a foreign language instructor, and have enjoyed using *SpeedScript* to print in foreign languages with my Gemini 10-X printer. Is there any way I can use *Ultrafont+* to create a new character set for *SpeedScript*?

Amir Findling

Yes and no. The VIC versions of SpeedScript *and the original 64 version published in January use the ROM character set, which is inaccessible. But the May* GAZETTE DISK *version for the 64 uses a custom character set (beginning at hexadecimal $2000, decimal 8192) which can be changed to fit your preference.*

If you have the 64 disk version, you can create a new SpeedScript *character set without too much effort. First you need to know what changes to make for your needs. For example, once you access the Gemini 10-X's Spanish character set, these characters are redefined in the printout:*

[from the keyboard becomes inverted exclamation point,

] from the keyboard becomes inverted question mark, and

£ *from the keyboard becomes capital N with tilde.*

Consult your Gemini manual to see how the characters are defined for other languages. The character code for the English pound sign (£) on the Commodore keyboard is 92. This means that the Gemini will print whatever character is currently ASCII 92 for the activated character set. In the Spanish set, that is the capital N with tilde. In the French set, it is the lower case C with cedilla. In the USA set, it is a backslash.

For Spanish, then, you would want to draw the capital N with tilde in the character block that contains the English pound sign. After you have used Ultrafont+ *to create the character set you want, use the S command of* Ultrafont+ *to save the new character set. The next step is tricky. After the set is saved, turn the computer off and on, then type:*

```
POKE44,32:POKE32*256,0
```

followed by RETURN. Now LOAD the new character set you created with Ultrafont+*:*

```
LOAD"CHRSETNAME",8
```

Now, to create a relocated character set,

```
SAVE"NEWSETNAME",8
```


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This will make the set with a new loading address compatible with SpeedScript. *Turn the computer off and on, LOAD but don't RUN* SpeedScript, *and*

```
LOAD"NEWSETNAME",8,1
```

Create the new version of SpeedScript *with the following (use any name you like):*

```
SAVE"NEWSPEEDSCRIPT",8
```

Refer to the discussion in the "SpeedScript Customizer" article in last month's issue for more information on printing foreign languages. Some characters are not available from the keyboard. If you want a lowercase n *with tilde, for example, you have to redefine a reverse video number in* SpeedScript, *like this:[6]=124 ([6] is obtained by pressing CTRL-£ then a 6). In this case you want to redefine the reverse video 6 character as an* N *with tilde using* Ultrafont+. *This way pressing CTRL-£ 6 prints the correct character on the screen. Don't forget that you still must access the foreign character set before the Gemini will print what you want. You could set up a Cyrillic, Greek, or Hebrew alphabet for* SpeedScript *with* Ultrafont+, *but it would only be good for "video notes," since the printout would still use English letters.*

Diskette Dangers

I am going to be traveling overseas and I'll be taking my software (on diskette) along with me. What precautions should I take to protect the diskettes against the likes of x-ray machines, airplane altitude, etc?

Tim Farrell

We contacted a representative of a diskette manufacturing company who stated that x-ray machines pose no real dangers to floppy diskettes.

However, there are precautions to be taken. Watch out for magnetic fields. Don't pack those diskettes in such a way that they will be exposed to electric motors, magnets, etc. Also, be aware of temperatures. Most manufacturers recommend that floppy diskettes not be exposed to temperatures below 50 degrees or above 125 degrees Fahrenheit (10 to 52 degrees centigrade). Because the cargo holds of airplanes could exceed these limits, it might be advisable to pack your diskettes with your carry-on luggage.

The most obvious danger is the possibility of physical damage while handling. Pack the floppies so that they will not be subjected to bending or crushing loads.

Pack them in a dust free container (plastic ziplock bags, for example) if possible. According to the representative, far more disks are lost to dust contamination than to magnetic fields.

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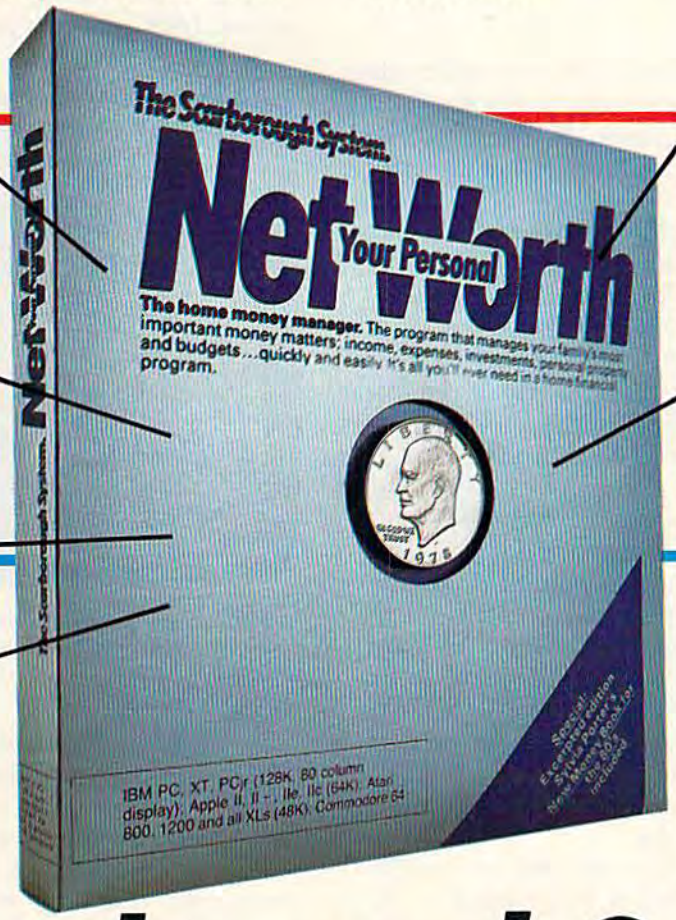

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New Approaches In Educational Software

Selby Bateman, Features Editor
Sharon Darling, Research Assistant

Construction sets, simulation programs, and other software innovations are bringing a new sense of interactivity and excitement to computer-based education. For Commodore owners, there's a new land of opportunity in learning software.

Trends in educational software often seem as volatile as the trends in the fashion or automotive industries. The field is certainly every bit as competitive and as potentially lucrative.

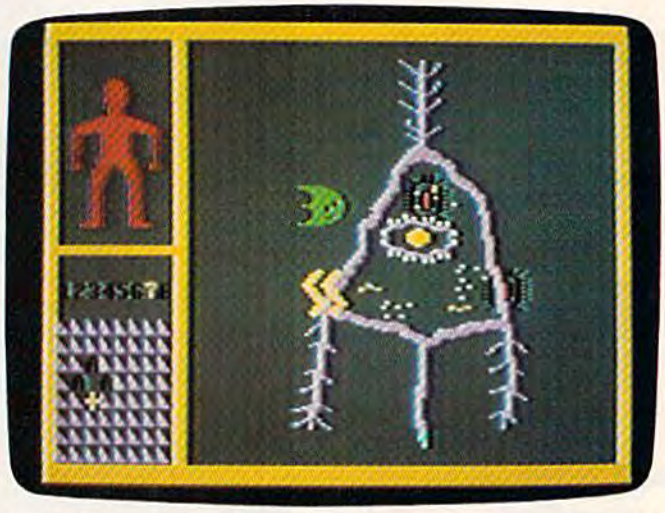
Hundreds of competing companies are exploring ways to take advantage of the educational software market. Educators debate the merits of a dozen different approaches to computer-based learning. And while everyone agrees there's room for improvement, some of the latest packages are showing the skeptics that the computer can be a stimulating, educationally valid learning tool.

That's very important, says Spinnaker Software Chairman William Bowman, whose company has been designing educational programs since 1980. "Children oftentimes don't want to learn the way you or I may want them to learn. Some kids learn visually, other kids learn in an auditory way, some learn tactilely.

"Good software should provide for as many of these different ways to learn as possible by providing the child an opportunity to choose multiple paths for learning."

Computer simulations offer one of the most fruitful means for this sort of heightened interactivity. Giving a computer user the ability to carry out everything from the dissection of a frog to the building of a space station, these simulated environments are thought provoking and, thus, highly educational.

Cell Defense, produced by ChildWare for Human Engineered Software (HES), for example, is an interactive human biology program which simulates the way the body defends itself. Children as young as ten years can take control of different parts of the body's immune system and defend cells against viral attacks.



In HES's Cell Defense, *players learn about the body's biological defenses through a simulation game in which invading viruses are repelled from a variety of cells.*

The game has multiple levels and offers a brief, if simplified, introduction to human physiological mechanisms. Skin, inner tissue, and nerve cells must be defended. Interferon, macrophages, antibodies, and B- and T-cells are used throughout the game to fight the viral attacks.

Youngsters learn how aging, stress, drugs, and alcohol affect the body as the players scan and then defend various layers of cells.

"While other biological software programs

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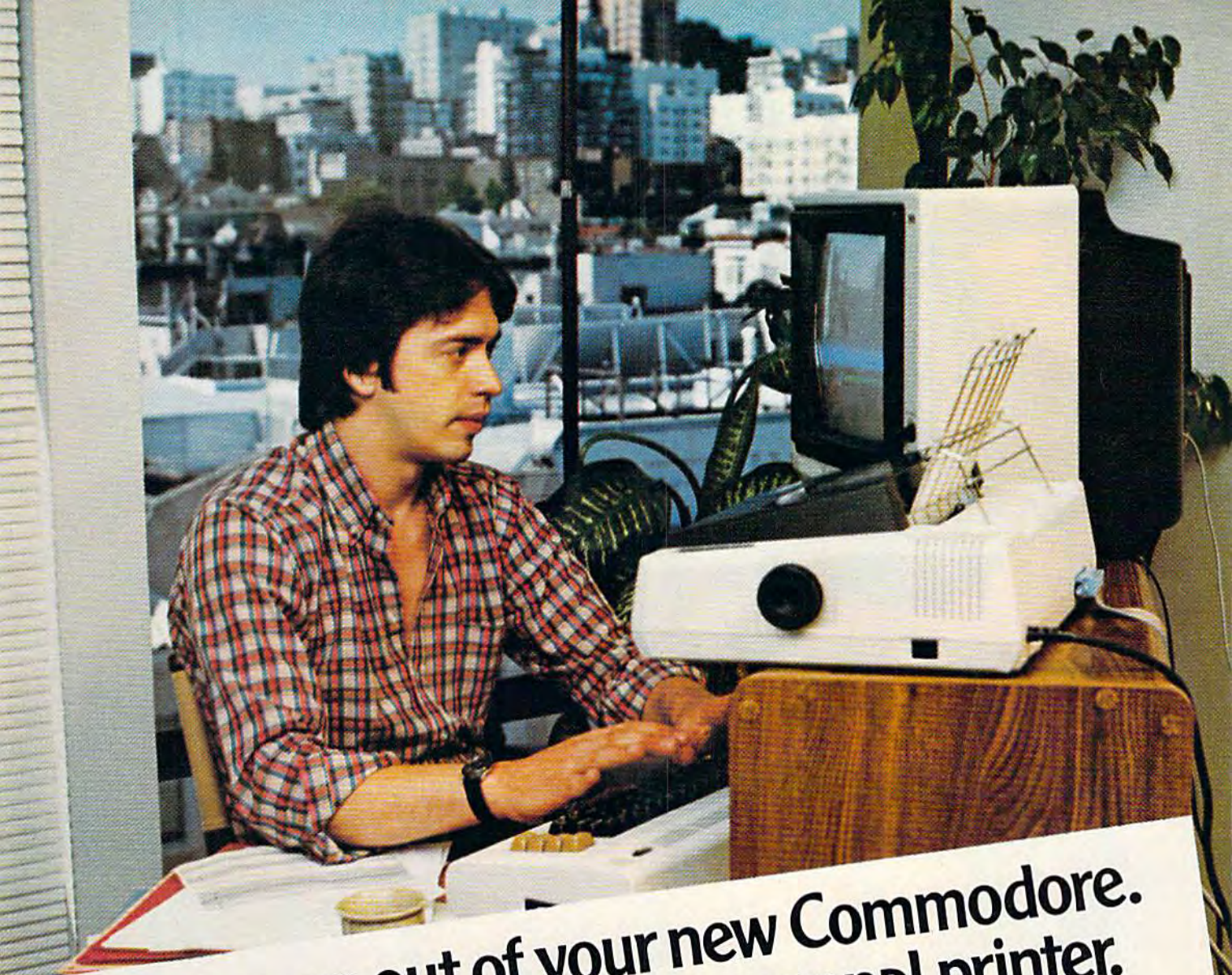

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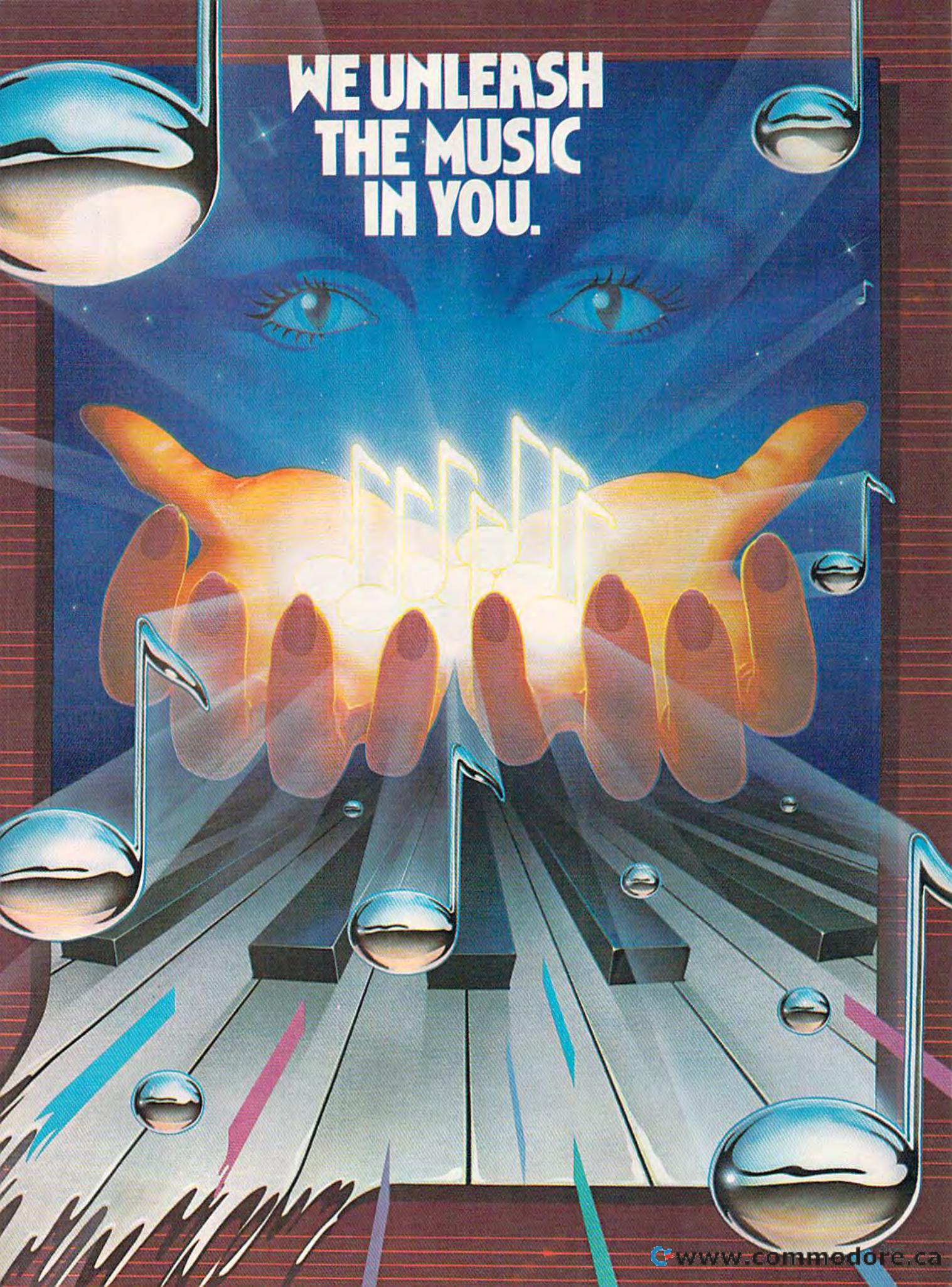

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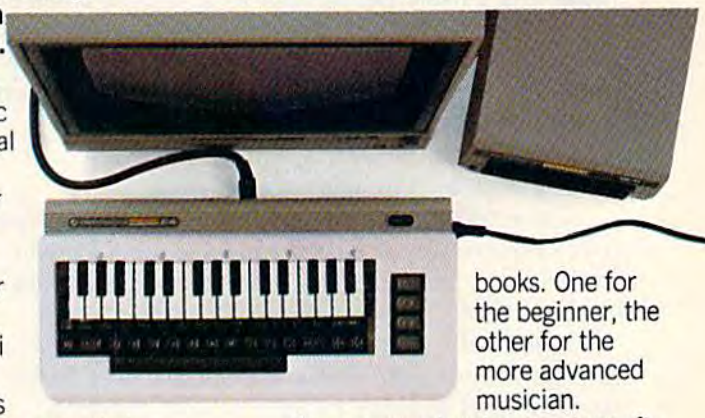

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are drill-and-practice-based, this is the first biology package that actually simulates the spread of a virus through the human body," says Dr. Sueann Ambron, director of educational software at HES. "With *Cell Defense*, children have to make their own decisions and draw conclusions from available data to successfully ward off the spread of disease."

Cell Defense is only one program in a new science simulation series from HES (all available for Commodore 64 on disk). Among the new titles is *Life Force*, in which students learn the basic cell processes by simulating the splitting of DNA and producing complete, animated organisms.

Other programs in the series include *Reflections*, which teaches the physics of light reflection, refraction, and absorption with mirrors and light beams; *Ocean Quest*, in which players search the world's oceans while aboard simulated research submarines; and *Project: Space Station*, which lets a player simulate the design and production of an orbiting, manned space station.

Project: Space Station is a simulation, but it is also a *construction set*, or *builder*. This type of software represents yet another trend in computer education and offers one of the most interactive learning environments.

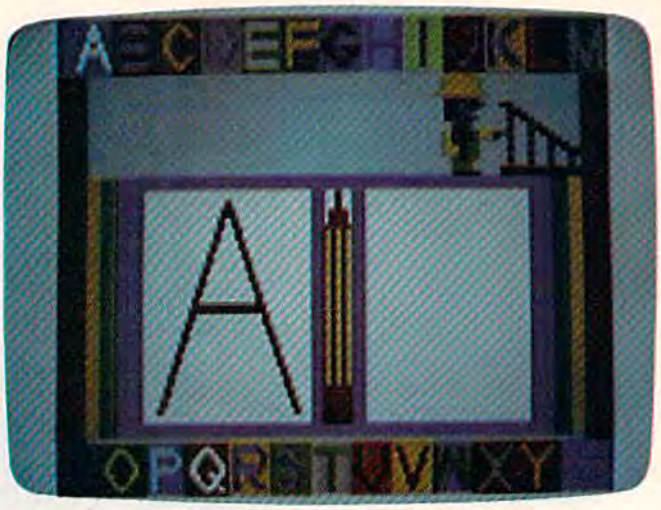
Builders are being used in a variety of ways, and for all ages, as educational tools.

HES's space station simulation/construction set, for instance, is based on designs provided by NASA. It includes such real-life constraints as budgeting problems, unfavorable media coverage, and bad weather. Players create a budget, schedule a launch date and place, choose equipment, modify and add parts, determine the focus of the mission, select a crew, and maneuver construction parts with a shuttle's remote manipulator arm or with rocket pods.

Other construction sets, all of which received their creative impetus from Bill Budge's *Pinball Construction Set* (Electronic Arts), are becoming easier to find.

Alphabet Construction Set, from Futurehouse's Playground Software Series, uses Robo the Alphabet Builder to help young children learn the alphabet. Youngsters not only hear a voice, which is generated by the program, say the letters and offer instructions, but also they construct the letters on the screen using the company's Edumate Light Pen. The program also analyzes the letters that the child draws, pointing out mistakes and suggesting corrections.

One of the most successful builders [previously available for Apple computers and now converted for the Commodore 64], is *Rocky's Boots*, an electronic erector set in which players

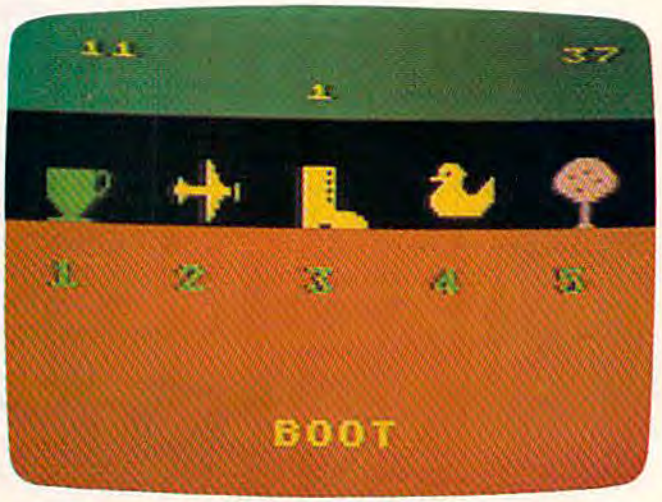


Alphabet Construction Set *(Futurehouse) offers youngsters a chance to see, hear, and actually form letters of the alphabet.*

ages nine and above learn the basics of building computers by playing any of 40 different games using simulated computer logic circuits.

Still another builder is used in Mindscape's *Tonk In The Land Of Buddy-Bots*, five multilevel games in one package for children from four to eight years. Players help Tonk, an electronic character, find the missing parts of a Buddy-Bot robot by performing well in different learning games. (See *Computing For Families* elsewhere in this issue.)

Building creativity, fun, and interaction into educational software is crucial to the success of a program, says software developer Frieda Lekkerkerker, author of the popular typing program, *Kids On Keys* (Spinnaker Software), and of *Linking Logic*, *Memory Manor*, and *Logic Levels* (all from Spinnaker's Fisher-Price Learning Software).



Kids On Keys *(Spinnaker), a popular typing program for young children, created by Frieda Lekkerkerker.*

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Her programs are not as curriculum-oriented, but rather "they involve more thinking, more logic concepts—they let kids make plans ahead of time," she says.

In *Linking Logic*, for children from four to eight years old, the player must plan a path through a building so that he or she picks up the greatest number of matching tiles missing from the bottom floor of the building.

This learning game, like her others, is an attempt "to make the software transparent, to give children the feeling they are in control," she says.

Lekkerkerker, a teacher who came to the U.S. from Holland, is currently working on several construction sets in which the concept of control is part of the overall game play. What she hopes to impart to these builders is a similar sense of interaction which children receive from non-computerized erector sets—Lincoln Logs and the like.

"Basically, my games are pragmatic. They come more out of watching kids play games," she says. "The frustration level, I feel, is very low [in her games]."

Lekkerkerker once completely redesigned one of her programs after observing children playing with it. "With the original concept of the game, children would have been penalized points for the method they devised, so I modified it," she says.

Flexibility and long-term interest are components of the best educational software, says Lekkerkerker. "A game, or any kind of product, should be very easy to understand at first. But it should be able to be expanded on in ways the creator doesn't even know," she adds.

Just Imagine *(Commodore) is a new interactive educational program which lets youngsters write their own animated stories.*

User-software interaction is a feature of several new educational software products from Commodore as well.

Just Imagine, for children from 4 to 14 years old, lets youngsters create their own animated stories. A variety of different background screens—a jungle, a farm, outer space, and other scenes—combine with animated objects and written stories to build a filmlike sequence. The child types the story, and the program provides graphics, music, and special effects. Up to three characters can be chosen to move around the scene as the story's plot is developed by the child.

"That's probably our latest and greatest as far as language arts is concerned," says a spokesperson for Commodore's educational software division. "A program shouldn't try to fit a child into one particular way of thinking. It should let them think divergently, and expand on what they know."

Another program from Commodore, *Number Builder*, for children from 8 to 13 years old, uses an arcade-style format with varying levels of difficulty to teach children mathematical operations. There is a self-testing mode in the game as well.

A similar concept is used in another Commodore mathematics program, *Fish-Metic* (for ages 7–13), in which children play a game to learn the concepts of greater than, less than, and equal to. Those concepts are then applied to positive and negative whole numbers, fractions, and decimals.

One of the newest programs from Commodore is *Sky Travel*, a home planetarium program which presents sky maps from ten thousand years in the past to ten thousand years in the future as users learn facts about astronomy. The maps can show the sky from anywhere on earth.

Players simulate flying a plane across a map of the world as the program automatically determines longitude and latitude.

"What we like to do with educational software is encourage the thinking process and the questioning that goes along with learning," says the Commodore spokesperson.

While no single article can mention the many new educational programs taking advantage of some of the newest computer-based learning concepts, even a cursory look at the field indicates that many programs are targeted at the Commodore 64.

The 64's graphics and sound capabilities are too good for programmers and software companies to ignore, according to Spinnaker's William Bowman.

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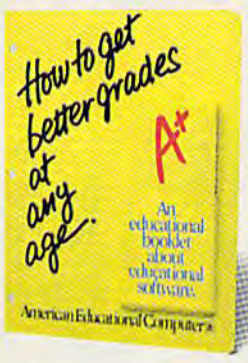

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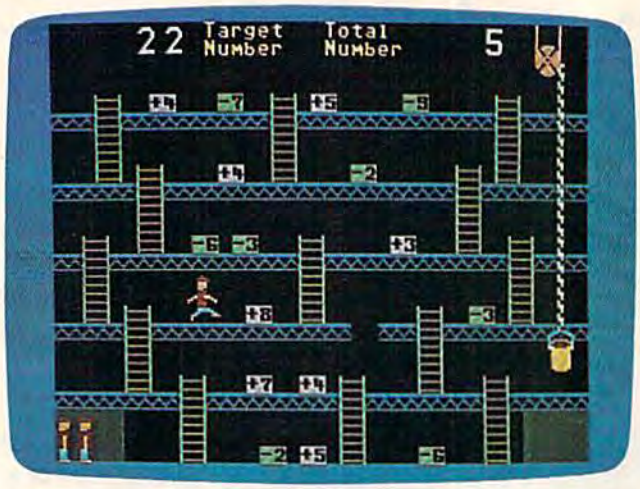

Number Builder *and* Fish-Metic *(both from Commodore) use colorful arcade-style screens and action to help children learn mathematical concepts.*

time working on challenging the sound chip [in the 64], or pushing the sprite graphics just as far as they possibly can be pushed," he says.

And the results for Spinnaker's 64 software, he believes, are educational programs which are "very visually deep, and have a musical dimension and game play that takes advantage of the machine, are consistent with the learning objective, and, very importantly, engage the child for a long period of time."

Putting these characteristics into educational programs is a challenge many software companies are eager to face. And with the huge installed base of 64s in the home and in schools, almost all of these companies are aiming their efforts squarely at Commodore owners.

Cross-Pollination: The Home-School Migration

There's a two-way migration going on among producers of educational software.

While some companies are broadening their school-based software lines into the home, those program developers who have concentrated on the home market are now promoting their products in school systems as well.

There are now two complementary markets for software companies to engage. Those businesses that have strength both in the school and in the home will survive, says Karen McGraw, software project editor for DLM Teaching Resources.

DLM, based in Allen, Texas, is an example of a company whose software was originally aimed at the school market, but which is now designing and selling educational software to the home market as well.

Much the same process is going on at Scholastic, Inc., long associated with schools, but now aggressively in the home educational computer market. And home sales for Scholastic are taking off, says President Richard Khaleel.

When American Educational Computer (AEC) began selling its line of educational computer software into homes, it related its programs almost totally to curriculum support by grade level and subject.

Says AEC President Thomas B. Garsh, "The subject is there; we know that. It's been tested and tried [in the schools]."

A good example of how a software company can promote its own products while at the same time offering a genuinely helpful service to schools interested in microcomputers is demonstrated by Scarborough Systems, Inc.

The company has begun a software donation program to schools. It runs from September 15 to December 15. When you purchase a piece of educational software from Scarborough, you also get a coupon that lets you donate a program of your choice to a designated school and teacher.

