

Reflections Of A Game Designer: Author Michael Crichton

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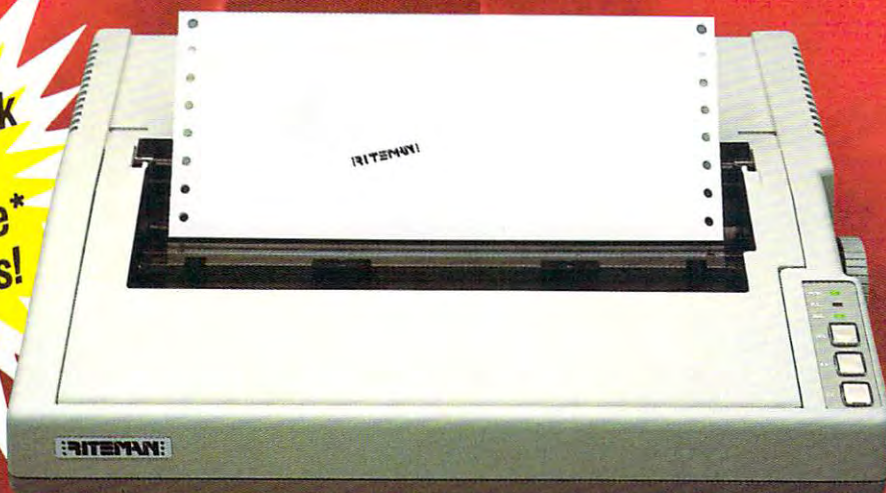
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• PRINTING MODE	(1) Reversed, Expanded and combination		
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• CHARACTER MATRIX	9 x 9		
• CHARACTER TYPES	ASCII	96	
	Italics	96	
	Semi-graphics	32	
	Commodore Graphic	64	
• PRINT SPEED	120 CPS		
• LINEFEED SPEED	100 ms		
• THROUGH PUT SPEED	63 LPM		
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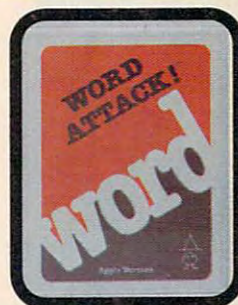


