Inexpensive Word Processors For VIC And 64

COMPUTE!'s GAZETTE

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October 1983
Issue 4 Vol. 1, No. 4
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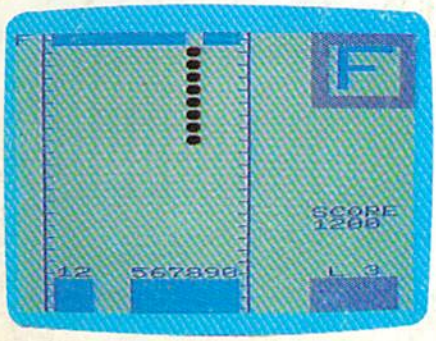
For Owners And Users Of **Commodore VIC-20**™ And **64**™ Personal Computers

Speeding Up The VIC-20

A simple programming technique can speed up your games and other programs – without machine language.

Educational Games
Aardvark Attack & Word Match



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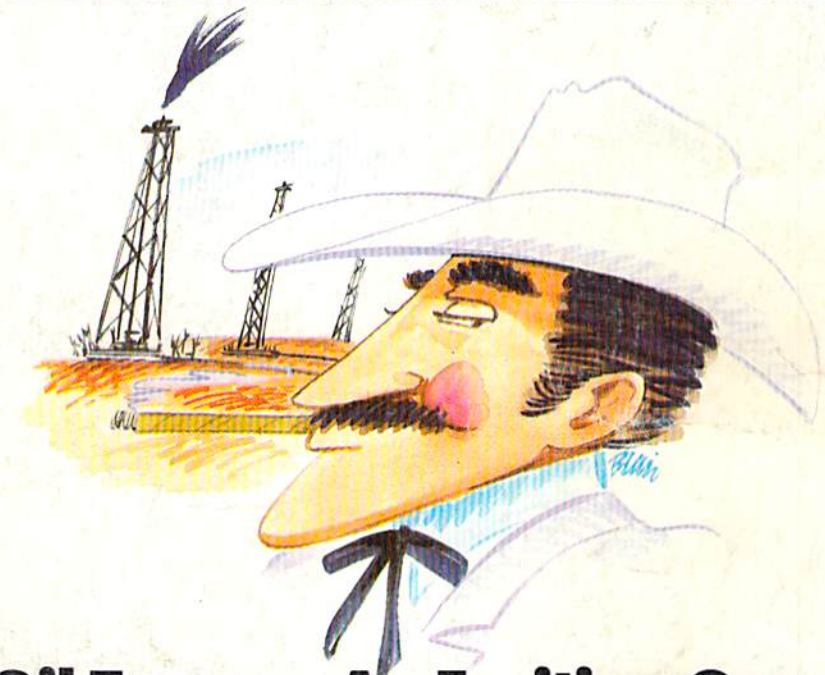

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Also In This Issue

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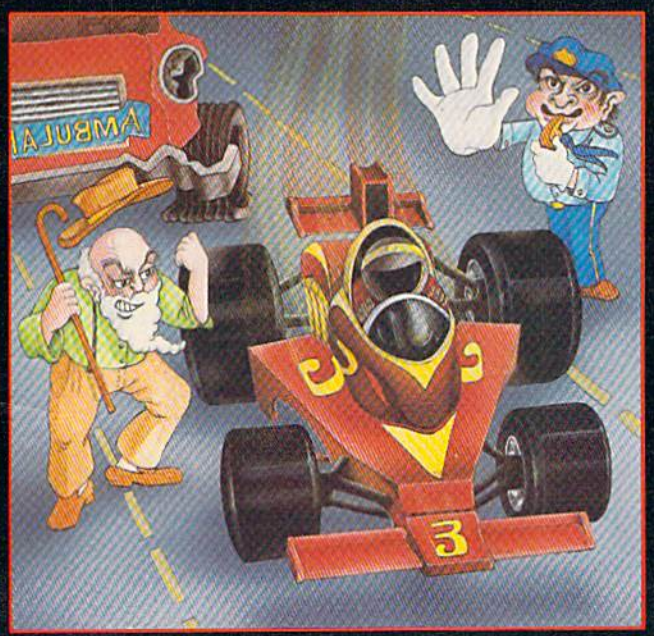

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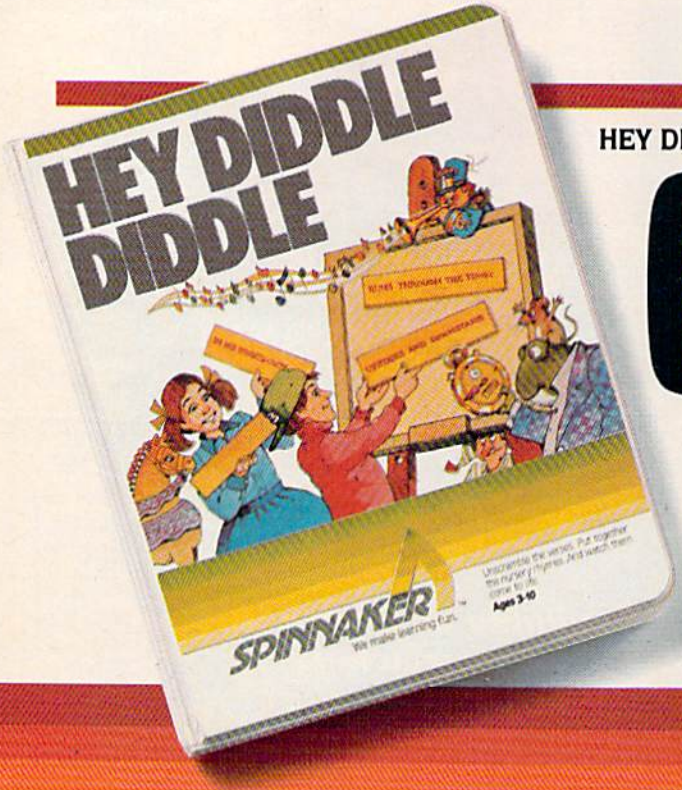

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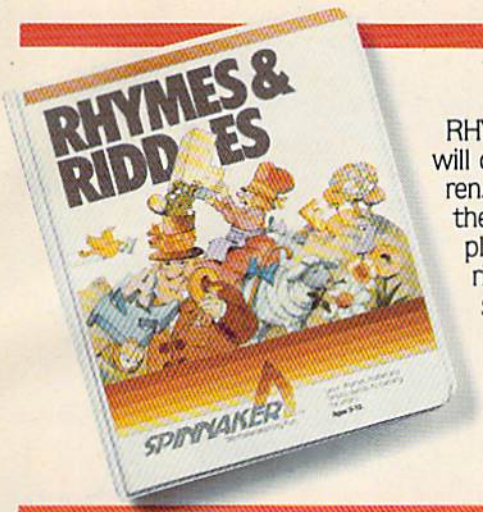

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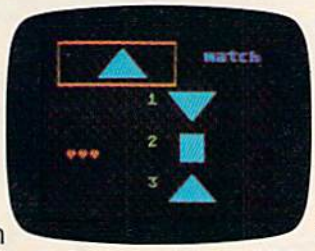
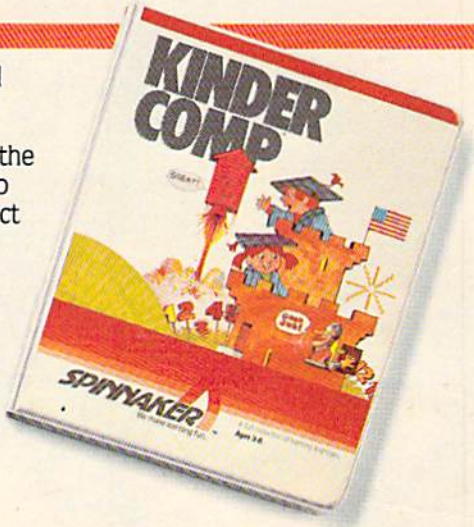


KINDERCOMP is a game that allows very young children to start learning on the computer. It's a collection of learning exercises that ask your children to match shapes and letters, write their names, draw pictures, or fill in missing numbers. And KINDERCOMP will delight kids with colorful rewards, as the screen comes to life when correct answers are given.

As a parent, you can enjoy the fact that your children are having fun while improving their reading readiness and counting skills.



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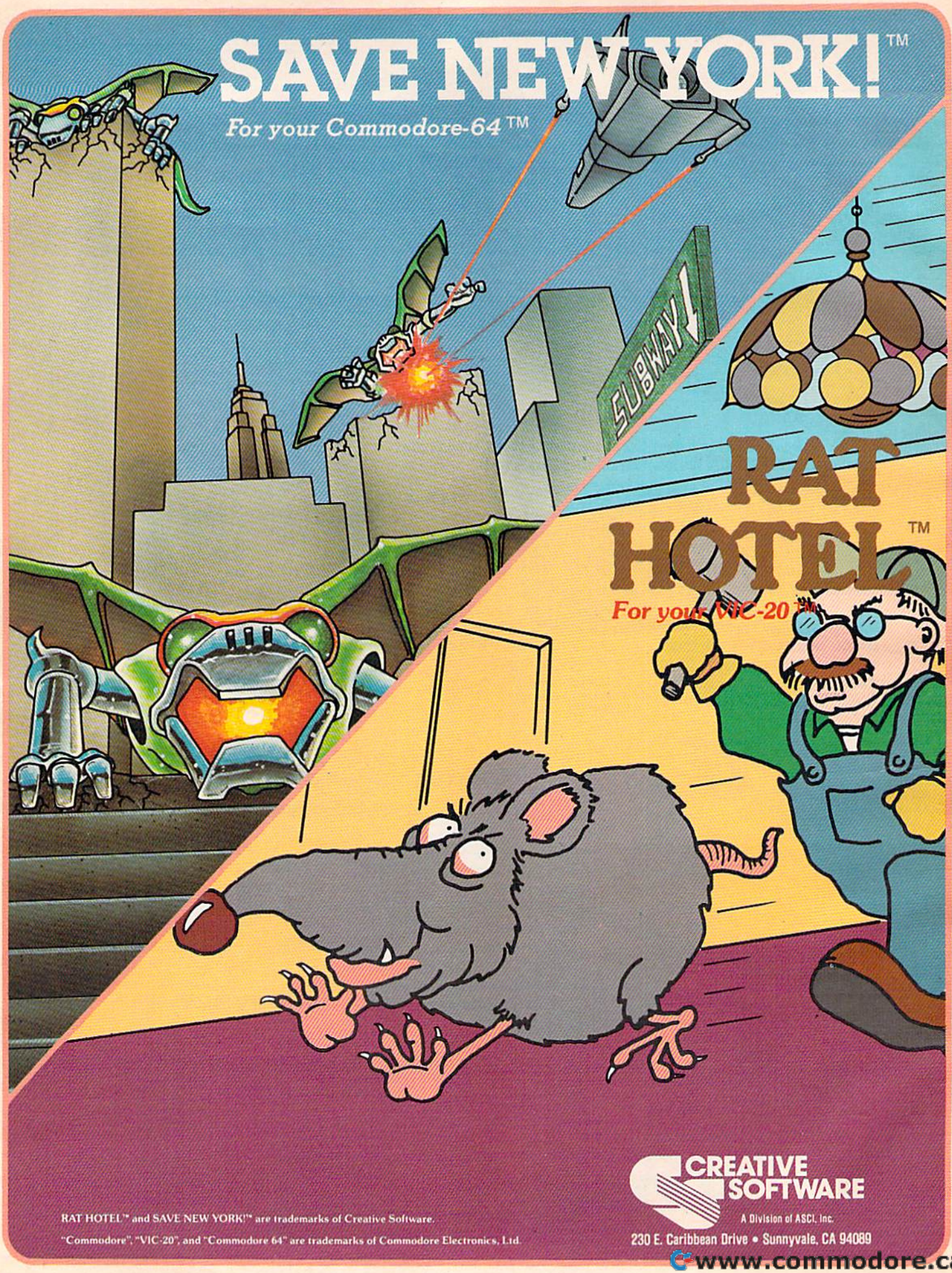

FEATURES

GAMES

REVIEWS

EDUCATION/HOME APPLICATIONS

PROGRAMMING

DEPARTMENTS

PROGRAM LISTINGS

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

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THE EDITOR'S *notes*

The acceleration of Commodore personal computer sales continues. Our reading indicates that VIC-20 sales are not slowing down at all, and Commodore 64 sales are increasing. Best estimates are that by the end of 1983 we'll have an installed base of between 2,000,000 and 2,500,000 VICs and 64s. That is a lot of users. What does it mean for you existing owners? Well, first of all, you'll have to balance your feelings about the declining prices of the hardware with the realization that if you'd waited you wouldn't have been this far along in learning to use your computer. More importantly, for the future, it means you'll see more and better software and support materials at more reasonable prices. That should be the true benefit of this rapid expansion in the installed base. Increasing quality and declining prices... we'll keep our fingers crossed.

By the time you read this, our first two books for the Commodore 64 will be released, plus our second and third books for the VIC-20. Among the September/October titles being released by COMPUTE! Books are *First Book of VIC Games, Second Book of VIC, First Book of the Commodore 64, VIC Games For Kids, First Book of Commodore 64 Games* and *Creating Arcade Games on the VIC*. They're all of the same level of quality you've come to expect from COMPUTE! Publications, Inc. Check your local book or computer store for availability.

Automatic Proofreader, by Charles Brannon, appears in this issue. Those of you who have experienced problems with typing errors, etc., while entering programs will be quite pleased. This program literally checks *each* line of the program and lets you know if the line has been correctly entered. While the concept is not unique, the most useful part of the process is that it lets you know after each line is entered rather than waiting until all lines are entered. Thus, if a line is entered incorrectly, you can fix it immediately. Read Charles's article for full details.

Within the next few weeks, many of you will be receiving a reader survey (if you haven't already). Please take the few minutes necessary to fill out and return the questionnaire. It's invaluable to us in profiling you, our active readers.

Horizons: 64, our new column for 64 owners will now begin appearing each month. Horizons will be authored by Charles Brannon on a regular basis, replacing Larry Isaac's column, "64 Explorer." For you devoted fans of Larry's insight into the inner workings of the 64, don't despair, he's moved the column to COMPUTE! on a monthly basis. We felt that with this move, Larry could turn to the more technical side of the 64 where he excels.

Our growing editorial staff is in need of experienced writers. Our offices are located in Greensboro, NC, an excellent area to live and work. If you have a writing or journalistic background, and experience in the personal computer field, we'd like to see your résumé. Please send it along, in complete confidence, to:

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COMPUTE! has an excellent working environment, currently a staff of 80+, and as a division of American Broadcasting Companies (ABC) offers an excellent benefits package as well. We look forward to hearing from you.

Until next issue, enjoy your Gazette.

Editor In Chief

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GAZETTE FEEDBACK

EDITORS AND READERS

Do you have a question or a problem? Or 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 *for Commodore? "Gazette Feedback" wants to hear from you.*

Pinning Down A Problem

I recently purchased a Commodore Video Monitor model 1701 to use with my Commodore 64 computer. The monitor came with a connecting cable that runs from the audio/video connector at the back of the computer to the audio/video terminals on the front of the monitor. The monitor user's manual mentions a three-jack cable that interfaces with the three terminals (audio, luma, chroma) on the back of the monitor. The interface is supposed to provide better screen resolution than the front connections.

The manual mentions that the computer must have an eight-pin audio/video connector to do this, and my computer has a five-pin arrangement. My question: Is there a cable available that will permit connecting a five-pin 64 to the monitor's three rear terminals, thereby improving the monitor's resolution? I have heard that such a device exists, but I have not seen it advertised anywhere. Can you provide any information on this subject?

Bruce D. Perine

We're glad you asked this question, because the answer is one of the best hints we've run across in some time. The following was conveyed to us by Associate Editor Jim Butterfield. Yes, you can connect your five-pin 64 to the Commodore 1701 color monitor while greatly *improving the picture quality. And it can be done without an external interface. But first, a brief explanation of the 1701 monitor and what the various connections are for.*

The two inputs on the front of the monitor (VIDEO and AUDIO) are easily connected to the Commodore 64 with the cables Commodore includes with the purchase of the monitor. The problem with these connections is that they do not allow you to get the best picture available from your 64. Without being too technical, this is because the VIDEO plug mixes two signals together, the chrominance and luminance. Briefly, the chrominance is the "color" in the color signal, and the "luminance" is the brightness. When these signals are mixed together, it causes a slight degradation of both which produces a less than optimal picture.

However, the 1701 color monitor has three connections in the rear: CHROMINANCE, LUMINANCE, and AUDIO. This allows you to perform the hookup without mixing signals. The hookup can be made without an interface, but you will have to buy a new cable, or make one yourself.

Here's how to hook it up. First, turn off and unplug the computer and monitor. Second, flip the switch on the back of your monitor labeled "Signal Select" to the "Rear" position. When this switch is set for "Rear Select," the connectors on the front of the monitor are disabled and vice versa.

Now purchase an all-purpose "octopus" type computer hookup cable at your local computer or electronics dealer. This cable should have the standard five-pin DIN plug (see your Commodore 64 User's Manual*) on one end, and four RCA-type plugs at the other. Connect three of the plugs to the CHROMA, LUMA, and AUDIO connectors at the rear of the monitor. The fourth is left unconnected. Although your cable color coding may be different, the ones we have here at COMPUTE!'s Gazette hook up as follows: white to CHROMA, red to LUMA, and black to AUDIO. If the connector colors on your cable are different, you can experiment with different hookup patterns until the best picture/audio combination is achieved. Switching plugs around shouldn't be harmful to the computer or monitor, but don't touch the center pin of any connector to any ground source or to any metal surface.*

If you cannot find a general-purpose connecting cable at your local store, you can make one yourself or have your local Commodore dealer do it for you. Check the Commodore 64 Programmer's Reference Guide *for complete details. Briefly, you need to wire three RCA-type plugs to the DIN connector at pins 1 (luminance), 3 (audio output), and 4 (video out). Pin 2 is your ground. The plug from pin 1 will connect to LUMA on the monitor, pin 3 to AUDIO, and pin 4 to CHROMA. No interface is required between the 64 and the 1701 monitor. After you have successfully completed all the connections, readjust the settings on your monitor for the best picture.*

It can be well worth the time and cost to perform these new connections. Buying the pre-wired all-purpose

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Of course, if you'd rather not take our word for it, you don't have to. The experts at Electronic Games have called *Kid Grid* for Atari "one of the most compulsive, utterly addictive contests in the world of computer gaming."

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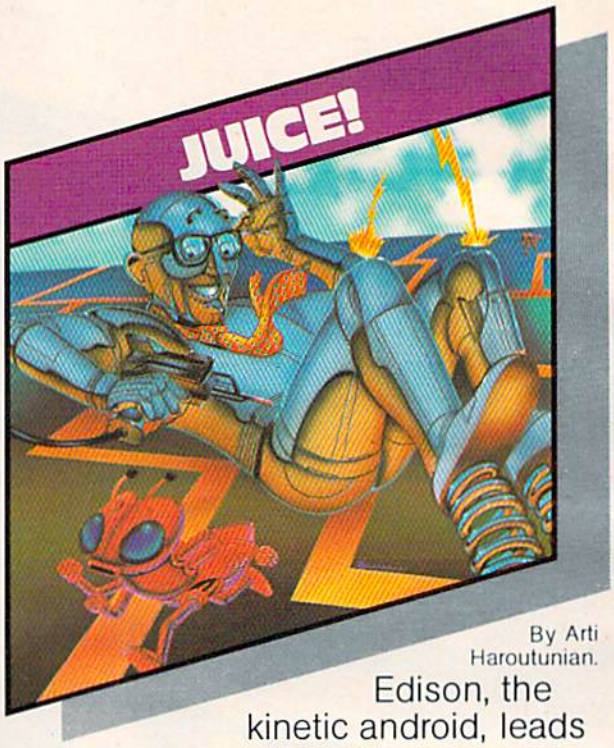

By Arti Haroutunian.

Edison, the kinetic android, leads a frustrating life.

All he wants to do is build his circuit boards and go with the flow. But things keep getting in the way.

Nohms—a negative influence—bug him constantly. Flash, the lightning dolt, disconnects everything in his path.

And the cunning Killerwatt is out to fry poor Edison's brains.

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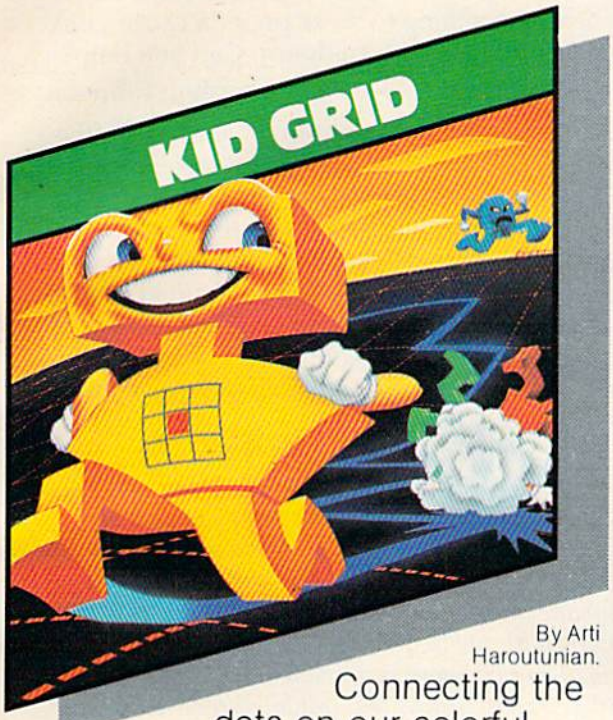

By Arti Haroutunian.

Connecting the dots on our colorful grid should be easy, right?

Wrong. Because the bullies are in hot pursuit!

Squashface, Thuggy, Muggy and Moose are their names. And *you* are their game. And what's more, they're faster than you are.

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So keep your eyes peeled for the mysterious question mark and don't slow down at corners!

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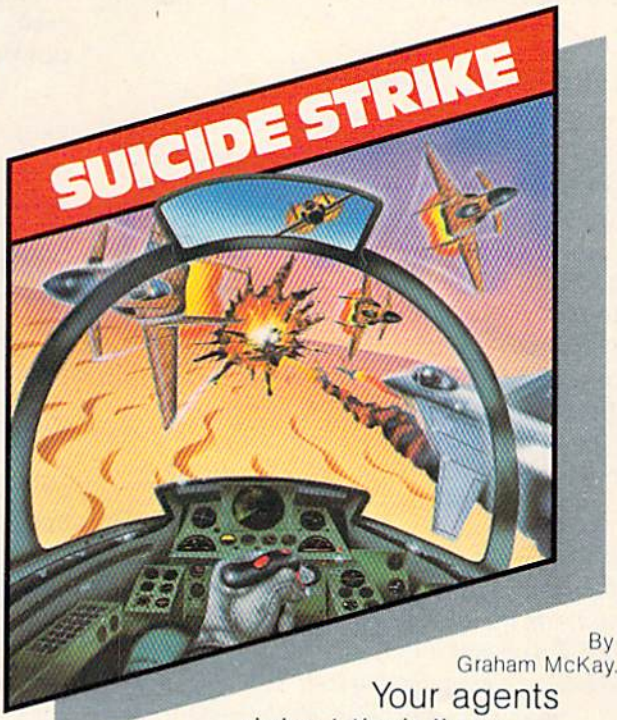

By Graham McKay.

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cable or constructing it yourself should cost you no more than $10, and believe us, it's well worth it. The improvements in picture sharpness, clarity, and color are magnificent. For more information on Commodore 64 video, see the new column "Horizons: 64" premiering this month.

Partial Screen Clears

I have a new Commodore 64. I have used a Radio Shack TRS-80 Model III for three years. I have three programs which use the split screen, containing calculated data at the top which is updated by questions on the bottom of the screen. Is there any way to change the HOME/CLR address on the Commodore 64 so that the lower part of the screen can be cleared without changing the upper section? Tandy MicroSoft BASIC allows CHR$(30) to clear to end of line and CHR$(31) to clear to end of screen. It also allows up to seven lines to be reserved from the CLS (clear screen) operation.

John R. Land

Commodore 2.0 BASIC (as found in the VIC-20 and 64) does not support partial clearing of the screen. However, you can write this option into your program with one FOR/NEXT loop and a POKE. The way to do this is to POKE blanks (screen display code 32) to the area of screen memory you want to clear. If, for instance, you would like to clear only the bottom half of your screen, include this line in your program:

```
60000 FOR A=1544 TO 2047: POKE A,32: NEXT A
```

Following is a short, simple machine language routine that you can add to your programs. When you want to clear the bottom three-quarters of your screen, include SYS49152 in your program; to clear the last half, SYS49162; and to clear only the last quarter, SYS49172. The machine language routine will LOAD into memory at 49152 and will not interfere with your BASIC program.

```
60000 FORA=49152TO49183:READB:POKEA,B:NEX
    T                                :rem 53
60010 DATA 162,0,169,32,157, 24, 5, 232
                                     :rem 226
60020 DATA 208,250,162,0,169,32,157, 8
                                     :rem 26
60030 DATA 6,232,208,250,162,0, 169, 32
                                     :rem 19
60040 DATA 157,248,6,232,208,250, 96, 0
                                     :rem 32
```

DOS Woes

When I first bought my VIC-20, I was very impressed with it, and I still am. But the more I work with the Disk Operating System (DOS), the less impressed I am. I have had some problems with the system, and I would appreciate your help.

When I use the "save and replace" (SAVE "@0:filename") as outlined on page 13 of the *1541 User's Manual*, more than three times it has started replacing the programs saved immediately before it without changing the names in the directory. So eventually I have the same program under several different names, and I lose the original programs. I think this is a ROM problem. Because I purchased the disk drive by mail order, no local authorized service center is willing to work on it (because I did not purchase the drive from them). Can you help?

Stephen Johnson

First, don't have your drive repaired. The cause for the errors while using the "save and replace" command is in Commodore's DOS, not your drive.

Some of Commodore's disk drives through the years have had some problems with this option. The first drives to exhibit this problem were the dual 2040's. Although the updated DOS found in the VIC-1540 and 1541 disk drives was supposed to correct this problem, it has not. Problems with the save and replace command still occur now and then.

The best solution is simply to stay away from this command. Instead, save your programs with "generation" identifiers. For instance, use names such as "program.g1" or "program.g2". When you look at your directory, you will be able to tell which is the most recent update by the generation numbers. Erase earlier generations with the SCRATCH command.

It may be a bit more inconvenient this way to keep your disks clean of unwanted, outdated revisions, but it's a lot better than losing that favorite program of yours altogether.

WordPro Colors

I have recently purchased a word processor (*WordPro 3 Plus/64*) for my Commodore 64. I find that the software automatically chooses white text on light blue background rather than light blue text on a dark blue background as programmed by the manufacturer. Is there any way of choosing light blue text rather than white? The resolution on my set seems to work better with light blue text on a dark blue background.

Also, is it possible to make a backup disk of this program, or is it made not to be copied?

Robert A. Konkol

Yes, it is possible to change the color combinations while working with WordPro, *and the color change options are part of the* WordPro *program. Instructions can be found on pages 2-17 of your* WordPro 3 Plus/64 User's Manual. *Briefly, it's done with the special function keys (F-keys). Press CTRL, then f-1, to change the text colors, press CTRL - F-3 to change the screen colors, and press CTRL - F-5 to change the border colors. (For more information on the* WordPro 3 Plus/64 *word processor, see the review in this issue.)*

As to your second question, WordPro *cannot be copied. This program, as well as the majority of other commercial programs available on disk, is engineered to be copy-proof. This is how companies protect their copyrights.*

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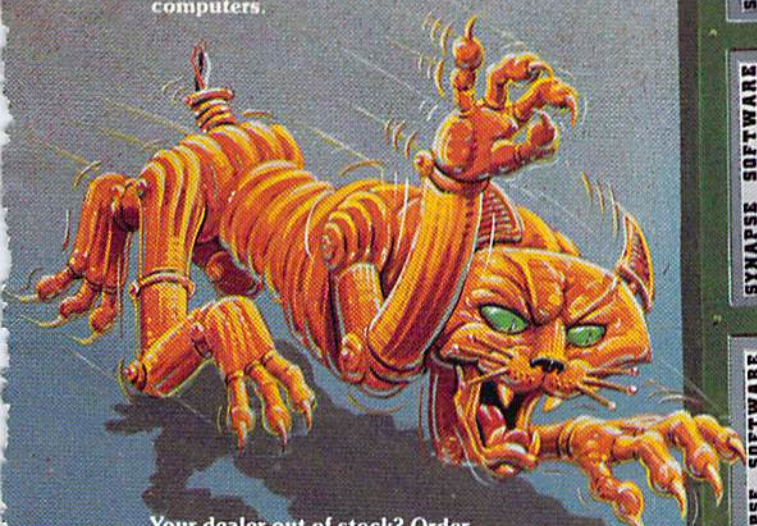

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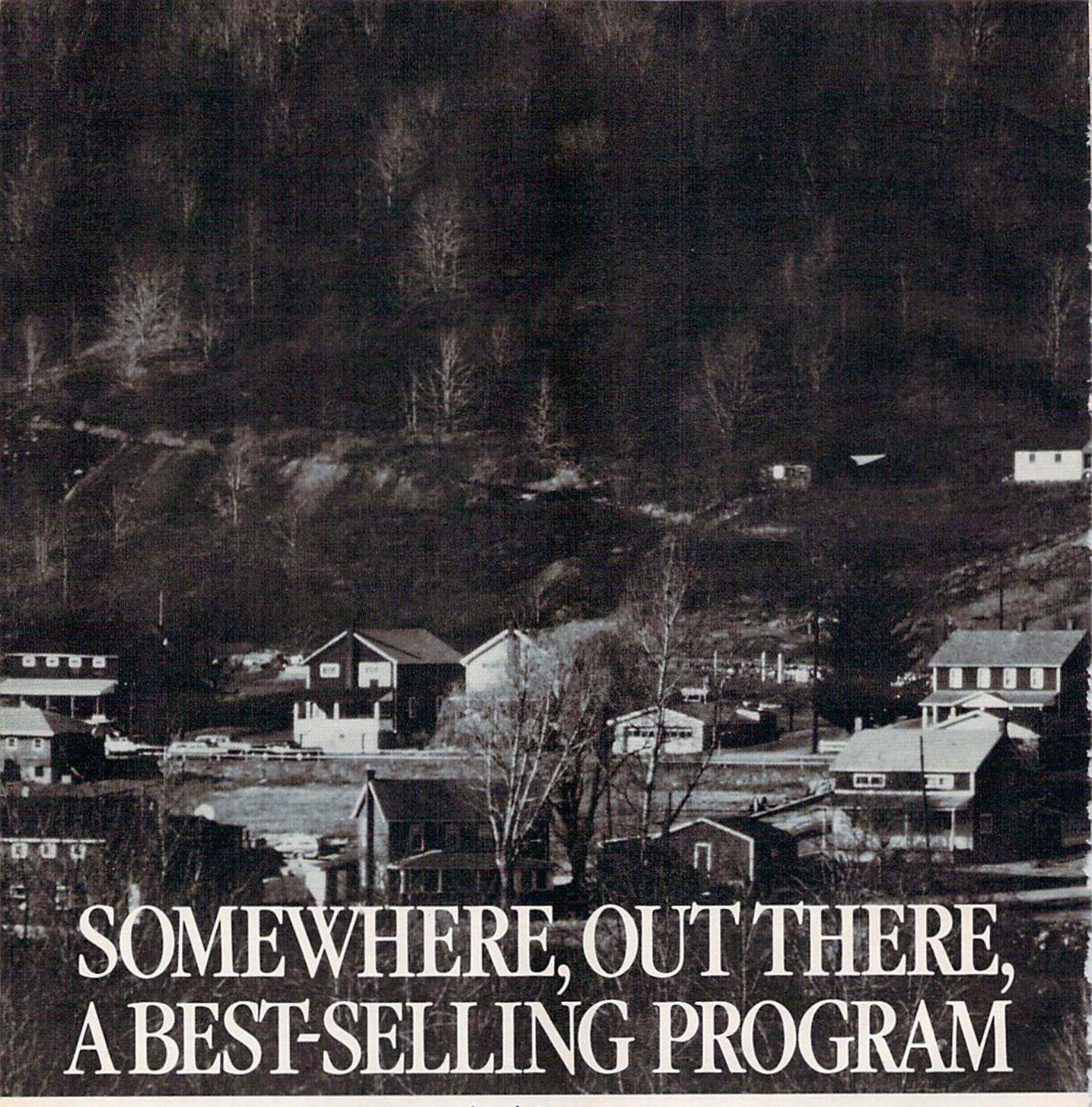

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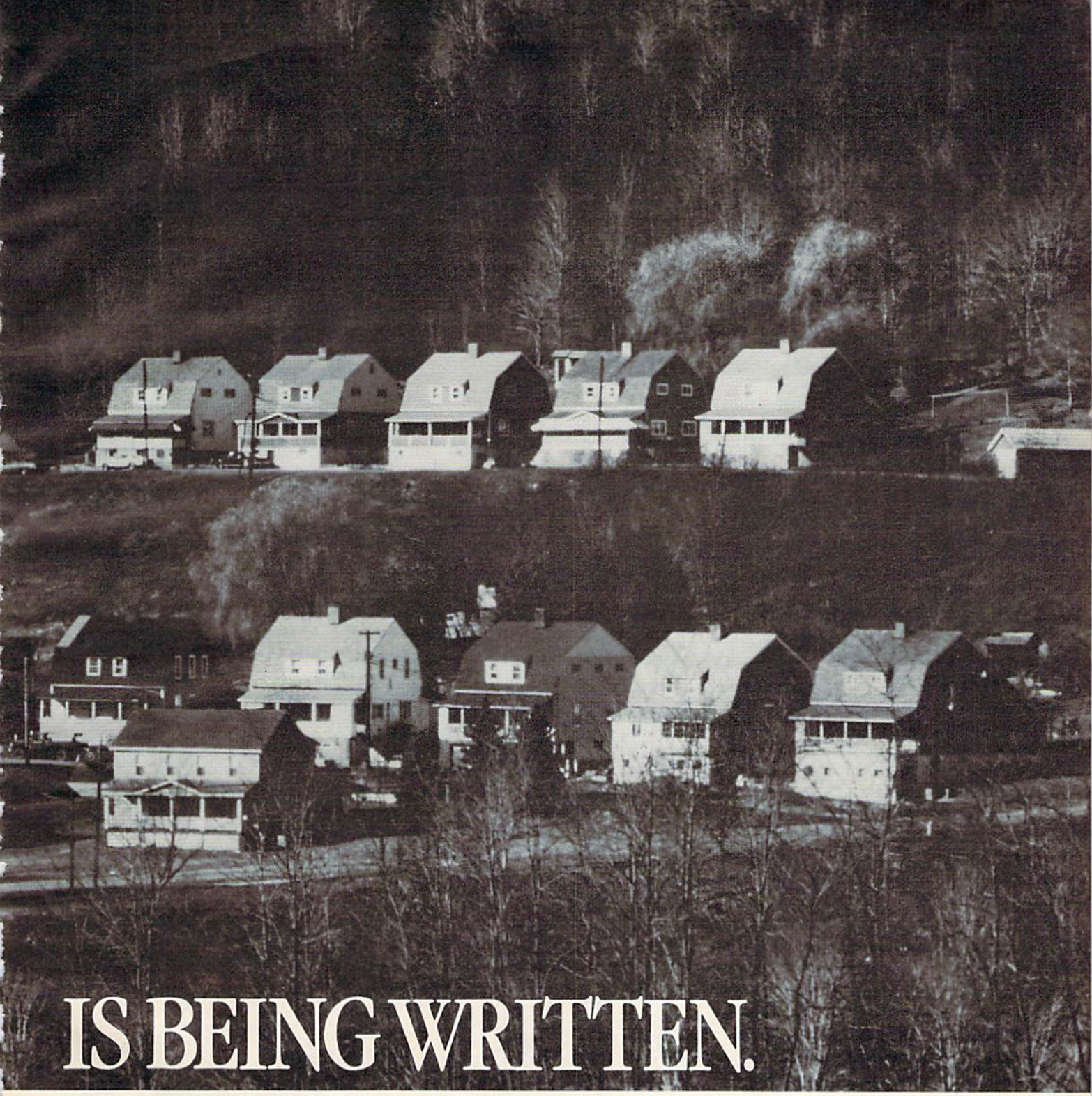

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SIMPLE ANSWERS TO COMMON QUESTIONS

TOM R. HALFHILL, EDITOR

Q A

Each month, COMPUTE!'s Gazette for Commodore will tackle some questions commonly asked by new VIC-20/ Commodore 64 users and by people shopping for their first home computer.