As microcomputers grow more prevalent in the home and in schools, educational software companies will continue to have two markets in which to compete. The result of this cross-pollination between home and school may ultimately mean higher quality and more diversity among computer-based learning products. ■

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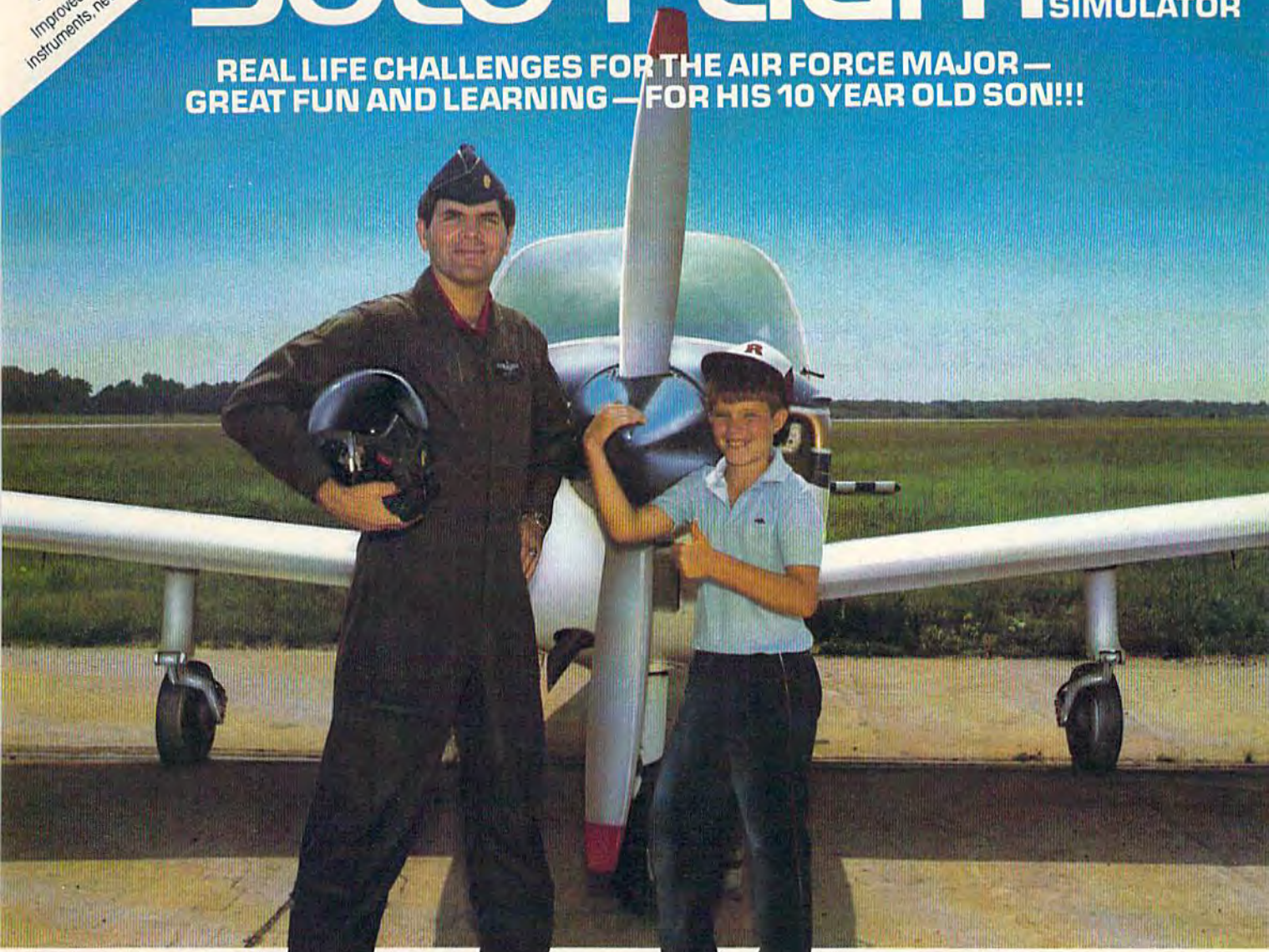

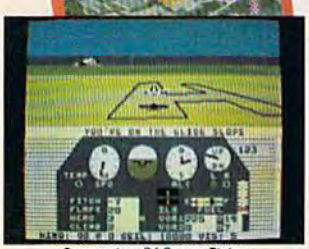

Commodore 64 Screen Picture

Major Bill has over 3000 hours of flying. He loves the sophistication of the SOLO FLIGHT simulation and its real life challenges of deteriorating weather, failing instruments, and overheating engines!! He knows the reality of flight — with SOLO FLIGHT he can bring it home!!

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Tom Snyder: Educational Software Developer

Kathy Yakal, Editorial Assistant

Software developer Tom Snyder

Education is changing: Instead of looking at books, teachers' faces, and phrases scrawled on the blackboard, students are looking at computer monitors and keyboards. But software developer Tom Snyder is trying to get students to look at each other, too.

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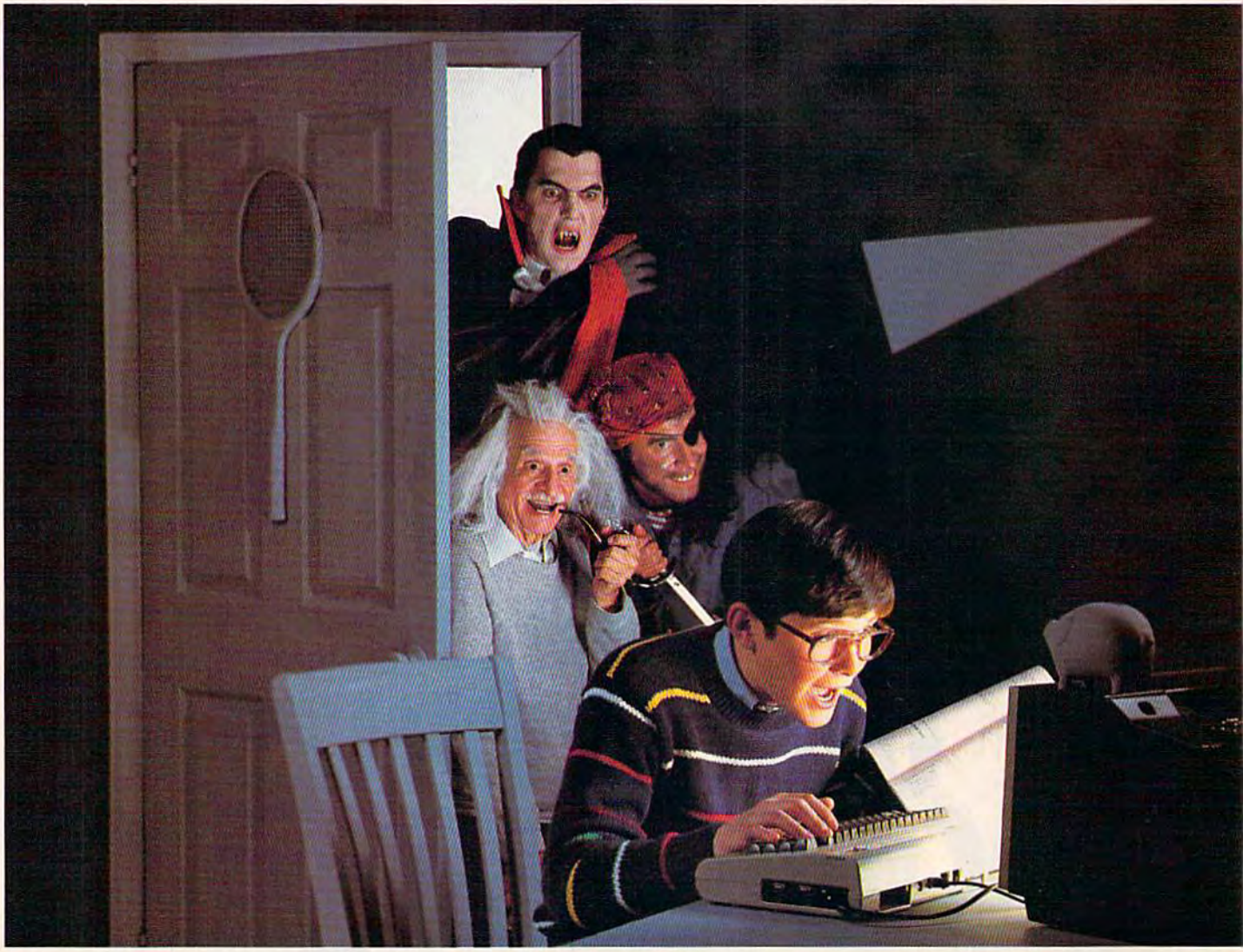

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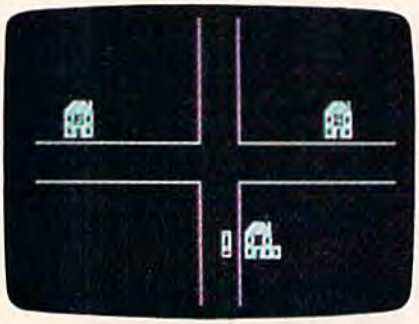

Hop in the Snoopmobile parked next to Snoop Headquarters...

...and drive around the streets of Costa Villa, questioning suspects at their homes and over the phone to find out who fishnapped Lily the dolphin from the Tabasco Aquarium. Snooper Troops *detective games help children learn to take notes, draw maps, classify and organize information, and develop vocabulary and reasoning skills. (All photos courtesy Larry Lawfer.)*

You can be a diver, or a detective, or a government agent. You'll travel on trains to different cities, on ships across the ocean, or in the "Snoopmobile," trying to find out who fishnapped Lily the dolphin.

Tom Snyder's educational software creates worlds for kids to play and learn in. His many programs are held in high regard by parents and educators for just that reason: Children are drawn to the software because it's fun, but they come away having learned new concepts.

And that's a difficult marriage. Educational software designers and publishers struggle constantly to find the right mix so kids like using the software, and parents and teachers are satisfied with its educational value.

"I'm a bit distinctive, probably, in that I was such a bad student."

Snyder's own education, as he describes it, was filled with frustration and self-doubt. Teachers told him, "Here, learn this set of facts. Write this paper. This is what you must know. This is what's important."

He asked them why. When they couldn't answer, he decided to learn what he thought was important, which didn't win him any points with teachers. "I was extremely active in projects, but I could not figure out how to do well in school," he says. "I began to think I was not a capable person."

He made films. He wrote songs. He played around with computers, and sent one of his designs to IBM.

Shortly afterward, he says, "I came home from school and found a couple thousand dollars worth of hardware parts on the lawn, with a note from IBM that said something to the effect of, 'That was a good idea you had. Mess around with this stuff and remember us when you design anything else.'"

"All it took for me to come into my own was getting a teaching job. Ever since that first day when I went in as a novice and saw 25 fifth graders looking at me, I've done exactly what I'm supposed to do."

In spite of the encouragement from IBM, Snyder's temporary fascination with computers faded for a while. After finishing high school ("definitely in the bottom half of my class"), he spent a few years playing keyboards in a rock and roll band, with a recording contract at Capitol Records.

He returned to school, studying French and music at Swarthmore College ("I was on probation most of the time"), then got a master's degree in education from Lesley College in Cambridge, Massachusetts.

His first day of work at Shady Hill School in Cambridge confirmed what he had believed as a student. "All I needed was a non-arbitrary responsibility," says Snyder. "If I didn't teach those kids, they were missing something. However, if I didn't write a paper on value-added tax for my economics professor who wouldn't read it anyway, nobody was worse for the wear except me, and I was already taking care of me."

"The group of people in the world which is least capable of learning for abstract reasons is the very group that is forced to learn for abstract reasons all of the time: kids."

"If you ask second-graders why they're studying math, it's surprising and depressing, but

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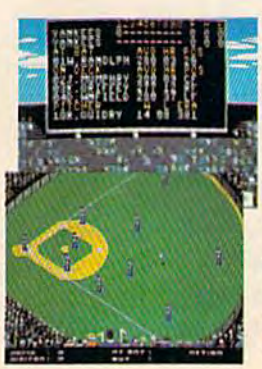

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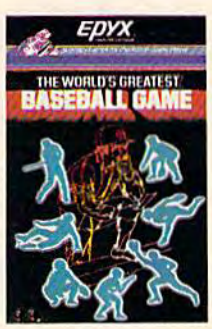

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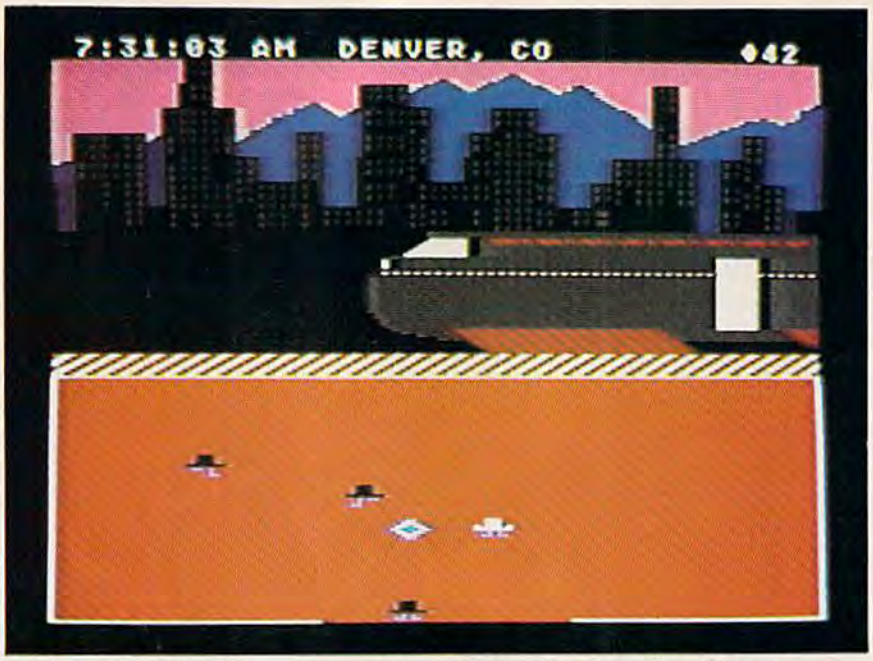

In Agent U.S.A., *it's up to you to save the nation from the dreaded FuzzBomb. On your way across the country by train, you must gather strength by growing crystals and keeping them away from the FuzzBodies. Make sure to read the schedule correctly at each stop, or you'll miss your train.* Agent U.S.A. *helps children learn to read maps, learn more about U.S. geography, and improve critical thinking and math skills.*

they'll actually say because it's good for them," says Snyder. Or because they have to or they're supposed to. "These are very arbitrary reasons.

"When I teach, I try to make sure the kids know exactly what they're doing, why they're learning. If I can't come up with a good reason, if I can't get the kids involved in the community or helping people or creating value in a real way, I create a game, which is the next best option to get them excited about what they're doing."

For Snyder's class of fifth-graders, these games were data-intensive simulations. If they were studying geography, they became the crew of a ship crossing the ocean. The kids loved it, but Snyder faced a real management problem just trying to keep track of all the needed information, using paper and pencil.

Though he had no notion of using it as an educational tool, Snyder had bought a Radio Shack computer in 1979, and was using it to organize notes, help write reports, and keep track of grades.

The management problem he was running into with his simulations sparked an idea. "It became obvious to me that I could use the computer to manage these simulations," he says. "The computer could keep track of where the kids were in the game, make random choices, and have an overview of what the world looked like."

"The next step was to turn the computer around and let the kids push the buttons. And as I dared to turn the computer around, I had to come up with easy ways for the kids to enter information and get information back."

By designing simulations in which the students were responsible for keeping track of the information, Snyder discovered an unexpected bonus. "I remember walking home the first few nights I did that and thinking, gee, maybe a computer could solve some of the problems my simulations have always had," he says.

One of those problems that disturbed him was how to get everyone in the group involved. "Having run the simulation without a micro, there were always certain people left behind or group dynamics problems," he says.

To combat that, he developed programs that divided the screen into several different areas, each of which contained information that was essential. "Suddenly you can sort of create an expertise in each child. Each child has a piece of information and no one bright student can get it all because it only lasts a few seconds on the screen."

Snyder watched children who had rarely spoken or been spoken to by classmates suddenly become an important part of the group. They were learning, they were having fun, and they were talking to each other.

"Teachers across the country say this software is important, this is a way to use the computer. Not one kid on one program, but having the computer actually promote group dynamics, which is just the opposite of what people thought the computer would do."

Buoyed by his breakthrough, Snyder hired a New York consultant for $500 a day (on a teacher's salary) to see if his discovery was as important

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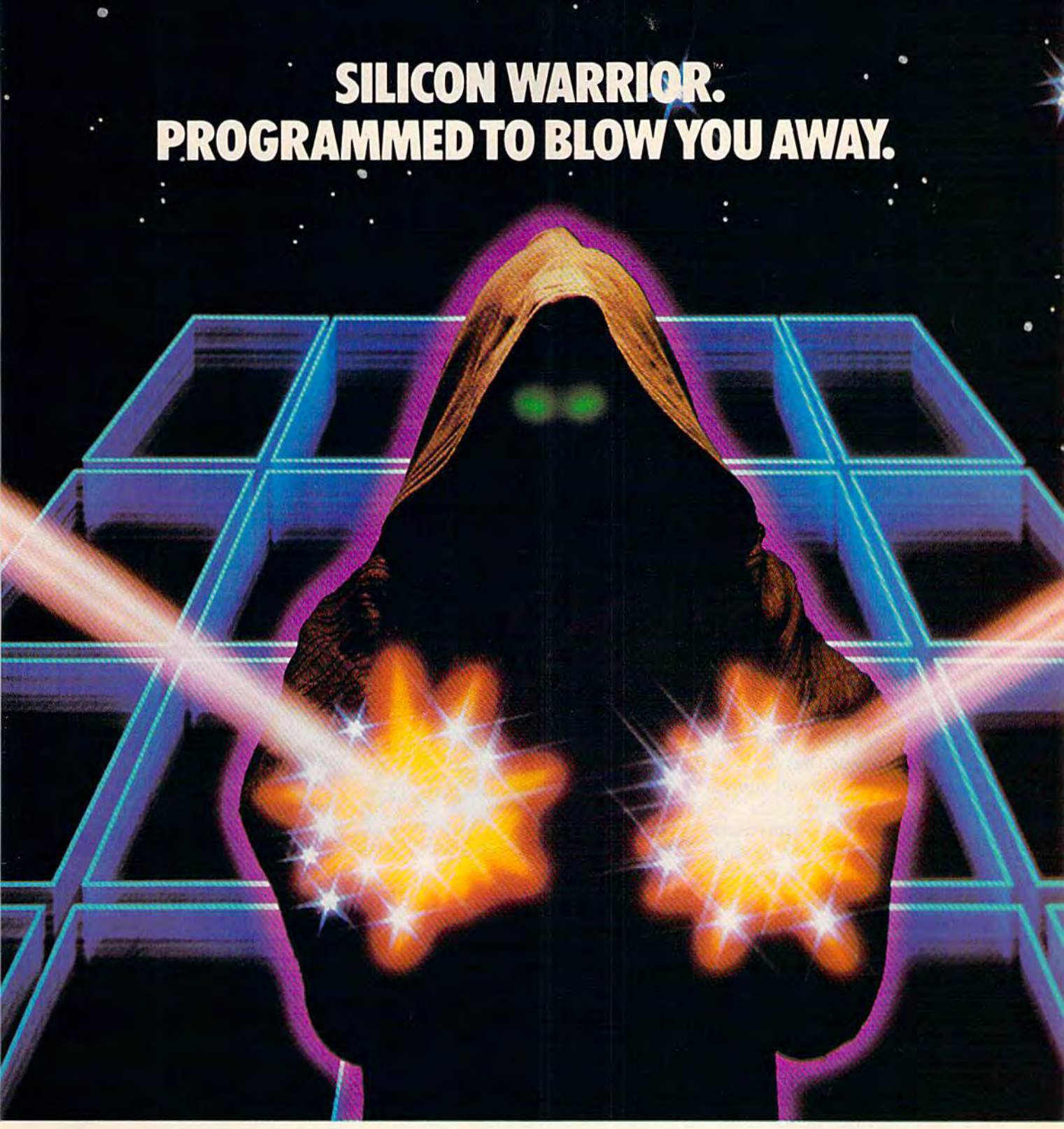

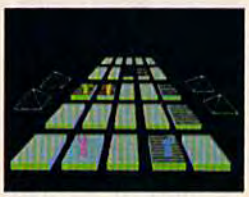

The year is 2084, and the Silicon Valley is enveloped in a conflict of the fiercest magnitude. Warriors from the House of Peanut, the House of Apple, the House of Adam, and the House of Pong are competing for a computer program which will unravel the mysteries of the Universe and lead to eventual domination.

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as he thought it was. Yes, said the consultant, you have something extremely special. I can get you a contract.

And he did. With McGraw-Hill, who saw Snyder's simulations and bought all five packages immediately. Snyder's experiments with computer-assisted group learning became the Search Series, a group of classroom simulations for grade-school children, which still sells well four years later.

"The best software requires teachers."

Snyder recalls one time when a student, after participating in *Energy Search*, went home and told his parents, "The neat thing about it was that we got to make decisions about things that really mattered."

But some of the grown-ups weren't so sure. On the road in 1981 to promote his series, Snyder was asked the same question over and over: Isn't this kind of software dependent on exquisite teaching?

No, he said for a long time. Anyone can use this approach. It's good for everybody.

"What I've learned now is that this stuff requires a good teacher, and good teachers come in a lot of forms," he says. "If someone comes up with teacher-proof software, that's just the beginning of the end. As soon as we start making software that runs itself, we're all losing control."

"You don't work by committee in art. You don't in software either."

About the same time Snyder was writing simulations for his classroom, the personal computer industry started to pick up speed, and Snyder had a new market for his learning discoveries: home educational software. "I met a couple of guys named Bill and Dave who were thinking of starting an educational software company, and converted one of my school programs for home use. That was the first program they published."

That program was *Snooper Troops*, the company was Spinnaker, and "Bill and Dave" were William Bowman and David Seuss, now Chairman of the Board and President at Spinnaker. *Snooper Troops* became the first educational game to make a software industry bestseller list.

In January 1982, Rick Abrams, a young financial consultant, entered the picture. With Snyder, they began building a corporate structure to channel Snyder's dreams into the burgeoning home computer market.

Over the last two and a half years, Tom Snyder Productions has grown from a staff of two operating out of a third-floor apartment to offices in Harvard Square with a staff of 17 software artists, writers, and other support people. Their profits grew from less than $50,000 in 1981 to more than $500,000 in 1983.

Software development group Tom Snyder Productions.

But not without stumbling a few times. "I had a few disasters just hiring programmers and having them program my dreams," says Snyder. "That undervalues programming as an art, as a personal passion."

So what he had to do was to "...go through the laborious approach of finding dreamers who wanted to get excited about some approach, then let them

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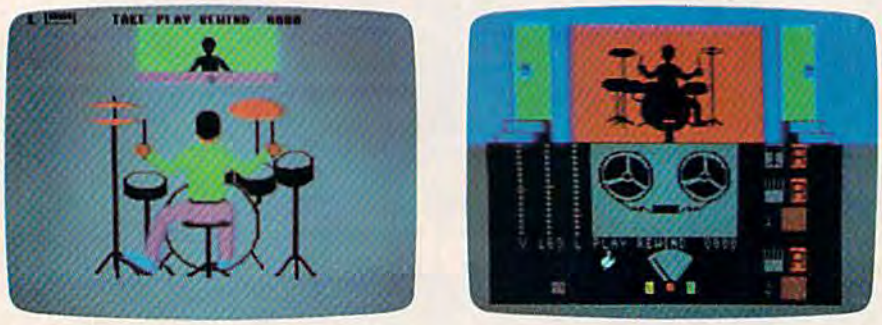
work and design on their own," he says.

Snyder discovered something interesting along the way. A female visitor to the office one day had criticized a program for being sexist because all the characters looked like men, but loved another program for some reason.



TSP's latest program, Rock 'n Rhythm, *turns your computer into a recording studio.*

The reason, believes Snyder, is that it was programmed by a woman. "The trick is not just to have women designing the software, but programming it," he says. "It became so obvious to me that we had a lot of women designers, but they were handing them to men to program.

"The 1.5 million judgment calls that Gabrielle Savage made [when she programmed *Spelldiver*] were a women's decisions, choices of shape, color, position, pacing, plot.

"If women are just using tools that men build, they're not finding out what the computer is capable of, given your particular fantasy. A graphics person who is not willing to find her own tools is like a cabinetmaker who has no say over what tools he uses."

The lights are seldom out at 123 Mt. Auburn Street in Cambridge. The staff of Tom Snyder Productions is encouraged to reach their speed, get into their own pace, however strange those hours are.

"Like most software development teams, we try to keep corporate culture out," says Snyder. Art, recording, and technical studios, as well as private offices ("no cubicles *here*") help sustain that, as do frequent weekend trips together.

Snyder's analogy for that team's relationship to the rest of the industry is a television production crew. "Something like a group that is trying to have several hit series on the air at once," he says. "There's a lot of separate creative production, but they all share production facilities."

And his "hit series" have been picked up by some of the top educational software publishers: *The Search Series* by McGraw-Hill; *Snooper Troops, In Search Of The Most Amazing Thing, Fraction Fever,* and *Rock 'n Rhythm* by Spinnaker; *Agent U.S.A., Spelldiver,* and *Bannercatch* by Scholastic, Inc.; and *Run For The Money* and *Making Millions* by Scarborough Systems, Inc.

"It's one thing to do your dream; it's another thing to hire a lot of people and then have to lay them off because you haven't made ends meet."

Treating software development as a creative art raises a fundamental question: Do you design programs that satisfy you artistically, or things that you know will sell?

It's not so impossible to do a little of each, believes Snyder. "There are restrictions in a commercial market, but that doesn't have to be the end of the world," he says. "It's like a sonnet. That has some pretty explicit rules to it, but there are an infinite number of ways you can write one."

And that thought satisfies him for life. "I love working within tight restrictions. Anything has restrictions except for jazz," he says. "Take the pop song, the two-minute-forty-eight-second song—there's so much you can do. The world has realized that that's just limitless. Symphonies had to go through lots of transitions, but the pop song continues to amaze people with what can be done."

"When we successfully eliminated Nancy Drew from our book list, we may have done something good for proper English but we might have done a bad thing overall for kids' investment in learning."

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As Snyder's software development team continues to chip away at the boundaries of home education, Snyder is turning his attention back to where everything started for him: the schools.

"I've stayed away from the school market for a few years, but now I'm looking back and seeing that the kind of stuff done for schools is still the one-on-one stuff: one kid, one computer," he says.

Further, he's concerned about the struggle that schools are going through trying to incorporate microcomputers into their teaching process. "There is an erroneous promise, an implication that you're going to be able to do quantifiable things with computers. Therefore, it's excited educators and educational consultants who say, finally, we can start pinning down this educational beast.

"Whereas good software designers come along and say, sorry, this is no more quantifiable than a good book or a bad book. It's an extremely flexible medium and we're going to have to learn to use it just as slowly as we learned how to use good fiction and good art."

So he's back to designing group simulations.

"I'm so excited to be doing it again. I feel very morally clear every day when I'm walking to work," says Snyder. "It's cool to think of the computer handling groups of kids well."

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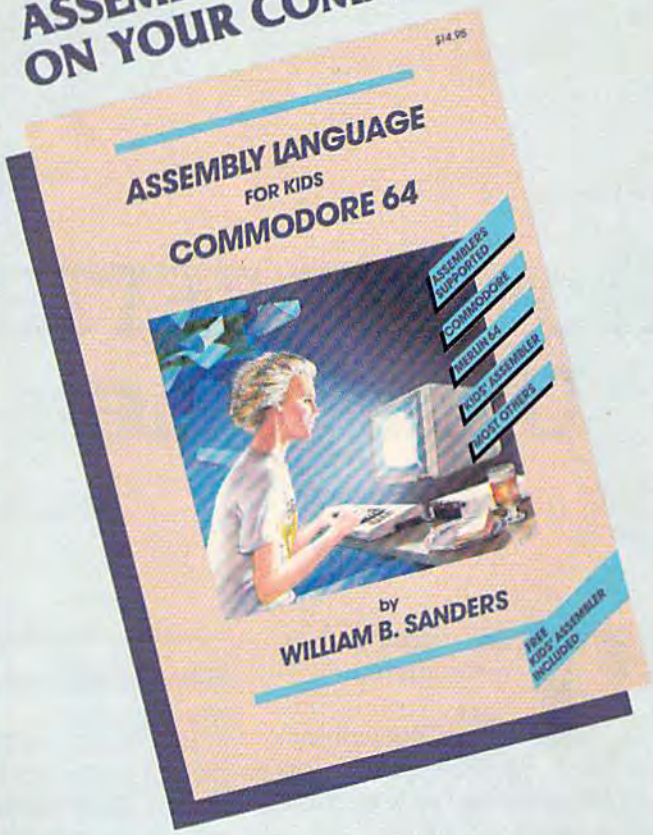

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How GAZETTE Readers Are Using Their Computers

Bernie Ghiselin

How do you use your Commodore 64 or VIC-20? COMPUTE!'s GAZETTE put that question to readers in 34 states. The variety of answers we received from this informal survey reveals just how versatile these computers—and their owners—can be.

"I am totally and utterly infatuated," says Bruce Kobrin about his Commodore 64. A San Francisco minister, Kobrin keeps track of information about his many parishioners by using his computer.

"It's just kind of fun to play with," Roger Brensinger says about his VIC-20. Brensinger, an air traffic controller in Waco, Texas, admits he also computes loan amortization figures and is interested in a biorhythm program for the machine as well.

But the biggest reward for Brensinger is in watching his five-year-old son—"It's helping him to learn to count and recognize numbers"—and his two-year-old daughter—"She just turns it on and listens to the sound. She doesn't know what she's doing yet, but she enjoys just sitting by it."

From educating children and playing games to helping with home productivity chores and learning to program, COMPUTE!'s GAZETTE readers are using their Commodore computers for a multitude of purposes.

Some homes have too many fingers chasing too few keyboards.

"We fight over it," says Natalie Adams, a resident of Avon, Colorado, whose 15-year-old son, Tim, usually beats her to their computer.

"Whenever I'm not at it," says Ron Long, "they [his wife and children] get a chance occasionally. The grass is about a foot high out there right now." Long, a school teacher in Ada, Oklahoma, has had both a VIC-20 and a Commodore 64. He spends up to five hours a day on the computer.