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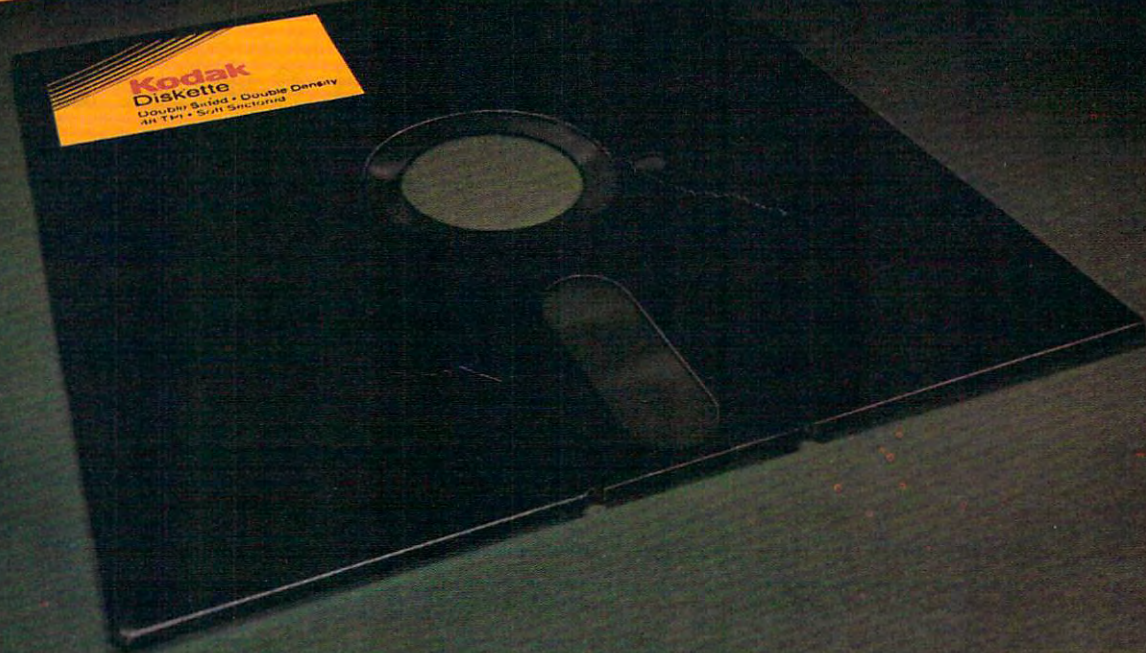
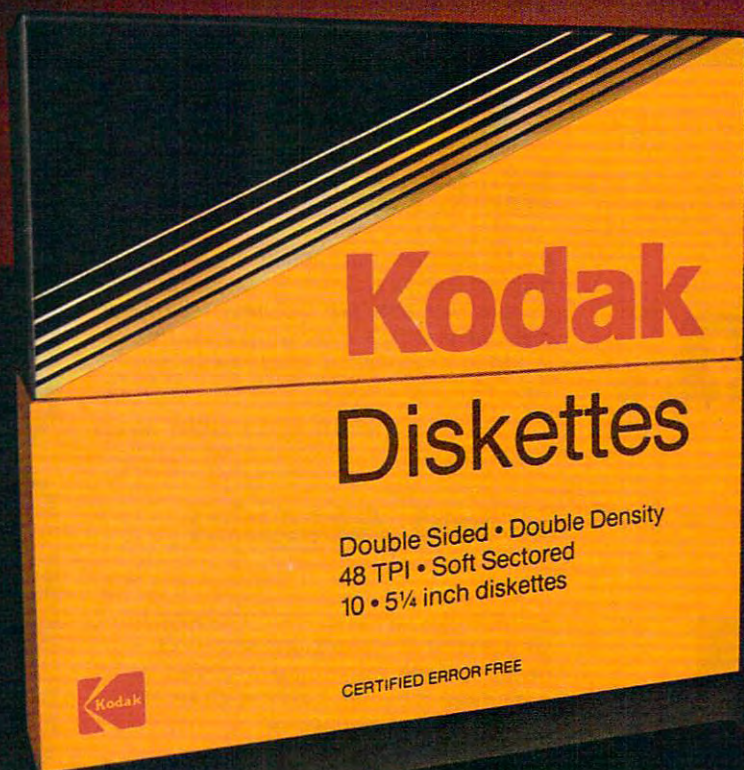
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If you have been looking very long, you have probably discovered that there are just too many claims and counterclaims in the printer market today. There are printers that have some of the features you want, but do not have others. Some features you probably don't care about; others are vitally important to you. We understand. In fact, not long ago, we were in the same position. Deluged by claims and counterclaims. Overburdened by rows and rows of specifications, we decided to separate all the facts — prove or disprove all the claims to our own satisfaction. So we bought printers. We bought samples of all major brands and tested them.

Our Objective Was Simple

We wanted to find that printer which had all the features you could want and yet be sold directly to you at the lowest price. We wanted to give our customers the best printer on the market today at a bargain price.

The Results Are In

The search is over. We have reduced the field to a single printer that meets all our goals (and more). The printer is the GP-550 from Seikosha, a division of Seiko. We ran this printer through our battery of tests and it came out shining. This printer can do it all. Standard draft printing up to a respectable (and honest) 86 characters per second, and with a very readable 9 (horizontal) by 8 (vertical) character matrix. At this rate, you will get an average 30 line letter printed in only 28 seconds.

"NLQ" Mode

One of our highest concerns was about print quality and readability. The GP-550 has a print mode termed Near Letter Quality printing (NLQ mode). This is where the GP-550 outshines all the competition. Hands down! The character matrix in NLQ mode is a very dense 9 (horizontal) by 16 (vertical). This equates to 14,400 addressable dots per square inch. Now we're talking quality printing. You can even do graphics in the high resolution mode. The results are the best we've ever seen. The only other printers currently available having resolution this high go for \$500 and more without the interface or cable needed to hook up to your computer.

Features That Won't Quit

With the GP-550 your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in ANY of 18 font styles. You not only have the standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Never again will you have to worry about how to print H₂O or X². This fantastic machine will do it automatically, through easy software commands right from your keyboard. All fonts have true descenders.

One of the fonts we like best is "Proportional" because it looks most like typesetting. The spacing for thin characters like "i" and "l" are given less space which "tightens" the word making reading easier and faster. This is only one example of the careful planning put into the GP-550.