Q. ***Some of the programs published in COMPUTE!'s Gazette and other magazines are in separate parts. I mean, you have to save the programs one after the other on tape and then load them separately. The first part will load and show a screen message telling you to "PRESS PLAY ON TAPE" and then load the second part. But what happens if you have a disk drive? Can you use these programs on disk?***

A. Yes, you certainly can use these *multistage* programs on disk as well as tape. In most cases, you won't even need to modify the programs. Try this:

First, type in the programs and SAVE them on the same disk with filenames that clearly indicate the order in which they should be loaded. For instance, "SPACE GAME 1" and "SPACE GAME 2". Then LOAD and RUN the first stage of the program as instructed in the article. When you see a screen message that says something like "PRESS PLAY ON TAPE," press the RUN/STOP key instead (*do not* press RUN/STOP-RESTORE). You should see a BREAK message and the READY prompt.

Now, LOAD and RUN the next stage of the program. If there is a third stage, repeat the process. In almost all cases, this should do the trick.

If you know something about BASIC programming, you can modify the programs so they automatically load the following stages from disk. Locate the lines which tell the computer to load the next stage from tape (usually found near the end of the program). Delete these lines and add a statement such as:

```
LOAD"SPACE GAME 2",8
```

Of course, this statement must be preceded by a line number, and you'll want to substitute your own filename for the example given. Also, make sure a disk with the subsequent stages is in the disk drive, or you'll get a FILE NOT FOUND error.

Multistage programs may seem inconvenient to use, especially with tape, but there's a good reason why programmers resort to this technique. By separating a long program into stages, it's possible to make it run on computers with limited memory, such as the unexpanded VIC. Commodore 64 users would almost never encounter a multistage program. But it's hard to write a complex game or other type of involved program to fit the VIC-20's 3.5K of available Random Access Memory (RAM). Such frills as screen instructions, which are viewed only once, do not need to occupy valuable memory while the main program is running. By dividing instructions and other setup functions into stages which are loaded first and then replaced, memory is conserved for more important tasks.

Q. ***Is there any way to salvage a cassette that gets jammed?***

A. There's at least a chance. Radio Shack stores sell "cassette repair kits" that include an empty cassette shell and instructions. You'll have to take apart the jammed cassette, transfer the tape to the new shell, and assemble the new cassette with the screws provided. If the tape itself was not severely twisted or creased, everything may be okay.

If the program still refuses to load properly, the tape was probably damaged. To fix it, locate the length of creased tape. Try to flatten out the crease so it will make good contact with the recorder's read/write head. If this doesn't work, the tape is probably ruined.

If a jammed cassette causes the tape to actually

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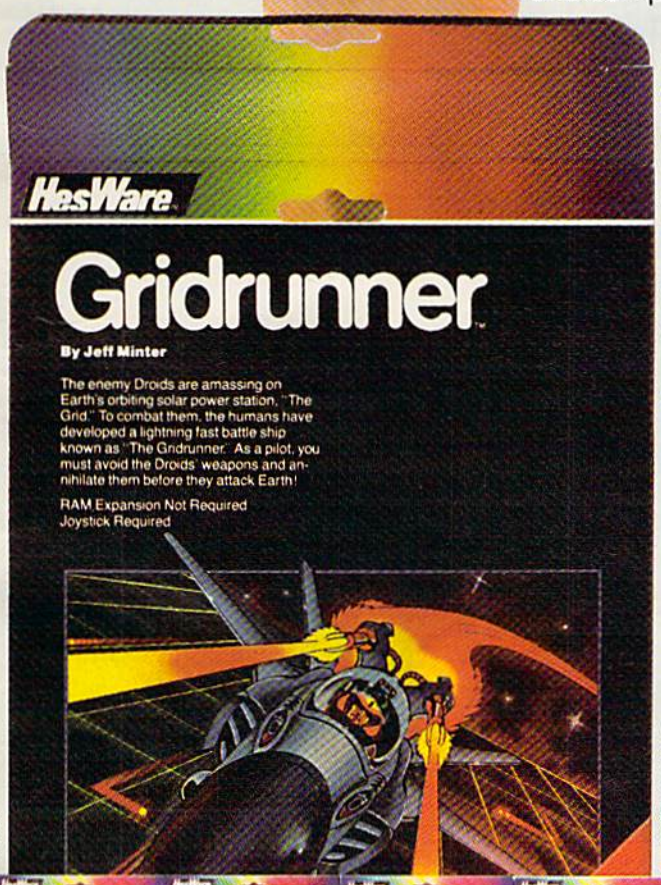

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break, we're sorry to say the situation isn't too hopeful. Although tape can be spliced, an "inaudible" splice for audio purposes will almost never be good enough for the computer; the data is recorded too densely. It's worth a try, though, especially if the tape holds the only copy of an important program. Before discarding a tape that has snapped, check to make sure that the leader hasn't simply been pulled off the hub – this can nearly always be fixed.

These kinds of problems are good reasons for backing up all important programs and data. You should have at least two copies, *on separate cassettes or disks*, of everything you can't afford to lose. To be even safer, you should store the backups in a different place than the originals.

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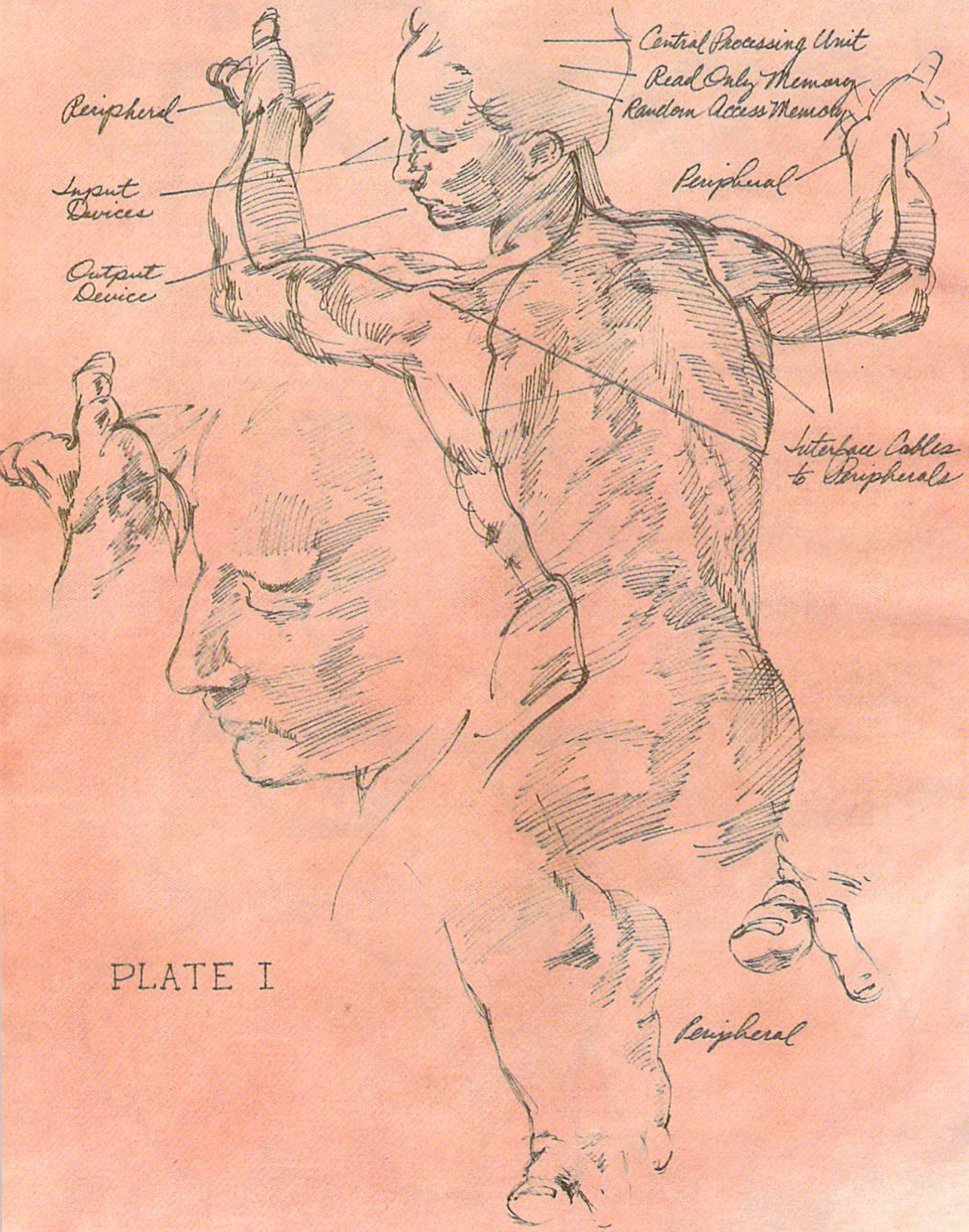

PLATE I

The Anatomy Of Computers

Tom R. Halfhill, Editor

Computers are easier to understand when you know what makes them tick. Here's how the parts of a computer work together – often invisibly – to create the results you see on the screen.

You don't have to be a mechanic or automotive engineer to drive a car. And you certainly don't have to be an electrical engineer or programmer to use a personal computer.

But a little knowledge about what's going on beneath the hood of your VIC-20 or Commodore 64 can go a long way when you're trying to fathom how a certain program works – or why it doesn't work. A cryptic error message such as "?DEVICE NOT PRESENT ERROR" makes a lot more sense when you understand how a computer interacts with its various devices. And even if you aren't interested in programming, a basic understanding of computers can make it clear why you have to type certain commands at certain times, or do other things just because the manual says so.

In many ways, computers are remarkably similar to the human brain, at least in terms of organization. Like the brain – which we call an "organ," although it is really several closely related structures – a computer is a system of interconnected subsystems.

Unlike the brain, however, which can perform many operations at once, most computers can do only one thing at a time. This might seem hard to believe, especially if you've ever played a fast-action computer game in which dozens of objects seem to be darting around the screen simultaneously. But it's true. Computers only *seem* to perform many operations at once because they work so quickly. Even the slowest home computer can easily carry out hundreds of thousands of instructions per second. Simultaneity is an illusion.

The main "brain" of a computer is the *Central Processing Unit*, commonly abbreviated CPU. The CPU performs or supervises all the major functions of a computer. One by one, it fetches the instructions written by human programmers, works the math, stores the results, and looks for the next instruction.

CPU size once determined computer size. Even today, the CPU of very large computers might occupy a box the size of a refrigerator. In early computers, those built in the 1950s and 1960s, the CPU sometimes occupied a whole room, or even a building. The breakthrough which made possible today's personal computers came in 1971, when engineers managed to squeeze an entire CPU onto a single "chip" of silicon smaller than a

fingernail. From this *microprocessor* was born the *microcomputer*. Generally speaking, a microcomputer is defined as a computer which uses a microprocessor CPU, is small enough to fit on a tabletop, and costs less than about $20,000.

There are many types of microprocessors. The VIC-20's CPU is a microprocessor designated the 6502. It was designed in the early 1970s by MOS Technology, now a subsidiary of Commodore. The 6502 is an extremely popular chip because of its high speed and low cost (under $5 in quantity). The Commodore PET, SuperPET, and 8032 models, as well as Apple and Atari computers, all use the 6502. The Commodore 64 uses a newer version of the 6502 called the 6510, identical in all important respects to its predecessor.

But a CPU alone does not make a computer. By itself, a CPU is like a disembodied brain – a small package of functionless "intelligence." The CPU must be connected to a few other subsystems before it can qualify as a computer.

The next most important part is memory. The CPU already includes a very small amount of memory, but not enough to make it useful. So, the CPU is wired to a set of memory chips.

Memory followed the same evolution as CPUs – starting out as roomfuls of bulky vacuum tubes, then passing through the stages of transistors, integrated circuits, and finally silicon chips. In personal computers, there are two general types of memory chips: *Random Access Memory* (RAM), and *Read Only Memory* (ROM). There's a vital difference to remember between RAM and ROM – *RAM needs a constant flow of electricity to maintain its memory*, while *ROM holds its information even when the power is turned off*.

Whenever your computer is switched off or "powered down," even for a split second, all the information held in RAM is instantly erased. Turning the power on again does not restore it. What's more, RAM happens to be where your programs are run. That's why, every time you switch on the computer, you must load in the program you want to use from a cassette tape or floppy disk, or else plug in a cartridge. The program, a series of instructions for the CPU, is permanently stored on the tape, disk, or cartridge. Typing the LOAD command copies the program from the tape or disk into RAM.

ROM, however, is quite different. Information is permanently "burned" into ROM chips by the manufacturer. You cannot change or erase the information in ROM. ROM chips are used inside computers to store information which the computer always needs and must never forget. ROM chips also are found inside plug-in program cartridges. Some manufacturers prefer to store frequently used programs – such as games – on cartridges instead of on tapes or disks, which are more easily damaged or worn out. Cartridges are also more convenient. When you plug in a cartridge, its ROM chips (and the information they hold) become part of the computer, so there is no waiting for a tape or disk to load.

The amount of memory in a computer depends on the number and type of memory chips it has. When people compare memory between computers, almost always they are referring to RAM. Computers with more RAM can hold larger programs and more information, which generally makes them more powerful.

For easy comparisons, memory is measured in *kilobytes*, abbreviated K. A kilobyte is 1024 *bytes*. A byte consists of eight *bits*, or binary digits. If you're unfamiliar with the binary number system, it's best to think of a byte as one character – a letter, a number, or a symbol. A kilobyte of memory can hold roughly a thousand characters.

Comparing kilobytes of RAM is one way of estimating the relative power of various computers – *but not the only way*. The VIC-20 comes with 5K of RAM, expandable to 32K, and the Commodore 64 has 64K of RAM. Does this mean a Commodore 64 is more than 12 times as powerful as an unexpanded VIC? It's not that simple. When comparing computers, remember that many other features besides memory must be taken into consideration, and that some features may be more important to some people than to others.

Equipped with a CPU and memory, a computer is roughly equivalent to a human brain. But to make a computer (or a brain) really useful, several more parts are required.

As a body has appendages, a computer has *peripherals*. These are devices attached to the CPU which enable it to communicate with the outside world, and especially with humans. Peripherals come in two types: *input* devices and *output* devices (some do both).

You may be so familiar with some of these devices that you might not even think of them as peripherals. For instance, the keyboard. The CPU constantly scans this input device and checks if any keys are pressed. When you press a key, a keycode number is stored in a certain place in memory. The CPU reads this memory location and acts accordingly. Among the things it might do is display the character you typed on one of its output devices, the TV screen. The keyboard and the screen are the most basic input and output devices of the computer.

One of the most important keys is RETURN. It derives its name from the carriage return key or lever on typewriters, and it returns the cursor

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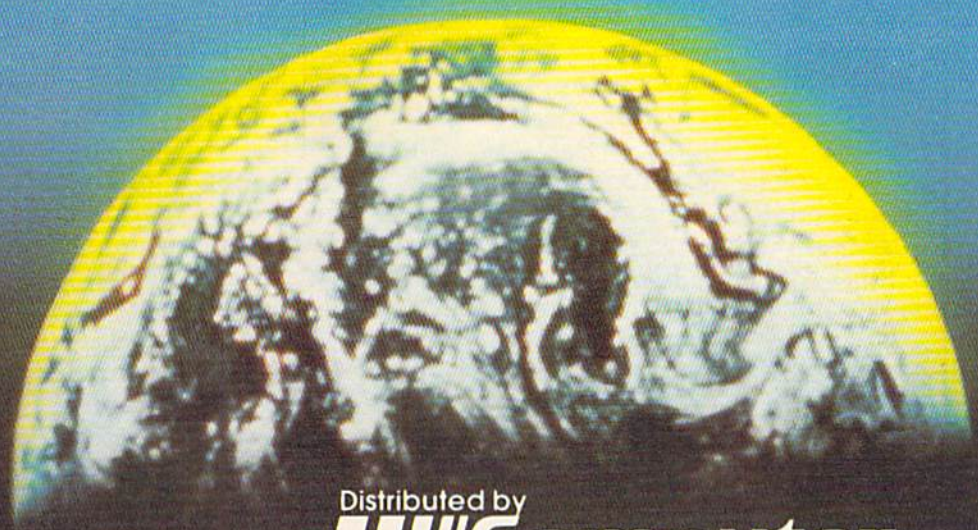

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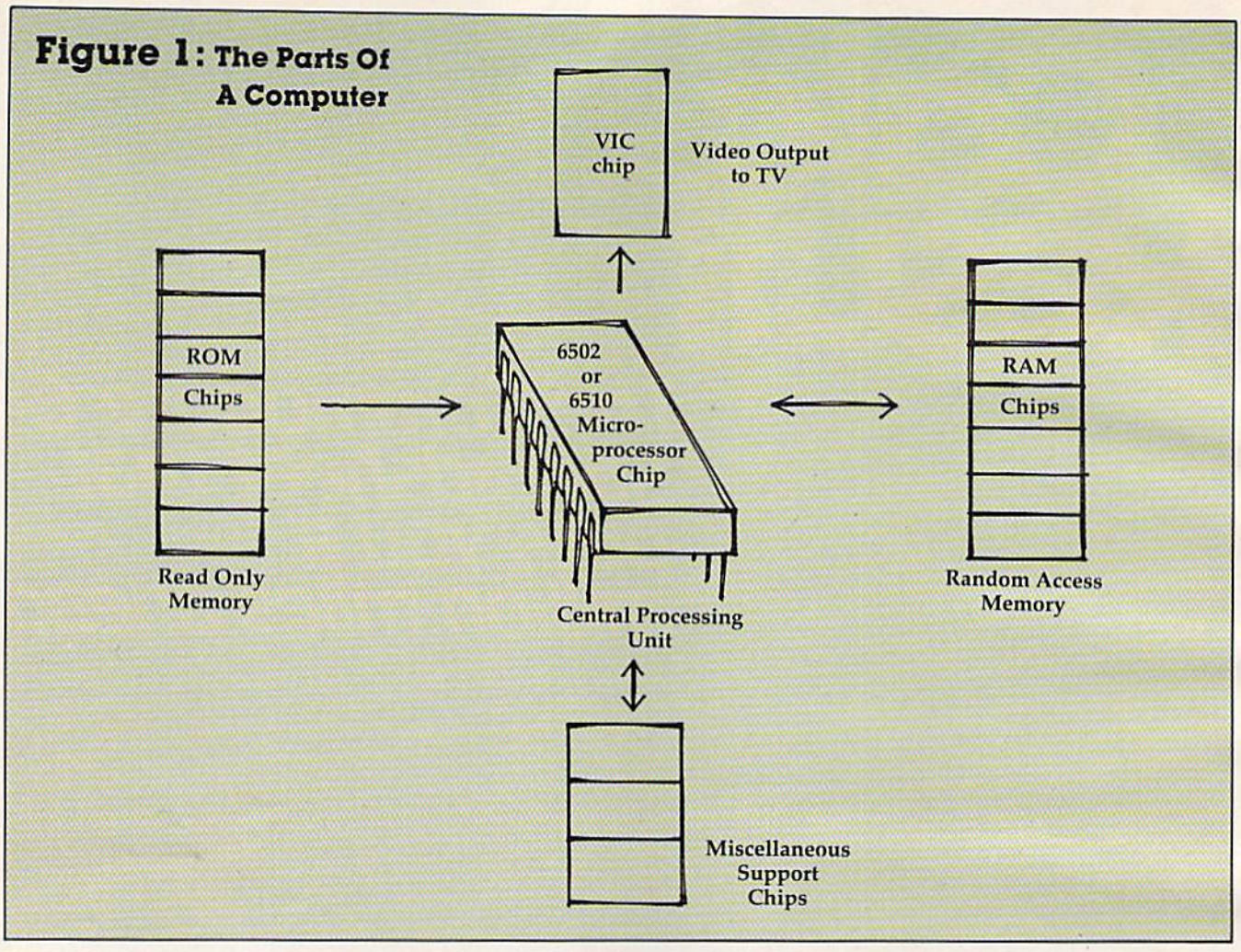
Figure 1: The Parts Of A Computer



(the moving white block) to the left screen margin when pressed. But it has an added function not found on typewriters – it tells the CPU to interpret whatever was just typed as a command.

For example, type the command LOAD, without pressing RETURN. The word appears on the screen, but the computer just sits there. The CPU knows you typed the letters L-O-A-D – after all, it read them from the keyboard and displayed them on the screen – but the letters are meaningless. The CPU ignores them.

Now press RETURN. Immediately, the computer displays the message, "PRESS PLAY ON TAPE."

By pressing RETURN, you told the CPU to accept the letters on that screen line as a command – specifically, a command to load a program from the cassette recorder. The CPU checked the recorder – similar to the way it checks the keyboard – and discovered the PLAY button was not depressed. Then it displayed the appropriate prompt. Until you press RETURN, the computer ignores what you type, allowing you to correct typing errors or change your mind.

The cassette recorder, of course, is another familiar peripheral – an input/output device. When loading a program from tape, it acts as an input device (remember that input/output is always from the *computer's* point of view). When you save a program on tape, the recorder becomes an output device.

You may have other peripherals in your computer system. A printer is an output device. A joystick or game paddle is input. A disk drive is both input/output. So is a modem. It's easy to see that without peripherals, the most powerful CPU and memory would be utterly helpless – the computer would be blind, deaf, and mute.

So far, we've confined this discussion to hardware, the parts of a computer that we can actually see and touch. But the hardware is just a collection of silicon chips, circuit boards, wires, metal, and plastic. It's like a human brain and body without life; it needs something more to make it work. What it needs is *software*.

Software is the programming which tells the CPU what to do and how to do it. Software is to hardware what the human mind is to the brain. If the software is poor, the computer may appear stupid, but the problem is really unexploited

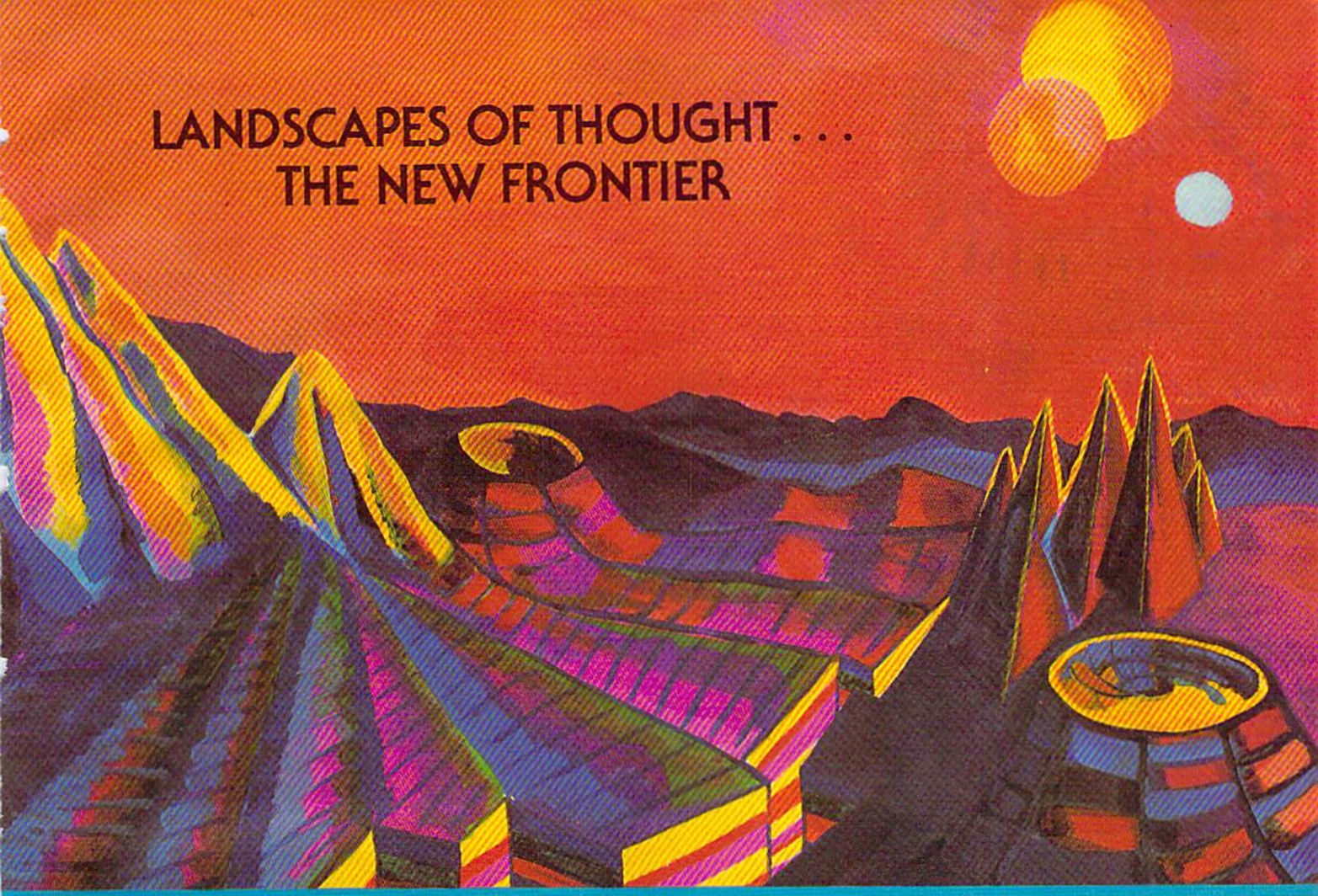


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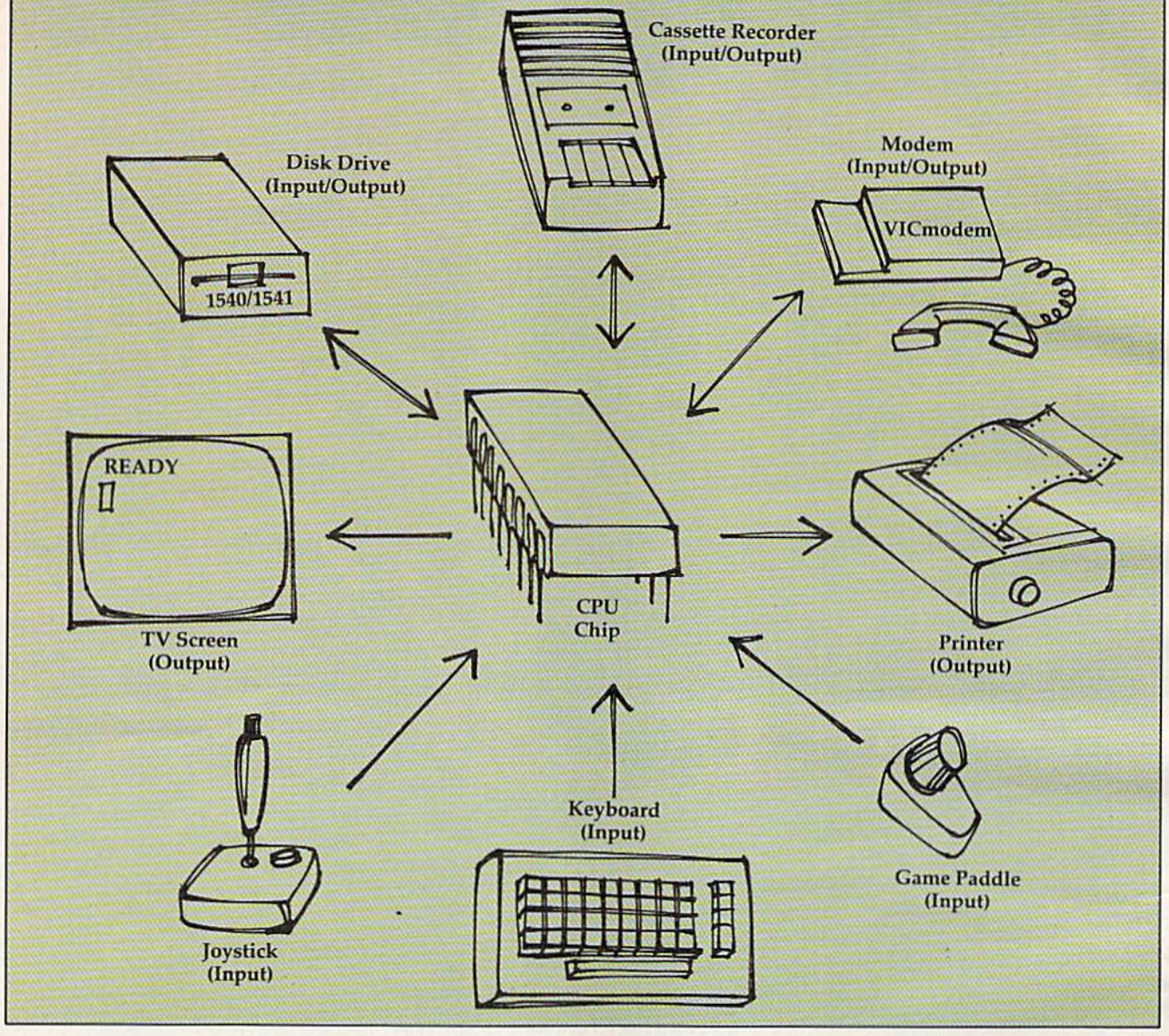
Figure 2: Computer Peripherals



potential. It's like an intelligent human with no knowledge. No matter how good a computer is, it won't appear much better than its best software.

That's why software is such a critical issue in computing. In fact, if someone shopping for a computer has a certain application in mind, it often makes more sense to find the proper software first, and then buy whatever computer it takes to run it. Unfortunately, some people take the opposite approach and wind up disappointed.

There are two main types of software for computers – and one of them is almost invisible to most users. Computer professionals, those who work with the big machines, refer to these two types as *application software* and *system software*.

You're probably very familiar with application software. This includes virtually any kind of program you can run on a computer: games, word processors, educational programs, spreadsheets, graphics and sound demos, you name it. Diverse as they appear, they share one characteristic in common – they allow the user to do something with the computer, to accomplish some purpose, whatever that purpose may be.

On the other hand, you might be somewhat less familiar with system software. You might not even know it exists at all. That's because system software runs "in the background," so to speak, performing housekeeping and other chores with little or no attention from the user. Without system software, the computer could not function.

Returning again to our brain analogy, system software is roughly equivalent to the human involuntary nervous system. Every moment of your life, your brain supervises routine housekeeping tasks that keep you alive: it regulates your heart

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and lungs, oversees the functioning of every organ from the pituitary gland to the kidneys, and even keeps its own house in order by allocating brain cells for memories and other purposes. Yet, all of these very sophisticated operations – operations that require a roomful of our best machines to duplicate artificially – occur without a single conscious thought. If we had to consciously direct all these operations, we could do nothing else. By regulating these functions in the background, the brain preserves our conscious minds for virtually anything else we care to think about or do.

A computer works almost exactly the same way. System software – in particular, a program called the *operating system* – performs all the small but significant tasks required to keep the computer functioning. Without any conscious effort or perhaps even awareness on your part, the operating system program runs constantly in the background, even when other programs are running. Fortunately, this saves you a lot of tedious work.

For instance, when you save or recall a program from disk or tape, the operating system takes care of the messy details involved in transferring the data to or from the external device. Typing SAVE or LOAD seems simple enough, but only because the operating system is doing all the dirty work. It's sort of like your brain communicating with your arm. You can move your arm with a casual thought, and subconscious areas of your brain handle all the complicated details of coordinating dozens of muscles and tendons. Because we aren't consciously aware of this going on, we take it for granted. So it is with the operating system.

Also like the brain, the operating system allocates memory to maintain order. When you type in a program, what keeps the last line you typed from being stored in the same memory space as the previous line? The operating system. Actually, in this case the operating system is working together with another piece of system software, BASIC. Yes, the BASIC language is a program just like any other, except that it runs in the background. There are other "invisible" programs, too. If you have a disk drive, it requires a *disk operating system*, usually abbreviated DOS. To keep things working smoothly, DOS works hand in hand with the computer's own operating system for input/output operations.

System software, of course, is not written in BASIC (after all, BASIC itself is one of these programs). Instead, system software is written in *machine language* – literally, the language of the machine. Machine language consists of binary coded commands recognized by the CPU. Each type of CPU chip has its own machine language, usually incompatible with others. The CPU does not understand BASIC any more than it understands English. When you run a program written in BASIC, BASIC translates or *interprets* each command for the CPU, converting it into machine language. Usually this happens much faster than we can notice. However, very complex programs – such as fast-action games with lots of animation – can run very slowly if written in BASIC. That's why practically all commercial games and other programs are written directly in machine language. This is harder than programming in BASIC, but since the computer doesn't have to interpret each command, execution is hundreds or even thousands of times faster.

If you are interested in learning more about machine language, see "Machine Language For Beginners," a regular column in COMPUTE!'s Gazette.

If the operating system, BASIC, and DOS are programs, you may be wondering why you can't recall ever loading these programs into your computer.