The situation is reversed for John Norton, an editor in Pueblo, Colorado, whose children dominate the machine: "It's hard for me to get near the thing." And Stephen Gaudet of Rumford, Maine, insists: "I'm telling you, it's on all day long. When somebody's at home, it's on."

Commodore owners may talk about their interests in computer-based learning software, programming, or simply getting familiar with computers for themselves and their children, but the use most often mentioned in our reader survey was—not surprisingly—education.

"The original purpose was education for me and the children," says Jack Adkins of Bethany, Oklahoma. "But it progressed into a hobby."

"Primarily for the kids to hack with," offers E.F. Gormel of Cape Canaveral, Florida, in response to a question about why he purchased a computer. "To get them familiar with the keyboard."

Even if a parent buys the computer for personal use, there is often a son or daughter somewhere in the background, learn-

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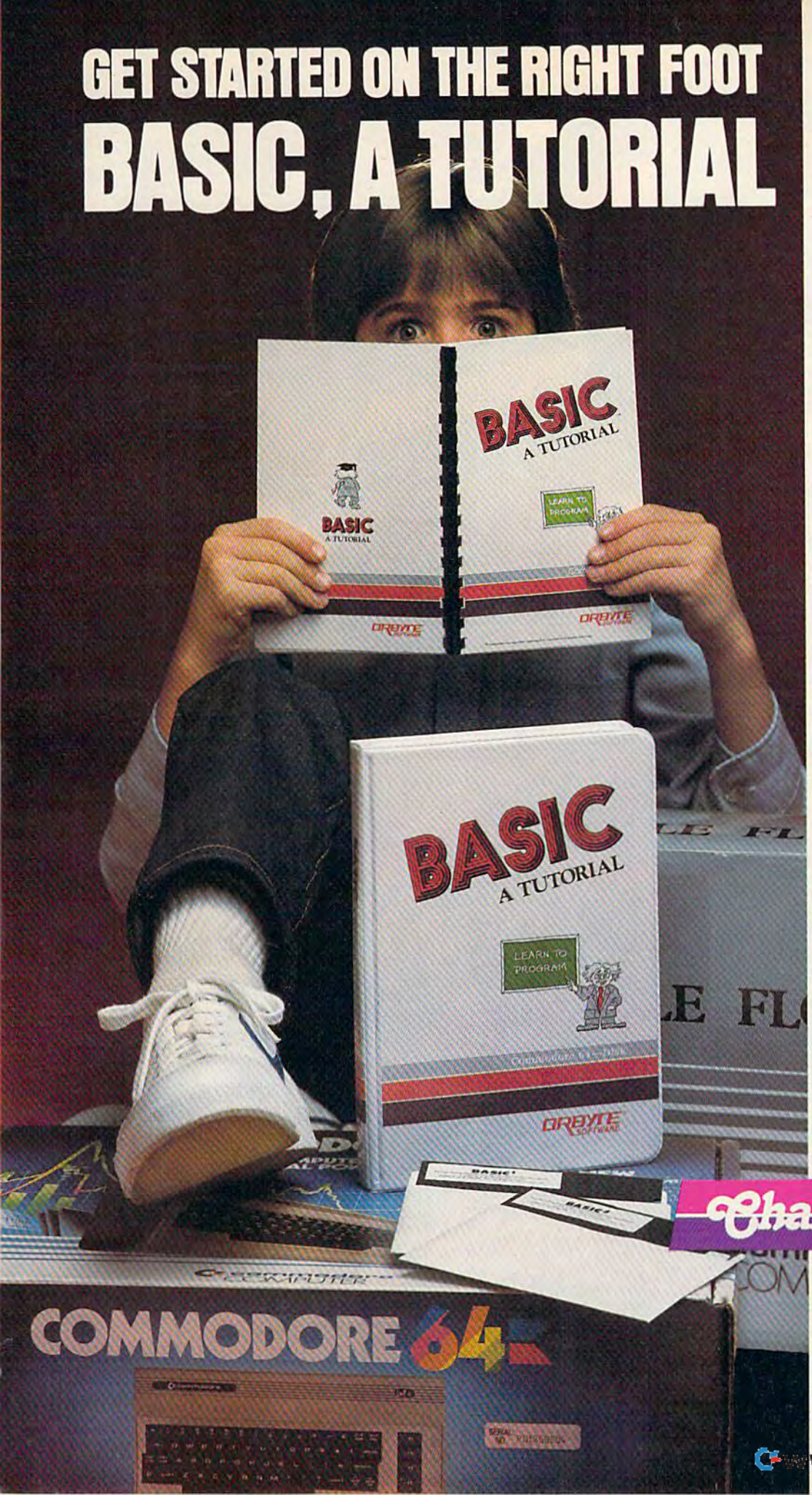
BASIC, A TUTORIAL



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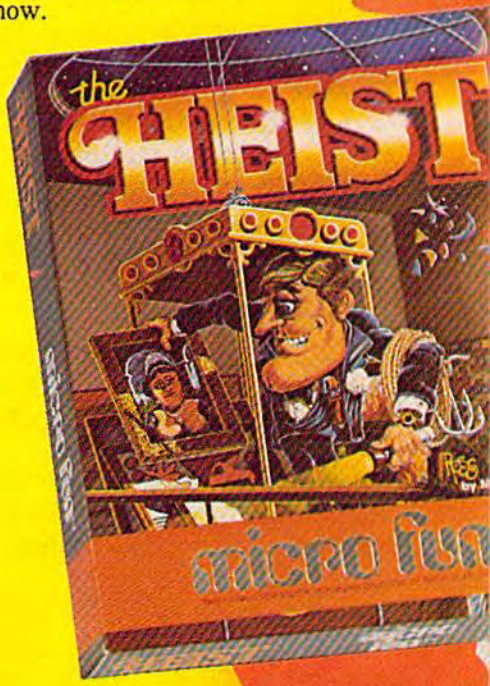

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ing BASIC, playing games, or writing school papers on the computer. And the frequently unspoken reason—although almost always a factor—seems to be the thought that those children need to be exposed to computers as soon as possible.

For example, when Frank Graham bought his Commodore computer, he didn't think his children, ages 5, 7, and 13, would become wizards of the keyboard. But Graham, a news director for WTAE-TV in Pittsburgh, didn't want them to face the silicon society in fear or ignorance of computers. "All three know what it is and are not afraid to sit down and work with it," he says.

The enthusiasm of Commodore owners we contacted is typified by Jack Adkins, an efficiency expert for Oklahoma City Schools: "I've talked 15 or 20 people into buying one at work," he says. "I'm loaded down with just about every game for the Commodore 64." At last count, Adkins' software collection contained about 150 disks and was still growing.

An interest in educational computing and an enthusiasm for the computer came together for Shirley Watson of Fort Worth, Texas—but not without some initial convincing that a computer wasn't just a fancy game machine.

"I thought, 'I don't need this. If you can show me there's something else we can do, then OK,'" she says. "After about three or four months I was amazed at all the things I could do."

The family's VIC-20 has helped her son, David, now 11, to learn his multiplication tables. And between Shirley's and the children's use of the VIC-20, her husband George was forced to buy a Commodore 64 just to keep peace in the home and get an opportunity to use it as well.

Shirley Watson carried her new-found interest to the PTA and a fourth-grade class at a local elementary school. "I brought a little math program, and I took about ten minutes with each child and asked them if they'd worked with a computer before," she says. "They picked up on it right away. It seemed complicated until we sat down and ran a little routine through."

Watson's presentation was so convincing that the PTA and the school principal authorized money for the purchase of a Commodore 64, disk drive, color monitor, and software.

Although computer gaming remains popular among readers, it's clear that educational programs are drawing an increasing amount of attention.

Not long after that, five other teachers bought their own computers to keep in the classroom.

The cautious first approach and later conversion to computing have been typical for many of the GAZETTE readers contacted.

"I felt intimidated by it," says Sara Miller, a teacher in Sterling Heights, Michigan. "I felt it was smarter than I was. I wanted to learn it and get my kids through that kind of feeling. I hope my kids will be comfortable when it comes to learning BASIC in junior high school. If that's all I get, I'll be satisfied."

Another concerned parent, Barry Arnes, is gently guiding his four-year-old son, Robbie, into the world of computers. "He sits in my lap and we have a sound demonstration tape. We play *Pac-Man*. And he's picked up his sight vocabulary in the last four or five months," says Arnes, a high school science teacher in Philadelphia.

"He's learning some of the commands, and he *loves* to erase. I type in something, and he hits 'delete.' He thinks that's great. Sometimes we play *Avenger*, but that's frustrating for him," he adds.

The list of uses for Commodore computers is a long one. Sequencing grow-lights for plants is something Bruce Hartigan of Ferrisburg, Vermont, wants to use his VIC-20 to coordinate. Another reader, 16-year-old Eric Jordan of Hiram, Georgia, uses the VIC he bought mainly to help with his math classes: plotting graphs and trigonometric and exponential functions.

"The computer is so much faster. I don't have to work it out the long way," he says. "I had to learn it all myself."

In Brooklyn, New York, Suzanne Bennett, 17, is using her computer in an accounting course and for word processing in her English classes. Across town in Queens, Mark Peress, also 17, is writing his own data base and filing programs. He has learned BASIC and is now working on COBOL and Pascal. Among his creations so far is a space shuttle simulator.

"You have to figure out the speed of the launch," he says. "If it's not enough, you crash. It does orbits, lines up with the runway, reentry, everything."

A few teenaged readers are not only using their Commodore computers for their own school work; they're helping others manage their affairs. In

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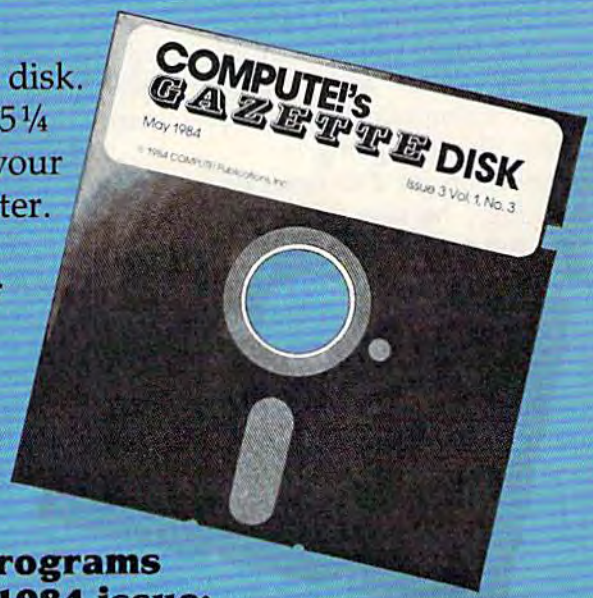

Here are just a few of the quality programs which appeared in the September 1984 issue:

- *80 Columns For The 64*—A two-program package including "Screen-80," which converts the 64 into an 80-column machine, and "Custom-80," which lets you create your own 80-column character set with a joystick.
- *SpeedScript Customizer*—Tailor the output of your VIC or 64 version of SpeedScript with this easy-to-use menu-driven program.
- *Disk Tricks*—For 1540/1541 disk drive owners, this package of four programs lets you change a disk name, change a disk ID, unscratch, and scratch disk files. For the VIC and 64.
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- *Power BASIC: Screen Headliner*—Make your own headlines on your VIC or 64 with this routine that expands characters to four times their normal size.

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Deerwalk, West Virginia, Andy Hall, 15, is writing a data base program for a nearby sports shop—"an inventory list for sports equipment, so they don't have to write it down each time," he says.

Among Andy's more challenging programs was a science project that graphically illustrated the triple conjunction of the Earth, Jupiter, and Saturn—a phenomenon which took place in 1981. "It's not going to happen again for 270 years or something," he says. If he had turned the project in on time, he would have had an "A," Andy admits. But he did win first place in an after-school science fair with his program.

Marvin Winston is proving invaluable to his mother and his karate instructor because of his computer. The 17-year-old Conway, Arkansas youth is using a data base program to help his mother, a nurse, keep track of about 1200 employee accident records. And he's organizing lessons and listing karate movements for his karate instructor.

To dazzle his English teacher, Marvin created a graphics program which simulated the death scene with Brutus from Shakespeare's *Julius Caesar*. Using sprites, the program includes text, swords, and music. "She really liked it," he says.

Many GAZETTE readers get their biggest enjoyment from the sense of accomplishment that comes with mastering a programming technique or a computer function: "The feeling that I did it all by myself!" one high school student says. Adds a teacher, "Just having the computer perform something I want it to do."

Although computer gaming remains popular among readers, it is clear that educational programs are drawing an increasing amount of attention. And there are those who find that education and entertainment have a common ground.

A favorite game for Bertram Rhoads, Jr., a 70-year-old semi-retired insurance salesman in Philadelphia, is a complex blackjack game which he wrote himself. With the help of his son, a systems analyst in Chicago, he's now writing what he feels will be an improvement over the blackjack games currently on the software market.

The new program includes a random factor which simulates the gambling odds at Atlantic City card tables, he says. "The computer is the dealer," says Rhoads. "It still has to play the rest of the hands around the table. When it finishes with the last player, the computer reveals what his down card is and whether he hits or stays. Then the computer goes around and tells you whether you won or lost."

One of the most enthusiastic groups of GAZETTE readers is composed of teachers who are finding a variety of ways to use their machines.

Los Angeles high school teacher Jerry Woodrome has written what he calls a subliminal reading program for his own children, ages four and six. The program simply uses a counter and a loop, flashing a word on the screen 1500 times before skipping to the next word. The program helped his daughter's reading comprehension in two days. "It about blew my mind," he says. "I didn't realize it was that efficient."

The first teacher to suggest using a computer at Indian River Junior High School in Chesapeake, Virginia, was GAZETTE reader Kathy Dulaney, an eighth-grade teacher. She brought her own VIC-20 to school and began using simple vocabulary exercises. "We can change vocabulary from week to week," she says, "erase their data and then put in our words."

At the younger levels, William Arnold is a GAZETTE reader who teaches computing in Cape May, New Jersey, elementary schools. "I'm just trying to get them familiar a little bit, so they won't be intimidated by the keyboard," he says. "They love it. They want to know everything about it." Among the programs that he's written is a letter recognition game for youngsters.

At the Oklahoma School for the Deaf, the students have warmed up to computers in a big way, say Ron and Elaine Long. The Longs teach at the school and have used the machines extensively.

"Most of the programs have a picture or something of identification," says Ron. "It's more fun. The deaf have a lower reading level. They don't get the input a hearing person does."

Before the arrival of the computers, few of his students could pass the driver's license test. Then they put together a computer-based tutorial. The result? "Everybody who's used it has gotten 100 percent," says Long.

Despite the heavy emphasis on educational uses and gaming, GAZETTE readers are involved with many more areas of interest as well. There are ham radio operators using their computers to read Morse Code. Real estate, commodity, and stock brokers are running programs that organize their trading activities. Whether they are college professors, hospital managers, business executives, or any of a hundred other occupations, readers are using spreadsheets, data bases, word processors, and other applications.

In Houston, Luther Barnhill keeps track of monographs for his academic papers. A retired mycologist with the U.S. Department of Agriculture, Barnhill may need to list 150 abstracts for a single paper on which he

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The *BLITZ!* compiler is faster than PET SPEED, and faster than any other Commodore compiler that has appeared to date. Shortly after Skyles took his seat and inserted *BLITZ!*, he had normal BASIC programs running up to 20 times faster after he *BLITZ*ed them.

The performer explained that *BLITZ!* translates the slow BASIC language into a much faster code, thus improving the performance of the BASIC routines. *BLITZ!* reads the entire BASIC program, decides which operations only have to run once, and compiles the operations. It then re-writes the program into its special P-code.

Skyles also showed how *BLITZ!* adds security to your programs, because once a program has been compiled, it is not readable. That means protection is an automatic part of the re-writing.

The highlight of the show was, for this reviewer, when *BLITZ!* compiled a string of BASIC programs such that one loaded the next. An impressed audience looked on as Skyles effortlessly passed information from one program to another.

***BLITZ!* on disk for the Commodore 64 costs only $99.00.**
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is working.

Denise Van Dosen of Marine City, Michigan, keeps track of Girl Scout activities with her computer. Policeman Dan Mathena of North Granby, Connecticut, records arrests, cars stopped, mileage, and other figures. "It helps me to see things I couldn't see before," he says. "Now we can know the percentage of drunk drivers [as compared to] motor vehicles stopped."

When she can wrestle her children away from the computer keyboard, Natalie Adams of Avon, Colorado, uses her Commodore to keep track of condominiums for a local management company and for mass mailings to the homeowners' association.

In Seneca, South Carolina, lab technician John McDonald has reached the point where he can send out his own programs for possible publication in computer magazines. He even successfully interfaced his VIC-20 with a home burglar alarm, although the initial efforts produced some overheating. "But it *did* work," he says.

Among the programs McDonald has created which his family finds useful is a grocery shopping list data base that includes about one hundred items. "We buy basically the same things, but not the same thing each time," he says. "We pick out certain items before we go, and it gives us a subtotal of the grocery bill before we go there. I know we save ourselves money. We know when we go what we want and don't let ourselves spend more."

Dale Bishop sells ads for a telephone directory publisher, and he takes his VIC-20 along on the road trips. The Vandalia, Illinois, salesman plugs the computer into his motel room's television set for a few quick games.

The Rev. Jack Skirvin, a country pastor for 33 years, is getting plenty of use out of his Commodore 64 at the M46 Tabernacle of the Pentecostal Church of God [M46 is a highway] in central Michigan.

He has started a Bible school on Saturday mornings, and uses word processing for his notes and quizzes. A data base program helps him keep track of about one hundred families. And he uses his printer for mass mailings. Skirvin is even writing his own data base program now. "I would like to include more information for each family," he says.

Skirvin says he's probably one of a minority of ministers around the country using a computer the way he does. "There are not too many of them that have a similar interest."

But when it comes to computer use, he admits he knows the shape of the future. "I see it mostly among the young people of the church."

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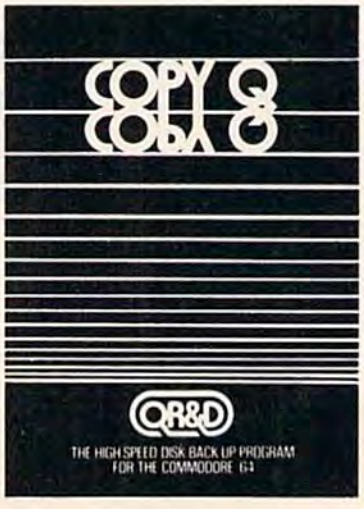

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Unknown to you, however, a defective coupling in the main power housing is unable to support the added strain. When it fails, you temporarily lose warp drive. In the process, the ship's dilithium crystals are destroyed. The ship must proceed on auxiliary power until new dilithium crystals can be acquired.

Long range sensors indicate a nearby planetoid that contains the needed crystals. Unfortunately, the planetoid is guarded by numerous drones, normally not much of a threat. However, with shield energy so depleted, they can become a deadly menace. In addition, there is a plasma cannon on the surface against which the ship's shields are totally ineffective.

Upon arriving at the planetoid, a mining team is beamed down to the larger of two mountain ranges. While avoiding the drones you must beam up the mined dilithium crystals. Fortunately, phasors are operational. You are reluctant to use them, however, because of the associated energy drain.

Avoiding The Drones

When the program is run, the screen clears and a wait message appears. At this point, the program is moving the character set to $3800(14336). This is done to reduce sparkle, which interferes with the sprite collision registers. Then the program asks you at what level (1–4) you would like to play. This determines two things: how fast the drones adjust their orbit to collide with the starship, and how active the plasma cannon will be. Once fired, you must avoid the plasma ball from this cannon at all costs. It will destroy your ship on contact.

Fortunately, the drones do not affect your shield energy while the plasma cannon is firing. The plasma ball has enough fuel for about two

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full orbits. In normal mode (no plasma ball), the drones cost about 15 energy units per hit. If shield energy is depleted, the starship will crash and the game is over. Phasors will destroy the drones, but no points are awarded since your mission is peaceful, and weapons are defensive. It should be noted that phasors do cost energy. If used sparingly they can help; but, generally, avoid using them.

When the game ends (either by completing two orbits or by being destroyed), you will be asked to play again (P) or end the game (E).

Your mission is to find energy crystals while avoiding the irksome drone ships.

Ship Operation

The ship's controls are: the cursor keys, which provide positive and negative orbital thrust; the space bar which engages phasors; and the T key, which controls the operation of the transporter. This can only be used directly over the large mountain and while in a low orbit. The mountain will flash yellow and the shield energy will increase as new dilithium crystals are beamed aboard.

The score is based on the time that has elapsed since the start of the most recent game minus the number of direct hits on the starship. The high score of the last successful game is compared to that of the present game and the result is logged under high score.

Machine Language Routines For Special Effects

The action in "Trek" is controlled almost exclusively from machine language (ML). The ML routines are in modular form accessed from BASIC via SYS commands. The various memory locations are assigned variable names, such as "SYS THRST" (thrust) and "SYS MOVE".

A list of these ML modules is included in the accompanying table along with a brief description of their individual functions. These commands serve as extensions of BASIC. They are independent of one another and thus are available individually for use in programs other than "Trek." These modules are grouped together via BASIC in lines 100–200, which form the main loop of the program. In addition, lines 8000–8035 form the plasma cannon loop.

Machine Language Modules

ML Routine	Memory Location	Function
BAM	49407–49459	Checks sprite collision registers to see if drones hit starship (sprites 1, 2, 0 against 3) and moves eliminated drones off screen.
MOVE	49232–49275	Checks to see if sprite 3 is above or below the drones and moves sprites 0, 1, 2 up or down if so.
PHAS	49472–49531	Checks to see if space bar is depressed and rapidly scrolls sprite 6 (phasor) across screen if so; also checks for collisions between sprite 6 and sprites 0, 1, and 2.
Main loop	828–886	After being called by the hardware interrupt, this routine scrolls sprites 2, 4, 5 one pixel to the left. It scrolls sprite 1 two pixels and sprite 0 three pixels.
Hardware Interrupt reset	989–1002	This must be called before the main loop machine language above can operate. It tells the IRQ to look at 828.
THRST	890–951	Checks keyboard to see if either cursor key is depressed and scrolls sprite 3 up or down if so.

Another area where ML is used is in the scrolling of the background. This is a routine inserted into the interrupt routine performed 60 times a second. This inserted routine allows the mountains and drones to be scrolled across the screen without taking time out from the main loop. This also makes the play much smoother.

Lines 600–899 contain the DATA statements that comprise the ML discussed above.

Lines 500–598 contain the sprite DATA statements. Lines 900–998 set up the playfield. Lines 1100–1379 contain the introduction screen. The lines at 3000 control the game restart and associated variable resets. Finally, the lines at 4000 control the victory screen received after the successful completion of this phase of the mission. The other lines are for the most part self-explanatory.

Sound in Trek has been embedded as much as possible to maintain smooth action.

If you would like a copy of Trek (tape only) send a self-addressed stamped envelope, a blank tape, and $3 to:

Andrew Beery
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See program listing on page 172.

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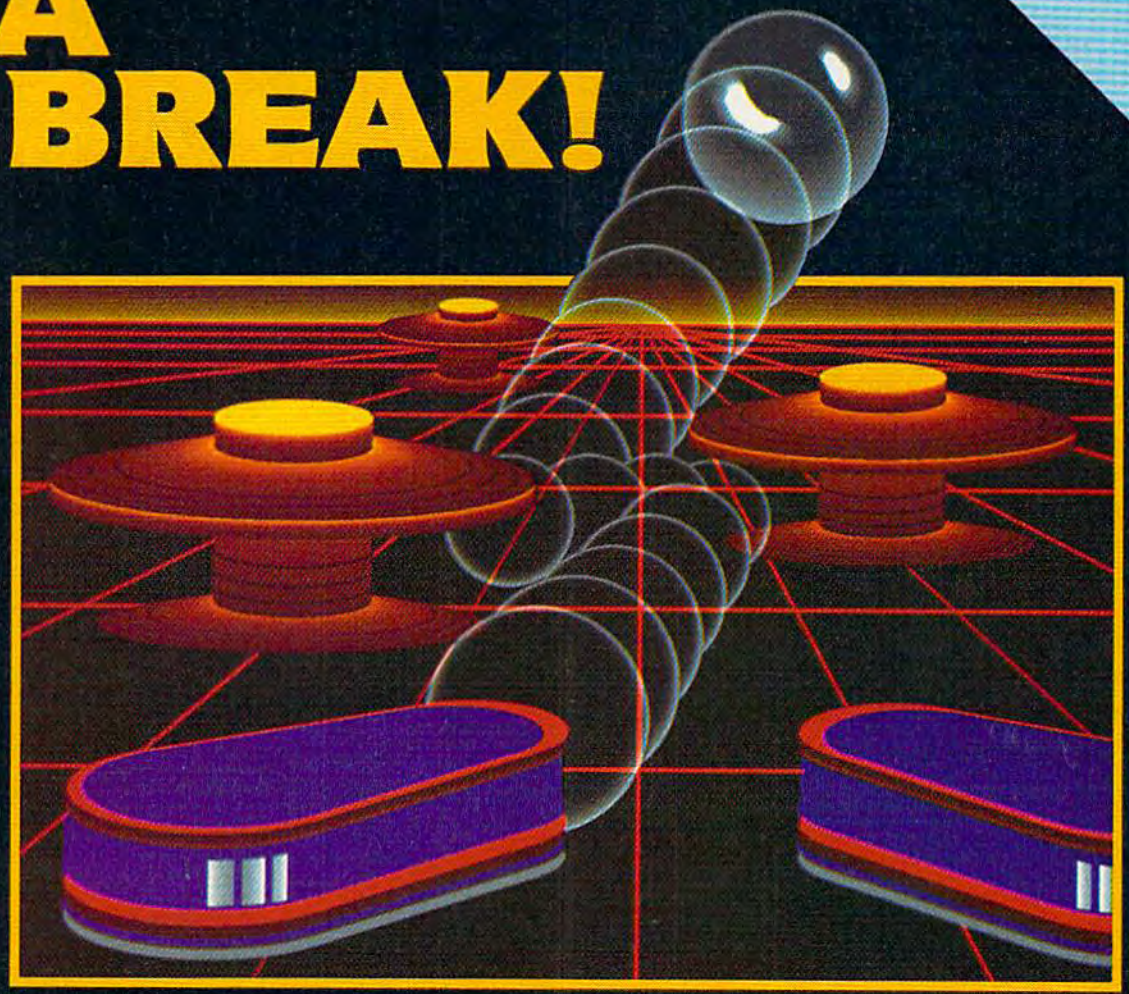

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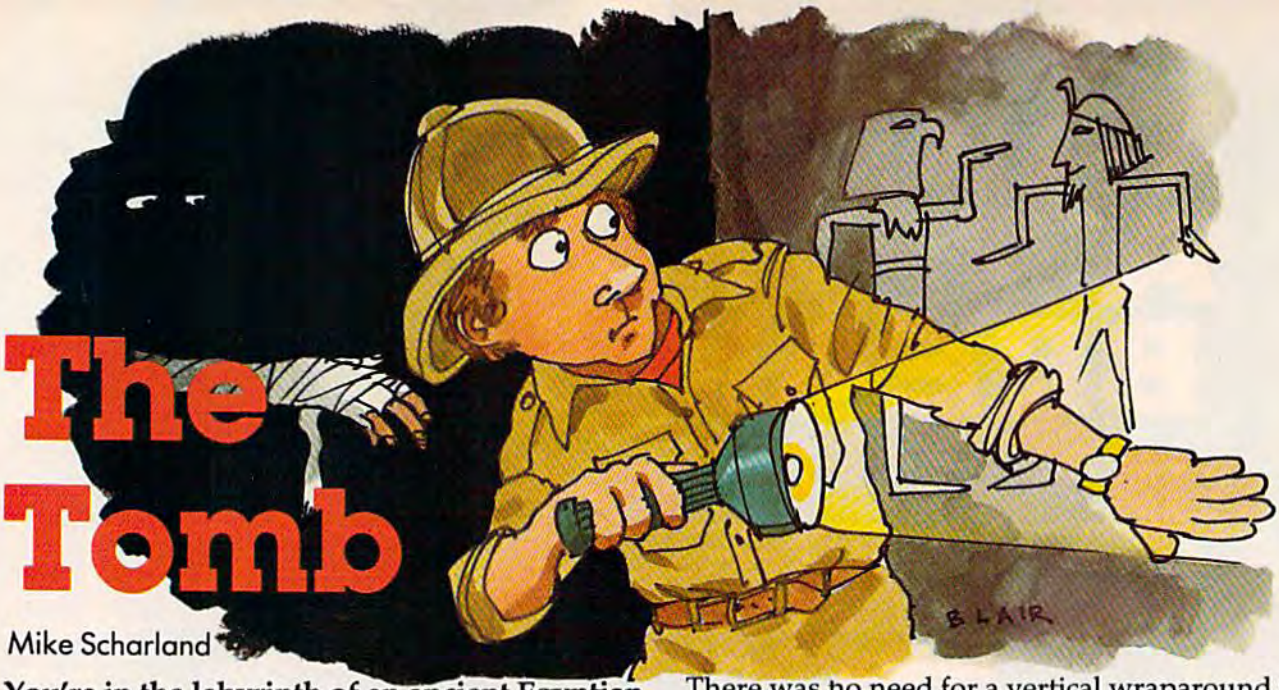


The Tomb

Mike Scharland

You're in the labyrinth of an ancient Egyptian tomb, searching for treasure. Getting through the maze to the treasure while evading the tomb's guardians is the challenge. For the VIC and 64, a joystick is required.