Do you sometimes want to emphasize a word? It's easy, just use **bold** (double strike) to make the words stand out. Or, if you wish to be even more emphatic, underline the words. Or do **both**. You may also wish to "headline" a title. Each basic font has a corresponding elongated (double-wide) version. You can combine any of these modes to make the variation almost endless. Do you want to express something that you can't do with words? Use graphics with your text — even on the same line.

You can now do virtually any line spacing you want. You may select 6, 8, 7½ or 12 lines per inch. PLUS you have variable line spacing of 1.2 lines per inch to infinity (no space at all) and 97 other software selectable settings in between. You control line spacing on a dot-by-dot basis. If you've ever had a letter or other document that was just a few lines too long to fit a page, you can see how handy this feature is. Simply reduce the line spacing slightly and ... VOILA! The letter now fits on one page.

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Most printers have a continuous loop ribbon cartridge or a single spool ribbon which gives nice dark printing when new, but quickly starts to fade after a while. To keep the printers' output looking consistently dark, the ribbons must be changed more often than is healthy for the pocketbook. The GP-550 solves this problem completely by using a replaceable, inexpensive ink cassette which is separately replaceable from the actual ribbon. It keeps

the ribbon loaded with ink at all times. You only replace the ribbon when it truly wears out, not when it starts to run low on ink. Just another example of the superb engineering applied to the GP-550. (When you finally do wear out your ribbon, replacement cost is only \$10.95. Ink cassette replacement cost is only \$5.95, both postpaid.)

The Best Part

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EDITOR'S NOTES

Senior Editor Richard Mansfield speculates on the perfect computer in this month's guest editorial.

—Robert Lock, Editor in Chief.

Configure, in your mind, the ideal computer. Forget about cost or the limitations of current technology. What would the ultimate thinking machine be able to do? What would it be like?

For example, everyone seems to agree that a perfect automobile would combine the safety of trains with the speed and ease of planes and the freedom and low cost of cars.

In fact, ideal things are generally safe, fast, easy to use, versatile, and cheap. On our planet, many things already qualify: light, water, electricity, TV, some kinds of love, to name a few. Not, however, computers. Not yet, anyway.

If we imagine the qualities of the perfect computer, the first thing that comes to mind is that it should be easy to use, but we have to be careful with this one. What you might find easy to use might perplex or annoy me.

For example, "user-friendly" is a selling point, a current fad, among computer manufacturers. Ads are filled with pop-up menus, windowing, icons, and mouse devices—all ways to make computing possible for nontypists and seductive to noncomputerists. For those of us who have learned to type or

to program, however, things like this can sometimes just get in the way. It's far easier, for many people, to simply type LOAD "PROGRAM" than it is to move a mouse to a menu, pull down the disk menu, move to the program name, move the mouse up to the word LOAD, etc.

Perhaps all these features are efforts to make computing easier to learn as distinct from easier to use. But as more people find themselves comfortable working with computers, maybe icons and such won't be as desirable as they now seem.

But what would be the easiest computer to use? Probably one which could communicate in English.

The second quality, safety, is related to ease of use. In computing, a safe environment prevents you from making serious mistakes like erasing an entire disk by accident. Current computers are fairly safe in this respect. But, again, some software goes too far. You can get very frustrated with a program which says ARE YOU SURE?, and then, after you type YES, responds with ARE YOU REALLY SURE?

The safest computer would be able to grasp the context and intent of your actions. If you have been reformatting a number of new disks, it should realize that and dispense with ARE YOU SURE? for each one. Such a computer would have, in effect, common sense.

Speed, in computing, also means more than it first appears to. In many ways, even the most limited computers are now far faster than humans. But a truly quick computer would have the same qualities as a quick person: a fast brain with a large memory. Speed, in this sense, promotes versatility and power.

In some ways, the current trend toward integrated software is an effort in this direction. The larger, faster personal computers are combining word processing, data base management, telecommunications, spreadsheets, etc., into one huge program. It's quite impressive when you can ask your word processor to look over a letter, spend a couple of seconds verifying all the spelling, and then mail the letter for you over a modem.