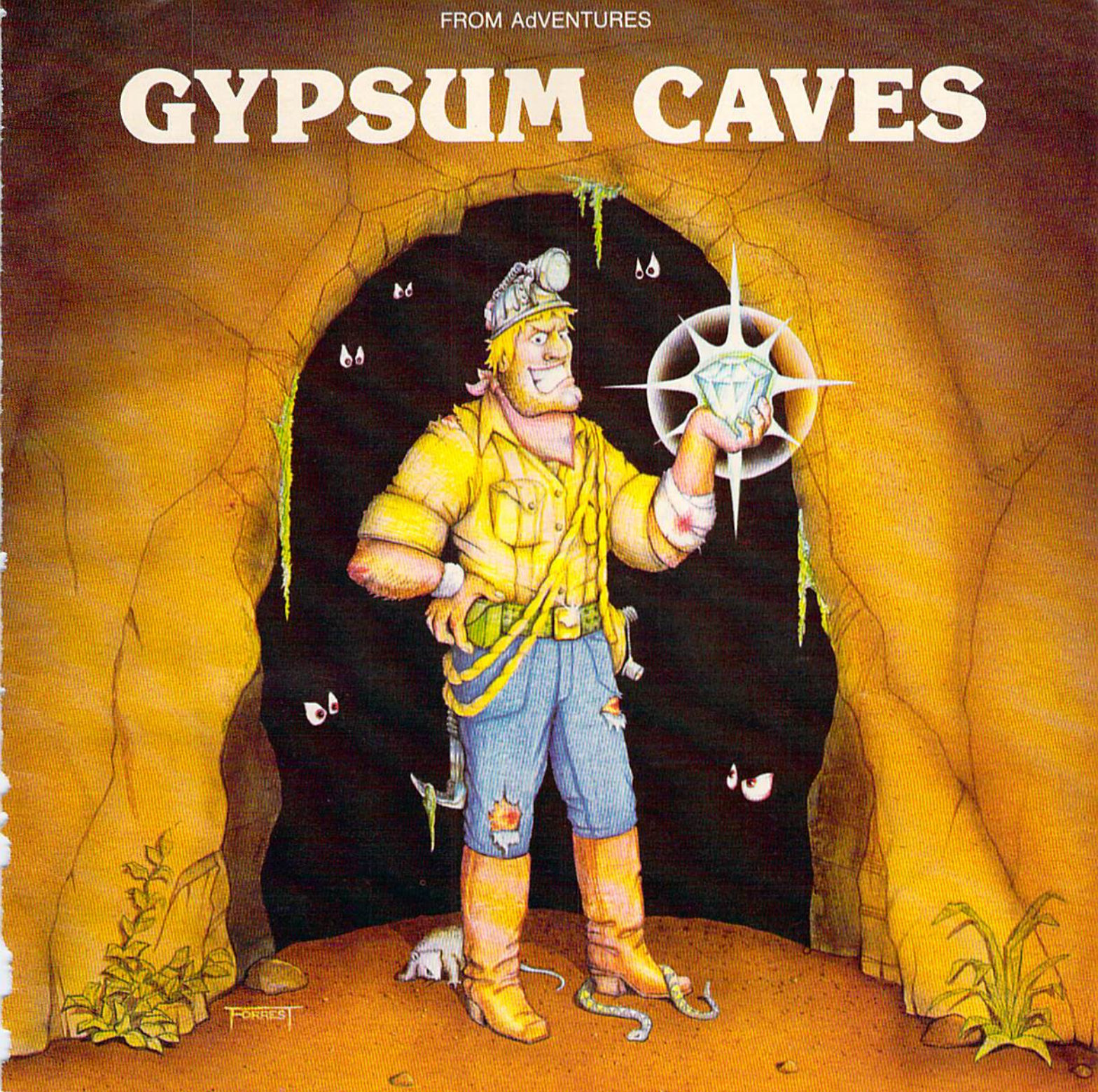
Remember RAM and ROM? System software is usually permanently burned into the ROM chips – the ones that never forget. Whenever you switch on the computer, these programs are up and running automatically. But this is only for convenience. It's important to realize that the computer's memory could consist entirely of RAM, in which case you'd have to manually load the operating system and BASIC from disk or tape each time you switched on the computer, just as you do with any other program.

In fact, this configuration is possible with the Commodore 64. It has 64K of RAM, and some of this RAM space is normally overlaid with ROM (which is why there is only about 39K of RAM free for programming). A few POKEs can disable the ROM and give you the full 64K of RAM to play with – but your program will have to take care of all the complex housekeeping once handled by the now-absent operating system. And since BASIC is gone, too, your program must be written entirely in machine language. Only the most advanced programmer can handle this.

So, if system software is analogous to the human involuntary nervous system, it's easy to see why application software is comparable to the brain's conscious thinking. Freed by the operating system and other background programs, the computer can focus the remainder of its power on executing whatever application program you care to run – anything from the most sophisticated data base to *Space Invaders*. The brain-computer analogy shouldn't be carried too far, but it's safe to conclude that, like a brain, a computer will appear only as "intelligent" as whatever is on its mind.

FROM AdVENTURES

GYPSUM CAVES



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TELEGAMING Today And Tomorrow

John Blackford

"Telegaming" means playing computer games with two or more computers linked electronically, usually over phone lines with modems. Already, there are telegames which dozens of enthusiasts can play at the same time, exchanging moves across the country. But as home computers grow ever more powerful, and as data communications speed up, what's in store? The immediate prospect: improved versions of existing games. On the horizon: wholly new concepts in telegaming.

Jommy's tendrils twitched in irritation – someone was trying to interfere with him, someone who knew his true identity. His irritation grew to worry, then fear. He'd been in the underground for three years without discovery. *How* could ... *who* could have leaked the secret that he was a member of the telepathic super race of Slans, part human, part mutant?

Jommy's worry grew intolerable. When he could stand no more, he uttered the words that he somehow knew had saved him before. He whispered: *GAME END.*

He felt the familiar blackness, the dizzying sense of dislocation. As his eyes cleared, he recognized the small room piled with baseball gear and the yellowing paper copies of his father's old computer magazines. A familiar voice was calling: "John, John Cross, you take off those vidphones and get in here for dinner this minute."

You probably won't see a game such as *Slan* anytime this side of 2001, but advanced telegaming is definitely on its way. With the number of home computers in the United States at four million and rising fast, there's a growing pool of computerists who are searching for new uses for their equipment. Telegaming could attract many of them because it allows people to communicate with others over great distances – through the medium of their computers.

A game such as *Slan* would be the ultimate in videogaming – a convincing simulation of reality, with a complete town or even nation in high-resolution graphics as the playfield. Each character in the game would have a unique personality created by artificial intelligence programs. Some would be computer-generated automatons. Others would be game players who, within the bounds permitted by the character, would be free to act as they pleased in the game world.

Computers linked via high-speed data lines could display the game action to your eyes through special "vidphones." Sound exciting, or kind of scary? Let's hope there'll always be an OFF switch in case the illusion gets *too* real.

But telegaming today is ages from anything like that – it's still in the horse and buggy stage. Today's game designers are thinking not so much of what can be done someday as what can be done tomorrow.

Despite all the recent advances in computer technology, we are still only a few years past the times when the first computer games were furtively played late at night on university and cor-

COMPUTE!'s First Book of VIC Games

Authors: COMPUTE! Magazine Contributors
Price: $12.95
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The VIC-20 is a versatile computer. Its programmable color, graphics, and sound can add a lot to game programs.

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Hidden Maze — Lost in a maze, you're trying to get out. But it is dark, and you can see only a few spaces in front of you.

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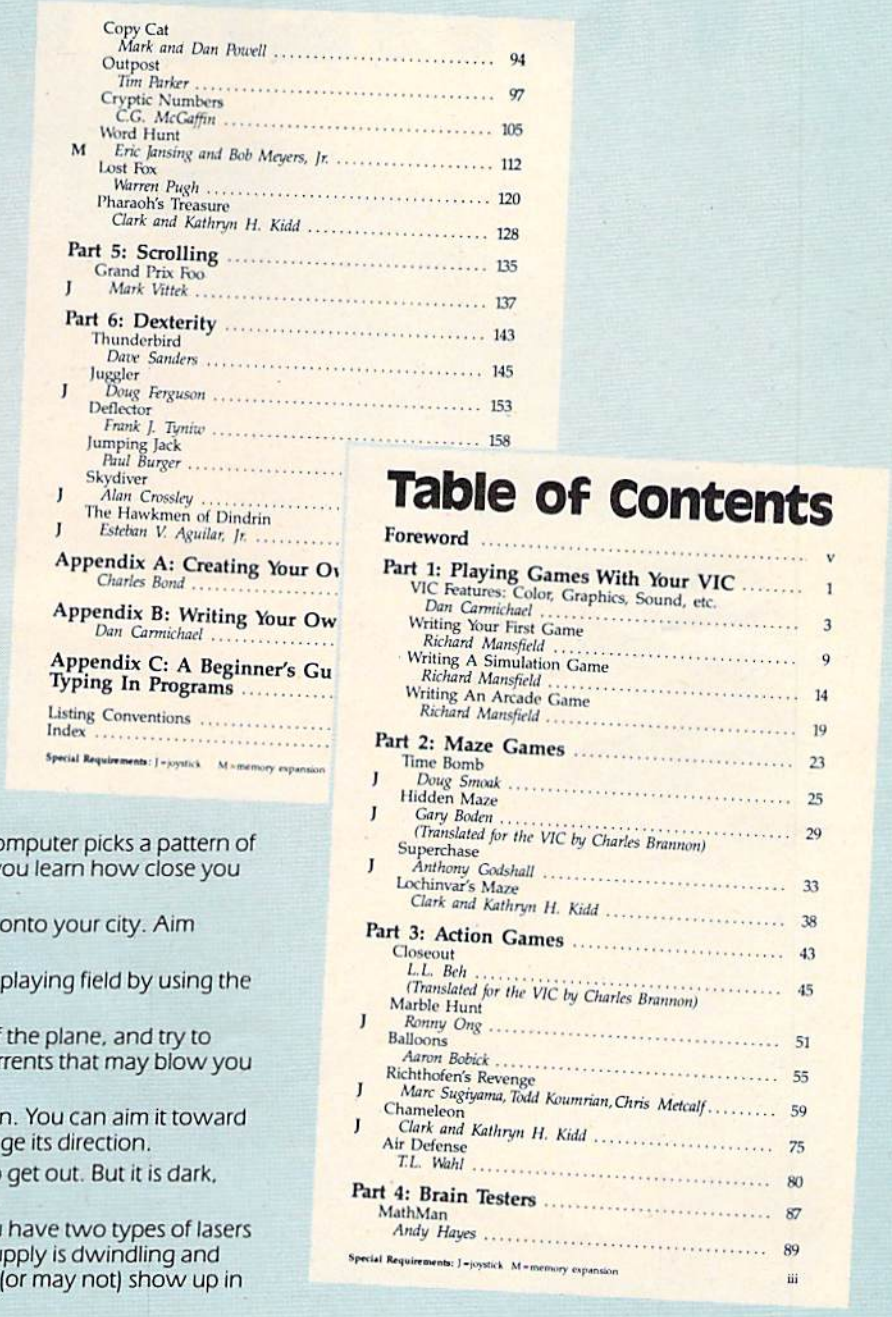

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First Book of VIC Games is more than just a book of program listings. Each program is annotated and explained; you can modify the games if you like or use the many programming techniques in your own games. Also included is a useful program you can use to draw mazes for games you write. Three chapters show you how to develop a game program. Another tells you how to take advantage of the VIC's sound, graphics, and color capabilities. The index lists references where you can learn more about programming. And *First Book of VIC Games* is spiral bound to lie flat while you are typing in programs.

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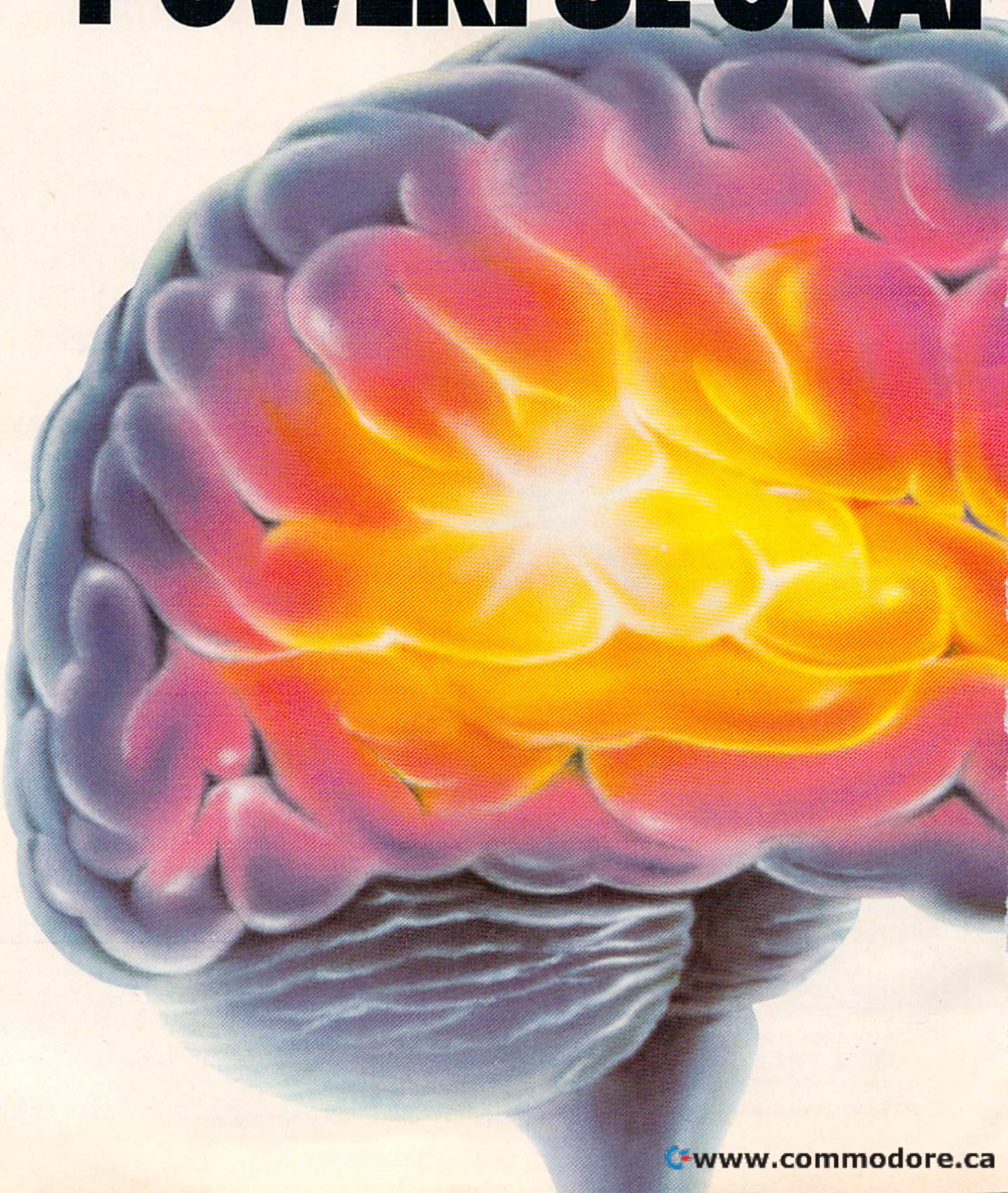

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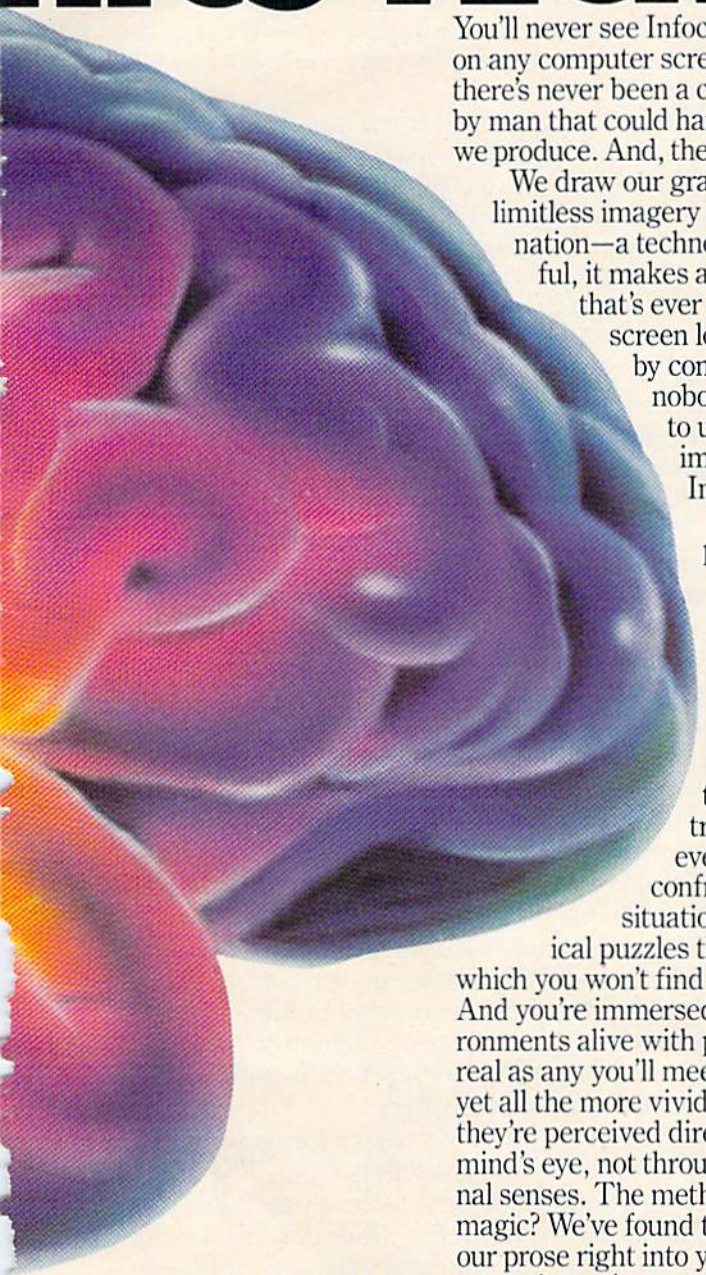

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porate mainframes. At first, even TV-type monitors were rare; the early text-only games were played out on terminals which used paper printouts instead of screens.

Later, minicomputers began to find their way into small businesses, and enterprising people – who may once have played *Star Trek* on campus – began selling computer time to eager game players. Some of these games were the ancestors of telegames, and they worked like this:

You would order a game by mail or purchase it in a store. The package included a rule book and a mailing address. By a certain date, you mailed in your move. The game company collected the moves made by players around the country and ran the game program on their computer with all the new moves added. The computer printed out the results, and the results were mailed back to all the players – who then sent in the next move.

People will become extremely agile in interfacing in hundreds of ways with games achieving total physical involvement.

And so the game would proceed, in ponderous two-week or monthly steps, a remarkable combination of high-tech and old-tech.

These kinds of games still have their adherents, and a company by the name of Flying Buffalo has been running them for 13 years, growing all the while. Based in Scottsdale, Arizona, Flying Buffalo now has several thousand players around the United States engaged in an increasing number of games. *Star Web*, a space game, is currently quite popular, though *Star Lord*, with its color printouts of each move, is starting to catch on.

Founder Rick Loomis hopes to speed up the games by adding a bit more high-tech. Right now, a small percentage of players send in their moves via "electronic mail," by hooking their personal computers or communications terminals over phone lines into The Source. Loomis wants to increase the percentage and improve the games. "We're looking at a way to call in moves by phone and get updates on moves already made," he says.

Even with electronic mail, games such as those offered by Flying Buffalo proceed slowly. Interest is generated by the strategy involved and the overall concept of playing against scores of opponents. What you miss in action on the screen, you can make up for by getting deeply into the game. Mastering the strategy gives a feel for the game's scope.

However, a game of this type could evolve into a more realistic simulation with the addition of sophisticated screen graphics. Players could study an expanded game area (much larger than a single screen), even though the positions of the game pieces would change, say, only once weekly or monthly.

Altogether different is the arcade-type game; it is played in "realtime" (with instant response), typically by one or two players against the computer. The telegame version could be played on a host computer, such as the mainframes operated by CompuServe, or in concert with another personal computer at a remote location.

"The most exciting possibility is where you get multiplayer games," says Bernie DeKoven, a games designer for the Children's Television Workshop.

At present, the most established games of this type are to be found on CompuServe. In addition to the company's list of single-player games are *MegaWars* and *SpaceWars*, two space games that permit many players at once to interact in realtime. The host computer has a vast 3-D map of space on which it tracks the players. Each player sees only a local sector, but when two or more players come within range of each other, the host computer signals them. They can radio each other, fight, or run.

SpaceWars is better for beginners, because of its streamlined command structure. *MegaWars*, with extensive commands and complex rules, is nearly impossible to master in one sitting. Still, it attracts regulars who become so familiar with the game that they can instantly recognize the user ID of many other players (each CompuServe subscriber has a unique user ID).

"We have a guy who works for us who loves *MegaWars*," says Larry Shelley, CompuServe's manager of entertainment technology. "But every time he would sign on, the other players would recognize his ID as someone who was in-house from CompuServe – and they would gang up on him. If someone got in trouble, he would call in the coordinates of our guy's planet, and people would come in and blow it away."

Shelley thinks this sort of thing is actually one of the reasons for the popularity of multiplayer telegames. Arcade games have instantaneous response and fast action, but are usually played

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in isolation by a single person. "The advantage of multiplayer games is the people-to-people interaction," he says.

Software designer Greg McNickle of Unitronics believes telegaming can support "love relationships, friendships, everything." He says, "Imagine you've drawn something on the screen that you like – and it goes into a network where others can draw and add to the original image. So you have two or more individuals who are relating to each other's art and thus are invited toward each other – maybe to get in touch in person."

The main hindrance to telegames now isn't a lack of willing players, but a lack of money. Equipment is expensive. An information service must purchase powerful computers, defraying the cost with subscriptions and connect fees. Creating new types of games may require new equipment, improved communications lines, or expensive high-resolution screens for home users. It might even require upgrading the entire telephone system, which wasn't designed for high data volume. "The concept is there," says DeKoven. "But I guess it takes awhile for the technology to catch up."

Another problem is the lack of standardization between computer types. "Software should be compatible between machines," says Terry Bradley, a vice president and co-founder of Sirius Software. He hopes the next generation of home computers will have standard voice and graphics chips to aid the transfer of games between machines. "Right now it is a tiny market," says Bradley. Sirius will write software for telegaming once the market develops, he says, but the company isn't out to create the market.

One company that is already selling telegaming software is Adventure International. The game, *Commbat* is a tank battle that's played between two home computers equipped with modems. The unique thing about it is that people with different computer types can still play one another. Each player loads a version of *Commbat* designed for the particular computer. Because the commands are standardized, different versions can communicate via phone, allowing the players to engage in a realtime battle with simple graphics.

To get around the limitation of slow data transfer over phone lines, designers are searching for fresh ideas that won't require exorbitant cash outlays. CompuServe recently announced an improved type of multiplayer game that has color graphics and true perspective. If the enemy's ship flies across your bow, you'll see it flash across your screen – but his view will show your ship moving away on the left side of his screen. If you accelerate, objects will begin to pass by more rapidly. CompuServe's Shelley says all this takes place at a leisurely transmission rate of 300 baud. The secret, he adds, has to do with getting objects to move on the various screens without sending graphics information over the phone lines – which would slow the pace to a crawl.

Simutron, of Vista, California, plans to get around the telephone bottleneck by eliminating it from their system. Instead, the company has designed a franchise system to distribute such games as *Star Trek*, licensed to them by Paramount. Each franchise would contain 16 to 32 intelligent terminals tied to an on-site computer. Action would be fast, arcade-quality, and completely shared among the terminals. High-quality computer graphics backed by special effects from videodiscs would combine to form a multiscreen presentation at each player's station. There's even a provision for voice and video communication among stations. You can call up your Klingon enemies in the heat of battle (and see their ugly faces) to discuss surrender terms.

"We feel we are taking one of the first steps toward the electronics of the future," says Simutron marketing director Dave Jenkins. The system is essentially complete, the interior design of the franchise outlets is finished, and the final touches are being added to the computer graphics. The holdup, again, is capital. People are excited by the idea, but are reluctant to put up money for such a new concept. Right now, Simutron is negotiating to combine the centers with the restaurants of a large chain.

If the effort does get off the ground, Jenkins says Simutron could hold national tournaments, using special high-speed communications links between centers. The cost of this would rule out a permanent hook-up, and besides, Jenkins thinks people would rather play with their friends than a stranger in another city.

Another way to get around the expense of topnotch telegames is to open them up to audience participation. DeKoven envisions a sports analogy where some game players would become expert, or even go professional. Viewers around the country could tune in for a fee to watch their favorite videogame stars do battle in high-resolution graphics. "People could follow the games on their screens, perhaps even interact in some way – possibly inform a player of danger," he says.

At the expert level, players could control the game on many levels – heart rate, alpha brain waves, and eye movement might each control different aspects. "People will become extremely agile in interfacing in hundreds of ways with games," says DeKoven, achieving "total physical involvement."

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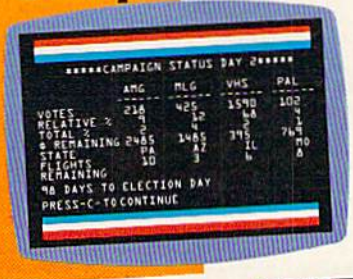

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Downloading Games:

A Step Toward Telegaming

Phone lines can be used to distribute games as well as play them. Games and other programs can be *downloaded* from a remote computer to the user's personal machine. This has some advantages. When you play the game on a host computer, you pay an hourly fee for connect time, the time actually spent on-line. But if the game is downloaded, you can play it at your leisure.

Establishing this two-way link for distributing software may be an intermediate step toward full-fledged telegaming. For although it will be some time before sophisticated realtime telegaming is practical in the average home, downloading software on a mass scale is possible today.

"What the consumer will experience most readily is downloaded software," says Bernie DeKoven, games designer for the Children's Television Workshop. DeKoven feels that many of the possibilities in telegaming require too much expensive technology to be likely to succeed in the immediate future.

Several companies are readying plans to distribute games and possibly other software over the phone system. Control Video Corporation recently announced plans to sell a modem that plugs into the Atari 2600 video game machine (of which there are about 11 million in American homes). The service, called Gameline, would transmit popular games for a fee. The game programs have built-in counters limiting their use to a certain number of plays. After the allotment is used up, the game stops working. This keeps the retailers happy, because people who like the game can still purchase a permanent version locally.

Downloaded software could be distributed in other ways, too. Cable TV makes a good medium for transmitting games because coaxial cable carries a tremendous amount of data – making possible games with superior graphics. Since game graphics eat up so much memory, a delivery system employing low baud rates (transmission speeds) would take much too long to download extended graphics. Not so with cable.

Starting December 1, some cable TV customers will be able to subscribe to the Games Network, a new system for downloading computer games into homes. For $14.95 a month, subscribers will lease an Apple-compatible terminal with 64K of memory. A menu of 20 to 40 games displayed continuously on the TV screen will show what's available. Each month, the selection is updated with new games.

To receive a game, you type a choice on the terminal, and the Games Network transmits the program through the cable. The program is sent in coded form during the *vertical blanking interval*, the split-second that elapses between frames on the TV set (visible as a black horizontal bar that rolls up or down your screen when the vertical hold is out of adjustment). By sending the game during the blanking interval, the broadcaster avoids disrupting the menu display. As the signal comes in, the terminal decodes it, and the game is ready to play. It cannot be stored permanently, however – it must be downloaded for each playing session.

This kind of two-way cable has many possible applications. Several power companies are even looking at the technique as a means of reading meters without having to send anyone out to a customer's house. Since the power companies could save considerable sums this way, there's more incentive for two-way cable. And that could spread such offerings as the Games Network.

Another possible means of distributing games is over FM radio. "The FCC has released so many new bands for FM, it's now possible to devote stations to the continuous broadcast of games," says Terry Bradley, a vice president and co-founder of Sirius Software. The station could repeatedly broadcast its entire selection of games, day and night. Using a "radio modem" and decoder, the computer could locate the desired program, decode it, and store it in memory for later use.

But Bradley suspects this type of mass distribution would be vulnerable to airwave piracy. If the radio modem/decoder could be copied fairly easily, anyone could receive the signals, not just subscribers. "There's no way to control it," he says. "It's like satellite TV."

Bradley thinks one solution would be to program commercials into the games – perhaps during the intermissions between levels.

But none of this will take place – according to scientist and futurist Robert Jastrow – "until fiber optics get into the home."

Why fiber optics? Fiber optics are bundles of glass fibers through which light can be flashed, transmitting massive amounts of data at stupendous rates. In some cities, slender fiber optics are replacing bulky copper cables for telephone trunk lines, though it could be the end of the century or beyond before fiber optics enter the home. When they do, data transfer will jump from hundreds of bits per second to megabits.

At that point, audio communication changes to video all over the country," says Jastrow. "People will be able to communicate by video in realtime, which will have a really decentralizing effect on our country. We'll return to the old idea of the cottage."

Thus, we may be headed for an era when work, shopping, information gathering, and recreation will all be centered around the home – borne on flickering threads of light. "Pretty soon our society is going to get on a real information high," says Sirius's Bradley. "Now, man is so mobile. We just hop around this planet. But we are using up our resources. The home is going to be designed more for pleasure, and people will spend more time at home."

Such an era would be conducive to telegaming. With powerful computers in every home and communications lines capable of flashing photo-quality images and graphics around the world, massive nationwide or worldwide tournaments could flourish. If you wished, you could follow the action around the globe, watching, as hour by hour new players awoke fresh from a night's sleep and signed on to play.

HOTWARE

A Look At This Month's Best Sellers And The Software Industry

Kathy Yakal, Editorial Assistant

Commodore 64 Entertainment

This Month		Last Month
1	*Jumpman* (Epyx)	1
2	*Zork I* (Infocom)	2
3	*Frogger* (Sierra On-Line)	–
4	*Temple of Apshai* (Epyx)	3
5	*Zork II* (Infocom)	–
6	*Repton* (Sirius)	–
7	*Gridrunner* (HesWare)	–
8	*Turmoil* (Sirius)	–
9	*Zork III* (Infocom)	10
10	*Deadline* (Infocom)	–

Commodore 64 Home/Business/Utility

This Month		Last Month
1	*WordPro 3 Plus/64* (Professional)	1
2	*HES Mon* (HesWare)	–
3	*Data Manager* (Timeworks)	2
4	*Money Manager* (Timeworks)	2
5	*6502 Professional Development Kit* (HesWare)	–
6	*Personal Finance Assistant* (Rainbow)	–
7	*HES Writer* (HesWare)	6
8	*Household Finance* (Creative)	–
9	*Inventory 64* (Computhings)	–
10	*TOTL.Text* (TOTL)	5

Commodore 64 Educational

This Month		Last Month
1	*Kinder Comp* (Spinnaker)	2
2	*Facemaker* (Spinnaker)	3
3	*Hey Diddle Diddle* (Spinnaker)	4
4	*Touch Typing Tutor* (Taylormade)	5
5	*Coco* (HesWare)	1

VIC-20 Entertainment

This Month		Last Month
1	*Choplifter* (Creative)	1
2	*Graverobbers* (Victory)	–
3	*Gridrunner* (HesWare)	3
4	*Shamus* (HesWare)	2
5	*Adventure Pack I* (Victory)	–
6	*Annihilator* (Victory)	–

VIC-20 Home/Business/Utility

This Month		Last Month
1	*Household Finance* (Creative Software)	5
2	*HES Writer* (HesWare)	3
3	*HES Mon* (HesWare)	–
4	*Home Office* (Creative)	2
5	*Turtle Graphics* (HesWare)	1
6	*TOTL. Label* (TOTL)	–
7	*6502 Professional Development Kit* (HesWare)	7
8	*Quick Brown Fox* (Quick Brown Fox)	–

VIC-20 Educational

This Month		Last Month
tie	*Computer Coach* (BEST)	–
tie	*Type Attack* (Sirius)	–
2	*Touch Typing Tutor* (Taylormade)	3
3	*Flash 'n Spell* (Qumax)	5
4	*Flash 'n Math/Multiplication* (Qumax)	–

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This month we examine some of the factors that either make a software product a best seller or banish it to the bargain bins. We're also continuing to look at some of the trends that have emerged over the summer.

You've probably seen numerous best seller lists for books, movies, records, TV shows, and other forms of entertainment. Usually they stay almost the same for weeks or even months on end as you look in vain for any significant changes. "Geez, when is that Wayne Newton album going to move up from No. 39? It's been there for weeks!" Or, "Why doesn't someone knock that Richard Simmons book out of first place?"

Not so with home computer software. For a number of reasons, a game that was on top of the list one month can fall right off the charts the next. And vice versa. What are the reasons?

Availability/Visibility. Say there's this great game made by a small company with very little funds for marketing and even less for advertising. The company could try to get some local stores to sell it or make it available by mail order. Both of these methods work, but chances are not good that it would get the exposure necessary to really make it move.

Now let's say the game is bought by someone who works for a major distributor. The distributor sees it, starts to carry it, recommends it to his retailers, and (if it's truly a great program) suddenly it starts selling. The effectiveness of marketing and distributing, especially in a still-maturing market such as home computer software, is tremendously important. Visibility and availability are absolutely essential to success.

Technical Problems. Again, because this is still a very young industry, there are a number of technical problems related to both hardware and software that affect the market. If a computer undergoes a series of upgrades that subtly change certain operating characteristics – as the Commodore 64 has – a game programmed for one model may not work properly on another. Technical problems can also affect supply of software. One distributor complained last month that he could not get a single copy of one of the current best sellers because the manufacturer was having trouble with cartridge production. This had a definite impact on the HOTWARE list.

Other Factors. Various other things may influence a program's market performance: whether its visual impact leads individual retailers to run demo copies on computers in the store; the quality of the program's packaging; the reputation of the software publisher; "word of mouth" advertising, especially through user groups; pricing; and even, to some extent, best seller lists such as HOTWARE.

Sophisticated Packaging

We're beginning to see a higher level of sophistication in the way software, particularly game software, is being packaged. A good example is Infocom, which was singled out by one distributor we contact every month. Electronic Arts, a new company whose games have not yet appeared on the HOTWARE list, is another.

Educational Software

Educational software is beginning to pick up. In spite of all the computers being used in classrooms these days, and for educational purposes in the home, educational software does not seem to move as well as games or business/utility programs. For one thing, there has been much less to choose from, especially compared to entertainment software.

Companies such as Spinnaker are changing that. Programs like *Facemaker* and *Kinder Comp* (both of which appear on this month's HOTWARE list) are often praised by our sources. In the first week that one of our sources stocked Spinnaker programs, they outsold all his other educational software combined.

Trend To Strategy Games

Racking up 100,000 points or gobbling up all the little dots or saving Earth is a heroic accomplishment, but based on the sales trends we're seeing, gamers are looking for challenges that involve more brains and strategy. This is not to say that action games are out; they will always have a following. But strategy games are definitely moving in.