You are a brave Egyptologist, seeking relics and treasure in the pharaoh's tomb. Using a joystick to maneuver your character, you must evade the three guardians of the tomb to retrieve the treasure from its resting place in the wall.

Inside the treasure room, many columns and walls form a labyrinth to hinder your progress. You cannot pass through these walls, but neither can the guardians. The amount of treasure you find depends on how quickly you travel through the labyrinth.

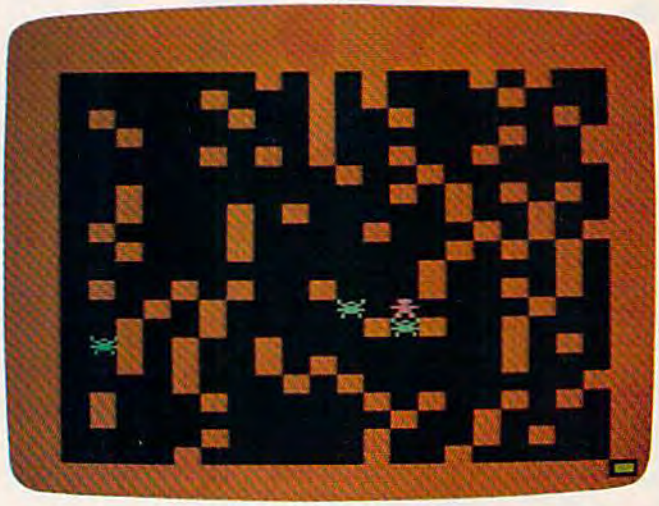
This program consists of one very short main loop and a large number of subroutines. The main program loop, lines 18–91, is designed for speed. There was no need for a vertical wraparound feature to prevent you from appearing on the other side of the guardians by going off the screen. The screen border is made of the same character which is used for the walls. The regular program loop checks for and does not allow a move into one of these characters, so you cannot move off the screen.

The subroutine at line 2000 creates the random screen. The subroutine beginning at line 3000 creates the custom characters. The subroutines beginning at lines 4000 and 5000 are used when you either meet your end or grab the treasure.

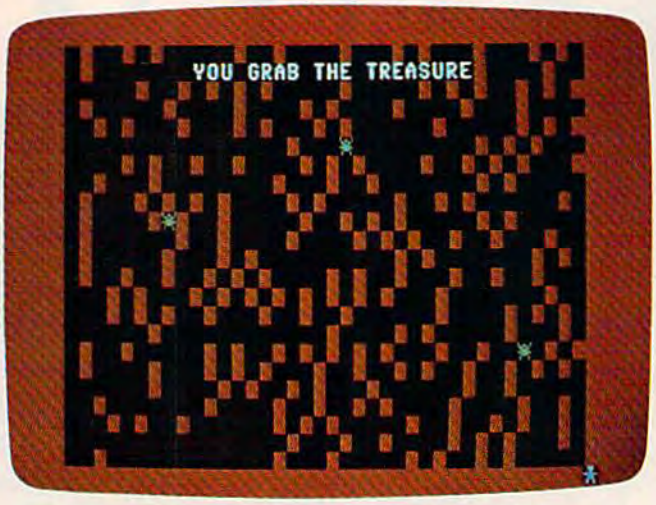
If you don't want to type this program, send me a blank cassette, SASE, and $3. I'll return your tape with two verified copies of the program (VIC version *only*).

Mike Scharland
3640 Halsted Blvd.
Steger, IL 60475

See program listings on page 151.



Two guardians are about to capture the player in the VIC version of "The Tomb."



The intrepid explorer has made it through the labyrinth (64 version).

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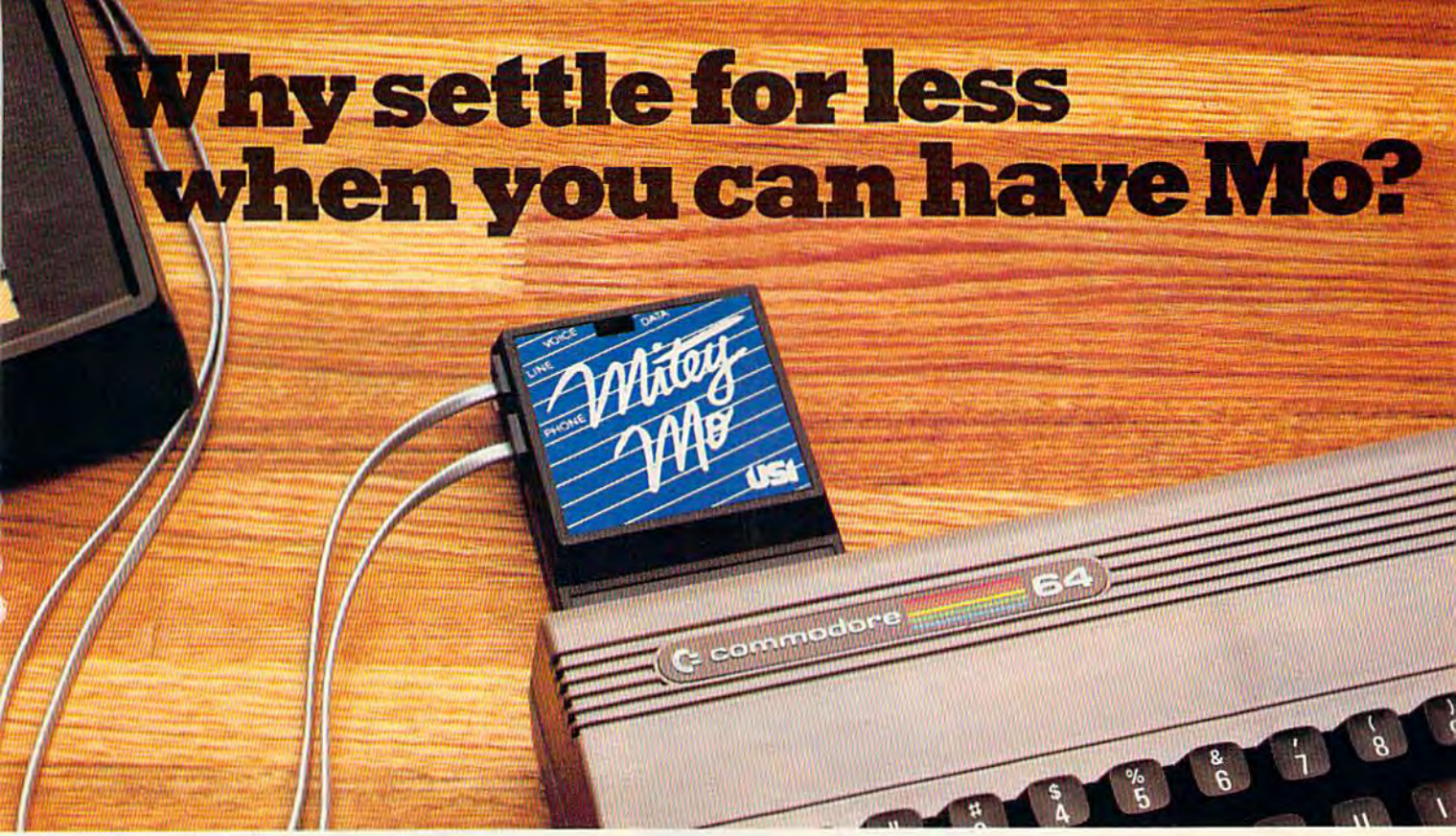

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Until Mitey Mo, Commodore's 1650 Automodem was the obvious choice when you went looking for a modem for the C-64. Like Mitey Mo, it has "auto-answer"— it receives data while unattended. And both modems are "auto dialers"—you dial right on the computer's keyboard. But that's about where their similarity ends.

Suppose you dial a number,

MODEM FEATURES	USI MITEY MO	COMMODORE AUTOMODEM
Auto Dial	YES	YES
Auto Answer	YES	YES
Auto Redial	YES	NO
Smooth Screen Scrolling	YES	NO
Both Cassette and Diskette Software Included	YES	NO
Menu Driven	YES	NO
24K Software Buffer	YES	NO
Function Key Template	YES	NO
Printing Capability	YES	NO
Easy-to-Use Manual	YES	NO
Bell 103 Compatible	YES	YES
Multiple Baud Rates	YES	YES
Dual Cables Included	YES	NO
Single Switch Operation	YES	NO
Warranty	3 years	90 days

Some mighty interesting features—ours and theirs. Yours to decide.

and you find that it's busy. Mitey Mo has "auto redial"—it hangs up and redials immediately until it gets through. With the other modem you have to redial each time—and somebody with auto redialing can slip in ahead of you.

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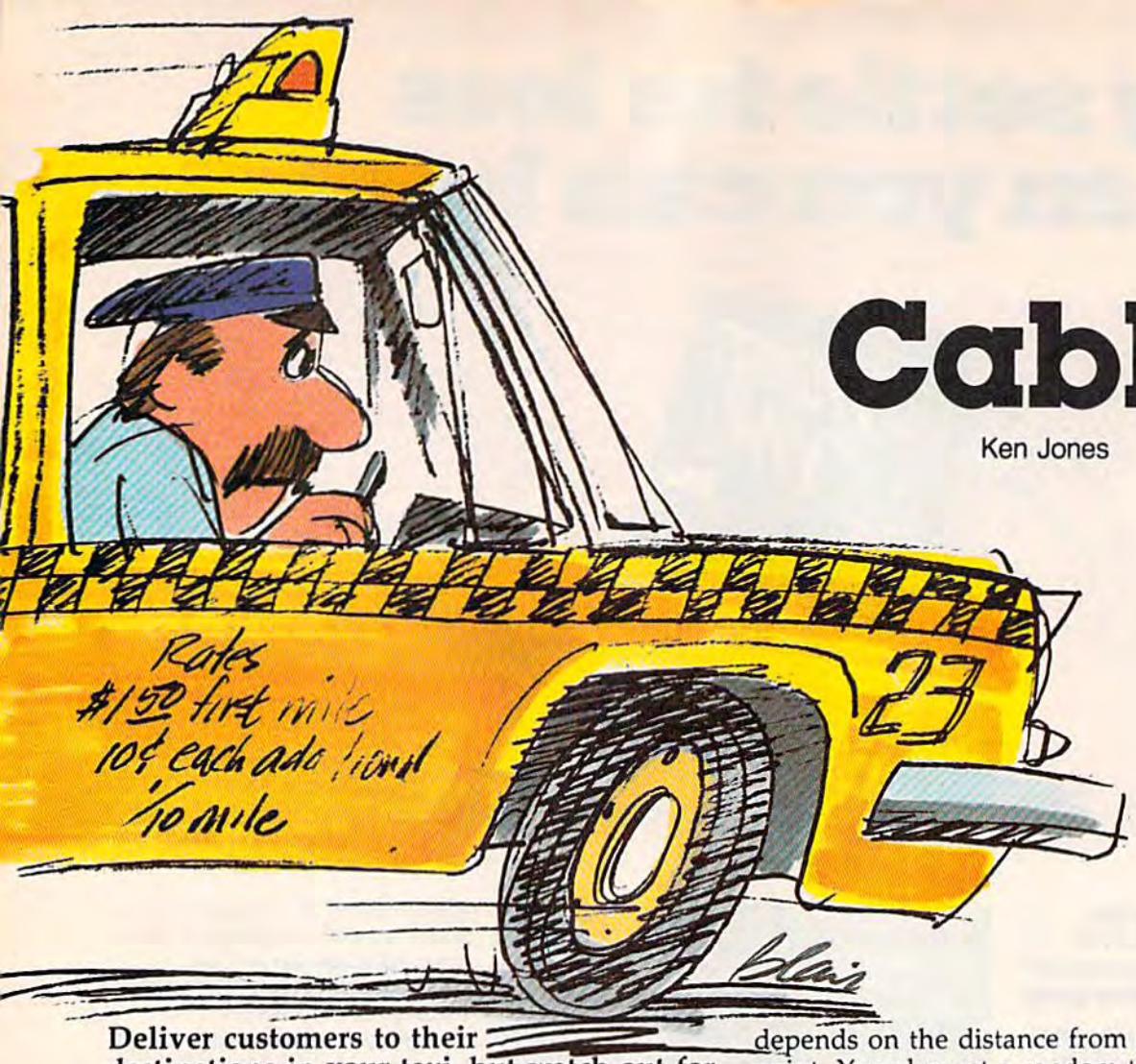

Cabby

Ken Jones

Deliver customers to their destinations in your taxi, but watch out for the vicious trolley cars, and try not to run out of gas. For the VIC (with at least 3K expansion) and 64. A joystick is required.

The object of "Cabby" is to drive your cab around the city picking up passengers and dropping them off at their desired destinations. If you earn $200 and get all the money back to the depot before wrecking your hack, you get to buy your cab and win the game.

Using The Radio

Messages sent from the dispatcher are flashed on the bottom lines of the screen. The messages tell you to go to the airport, go to the zoo, etc. Head for the appropriate letter on the map (the first letter of the name of the location). You cannot pick up passengers at any destination except the one to which you have been dispatched. The one exception to this rule is the street man, who appears randomly from time to time hailing your cab. You can pick him up anytime your cab is empty.

After picking up a passenger, you must take him or her to the required destination, which appears at the bottom of the screen. Your cab fare depends on the distance from pick up to drop off point. You also get a random tip proportional to the fare collected.

Trolley Cars And Traffic Lights

Trolley cars hate cabbies and will crunch you any chance they get.

You can pass a traffic light only if it is green. A red or yellow light stops you in your tracks.

To make things even more sticky, you have to watch your gas consumption. Pushing the fire button on the joystick gives you a gas gauge readout on the lower portion of the screen. If your tank is near empty, head for the gas pump near the bottom right of the screen. You'll hear a pump sound when filling up.

Don't get caught heading for a red or yellow traffic light with a trolley car close behind. Chances are it will not change in time to save you from your fate. The trolley movement appears to be random and no threat to you until you move into its line of sight. But they bear down on you when they see you.

Don't wait too long to gas up. If you run out of gas, the trolleys get nine turns (the time it takes you to walk to the gas station and back with half a tank of gas) to close in. Head for the pump when it's clear of trolleys. Most of the time there

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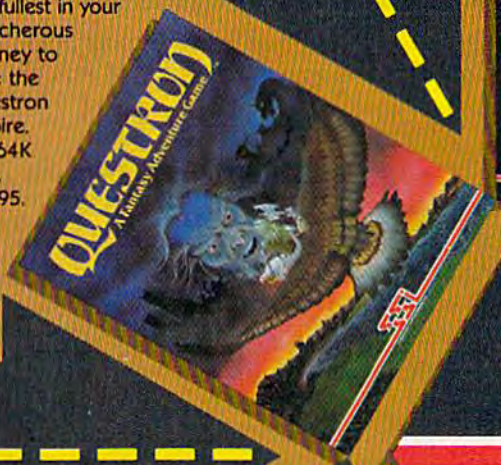

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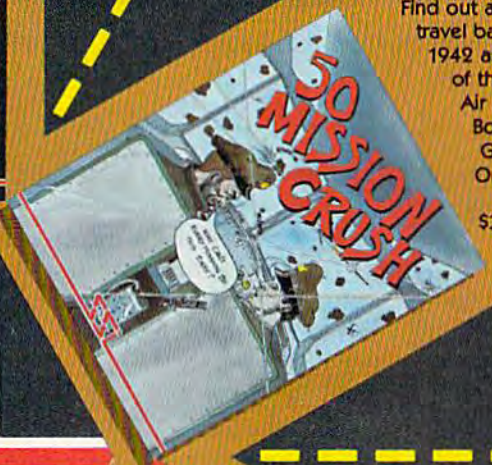

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Deposit money in the depot to keep it safe (VIC version).

The dispatcher's messages appear at the bottom of the screen. A customer is waiting at the office (64 version).

is one guarding the pump, making it difficult to get gas when you need it most.

Some letters are found on the city map more often than others, for example school, theater, and restaurant. Remember, the farther ones will return you more money. You get more for north-south movement than for east-west.

Finally, you can drop off your money on hand at the depot anytime. Your final score is the cash you have cached at the depot, not the amount you are carrying.

In the VIC version there are four levels of difficulty: 1, the easiest, to 4, the hardest. At level 1, one trolley car moves for every move your cab makes. At level 4, all four trolley cars move for every move your cab makes. It's best to start at level one before trying higher levels.

Adjusting For VIC Memory

Program 1 was written for the VIC with 3K memory expansion. If you only have an expander that provides 8K or more of additional memory, you must delete line 5 from Program 1. Then, each time you load Cabby you must first enter the following lines:

```
POKE 43,1:POKE 44,32:POKE 8192,0:NEW
POKE36869,240:POKE 36866,150:POKE 648,30:
  PRINT "{CLR}"
```

Tracing The Program (VIC Version)

Line 5 protects memory for special characters: multicolored cabs, depot, traffic lights, the street man, and trolley cars. These are protected by lowering the top of BASIC memory in the 3K expanded VIC to 7168 instead of 7679.

Lines 10 and 20 alert the user that special graphics are being generated.

Line 50 copies the first 64 characters from the ROM character set at 32768 down to RAM.

Line 55 copies the special characters, 13 in all, into locations in protected memory.

Line 60 sets the joystick variables.

Line 65 dimensions the array variables.

Line 66 reads place names into the string variable F$(I).

Line 150 initializes screen variables.

Line 160 defines two major functions used frequently throughout the program.

FNA(X)=INT(RND(1)*X)+1 gets a random number from the 1 to X by simply using FNA(X), where X is the highest number we want a chance to generate. For example. X=FNA(20) makes X a random number from 1 to 20. This saves memory if you are doing lots of random number generation. The second function is FNL(Q)=H+22*Y+X, which lets you plot anything on the screen at a particular spot by giving the X and Y coordinates of the spot you want. Both X and Y must be set before the function is called. In this case, Q is a dummy variable, and its value is not important. It is required by the syntax of the DEFine function statement. Y is the line or row number from 0 to 22. X is the column or character position from 0 to 21. For example, if we found the following line in our program

```
X=10:Y=10:POKE FNL(Q),0
```

the computer would put the street man character zero 10 lines down and 10 columns across on our screen.

Line 170 initializes the traffic lights.

Lines 180–190 determine the level of difficulty.

Line 195 changes the character register to point to the protected RAM area rather than the ROM area 32768.

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Line 200 calls the subroutine to draw the city map.

Lines 210 & 220 initialize a few more variables.

Lines 300–390 control the program.

The main program is set up as a series of subroutine calls. This makes adding new ideas much easier. All you have to do is write the subroutine and then add the calling line to the main loop.

The subroutines called by the main loop are as follows:

Lines	Subroutine
500–630	joystick and cabby movement
1000–1020	traffic lights
2000–2020	dispatcher call to cabby
3000–3300	draw city map
4000–4700	passenger pick up or drop off
5000–5240	trolley car control
6000–6095	game over (crunched by a trolley car)
7000–7040	draw street man
8000–8040	depot (deposit money)
9000–9150	fill up at gas pump
9600–9660	gas gauge readout routine if fire button pushed
9700–9770	out of gas routine

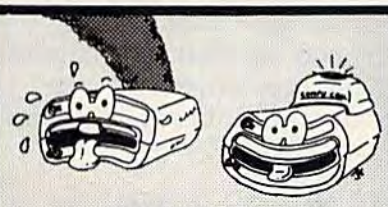
See program listings on page 153.

The 64 Version

The Commodore 64 version of "Cabby" has different trolley movements, and only two difficulty levels. In this version, the trolleys run on predetermined routes. If your cabby happens to be on the same route as one of the trolleys, that trolley will chase the cab until it hits it, or reaches the end of its route.

Difficulty levels, in the 64 version are based on the number of destinations available to the cabby. For instance, in both versions, the computer prompts you to go to a specified location—say a school. In the easy level, there are several different schools on the screen. In the hard level, the computer randomly picks one particular school as your destination.

To move the cab, use a joystick in port 2. You can move the cab in four directions—left, right, up, and down. Diagonal movement is allowed only to enter a destination, or to pick up the street man. He can get into your cab only when there is no destination message flashing on the screen.



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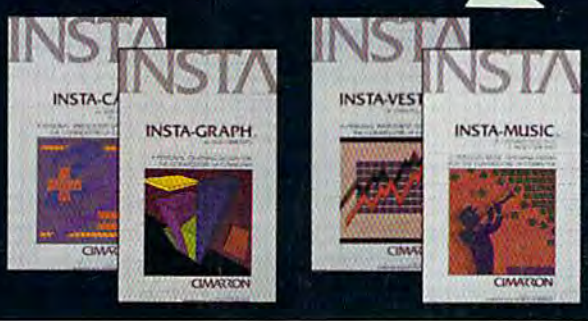

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A Journey Through The Land Of The Buddy-Bots

Fred D'Ignazio, Associate Editor

Software Fairy Tales

Software developers looking for new approaches to early-learning software could spend a profitable afternoon visiting and browsing through a good children's bookstore.

If they wander through a bookstore, they'll notice that most paper-and-print materials for young children are centered on *stories*. Even the youngest children are fascinated by stories about other children, animals, and creatures—both realistic stories and make-believe stories. Often these stories carry significant educational messages, but the messages are artistically hidden within a strong plot, and expressed through the medium of lovable, realistic characters.

I'd like to see more programs designed along these same lines. We've had enough programs for young children with weak, poorly developed story lines and insipid characters. What we need now are *software fairy tales*—stories and characters that "come alive" when the child turns on the computer.

Not For Children Only

Most families with little children have at least a small collection of children's books. And some of those books are well-worn, well-read, and special.

When my children, Catie and Eric, were younger, they had several favorite books and several favorite authors (and illustrators). Among their favorites were Judith Viorst (*Alexander and the Terrible, Horrible, No Good, Very Bad Day*), H. A. Rey (*Curious George*), Ludwig Bemelmans (*Madeline*), Maurice Sendak (*Where the Wild Things Are* and *In the Night Kitchen*), and Mercer Mayer (*One Monster After Another* and *There's a Nightmare in My Closet*).

My children weren't the only ones who loved these books. So did their parents. The characters, the stories, and the pictures charmed all of us. So we read the books over and over again—as much for our entertainment as for our children's.

Programs With Personality

The most important ingredient missing from most early-learning software now on the market is *personality*. There are no interesting characters for children and parents *to care about*. The world in which the software action takes place is usually so artificial and sketchy that we have no desire to go back to it. And the story line is usually nonexistent.

This is why when I saw an announcement for a new line of software by Mercer Mayer, one of my family's favorite authors, I got very excited. Perhaps Mayer's programs would have strong characters, stories, and personality, just like his books.

On the other hand, I was worried that the programs might be as shallow as the other "celebrity" programs I had seen. Celebrities in sports, the movies, books, and records have been making software for the last year and a half, lending their famous names to rather mediocre programs. I was afraid Mercer Mayer's software might not be as wonderful as his books.

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Tonk And The Buddy-Bots

Mercer Mayer's first program, *Tonk in the Land of the Buddy-Bots* ($39.95 for the Commodore 64), is part of a future line of eight Sprout programs for children ages 4 to 12. Mayer's software development company, Angelsoft, is publishing the programs through Mindscape. For more information contact:

Mindscape, Inc.
3444 Dundee Road
Northbrook, Il 60062
(312) 480-7667

Solid Packaging

When I got *Tonk in the Land of the Buddy-Bots* in the mail, the first thing I noticed was the unusually nice packaging.

The program materials come inside a red hard-plastic case the size of a trade paperback book. Like a paperback, the case has a spine label so the software can be placed on a bookshelf—in a bookstore, a library, or home—along with other children's materials.

On the front side of the case is a nice cartoon featuring Tonk, with some of his Buddy-Bot friends in the background. Tonk and the Buddy-Bots are honestly portrayed on the cover and elsewhere in block-graphics form, instead of as smoothly drawn cartoon characters. This representation does not detract from their charm or humor.

On the back of the case are two screen photos of the program and lots of information about the contents of the package (handbook, warranty, disk), the machine requirements to make the software work (Commodore 64, disk drive, color monitor or TV, joystick optional), the age group the software is targeted for (ages 4 to 8), and the educational benefits. (Among other things the programs help children improve their concentration, their memory, and their visual discrimination skills.)

A Journey Inside The Computer

The manual to *Tonk in the Land of the Buddy-Bots* is excellent. It is short, clear, and full of cartoons and screen photos. And it begins by leaping right into the story:

> **Meet the TinkTonks!**
> *Imagine that you have become a beam of light and are magically swept along inside your computer. Below you is a deep blue sea crisscrossed by a glowing grid. Above you is a peach-colored sky. On the Horizon, little disk-shaped islands float in the air above the CrissCross Sea. You fly down for a closer look. On the islands are mountains and valleys, lakes and rivers, forests and fields. One island even has a little town with houses and streets. You have found TinkTonk Land, the home of the TinkTonks.*

The reader is introduced to the TinkTonks, including their trusty leader Tink; Zoomer, the speediest TinkTonk; Boomer, the biggest TinkTonk; Teep and Beep, the little twin TinkTonks; and Tinka, the best Tonkerball player in the land. In addition, the reader meets Tonk, who is Tink's best friend, and the TinkTonk who usually gets in the most trouble.

When the program begins, the first thing we see is Tonk and four Buddy-Bots on the screen dancing. The Buddy-Bots are hilarious. There is a dancing creature with rotating eyeballs, a wheeled "bot" with crossed eyes and shimmy arms, and a jogging creature with bug eyes.

The music makes the dancing, gyrating creatures seem part of a musical play. The creatures, Tonk, and the music whet your appetite for more story and more adventure.

The next thing you see is a simple menu. If you press 1, you go directly into an adventure. If you press 2, you get to play Buddy-Bot games.

My advice is to go on the adventure. The games are good, but the charm of this program is in having your child play the part of Tonk and helping out the Buddy-Bots. The games are much more effective when they are played as challenges faced during the course of the adventure.

Find The Buddy-Bot Parts

When you and your children choose "Adventure" on the menu, Tonk and a Buddy-Bot appear on the screen along with this message:

"Emergency! Emergency! Trouble in Buddy-Bot Land! A Buddy-Bot's parts are scattered everywhere. The Buddy-Bot needs Tonk to collect his parts and put him back together again."

If the child presses Y at this point, he'll look for scattered parts of the Buddy-Bot shown on

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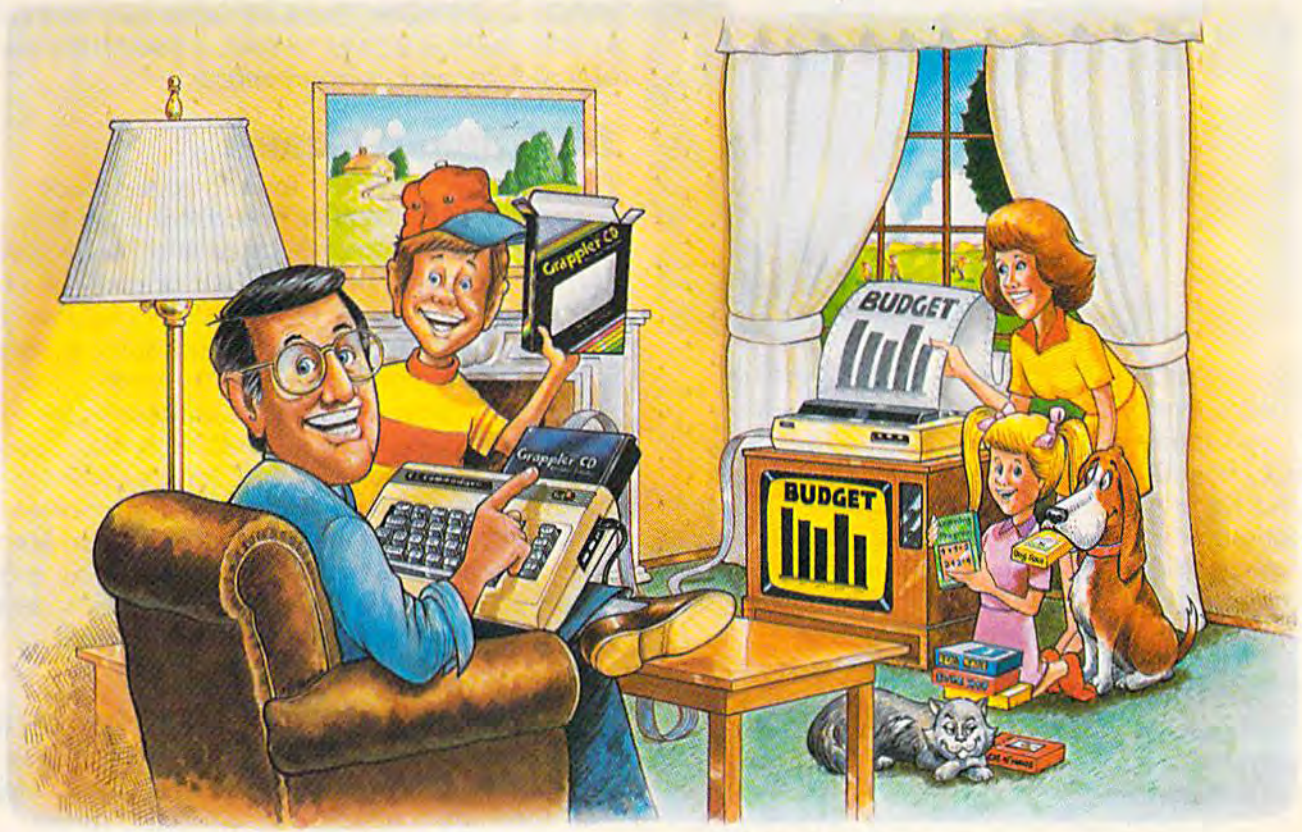

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the screen. If the child presses N, he gets to choose from 128 different Buddy-Bots.