So, the perfect computer would speak English, have common sense, and be brilliant and versatile. Depending on your personal predilections, such an entity might be indistinguishable from Einstein or Agatha Christie: It would have all of their good qualities and none of the bad; it would be honest, patient, always there. An ideal intellectual companion, a silicon and plastic angel.

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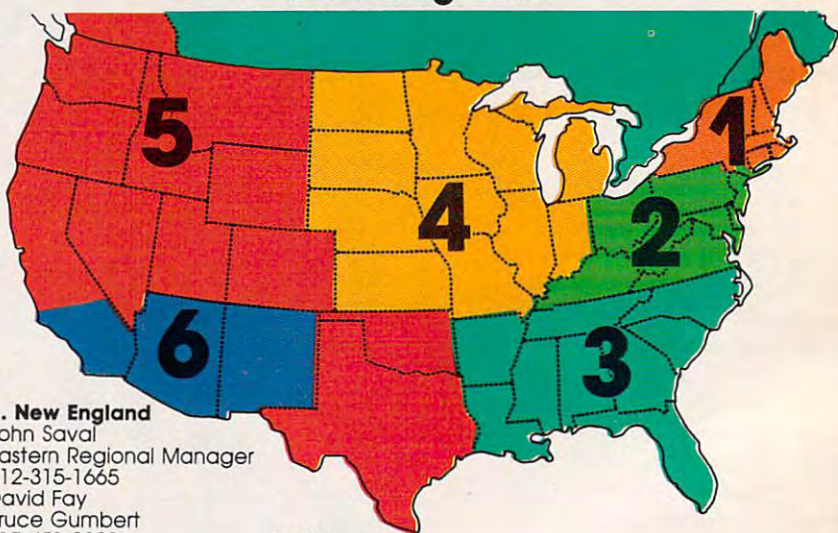
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READERS' FEEDBACK

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Do You Need Two Disk Drives?

I have a TI-99/4A and an Amdek color monitor. I'm planning to buy a second computer, but I'm confused about the advertising for two disk drives. Why do you need two disk drives?

Natalia Macedo

For many home computer users, one disk drive is sufficient. Two drives are, however, useful in several ways. For example, if you do a lot of disk copying you won't have to keep swapping the disks back and forth.

Some software packages, particularly business programs, require two disk drives. An example would be a data base manager which holds the program disk in one drive and the data disk in the other. Similarly, if you do a lot of programming, you can use two drives to hold your system disk and utilities. Some compilers and assemblers also require or work much faster with two drives.

Many writers prefer dual-disk systems for word processing because they can periodically save backups on separate disks for safety. In general you can live with one and live very well with two.

What Is DOS?

I'm going to buy a disk drive, and different brands of drives have a different DOS. What exactly is DOS?

Ricky Gibbs

DOS (usually pronounced to rhyme with "moss") stands for Disk Operating System. Basically, this is a program which allows the computer to work with a disk drive. On most computers, DOS lets you save and load files, view disk directories (lists of files stored on disks), rename files, erase files, copy files from one disk to another, copy entire disks, format blank disks (prepare them for use), and other functions.

There are many different types of DOS for different computers, and they're usually incompatible with each other. It's important that you use the proper DOS for your computer, disk drive, and system configuration. Fortunately, most disk drives (or

computers with built-in disk drives) already include the proper DOS.

Usually DOS comes on a disk that must be inserted in the disk drive before you turn on the computer. It loads automatically when the power is switched on. This process is called booting up. An exception is Commodore DOS, which is stored in Read Only Memory (ROM) chips within the disk drive itself. Commodore DOS is available whenever the computer and disk drive are powered up.

There are many versions of DOS even for the same computer. As revisions, corrections, and updates are made, new versions of DOS are released, usually denoted by different numbers. Examples are Atari DOS 1 (the original version), DOS 2.0S (improved single-density), and DOS 3 (enhanced density); PC-DOS 1.1 (the original version), DOS 2.0 (with improvements added for hard disks), and DOS 2.1 (modified for the PCjr); Apple DOS 3.3 (originally intended for the Apple II and II+) and ProDOS (introduced with the Apple IIe and IIc); and so on. Commodore DOS is harder to modify since it's embedded in ROM chips, but unofficial updates are usually made when new models of disk drives are introduced.