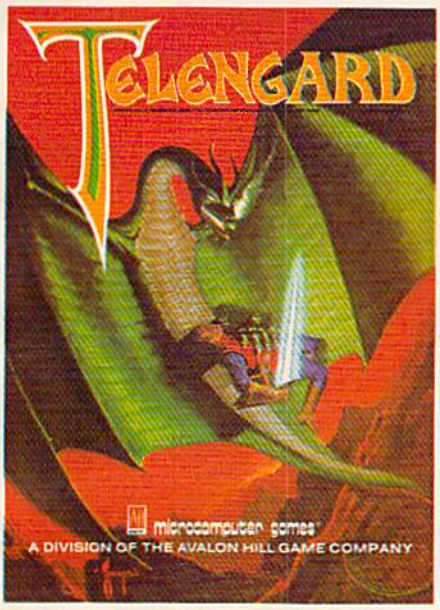
Commodore 64 HOTWARE

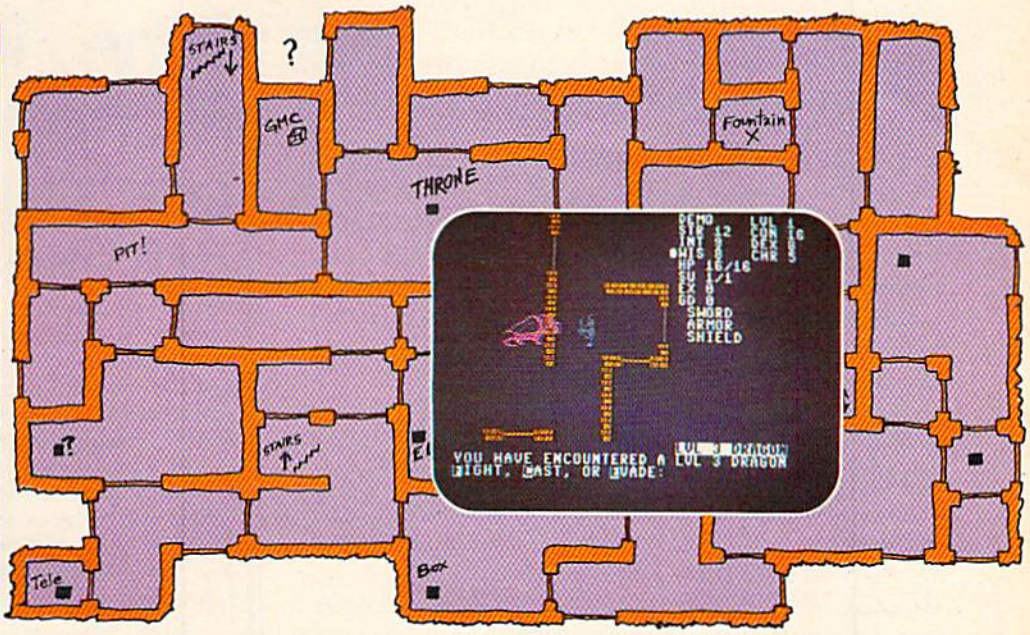
Jumpman and *Zork I* continue to hold first and second place in the entertainment category. *Temple of Apshai* slipped to fourth place, and its former third-place position was snapped up by a new entry this month: Sierra On-Line's *Frogger*.

Sirius Software is creating some competition for Epyx and Infocom, which have been dominating our HOTWARE list. Last month's *Fast Eddy* and *Squish 'em* dropped off the list this month, but were replaced by *Repton* and *Turmoil*. HesWare's *Gridrunner* is back on the list again, taking the No. 7 position.

In the home/business/utility category, *WordPro 3 Plus/64* retains its No. 1 position, in spite of all the competition coming into play. New Commodore 64 owners are hungry for home/business-oriented programs, and there are plenty of software companies willing to supply them. Timeworks, which had two best-selling games last month, stays on the charts with *Data Manager*

Be Amazed!





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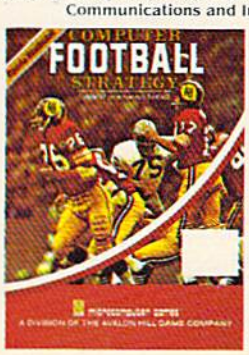

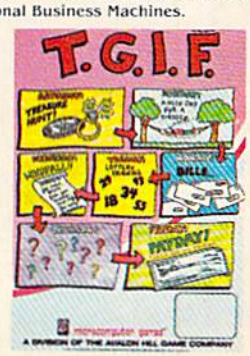

and *Money Manager* in third and fourth place. HesWare is still a strong competitor in this category; it takes second, fifth, and seventh places with *HES Mon*, the *6502 Professional Development Kit*, and *HES Writer*. Computhings, which had a best seller in its *Dome Business* last month, appears again with a program called *Inventory 64*. Rainbow Software debuts this month with *Personal Finance Assistant* in sixth place.

Spinnaker is still producing the best educational software, according to our HOTWARE sources; *Kinder Comp*, *Facemaker*, and *Hey Diddle Diddle* claim the top three spots this month. It appears, though, that Scholastic may be stiff competition for Spinnaker. One of our sources says that Scholastic's packaging is phenomenal, and the programs themselves are excellent.

VIC-20 HOTWARE

It's almost as difficult to get information about best-selling VIC-20 software as it was to get the same information a few months ago about Commodore 64 software. Not for the same reason, though: VIC-20 software *is* available, but people don't seem to be buying as much of it at the same places anymore. Most of our sources are specialty retailers and distributors, and the bulk of VIC-20 software sales seems to be shifting to the discount stores (as discussed in last month's HOTWARE).

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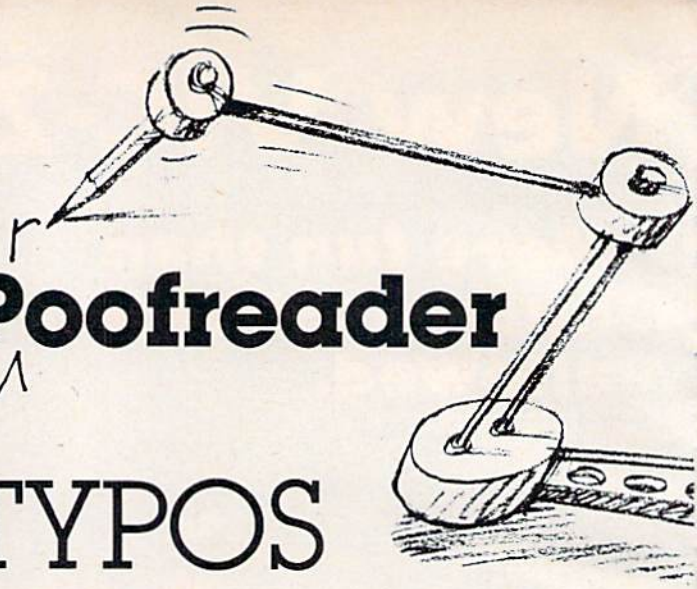


The Automatic Poofreader

BANISH TYPOS FOREVER!

Charles Brannon, Program Editor

The vast majority of letters and telephone calls we receive from readers concern our program listings. Many readers have trouble getting the programs to work. All listings are generated with a computer and a printer directly from fully tested, working versions of the programs, yet many readers continue to experience problems. To solve a lot of frustrations on both ends, COMPUTE!'s Gazette introduces "The Automatic Proofreader" – a revolutionary new way of entering programs that alerts you *instantly* if you've made a typing error.

We all know it's hard to type in a program correctly the first time. Seemingly trivial typing errors can cause dreaded ERROR messages, or even a *system crash* (the keyboard will not respond to RUN/STOP-RESTORE). Usually the only way to recover from such a crash is to reset the computer by turning it off, then on again – wiping out the memory and all your typing in the process.

Even when you locate and correct the mistyped lines, there always seem to be more errors lurking in the hundred-odd lines of the program. Sometimes you feel like giving up.

Elusive Errors

Some errors are almost impossible to spot, especially for beginners who know little or nothing about programming. For instance, can you spot the mistake in this line?

```
100 PRINT RIGHT$("00"+MID$(STR$(V),2,3)
```

Here's how it should read:

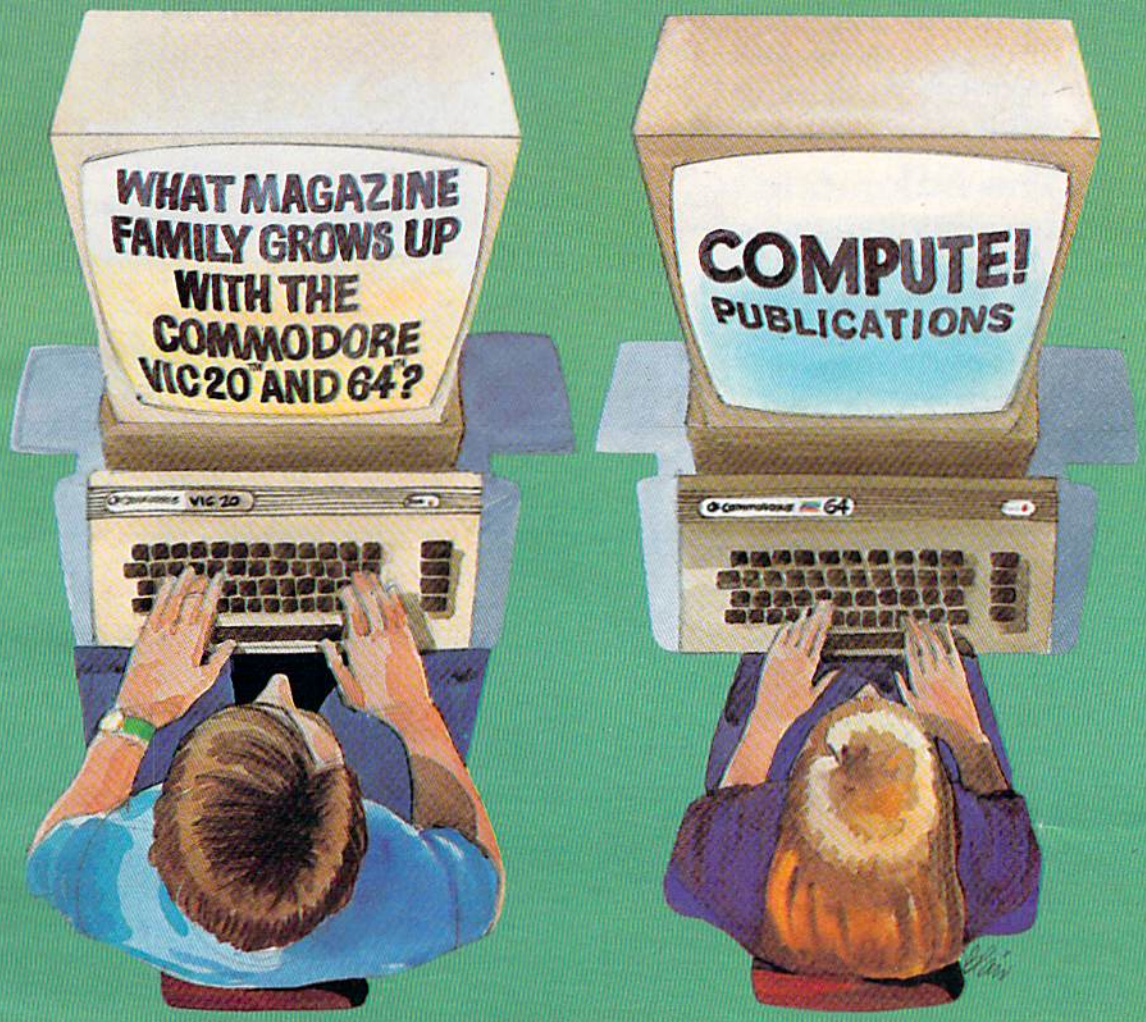
```
100 PRINT RIGHT$("00"+MID$(STR$(V),2),3)
```

Did you catch the difference? A right parenthesis was missing after the number 2. (A left parenthesis must always have a matching right parenthesis. If you add up all the parentheses in a statement, you should get an even number.)

An Impossible Dream?

The strong point of computers is that they excel at tedious, exacting tasks. So why not get your computer to check your typing for you? An impossible dream?

Not with "The Automatic Proofreader." Nestled within your VIC-20 or Commodore 64, the Proofreader automatically checks every line you type in. It displays a number at the top of your screen. This number, called the *checksum*, corresponds to the line you've just typed. It represents every character in the line summed together. A matching number in the program listing lets you compare it to the checksum that the Proofreader displays. A glance is all it takes to confirm that you've typed the line right.



Our newest magazine, *COMPUTE!'s Gazette* for Commodore, is written for the beginning consumer of personal computing. Each monthly issue will bring you interesting features, exciting news, intriguing new products, and more.

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The Automatic Proofreader is a small machine language program that resides in a relatively safe area of memory, the cassette buffer. It will remain there until you turn off your machine, or run another program that uses the cassette buffer. Loading or saving BASIC programs from tape or disk will not affect it.

Entering The Automatic Proofreader

If you have a VIC, type in Program 1. Program 2 is for Commodore 64 users. There's only one small catch – the Proofreader can't check *itself*, so be extra careful to type it in correctly in the first place. Since it is a machine language program, be especially diligent. Watch out for typing extra commas, a letter O for a zero, and check every number carefully. Fortunately, the Proofreader is a short program, so you should have no trouble.

When you've typed in The Automatic Proofreader, SAVE it on tape or disk at least twice *before running it for the first time*. If you mistype the Proofreader, it may cause a system crash when you first run it. By SAVEing a copy beforehand, you can re-LOAD it and hunt for your error. Also, you'll want a backup copy of the Proofreader because you'll use it again and again – every time you enter a program from COMPUTE!'s Gazette.

When you RUN the Proofreader, the program will be POKEd safely into memory. Then press RETURN on the line the cursor is sitting on to activate the Proofreader. If you ever need to reactivate it, just enter the command SYS 828 and press RETURN.

Using The Proofreader

Now, let's see how it works. LIST the Proofreader program, move the cursor up to one of the lines, and press RETURN. If you've entered the Proofreader correctly, a number will appear at the top-left of your screen.

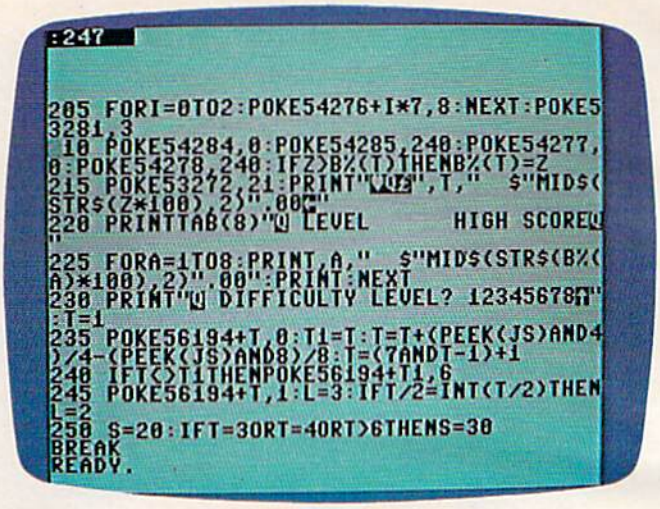
```
10 A=1:B=72:PRINT"SCORE=";SC :rem 199
```

Checksum

Don't type this

Try making a change in the line, hit RETURN, and notice that the number has changed. All VIC and 64 listings in COMPUTE!'s Gazette now have a number appended to the end of each line, for example ":rem 123". *Don't enter this statement.* It is just for your information. The "rem" is used to make the number harmless if someone does type it in. It will, however, use up memory if you enter it, and it will cause the checksum displayed at the top of the screen to be different, even if you entered the rest of the line correctly.

Just type in each line (without the printed checksum), and check the number displayed at the top of the screen against the checksum number in the listing. If they match, go on to the next line. If they don't, there's a mistake. You can correct the line immediately, instead of waiting to find the error when you RUN the program.



"Automatic Proofreader" displays a checksum number in the upper-left corner of the screen that tells you immediately if you've typed a program line incorrectly. Just compare the checksum to the REM number in the printed listing.

The Proofreader is not picky with spaces. It will not notice extra spaces or missing ones. This is for your convenience, since spacing is generally not important. But occasionally proper spacing *is* important, so be extra careful with spaces, since the Proofreader will catch practically everything else that can go wrong.

There's another thing to watch out for: if you enter the line by using abbreviations for commands, the checksum will not match up. But there is a way to make the Proofreader check it. After entering the line, LIST it. This eliminates the abbreviations. Then move the cursor up to the line and press RETURN. It should now match the checksum. You can check whole groups of lines this way.

When you're done with the Proofreader, disable it by pressing RUN/STOP-RESTORE (hold down the RUN/STOP key and press RESTORE). If you need it again, enter SYS 828. It will then be ready once again to act as your personal typing aid.

Checksum programs are not new in computer magazines. But until now, there was nothing like The Automatic Proofreader – it shows you *instantly*, as soon as you've entered the line, if you've made a typo. We hope that the proofreader makes your program entry both faster and easier, and that you'll never have to face another frustrating ERROR message.

See program listings on page 145.

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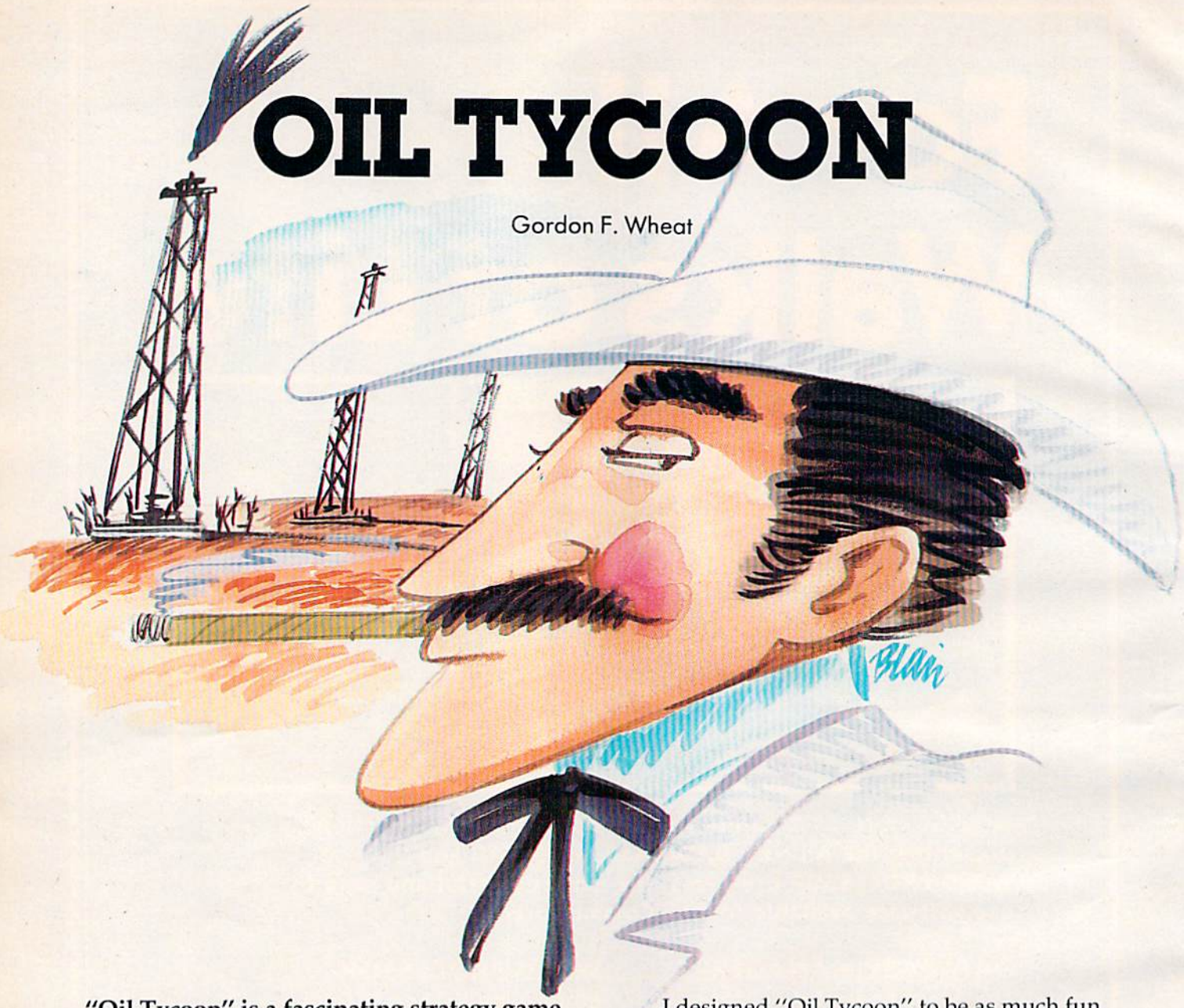
OIL TYCOON

Gordon F. Wheat



"Oil Tycoon" is a fascinating strategy game with multiple difficulty levels and hundreds of play possibilities. For the unexpanded VIC and the Commodore 64. It requires one joystick.

You are P. J. Uing and you are about to make big money in the petroleum business, but drilling for oil is not as easy as it sounds. There are obstacles you must overcome in order to make a profit. There are shale formations that grind away your pipe. You can blast through them, but your dynamite is limited. Pockets of natural gas sometimes collect where you have previously pumped out the oil. Hit one of these and your oil rig goes up with a bang. There are also "devils" that live in the oil. They take a dim view of your draining their caverns. But you won't give up – because you are the Oil Tycoon.

I designed "Oil Tycoon" to be as much fun for parents as it will be for children. Since the game is not based on reaction time but rather on strategy, it helps even the score for the "arcade dropouts." Your strategy will slowly build, and before long you will be rolling in cash or attaining high scores, however you wish to look at it.

Loading Procedure

Oil Tycoon will run on an unexpanded VIC, and there's another version for the 64. The VIC version fits in 5K of memory because it is actually two separate programs. The first program displays a brief review of the control features and a few simple warnings, along with the message "PLEASE WAIT FOR FURTHER INSTRUCTIONS." At this point it POKEs into memory the custom character information and the machine language portion of the game used for reading the joystick position. It protects this area of memory from BASIC, then

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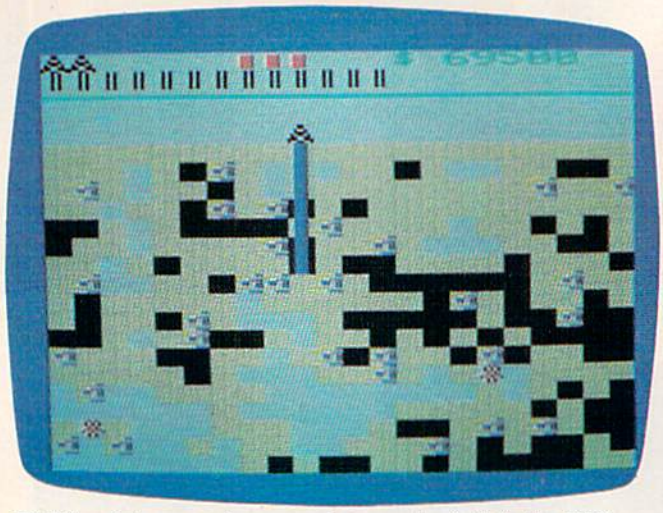

Drilling into an underground reservoir of oil in the VIC version of "Oil Tycoon." Note the little red devils lurking in the pumped-out caverns.

LOADs and RUNs the second program, erasing itself in the process. When this is completed, the message "PRESS STOP ON TAPE" appears at the bottom of the screen and the program waits until you comply.

Because of the Commodore 64's much larger memory, the 64 version is one completely self-contained program.

Difficulty Levels

The next screen displays the high scores attained for each of the eight difficulty levels. The program will return to this screen after each game. Your score and the difficulty level of the game you have just completed are displayed at the top of the screen.

At the bottom of the screen you will see "DIFF. LEVEL 12345678." Choose the difficulty level by moving the joystick left and right and pressing the fire button when the number of the difficulty level you want is blinking. Level one is primarily for small children. I would recommend that seasoned gamers begin with level two. The higher the difficulty level, the more difficult the game becomes. The various conditions for the eight difficulty levels are as follows:

Level	Sticks of Dynamite per Oil Rig	Pieces of Shale	Invisible Shale
1	3	20	No
2	2	20	No
3	3	30	No
4	2	30	No
5	4	20	Yes
6	3	20	Yes
7	4	30	Yes
8	3	30	Yes

Playing Oil Tycoon

After you choose the level, the oil field is drawn on the screen. It will be different for each game; you should never see the same screen twice. For each game, you receive five oil rigs, each of which has 20 lengths of pipe and a number of sticks of dynamite, depending on the difficulty level you choose.

In the upper-left corner of the screen are the oil rigs you have remaining. In the upper-right corner is your score. Between these are the sticks of dynamite you have remaining for the oil rig now in play. The second line displays the unused lengths of pipe for the oil rig now in play. As you drill, this pipe will be used one length at a time and will be replaced as you withdraw your drill. The lower portion of the screen is the playing field. Yellow squares are dirt, black squares are oil, and the irregular squares are shale.

Move the joystick left and right to position your oil rig over the column you want to drill through. To drill, pull the joystick down. To withdraw the drill, push the joystick up. You cannot move the oil rig while there is drilling pipe in the ground. You cannot bore through shale, devils, or off the bottom of the screen. If you try, your drill will be ground up, and you will lose that length of pipe for the oil rig in play. This becomes very important in difficulty levels above four, for the shale is invisible and looks like dirt. At these levels, it is very easy to lose most of your drilling pipe before you realize that you are trying to drill through shale.

Also try to avoid drilling through empty spaces from which you have previously pumped oil. Natural gas can collect in these empty spaces and may cause an explosion when you try to drill through them again.

Controlling the fire button takes some getting used to, because it does three things. As you bore, if the end of the drilling pipe is in oil or an empty space, pressing the fire button causes your oil rig to start pumping. If the end of the pipe is in dirt, pressing fire drops a stick of dynamite down the pipe. If you are not drilling, or if you have fully withdrawn the pipe, pressing fire replaces your current oil rig with one of your remaining rigs. Be careful – it is easy to lose valuable rigs. Replacing your oil rig with a new one is useful mainly when you have used up your allotted dynamite for the rig in play, or if you do not have enough pipe remaining to reach pools of oil near the bottom of the screen.

Use your dynamite to blow up shale, devils, or dirt. Note that when you drop dynamite down the pipe, it will continue to fall until it hits one of these three obstacles. This means that if there is oil or empty space directly below the tip of the drill, the dynamite will fall out of the bottom of the pipe and through this space until it hits shale, a devil, or dirt.

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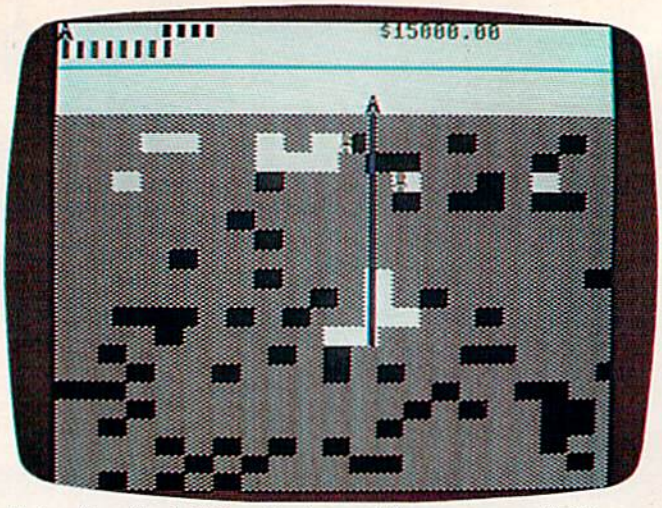

Extending the drilling pipe toward deep reserves of oil in "Oil Tycoon," 64 version.

Pumping Oil

When you pump, all of the oil in adjacent spaces to the sides and above the level of the drill bit will be pumped out. In other words, all squares of oil connected to the one you are pumping will also be pumped out only if they lie directly *above* or *to the sides* of the oil being pumped. Any squares of oil *below* those which are being pumped out will remain where they are.

If you uncover a devil while pumping, it will blow up your oil rig. If you try to pump a pool of oil which is at or below the level of an uncovered devil, and which is directly connected to the devil's space, it will also blow up your rig.

The deeper the oil, the more it is worth when you pump it out. An extra oil rig is awarded for each $100,000 you acquire. In addition, if you pump out all the oil on the screen and then retract your pipe, you will be awarded an extra oil rig and a new screen is drawn.

Entering The Program — VIC Version

REM (REMark) statements were excluded in Program 2 to conserve memory. For those who are interested in studying the routines, a summary is presented at the end of this article.

If you do not want to go through the trouble of typing the entire game into your computer, simply send $3 and a blank tape in a stamped, self-addressed cassette mailer to:

Gordon Wheat
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Denton, MD 21629

To enter the VIC version of Oil Tycoon into your computer, type in Program 1. SAVE the program on tape and VERIFY it. Now remove that tape, without rewinding it, and place a second tape in the cassette. SAVE and VERIFY the program on this tape. As before, do not rewind this tape and do not RUN the first program. Type NEW to erase the first program and type in Program 2.

It is *very important* that all BASIC statements be abbreviated when entering the second program or you will quickly run out of memory. Look in your manual to see how BASIC statements are abbreviated. SAVE and VERIFY this program on both tapes. You should now be ready to play Oil Tycoon.

After LOADing the first program, do not press STOP on the cassette recorder; it will stop by itself. When the first program is RUN, it will LOAD and RUN the second program.

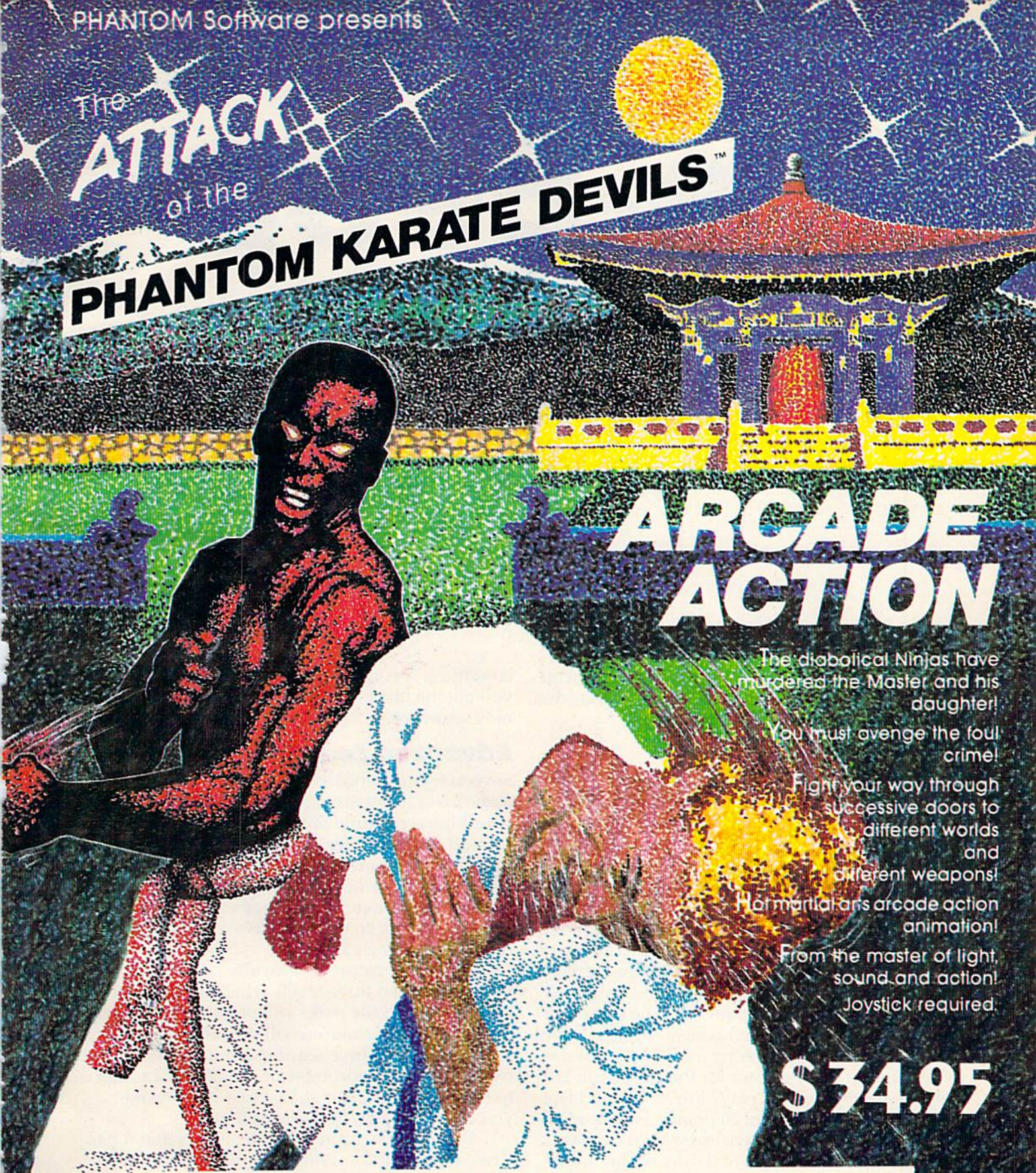
This is the first game program I have written, and I have been programming for only nine months, so any comments or ideas would be welcome.

Special thanks to Rick Capacio for his many hours of testing.

Breakdown of Routines – Program 2 (VIC Version)

Lines	Routine
1-4	Game initialization.
5-23	High score screen, difficulty selection.
24-25	New oil rig.
26-29	Drill.
30-33	Secondary loop.
34-39	Primary loop.
40-45	Withdraw pipe.
46-60	Pump.
61-68	Upper screen update.
69-77	Drop dynamite.
78	Natural gas.
79-81	Exploding pipe and rig.
82	Bell sound.
83-84	Explosion sound.
85-86	Devil.
87-92	Screen setup.
93	Explosion picture.
99	Drilling sound.

See program listings on page 145.



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Re-Beep

For VIC And 64

Robert L. Lykins

"Re-Beep" is a *Simon*-type game written originally for the unexpanded VIC-20. We've added a translation for the Commodore 64.

"Re-Beep" is a game for the VIC-20 and Commodore 64 that will truly keep you on your toes. An increasing amount of concentration is required to keep your score rising. You must duplicate the ever-lengthening tone sequence the computer gives you by pressing the special function keys in the correct order.

If you correctly duplicate the sequence, your score will increase by one. (You receive one point for each beep in the pattern.) The computer will then add a note to the old pattern, and you must then attempt the longer sequence. The computer starts with one note, which is easy enough. Soon, however, you will be hearing a befuddling series of beeps. Can you hold out for the maximum 127 notes the computer can play? Probably not. I feel lucky if I manage to score 20 points. For the memory experts, however, there is a way to increase the note capacity to 255. We'll discuss this later.

When your memory fails, all is not lost. The computer will sound a buzzer, tell you to try again, and then replay the sequence for you. Who says a computer can't be humane? If, despite the trauma of blowing your first try, you regain your concentration and properly play the sequence, the game continues. If you can't do it the second time either, you get the raspberry and the computer starts a new sequence.