A moment later the child sees Tonk leave his treehouse, climb into a little flying saucer, and fly to the land of the Buddy-Bots. Then the computer transfers control to the child. From now until the end of the adventure, the child controls Tonk and guides him on his quest for the missing Buddy-Bot parts.

The child uses the joystick or the keys I, J, K, and M to move Tonk around Buddy-Bot Land. The land is divided into 65 screens (pictured together in a map on pages 12 and 13 of the handbook).

The child has many different options as he explores Buddy-Bot Land. If he is tired of his adventure, he can press the RUN/STOP key to stop an adventure or the f1 key to go back to the main menu. He can call up a HELP screen to review the rules. He can press the B key, and the computer will show him the Buddy-Bot parts he has found and what they look like when they are assembled into a complete Buddy-Bot.

Watch Out For The Great Gork!

No story is complete without danger and villains. The stories that appeal most to small children are miniature morality plays pitting the forces of evil against the forces of good.

In a computer game the "good guys" should be under a child's direct control. In Mercer Mayer's first adventure, there is only one good guy—Tonk. But there are plenty of bad guys and dangers, including the Great Gork, Gork's Soldiers, Black Holes, and Sky Holes.

If the child bumps into Gork, he is sent away from Buddy-Bot Land. If the child meets the soldiers, they will steal one of his Buddy-Bot parts and capture him and send him to Gork's castle.

If a child falls through a Black Hole, he lands inside Gork's castle. If he falls into a Sky Hole, he is carried back to his treehouse. He loses all his Buddy-Bot parts and must start the adventure all over again.

Buddy-Bot Land is complex enough to be interesting, varied, and challenging. Along with the pitfalls and villains, there are cable cars and rafts to ride, there is a river to ford, a Buddy-Bot factory to visit, and caves to enter.

Educational Games

There are two ways for Tonk to collect Buddy-Bot parts. He can search Buddy-Bot Land for parts, or he can enter the caves and play a game. A child can go on the adventure or play the individual games at any of four levels of difficulty.

The games are standard educational games you see in computer programs for young children, but they are enhanced significantly by being embedded in the adventure. A child can play them with the story and Tonk's quest for Buddy-Bot parts as a backdrop that galvanizes his imagination and engages his emotions. He isn't just matching shapes in the games, he is trying to rescue a Buddy-Bot. This provides a strong incentive to concentrate, learn, and do well.

There are six games:

1. *Different/Alike*—The child has to pick the minibot (Buddy-Bot) on the screen that is different from the rest. As in all the games, there are four levels of difficulty. At the highest level, the child has to pick out the two minibots that are *exactly* alike.

2. *Match the Shadow*—The child moves a large cross-shaped cursor around on the screen until it falls on the shadow of the minibot pictured on the lefthand side of the screen. There are six minibot shadows to choose from in the easiest level, and ten shadows in the hardest level.

3. *Minibot Shuffle*—This is my favorite. It resembles the old "shell" game in which someone hides a pea inside a walnut shell, then shuffles the shells around on a table trying to confuse you so you don't know which shell hides the pea. In Minibot Shuffle, the shell is replaced by a colored box, and the pea is replaced by a minibot. The speed of the shuffling minibot boxes increases along with the level of difficulty. This is a challenging, fun, and different kind of computer game. And it is an excellent device for strengthening a child's sequencing ability, eye-tracking ability, and understanding of spatial relationships.

4. *Remember Me*—This is another nice game. First the child sees a minibot on the screen. Then the minibot disappears, and the child

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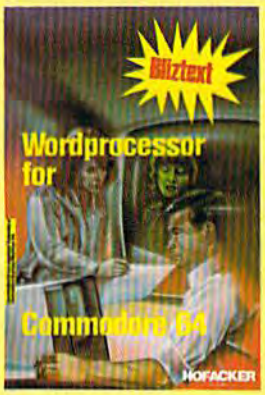

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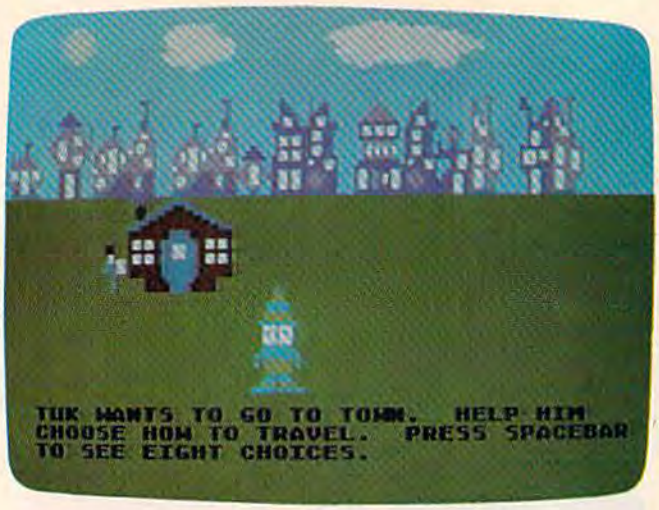

has to reassemble it from an assortment of body parts. The task is divided into three steps related to parts of the body. The child has four heads to choose from, then four trunks, followed by four sets of legs and feet. At the highest level, a child has only two seconds to look at the assembled minibot at the beginning of the game before it disappears.

5. *Buddy-Bot Puzzle*—This time the pieces of the Buddy-Bot and the entire, assembled Buddy-Bot are on the screen at the same time. On the right side of the screen is a puzzle box where the child assembles the Buddy-Bot. A flashing cursor points to one of 12 sections inside the box that corresponds to one of 12 puzzle pieces on the center of the screen. At the highest level, the cursor jumps randomly around the puzzle box, the Buddy-Bot parts are randomly arranged (from A to L), and when a child makes a choice, he cannot change his mind.

6. *Minibot Factory*—After the other challenging games, this game is a relief. It's just for fun. The child pilots Tonk inside a Minibot Factory and watches minibot parts roll by across the top of the screen on a conveyor belt. A large, hollow, block-shaped cursor frames the parts momentarily as they roll by. The child selects a part when he presses the space bar. The fun of this game is to make silly Buddy-Bots—with heads underneath legs underneath bodies; or with three heads, or three bodies, or three sets of legs. Once the child has built the minibot, the computer animates it, and the jaws open and close, the eyes rotate, the arms wave, and the legs jump up and down.

What Eric Thought

After I previewed *Tonk in the Land of the Buddy-Bots*, I found my five-year-old son Eric, and we played together.

Eric liked the adventure and the games as much as I did. Together we had only one serious criticism: the way right and wrong answers were handled.

For example, in playing *Same or Different*, when Eric picked the wrong minibot, the computer responded with: YOU'RE WRONG!

This answer was a real shocker. Most early-learning software developers these days adhere to the philosophy that software for little children should not be judgmental, or that, at least, the judgments should be gentle. This is not gentle. Eric and I thought that software that yells at us (with exclamation points) is very unfriendly and not very nice.

We also had other problems with the messages. For example, they were not accompanied by any sound. This seemed to be a great oversight—both in terms of entertainment and educational value. The Commodore 64 has such good sound (used so well in other parts of the program) that it's a shame when it's missing. The contrast with the other parts of the game in which sound accompanies the action was very noticeable and unpleasant.

Finally, after Eric and I got zero out of six answers correct on one game, the Great Gork appeared on the screen to tell us that we didn't get all the answers right, and to try again. Later, after we got four out of five answers correct on another game, Gork reappeared with the same message.

I found this a great let-down. When we got all the answers wrong, we thought Gork was being nice to us, but when we got almost all the answers correct, we were proud of our efforts. We expected Gork to come on the screen and congratulate us. Instead he told us we weren't perfect ("You did not get all answers right."), and he ignored our achievement.

Later, when we were playing the *Remember Me* game, we had a similar experience. We remembered two out of three of the minibot parts, but the minibot still told us, "You forgot me!" I would have preferred to have had the minibot congratulate us for remembering two out of three parts, and then call our attention to the part we missed.

Encore!

These are serious grievances, but they are still minor compared to the pleasure Eric and I had playing with the programs.

The games are innovative, and Tonk and the minibots are delightful. There are lots of nice little touches, too, which show careful design.

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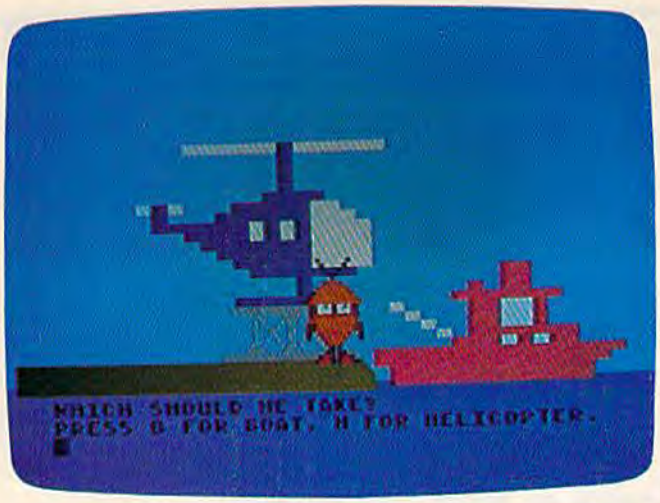

For example, when Tonk bumps into a wall, he falls back, gently, on his bottom.

Mercer Mayer's first "software fairy tales" are not as good as his books, but they are still superior to most of the programs now on the market for young children.

Eric and I hope that in future programs the computer's responses to our answers will be improved, and we hope to go on new adventures with Tonk and the other TinkTonks really soon.

Run, Tonk, Run!

Tonk in the Land of the Buddy-Bots allows your child to play using the I, J, K, and M keys on the keyboard or using a joystick.

Your natural tendency might be to have your child abandon the complicated keyboard in favor of the joystick. But you might want to reconsider.

First, joysticks are notoriously hard for small children to control. They are stiff and hard for little children to move. They are awkward for little children to hold in their small hands or in their laps. And young children frequently get the joystick turned upside down so that the joystick action is reversed from what the child expects (left is right and up is down). All in all, this adds up to a very frustrating experience for a small child.

Second, keyboards are not as frightening to small children as they are to adults. Also, children find that once they learn the direction keys on a program, they have more control over the motion of the computer character on the screen than they do with a joystick.

Teachers and parents can help small children recognize the I, J, K, and M keys on the keyboard by putting small colored dot stickers on each of the keys. For example, a red dot could go on I, a blue dot on M, a yellow dot on J, and a green dot on K. This helps children associate the dots with the letters and the respective directions.

If you plan to use a joystick anyway, you might consider one of the new Wico joysticks. After experimenting with several joysticks, my son Eric and I have decided that the Wico sticks are the easiest to control.

Wico Analog Joysticks have the softest touch and are the best for small children. Another good Wico joystick for the Commodore 64 is the Wico Command Control. You can learn more about these joysticks and others by going to your dealer or by contacting: Wico Corporation, Consumer Division, 6400 West Gross Point Road, Niles, IL 60648, (800-323-4014).

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Michael S. Tomczyk

BASIC Magic

Getting Comfortable With The PRINT Statement

We're pleased to welcome Michael S. Tomczyk and his new column, BASIC Magic, to COMPUTE!'s GAZETTE.

Michael's background includes four years at Commodore, where he served in key marketing, design, and publishing capacities. He was also co-author of the *VIC-20 User's Guide* and the VIC and 64 *Programmer's Reference Guides*. His column will focus on BASIC for beginners.

I'm happy to be writing a new column for COMPUTE!'s GAZETTE. I've always felt COMPUTE!'s magazines to be the best in the industry. BASIC Magic will be written for beginners, but I'll try to include a lot of information that will apply to most programming interests.

Our discussions will apply to the VIC-20 and Commodore 64, as well as the Plus/4 and the 16, expected out this fall.

We'll look at as many examples, tips, tricks, and secrets as we can pack into each column, so you'll have a lot of material to experiment with between columns. This month we'll start with a quick overview of the PRINT command. We're going to move fast, because we know you want to learn fast—but we'll proceed in very small steps so nobody gets lost. Your job is to study the lessons we cover, then experiment with the techniques and use them in your own BASIC programs. Are you with me? OK. Let's jump right in.

The Most Popular BASIC Command

The PRINT statement is the most popular BASIC command. It has more uses than any other command and you can have a lot of fun with it. In this lesson, we'll give you a very quick tour of the PRINT statement and see what it can do, then show you how to "mix and match" different types of PRINT commands in your own BASIC programs.

REM: *Before you begin, here's a helpful hint to save wear and tear on your fingers. You don't have to type out the whole word PRINT. You can abbreviate it by typing a question mark (?) instead. In other words, ?"MAGIC" is the same as PRINT"MAGIC". To use this shortcut, hold down the SHIFT key and type the key with the question mark on it.*

Displaying Information On The Screen

The PRINT command is mostly used to display or "print" information on the screen of your TV or monitor. You can do this directly just by typing the command like this (remember, you have to hold down the SHIFT key to type the quotation marks):

```
PRINT"MAGIC"
```

Now press the RETURN key, and you'll see that the computer PRINTed the word MAGIC. Try PRINTing your name. You can PRINT all the characters on your computer keyboard, including letters, numbers, graphic symbols, punctuation marks, blank spaces, and even sentences, like this:

```
PRINT"I LIKE BASIC PROGRAMMING."
```

PRINTing Graphic Symbols

When you look at your keyboard, you'll see that most of the keys have two graphics symbols on

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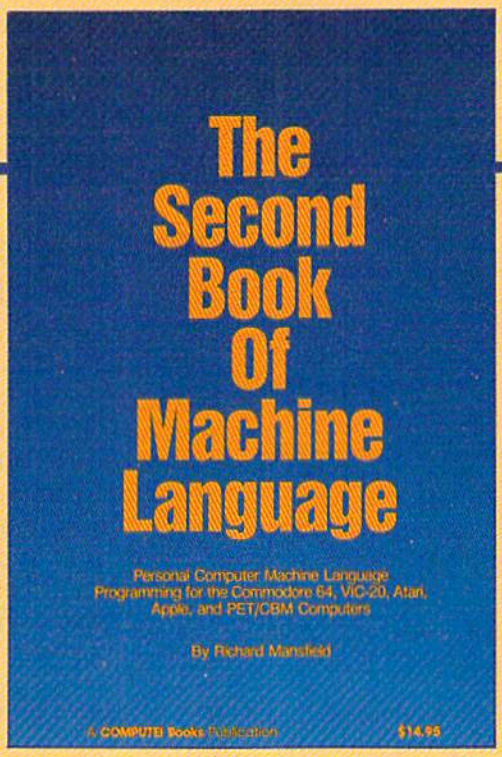

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the front, one on the left and one on the right. You can PRINT these symbols just like you would words or sentences. They're handy for making interesting designs, pictures, or even business charts.

Let's draw a horizontal line across the screen using the left graphics symbol on the T key, like this:

```
PRINT"─────────────────────"
```

To make this line, hold down the Commodore key and press the T key 22 times if you have a VIC, or 40 times if you have a 64, Plus/4, or 16.

REM: *To type a left side graphics symbol, hold down the Commodore key and press the graphics key. To type a right side graphics symbol, hold down the SHIFT key while pressing the graphics key.*

Now try a right side graphics symbol, the heart (found on the S key). Remember to hold down the SHIFT key to type the heart.

CLEARing The Screen With The PRINT Command

Find the CLR/HOME key on your keyboard. When you hold down SHIFT and press this key, the screen is completely erased and the cursor moves to the top lefthand corner of the screen, which is called the *home position*. You can use the PRINT command in a program to clear the screen and home the cursor like this:

```
PRINT"{CLR}"
```

The CLR in braces indicates that you should hold down the SHIFT key and press CLR/HOME at the same time. A reverse heart will appear. This symbol represents the CLR/HOME command inside quotation marks.

You can put the CLR/HOME command inside quotation marks at the beginning of a message, like this:

```
PRINT"{CLR}YOUR MESSAGE HERE"
```

By including the CLR/HOME command in front of the message, you automatically erase the screen and your message appears at the top left corner of the screen.

PRINTing Editing Commands

The PRINT command is so versatile you can even print cursor movements. For example, if you want to tell the computer to clear the screen, move the cursor five spaces down, move the cursor five spaces to the right, then PRINT "HELLO", you can use a one-line command:

```
PRINT"{CLR}{5 RIGHT}{5 DOWN}HELLO"
```

The {5 RIGHT} means to press the cursor right key five times, and the {5 DOWN} means to press the cursor down key five times. Notice that pressing the cursor down key inside quotation marks makes a reverse Q appear. Cursor right is shown as a reverse bracket. Cursor up is shown as a reverse ball, and cursor left is a reverse vertical line. These reverse graphics (like the reverse heart for the CLR/HOME command) help you see where cursor controls and other editing commands appear inside your BASIC programs.

PRINTing Numbers, Values, And Calculations

Let's take a moment to look at how the computer tells the difference between a number which is PRINTed inside a message, and a numeric value which is used for calculation. If you include a number *inside* quotation marks, your computer treats that number just like a letter or graphics symbol, simply a displayed character. If the number is *outside* quotation marks, the computer treats the number as a *value* which can be used for calculation. Try these examples:

```
PRINT"5 PLUS 3 EQUALS 8"
```

In this example, the numbers have no value because they're printed as part of a message—*inside* quotation marks.

Numbers used as values are always PRINTed *outside* quotation marks like this:

```
PRINT 35
```

You can use the PRINT command to calculate the result of a mathematical operation, like the examples shown below. (When you press RETURN, the computer automatically displays the answer.)

Addition: `PRINT 2+2`
Subtraction: `PRINT 100-40`
Multiplication: `PRINT 5*4`
Division: `PRINT 288/12`
Combined: `PRINT (288/12)+(100-40)+(5*4)`

To combine a message with a mathematical operation you have to put the message *inside* quotation marks, and the calculation *outside* quotation marks. Notice in this example, even the dollar sign which goes with the answer is still part of the message because a dollar sign is not a number (value) and is not really part of the calculation.

```
PRINT"155.00 DIVIDED BY 2.4 EQUALS: $"
155/2.4
```

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one of the color keys to PRINT messages or graphics in that color. The Commodore 64 has 16 colors but only 8 are shown on the keyboard (the rest are obtained by using the Commodore key instead of CTRL). The new Commodore 16 and Plus/4 have 16 colors controlled by the CTRL and Commodore keys, with the added feature of *luminance*, which regulates the intensity.

To set a color inside a PRINT statement, hold down CTRL and press the appropriate color key—a reverse graphics character will appear—and everything after the color command will PRINT in that color until you change colors with a new color command. This short example prints 4 different colored balls (SHIFT-Q) on the screen:

```
PRINT"{BLK}Q{RED}Q{GRN}Q{PUR}Q"
```

The underline (as in Q) is the GAZETTE's way of showing that you should hold down the SHIFT key while typing the character. Notice that the computer stays set in the last color that was set—in this case, purple. If you want to go back to the standard color, or to another color after the command, add the color command you want at the end of the line. For example:

```
PRINT"{BLK}Q{RED}Q{GRN}Q{PUR}Q{BLU}"
```

will return the VIC to it's normal blue PRINT color. For the 64, replace the {BLU}—CTRL-7—with the proper key combination to get light blue, the 64's standard character color. That's done by pressing the Commodore key and 7 key simultaneously.

PRINTing Reverse Characters

You can PRINT any of the Commodore symbols in reverse by using the RVS ON and RVS OFF keys. (These keys are enabled by pressing the CTRL key first.) Here's a quick example:

```
PRINT"{RVS}NEGATIVE{OFF}POSITIVE"
```

PRINTing Variables

We'll cover variables much more thoroughly in a future column, but for now here's a quick introduction. A variable is like a code you can use to stand for something else. For example, let's say variable A stands for the value of the number 1, and variable B stands for the value of the number 2. Let's PRINT A+B and see what happens:

```
A=1:B=2:PRINTA+B
```

The computer displays the answer (3) because PRINT A+B is the same as PRINT 1+2, and we defined the variable A as 1 and the variable B as 2. Now, here's a real teaser for you. Can you figure out how this program works?

```
A=1:B=2:P$="PLUS":E$="EQUALS":PRINTA;P$;B
  ;E$;A+B
```

This is a more complex example, so let's look at the line closely. A and B are numeric variables used to stand for numbers 1 and 2. P$ and E$ ($ is pronounced "string") stand for the words PLUS and EQUALS. (String variables work like numeric variables—they represent something else. The dollar sign tells the computer that the variable is alphabetic, not numeric.) The PRINT command displays the numbers and words defined by the variables. A+B is a calculation, so the answer is PRINTed. The colons (:) allow you to put more than one command on one line (more on this later), and the semicolons (;) make the words and numbers print next to each other. Try it without the semicolons.

How BASIC Programs Work

So far, we've typed all of our examples directly into the computer—now we're going to see how we can use these commands in a BASIC program. Actually, any of the PRINT commands we used so far can be turned into a BASIC program simply by adding a line number.

The way to tell the computer that you're giving it a BASIC program is to type a line number first, then your command. A BASIC program can range from one line to several thousand lines. Here's an example of a one-line BASIC program using the PRINT statement:

```
10 PRINT"THIS IS A VERY BASIC PROGRAM."
```

When you press RETURN, your computer reads the line number (10) and realizes this is a BASIC program. Your computer then stores the program in its temporary memory and keeps it there until you tell it what to do next. From here you have several choices.

First, you can LIST the program by typing the word LIST and pressing the RETURN key. Try it.

After you LIST the program, you can correct or edit it by "cursoring" (moving the cursor with the cursor keys) to the place you want to change, and then use the INSERT/DELETE key (INST/DEL) to insert where you want to add information, or delete characters you want to eliminate. After editing, remember to press RETURN. Page 8 in your VIC user's manual and page 34 in the Commodore 64 manual show you how to edit BASIC programs.

Second, you can RUN the program. This tells the computer to perform all the commands or execute the program. Type RUN and press RETURN and the computer will follow the command and PRINT "THIS IS A VERY BASIC PROGRAM." If you've made a mistake, the computer displays an error message.

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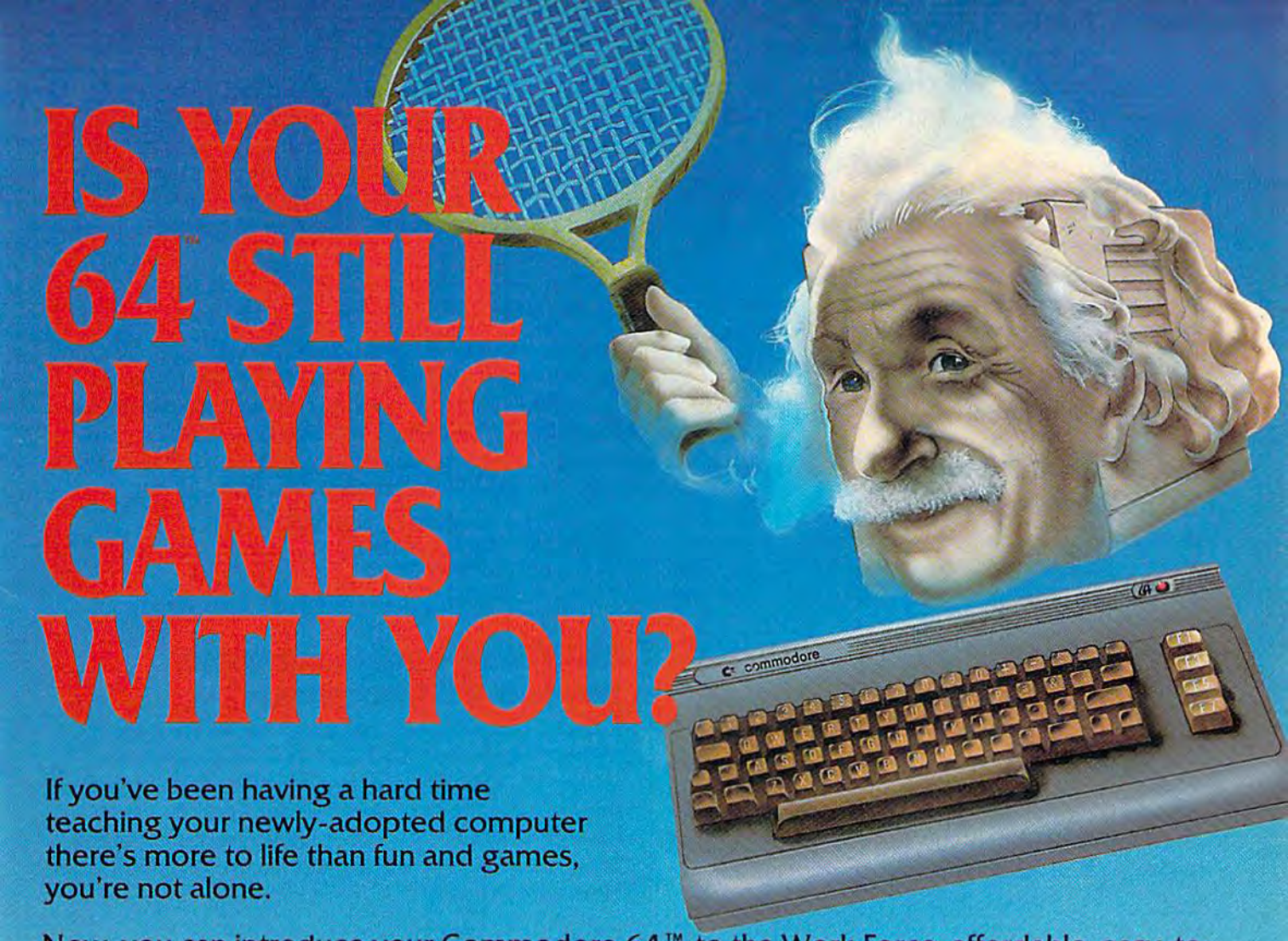

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You can also SAVE your program on tape or disk, or print the program on paper if you have a printer.

Finally, you can erase the program from memory by using the NEW command, which tells the computer to erase its memory to get ready for a new program. *But be careful* if you use this command because *everything* in your computer's memory will be lost. To erase the program you just entered, type the word NEW and press RETURN. The program is immediately gone. If you try to LIST the program, you'll see it isn't there any more.

BASIC Programs With More Than One Line

Now let's type a longer BASIC program with PRINT statements on several different program lines. Type NEW and press RETURN, then type this:

```
10 PRINT"{CLR}BASIC"
20 PRINT"IS"
30 PRINT"FUN!"
40 PRINT"{RED}SSSSSSS{BLU}"
```

The SHIFTed-S characters in line 40 should appear as heart shapes. For the 64, you'll need to change the final {BLU}—CTRL-7—to Commodore key-7. When you run this program, your computer will display this on the screen:

```
BASIC
IS
FUN
♥♥♥♥♥♥♥
```

Seems like a lot of typing to get this simple message, doesn't it? There's an easier way. You can put all these PRINT messages on one line if you separate each command with a colon (:). For example, our entire example can fit on one program line. To try this, type NEW and press RETURN, then enter this new line 10:

```
10 PRINT"{CLR}":PRINT"BASIC":PRINT"IS":PR
   INT"FUN!":PRINT"{RED}SSSSSSS{BLU}"
```

Type LIST and press RETURN, then type RUN and press RETURN to see the program in action. The result is the same as our first example, but only required one program line.

PRINTing Blank Rows

You can insert a blank row by using the PRINT command all by itself. Type NEW and press RETURN to erase any previous programs from your computer's memory, then enter this short program:

```
10 PRINT"{CLR}ONCE"
20 PRINT"UPON"
30 PRINT"A TIME"
```

Type the word RUN and press RETURN. The words are all on top of each other. We can add more space by inserting blank rows between the words, but you don't have to retype the program. Just type two new lines numbered 15 and 25 and they'll automatically be inserted in your program. Try this:

```
15 PRINT
25 PRINT
```

Now LIST your program and lines 15 and 25 are automatically included. Now RUN the program.

Here's another way you could have done the same thing. You could have put the PRINT command on lines 10 and 20 by adding a colon and then the PRINT command, like this:

```
10 PRINT"{CLR}ONCE":PRINT
20 PRINT"UPON":PRINT
30 PRINT"A TIME"
```

PRINTing Long Messages: Beyond 80 Characters

Each line of a BASIC program can contain up to 88 characters on a VIC and up to 80 characters on the 64, Plus/4, and 16. But what if your message is too long for one program line? You then have to use several PRINT messages on different lines, and tie them all together with semicolons. Here's an example:

```
10 PRINT"{CLR}";
20 PRINT"THIS MESSAGE IS LONGER THAN 80 C
   HARACTERS, SO WE HAVE TO CONTINUE";
30 PRINT"ON ANOTHER LINE, USING MORE THAN
    ONE PRINT STATEMENT AND PUTTING";
40 PRINT"SEMICOLONS AT THE END SO ALL THE
    PRINT LINES LOOK LIKE ONE LONG ";
50 PRINT"SENTENCE."
```

Notice how we begin each program line with a PRINT command, but continue the message uninterrupted in quotation marks. If there's a natural space between words at the end of a line, you have to include a space in your program, either at the end of the previous line or the beginning of the next line; otherwise the words run together. The semicolon at the end of each PRINT message program line is used like "programming glue" to make all the messages display right next to each other. Make sure the semicolon is *outside* the quotation marks.