In addition to the DOS versions released by computer manufacturers, there are also custom versions of DOS sold by independent companies for certain computers. Examples are OS/A+ DOS for Atari computers, CP/M-86 for IBM computers, and CP/M-80 for numerous personal computers. Sometimes a custom DOS is compatible with the manufacturer's DOS, and sometimes it requires extra hardware (such as a CP/M board).

The disk drive you buy for your computer will probably come with the right DOS for your system. If it doesn't, the dealer can recommend the proper DOS or a compatible custom DOS.

The Great Commodore Save/Replace Debate

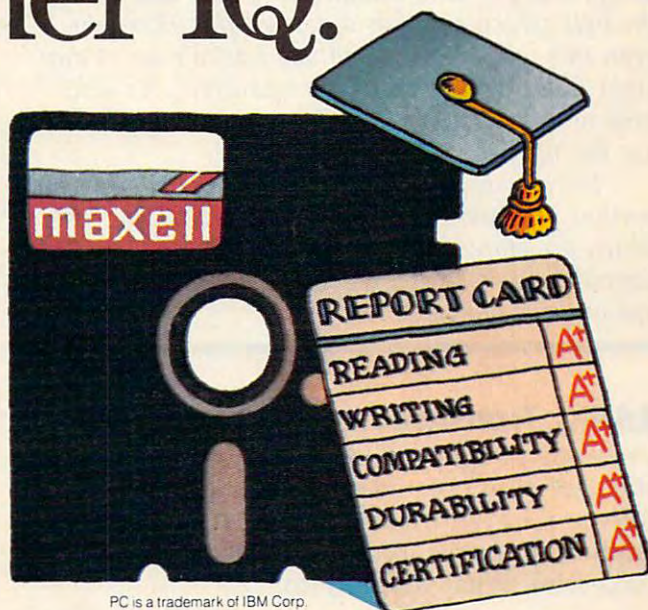
I have a Commodore 64 and a 1541 disk drive. Recently I saved a program on a disk and later saved another program on the same disk. When I



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tried to load the first program, I was surprised to get the second instead! What happened? How can I get my first program back?

Jason Stearns

Assuming there's no mysterious hardware error, it's possible that you saved the second program with the save/replace command (SAVE "@0:filename",8). When you precede a filename with the at sign (@), the computer first saves the new file with the same filename before erasing the old file. The purpose of save/replace is to make it easier to update files on a disk in one step. (Some computers do this automatically.)

The save/replace command is a controversial subject among some Commodore users. For years it's been rumored that save/replace contains a bug which can scramble programs and disks, but it's unpredictable and therefore very difficult to confirm. Usually it seems to happen when you are using a disk with less than 100 blocks free. We recently lost a file after using save/replace and spent hours trying unsuccessfully to duplicate the error.

One programmer, convinced that save/replace works, has offered a reward to anyone who can prove otherwise. COMPUTE!, however, has concluded that where there's smoke, there might be fire; mangled disks can be so frustrating, lost files can be so difficult to replace, we don't think the added convenience of save/replace is worth the risk.

To be safe, avoid using save/replace. Instead, save the program with a different filename, maybe with a .V2 extender (for version 2). The next file can be .V3, etc. Then rename the file after you have a final debugged version and delete all the early versions.

Your first program was probably still recorded on the disk after it seemed to disappear, but to recover it you would need a disk editor utility. Such a utility lets you read the directory map and change the byte which signifies a deleted file. However, even this works only when you haven't saved any other files on the disk in the meantime. It's also easy to destroy other files if you aren't sure how to use the utility.

It's a good practice to always save copies of important programs and data files on backup disks which are stored away from your main disks. If you upgraded to disk from tape, you can also save backups on your old cassettes.

BASIC Translations

I recently bought a Timex Sinclair 2068 computer and was disappointed when I could not find any software. I even tried typing in Atari and Commodore programs from COMPUTE!, but was unsuccessful. What should I do?

Wagih Mando

You'll have to stick to relatively generic BASIC programs—those that have few or no PEEKs, POKEs, graphics, or sound commands (which are nearly always machine-specific). You could, of course, translate the sound and graphics commands of other computers into the corresponding Sinclair BASIC statements, but this can be difficult, especially if you're not familiar with the other program and computer.

Programs written for earlier models of Sinclair computers should translate fairly easily for the 2068—but again, avoid programs with many PEEKs, POKEs, and machine language subroutines. Naturally, these programs won't take advantage of the 2068's new features, including color graphics.