Advanced Features

Several features incorporated into this *Simon*-type game make it better than many. First, it remembers your high score until you erase the program or turn off the computer. Some patterns are easier to remember than others, and you may find that you do not score nearly as high on one game as on another. The computer keeps and displays your high score so you will have a goal to shoot for in succeeding games.

A second feature is difficulty selection. You may select from three levels which determine the speed at which the notes will be sounded. Beginners and young children will probably do best on level one. Level three requires a quick wit, so level two is a good compromise. It is not slow enough to become boring, nor so fast that it will make you blink and say, "What was that?"

Perhaps this game's best feature is that it has a two-player option. Most computer games seem designed for only one player. With Re-Beep, you may elect to play with another person. If so, the computer will ask the name of each player and provide a separate scoreboard for each. The high scores are also displayed separately.

Player one begins, and his scoreboard number

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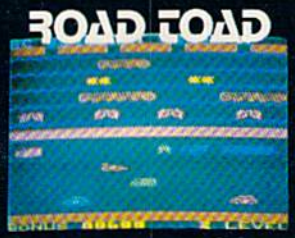


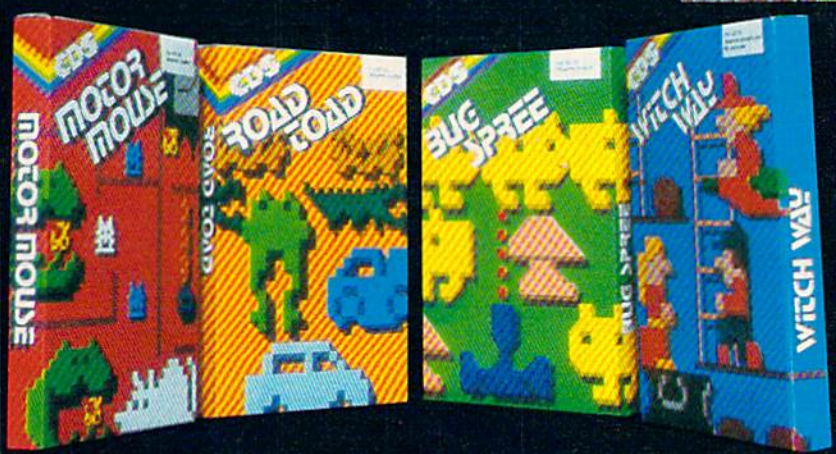
Can our hero make it across the freeway without getting that run-down feeling?

And if he does . . . does he know he can't swim?!?!

It's the thrill of victory and watch out for the alligators!

Keep your eyes open — there's a tasty treasure in cheeses just ahead! But . . . there's hungry cats around every corner!

One wrong move, and you're hickory dickory dead!



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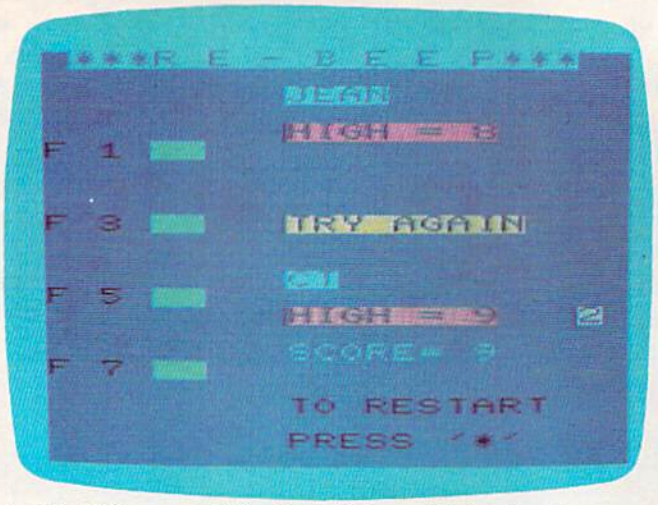
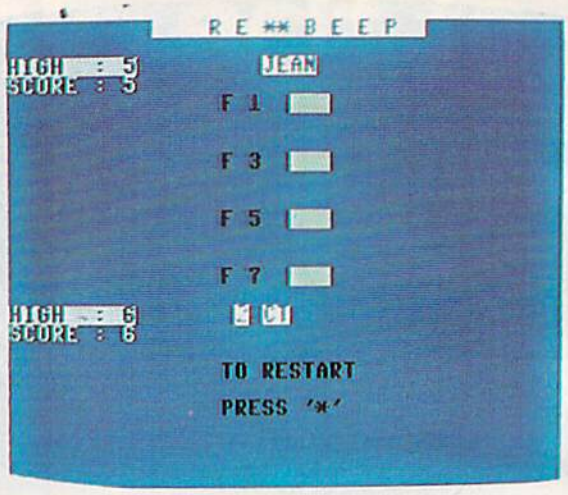


In this VIC game of "Re-Beep," player CT has just been tripped up by a nine-tone pattern – but he gets a second chance.



"Re-Beep" for the Commodore 64 uses the built-in synthesizer to generate tones.

(1) is lit until he loses. The computer then lights the second scoreboard number (2) and begins a new sequence for player two. When player two's concentration fails, play is switched back to player one and his scoreboard. Play thus alternates between the two scoreboards.

If only one person wishes to play, the computer will skip the name request, display only the top scoreboard, and will not light a scoreboard number. This allows maximum concentration on the task at hand.

Opposing teams could be formed if more than two wish to play. Each scoreboard will hold 12 characters for the name or names, but if two are used, they should not be separated by a comma due to the computer's INPUT characteristic of disregarding anything after a comma. A slash (/) should work fine, however.

How It Works – VIC Version

This program employs a technique known as *string concatenation* – the addition of two strings. (A "string" is a group of characters.) In this case, STR$(R) is added to S$, the string containing the information the computer uses to play the series of notes. R is a random number from one to four, inclusive, corresponding to one of the four function keys, and is selected by line 230. It must be converted into a string by STR$(R) so that it can be used in a sequence of numbers.

For example, if S=0, S$="", first R=3, then R=4, then:

Numeric Addition	String Concatenation
S=S+R	S$=S$+STR$(R)
S=0+3=3	S$=""+"3"="3"
S=3+4=7	S$="3"+"4"="34"

In this example, R first corresponds to function key F5 (3), then to F7 (4). Adding three and four numerically results in the number seven, only one numeral which has no corresponding key. But concatenating the strings as in line 240 provides a sequence of selected R values which do have a corresponding function key and tone.

Using lines 260 to 300, the computer plays a series of tones and lights up the green rectangles corresponding to the function keys. It does this by converting each number in S$ into a numeric value (Q) in line 270. Line 290 sends the program to one of four note-playing and rectangle-lighting subroutines, depending on the value of Q. The handy ON-GOSUB statement replaces four IF...THEN statements. If Q=1, the program GOSUBs to the first line number, 480. If Q=2, it GOSUBs to the second, etc.

The NEXT statement in line 300 repeats the process if line 260 indicates there is more (depending on the LENgth of S$). Perhaps you noticed in the string concatenation example that the numerals were preceded by spaces. This is because STR$(R) puts a blank space in front of the numeral, and a LENgth check will bear this out: LEN(STR$(4))=2. Of necessity, then, the FOR-NEXT loop beginning in line 260 starts with 2 and STEPs 2 so that line 270 won't read a blank. If you wish to slow the game, you can start the loop with 1 and eliminate the STEP portion of the statement. This will result in Q having a value of 0 every other time, which will not play a note. Leaving in the STEP portion will result in line 270 reading blanks only, and line 290 will never execute a tone subroutine.

After all the notes in S$ have played, lines 310-350 get the player's response on the function keys, play the appropriate notes with the same subroutines, and build F$. Line 370 compares the LENgth of the player's string (F$) and the computer's string (S$). If they are the same LENgth, it means the player has played as many notes as the computer and further comparisons are made. If not, the program returns to line 310 for more player input.

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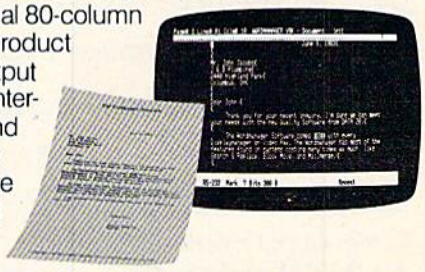

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Line 380 determines whether or not the player's sequence is correct. If not, it allows the player to try again if E=0, then changes the value of E to 1. This causes the program to skip the "Try Again" routine if the player fails the second time.

Line 400 catches this and sends the program to the end-of-game routine. If the program can get by lines 380 and 400 without being diverted, the player has played the sequence correctly, and the program enters the scoring routine. The program then adds another numeral to S$ and the tone sequence lengthens. The process repeats.

For Mnemonists

Allowing STR$ to put blank spaces in S$ and F$ actually wastes half the memory available for the tone sequence, limiting it to 127 notes, though this quantity should prove to be more than adequate for most players. Perhaps a few readers have really extraordinary memory capabilities. If so, the following will increase the challenge of the game. If not, at least it illustrates what can be done to solve the waste problem and may be useful in other applications.

To fill S$ and F$ with useful numbers (and obtain 255-note capacity), only the numeral and not the blank space in STR$ should be added. This is accomplished by using the RIGHT$ function as illustrated in lines 240 and 320-350 below. In this instance, the farthest right character from STR$, the numeral, is added to the tone string instead of the whole of STR$.

Change the following lines for 255 notes:

```
240 S$=S$+RIGHT$(STR$(R),1)
260 FORL=1TOLEN(S$)
320 IF Z$="{F1}"THENGOSUB480:F$=F$+RIGHT$
    (STR$(1),1)
330 IF Z$="{F3}"THENGOSUB540:F$=F$+RIGHT$
    (STR$(2),1)
340 IF Z$="{F5}"THENGOSUB600:F$=F$+RIGHT$
    (STR$(3),1)
350 IF Z$="{F7}"THENGOSUB660:F$=F$+RIGHT$
    (STR$(4),1)
```

Other Techniques

Level of play is determined by the value of LV (1-3), INPUT early in the program (line 50). Certain lines in the program employ delay loops that incorporate LV. LV is squared and is then used to divide the loop length number. On level one, the number is divided by one – no change. If LV=2, the number is divided by four (LV^2), substantially reducing the delay. And on level three, the number is divided by nine.

Loops are also employed to print multiple items on the screen. The title display is created in this manner by line 40. Different print colors are obtained by POKEing 646,L. Lines 150 and 160 print the function keys' F numbers and matching green rectangles. Using this technique can be a memory saver.

Note that line 130 uses a WAIT statement rather than the more familiar 130 GETA$:IF A$="" THEN 130. You should experiment with this before putting it in your own programs, however, because the results are somewhat unpredictable. (See "Hints and Tips" in this issue.) Memory location 197 contains keyboard information. Using WAIT 197,64 will cause the program to wait until any key is pressed, including the RETURN key, which may still be down from INPUTing in line 60 or line 80. This problem is solved by using number 32 instead of 64. Now, about half the keys will cause the program to continue, including the space bar. The RETURN key will have no effect. Using another number may cut out more keys or may be ineffective in stopping the program at all.

You may have noticed that some PRINT statements do not have ending quotation marks. They are unnecessary on the VIC and 64 at the end of a line, unless used to define the length of a series of blank spaces.

Also unnecessary many times is the REVERSE OFF command. If the PRINT statement is not followed by a semicolon, REVERSE is automatically switched OFF when the statement ends. Line 769 is a REMark, but without the REM. It is unnecessary because the program never reaches this line, and so never detects the syntax error. The lines following it are subroutines, and line 760 sends the program to a line above it. These techniques can also save memory.

Readers who would like a tape copy of this program (VIC version only) may send $5 for a copy returned postpaid or $3 with a blank tape and a self-addressed, stamped mailer to:

Robert L. Lykins
P.O. Box 8140
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See program listings on page 148.

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BOMB'S AWAY - Can you stop him? The crazy bomber drops the bombs from the top of the screen. You get 3 buckets to catch them. Before you know it bombs are falling so fast you wonder when he will stop. Just when you think you have him under control your bucket gets smaller. Is your hand quicker than your eye? **Special $9.95**

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MOW - Get ready for the fast and furious action of the craziest mower you have ever seen. How much grass can you cut? Joystick moves your mower around as fast as you dare. Watch out for granny's dafodils and grandpa's radio antenna. **$14.95**

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TARGET COMMAND - The whole West Coast is being bombarded and only you can save it. You are at the controls of the missile launcher and hold the destiny of our country in your hands. It takes a cool head, not hand and fast reflexes to zap those missiles right out of the air. Get ready to pulverize — atomize and vaporize them. Oh, my God, those warheads are heading right for our ammo dumps. They are everywhere. NO ONE CAN SAVE US — EXCEPT YOU. You must move your laser into position and fire as fast as you dare. Time limit with arcade style excitement. Protect your ammo at all costs. 10 levels of play. **$14.95**

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SNAKEOUT - Slip your snake into position and score by chomping the blocks. Watch the way you slither because your escape routes get smaller. 2 Bonus games included. **$14.95**

HEAD-ON - Please do not buy this game if you are the type that says "I'll play it just one more time". Players have been known to start playing HEAD ON at 8:30 p.m. and at 2 a.m., wonder where the time went? Have you ever tried to explain to someone why you played a game for five and a half hours. We know of no remedy for the addiction to HEAD ON except to beat the VIC on level 9. No one has done it, YET, will you? We think not. Move your car as fast as you can dare around the tracks. You get 3 cars and MUST avoid the computer car. Points for the most dots covered. Bonus cars, nine levels of play. **$14.95**

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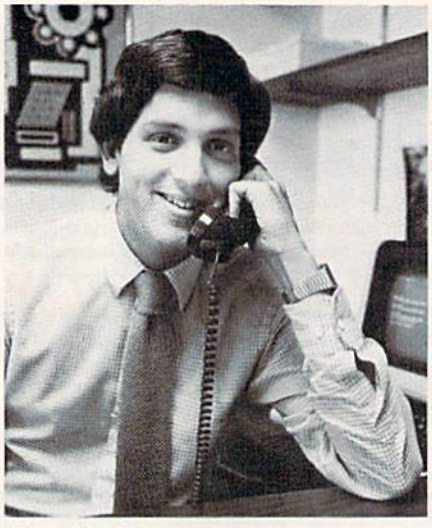
Marc Blank
The Programmer Behind *Zork*

Kathy Yakal, Editorial Assistant

Don't call Infocom a "software publisher." Or its creative staff "game programmers." This month's "Inside View" looks at the rather unusual evolution of a staff of game designers and the unique products they are creating.



Marc Blank.

Take a look at any software best-seller list. Chances are you will see a great number of games that involve gobbling up little dots, or shooting at something that's trying to annihilate you, or working your way through mazes.

There is another kind of computer game that has developed quite a following over the last few years: the adventure game. "We're the only people committed to that sort of game," says Marc Blank, 28, vice-president of Infocom and the programmer behind *Zork*. "I'm happy to be doing something that no one else is doing."

To date, Infocom has seven products on the market: *Zork I, II,* and *III, Starcross, Deadline, Suspended* and *Witness*. All adventure games. And all successful. "Our adventures are more like books than games." says Blank. "They are a valid form or entertainment, a new kind of fiction."

Early Inspiration

Blank's personal interest in adventure games goes back to when he was an undergraduate at the Massachusetts Institute of Technology in the mid-1970s. He, along with people all over the country, played the original *Adventure* (written by Don Woods and Willie Crowther, who were then at Stanford) on huge mainframe computers. *Adventure* required a tremendous amount of memory – about one megabyte.

This original adventure game was based loosely on the Dungeons and Dragons theme – a fantasy that requires its players to take on the personas of other characters as they engage in an imaginary trek through a castle, seeking treasure and warding off monsters.

The major interaction in this large-scale fantasy game was two-word commands typed in by the players on their own terminals at home and transmitted through a modem over the phone lines. The computer played the role of the dungeon master; it knew where all the treasure was

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hidden and all the danger lurked, and would execute the players' commands and tell them the results of their actions.

One of the problems with this initial version, according to Blank, was the computer's lack of vocabulary. Because it would accept only two-word commands, the computer made some decisions that would have made the game more challenging had they been left up to the player. For example, you could enter the command, "Open door," and if there was more than one door near you, the computer would decide which one you meant.

The Birth Of *Zork*

Marc Blank believes that one of the motivations for programming is to see if you can do something better than what's already been done. So he started to work on an adventure game of his own.

Using MDL, a computer language invented at MIT, Blank and some of his acquaintances wrote the original version of *Zork* on a PDP-10 (a mainframe). Blank had by this time finished his undergraduate studies and was attending medical school at Albert Einstein in New York.

The mainframe version of *Zork* first became available in June 1977.

Blank graduated from medical school in 1979 but decided not to pursue that profession, opting for what he considered a more creative field. He and a few other people spent the next year developing a language that they could use to program adventure games like *Zork* on the new microcomputers.

Memory limitations of micros forced them to cut the original version of *Zork* in half. But, says Blank, the new game was actually more complex. It took up about 70K (which does not mean that you need a computer with that much memory to play *Zork*; the program is set up so it calls on different sections at different times).

Blank believes an important element of adventure games is making the players feel like there's no computer there – that they're actually participating in the fantasy. One of the ways this was accomplished was by developing an English language parser that would allow the computer to respond to more than two-word commands.

"An adventure game is only as good as its parser, that part of the program through which the player communicates with the game's environment," says Blank. "If the parser gets in the way of the player's creative expression, even the best-plotted game can become slow, tedious, and frustrating."

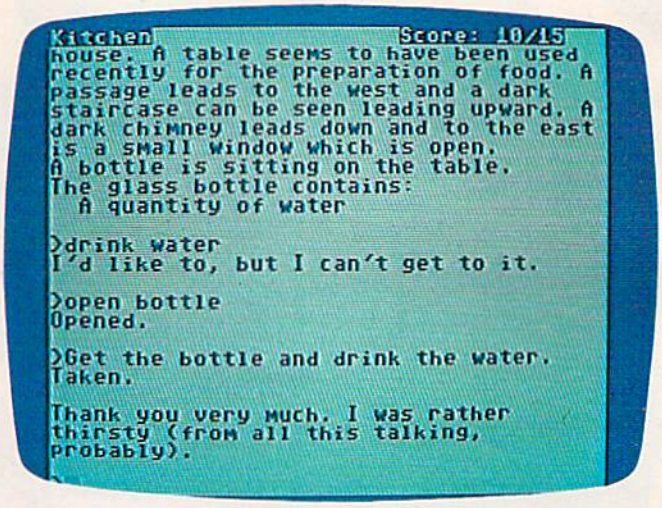
The original *Zork*, programmed for the Apple and the Radio Shack TRS-80, had a 600-word vocabulary, which helped accomplish Blank's goal of communicating with the game itself. Later Infocom adventures have even larger vocabularies.

Providing An Alternative

In a market as volatile as the microcomputer software industry, it's highly unusual for one publisher to dominate the best-seller lists. Infocom has managed to do that. In its four years of existence, the company that Marc Blank helped create has yet to produce an unsuccessful product. Why?

"They're good. Very entertaining," says Blank. "After all, the classics stay in print, don't they? Besides, peoples' imaginations don't go out of style."

Blank doesn't see adventure games as a replacement for arcade games – merely an alternative. "I like arcade games as well as anyone, but a computer can handle much more than games," says Blank. "People like to see themselves as characters in a story. We're committed to giving them those stories."



Pausing for refreshments in a game of Zork *on the Commodore 64. Note the program's amusing response to the compound sentence "Get the bottle and drink the water."*

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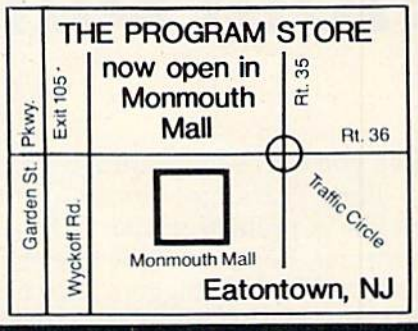

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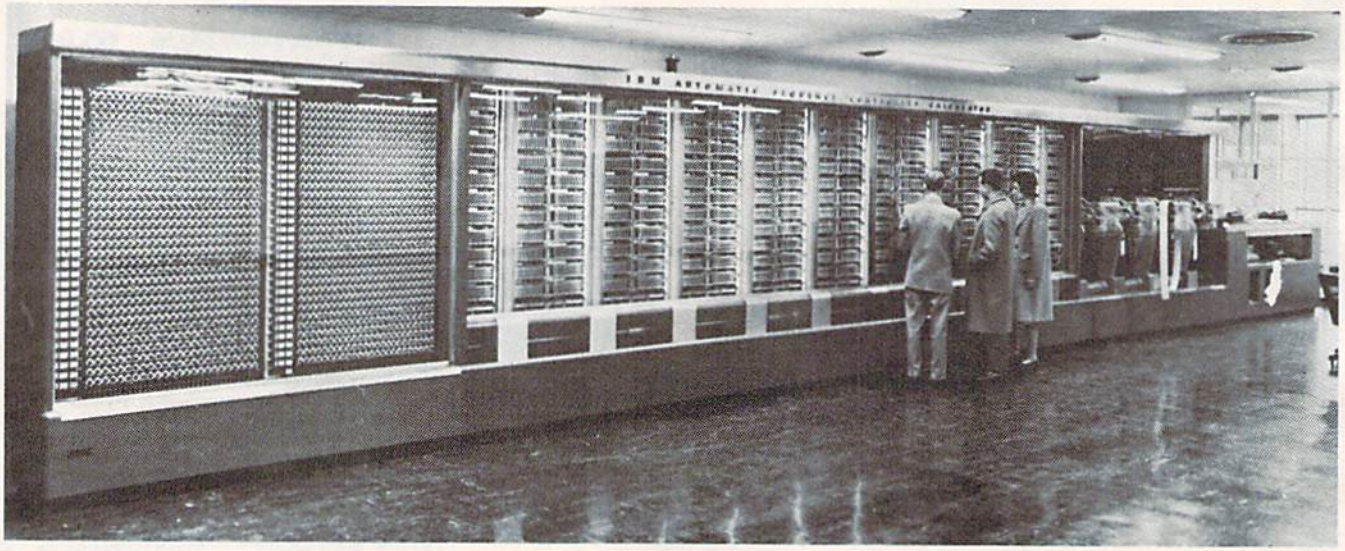

A "dinosaur" computer of the 1940s. When the IBM Mark I began working in 1944, it sounded like a roomful of knitters using metal needles. It went "clickety-clickety-clickety."

Courtesy of IBM.

From Dinosaurs To Freckles

Have you ever seen a dinosaur spit out numbers?

Forty years ago, dinosaurs inhabited Earth, just like in prehistoric times. The dinosaurs were enormous. Some were the size of your living room. Others were even bigger. They filled warehouses, laboratories, and entire city blocks. And when they were well fed, they spit out numbers.

The dinosaurs had metal skin. Inside their bodies were millions of wires, some the size of jungle pythons. The dinosaurs were controlled by thousands of hot, glowing vacuum tubes the size of big dill pickles. The vacuum tubes acted like traffic cops and routed the flow of electricity through the dinosaurs' wires.

The dinosaurs spit out numbers. They also ate them. The dinosaurs liked only two kinds of numbers: ones and zeros. Dozens of human beings fed them ones and zeros in long, caterpillar-like strings.

The humans hoped that after the dinosaurs finished eating, they would say something wise. They hoped the dinosaurs would solve their problems. But the dinosaurs were slow. After weeks of eating bucket loads of numbers, the dinosaurs finally answered. Unfortunately, they were often wrong.

In some ways, these recent dinosaurs were unlike their ancestors. For example, the old prehistoric dinosaurs were mostly brawn. They had tiny brains, the size of a pea or a walnut. Like the old dinosaurs, the new dinosaurs were big. But their bigness was all brain.

The new dinosaurs were different in another way, too. The first dinosaurs were living creatures. They were *reptiles*. Their descendants include alligators, crocodiles, snakes, and lizards. These creatures are alive today.

But the new dinosaurs were not alive. They weren't even creatures at all. They were machines. They were the world's first *computers*!

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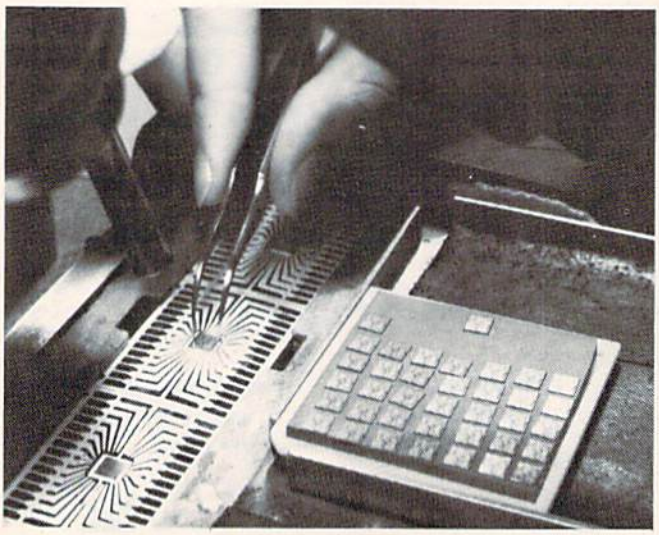
Engineer Mike Grieco at Bell Labs holds a wafer with 64 tiny chips. Behind him you can see a TV picture of the transistors on just one chip magnified 400 times.

Courtesy of Bell Laboratories.

The computers were almost as rare as dinosaurs. For several years after they were invented, there were only half a dozen computers scattered across the whole world. And, though they were big, they were sensitive and fussy creatures. Every time you turned them on, one or two of their vacuum tubes would explode from the surge of electrical power. Then it sometimes took people several days to find the bad tubes among the thousands of good ones.

Almost as soon as computers were invented, scientists, business people, and military generals realized that computers, one day, could become important machines. Computers could help people conduct experiments, solve mathematical problems, process a company's records, and guide missiles, satellites, and spaceships. But, somehow, they had to become smaller, faster, cheaper, and more reliable.



"Brain" chips are lined up like soldiers on parade. A human factory worker uses tweezers to pick up the chips and place them in a protective metal package. The packages resemble spiders with 28 gold legs, so they are known as "bugs."

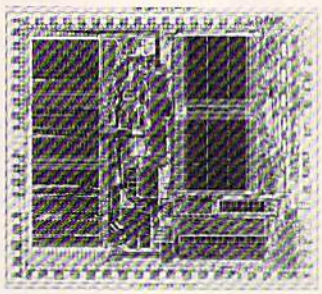
Courtesy of Texas Instructions Inc.

No More Tubes

Then a breakthrough occurred. Two days before Christmas in 1947, scientists at Bell Laboratories in New Jersey invented the *transistor*. Transistors could function just like a computer's vacuum tubes. They could act like "magnifying glasses" and create a big electrical charge from a small charge. They could act like "traffic cops" and route charges through a computer's thousands of wires. And they could act like "light switches" and turn charges on and off.

Transistors could do everything vacuum tubes could do. They were also cheaper, smaller, faster, and more reliable.

The first transistors, used in computers in the late 1950s, were about the size of paper clips or small Tootsie Rolls. This was small, but it wasn't small enough. Scientists kept searching for new ways to make the transistors even smaller.



This is what a chip would look like under a microscope. Its thousands of tiny transistors and pathways resemble buildings and streets in a large city.

Courtesy of Motorola Inc.

In the early 1960s, scientists invented the *integrated circuit* (or IC). The integrated circuit could squeeze up to a hundred transistors onto a round surface the size of a small sugar cookie.

To make an IC, scientists grew a large *silicon crystal* in their laboratory. Silicon is an element – one of the basic building blocks of the universe, like oxygen, mercury, and iron. When you go to the beach, you see silicon everywhere, mixed in with the sand. It is the silicon that sparkles up at you when you run across the beach on a sunny day.

The silicon crystals in the scientists' labs resembled long, fat Italian sausages. The scientists sliced the crystals into thin wafers using an extremely sharp buzz saw. They took a photograph of lots of transistors' wires, then reduced (or shrank) the photograph until it was the size of one of the wafers. They placed the photograph on top of the wafer and dropped the wafer in a strong chemical bath. The chemical dug tiny "trenches" across the surface of the wafer. The trenches followed the wires in the photograph. When the chemical evaporated, the trenches were filled with metal. They had become transistors and incredibly tiny pathways for electricity.

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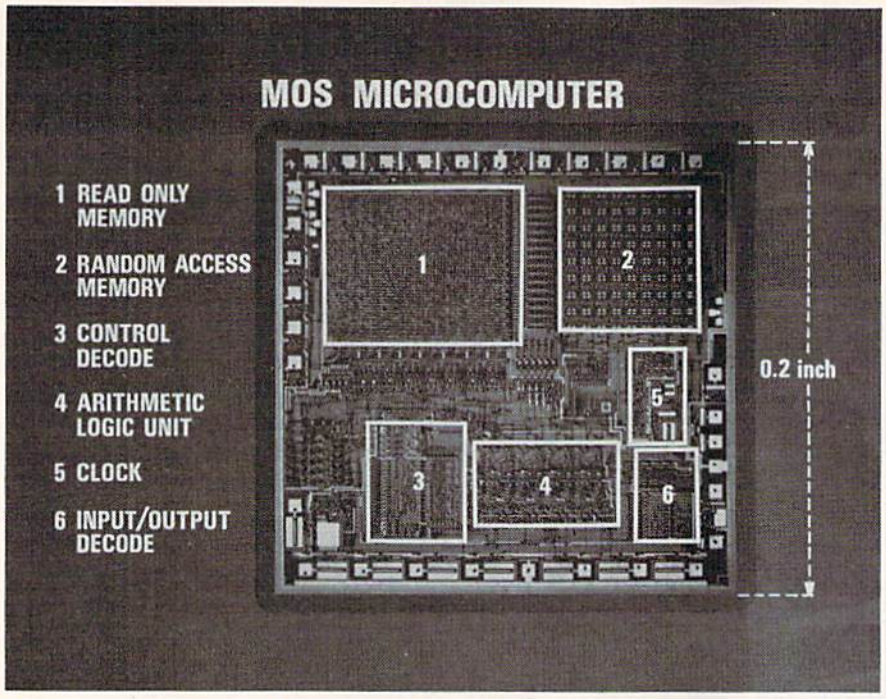

An average chip is only .2 inches (1/5 of an inch) on a side. Yet it is made up of several complicated parts including a part that does arithmetic (#4 – Arithmetic Logic Unit), a "clock" (#5), a "brain" (#3, #4, #5, and #6 working together), and two kinds of memory (#1 and #2).

Courtesy of Texas Instruments Inc.

connect them to typewriters, TV screens, and tape recorders, they become *personal computers*!

Kids use personal computers to draw pictures, make music, do their schoolwork, and play games. Personal computers fit on top of a kitchen table.

Personal computers are small and easy to use. They use less power than a simple light bulb. Yet they are a million times more powerful than the dinosaur-sized computers of forty years ago.

The early computers weighed more than a basketball team of elephants. They were powered by up to 20,000 vacuum tubes and cost millions of dollars.

A personal computer might weigh less than five pounds. It might cost less than $100. And its "brain" is a chip the size of a freckle.

The scientists cut the round silicon wafer into little squares the size of a bread crumb. Each little square was called a *chip*. On its surface were dozens of transistors. The transistors criss-crossed the chip's surface, like a maze of tiny roads.

Computers On A Chip

During the 1960s and 1970s, scientists found ways to pack more and more transistors onto a single chip. Today, in the mid-1980s, scientists are able to build a chip with more than a *million* transistors.

The first chips were primitive. With only a couple of transistors, all they could do was turn lights off and on, or remember a couple of numbers, like 5 and 14.

Today's chips are completely different. They can do almost anything! A single chip can act as a computer "brain" and add a million numbers in only one second. It can act as a computer "memory" and remember a hundred thousand kids' birthdays. It can tell the time, control a car, guide a robot, or act as your opponent in an electronic game.

An entire computer can fit on a single chip. But chip-sized computers are too small and delicate for us to carry around in our pockets. To use them, we must connect them to something larger. We can wear them on our wrists inside digital watches. Or we can hide them inside dishwashers, arcade games, and microwave ovens. Or, if we

Chips are so small they could hide under your tongue, behind your ear, in your sock, or ride on the back of a ladybug.

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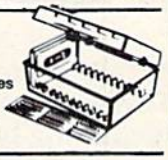

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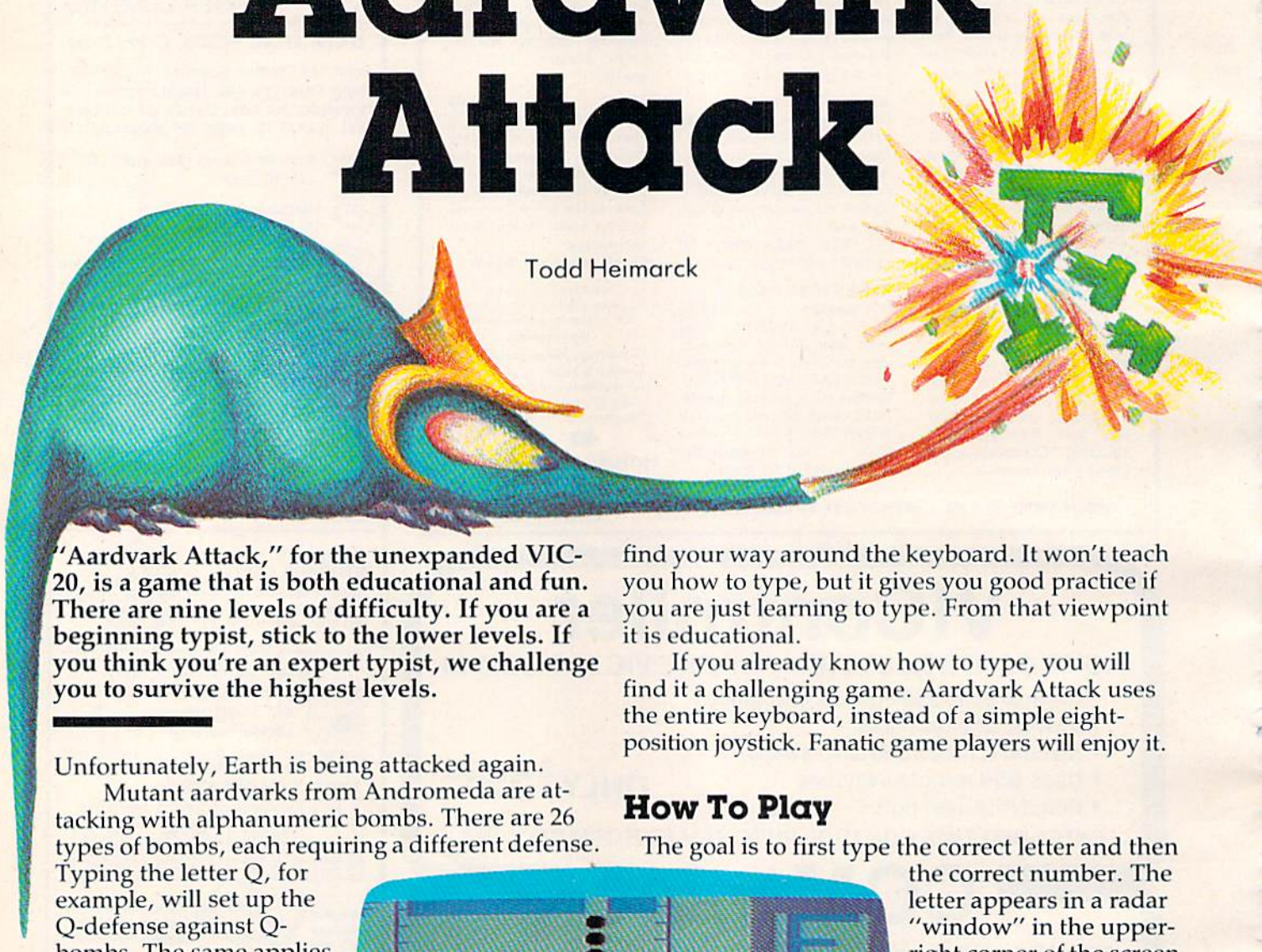
Aardvark Attack

Todd Heimarck



"Aardvark Attack," for the unexpanded VIC-20, is a game that is both educational and fun. There are nine levels of difficulty. If you are a beginning typist, stick to the lower levels. If you think you're an expert typist, we challenge you to survive the highest levels.