We'll continue our discussion of the PRINT statement with some more advanced examples next month. In the meantime, as you learn more about BASIC you'll discover there are usually many different ways to program a BASIC action. As we continue, we'll try to show you some of these techniques so you can perform some BASIC magic.

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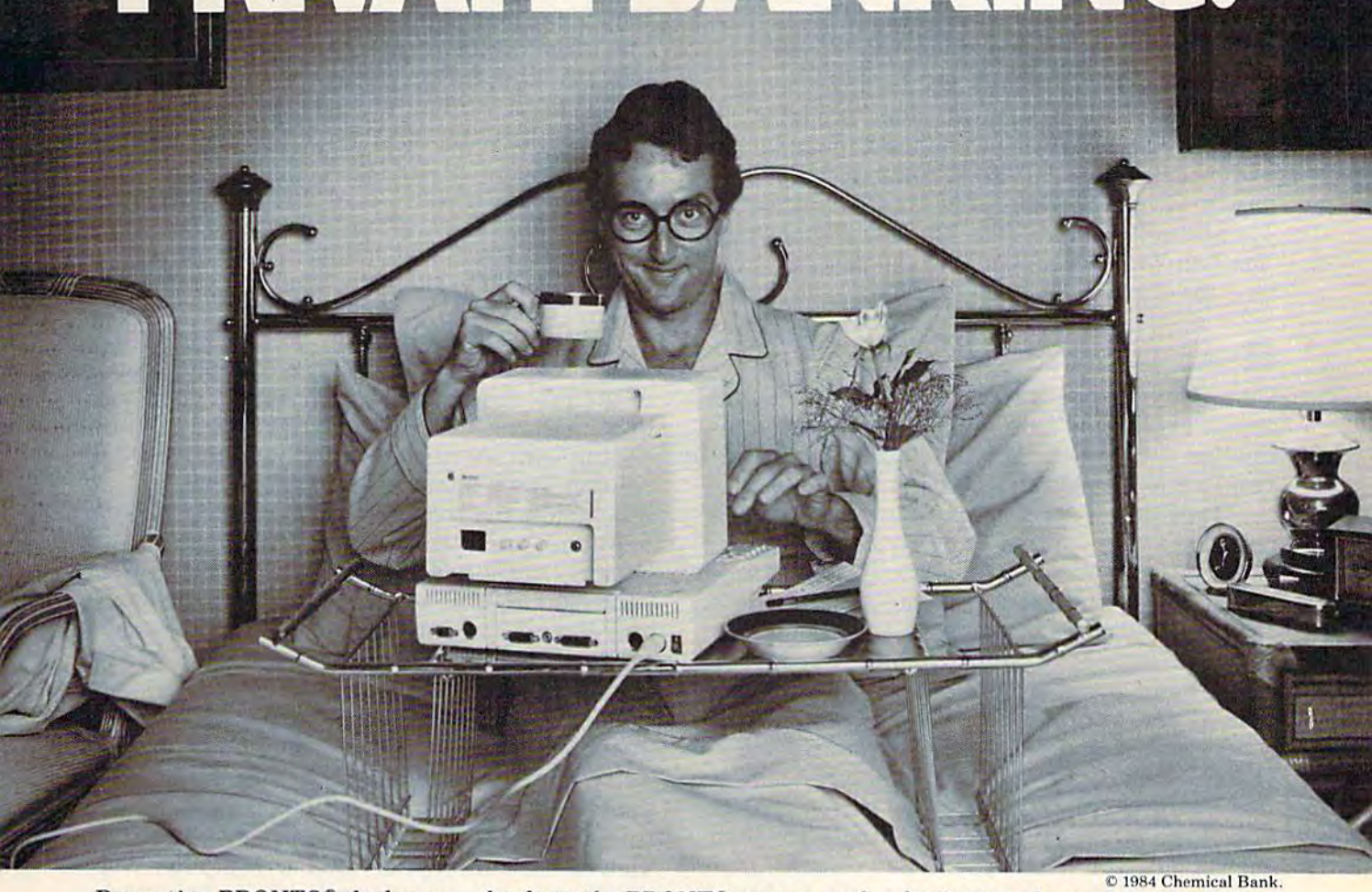

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Quiz Master For The 64

George Miller, Assistant Technical Editor

This two-program package for disk users offers an effective and uncomplicated way to set up and administer multiple-choice quizzes. It's menu-driven for ease of use, and ideal for school or home study.

"Quiz Master" for the 64 is a package of two programs, "Quiz Generator" and "Student Quiz." Together, they can be used to create and administer quizzes. The first program allows parents or teachers to create multiple choice tests. The second program gives the test to the student. The only input required from the student is to type the answers for the quiz.

Menu Options

Quiz Generator begins with a display of the main menu: Enter New Questions, Review Questions, Change A Question, Load Previous Data, Add To Test In File, Initialize Disk, or End.

Type 1 to enter new questions and create a quiz. Each quiz can hold up to 100 questions. You'll then be asked if a file of quiz names exists. If this is the first time you've used the program, or if you're starting a new group of tests on a new disk, answer N. You'll then be asked to provide a name for your quiz. Type in the name, exactly as you want it to appear. The quiz name will be stored in a SEQuential file called TEST TITLES. Quiz Generator will accept up to 15 quiz files for each disk because of the screen formatting of the menu. (If you're covering more than one subject, you may want to have a separate disk for each one. For instance, a disk for history quizzes, another disk for math quizzes, and so on.)

Now follow the screen prompts to enter your quiz. You have full use of all screen editing functions, including the cursor control keys and the DELete/INSerT key. Be careful to make changes only where you intend to and don't move the cursor to areas where other text appears.

You shouldn't be concerned about word wraparound, the breaking of words at the end of the 40-column line. Just type each sentence using spaces where they normally occur, and standard punctuation, including commas and colons. Quiz Generator will look at your sentences and find the proper place to break each line. Each question can contain up to 80 characters, counting spaces.

Type in the four answer choices to the question, and give the correct letter choice when prompted.

To store the quiz, type the British pound symbol (£). The program will open a file with the quiz name you specified and store your information. A file to store the student's grades will also be created.

When you return to the menu, type 2 to review the questions. The screen formatting section of the program will now right-justify your questions, and the screen display will have each line ending with the last word that will fit on a 40-column line without breaking the word.

Follow the screen prompts to review each question. You'll be shown the questions, answer choices, and the letter of the correct answer to make sure that no typing errors were made when you entered the quiz. If you notice any mistakes, jot down the number of the question so you can change it later.

If you want to change any questions, enter 3, and answer the prompts from the computer. You'll have to enter the number of the question you want to change, so this is where you'll need the numbers you jotted down when you reviewed the quiz (option 2). The computer will display the question and answer choices, and then you may enter the correct question and answer choices.

Option 4, Load Previous Data, loads a quiz previously stored. You can then review this quiz.

Select option 5 if you want to add questions to a quiz already stored on your disk. You'll start entering questions at the first unused question number in the file.

The Initialize Disk routine, option 6, will format, or NEW, a disk, and give you several chances to abort the routine prior to formatting

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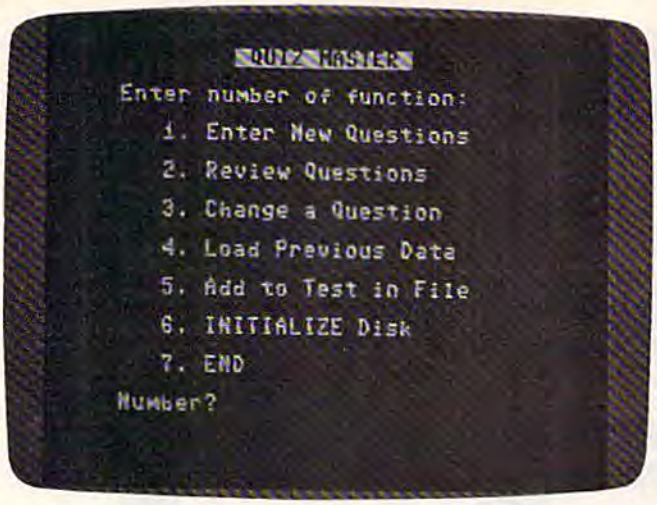

the disk. Make certain the disk in the drive is the one you want formatted, as all information on that disk will be destroyed by the routine. You can't enter this routine by accident, because you are actually taken out of the program before you can run the routine.

Abbreviations Required

Type in Quiz Generator and save it on a new disk. You'll be using Quiz Generator to generate sequential files, which can use up disk space rather quickly, so it's best to start with a fresh disk. You'll find that a few program lines extend beyond the 80-character limit of the 64, so it will be necessary to use keyword abbreviations. These can be found in Appendix D of the *User's Guide* or Appendix A of the *Programmer's Reference Guide.*

Some of the abbreviations you'll find most useful in entering Quiz Master are ? for PRINT, P SHIFT-R for PRINT# (?# is *not* correct), GO SHIFT-S for GOSUB, I SHIFT-N for INPUT#, P SHIFT-O for POKE, and P SHIFT-E for PEEK. To make entering and reading the text easier, hold down SHIFT and press the Commodore logo key to shift to upper- and lowercase text. You'll find this easier to read than the graphics characters the SHIFTed keys will normally print to the screen. You *must* use keyword abbreviations for lines 140, 790, and 1940 of Quiz Generator, and lines 40, 120, and 520 of Student Quiz. If it's necessary to edit these lines after entering and listing the lines, you'll have to reenter the entire line, with the keyword abbreviations.

Next, type in Student Quiz and save it. (Be sure to save this program before typing RUN as mistakes in typing will cause a return of a scrambled, tokenized BASIC listing.) If you plan to use Quiz Generator to give tests to groups of students, save Student Quiz on a second disk for use by the students. This will safeguard Quiz Generator from accidental erasure.

Student Quiz

When a student loads and runs Student Quiz, RUN/STOP–RESTORE and LIST are disabled, as are all cursor controls. The student can only answer the prompts from the computer. The student will be asked which quiz has been assigned, and that quiz will be loaded and run. With the checks built into the program, all the student can do is enter A, B, C, or D for answer choices.

If you want to guard Student Quiz from prying eyes, enter the following sequence of characters:

1, 0, R, E, M, ", ", DEL, RVS ON, SHIFT-M, SHIFT-S, Q, Q, Q, Q, Q, Q, Q, Q, Q, Q, RVS OFF, SPACE, SPACE, SPACE, SPACE, D, O, N, ',T , SPACE , D, O, SPACE, T, H, A, T, !, RVS ON, S, ", SHIFT-L

These keystrokes must be made in this order for the line to work correctly. Don't type the commas, just the indicated characters. Check your typing carefully before you press RETURN to enter the line; after you enter the line, you won't be able to edit it. (If you can LIST line 10, you've done something wrong.) DEL is the unSHIFTed position of the INST/DEL key at the upper right of the keyboard. RVS ON is CTRL-9, and RVS OFF is CTRL-0; these keys will not print any character on the screen, but all characters in between will appear in reverse video.

The strange combination of characters in this REM statement will cause any printing on the screen to be deleted, move the cursor down ten rows and over four spaces, and print DON'T DO THAT! on the screen. The listing will then end with a SYNTAX ERROR, leaving the cursor in the upper left corner of the screen.

This technique will also work on any other program you might like to protect. It's not foolproof, but it will prevent most students from listing the program. Of course, deleting line 10 will allow the program to be listed normally, as will listing from line 11 on (LIST 11).

A random number routine is used to scramble the order of the questions, so the quiz will be different each time. Quiz Generator also uses one question less than you have placed in memory. In effect, each student will be taking a different quiz, and each time anyone takes the same quiz it will be slightly different. The more questions you store in the file, the more variations Quiz Generator has to work with.

Since the random number generator searches for new numbers every time, it can take several minutes to generate a quiz, especially if you have many questions in the file. The screen will be blank during this process, and all keys will be disabled. Everything will return to normal when the quiz is ready.

See program listings on page 163.

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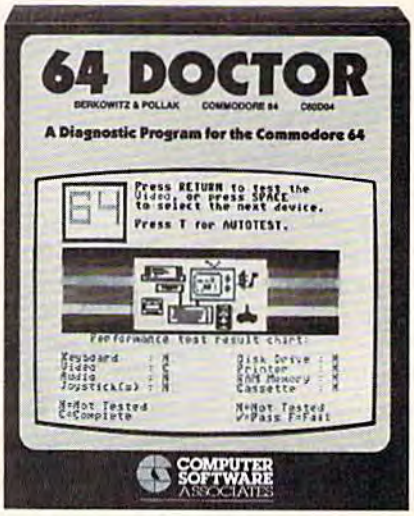

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Vocab Builder

William J. Treanor

This program not only helps increase vocabulary, but also assists students who must memorize words for spelling, biology, history, or other classes. Up to 100 words and definitions can be entered and saved to tape or disk. For the 64 and expanded (any amount) VIC.

My son's sixth grade teacher regularly distributes lists of words and their definitions to the students. The children then take a spelling test at the end of the week.

"Vocab Builder" was originally written to help my son prepare for these tests. But it was soon obvious that it could be used for other subjects—a history drill, say, with facts and dates in place of vocabulary words. Vocab Builder has even been used by college students learning medical terminology. The program flow is fairly straightforward; modifications (using a printer, for example) should be easy to make.

Four Menu Options

Enter the program, save it, and type RUN. First, you are asked to input your name, which is printed at the top of the screen.

Next, you'll see the main menu, which gives you four options: Enter new words, Study, Test, or End.

If you choose to enter new words, you are asked how many words will be in this particular file. You must then type in the words and their definitions. If you make a mistake, don't worry, you'll have a chance to correct it later. When all words and definitions are entered, they are printed on the screen. You can fix mistakes at this point.

The program then saves the word list as a sequential file on tape or disk. You are prompted for the date, which becomes part of the filename. (Note: Since the date is part of the filename, and the filename must be unique, be sure to use a different filename if you create a second quiz on the same day. For example, if you create a quiz named 11-21-84, use 11-21-84.1.) The program then returns to the main menu.

The second option from the menu allows you to study words which were previously entered. First, you enter the date of the test and the file is loaded from tape or disk (depending on your response, T or D, to the prompt).

The list is put into random order. A definition appears on the screen and the student is given three chances to enter the corresponding word. Spelling is important. If the word is correct, the student is congratulated. If the first two letters are correct but the word is misspelled, the message YOU'RE CLOSE appears.

When all words have been covered, the score (number of answers right and wrong) is displayed. Any word which was answered wrong on the first attempt is counted as incorrect. The student is then given a list of which words were incorrect and need further study.

The test option is similar to the studying option, but the student has only one chance to supply the correct word.

The final option, End, allows you to exit the program.

A Tireless Teacher

For young children, Vocab Builder may help develop a sense of responsibility. They can choose when to study and how long. They don't have to wait until a parent or sibling has some free time to help them with schoolwork.

The child is addressed by name, so it becomes his or her computer program. A computer doesn't tire of helping the child, or lose its patience. And it does not chastise the child for answering incorrectly. Words are randomized automatically (so the student actually has to learn the words rather than memorize them in order).

Memorizing can be a chore. Vocab Builder can help relieve some of the tedium.

See program listing on page 178.

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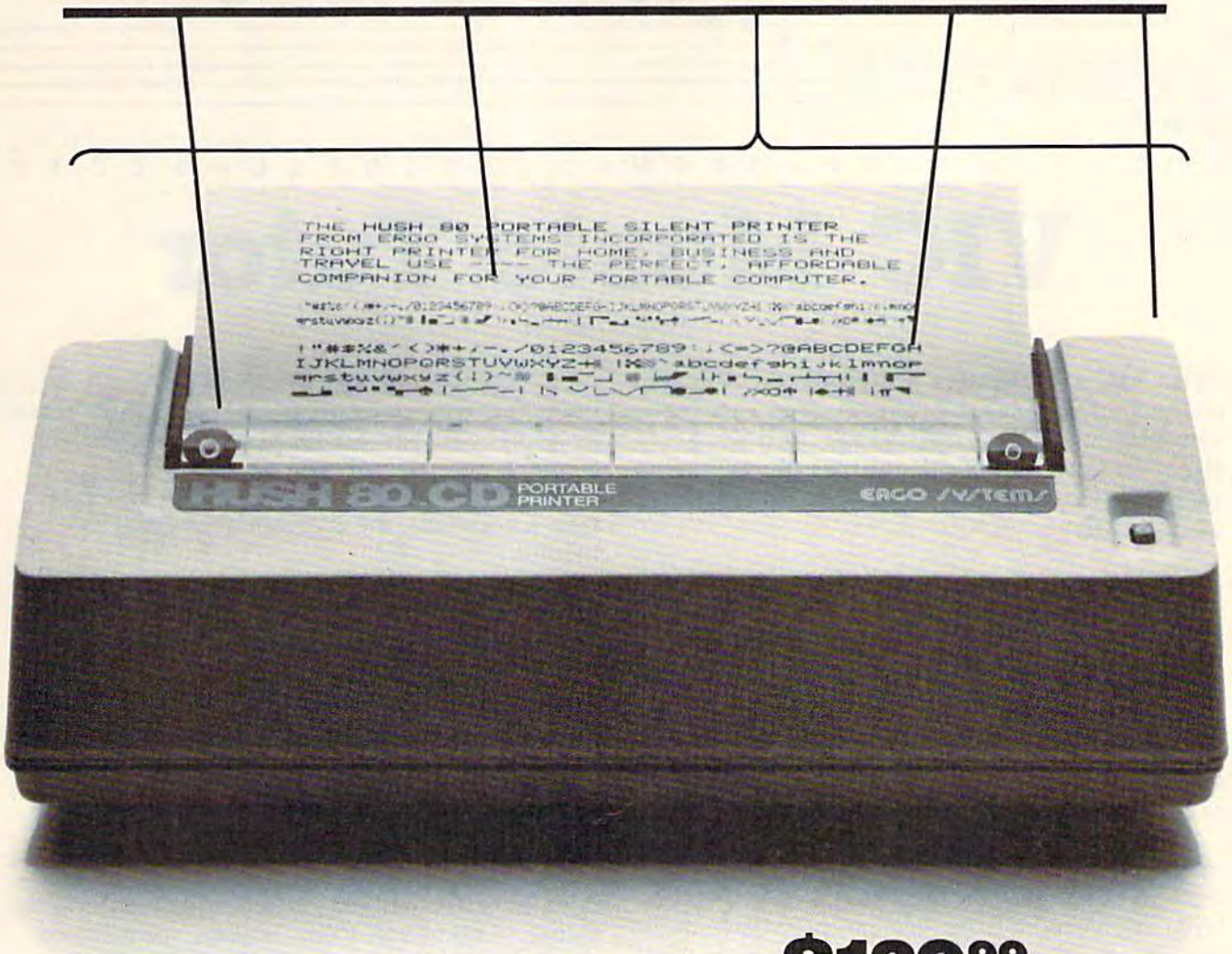

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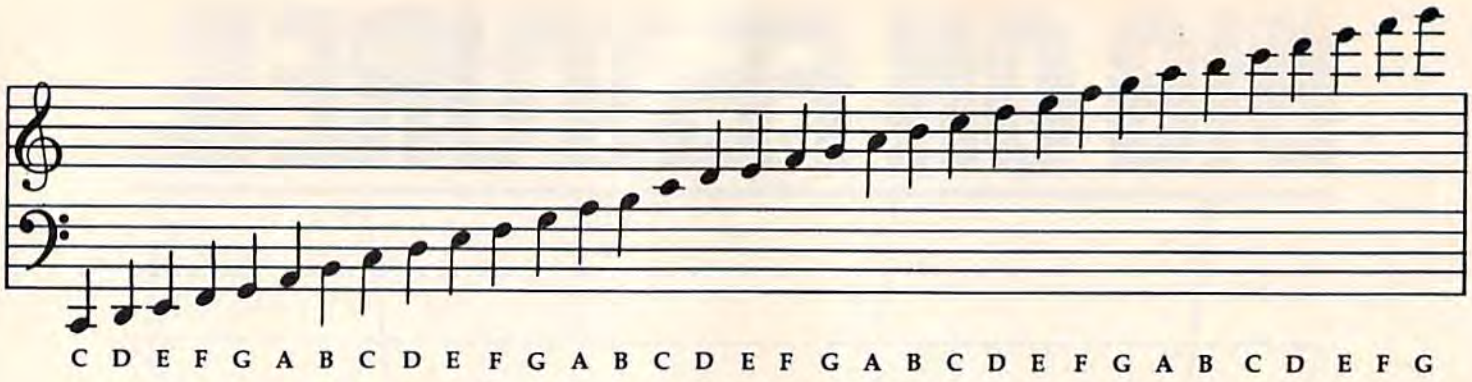

VIC Music Tutor

Howard Parnes

Your VIC-20 becomes a melody-editing machine in this useful program. You can create, play back, and edit songs, and save them to tape or disk. Requires 8K or more memory expansion.

This music aid for the VIC can help overcome certain problems faced by new musicians. It allows you to enter a tune from written music, or to compose your own, to play all or part of the music back at varying tempos, and to save it on tape or disk for later use. Insert at least 8K memory expansion, turn on your VIC, and enter and save the program.

After typing RUN, you encounter the first option in the program: to enter a new tune or load and play back an old one. Once you've entered and saved a tune, you can play back an old one, but the first time you use the program you'll be entering a new one. Give the song a number and type in the name. Then start entering the song note by note.

The Note Names

Each individual note in a music score provides two kinds of information: the pitch of the note, and its duration or time played. For simplicity, let's refer to the pitch as "note" and duration as "value."

First you enter the note. Since each of the three music voices on the VIC is limited to three octaves, we have a three-octave limit on the range of the notes we enter. Each octave starts with a C note. First determine which octave you want. If the note falls in the lowest octave, just enter the note itself—C or F or G, for example. If it is a sharp or flat, add either an S or F after the letter. An E-flat in the lowest octave would be entered as EF, an F sharp as FS, and so on. To move up to the next octave, add a 1 after the note. So a C-sharp one octave higher than the lowest octave is entered as CS1, an E one octave up as E1, etc. Add a 2 for notes two octaves up: C2, FS2, etc.

If you have difficulty figuring in which octave a note falls, the diagram above may be helpful.

Press RETURN after you've entered the data for the note. Now you enter the value for the note. Referring to "Time Values," you can readily see how to enter standard whole, half, quarter, eighth, sixteenth, and thirty-second notes. If you encounter a dotted note, simply add a D after the letter for the note value. For instance, HD is a dotted half note.

You may enter triplets and grace notes as well. Note in "Time Values" that there are divisions listed for each note—16 for the whole note, 8 for the half, etc. You may also enter note values in numerical form. Triplets, for instance, may take the form of three notes of equal duration played in the space of one quarter note. Thus each note in the triplet has a value of 1.33. Add the 3 triplets together and you get a value of 4—our quarter note value. Grace notes are played very quickly in front of a note of normal value. To place a grace note in front of a quarter note, for example, assign a short value to it like .2 and subtract it from the value of the quarter note. The grace note has a value of .2 and instead of entering a Q for the quarter note, enter 3.8.

To enter a rest simply enter R for the note followed by the value for the duration of the rest. After you enter each note and its value you will have a final check before the information is preserved in memory. The note and its value are displayed and you type either Y or N. Typing N lets you re-enter the note and value, while Y moves you on to the next note and value entry. To stop entering notes simply enter the English pound sign (£) instead of a note. This moves you to the next part of the program.

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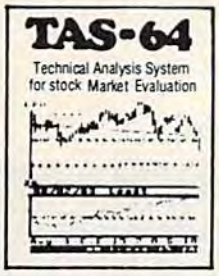

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How Does It Sound?

After typing the pound sign, you are asked if you want to hear the song. Type N and you skip to the editing phase. If you want to hear the song, type Y and select a tempo from 0 to 10. Most songs play best at a speed between 3 and 7 but you can slow them down or speed them up as you like. Next select the playback pitch, either 1 for low, 2 for medium, or 3 for high. There is an octave difference between each of these.

After you've made your selection, press RETURN again and the song will play. At the end of the song you have two options. Press RETURN again and the song will replay exactly as before. This is an important and useful feature we'll look at more closely later on. If you do not hit RETURN, pressing any other key takes you to the next option.

Here you are asked if you want to hear the song again. The first time you listen to your song you may select the tempo and pitch but you must listen to the entire song (or all you've entered up to that point). This time, however, you may choose to listen to only a part of the song. If you respond with a Y to "Do you want to hear it again?" you are then asked if you want to hear just part or the whole song. If you respond with "just part," you'll be told the total number of notes in the song and asked to select the starting and ending note of the part you want to hear. Then you may re-enter the tempo and pitch. Press RETURN and it will play according to your selected parameters. After it ends you'll return to the same series of options.

The choices may seem to be confusing and unnecessary at first, but they actually make the program flexible and easier to use. For example, most musicians, when learning a new piece of music, learn it in sections. They break the piece into smaller sections, practice these until they are smooth, then go on to the next section, until they've mastered the whole piece. "Music Tutor" is ideally suited for this. You can select any section to work on. You can then play the tune at a very slow tempo at first, and speed it up later. Sitting near the computer with your instrument you can listen to a section, then practice playing it. To hear the same section again at the same tempo, press RETURN once and it will repeat. As you get familiar with the section, speed up the tempo. Since values have already been assigned to all the variables from the previous playback, merely pressing RETURN for any option will leave that variable unchanged. If all you want to change is the tempo, simply press RETURN for the other options. But when the tempo selection comes up enter the new speed and then press RETURN.

Editing The Music

When you no longer want to hear the song, you then pass on to the next option. In this instance you can choose to single step through the song. Pressing f1 will play the notes one by one. When each note is played, the number, note, and value appear on the screen. If you want to change a note or its value, press f7. You then enter the replacement note and value and continue to single step through the tune. To add a note, press f2, enter the new note and value then continue to single step through the song. If at any time you want to stop the single step mode, press f5.

If you choose not to go into the single step mode, your next choice is whether to add more notes to the song. You are sent back to the record mode where once again you enter notes and values. These notes are added to the end of the tune already in memory.

In this manner you can enter a song piece-by-piece instead of all at once. Enter one section, then listen to it. Make any corrections via the single step process. You may then save this section. RUN the program again, load the song back, then add more notes. Check the song by listening again. Save it, and continue. This is an especially effective way to work when entering longer works.

The last option in the program asks if you want to save the tune. If you respond Yes, save to tape or disk. A negative response ends the program.

The program requires at least 8K expansion. It allows songs of up to 371 notes to be entered. With 16K expansion, you can have a maximum of 883 notes, and with 24K a whopping 1395 notes.

For those of you who would rather not type in the program, I'll make a copy (tape only) if you send a prepaid mailer, a cassette tape, and $3 to:

Howard Parnes
115 Chestnut Street
Frostburg, MD 21532

See program listing on page 176.

Time Values

VALUE OF NOTE	CODE	NO. OF DIVISIONS
Whole	W	16
Half	H	8
Quarter	Q	4
Eighth	E	2
Sixteenth	S	1
Thirty-second	T	.5
Whole Dotted	WD	24
Half Dotted	HD	12
Quarter Dotted	QD	6
Eighth Dotted	ED	3
Sixteenth Dotted	SD	1.5
Thirty-second Dotted	TD	.75

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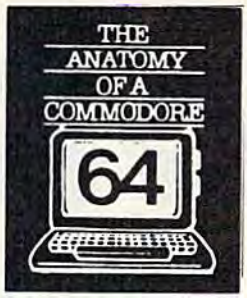

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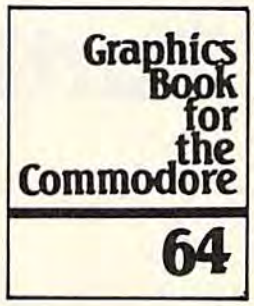

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Turtle Graphics Interpreter For The 64

Irwin Tillman

This comprehensive three-program package gives your 64 full turtle graphics capabilities. It's an excellent learning tool for children, and it offers a new graphics capacity for all ages. For disk or tape users.

Turtle geometry is fast becoming the first exposure to computers for many children. Instead of printing their names on the screen, they are more likely drawing squares and triangles. While such facilities are generally found with specific languages (such as PILOT and Logo), the concept of turtle geometry is not unique to any single language. One of the reasons for its popularity is that it's not only a natural introduction to computing, but also an excellent tool to teach thinking (see Seymour Papert's *Mindstorms*).

If you're not familiar with turtle graphics, the basic concept involves moving a turtle around the screen, leaving a trail as it goes. This is accomplished through a series of English commands, such as FORWARD and RIGHT. Other commands control the color scheme, define loops, and allow you to assemble a series of commands into procedures.

Coordinating The Turtle Programs

"Turtle Graphics Interpreter" consists of three programs designed originally for use with a disk drive; if you are using a tape drive, be sure to read the appropriate section elsewhere in this article.

The first program, "Interpreter," does most of the work. It accepts and executes the commands you enter. Program 2, "Turtle Data," POKEs in the shape tables for the turtle sprites and a number of machine language routines. Finally, "Turtle Boot" (Program 3) runs the whole thing.

It is very important that you type the DATA in Program 2 correctly; otherwise the machine language routines may crash the machine when the Interpreter is run. Also, you should leave out the CHR$(31) in line 140 of Program 3 until you're sure everything is working right. This will make the operation of the Boot program visible. When you are sure that the Boot is loading and running Turtle Data and Interpreter, reinsert the CHR$(31). Then, to run the whole package, just load and run the Boot program.