COMPUTE! has not published any programs for Sinclair computers for quite a while, but copies of *Creating Arcade Games* on the Timex Sinclair are still available from COMPUTE! Books. Although it's aimed primarily at users of the Sinclair ZX-81 and TS-1000, some of it would apply to your 2068.

Atari Amnesia

I recently bought an Atari 800XL which claims to have 64K, but which seems to have only 48K user memory. The other 16K supposedly is available only with certain software programs. Which ones? I am also having trouble with the memory test. The other day I bought a game requiring at least 48K. I tried to load it on my 1050 disk drive, but the picture is distorted. I tried again, but got the same results. So I tried the memory test by holding down the OPTION key while turning on the computer. The ROM checks green. So does all my RAM, up to 44K. I checked it again, still 44K. What do I do?

Steve Whitlow

It sounds like your computer is behaving normally, but the software may not be compatible with the 800XL. Check with the dealer who sold you the program or with the software publisher. Some programs designed for the older Atari computers have trouble running on the newer XL machines because of changes in the computer's operating system. The fault still lies with the software, though, because from the beginning Atari made it clear that programmers should follow certain rules to insure compatibility with future models.

One solution might be to obtain a translation disk which, in effect, temporarily converts your XL into an older-model Atari 800. The disks are available from Atari for a nominal fee and from some independent companies.

The memory discrepancies you discovered are unrelated to the software problem. The Atari 800XL does indeed have 64K of Random Access Memory (RAM), but as with the Commodore 64 and 64K Apple

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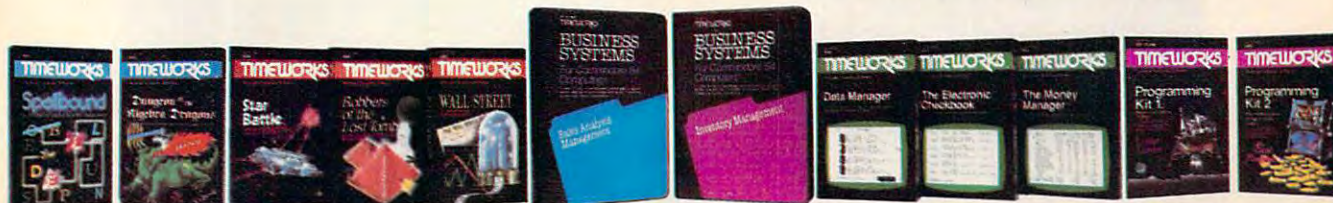
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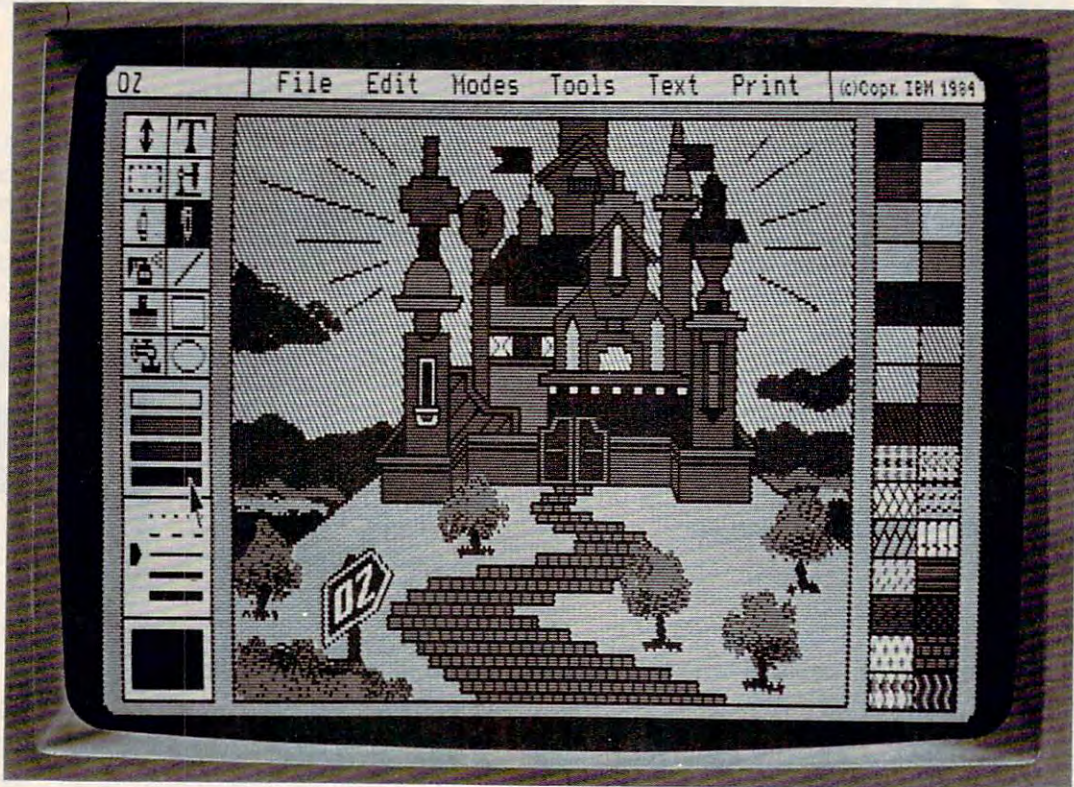