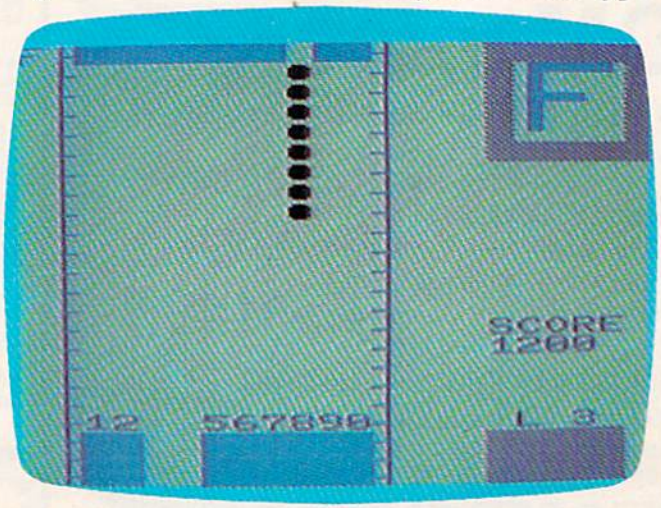
Unfortunately, Earth is being attacked again.

Mutant aardvarks from Andromeda are attacking with alphanumeric bombs. There are 26 types of bombs, each requiring a different defense. Typing the letter Q, for example, will set up the Q-defense against Q-bombs. The same applies to the other 25 letters. Also, the aardvarks are attacking your ten biggest cities (numbered 0 to 9). Once you set up the defense, you have to decide which city is being attacked.

Educational And Fun

You could say that "Aardvark Attack" helps you find your way around the keyboard. It won't teach you how to type, but it gives you good practice if you are just learning to type. From that viewpoint it is educational.

If you already know how to type, you will find it a challenging game. Aardvark Attack uses the entire keyboard, instead of a simple eight-position joystick. Fanatic game players will enjoy it.



An F-bomb plunges toward city No. 8 in "Aardvark Attack."

How To Play

The goal is to first type the correct letter and then the correct number. The letter appears in a radar "window" in the upper-right corner of the screen. When it appears, you respond by typing it. If you make a mistake, try again. When you get the right letter, the falling bomb reverses colors. Then you look at the row of numbers at the bottom of the screen – representing your cities – and type the corresponding number to destroy the bomb.

You have a limited time before the bomb hits

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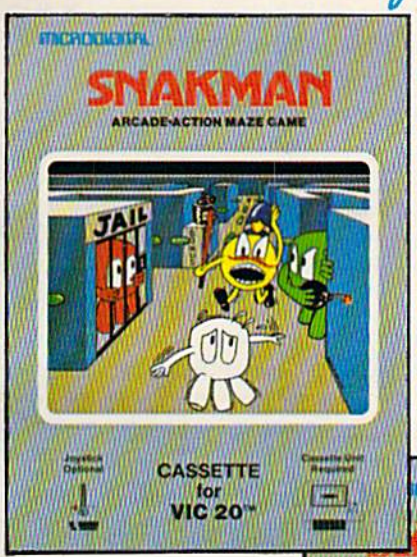

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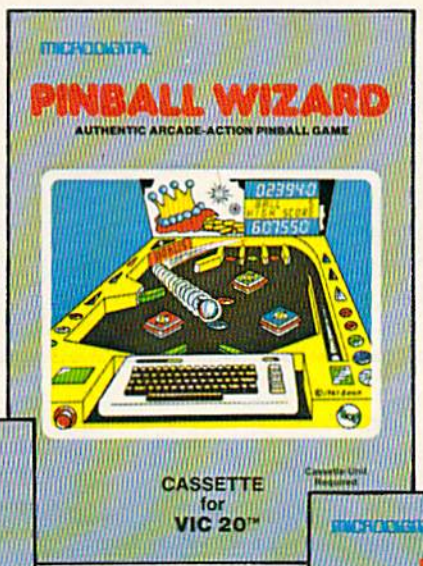

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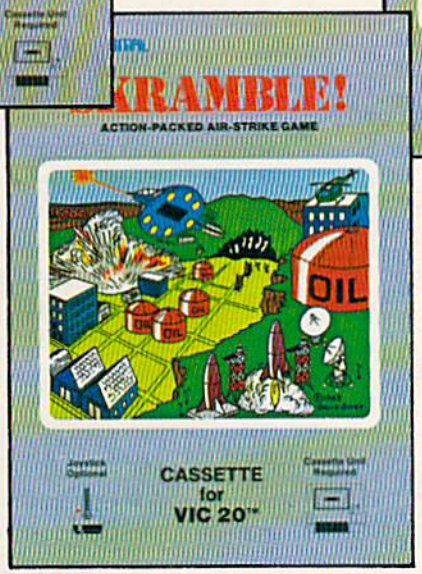

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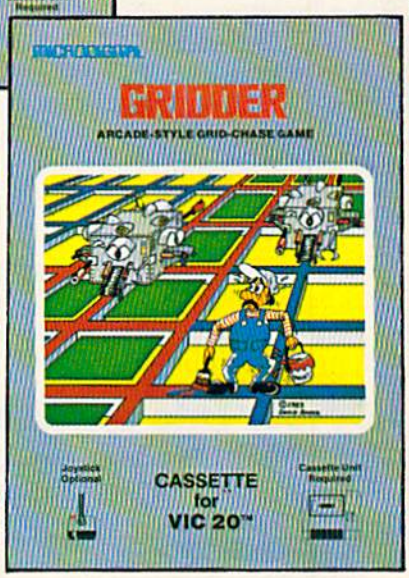

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the ground, ranging from a few jiffies at the expert level to a few thousand jiffies for novices (a "jiffy" is a sixtieth of a second). Each level (there are nine) is about 30 percent faster than the previous one. The faster games score more points, because they're more difficult.

If you are a parent or teacher of very young children who are just learning their letters, you could act as their fingers. Have them call out the name of the letter for you to type. Beginning typists can practice at the lowest levels, while expert typists and game players will like the higher levels. It is a game for almost everyone.

Writing The Game

To be honest, I did not start out to write a game.

I wanted a program that would display larger than normal letters to use as headlines. My first program printed characters that were eight times larger. They were gigantic. But I could fit only four letters on the screen of a VIC-20.

Then I doubled the size of each character. I used custom characters and got the program to work. The only problem was, I had no memory left to do anything useful. It was like having a 20-gallon gas tank and living ten gallons from the nearest service station. By the time you fill the tank and drive home, it's time to go back.

I finally realized the simple solution was to quadruple the size of each character. I left the character generator in Read Only Memory (ROM) and used the graphics characters (the ones you get when you press the Commodore key and type "C" or "V"). The characters were four times as big as regular letters.

Unfortunately, a fourfold increase in size means a fourfold decrease in the number of characters per line. I could print only a five-letter word on each line. I forgot about headlines and used the program as part of a game.

A False Start

Could a single oversized letter be used in a game for beginning typists? Of course! I wrote a simple program that had the endearing quality of boredom. It was not fun to play.

Detour Into Machine Language

Rather than improving the playability of the game, I decided to work on the radar window. As the oversize letter was being calculated, the player could watch it being formed.

I wanted the letter to appear out of nowhere. The old "polar bear in a snowstorm" trick would work. I printed the character white on a white screen (which is impossible to read).

After the character is formed, you change the polar bear into a black bear. Machine language would make it fast. And I believed a friend who said ML was easy.

I did not know how to program in machine language (but it's easy, right?), and I did not have an ML monitor (a utility to make ML programming much easier). I wrote the code, translated to hexadecimal, and translated to decimal. I POKEd the numbers into the cassette buffer (because that's what everyone else does) and started it. But every time I SYSed, I missed. My VIC closed its eyes and ears and played dead. After a dozen tries, I was ready to throttle my friend who said machine language is easy.

I finally figured out that to jump backwards in ML, you have to *exclusive-or* the distance with 255. (If that makes no sense to you, consider your ignorance a blessing.) It worked! And the game was still boring.

Polishing It

My general theory of programming is that if it takes an hour to write a program, it takes ten hours to debug and polish it. Aardvark Attack needed a lot of polishing.

First I added extra columns for the bomb and improved the game graphics. As the complexity of the game increased, it got more interesting. I realized that children would never play a game that was impossible to win, so I added nine levels of play. I tacked on a scoring routine, instructions, and voilà – the game turned out to be interesting and fun to play.

This is how it works, for those who are interested in programming:

Line 10 takes you to the housekeeping subroutine that DIMs the arrays and reads the oversize character shapes.

12 jumps to the subroutine that POKEs the machine language routine into the cassette buffer (SYS 828 clears the window, and SYS 833 turns the polar bear into a black bear).

14-16 give you the instructions if you want them (from subroutine 1200).

18-19 print the title page on the screen.

20-24 set the level of play and the variable HF (How Fast).

25-30 clear the screen and print the playing field. Subroutine 900 clears everything, and 925 clears the field between rounds. Programming hint: If you look at subroutine 900, you will find that it uses the same RETURN as subroutine 925. If you have two subroutines that do almost the same thing, you can put them together to save memory. The machine language program uses the same method.

32 blacks out the radar window.

40-63 pick a letter at random and set up the array that defines the oversize character shape for that letter.

70-74 change the asterisks to solid black spaces

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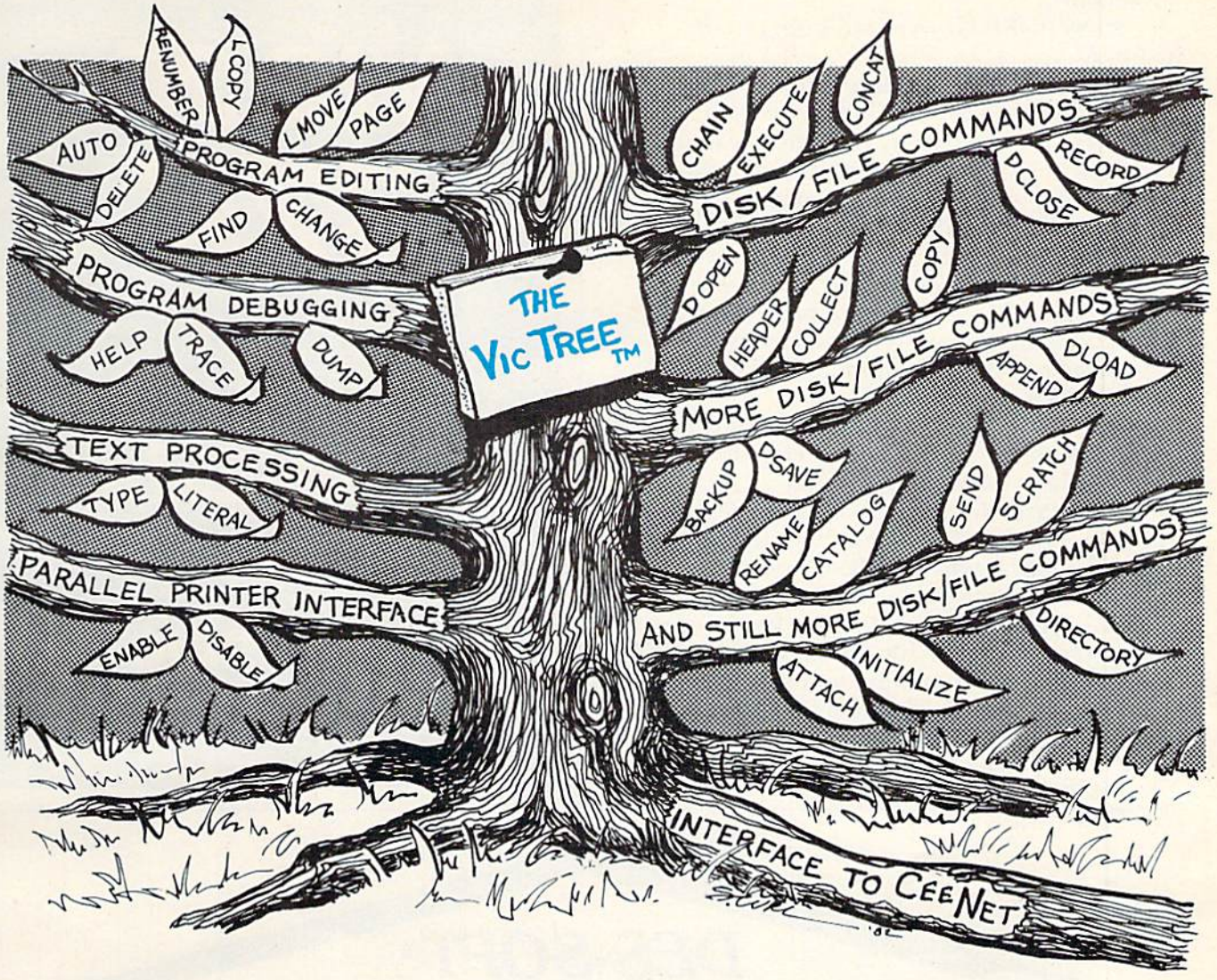

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and flash them (as a warning that attack is imminent).

80-98 POKE the oversize letter into the window.

100-200 are the attack routine. The ball character drops 18 spaces from top to bottom. After each step, there is a delay loop (from variable HF: How Fast). The program also checks for keyboard input. If the right letter and number are typed, it jumps to the scoring routine.

210-280 execute if the bomb drops to the planet. If the letter was correct, one space is erased. If neither letter nor number was typed, two spaces are erased. When defenses are destroyed and an alphanumeric bomb lands, everything is over.

300 figures out the score (if the player typed the correct letter and number) and goes back to clear the field for the next round.

320-328 are for the end of the game, when the planet has been lost. You have the option of playing again at whatever level you choose.

Note: If you use abbreviated BASIC commands, you should be left with a few hundred extra bytes of memory on an unexpanded VIC. You could use this memory for explosion noises or music. Or could add a high score counter (if your household is competitive).

See program listing on page 150.

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In the Extended Tag mode the CPI will generate "tags" (neumonics) for graphics, cursor control, print control and special characters. For any graphics characters that are not standard ASCII, the decimal value of the graphics symbol is printed. For instance, the "checker board" character (press the Commodore key and the plus sign) lists as [166].

The Abbreviated Tag mode is the same as Extended Tag mode, except all the tags are replaced by the "#" sign. This mode would be used if you wanted a program listing to be formatted as the original program. That is without the "tags" using several print spaces instead of one print space.

The CPI is equipped with a built-in self-test program that will check the RAM, ROM and I/O hardware of its microprocessor. This test can be helpful in determining if something is faulty or if the configuration you are using is valid. The self-test will print information to the printer.

CPI LISTING LEGIBILITY TAGS

TAG	Is Printed For:	TAG	Is Printed For:	TAG	Is Printed For:	TAG	Is Printed For:
[CD]	Cursor Down	[DL]	Delete	[ORA]	Change to Orange	[F2]	Function Key 2
[CU]	Cursor Up	[BLK]	Change to Black	[BRN]	Change to Brown	[F3]	Function Key 3
[CL]	Cursor Left	[WHT]	Change to White	[LTR]	Change to Light Red	[F4]	Function Key 4
[CR]	Cursor Right	[RED]	Change to Red	[GY1]	Change to Grey 1	[F5]	Function Key 5
[HC]	Home Cursor	[CYN]	Change to Cyan	[GY2]	Change to Grey 2	[F6]	Function Key 6
[CS]	Clear Screen	[PUR]	Change to Purple	[LTG]	Change to Light Green	[F7]	Function Key 7
[RV]	Reverse On	[GRN]	Change to Green	[LTB]	Change to Light Blue	[F8]	Function Key 8
[RO]	Reverse Off	[BLU]	Change to Blue	[GY3]	Change to Gray 3	[PI]	Pi Symbol
[IN]	Insert	[YEL]	Change to Yellow	[F1]	Function Key 1		

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Word Match

A Memory Game For VIC And 64

Andy VanDuyne

"Word Match," an educational game for one or two players, originally was written for the unexpanded VIC-20. A translated version has been added for the Commodore 64.

Loosely adapted from the old TV show *Concentration*, "Word Match" is designed to entertain and test the memory of one or two players. The object is to find and match pairs of words hidden behind rows of colored blocks.

Word Match is easy to learn. Players take turns selecting blocks, which disappear to reveal the words they conceal. An unsuccessful match means it's the next player's turn. Players who successfully match a pair of words gain another turn, and the matched blocks turn into the player's own color. To win the game, a player must match more pairs of hidden words than the opponent. The opponent, by the way, can be either another person or the computer itself.

Word Match is ideal for grade-school children because all the words are only three letters long. A total of 28 words are included in the program data. (Longer words will not fit on the VIC's screen, although the Commodore 64's 40-column screen format will allow longer words.)

You can customize the program with your own word list by amending lines 32 and 33 (VIC version). Twenty-eight words seem to be the safe limit. If you vary from 28, you must change all occurrences of the number 28 in lines 30, 35, 36, and 38 (VIC version) to however many words you use. The standard words were chosen especially for children at early reading levels.

Using Word Match

When you first run Word Match, it asks for the players' names. After the second name is entered, the screen clears, and nothing seems to happen for a few moments. Don't be alarmed – the program requires some time to select the words and display the screen.

Although Word Match was designed primarily for two players, one person can compete against the computer by typing "VIC" as a player's name when the program starts (or "64" with the Commodore 64 version). The computer, however, is not as smart as you might think. It picks its blocks completely at random. A young child can have fun in this mode without becoming discouraged by an unbeatable opponent.

An interesting twist, incidentally, is to enter the computer's name for both players and then watch the machine play itself. Usually an out-of-memory error results after several rounds, but sometimes the computer actually beats itself!

No delete function is allowed during answer

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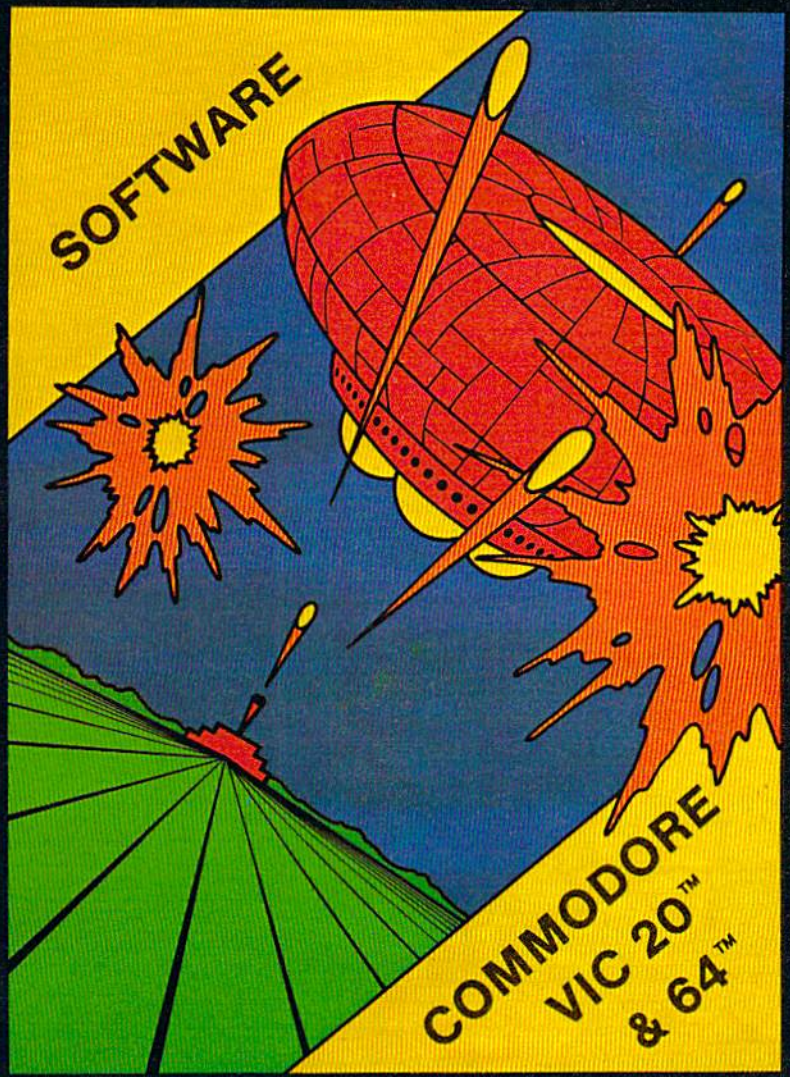

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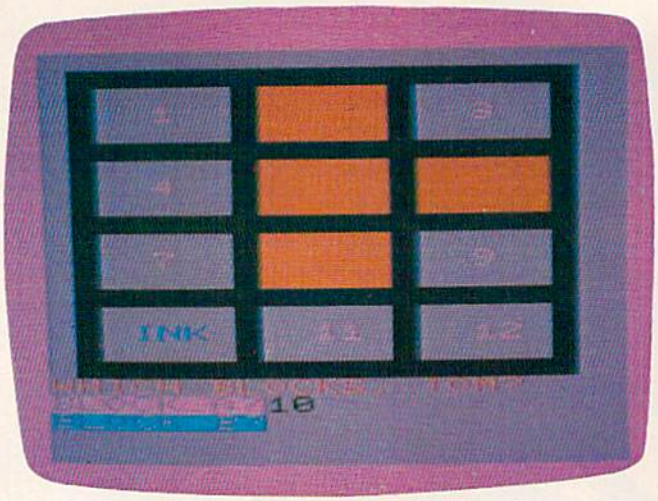

In this round of VIC "Word Match," the player has uncovered the word INK under block 10. Now he must remember which block is hiding the matching INK.

input. However, the program will not accept an answer larger than 12. If you make a typo when answering a prompt, just add an extra digit or two so the response is too large. Also, the program will not accept numbers for blocks which have already been matched.

If you don't feel like typing the program, I'll make a copy for you. Send a blank cassette, a stamped self-addressed mailer, and $3 to:

Andy VanDuyne
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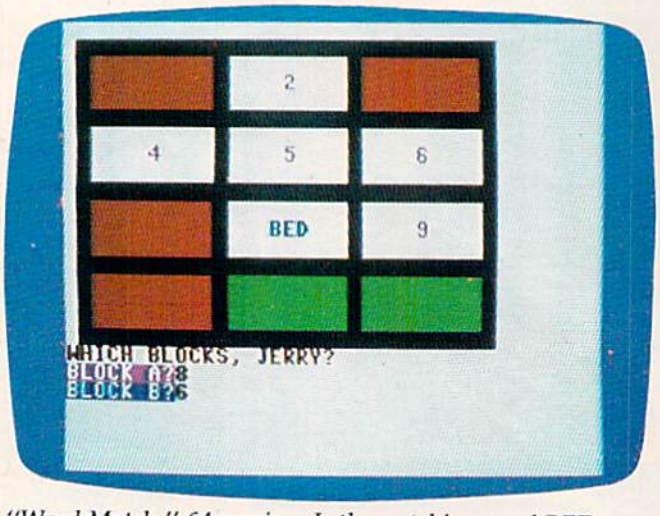
Norwood, NY 13668



"Word Match," 64 version. Is the matching word BED under block 6, as Jerry thinks?

Notes For Programmers

Here's a brief summary of how the VIC version of Word Match works:

Lines	Explanation
1-13	Start the program and secure the names of the players.
30	Dimension several arrays.
32-33	Store the words.
35-47	Pick and sort six words.
50-81	Set up the screen and store values to find each block later.
100-130	Get the answers.
132-140	Reveal the hidden words.
150-162	Give the response for no match.
200-238	Give the response for a correct match, set aside already matched blocks, and check to see if all matches have been made.
300-314	Declare the game over, who won, and ask about another game.
1000	Is the routine allowing the computer to play.

See program listings on page 151.

Young People

COMPUTE!'s Gazette wants to know what today's young people are doing with computers. We want our readers to know, too. If you've written an interesting program for the VIC-20 or Commodore 64, share it with us.

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for grownups

Giants And Dwarfs

This installment of "Computing For Grownups," a bi-monthly column, looks at the different ways adults and children perceive computers. We also look at one family's approach to word processing.

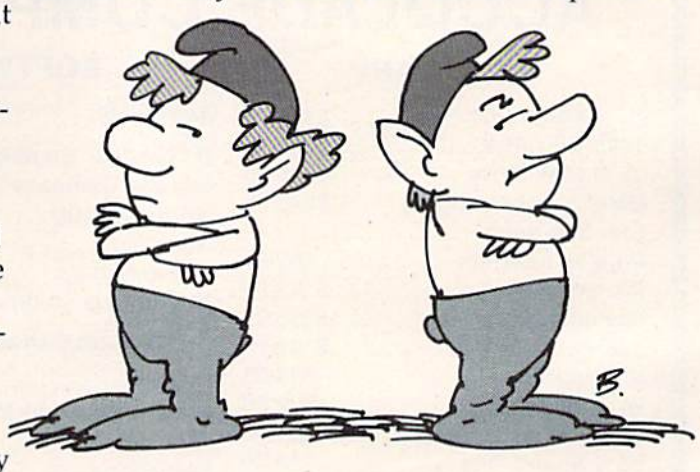
Yesterday my seven-year-old daughter Catie went off to computer camp at Hollins College, here in Roanoke, Virginia. When she came home she could hardly wait to tell me about her day. "Computer camp was fun!" she exclaimed. "I thought we'd have to program all day, but we didn't. We did *lots* of things!"

One thing Catie did was send electronic mail back and forth to her campmate, Ashley Bell. The girls used the Minerva terminals on Hollins College's DEC (Digital Equipment Corporation) computer system.

Using a *big* computer was a new experience for Catie. The only kind of computers she has ever seen are personal computers. Until yesterday she didn't even know what a big computer was. She thought it was really neat that she and her campmates were all using a computer – the same computer! She has grown up in a world of truly personal computing; *group* computing was a new experience for her. And she loved it.

For example, last night she wanted us to wire all our little computers together. Catie wanted to send games and electronic mail from her bedroom to her brother Eric's bedroom, and from the kids' bedrooms to my study, to the kitchen, the basement (kid's playroom), and even to the bathroom ("In case I want to tell you something while I'm taking a bath," Catie said).

I had to explain to Catie that the computers she was using at computer camp were really just terminals – "octopus arms" to a single giant computer. The computers in our house, I said, were different. They were like little dwarf computers –



dwarfs of every sort, color, and personality. The dwarfs were all different from each other. Most were not even on speaking terms. Getting them to talk to each other was not "just a quick project" as Catie called it.

Different Perceptions

All this talk about giants and dwarfs got me thinking. When it comes to computers, Catie and Eric's generation sees things just the opposite of my generation (adults in their 20s and 30s, and above). When I close my eyes and try to picture

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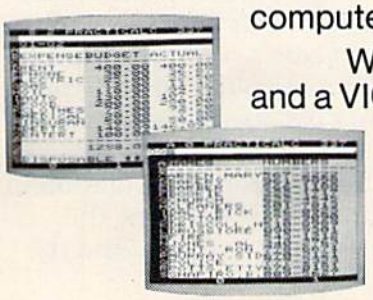

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computers, I still see the big IBMs, Univacs, Honeywells, Burroughs, and other machines. When Catie closes her eyes, she sees VICs, Commodore 64s, Apples, Ataris, and small lap computers such as the Epson HX-20 and TI's CC-40.

Now that small computers are popping up everywhere in millions of people's homes, classrooms, and offices, we adults are beginning to change our impressions. More and more, we acknowledge that there are two kinds of computers – giants *and* dwarfs.

But kids still see only one kind of computer. And that's all they'll ever see, until they grow up and try to get a job. Then, *BOOM!*, they'll come face to face with their first computer giant. And they'll be ill-prepared for that experience.

As far as most kids know, the Computer Age began in 1977 and 1978 with the appearance of the first Apples, Commodore PETs, and Radio Shack TRS-80s. The memories of younger kids don't go back even that far.

For most kids the giant computers have disappeared. Or, they never existed. Giant computers are creatures from adult fairy tales that filter home from the office or workplace. Little kids see them occasionally on TV or in the movies because they are stereotypes. But they are vague, hazy creatures. Based on movies like *Superman III* and *War Games*, kids' images of big computers are certain to be extremely stilted and unrealistic.

Giant computers are not a tangible part of a child's everyday world. But they have not disappeared. They have faded from the popular consciousness because they are not as trendy, fun, or cheap as the little personal computers. And they are not poking their terminals into all of our homes.

Giant computers are not mass-media superstars. But they still run the world. Personal computers are the front men for the computer revolution, but the big mainframe computers are still there, locked in the back room, chugging away, churning out most of the world's work.

An Emerging Network

Pretty soon, mainframe computers will play a larger part in the life of our families. When we dial up an information network such as CompuServe or The Source, we are linking our personal computer with a mainframe computer. Information networks, libraries, mail systems, banks, and shopping catalogs will soon become a major adjunct to "personal computing."

In the next couple of years, small computers will cease to be little isolated atoms in the electronic universe. Instead they will become *nodes* linked in neighborhood, professional, and national networks. Personal computers are now autistic, shut off from each other. This is no way to gather information, learn new things, and get work done. Personal computers must communicate. And the big computers will act as the middlemen.

What's more, big computers have advanced computational abilities still sadly lacking in most smaller computers. As part of their computer education, our kids (even our smallest kids) should learn about these powerful machines.

Computer camps at universities are great places to learn more about large computers. Another place is Walt Disney's EPCOT Center (Experimental Prototype Community of Tomorrow), in northern Florida, near Disney World. When I found out that EPCOT did not feature personal computers in a "community of the future," I called to ask why. An EPCOT official explained that the designers of EPCOT had studied small computers, but they had decided that small computers were still not friendly enough. "Big computers can be much friendlier than small computers," she said. "Our big computers at EPCOT are fast, have gigantic memories to store millions of facts, and are capable of displaying beautiful, high-resolution pictures."

As I listened to her talk, I remembered the big computers I had grown up with. Maybe they were big and fast and were magicians with pictures, but they were also cold, unfriendly, and aloof. As a college student, the closest I ever came to an IBM 370 was when I pressed my nose up against the heavy-duty glass surrounding the computer room. I told this to the EPCOT woman.

She explained that their big computers were hidden away, but their terminals (like the octopus arms of the computer at Catie's computer camp) were all over EPCOT for everyone to use. "And we don't put up a barrier between people and our computers by making people use a keyboard," she said. "People can interact with our computers by operating simple controls, by touching the picture screens, and by talking to them. And the computers talk back."

Family Word Processing

I make my living by writing. I prefer to use *WordStar* on a personal computer to write faster and better. This has made me the default champion of "family word processing" here in our home in Roanoke.

I may be family champion for now, but there are several challengers on the horizon.

First, there is my wife Janet. Janet doesn't like *WordStar*. "It's too complicated," she says. "Using *WordStar*, you don't write a letter, you *program* it!"

Janet isn't an ex-computer programmer like me. Instead of running programs, she runs buses. And when she sits down to type a letter, she doesn't want to program. She does not want to

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go through an elaborate regimen of switch-flipping and button-pushing, as if she were Sally Ride preparing for blast-off on the space shuttle *Challenger*. She just wants to type a letter.

So Janet has abandoned *WordStar* in favor of another word processing program, *Text Wizard*. And now she's turning out whole piles of papers, résumés, and correspondence.

Then there's Catie. Catie does her word processing lying in bed.

Catie's computer is right beside her bed on a card table. Catie has a perfectly good chair to sit in, but she has swiveled her computer around to face the bed, and she types lying down, with her fat black cat draped across her back.

Catie has a simple explanation for the unusual way she has arranged her word processing workstation. "Mowie [the cat] wouldn't fit on the chair," she says.

Catie doesn't use *Text Wizard* or *WordStar*. Her favorite is *Bank Street Writer*. She cranks out page after page of very short stories, and notes to her parents, Eric, and Mowie. According to Catie, *Bank Street Writer* is the preferred word processor for seven-year-old girls, "because it's easy to fill up the little box on the screen, and it makes pretty letters."

(Although *WordStar*, *Text Wizard*, and *Bank Street Writer* will not run on a VIC or 64, many other word processors of similar quality are available. See "A Survey Of Inexpensive Word Processors For VIC And 64" in this issue.)

Gobbledygook Processing

Is that it? Are there any other family members who are challenging me for my position as the family's number-one word processor?

There couldn't be any body else, really. There's Eric and Mowie, but neither of them can read or write.

Mowie is truly out of the running. She's content to lazily nap on Catie's back. But Eric is another story.

Every morning before nursery school and every night right at his bedtime, I find him in the study pounding away on a computer. I'm not certain what Eric is typing, but the paper flies! As far as I can tell, Eric may not even be competing with the other members of the family. He may have created his own category – *gobbledygook processing*.