Turtle Commands

The Interpreter recognizes 30 commands, some of which can be abbreviated. In addition, the CLR/HOME key will clear the text portion of the screen and home the cursor (regardless of whether the SHIFT key is pressed). Pressing the f1 function key will change the border color; f3 handles the text-background color. In addition, trying to move from the text window into the hi-res screen will be treated as a CLR/HOME.

The commands are as follows:

FORWARD x (can be abbreviated as **FD**)—moves the turtle a distance of x in the direction it is pointing. The value of x must be greater than zero. The turtle will normally leave a trail as it moves (see PENUP, PENDOWN, PENDRAW, and PENERASE). You cannot leave the screen.

RIGHT x (RT), LEFT x (LT)—turns the turtle right (clockwise) or left (counterclockwise) x degrees (x is at least zero). Because there are only eight turtle sprites, the turtle will not always seem to be pointing in exactly the direction it should, but it will still draw and move properly.

SETHEADING x (SETH), PRINTHEADING—Setting the heading to x will turn the turtle without changing its position. Headings range from 0

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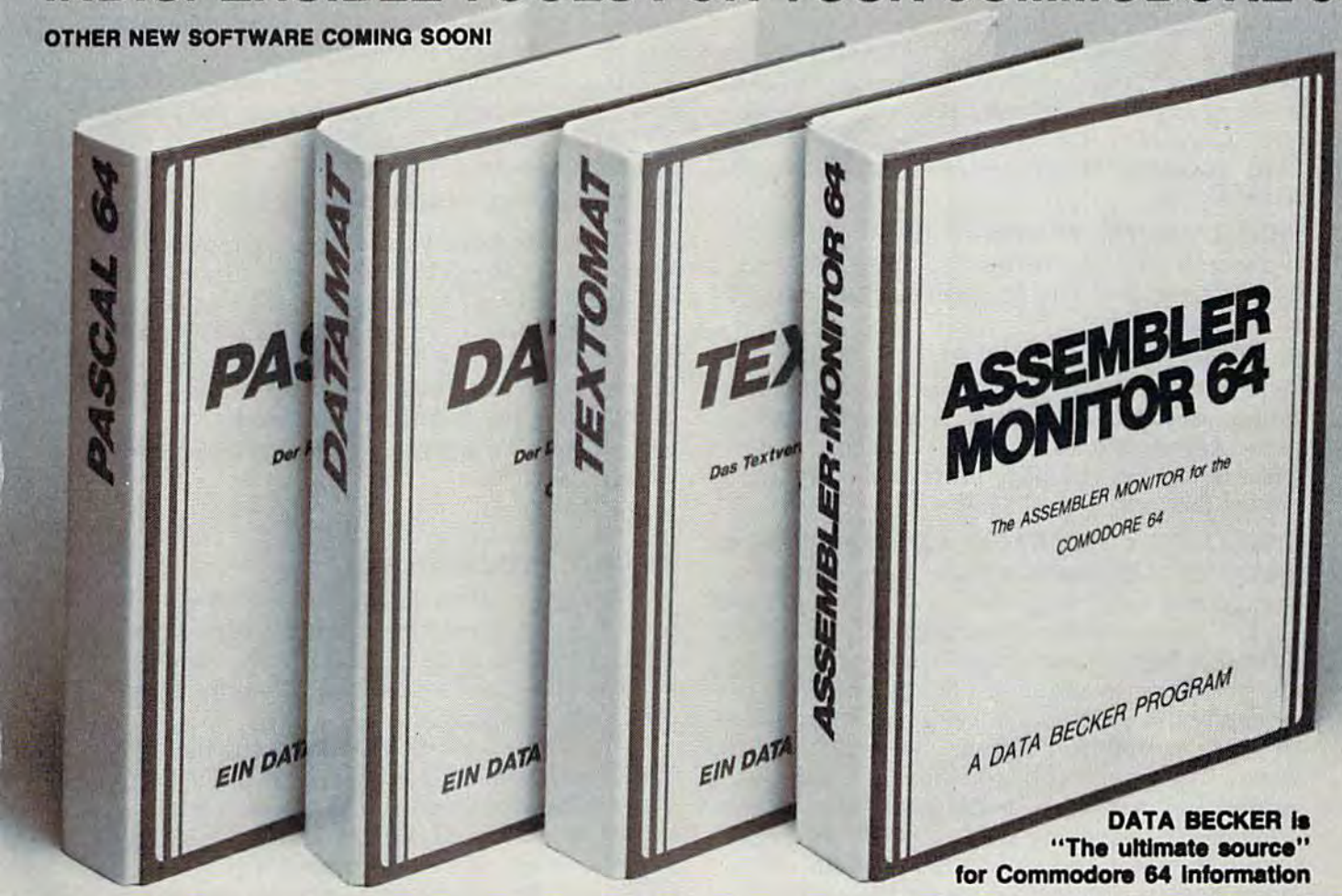

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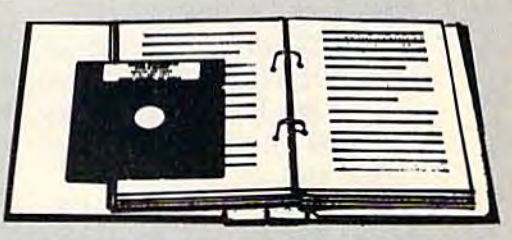

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to 360. Straight up is 0 degrees, and the values increase clockwise. PRINTHEADING returns the current value of the turtle's heading.

SETPOSITION x y (SETP), PRINTPOSITION—Setting the position to (x,y) moves the turtle without changing its heading. The value of x should be between −159 and 160, and y values range from −106 to 106. Note that the range of y will change if you change the "crunch factor" (see "Crunching the Screen"). The turtle starts at (0,0), the center of the screen. PRINTPOSITION returns (x,y).

PENERASE (PE), PENDRAW (PW)—These commands control whether the turtle will leave a trail or erase one. The program starts in draw mode.

PENDOWN (PD), PENUP (PU)—Normally the turtle's pen is down. Penup raises it so the turtle cannot leave or erase a trail. You may still set draw or erase modes, but you will not see any effect until after you have lowered the pen and moved forward.

PENCOLOR x (PC), BACKGROUNDCOLOR x (BC), TURTLECOLOR x (TC)—Each of these changes the color to x, where x is between 0 and 15. The first two will also perform a CLR/HOME. (It's not a bug, it's a feature.) There can only be one pen color on the screen at any time, so executing the PENCOLOR command will recolor all the lines that have already been drawn on the screen. Try a number of combinations of background and pen colors. Because of the hardware problems in displaying isolated pixels on the screen, the same pen color will appear as different hues at different points on the screen. Experiment—you may like the effect, which is known as "artifacting."

SHOWTURTLE (ST), HIDETURTLE (HT)—Hiding the turtle is useful when you want to view a finished design. These commands have no effect on the turtle's color, movement, position, etc.

HOME—moves the turtle to (0,0) and sets the heading to 0 degrees.

CLEAN—erases the hi-res screen. Note that pressing CLR/HOME will *not* disturb the hi-res drawings.

CLEARSCREEN (CS)—performs a CLEAN and HOME.

Combining Commands

The Interpreter will accept lines of up to 78 characters, and you may include numerous commands on each line—just be sure to use spaces between commands (no commas or colons). Here's a simple demonstration to animate the turtle:

```
FORWARD 100 RIGHT 90 FORWARD 100 RIGHT 90
FORWARD 100 RIGHT 90 FORWARD 100
```

These commands cause the turtle to draw a square. Because the Interpreter is in BASIC, the turtle won't move at breakneck speed. (If you are extremely ambitious, you could convert the plotting routine to machine language.)

If you are willing to give up a little more time in interpretive overhead, you can use the powerful REPEAT (RP) command. We can rewrite the commands to draw a square as:

```
REPEAT 4 [FORWARD 100 RIGHT 90]
```

The statements you want to be repeated should be enclosed in square brackets and preceded by REPEAT x, where x is the number of times they should be repeated. REPEATS may be nested to a depth of 255 (although procedure calls will decrease this, as detailed below). For example, try the following commands:

```
CS REPEAT 8 [REPEAT 4 [FORWARD 100 RIGHT
90] RIGHT 45]
```

Using Procedures

The full power of turtle graphics is realized with procedures. A procedure is like a program; it's just a series of commands given a specific name. That name is added to the commands that the interpreter will recognize.

To make up a new procedure, use the DEFINE command. For example, type DEFINE BOX. You will be prompted with BOX?, after which you should type REPEAT 4 [FORWARD 100 RIGHT 90]. The interpreter will respond with BOX DEFINED. From now on, whenever you type BOX (either from the keyboard or from within another procedure) the commands REPEAT 4 [FORWARD 100 RIGHT 90] will be executed. We could define the design above as 8BOXES: CS REPEAT 8 [BOX RIGHT 45].

Each time you call a procedure counts as a level of nesting (just as a repeat loop does). One very important warning: Don't allow a procedure to call itself (or to call *another* procedure that may eventually call the first). This will result in a loop that you will have to break by pressing the STOP key. When you restart the program by typing RUN, you will lose your procedure definitions and any designs on the screen.

There are a number of commands which facilitate working with procedures. NAMES will print the names of all the current procedures (limit of 255). PRINTPROCEDURE x (PPROC) will print the commands associated with the procedure named x. ERASE x will erase the procedure x, and RENAME x y will change the name of procedure x to y. ERASEALL will erase all the current procedure definitions.

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Saving And Loading Procedures

Procedures may also be saved to and loaded from disk or tape. SAVE x will save *all* the current procedures (a "workspace") to a file named "x.turtle"; LOAD x will copy the procedures in "x.turtle" into memory. These will be *added* to those already defined, so you can merge workspaces. Files may be erased from the disk with SCRATCH x, which will erase "x.turtle." While these commands are operating, the screen will seem to go awry; ignore this as it will be restored when the operations are complete.

QUIT will exit the program, but leave the machine in an unusual state. The screen will still be split, but this may be corrected with RUN/STOP–RESTORE. Since memory is reconfigured, you'll want to return it to its normal state. If you don't want to power off and back on again, type

```
POKE 2048,0: POKE 44,8: NEW
```

Crunching The Screen

Because each brand of TV and computer monitor has a different vertical aspect ratio, you may notice that your squares aren't square, circles look like eggs, etc. If so, type

```
REPEAT 180 [FORWARD 2 RIGHT 2]
```

If your design isn't a circle, take a centimeter ruler and measure the diameter along the x and y axes. (These should be easy to identify; just slide the ruler along the screen until you get the maximum measurements in the horizontal and vertical directions.) Divide the x value by the y value. This is the "crunch factor." Change line 50 of Program 1 to set CR to this value. If you are using a Commodore color monitor, the value I've supplied in the program (.74) is appropriate. Note that changing this value changes the scaling on the y axis. The new limits will be ±79/CR.

For Tape Users

You can modify the package to use a tape drive with the following changes:

- Change the device numbers in lines 150 and 170 of Program 3 from 8 to 1.
- Change the word DISK to TAPE in line 80.
- Delete lines 7000–7100, 25000–25060, and line 1280 in Program 1.
- Change these lines in Program 1:

```
23010 GOSUB 5000:IF WD$<>""THEN23018
23014 ER=-1:PRINT"YOU MUST SUPPLY A NAME"
      :RETURN
23018 OPEN2,1,0,WD$+".TURTLE"
23060 CLOSE2:RETURN
24010 GOSUB 5000:IF WD$<>""THEN24018
24014 ER=-1:PRINT"YOU MUST SUPPLY A NAME"
      :RETURN
24018 OPEN2,1,1,WD$+".TURTLE"
24040 CLOSE2:RETURN
```

Program 3 should be saved first on the tape, followed by Program 2, and then Program 1. When Program 3 is loaded and run, it will then load and run the other two programs. For this autoload feature to work properly, you must save the programs with the names shown in lines 150 and 170—TURTLE GRAPHIC 2 for Program 2 and TURTLE GRAPHIC 1 for Program 1. Alternately, you could change the names in those lines to match the names under which you saved the programs.

There is one additional requirement for the autoload feature to operate properly. You *must* leave the PLAY button depressed after Program 3 finishes loading. If you release the button, the PRESS PLAY message will be printed to the screen when Program 2 is loaded, which will prevent the loading of Program 1.

How It Works

Short of rewriting the Interpreter in machine language, there are still a number of modifications you may wish to make to customize the program. I've included these details to briefly give you an idea of how the package functions.

Program 3 reconfigures memory to start loading programs at $4000, leaving $0800–$03FF free for turtle sprite data. Only the last 512 locations are used, so you could put additional sprites below them. The LOADs and RUNs are accomplished by printing the appropriate commands on the screen and filling the keyboard buffer with RETURNs.

Program 2 POKEs in the 512 bytes of sprite data below $0400, and then puts a number of machine language routines in memory beginning at $C000. The first routine is an interrupt-driven split screen routine. It also takes care of checking for f1, f2, CLR/HOME, and keeps text from scrolling onto the hi-res screen. This routine is initialed with SYS 49322. To clean the hi-res screen, use SYS 49295. SYS 49235 will clean under the hi-res screen (1024–1823) and erase the text screen (1824–2023). The hi-res bitmap is stored beginning at 8192.

Here are the important sections of the Interpreter (Program 1):

10–170: Initialization. Frequently used variables and constants are created first to improve speed. Here are most of the variables' functions:

PE	−1 = penup, 0 = pendown
DR	−1 = pendraw, 0 = penerase
C	conversion from degrees to radians
SC	screen base
BL	bytes per hi-res screen line
BB	bytes per hi-res screen block

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MX	MSB of sprite x location
PX	LSB of sprite 0 x location
PY	sprite 0 y location
BG	used for sprite x seam
CR	screen crunch factor
MA	mask
BA	base in computer
C1-C7	constants used in determining sprite position
SP	sprite image number (0–7)
H	heading
CI	degrees in circle
XH, XL	x-hi, lo values
YH, YL	y-hi, lo values
IX, IY	initial x,y coordinates in FORWARD command
X,Y	current coordinates
SS	sprite spacing (45°)
HA	one-half
FF	used as a mask
PC	procedure counter
DH	delta heading
K, QQ, ZZ	temporary numeric storage
T$, ZZ$	temporary string storage
SE	sprite enable
PT	sprite 0 pointer
D	distance traveled
ER	−1 = error, 0 = ok
BY	byte to be POKEd
BI	bit to be POKEd
RO, CO	row, column for upper-left corner of sprite
XS, YS	coordinates for turtle sprite
WD$	current word
NU	numeric input value
PN	procedure number temp
MD$	disk read/write mode
NP	number of procedures in disk file

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200–620: The parser routine is the most complicated part of the program. NE keeps track of the nesting level. The command line typed at the keyboard is assigned to ST$(0). This serves as a permanent copy of the command line. ST(0) is an index into this string (how much has been processed). These are copied into IN$ and IN, which is what we actually work from. Commands are read off (and removed) from the left end of IN$ and executed in 1000–1300; IN and ST(0) are constantly updated.

Whenever a repeat command is found, the nesting level is incremented, the repetition factor is put in RP(NE), and the contents of the loop are put in a new command line, ST$(NE). The parser then executes ST$(NE) as already described. When we reach the end of a command line, we "pop" up by decrementing NE and continuing where we left off in the previous command line. Advanced programmers may recognize this as a stack used to simulate recursion.

Procedures are implemented in the same way. Whenever a procedure name is encountered, we drop down a nesting level, and treat the procedure's commands as the contents of a repeat loop with a repetition factor of 1.

1000–1300: Identifies and executes commands. If you choose to permanently change the name (or abbreviation) of a command, do it here. This section also clears the error flag to 0 (false) before each command. Any command that fails will set the error flag to −1 (true). The parser keeps track of the flag, and aborts all pending commands when the flag is set true. The individual commands all have good diagnostics, and you may assume that your commands have been successfully executed if no message to the contrary is printed.

2000–8000: These subroutines are used by the Interpreter in executing various commands.

9000–22000: Each of these subroutines corresponds to a single command; consulting the variable list should help clarify them.

Sample Designs

Here are some simple designs to get you started:

RECTANGLE: RP 2 [FD 80 RT 90 FD 30 RT 90]

HEXAGON: RP 6 [FD 100 RT 60]

PENTAGON: RP 5 [FD 100 LT 72]

PENTAGRAM: RP 5 [FD 161.8 LT 144]

TWOPENTAS: SETP −60 −80 SETH 90 PENTAGON LT 36 PENTAGRAM

ARROW: RECTANGLE LT 90 FD 15 LT 135 RP 2 [FD 42.4 LT 90] LT 45 FD 15 PE FD 28 PW

HONEYCOMB: SETP −30 30 SETH 330 RP 6 [RP 6 [FD 25 RT 60] RT 120 PU FD 25 LT 60 PD]

See program listings on page 167.

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First Aid

Scott M. Huse

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To use this program, simply type it in and RUN. To select a specific category from the main menu, push the corresponding letter or number. Any key will return the user to the main menu. In order to customize the emergency phone numbers to your specific area, simply substitute your local numbers in lines 550–600.

See program listing on page 159.

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REVIEWS

Software Disk Alignment For The 1541

George Miller, Assistant Technical Editor

Sooner or later it happens: You try to load that exciting new software, but after your disk whirs and clatters for several minutes, you get a READ ERROR. That's not possible, you say. This is a brand new disk. Surely the disk must be defective. So it's back to the dealer, who successfully loads the program into his computer on the first try and then says, "Sorry, your disk drive must be out of alignment."

Can that be true? Of course not. Last night you formatted a disk and saved a program that loads and runs perfectly. But all that tells you is that your drive can read disks it has formatted itself. It reveals nothing about the alignment since those disks have been formatted with the tracks misaligned.

Head misalignment is a common problem with heavily used 1541 disk drives. Almost all of the dozen or so 1541 drives in daily use here at COMPUTE!'s offices have experienced the problem at some point in their service lives. Many of the drives seem to begin to experience head alignment problems six months to a year after being put into service (unfortunately, beyond the expiration date of Commodore's warranty).

The symptoms include the inability to load programs from commercial disks and frequent READ ERRORs when using disks formatted when the drive was comparatively new. Such errors are generally caused by the inability of the disk drive to access track 1 or track 35 of the disk.

Commodore 1541 alignment problems are often related to the fact that the drive's head is logic seeking. In other words, it looks for data on the disk and aligns itself to read the data. This is done by bumping a cam attached to a stepper motor against a fixed stop mounted on the frame of the drive; from there the drive searches for information to indicate that it has found track one.

Unfortunately, Commodore has used a pressure fitting method to secure the cam to the shaft of the stepper motor. Repeated bumping against the end stop will eventually begin to bump the drive out of alignment, and that's when your problem begins.

Misalignment can come about through ordinary use. In addition, commercial software using bad tracks and sectors for copy protection may contribute to an eventual alignment problem. Every attempt to read a bad track forces the cam to hit the end stop, eventually causing slippage of the cam. It should be noted that many normal functions of the DOS (Disk Operating System) can cause the end stop to be hit by the cam.

Until now, the only remedy was to visit a service center (if you could find one), wait until the service technician finds the time to squeeze you in, and then pay the going rate. The price could range from $40 to $85, and repairs could take two weeks to a month or more.

A Quick And Easy Fix

But with *1541 Disk Drive Alignment* from CSM Software, you can fix it yourself in an hour or so and the program will pay for itself the first time you use it. Besides allowing you to bring wayward drives up to specs, it also provides a ready reference to let you determine when your drive is beginning to slip before the problem becomes critical. In fact, if you wait too long to correct alignment problems, you might well find that the disks you wrote most recently are unreadable on your newly aligned drive.

Previously, most disk alignment procedures required at least a calibration disk, a dual trace oscilloscope, and precision alignment tools. This program, however, requires only a 64, a disk drive able to read the program disk, a screwdriver to disassemble the plastic disk drive

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I put auto-dial to work right away. I auto-dialed CompuServe, but couldn't get through, so I had VIP Terminal redial 'til it got through — it dialed five minutes straight! Then I auto-logged on with one of my 20 programmed keys, and downloaded some graphics screens, and stock quotes for dad. I printed it and saved it to disk as it came on the screen. Wow! And now I can send you my programs automatically. I got yours and they worked right off.

Those icons — you know, like the Apple Lisa — are a lot of fun. I also like the menus, function keys, highlights, help tables — great for a newcomer like me. And with the many options there isn't a computer I can't talk to.

What's really neat is that Softlaw has a whole VIP Library of interactive programs, including a word processor, spreadsheet and database, which will be out soon. Sis promised me the whole set for my birthday.

I see by the built-in "old clock" on the screen that long-distance rates are down. Got to call that L.A. BBS. Yep, there goes the alarm. Later.

- Lone

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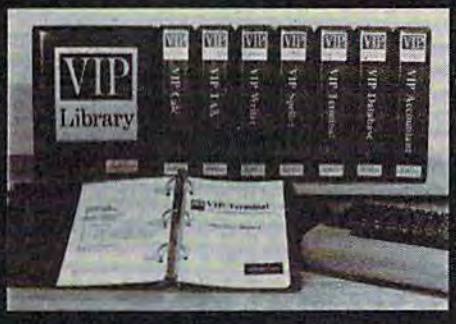

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Who Is Softlaw?

Softlaw Corporation has years of software experience in micros. We currently offer the full-line **VIP Library** for other micros in the U.S. and in Europe. Now we are bringing this experience to the Commodore 64 so you get ultra-high quality software at very affordable prices.

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case, a small screwdriver for an internal adjustment, and a feeler gauge to set the end stop.

In practice, after completing the other adjustments, the end stop is usually well within tolerance, and no further adjustments are necessary. No technical expertise is required to accomplish the alignment procedures, and the manual accompanying the program thoroughly describes the procedures.

To use the CSM program, simply load it into your 64 and follow the instructions in the manual. If your drive is very far out of alignment, the program may need to be loaded from a working drive, although it worked fine with each of the misaligned drives we tested it on at COMPUTE!.

The program includes checks for proper operating speed, a program to set the stepper motor correctly, and a test program for proper alignment, which allows you to adjust for the best possible alignment of your drive.

For disk drives that are badly worn and simply will not hold an alignment, the Fix is included. This is a method of securing the cam to the stepper motor shaft. It requires some additional tools, as well as a bit more technical and mechanical ability, but it may give your old drive new life. It certainly beats the price of a new one.

Included in the CSM package are *1541 Disk Drive Alignment*, *1541 Disk Drive Alignment Calibration*, and the instruction manual. Anyone with average mechanical ability, patience, and a little caution (you're working with an exposed circuit board and power supply plugged into a potentially dangerous 117 volts) can do his own alignment, or at least run a reliable test to judge the alignment.

The program is compatible with the 1541 and with the built-in disk drive on the SX-64. Due to the difference in speeds between the 1540 and the 1541 disk drives, the speed check and adjust program included with the program will not work properly on the faster 1540s. *1541 Disk Drive Alignment* should surely be part of every user's group library, and is a wise addi-

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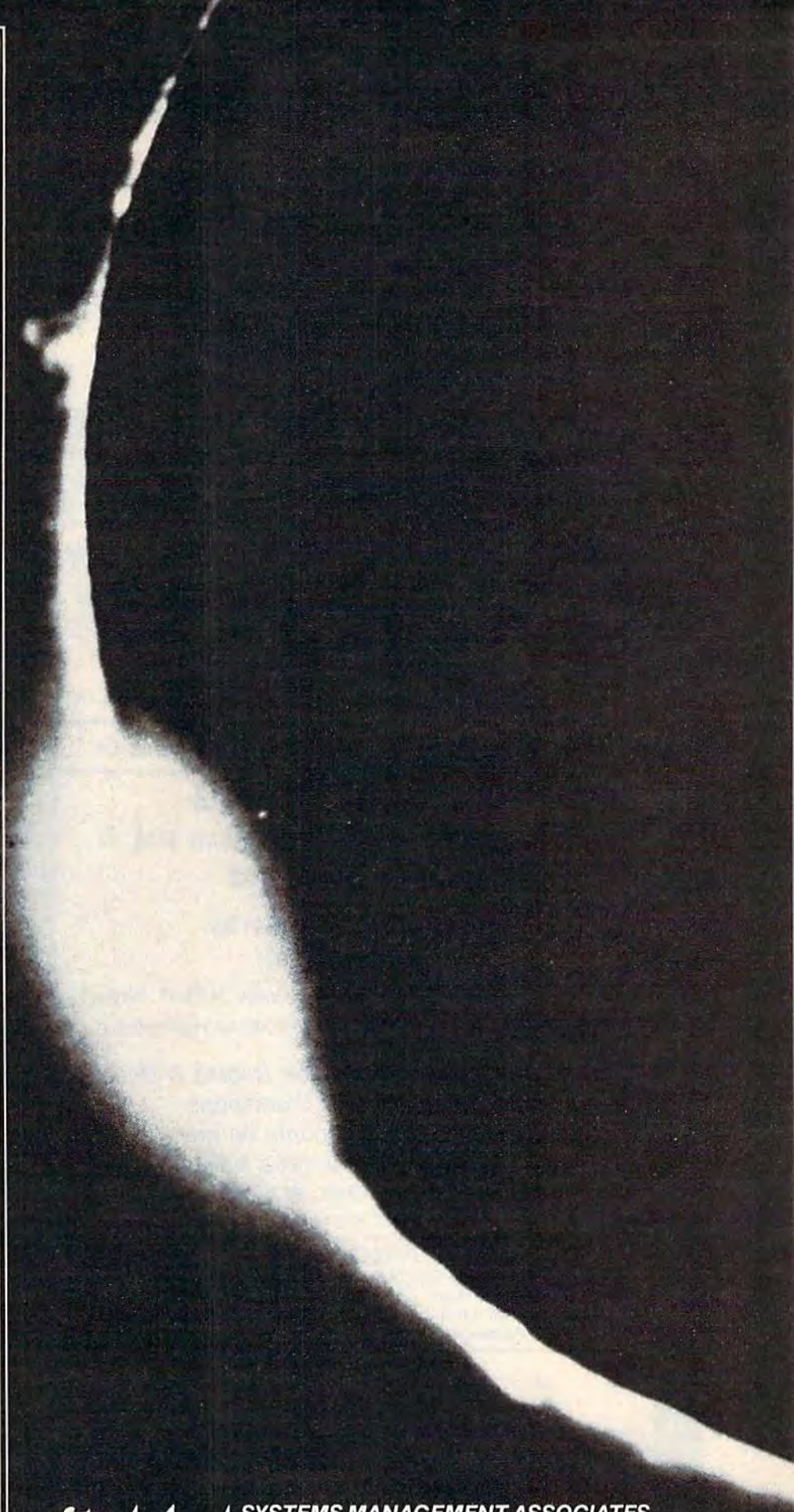

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Two Flight Simulators For The 64

David Florance,
Programming Assistant

Commercial flight simulators were developed for one very good reason: Airplanes cost a good deal of money. When a student learning to fly makes a mistake, it's better for the mistake to happen in a simulation of an airplane safe on the ground than to lose an entire aircraft.

Some software companies have recently adapted flight simulators to personal computers. You can't expect to use these programs to qualify for a pilot's license, but they're both fun and educational.

A flight simulator combines strategy (how much fuel is left, what the airspeed and altitude are, etc.) with action (split-second decisions to climb or dive). Often you can choose the level of difficulty. You may want to go for a joy ride, swooping up and down among the clouds. Or you can make it into a game, where you have a specific goal—delivering the mail on time or shooting down enemy planes, for example.

Since flying a plane is more complex than driving a car, there must be some tradeoffs. If you want realism, the program must be fairly detailed. If you want playability (and fun), some aspects of "real" flight must be sacrificed.