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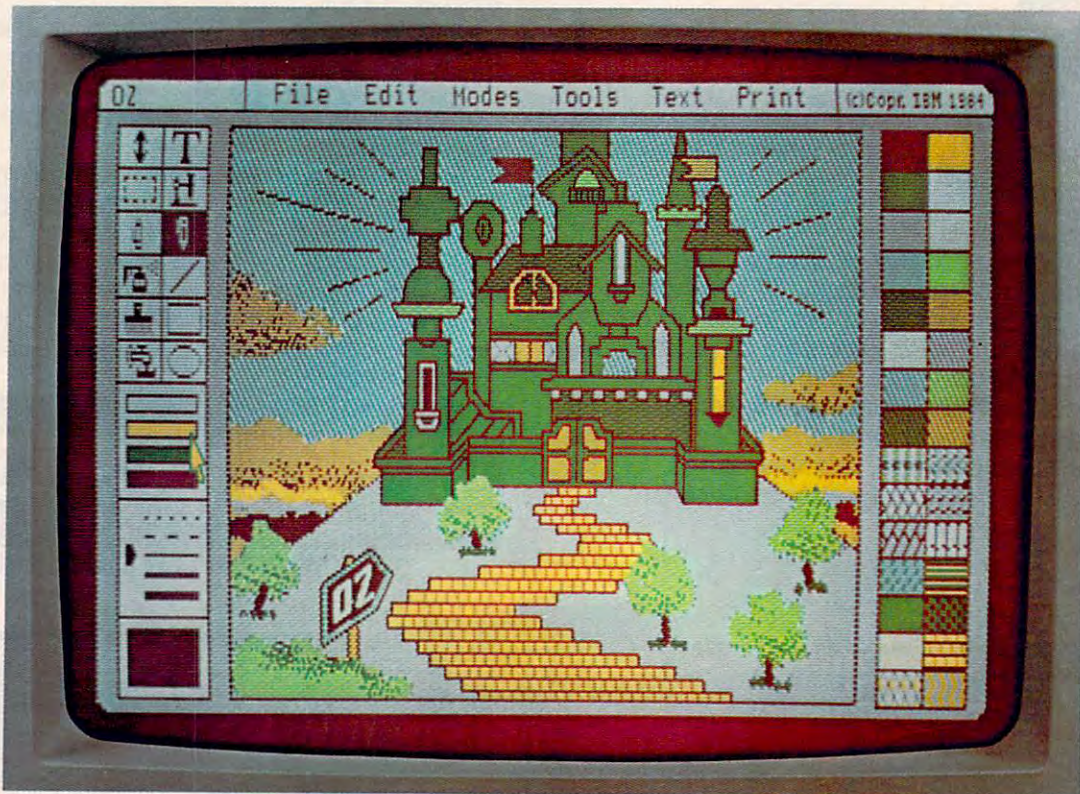
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Permanent Memory (ROM): 64KB	Runs both diskette and cartridge programs
Diskette Drive	Display
Double-sided, double density	40- and 80-column
Capacity: 360KB	Resolution: 4-color: 640h x 200v
	16-color: 320h x 200v
Processor	Expandability
16-bit 8088	Open architecture
Keyboard	Optional 128KB Memory Expansion Attachment(s)
Typewriter-style	13 ports for add-ons, including built-in serial interface
Detached; cordless	
Warranty	
1-year limited warranty	

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Ile, not all of this RAM is immediately accessible. All these computers use 6502-family chips for their Central Processing Units (CPUs). The 6502 is limited to accessing, or addressing, a total of 64K of memory at a time. Part of this 64K must be allocated for internal programs necessary to operate the computer. This includes the operating system and BASIC language.