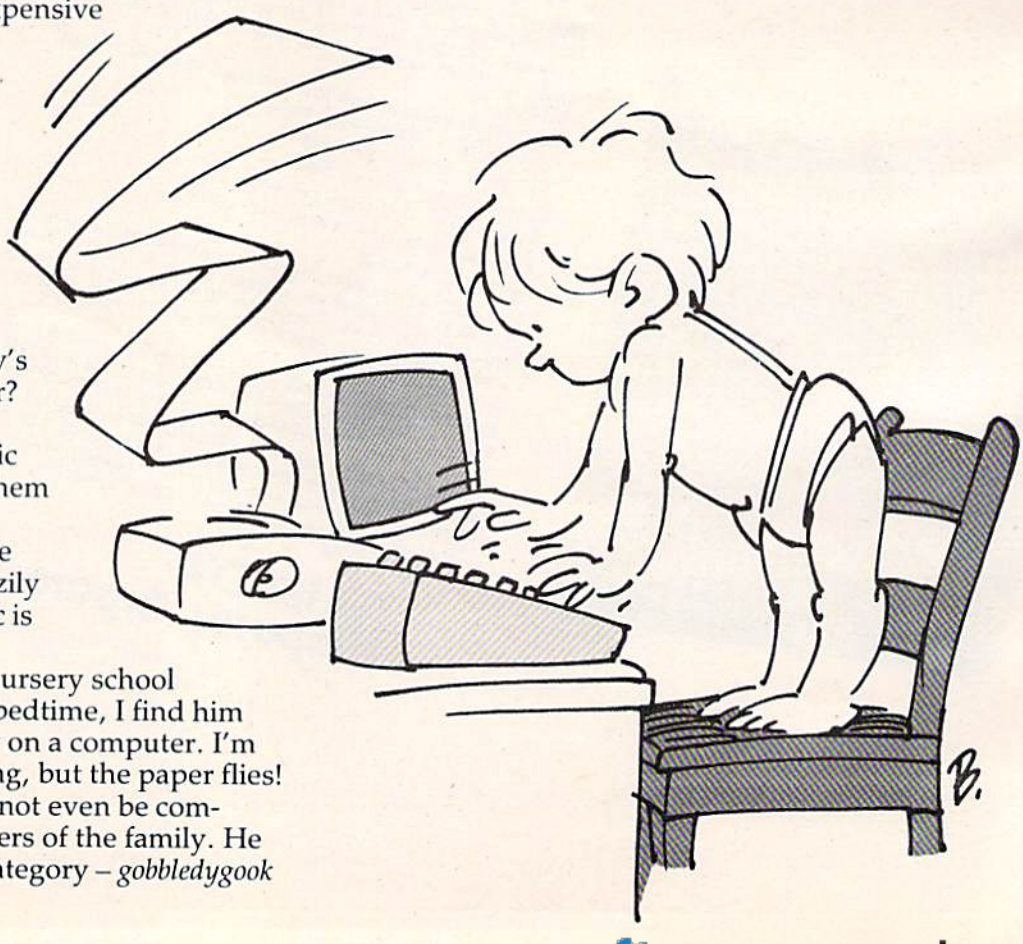
Eric's workstation is even more unusual than Catie's. He achieves maximum productivity when he is standing on the creaky wooden chair in my study and leaning over the computer. He usually does his typing in his bare feet, and this morning, in his underwear, too. (The increased ventilation probably keeps the ideas flowing).

I left him alone this morning for about 15 minutes. When I came back, he had a streamer of printer paper about six feet long sticking out of the computer. "Look at this, Daddy!" he exclaimed proudly. "Look at all the work I did!"

Eric doesn't have his own briefcase yet. So when he went off to school this morning, he had his work rolled up, fastened with a green rubber band, and dangling inside a plastic bag.

As soon as he got to his class, he was besieged by other kids asking to see the bag's mysterious contents. He pulled out the paper, unrolled it, and carefully explained how he made all the hundreds of random letters, numbers, punctuation symbols, and graphic characters that he and the computer processed.

The kids were impressed. They'll probably go home and tell their families. And, who knows, with Eric around, advanced gobbledygook processing might become very popular in Roanoke. Soon all the preschoolers could be doing it.



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Bargain Software For The 64

Commodore's Public-Domain Programs

John Blackford

Last spring, Commodore Business Machines released more than 600 educational programs for the PET and Commodore 64 through dealers, who were to make copies for customers at a nominal charge. Now, Commodore has streamlined the offering, putting the best programs on 27 diskettes available nearly at cost. With each disk containing 10 to 20 programs, you can build a software library at rock-bottom prices. The disks are arranged by category (such as math, computer literacy, or business) and may be purchased individually at dealers.

Whenever a new computer appears, a common complaint is that there isn't much software for it. Apple computers were one of the first brands widely purchased by home users, and it took years for software developers to grind out a full line. Now there's plenty of software. The same was true for Atari, except that market pressure speeded up the development process. When the Commodore 64 was introduced, people were impressed with its graphics and sound, as well as the price, but wondered how long they would have to wait for a large selection of programs.

At first, programs were scarce. Commodore's early advertising for the 64 (in the summer of 1982) noted hopefully that the product "will have a broad range of custom software ...." In other words, there was almost nothing yet. But as sales climbed, independents began rushing out games and utilities, and Commodore provided more of its own. By the spring of 1983, software was appearing in some quantity, and Commodore took the opportunity to release a collection of 656 educational programs originally written for the Commodore PET in the Canadian school system.

The idea was to offer the software as a public service at minimal cost. All the programs are in the *public domain* – not copyrighted and free to be reproduced by anyone. They were written for the PET by people in the Canadian schools – and since Commodore is the No. 1 educational computer supplier in Canada, there were lots to choose from. Student programmers there, in cooperation with Commodore of Canada, revised the programs to run on the 64.

Unfortunately, some dealers in the United States were reluctant to handle the material. Under the original plan, dealers were to purchase the complete set – some 50 disks at the time – and make copies available to customers for a small fee. But it looked like a headache to many dealers. Then it turned out that some of the programs wouldn't run properly on improved versions of the 64 (see "Commodore 64 Video Update," COMPUTE!'s Gazette, July 1983). The solution was a simple one-line addition to each program, but

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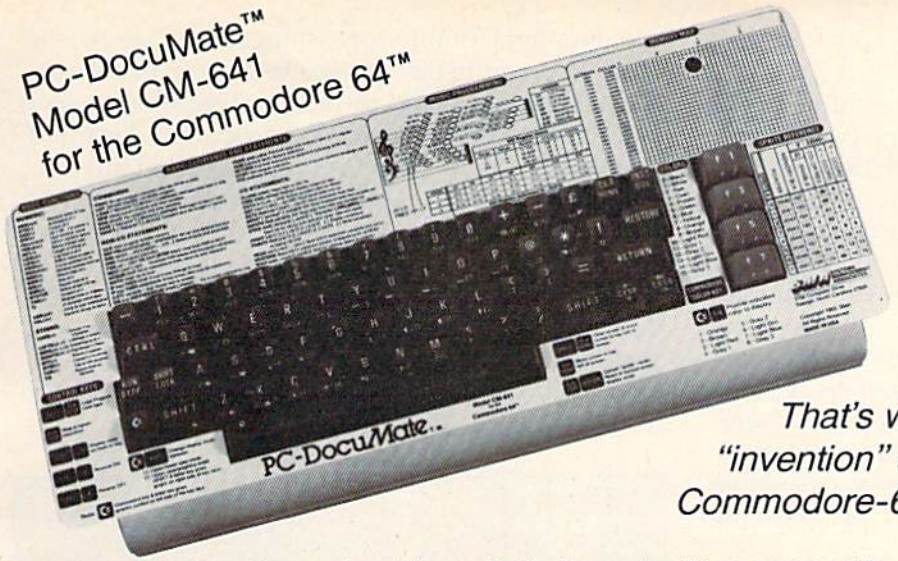

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INCONVENIENT MANUALS

The user's guide was a nuisance and the programmer's reference manual was just plain inconvenient to use. We found the control key combinations confusing and the introduction to BASIC to be too "basic" for our needs. We needed a simple solution to our documentation problems.

So we decided to surround the keyboard of each PC with the information we wanted. We decided to print whatever we needed on sturdy **plastic templates** which would fit the keyboard of either the VIC-20 or Commodore 64.

SIMPLE SOLUTION

This was the simple solution to our problem. Now we could have the essential information right at our fingertips.

On the left side and top of the templates we put **BASIC** functions, commands, and statements. On the lower left we used **key symbols** to remind us of how to use SHIFT, RUN/STOP, CTRL and the "Commodore" key. Over on the bottom right side we put some additional keys to help remember about CLR/HOME and RESTORE. But we were still a little confused.

STILL CONFUSED

We found we were confused about music programming, color graphics, and sprites. On both the VIC-20 and the CBM-64 templates we carefully organized and summarized the essential reference data for **music** programming and put it across the top—showing notes and the scale. All those values you must POKE and where to POKE them are listed.

Then to clarify **color graphics** we laid out screen memory maps showing character and color addresses in a screen matrix. (We got this idea from the manuals.)

For the VIC-20 we added a complete memory address map for documenting where everything is in an expanded or unexpanded VIC.

For the Commodore 64 we came up with a really clever summary table for showing almost everything you ever need to know for **sprite** graphics.

GETTING EASIER

Now we had organized the most essential information for our VIC and 64 in the most logical way. BASIC, music, color graphics, and sprites all seemed a lot easier. Our initial problem was solved by PC-DocuMate™.

But we have a confession to make.

WE CHEATED

We had solved this kind of problem before. In fact, many times before. You see, we at SMA developed the original PC-DocuMate for the IBM PC. We've made templates for IBM BASIC and DOS, for WORDSTAR™, VISICALC™ and other best-selling software packages for the IBM PC.

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Take advantage of our experience and success with PC-DocuMate templates. Get one for your personal computer.

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Our templates for the VIC and 64 are made from the same high quality **non-glare** plastic as the more expensive IBM PC versions.

The templates are an attractive **gray** color and are imprinted with a special black ink which bonds permanently to the plastic. They are precision **die-cut** to fit your keyboard.

Unlike some other products we've seen in this category, PC-DocuMate templates are professionally and expertly designed. And they are fully guaranteed.

OUR GUARANTEE

We guarantee your satisfaction. **You must be satisfied** with your PC-DocuMate for your VIC-20 or CBM-64. Try it for 10 days and if for any reason you are not satisfied return it to us (undamaged) for a full refund. **No risk.**

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Dealer inquiries invited.

busy dealers began to wonder how much of their time was going to be involved.

To insure that the programs would be widely distributed, Commodore revised the packaging this summer so dealers wouldn't be tied up with the copying. At the same time, the company went over each program, revising whenever necessary to make sure every one would run on all versions of the 64. Commodore's software team eliminated some programs that were similar to others in the group, and dropped some that weren't of the highest educational quality. The final set consists of nearly 400 programs on 27 disks (so far, there are no plans to make them available on tape). Each disk is now packaged separately – available for $6.95 – with descriptions of each program on the back.

The disks are grouped in nine categories: business, geography, English, math, computer science, technology, science, history, and educational games. Some of the categories, such as math and English, are on more than one disk. There are seven English and eight math disks, with programs arranged loosely according to complexity. The three game disks have word-guessing puzzles, logic games, I.Q. simulations, and many other programs. Although they aren't available on tape, cassette users may copy them freely from someone with a disk drive, because the programs are not copyrighted and are unprotected.

Commodore is now working on yet another collection of educational programs, according to company spokesmen. The exact contents and the date of release are not yet definite, but the new batch will be available in the same format and at the same price as the revised disks. If all goes according to plan, they might be available before Christmas.

These public-domain educational programs are not being offered in isolation. Commodore is pushing software in general and educational programs in particular. Back in June, when the revised disks were announced, the company also slashed its regular software prices by up to 50 percent, and introduced 70 new programs, including word-processing and small-business packages.

Then, during the summer, Commodore announced an agreement with the Minnesota Educational Computer Consortium (MECC) to produce 100 educational programs. MECC, a leader in educational computing, will rewrite its 100 best programs for the 64. MECC will begin offering these versions to schools this fall and should have them all completed by the end of the school year, June 1984. Also, recognizing that the home and educational markets are merging, Commodore will make these programs available through both its dealer network and mass distributors.

Finally, Commodore is improving service to schools by sponsoring more seminars on educational computing and by designating some dealers as educational specialists – equipped and trained to give top-quality service to educational buyers.

This is good news for schools, but it doesn't leave out the home user, either. MECC's software will be available at a cost similar to games and other commercial software. And the public-domain material averages less than $1 per program. At that price, you can get a baker's dozen of engaging programs for little more than the cost of a blank disk.

Programmers

Have you written an exciting game? A utility that makes programming easier? An educational program for children? Any kind of useful home application program? If so, *COMPUTE!'s Gazette* wants to hear from you.

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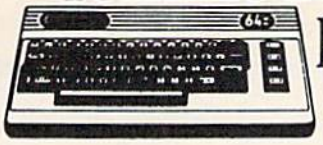

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A Survey Of Inexpensive Word Processors For VIC And 64

Larry L. Bihlmeyer and Kathy Yakal, Editorial Assistant

Word processing software and hardware for the Commodore 64 and VIC-20 is growing by leaps and bounds. Besides many new releases, older programs are being updated and re-released.

This all goes to show the competitive battle going on to capture buyers (you). At the same time, features usually found in more expensive word processing programs are working their way into lower-cost editions: color capabilities, word count calculations, addition/subtraction of columns or rows of numbers.

If you are shopping for a word processor for your VIC or 64, you can quickly become confused. Let's clear up the confusion and see what's available. In the process, we'll answer some key questions. Such as: What do you get for your money? Which programs support the RS-232 port? How do word processing programs on cartridges compare to those on tape and disk? Are there many low-cost word processors to choose from?

Define Your Needs

Before we look at the low-cost programs, you first need to know what your needs are and what equipment you'll be using. This is vital because many programs support only the serial port (device #4) on Commodore machines. Thus, if you use the RS-232 port (device #2) with a printer interface, you could end up with a word processing program that won't work with your printer. Figure 1 shows the two possible printer hookups to a Commodore 64.

To determine your needs, make a list of how you would use a word processor if you had one. Remember that a word processor is more than just an electronic typewriter. A good word processing program can help you store information, prepare charts and newsletters, do form letters to use with mailing lists, and even do small budget sheets.

So make a list of what you expect a word processor to do. Are you going to jot short letters to your friends, or write a novel that rivals *War and Peace*? Do you need mailing list capability? Do you have a disk drive or a tape recorder?

Once you've defined your needs, list the kind of equipment you have or plan to buy which must be compatible with the word processor. What kind of printer (parallel or serial)? Will a printer interface be used, such as a Data 20 Printer Interface for the RS-232 port? Or will you use a Commodore printer connected to the serial output jack? Do you plan to add a disk drive in the future?

A Variety Of Features

When you've finished both these lists, it's time to see what word processors match your needs and equipment. Table 1 lists word processing programs and some of their features. Table 2 lists the company addresses.

These programs basically fall into three price groupings: $15-$30, $30-$65, $65-$125. In general, the more you pay, the more features you get. But there may be a limit to what you might need. Maybe you don't need more than just "basic" word processing capabilities. This will, of course, depend on your needs list.

The programs in the $15-$30 range contain the basic word processing commands. For example, *TOTL.Text 2.0* ($25) for the VIC-20 has 16 basic features, including page numbering, right and left margin control, centered title lines, tabs, full-screen editing, full cursor control, scrolling up and down, and editing of blocks of text. *TOTL.Text 2.5* ($35), an enhanced version of *2.0*, adds nine more features, such as headers and footers, keyboard input for form letters, and added printer controls. For the Commodore 64, you can buy *TOTL.Text 2.6+* ($40), which has about 25 features and supports both the serial and RS-232 ports.

Word Processor Plus ($25) provides good basic features including repeating keys, a standard letter format output, and a spool routine to print a series of text files.

The second price grouping ($30-$65) moves you up to more features, longer manuals in binders, and sample text files to help you learn the program. For example, *Quick Brown Fox* (VIC or 64) comes with a nice binder

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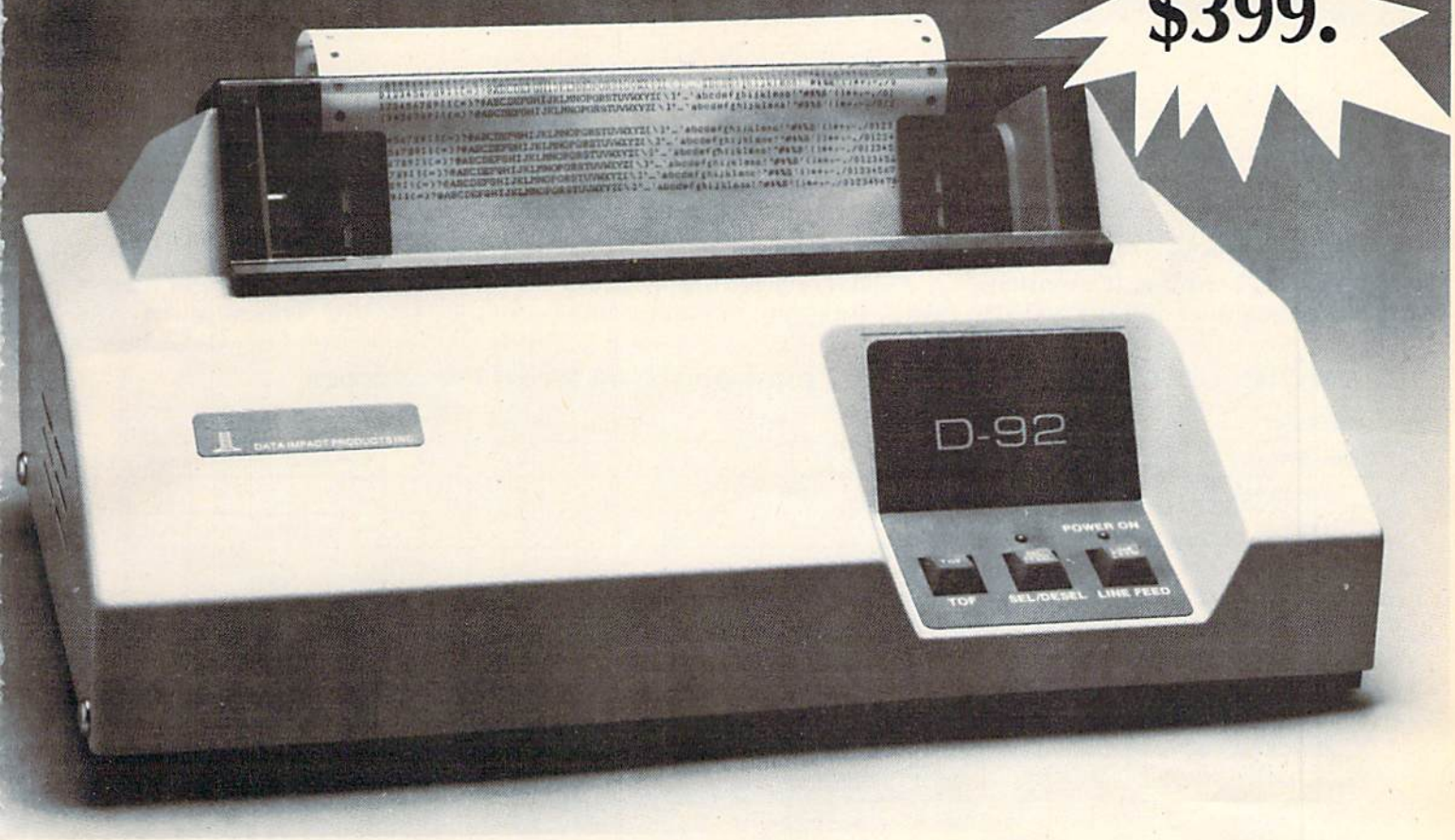

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and a cassette tape with sample files to aid learning. It's written for the beginner and the instructions contain lots of illustrations.

Quick Brown Fox is a "firmware" program, in that it comes as a cartridge which slides into the cartridge slot at the right rear of the 64 or VIC. This means it

Table 1: Summary Of VIC-20/Commodore 64 Word Processors

PRODUCT	VIC	64	TAPE	DISK	CART.	Price,$*	COLOR	SERIAL†	RS-232	COMMENTS‡
Casual Writer	X		X			29	N	Y	N	Requires 8K expansion on VIC
EasyScript 64		X		X		79.95	Y	Y	Y	
The Editor	X	X	X	X		34.95	N	Y	N	Requires 8K expansion on VIC
HES Writer	X				X	39.95	Y	Y	N	
HES Writer/64		X			X	44.95	Y	Y	N	
Page-Mate	X	X	X	X		40	N	Y	Y	
PaperClip		X		X		125	Y	Y	Y	
Quick Brown Fox	X	X		X	X	65 (cart.)	N	Y	Y	
Smithwriter		X	X	X		49.95 (tape) 54.95 (disk)	Y	Y	Y	VIC version available soon
Script 64		X		X		99.95	Y	Y	Y	
TOTL.Text 2.0	X		X	X		25 (tape)	Y	Y	Y	Disk version is $29
TOTL.Text 2.5	X		X	X		35 (tape)	Y	Y	Y	Disk version is $39
TOTL.Text 2.6		X	X	X		40 (tape)	Y	Y	Y	Disk version is $44
Un-Word Processor	X		X			20	N	Y	Y	
VIC-NIC	X		X	X		19.50	Y	Y	Y	Commodore 64 version available soon
Word Manager	X	X	X	X		Free with purchase of Data 20 Video Pak	N	Y	Y	Requires Video Pak
Word Mite Plus	X		X			14.95	Y	Y	N	
Word Mite 2	X		X	X		14.95 (tape) 16.95 (disk)	Y	Y	N	
Word Mite 2C		X	X	X		14.95 (tape) 16.95 (disk)	N	Y	N	
Word Pro 1 Plus/64		X	X	X		39.95	Y	Y	N	
Word Pro 3 Plus/64		X	X	X		89.95	Y	Y	N	
Word Processor Plus	X	X	X			25	N	Y	Y	
Word Wizard	X		X			34.95	N	Y	Y	Requires 8K expansion on VIC
Word Wonder	X	X	X	X		29.95 (VIC-20) (price for 64 version was not available at press time)	Y	Y		Requires 8K expansion on VIC
Wordcraft	X	X			X	99.95 without 8K expansion (VIC) 199.95 with 8K expansion; 64 version 149.95	Y	Y	Y	
Wordwiz	X		X			14.95	Y	Y	N	
Write Now	X	X			X	39.95 (VIC) 49.95 (64)	N	Y	N	
Writer's Assistant		X		X		125	Y	Y	Y	

* Suggested retail price at press time.
† Refers to whether program can be used with a printer connected to this port.
‡ Unless noted, VIC-20 version will run on an unexpanded VIC.

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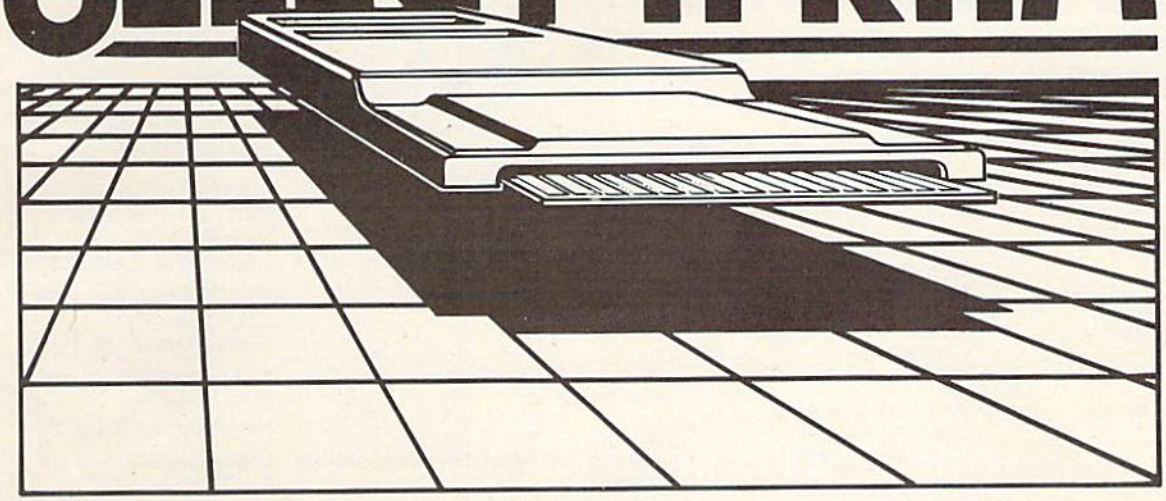

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Table 2: Manufacturers Listing

PRODUCT	COMPANY ADDRESS
Casual Writer	E. N. Publications R.D. 1 Worden, IL 62097
EasyScript 64	Commodore Business Machines, Inc. 1200 Wilson Dr. West Chester, PA 19380
The Editor	Powerbyte 2 Chipley Run West Berlin, NJ 08091
HES Writer	Human Engineered Software 71 Park Lane Brisbane, CA 94005
Page-Mate	AB Computers 252 Bethlehem Pike Colmar, PA 18915
PaperClip	Batteries Included 71 McCaul St. Toronto, Ontario Canada M5T 2X1
Quick Brown Fox	Quick Brown Fox 548 Broadway Suite 4F New York, NY 10012
Smithwriter	Softsmith 2935 Whipple Ave. Union City, CA 94587
Script 64	Pacific Coast Software 3220 S. Brea Canyon Rd. Diamond Bar, CA 91765
TOTL.Text	TOTL Software, Inc. 1555 Third Ave. Walnut Creek, CA 94596
Un-Word Processor	Midwest Micro Inc. 311 W. 72nd St. Kansas City, MO 64114
VIC-NIC	Type Thrift Dept. K Shelburne, Ontario, Canada L0N 1S0
Word Manager	Data 20 Corporation 23011 Moulton Pkwy. Suite B10 Laguna Hills, CA 92653
Word Mite	Nelson Software 2232 Ogden Ct. St. Paul, MN 55119
WordPro	Professional Software, Inc. 51 Fremont St. Needham, MA 02194
Word Processor Plus	William Robbins Box 3745 San Rafael, CA 94912
Word Wizard	Micro-Ware Dist., Inc. 1342 B Rt. 23 Butler, NJ 07405
Word Wonder	Microspec 2905 Ports O'Call Ct. Plano, TX 75075
Wordcraft	UMI 3503-C Temple Ave. Pomona, CA 91768
Wordwiz	World Electronics 177 27th St. Brooklyn, NY 11232
Write Now	Cardco 313 Mathewson Wichita, KS 67214
Writer's Assistant	Rainbow Computer Corporation 490 Lancaster Ave. Frazer, PA 19355

comes on instantly when you turn on your computer, so there is no waiting to load the program. However, the 64 version requires loading a short tape utility program before using a printer with the RS-232 port.

HES Writer 64 ($45) also is a cartridge program. It has 15 program commands and 14 format controls (for printing), making it a complete package. It supports the Commodore serial port but not the RS-232 port at this time.

The third price group ($65-$125) puts you on the borderline of full-feature business-type word processors. Two good examples are *PaperClip* ($125) and *Writer's Assistant* ($125). Both are for the Commodore 64 only and come on disks. *PaperClip* contains many advanced features, such as horizontal scrolling, addition/subtraction of columns or rows, column changes (edit whole columns at one time), and alphanumeric sorting. By the time you read this, it should be available in an updated form which supports the RS-232 port, and which has expanded printer files, wider horizontal scrolling, and improved manuals and operation.

PaperClip comes with a "dongle" which fits into control port #1 (usually used for joysticks). This is for copy protection purposes – unauthorized copies will not run without the dongle.

A similar program, *Writer's Assistant* ($125), comes on disk and contains several sample files. For example, a "Demo for Writer" file shows many of the printing features and a "Glossary Sample" file shows you how to store frequently typed information to

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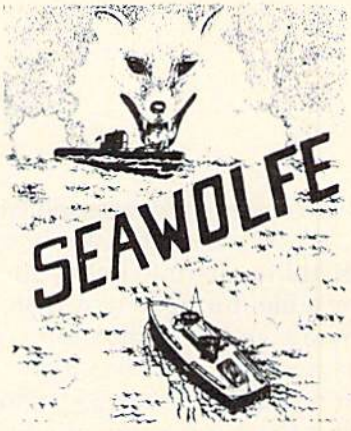

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avoid retyping it when used later.

Writer's Assistant also has a disk utility menu to help you copy a file, format a new disk, generate and list a directory, rename a file, and kill a file. When you first use it, you configure it to your system and it will then remember this each time you start up. Another nice feature is the "date" format. When you first start the program, it asks you the current date. Then, whenever a date is needed, it puts in the value you gave it.

Is It Comfortable?

By now, you can see the wide range of word processing programs available for the VIC and 64. Cartridge programs offer faster start-up, since they basically become part of your computer's operating system. However, they may not easily support your printer if you are using the RS-232 port.

One way to make your final selection is to narrow your choices down to two or three with the features you want, then contact each company or local dealer for specific information about the latest version, printer and interface support, cost, memory needs, and other criteria.

With this information, a final selection shouldn't be hard to make. Then, when you get the program home, give it a good workout, allowing enough time to learn all the features carefully. Only then will you actually be able to rate the program for yourself. Ask yourself: Is the word processor fun to use? Since you'll be using it for creative purposes, it shouldn't inhibit you. After all, if it isn't fun to use, it'll just gather dust and soon be forgotten.

If the word processing program you select just doesn't "fit" right, return it for a refund or credit towards another program. Most companies will work with you to resolve any problems, perhaps by making updated versions available at a nominal cost.

WordPro 3 Plus/64

Dan Carmichael, Assistant Editor

Editing text with WordPro 3 Plus/64.

One of the more useful tools to emerge from the computer revolution is the word processor.

A word processor enables you to compose and edit text on the TV screen by inserting or deleting letters, words, or sentences at will. You can rearrange whole paragraphs within a document, or move them to another document. You can store the text on peripheral storage equipment, such as tape or diskette, to be recalled, edited, and printed at any time.

Some word processors even have a standard data bank of tens of thousands of words. The computer can use this "dictionary" to check your spelling or your syntax. All this can be done within the computer before ink ever touches the paper.

A Wealth Of Options

WordPro 3 Plus/64 is a word processor that is written to work with the Commodore 64 computer, a disk drive, and a printer. Although it does not contain all of the above options, it does have all the features that the home computerist or the small business user is likely to need. This, plus its budget price (about $89), makes it a good buy.

Among *WordPro 3 Plus/64*'s options is *insert/delete*, in which anything from a single letter to whole paragraphs can be easily inserted or deleted. The ability to work with *global* files allows you to link many files together for use with the various commands. This means you can print out a document much larger than the computer's memory by breaking it up into smaller files which are hooked together and treated as a single document. Another option is the *search* and *replace* command. This allows you to scan the entire text to search for and replace any words you wish. For instance, you might want to replace all occurrences of "Smith" with "Smythe." *WordPro* will do this automatically.

Options to format the printed output are also included. These include variables for page numbers, line spacing, centering lines of text, right and left justification, and the setting of tabs. *WordPro* for the 64 also supports subscripts, superscripts, and underlining – if these options are also supported by the printer.

For the small business user or for those interested in accounting applications, there is a *numeric mode*. In the numeric mode, *WordPro* automatically aligns columns of numbers by their decimal points.

Another advanced feature of *WordPro 3 Plus/64* is the "boilerplate" or *extra text mode*. The extra text mode is much like having an "alternate memory" area in *WordPro*. This enables you to call in or reuse a standard paragraph or a whole file. This option can be used when generating form letters that contain the same standard paragraph. For example, when writing the form letter you can "call in" or add the standard paragraph to your text with a simple command.

The screen display on your TV or monitor can be adjusted with *WordPro*. You have the option of separately changing the screen background color and the print (text) color.

One option missing from *WordPro 3 Plus/64* is the ability to preview on the screen how the formatted output will appear on paper. This is because the screen display is limited to 40 columns while the printer output is set at 80, and *WordPro 3 Plus/64* does not support horizontal scrolling.

Other options include a small library of standard disk commands which include: FORMAT, INITIALIZE, VALIDATE, DUPLICATE, COPY, RENAME and SCRATCH.

A Few Flaws

Although a fairly good word processor, *WordPro 3 Plus/64* does have a number of flaws that could cause problems if you're not careful. In certain circumstances, if you press the wrong key at the wrong time, all

Pressing certain adjacent keys at the same time, such as Commodore-RUN/STOP, can erase all your text and restart the program.

your text can be lost.

For instance, the Commodore key on the Commodore 64 keyboard is used as a CTRL key. If you press the control key and then inadvertently press the RUN/STOP key (the key next to it), the computer will completely reset *WordPro*, and destroy any text you were working on. The same thing happens if you type a capital "Q" after the CTRL key is pressed.

These and other flaws revolve around one area of design of *WordPro 3 Plus/64*. The program does not ask, or double-check, to make sure you want to execute a certain option or command. In the previous example, it would seem more efficient to ask the user, "Are you sure you want to reset *WordPro*?" If the keys were indeed accidentally pressed, you could then recover with no loss. *WordPro* doesn't ask; it simply resets, and the text is gone. Because there are so many commands available which will erase or delete some or all of the text, such a "fail-safe" system would be welcome.

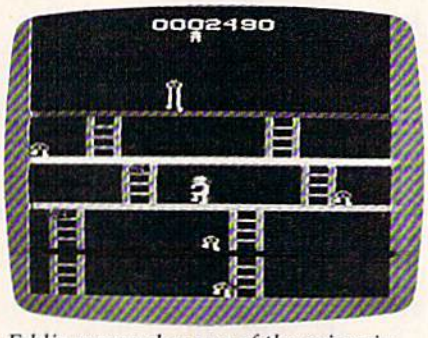
WordPro 3 Plus/64 comes with a relatively well-written instruction manual. The manual contains thorough explanations of each command, along with format illustrations, and some step-by-step examples. However, there is no quick reference card. A quick reference card was included with *WordPro* versions for other computers (PET, etc.) and should have been included with the Commodore 64 version.

WordPro 3 Plus/64
Professional Software, Inc.
51 Fremont Street
Needham, MA 02194

Fast Eddie For VIC And 64

Tony Roberts, Assistant Managing Editor

If you can run faster, jump farther, and climb higher, get ready to put yourself into the shoes of Fast Eddie, the protagonist in a new game by the same name from Sirius.



Eddie approaches one of the prizes in Fast Eddie.

It won't really matter, though, whether you can outdo your friends at the decathlon. For to play *Fast Eddie*, all you need is perfect eye-hand coordination and a comfortable joystick.

Versions of *Fast Eddie*, which was designed by Mark Turmell, are available for the Commodore 64, the VIC-20, and Atari. The VIC and 64 versions were programmed by Kathy Bradley.

In the game, you assume the persona of Fast Eddie, a somewhat barrel-shaped fellow in a green coat. Your goal is to collect prizes, which float near the ceilings of the first four floors of your building. Because of your superior leaping ability, it's no trouble for you to simply jump up and bring down a prize. A touch of the fire button is all it takes.

Collect nine prizes, and a key appears above High-Top, the creature who lives up on the fifth floor. Capture the key and you move on to a new screen and new prizes.

Sneakers And Ladders

The Sneakers, short-legged relatives of High-Top, are the turned ankles in this track-and-field style game. These dancing semicircles with eyes guard the prizes and keep Eddie moving. Eddie can outrun the Sneakers, hop over them, or climb aboard a ladder to another floor. But if he is caught, Eddie is through, and one of the reserves takes over back on the first floor.

You have four Fast Eddies at the start of each game, and, if you have fewer than three in reserve when you complete a screen, you get an additional Eddie.

Generally, the ladders that connect the floors of Eddie's building are easy enough to negotiate, and while Eddie is climbing, he needn't worry about getting the boot from one of the Sneakers.