Two flight simulators from two different companies well illustrate the tradeoffs. *Flight Simulator II* from subLOGIC is

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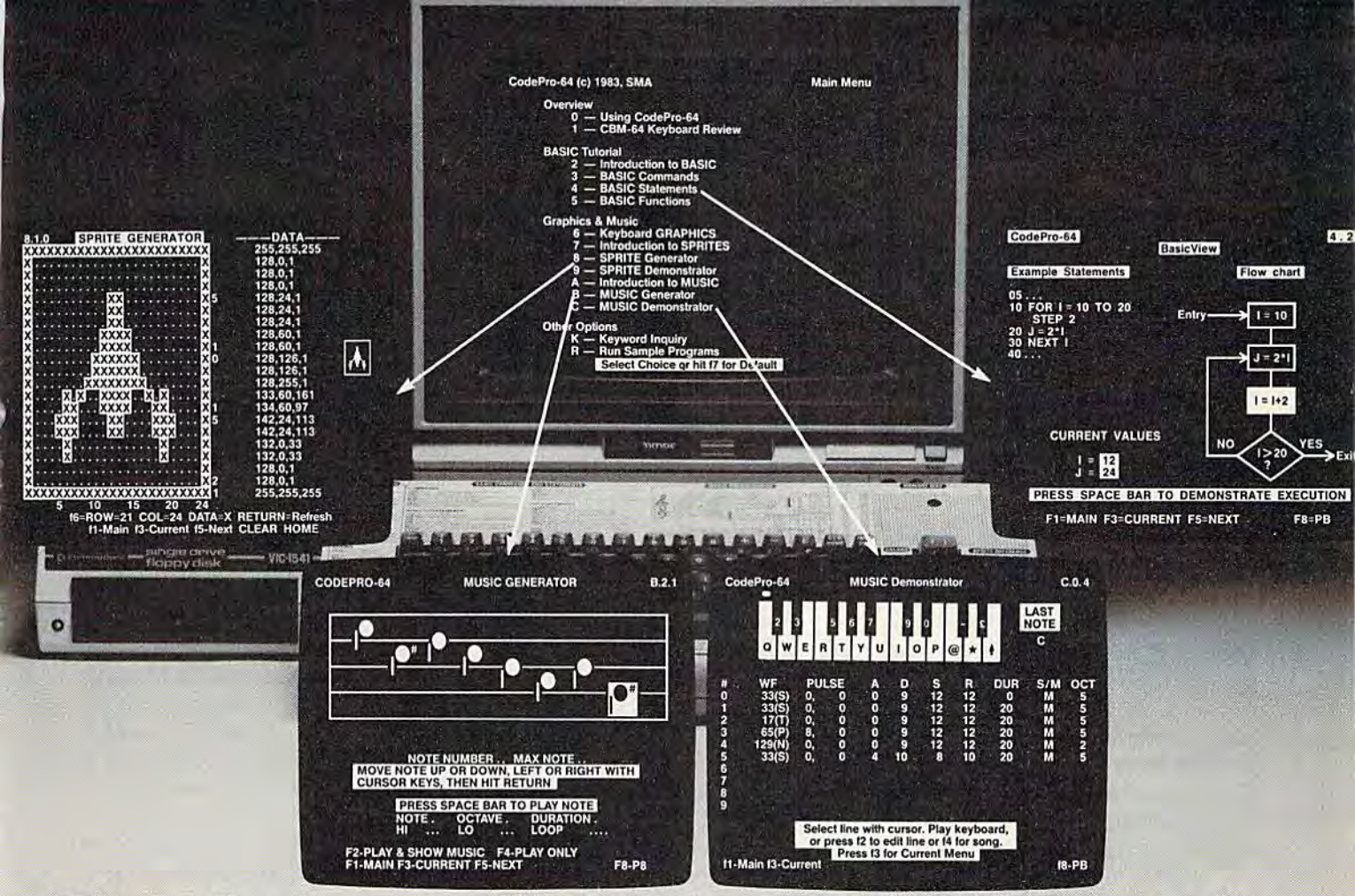

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likely the most realistic in its approach; but its complexity may be daunting to a beginner. *Solo Flight* by MicroProse is perhaps easier to learn, but less realistic as a simulator.

subLOGIC's *Flight Simulator II*

If you know nothing about flying, *Flight Simulator II*, by Bruce Artwick, may overwhelm you. This is not a simple simulation. Your first step should be to read the manuals which are included in the package. The main handbook explains the keyboard and joystick operation of the aircraft. The FS2 is designed to simulate the performance characteristics of a Piper Cherokee Archer II.

Before you begin, perhaps you should read Flight Physics, the manual that explains how an aircraft operates. Once you know a bit about flying, you'll be better prepared to enjoy (and understand) the simulation. Even if you've done some flying, you'll benefit by reading the flight physics manual. It provides a good overview of a flight instruction class.

Once you've learned a little about flight physics, you should become familiar with Figure 1 in the handbook. It explains the various instruments you'll be working with. These instruments should be constantly monitored during flight because they indicate your airspeed, attitude, altitude, heading, and throttle at a glance.

Practice makes perfect. When using the keyboard, remove the flight reference card included in the package and have it in a strategic location for easy reference. Play around a bit to become familiar with the F, H, G, B, V, R, C, M, and T keys, and their uses. As you improve your flying skills, you'll learn how to use navigational aids such as the VOR, the ADF, the NAV 1, NAV 2, and COM radios. You can use the 3-D display window to look around you from nine different perspectives. Finally, there is the radar view, which is indispensable when taxiing on the runways.

With the Editor, you can redefine current flight parameters. The User Mode Library gives you ten preset modes and options to save and load player-defined modes. You can use the Editor to set cloud layers, wind factors, seasons, and even the time of day. Say, for instance, you want to work on landing skills. You would call the Editor, set the flight parameters for just prior to a landing, save it in the Library, and reenter the flight mode.

Without a working knowledge of the instruments, you'll have trouble making successful flights. You won't fly far if you haven't practiced banks and yaws, or the use of the elevators. You'll sometimes crash, but don't be discouraged when it happens.

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identically equipped. Larger facilities will make use of more sophisticated equipment. There are hours of exploration within each region.

Flying from one region to another is possible, too, but it may take four or five hours. Slewing, or exponential travel, is an alternative to realtime flying. It allows you to rapidly travel great distances in little time.

In addition to the four regions available for civilian flight, there is a fifth, the World War I game in which you are placed in Europe in 1917.

One Of The Best

Flight Simulator II is interesting, challenging, graphically superb, diverse, rewarding, and just plain fun. And the documentation is great. In terms of realism, it sets the standards.

There are two slight drawbacks. The instruments are more delicate than on aircraft like the Piper Cherokee. There are legitimate arguments that this is the way a flight simulator should respond. On a computer simulation, some would prefer to see more realistic controls which give a response exactly like the real thing. The other drawback is the obvious one that applies to all computer flight simulators. The absence of rudder pedals and the controlling of the aircraft using keys or a joystick may befuddle pilots who are used to real controls. These drawbacks, however, are outweighed by the sheer delight this program brings.

Solo Flight By MicroProse

An exciting realtime simulation, *Solo Flight*, by MicroProse, offers sharp graphics and realistic controls. It allows the player to learn quickly, and to advance quickly into more difficult levels of play. This is a flight simulator that everyone can enjoy the first few times it is played.

You don't have to know a lot about flying to get going. Simply load the program and choose your options. There are three states in which to fly: Kansas, Washington, and Colorado. After choosing one of them (with or without the Mail Run) you can choose a difficulty level. It's probably best to start out on the student level.

Send your throttle up to at least 6 or 7, and pull back on the joystick as soon as your airspeed indicator (the dial on the right of the display panel) reaches 60. You're on your way!

You'll immediately notice the striking view displayed on the top half of your screen. You are inside the aircraft, but what you see is the rear of your plane, as if you were in another aircraft tailing the one you're flying. This gives you more time for making decisions while in flight. You see more of your surroundings, and at low altitudes there is even a shadow of the aircraft. Because of this view from behind, you'll not crash as much with *Solo Flight* as with other simulators.

If you've seen and tried other flight simulators, this one will seem easier to handle, particularly on the student and private levels. If you've flown a bit before, you'll find a challenge on the senior and command levels.

Use the arrow keys to get additional views of your surroundings. Look left, right, down, or behind to see exactly where you are.

The Instruments

Learning to fly well in *Solo Flight* depends on how soon you become familiar with the dials on your instrument panel. Get a feel for these and before long you'll be soaring. While the two large dials (altimeter and airspeed) and the one small one (attitude or artificial horizon) are important, don't overlook the four digital displays on the lower left. They give your pitch (position of the nose relative to the ground), flaps extension, directional compass reading, and climb. These become increasingly important as you move up in levels of play.

The instruments also include two VOR (very high frequency omnidirectional range) readouts. Use these as navigational aids. The ILS (instrument landing system) gives you an idea of what kind of approach you are making.

Learning To Land

As always, the most intricate part of flying is getting back on the ground. A combination of the Commodore 64's hi-res capabilities and the effective graphics designed by Sid Meier make landing this plane visually exciting.

The aircraft has landing gear, so don't forget to lower the wheels before you touchdown. You will find landing more involved than taking off, but after a few tries you'll improve.

Delivering The Mail

Also included in this software package is a game in which you deliver mail to different cities. You choose the state, and the computer tells you what cities to deliver to. Points are received

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PHOENIX LAIR is a ten board arcade game playable at any of ten speeds, and introduces a new concept to home arcade excitement: the interlude board. After each board, you are in a head-to-head joust for bonus points, making PHOENIX LAIR two games for the price of one! The ten levels of play begin with one training level, but rapidly escalate to complex levels requiring problem solving at arcade speeds. As the Phoenix, you must destroy the enemy's eggs found throughout your cave, to progress from one board to another. Different strategies and reflexes are required for each board, ensuring that PHOENIX LAIR is one home arcade game you won't soon master. Disk only; $29.95.

FILE-IT 2+

Finally! A user friendly package for your C64 to help you get organized. Designed to be used for your business or for your home, FILE-IT 2+ is an extremely easy to use, complete, powerful financial database management system. These programs can perform mathematical calculations on any selected fields of the six available, and can treat data either numerically or alphabetically. You can sort any field at machine language speeds for rapid sorting of up to six levels, and you can save both the sorted data and your original database separately. Most popular printers, and up to four disk drives are supported, and file merging is simple and straightforward. You can also use FILE-IT 2+ to print labels for your mailings! Use FILE-IT 2+ to follow your family finances or to help prepare your income tax. Disk only; $49.95.

TRIVIA TREK

This classic program is now available for the C64! Trivia fans—this one's for you. Rated 10 out of a possible 10 by independent review. Terrific at parties, or great for the whole family for nights and nights of fun. This multiple-choice trivia game allows two players to compete against each other or one player to compete against the computer, from a database of 500 trivia questions in 50 categories; the disk contains 2000 multiple choice answers for many evenings of fun. Even when you've exhausted these questions, the program allows you to add your own trivia questions and answers, either from classic trivia sources, from your own family history, or from your friends' and relatives' backgrounds. If you're looking for family fun with your C64, or for a really great party theme, TRIVIA TREK is the program for you. Disk only; $29.95.

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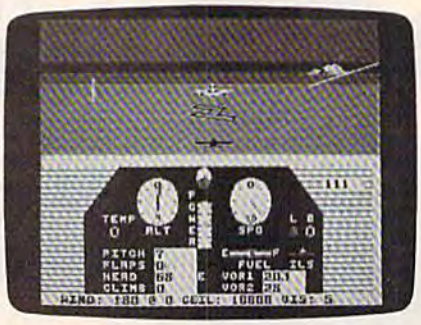
Approaching New York's Kennedy International in Flight Simulator II.



Note the shadow of the aircraft about to land in Solo Flight.

by choosing more difficult routes and levels, using little time, and delivering as much mail as possible.

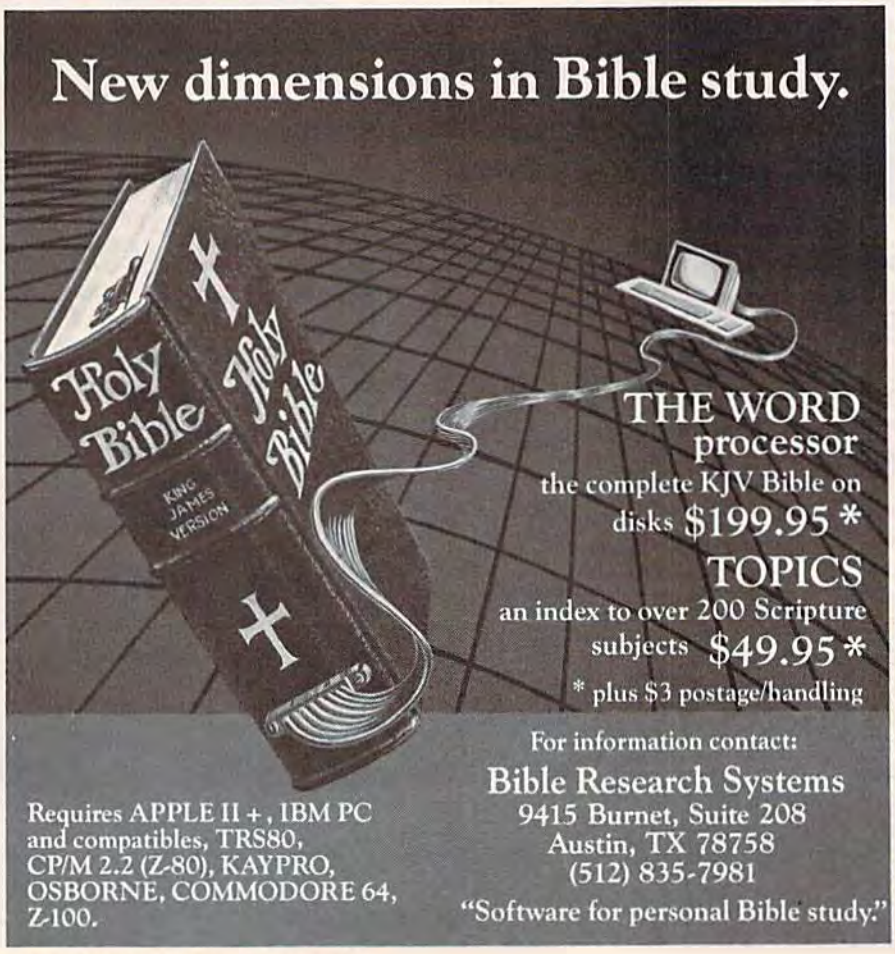
The interesting part of the game comes when the weather, which starts out fair, gets worse. Don't be surprised if your airplane turns, banks, or slips when you didn't want it to. If you deliver enough mail, you may even see clouds form on the screen. To make the scenario even more challenging, your instruments sometimes lose their reliability. When this happens, you must land at the nearest airport for repair.

Flying For Fun

The word that best describes *Solo Flight* is fun. You are rewarded quickly for good flying techniques. The game is easy to use, visually pleasing, and fast moving. And it's appropriate for those who don't wish to spend a lot of time reading, but would rather be flying.

Flight Simulator II
subLOGIC
713 Edgebrook Drive
Champaign, IL 61820
$49.95 (disk)
$39.95 (tape)

Solo Flight
MicroProse Software
10616 Beaver Dam Road
Hunt Valley, MD 21030
$34.95 (disk)



Calc Result: A Spreadsheet For The 64

Emily Herman

If you don't know how a spreadsheet program works, *Calc Result*, from Handic Software is a nice way to get acquainted. Two versions are available: *Calc Result Easy* and *Calc Result Advanced.*

The advanced version is not any more difficult to learn. In fact, the manuals are identical when covering features common to both versions. The most significant difference is that *Calc Result Advanced* can store twice as much information as *Calc Result Easy*. It also costs $70 more.

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Built-In Functions

Both versions have a matrix of 63 columns and 254 rows, but, in fact, it's not possible to have a sheet that uses all these positions. *Calc Result Easy* can store about 1000 positions, and *Calc Result Advanced* about 2000. At each position on the sheet you can input labels (alpha, numeric, and special characters), or values (numeric data or formulas).

A good selection of built-in functions is available and may be incorporated in the formulas. Functions available are: COUNT, MAX, MIN, MEAN, STDDEV, SUM, NPV (net present value), ABS, FRAC, INT, LN, LOG10, SQRT, RND, IF-THEN-ELSE, OR, AND, and NOT. For example, at the end of a column of numbers, a position could contain the formula "MEAN(B1:B10)". This would calculate the average of the numbers in positions B1 to B10. The average (not the formula) would then be displayed on the sheet. If any of the numbers were subsequently changed, the average would automatically be recalculated. *Calc Result Advanced* also has trigonometric functions.

The cursor keys or a GOTO command are used to move around the sheet. You then type information into each position. Position contents can easily be blanked out or edited. At any point, rows or columns can be added, deleted, or moved. Values or labels can be replicated across or down the sheet. Numbers can be displayed in maximum precision, integer, or dollar and cents (two decimal places) format.

If a value is displayed in integer format, the decimal value is still stored in memory

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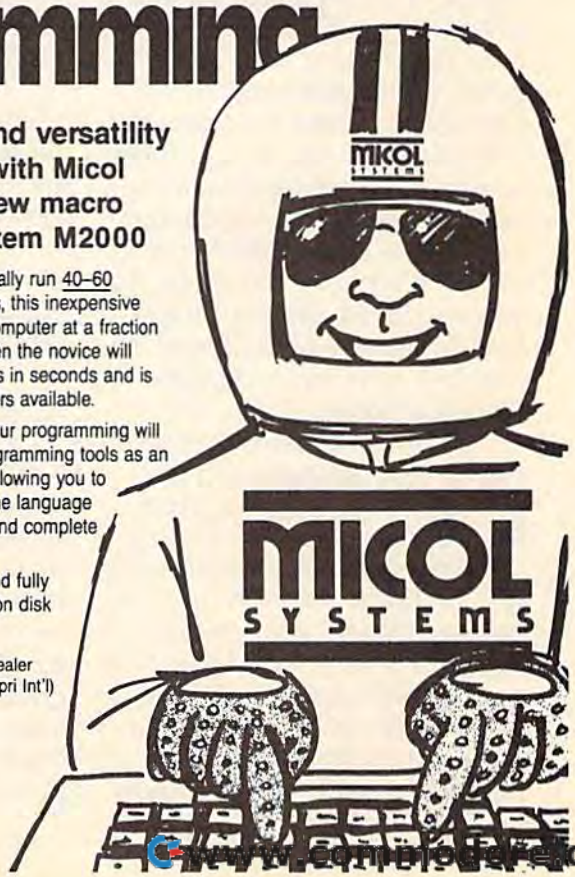

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and will be used for calculations. Labels are left justified and values are right justified, but this can be altered. Columns can be between 5 and 18 characters wide. The columns displayed on the screen are the same width, but they can be printed out in varying widths. A label that is longer than the column width is stored intact even though it is not displayed completely on the screen. Titles can be fixed so that they will be visible as you scroll across (but not down) the sheet. Formulas are calculated by columns, from left to right, but this can be changed to calculate vertically by rows.

Saving And Recalling

Spreadsheets can be stored and later recalled. Templates (a report form set up with headings and formulas) can be made, saved, and later called up and filled in. The filled-in form is then saved using a different name so that the template can be used again the next time it's needed. For example, you might want a template for a monthly sales report. The formulas and column headings would stay the same from month to month, but you would use different numbers within the form. Templates can save time when used for regular reports.

Entire spreadsheets or sections of spreadsheets can be printed out, even in bar chart form if you prefer.

Two features available only in *Calc Result Advanced* are paging and DIF (Data Interchange Format) files. With paging, multiple pages of the same form can be created and include a summary page. It's possible to load different pages at the same time. DIF allows data to be stored so it can be used in programs other than *Calc Result Advanced.* Files saved with this command save only the values derived by the formulas used in the spreadsheet, not the original formulas. Formatting information is not saved either. (In fact, I saved a spreadsheet with *Calc Result Advanced* and was able to load it in *Visicalc* on a CBM 8096.) DIF files are also very handy if you want to save part of a sheet and then incorporate it into another *Calc Result Advanced* sheet.

Calc Result Advanced also has help screens, and these are available in several languages.

The Manual: Not For Beginners

The manual does not have an index, an annoying omission for beginners. One must search through the table of contents and the manual itself to find information.

The novice will also be confused by some of the pictures of the screen in the tutorial. In several instances, the displays show what the screen will look like several steps later. The manual was also a little sketchy in places where I would have preferred more detailed information.

At the very beginning, a little discussion about the difference between SHIFT SPACE and SPACE (unshifted) would have been helpful for the computer novice. SHIFT SPACE is a toggle that indicates whether or not a position contains a label or a value. For the first example you are instructed to type in GROSS INCOME as a label. If you have SHIFT LOCK down when you type, your entry will change from a label to a value when you press the space bar for the space between GROSS and INCOME.

Overall, these omissions are minor in context, only annoying to beginners or, perhaps, first-time users. The manual is well organized and the program itself offers many good features, and is easy to learn and use.

Calc Result
Handic Software, Inc.
Fellowship Rd. B-206
Mt. Laurel, NJ 08054
Easy, *$79.95 (disk)*
Advanced, *$149.95 (disk)*

Write Now! For The VIC-20

Harvey B. Herman, Associate Editor

Not everyone likes computers. Many people secretly—or not so secretly—detest them and feel that certain applications ought to be done by real people, not by impersonal machines. Even so, these same computerphobes grudgingly concede that if we must have them, then their most appropriate use is word processing.

A Bewildering Choice

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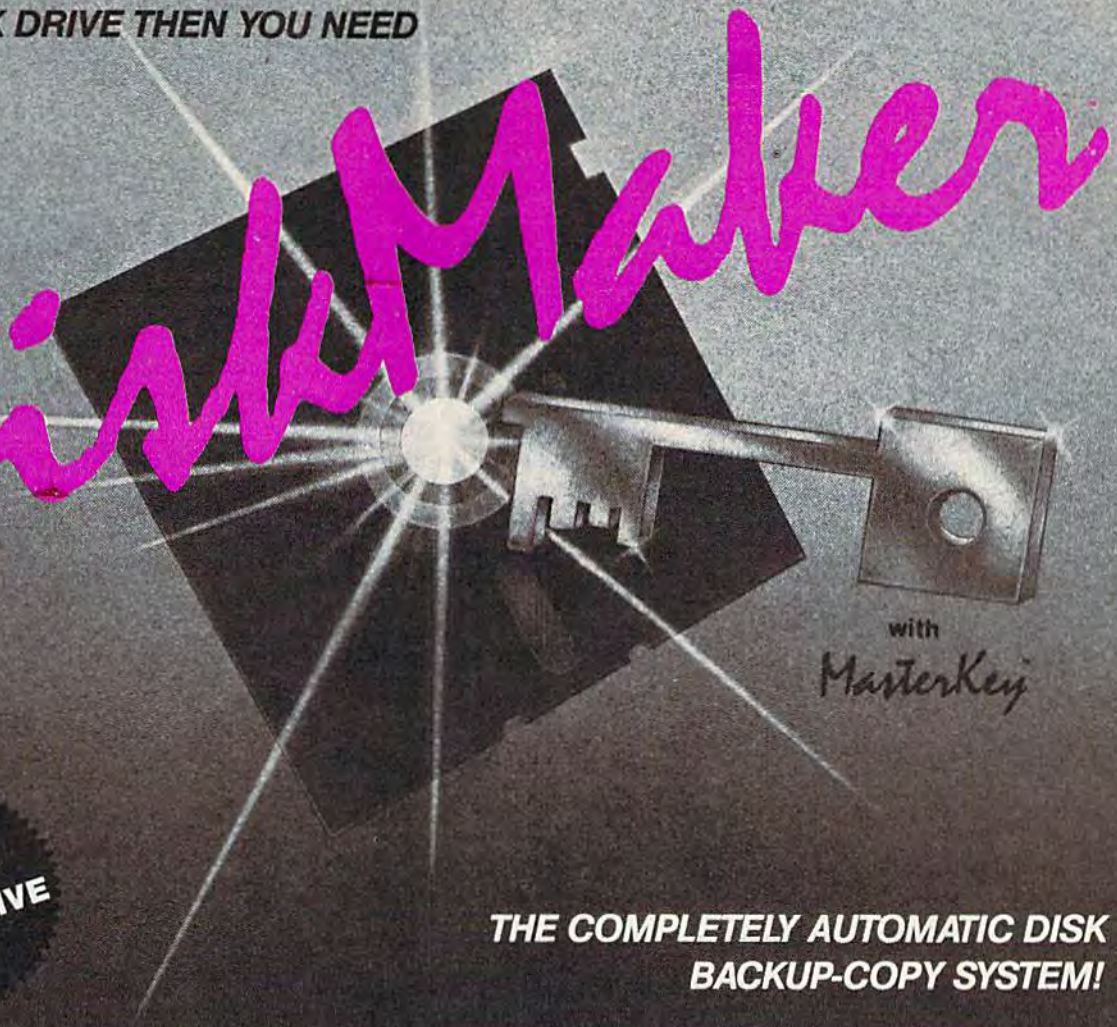

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categories; you could easily pay half the cost of a VIC for a word processor. Each company touts particular features which it claims will make your choice obvious. But which features are really important?

First, to begin your selection process, talk to your friends who have and use word processors. See if a demonstration can be arranged, and read reviews in magazines. And make certain it will work with your equipment. This last point is crucial and might be worth getting in writing. I can imagine the sinking feeling of 40/80 column board owners who read in their *Write Now!* manual, too late, that the program won't work with one.

Simple And Easy To Use

Write Now! for the VIC (a 64 version is available also) is, in a word, friendly. I don't subscribe to the view, held by some, that it can be used without a manual. Nevertheless, it is one of the easiest to learn of the word processors I've tried.

Here's why: It comes with an audio cassette tape which gives elementary lessons on program operations. It has keyboard overlays so you won't forget the meaning of special keys. And it has a professionally written, easy to follow, instruction manual.

A novice should find *Write Now!* unintimidating because it's so simple. When writing a paragraph, you keep on typing (never hitting RETURN) until the paragraph is finished. The program will format the lines properly on the final printout—a point first-time users find confusing on any word processor.

Formatting is controlled by "dot" commands on separate lines. For example, use ".ls 1" if single spacing of printed text is desired. Change the 1 to a 2 next time and you get double spacing without having to reload the whole document. No wonder everyone is smitten by word processors.

To better illustrate the dot commands, here's the way my screen appeared as I wrote this review:

```
.lm 5←
.rm 75←
.he 1 Write Now!←
.bm 3←
.ls 1←
.pl 66←
.pn 1←
.pc 15←
Review          VIC-20          Cart
ridge                           3/10/84←

Reviewed by Harvey B.
Herman←

Not everyone...
```

Plenty Of Features

Write Now! has many of the features of more expensive word processors, including search and replace, and a deleted character buffer. Search and replace allows you to change the spelling of one word appearing throughout a file. The delete character buffer is made for people whose fingers move faster than their minds. When characters are deleted, they are stuffed into a 256-character reserved area (buffer). If desired, the deleted characters can be recalled with one key press.

Space limits a full discussion of the many operations included with this word processor. At the end of this review is a brief summary of the operation of the special keys, whereby text is manipulated, loaded, and saved (disk or tape), etc., and the dot commands which control the formatting of the printout. You should keep a list of the dot commands nearby until you learn them. This is not necessary for the special keys because

Special Keys

Print	
Save/Load	
Dump/Clear buffer	
Free space	
Bottom of text	
Exit	
Set/Go to mark	
Delete word	
Search/Replace	
Options	
Block	– mark start
	mark end
	go to start
	go to end
	copy/delete
	write
Tab	– key/set/clear/display
Up/Down page	
File position	
Directory	

Dot Commands

.lm	left margin
.bm	bottom margin
.ls	line space
.cj	center justify
.pp	page pause
.rn	Roman numerals
.rc	redefine char
.sp	printer code
.bb	building block (for printing long text files)
.tw	text width
.pl	page length
.fj	fill justify
.pa	page advance
.wa	wait
.ru	Roman upper
.df	default
.pc	prefix character
.tm	top margin
.pn	page number
.lj	left justify
.cp	conditional page
.nc	number column
.he	header sequence
.es	escape sequence

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of the overlay previously mentioned.

There appear to be two minor flaws. There is no word wrap and it may be awkward to interact with all printers. It bothers some people to see words broken up on the screen. For example, on the one I'm using now, "manuscr" appears on one line and "ipt" on the next. This doesn't happen with a word wrap feature. However, the alternative may not be practical on the 22-column VIC.

The other flaw, if you can call it that, is a consequence of the requirement that dot commands appear on separate lines. Some printers must receive elaborate character sequences to control operations, and dot commands would be used for this. Your text on the screen, consequently, is not continuous and is difficult to read and correct. This problem is not unique to *Write Now!*, however.

Write Now! is an excellent program for anyone who intends to do word processing on the VIC. It has features which make it very attractive, it's inexpensive, and it even works on an unexpanded VIC.

Write Now!
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Wichita, KS 67214
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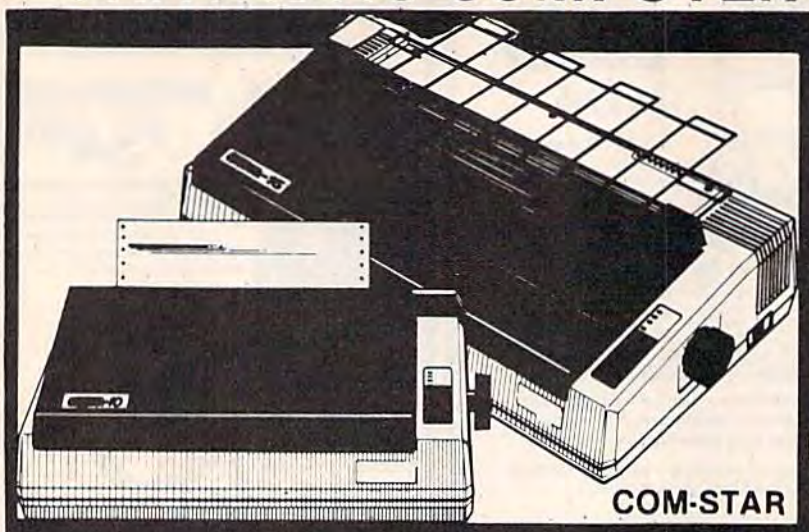

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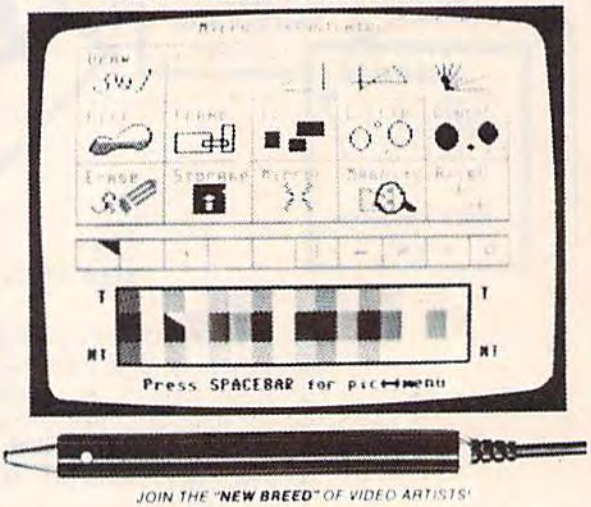

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