Most of the time, the ladders are staggered. After climbing up a floor, for example, Eddie must move right or left to board another ladder to another floor. Some ladders, however, are aligned. On these structures, it's

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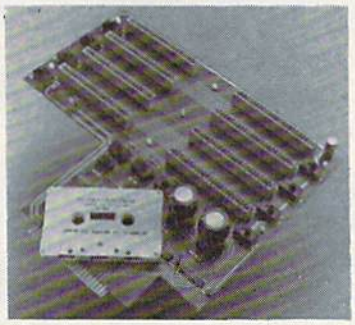

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all too easy to zip past the intended floor, and wind up in deep, unexpected trouble.

Sneakers In All Sizes

Eight levels are available in *Fast Eddie*, each with five screens. If you complete the five screens of one level, you automatically move to the next higher level. You also can use the f5 key to start the game at any level.

At each level, the objective is the same: collect nine prizes and the key. The differences between levels can be found in the Sneakers.

At level one, a single Sneaker guards each of the four floors. At level two, you'll find a pair up on deck four. At level three, there is a pair on the second floor, another pair on the fourth, and an extra-wide model on the third floor.

In some cases, two Sneakers will be positioned side by side, requiring that Fast Eddie leap them in a single bound. In other cases, they'll be strewn far apart, making Eddie negotiate them in a series of jumps.

Beginning at level six, you'll see three Sneakers on some of the floors. If the three are close together, it will take a perfectly timed jump to clear the bunch. If they are spaced apart, you'll need a pogo stick to get across the screen.

He's Not Called Fast For Nothing

Once Fast Eddie gets going, he can really move. The program itself is fast and colorful, and the action is smooth. Inexperienced players will be able to enjoy the lower levels of *Fast Eddie* and work their way up. Old hands at the joystick will find plenty here to challenge them.

When being guided by a practiced hand, Eddie will look inspired. His running, jumping, climbing, and countless close calls will leave you breathless and exhausted.

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$39.95 VIC-20 cartridge

HINTS&TIPS

A SHIFTy Solution

Steven Darnold

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Most programs need to pause at some point to give the user time to read instructions or other information on the screen. Often this is done by putting the computer into a loop:

```
50 GET G$ : IF G$=" " THEN 50
```

and instructing the user to "Press any key to continue."

This approach, however, is somewhat clumsy. The loop requires a separate line all to itself, it adds a byte of variable garbage every time it is used, and it permits inexperienced users to break out of the program by pressing the RUN/STOP key.

A much more elegant approach is to use WAIT 653,1 and instruct the user to "Press SHIFT to continue." On both the VIC-20 and the Commodore 64, memory location 653 contains a 1 whenever the SHIFT key is down. WAIT 653,1 is shorter, faster, and neater than the usual GET loop.

If there are several pages of instructions with a WAIT 653,1 at the end of each page, the user can skip through them simply by holding down the SHIFT key. If this is undesirable, the program can check to see that the SHIFT key is released each time. This is done with a WAIT 653,1,1. Example:

```
10 PRINT "Press and release SHIFT to continue."
20 WAIT 653,1
30 WAIT 653,1,1
40 PRINT "Continued, OK"
```

C. REGENA

Program Transfer

My apologies to all those who were not able to RUN my previous sample programs on a Commodore 64! Until now, I didn't own a 64. Then I braved the early-summer Utah floods and crossed a newly formed river down the center of Salt Lake City to get to a computer store. I now have a new Commodore 64 sitting next to my VIC-20 so I can make sure my examples and sample programs work equally well on both computers.

Most of the BASIC programming techniques are the same for both computers. Differences are largely because the Commodore 64 has different memory locations and because the 64 has more rows and columns available on the screen than does the VIC. A full printing line on the VIC takes up only about half a line on the 64. The screen memory maps, therefore, use different numbers. Any numbers involved in POKE commands for graphics and colors will be different for the computers. Numbers used in the POKE commands for music are also different. In addition, the 64 has features available that are not possible with the VIC.

My previous columns have discussed graphics and music on the VIC. I usually like to start with graphics and music because they are features that make a home computer *fun*. Once you experiment with graphics and music, you can really be creative. In this column I'm going to go back and discuss some of the fundamentals of BASIC programming.

Each program line in a BASIC program has a line number. When you RUN the program, the computer executes each line in exact numerical order, *unless* ... unless you tell the computer otherwise. Directing the program to go somewhere else can be called "program transfer" or "branching" and often involves "logic" that really enables the computer to make decisions. Following are some of the branching commands available in Commodore BASIC.

GOTO

The most direct command to go to a different line is GOTO *n*, where *n* is a line number, such as GOTO 550. A command may tell the computer to skip several lines and GOTO a later line number, or to back up and GOTO a previous line number, or even to stay at a certain line number by a GOTO to itself. Here is an example:

```
10 REM PROGRAM STARTS HERE
20 PRINT "HELLO"
30 GOTO 70
40 PRINT "THIS IS LINE 40"
50 PRINT "PRESS RUN/STOP KEY"
60 GOTO 60
70 PRINT "THIS IS LINE 70"
80 GOTO 40
```

The computer starts executing the lines in order, starting with line 10 (which is actually ignored because of the REMark statement). Next is line 20, which prints a message. Line 30 says to GOTO line 70 without paying attention to any lines in between. Line 70 then prints a message. Line 80 branches again – this time GOTO 40. Line 40 prints a message, then line 50 prints a message. Line 60 says GOTO 60. The computer will just stay at line 60 (an "endless loop") until you press the RUN/STOP key.

You can probably see that using GOTO statements isn't the most efficient programming technique. It can make programs hard to understand.

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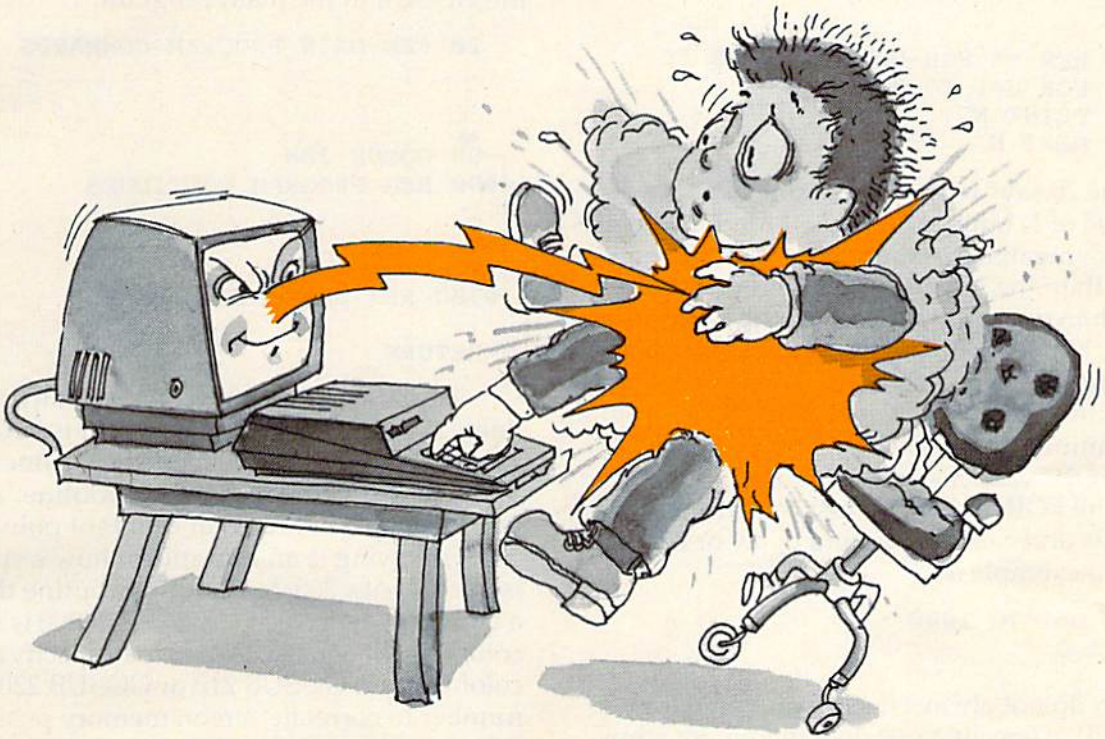

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Many structured-programming advocates say you should rarely or never use a GOTO. Good program planning can at least minimize the GOTOs. Some of my early programming efforts used lots of GOTOs. My husband teasingly said it was good program security – no one could follow all the branching to figure out the program.

GOTO may also be typed GO TO (with a space between the words). The abbreviation is G shift O.

FOR-NEXT

A FOR-NEXT loop is used when you want to perform a process by repeating lines a certain number of times.

```
10 REM ** FOR-NEXT EXAMPLE **
20 FOR N=1 TO 8
30 PRINT N
40 NEXT N
```

Line 20 says to let the variable N start with the value of 1. Line 30 prints N. Line 40 says NEXT N, which means increment N by 1 and see if it is greater than the limit of 8 specified in line 20. If N is less than or equal to the limit, the computer goes back to line 30. Now the value for N is 2, and the computer prints "2" as N. The process continues until the limit of 8 is reached. The program then continues with the next line.

A FOR-NEXT loop with no commands between the FOR and NEXT just counts between the limits and can be used as a delay or timing loop. An example is:

```
20 FOR D=1 TO 1000
30 NEXT D
```

You do not always need to increment by 1. Use STEP to specify your own increment steps.

```
10 REM ** FOR-NEXT-STEP **
20 FOR N=1 TO 8 STEP 2
30 PRINT N
40 NEXT N
```

RUN this program to see the difference STEP makes. Try changing the 2 in line 20 to 3. You may even use a fraction such as .5. There are also times when you may want to use a negative step size. Try changing line 20 to:

```
20 FOR N=10 TO -6 STEP -2
```

All the numbers in the FOR statement may be variables and expressions, such as FOR N=X TO Y+5 STEP S.

To conserve memory, you may leave out spaces in the FOR and NEXT statements. However, if you use variables as the limits, you must have a space after the variable name. Examples:

```
20FORN=1TO8STEP2
20 FORN=X TOY+5 STEPS
```

You may also use abbreviations. FOR may be abbreviated F shift O, NEXT may be abbreviated N shift E, and STEP may be abbreviated ST shift E.

GOSUB

GOSUB means GO to a SUBroutine, then come back to execute the next line. A *subroutine* is a set of instructions that may be used several different times during the execution of the program. The subroutine may be placed anywhere in the program. The last statement of the subroutine is RETURN to branch back to the next statement after the GOSUB in the main program.

```
20 REM MAIN PROGRAM COMMANDS
 .
 .
80 GOSUB 300
90 REM PROGRAM CONTINUES
 .
 .
 .
300 REM SUBROUTINE HERE
 .
RETURN
```

The subroutine may consist of any number of lines, as long as the last command is RETURN. The GOSUB command specifies the line number of the first statement in the subroutine. A subroutine may be entered at different points.

Following is an example of how a subroutine is used. Lines 200-340 are a subroutine that draws a border using color C. If GOSUB 200 is used, the color C is set equal to 2. You may specify a different color C, then GOSUB 210 or GOSUB 220. A is the number to correlate screen memory position with color positions. A may be a number used in other calculations, then reset when the subroutine is entered.

Line 10 clears the screen. In the Commodore 64 version, line 15 changes the screen to a white background. Line 20 prints a sample title. Line 30 says GOSUB 200, which goes to the subroutine starting at line 200 and executes the statements until the command RETURN. Line 40 is the next line executed, which delays slightly. Line 50 and line 60 clear the screen and print a different sample title. Line 70 "primes" the subroutine by specifying color C=6. Line 80, GOSUB 220, goes to the subroutine starting with line 220, and executes until the RETURN command at line 340. Line 90 delays, line 100 clears the screen, and line 110 repeats the subroutine again, this time starting at line 200.

VIC-20 Version

```
5 REM ** GOSUB **
10 PRINT "{CLR}{BLU}"
20 PRINT TAB(5);"{6 DOWN}TITLE SCREEN"
```

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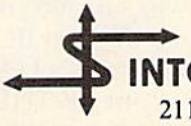

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```
30 GOSUB 200
40 FOR D=1 TO 1500:NEXT
50 PRINT "{CLR}{RED}"
60 PRINT TAB(6);"{6 DOWN}GOSUB DEMO"
70 C=6
80 GOSUB 220
90 FOR D=1 TO 2000:NEXT
100 PRINT "{CLR}{BLU}"
110 GOSUB 200
120 END
200 C=2
210 A=30720
220 FOR S=7703 TO 7722
230 POKE S,90:POKE S+A,C
240 NEXT S
250 FOR S=7744 TO 8140 STEP 22
260 POKE S,90:POKE S+A,C
270 NEXT S
280 FOR S=8162 TO 8143 STEP -1
290 POKE S,90:POKE S+A,C
300 NEXT S
310 FOR S=8121 TO 7725 STEP -22
320 POKE S,90:POKE S+A,C
330 NEXT S
340 RETURN
```

Commodore 64 Version

```
5 REM ** GOSUB **
10 PRINT "{CLR}{BLU}"
15 POKE 53281,1
20 PRINT TAB(14);"{8 DOWN}TITLE SCREEN
30 GOSUB 200
40 FOR D=1 TO 1500:NEXT
50 PRINT "{CLR}{RED}"
60 PRINT TAB(15);"{8 DOWN}GOSUB DEMO"
70 C=6
80 GOSUB 220
90 FOR D=1 TO 2000:NEXT
100 PRINT "{CLR}{BLU}"
110 GOSUB 200
120 END
200 C=2
210 A=54272
220 FOR S=1065 TO 1102
230 POKE S,90:POKE S+A,C
240 NEXT S
250 FOR S=1142 TO 1942 STEP 40
260 POKE S,90:POKE S+A,C
270 NEXT S
280 FOR S=1982 TO 1945 STEP -1
290 POKE S,90:POKE S+A,C
300 NEXT S
310 FOR S=1905 TO 1105 STEP -40
320 POKE S,90:POKE S+A,C
330 NEXT S
340 RETURN
```

GOSUB may be abbreviated GO shift S, and RETURN may be abbreviated RE shift T.

IF-THEN

The IF-THEN statement is a conditional branching statement that makes the computer seem intelligent. The computer evaluates a condition or expression, then branches or takes actions accordingly. The branching occurs only if the condition exists, or if the expression is true. The IF-THEN statement may be of the following forms:

IF *expression* THEN *line number*
IF *expression* THEN *action*

The *expression* may be a variable, string, number, comparisons, or logical operators. The *line number* is a line number of another statement in the program. Only if the expression is true will the program branch to the line number.

```
10 REM ** IF-THEN **
20 A=1
30 A=A+1
40 IF A<11 THEN 20
50 END
```

At line 40, if the value of A is less than 11, then the computer will branch to line 20. Another way of thinking or interpreting this statement is if the expression A<11 is true, then branch to line 20. RUN the sample program to see what happens.

Rather than a line number after THEN, you may specify an *action*, or several commands. Here is an example:

```
10 REM ** IF-THEN **
20 FOR A=1 TO 10
30 IF A<6 THEN PRINT A
40 NEXT A
50 PRINT "A =";A
60 END
```

In this sample program, the FOR-NEXT loop allows A to be from 1 to 10, but line 30 prints only the numbers less than 6. After the FOR-NEXT loop is completed, the final value of A is printed. (Note that A has been incremented 1 more than the limit of 10.)

String variables and string comparisons are allowed in IF-THEN statements. Here is a simple example.

```
10 REM ** STRING COMPARISON **
20 N$="HELLO"
30 M$="HI"
40 PRINT "ENTER 'HI' OR 'HELLO'"
50 INPUT A$
60 IF A$=N$ THEN PRINT M$:GOTO 80
70 PRINT N$
80 END
```

This time the action in line 60 actually consists of two commands – PRINT M$ then GOTO 80. If the condition A$=N$ is not true, the computer goes immediately to the next line and disregards anything after THEN in the present line. This program will print either HELLO or HI depending on what you type in and enter.

Keep in mind that in programming there are many ways to accomplish the same results. For example, the first IF-THEN example could have been written as a FOR-NEXT loop to produce the same output. IF-THEN statements may be written in a variety of ways. The expression to be evaluated also may be written in many different ways.

For example, a condition A<6 may be tested, but another way to write the same condition is A<=5 (A less than or equal to 5). Perhaps you would prefer to test the opposite condition, A>5 or A>=6 (A greater than 5 or A greater than or equal to 6). By the way, "not equal to" is written <>.

A word of warning: in general you may combine commands on one line by separating statements with the colon, such as 30 READ X:PRINT X. If you are translating a program and combining lines to save memory or typing effort, do NOT combine an IF statement with the next line. If the condition tested is false, program control goes to the next line; and the IF-THEN statement with the command(s) following THEN must be kept separate from the next line which contains different actions.

Math Competency: Saving Money

This month I am including a sample program that illustrates the use of various branching statements. The program writes out a story problem or word problem in arithmetic. The type of problem involves division calculations. A person needs to save a certain amount of money for a major purchase; how much needs to be saved each week?

FOR-NEXT statements are used in lines 40-90 to read in DATA from lines 100-110. N$(n) is the name for the problem, and there are six possible names (three girls and three boys). There are three kinds of purchases that can be made. A$(n) is the item desired. The price is chosen randomly. B( ) is the lowest base price for the particular item. A random factor from 1 to F( ) is chosen to multiply by M( ) to get the price of the item.

R6 is a random number from 1 to 6 to choose the person's name. R3 is a random number from 1 to 3 to choose the item.

Lines 470-510 are a subroutine that converts the price in raw form to dollars and cents. The subroutine may be entered at either line 480 or line 470. C$ is the cost in dollars and cents.

The logic in lines 200-220 determines whether to print "HE" or "SHE" depending on the random subscript R6 – the first three subscripts refer to girls, and the other subscripts refer to boys. Another way of doing this would be:

```
200 P$="HE"
210 IF R6<4 THEN P$="SHE"
```

(delete line 220)

After the student enters an answer, line 300 compares the INPUT answer with the calculated answer S; if they are within one cent, the program branches to the "Correct" procedure. If the answer is incorrect, lines 310-340 show how to get the correct answer. Line 330 uses GOSUB 470 to convert the answer S to the dollars and cents form of C$.

If the answer is incorrect, the student presses RETURN, and line 370 tells the computer to branch back to line 120 for another problem. If the answer is correct, lines 400-420 print the option to try again. The IF-THEN statements check the key the student presses and branch accordingly. If the key pressed is not Y or N, line 460 branches to line 430 to keep checking for a key pressed.

Commodore 64 owners, please add this line: 25 POKE 53281,1. This command creates a white background so you can read the blue letters. The program works for both VIC-20 and Commodore 64 (with the addition of line 25 for 64 users).

See program listing on page 155.

MACHINE LANGUAGE FOR BEGINNERS

RICHARD MANSFIELD, SENIOR EDITOR

Windows And Pages

Last month we introduced the *disassembler*, a primary tool for machine language (ML) programming. With it, you can create ML equivalents of BASIC's LIST command. In other words, you can see a program on screen and follow its logic. Let's put the disassembler to work this month and also learn something about pages, datamakers, and ML "variables." If you don't have the disassembler program, you might want to send for a copy of the September 1983 issue of COMPUTE!'s Gazette.

One of the most effective ways to learn ML is to examine short routines in BASIC and then see how the same thing is accomplished in ML. After all, there are a fairly limited number of basic programming techniques in any language: looping, branching, comparing, counting, and a few others. And long programs are not created in a furious burst of nonstop programming. Rather, they are built by knitting together many small sub-programs, short routines which are as understandable in ML as they are in BASIC. In the months to come, we'll provide frequent, side-by-side BASIC-ML examples. Before you know it, you'll be able to think in both languages, and you'll have a working knowledge of ML.

Peering Into Memory

To start things off, type in either Program 1 (if you have a Commodore 64) or Program 2, for the VIC-20. These are called *BASIC Loaders*, and their function is to POKE a machine language program into RAM memory. The numbers in the DATA statements are the ML program. SAVE the program in case things go awry, then type RUN. Nothing seems to happen. You can then type NEW because the little loader has done its job: a short ML program is now in memory from address 864 to 875.

Program 1: 64 Loader

```
800 FOR ADRES=864TO875:READ DATTA:POKE A
    DRES,DATTA:NEXT ADRES
864 DATA 162, 0, 189, 0, 0, 157
870 DATA 0, 4, 232, 208, 247, 96
```

Program 2: VIC Loader

```
800 FOR ADRES=864TO875:READ DATTA:POKE A
    DRES,DATTA:NEXT ADRES
864 DATA 162, 0, 189, 0, 0, 157
870 DATA 0, 30, 232, 208, 247, 96
```

Because of the color memory problem (you have to POKE values into the entire color memory before you can see things), RUN this short BASIC line before trying out the ML program and after each time you clear the screen:

FOR I=55296 TO 55552: POKE I,6: NEXT (64 version)
FOR I=38400 TO 38656: POKE I,6: NEXT (VIC version)

To see what this ML program does, you can just SYS to the start of it: SYS 864. If you typed in the DATA statements correctly, you'll see a collection of strange symbols on the screen. Now clear the screen and type in Program 3. When RUN, it allows you to see things happening. Some characters are flashing rapidly, some change only in response to things you typed on the keyboard, some do nothing. What you're looking at is the first 256 memory addresses in your computer. The "flashing" characters (160, 161, and 162, counting down from the top left corner of the screen) are your computer's clock. They're what

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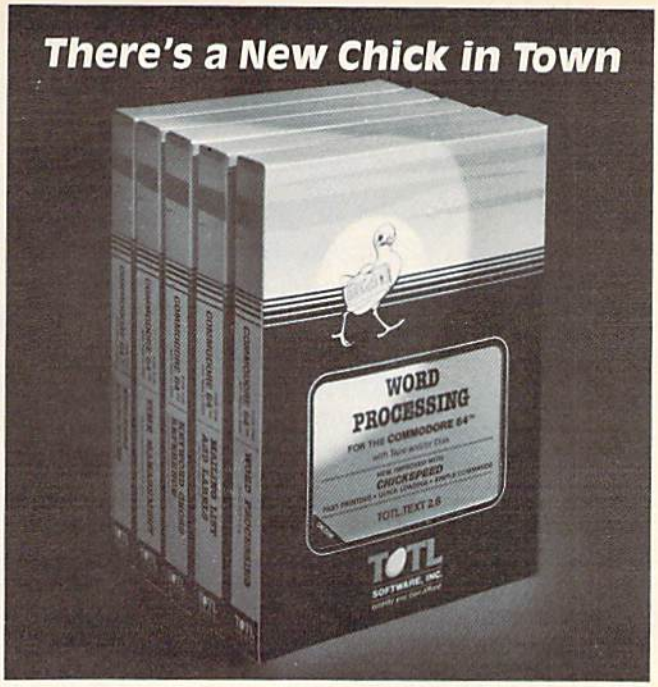

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Program 3: The Window

```
10 SYS864
20 GETK$
30 GOTO10
READY.
```

The computer divides its memory into groupings of 256 bytes, called *pages*. What you're seeing on screen is "zero page." Stop the program with the RUN/STOP key and type POKE 868,1. Then RUN the BASIC program again. Now you've changed the zero to a one, and you've changed the ML program so that it puts page one on screen. You can see any of the 256 pages in the computer by just POKEing the page number into address 868.

Comparing BASIC And Machine Language

How does this little ML program send the contents of RAM memory up to the screen? Let's show how we could do it in BASIC and then see how ML does it:

```
10 X=0
20 A=0+PEEK(X)
30 POKE 1024+X, A
40 X=X+1
50 IF X <> 256 THEN 20
```

Of course you would probably write a program like this using a FOR/NEXT loop, but we've distorted normal BASIC style a bit to more closely reflect the approach used in ML. Look at Program 4. It's the kind of disassembly you would see if you used a "monitor" program like Tinymon (published last year in COMPUTE! Magazine). The first column, starting with "0360" and containing a series of four-digit hexadecimal (hex) numbers, represents the addresses in memory where each ML instruction resides. (We'll get into hexadecimal arithmetic in a future column.) For now, it's enough that you understand that, in ML, memory addresses perform the same function as BASIC's line numbers do in a program LISTing.

Program 4: Monitor Disassembly

```
0360 A2 00     LDX #$00
0362 BD 00 00 LDA $0000,X
0365 9D 00 04 STA $0400,X
0368 E8        INX
0369 D0 F7     BNE $0362
036B 60        RTS
```

Program 5: Disassembler

```
starting address (decimal)? 864
start address hex  0360
 864  ldx   # 0
 866  lda  0 ,x
 868  sta   1024 ,x
 871  inx
 872  bne        866
 874  rts
```

After the "line number" address, you see some groupings of two-digit hex numbers. The first group is "A2 00." These are the actual numbers that the computer reads when it executes the ML program. These numbers are the most elemental form of machine language and sit in memory at the addresses indicated to their left. Finally, the "LDX #$00" is the disassembly (the *translation*) of the ML "A2 00." LDX means "LoaD the X register." The X register is like a variable and the # symbol tells the computer to load the *number* zero into the X – as opposed to the number found at *address* zero. Without the #, X would be given whatever number was currently in address zero. The $ means that the number is in hex notation, not decimal.

Now take a look at Program 5. If you have a copy of the disassembler program from last month's column, LOAD it. When it asks you for "starting address (decimal)", type in 864 and you'll see the same disassembly as illustrated in Program 5. Notice that 864 is translated into hex (0360). Program 5 is nearly identical to Program 4 except that the two-byte numbers between the address and the disassembly are not shown.

The second "line" in Program 5 "LoaDs the Accumulator" with the item in *address* zero + X. That is, if X is 5, then the item in 0+5 (address 5) is loaded into the accumulator. The accumulator is another "variable" in ML, used to hold things temporarily. Since we're trying to send all the items in zero page (addresses 0-255) up to the screen memory so we can see them, our next job is to "STore the Accumulator" at address 1024+X. (1024 is the starting address of screen memory on the 64.) As you can see, we're making X do double duty here as an "index." It's acting as an offset for both the source items (in zero page) as well as the target to which we're sending those items (screen memory).

The next line raises, or *increments*, X by 1. INcrement X causes X=X+1 to take place, so, this first time through the loop, X goes up from 0 to 1. The BNE means "Branch if Not Equal to zero." Branch is like a GOTO, but instead of giving a line number as its target, it gives an address in memory (866 in this case, the start of our loop). How does X ever get to zero if it's being INXed each time through the loop? No single-byte variable in ML can go higher than 255. (Likewise, no individual memory address in the computer can "hold" a number beyond 255. This is similar to the fact that no decimal digit can ever go higher than 9. After that, the digits "reset" to zero.) As soon as you've raised X to 255, the next time you INX, it resets itself to zero and starts over. So,

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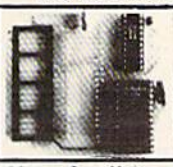

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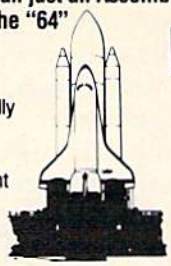

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"line" 872 in Program 5 will throw us back to line 866 until we've been through the loop 256 times. Then, we'll finally get to line 874, where "ReTurn from Subroutine" sends us out of ML and back into BASIC where we left off. Notice that SYS-RTS has the same effect as GOSUB-RETURN, except that the former moves between BASIC and ML.

Making A Loader Automatically

Program 6 is another useful tool when you're working with ML. Loaders (Programs 1 and 2) POKE an ML program into RAM memory for you; Program 6, "Datamaker," goes in the other direction and translates an ML program from RAM into a BASIC loader. After you type it in and SAVE it, try an experiment. To make a loader out of "The Window," change line 1 to read S=864:F=875:L=9. S is the starting address of your ML and F is the finish. Then RUN. You'll see the loader created for you on screen. The Datamaker destroys itself after it's finished. (Note: Sometimes it doesn't complete its job, and you need to hit RETURN a couple of times to help it out.) Notice, too, that the line numbers created in the loaders made by Datamaker are also the *addresses* where the ML will be POKEd. And don't forget to change the starting and ending addresses in line 800 before SAVEing a finished loader.

Program 6: Datamaker

```
0 QK=198:QB=630
1 S=826:F=1023:L=9:REM>S&F=ADRES
2 PRINT"{CLR}{2 DOWN}":FORI=STOS+47STEP6
  :IFI>FTHENNEXT:L=3:PRINT"QK="QK":QB="Q
  B":GOTO6":GOTO5
3 PRINTI;"DATA";:FORJ=0TO5:PRINTPEEK(I+J
  )"{LEFT},";:NEXTJ:PRINTCHR$(20):NEXTI
4 PRINT"QK="QK"{LEFT}:QB="QB"{LEFT}:S="S
  +48"{LEFT}:F="F"{LEFT}:L="L"{LEFT}:GOT
  O2"
5 POKEQK,L:FORK=1TOL:POKEQB+K,13:NEXTK:P
  RINT"{HOME}":END
6 PRINT"{CLR}{2 DOWN}":FORM=0TO7:PRINTM:
  NEXTM
7 POKEQK,8:FORK=1TO8:POKEQB+K,13:NEXTK:P
  RINT"{HOME}":END
800 FOR ADRES=826TO1023:READ DATTA:POKE
    ADRES,DATTA:NEXT ADRES
```

Next month we'll take a closer look at some of the events illustrated on screen when you RUN "The Window." You might try substituting INPUTK$ for GETK$ in Program 3 to try to find out where your input from the keyboard is temporarily stored in the computer before you hit RETURN and BASIC analyzes it. If you have any suggestions or questions, please write to me c/o COMPUTE!'s Gazette.

Improved Paddle Reader Routine For VIC And 64

Dan Carmichael, Assistant Editor
Tom R. Halfhill, Editor

This fourth installment of "Power BASIC," a continuing series of useful utilities and routines, is an enhancement of the first "Power BASIC" which appeared in the July 1983 issue of COMPUTE!'s Gazette. It works on the Commodore 64 or VIC-20, any memory size.

The "Power BASIC" in our Premier Issue was a paddle reader routine for the Commodore 64. The idea was to reduce the "jitter" in screen objects controlled by the game paddles. This jittering is caused by minor fluctuations in the paddle's readings. To calm down the jitter, author Bobby Williams wrote a short machine language routine which read the paddle 256 times in a split second, averaged the readings, and used the average for a final paddle value.

The routine worked fine, but some readers wanted more. One person in particular wrote an amusing letter – in the form of a poem – asking why we had not provided a version for the VIC-20. True, for some reason the VIC is not afflicted with a case of the paddle jitters as severe as the 64's, but it's distracting enough. Also, the original routine was for one paddle only, ignoring the second paddle.

So, to keep everyone happy, we present the "Improved Paddle Reader Routine."

Two BASIC Loaders

As before, you don't have to know anything about machine language to use these routines. They are published in the form of BASIC loaders – short BASIC subprograms which you add to your own BASIC programs. Using the POKE statement, they load decimal numbers into memory which correspond to the proper machine language commands.

The VIC version is stored in the cassette buffer, an area of memory normally unused during program execution. However, a SAVE or LOAD command will use the cassette buffer, overwriting the routine. If you make this routine a part of your regular program, there should be no problem.

The 64 version is stored in a normally safe area of memory, the 88 bytes from address 679 to 710 (decimal). This is not the same area where the previous paddle reader routine was stored. The earlier routine was stored in an often-used block of memory that we've decided to preserve for other purposes.

Be sure to type in the correct version, and as always when dealing with machine language, SAVE the program before the first RUN. This allows you to recover your work in case of a typing error that crashes the computer.

Reading The Paddles

Once the routine is added to your BASIC program, it must be activated with a SYS statement each time you want to read the paddles. To start the VIC version, use SYS 828 (the beginning address of the cassette buffer where the routine resides). To start the 64 version, use SYS 679.

With either version, you then read the paddles with a simple PEEK statement. To get the averaged reading of paddle 1, use PEEK(251); for paddle 2, use PEEK(252). Here's an example on the VIC:

```
100 SYS 828:P1 = PEEK(251):P2 = PEEK(252)
```

Here's an example on the 64:

```
100 SYS 679:P1 = PEEK(251):P2 = PEEK(252)
```

Note that these locations are different from the usual paddle locations. That's because the routine stores the averaged readings at 251 and 252, not at the customary locations (i.e., 54297 on the Commodore 64).

See program listings on page 155.

How To Use Tape And Disk Files

Richard Mansfield, Senior Editor

After a few weeks with their computers, many people find themselves trying (and failing) to make *files* on tape or disk. Files are quite useful, even necessary in many kinds of programs, but you do have to be a bit patient with them at first. They're not as immediately obvious as other aspects of BASIC.

We'll take it step by step, and you'll soon have files going in and out of the computer like a pro. But before getting down to specifics, a brief historical note will demonstrate that any confusion you might have experienced when working with files is fully justified and puts you in good company. In the early days, files mystified nearly everyone.

Charming, But Slim

In 1978, the first true consumer computers – the venerable model 2001 Commodore PETs – were shipped with a charming, but slim, user's manual. This booklet, 49 pages long, was called *An Introduction To Your New PET (Revised)*. It included instructions on using the reverse field key, the cursor controls, and some elementary BASIC, along with tips on how to clean the PET. Nothing about files.

Also, there were very few books or magazines about personal computers at that time. And they said nothing useful about files either. The best sources of specific information were the few mimeographed user group newsletters. These early publications were full of techniques and debates about how to make files work.

To get a firm grip on OPEN, CLOSE, PRINT# and INPUT# (BASIC's file-handling words), the first thing we should do is clearly understand the general differences between programs and files.

Telling Them Apart

Tapes or disks can store two entirely different things – *programs* and *files*. (Don't be confused if you should read something like this in a book: "Store your program files on tape." That terminology is both redundant and confusing. There is a crucial distinction to be made between programs and files.)

A BASIC program is a collection of lines, and each line contains instructions to the computer. These instructions are to be carried out during a RUN of the program. That is, the instructions are followed in order, from the lowest line number to the highest, after you type the word RUN. A data file, by contrast, is raw information, like a page in a telephone book, without any instructions about what to do with that information.

When programs are SAVEd onto a disk or tape, they can later be LOADed back into the computer to be RUN any time in the future. Programs you type into the computer will stay there only as long as the computer is turned on. So, to build a library of programs, you must SAVE them on tape or disk. (Let's refer to tape or disk storage as *magnetic memory* from here on.)

When programs are SAVEd to magnetic memory, it's as if the tape or disk were given a photo of the program that was in the computer at the time of the SAVE. BASIC keeps track of how large a program is – where it starts and ends in the computer's memory cells – so it knows just what to "photograph" when you ask for a SAVE.

BASIC doesn't help you out this way with your files; BASIC doesn't thoroughly supervise file storage and recall. You must do several things to create a file on magnetic memory and several things to get it back into the computer later. You establish the size of the file, the divisions between items in the file (called *delimiters*), and the order of the items. We'll illustrate this in a minute, but first let's visualize how programs and files differ:

A typical can of soup will have both a "file"