The Atari operating system, stored in Read Only Memory (ROM), requires 10K of space. Additional ROM space is used for the international character set and self-test routines. BASIC, when selected, uses a little over 8K of space. The input/output chips need 2K of address space, since they are controlled as if they were memory locations. This leaves less than 40K of RAM when using BASIC. Roughly the same amount of memory is available for BASIC on a Commodore 64 or 64K Apple IIe.

If you switch off BASIC in your 800XL (equivalent to unplugging the BASIC cartridge on the older Atari 400, 800, and 1200XL computers), 48K of RAM is directly addressable. To switch off BASIC, hold down the OPTION button when powering up.

Don't think you're being misled by the 64K RAM claim; it's there, but it takes some special programming to access it. Not many commercial programs take advantage of this extra memory, though, because they would not be compatible with the large number of older 800s still in use.

If you have some programming experience, you can reach this additional memory with your own programs. The PIA chip in your Atari, used for the two joystick ports, also helps control memory mapping and other special XL functions. These functions are controlled with memory location 54017 (PORTB, \$D301), formerly used on the 400/800 to read joystick ports 3 and 4, which are omitted on the XL models. (Incidentally, if you try to read the shadow registers for joysticks 3 and 4, or use STICK(2) or

STICK(3) in BASIC, the values returned will be those of joystick ports 1 and 2.) The eight bits at \$D301 control eight functions (see chart).

Add up the decimal values of the functions you want to enable or disable, then store the sum into location 54017. Of course, you would not want to turn off BASIC or the operating system with a POKE from BASIC (without a language, operating system, or controlling program, the computer would be reduced to a prism of pure memory with nothing to remember). Feel free to flicker the LEDs (found only on the 1200XL) from BASIC, but memory mapping should always be done with a machine language program.

With both BASIC and the operating system disabled, there is free RAM from \$A000 to \$FFFF, 16K of additional RAM space. Well, almost 16K. The computer is pretty useless without its video and input/output chips, so they are kept active from \$D000 to \$D7FE, leaving this 2K of RAM inaccessible.

If you're going to tackle the job of accessing all of the Atari's hidden RAM, there's another consideration, too. The video chip generates a non-maskable interrupt (NMI) every 1/60 second so that the operating system can update screen variables. This NMI cannot be disabled, so if the operating system is out to lunch when the interrupt happens, the 6502 tries to make an indirect jump through the NMI vector at \$FFFA, finds nothing of value there, and crashes. So before you switch out the RAM, write the address of a nominally functional NMI routine into \$FFFA and \$FFFB. This can simply point to an RTI (return from interrupt) so that NMIs will be ignored.

Remember also that with the operating system and interrupts disabled, you cannot make use of any of the shadow registers for input/output. You must store directly into the hardware locations. And naturally, you have to reenable the operating system to call routines like CIO (Central Input/Output).

Using The Commodore Wedge In Your Programs

Many people incorrectly state that DOS 5.1 commands don't work in program mode. The commands not only work, but can be used to do some things which would be difficult or impossible to do from BASIC. It's only necessary to enclose the operand in quotes. For instance:

```
10@"IO"
20@"$"
```

This will initialize the disk drive and list the disk directory without disturbing the program in memory. Other possible uses for the Wedge in program mode exist.

Dave Palmer

Bit Position	Bit Value	Decimal Equivalent	Function
0	0	0	Disable operating system ROM, enable RAM from \$C000 to \$FFFF.
0	1	1	Enable OS ROM (default).
1	0	0	Disable built-in BASIC ROM.
1	1	2	BASIC off, RAM on at \$A000-\$BFFF.
2	0	0	Turn on LED #1.
2	1	4	Turn off LED #1.
3	0	0	Turn on LED #2.
3	1	8	Turn off LED #2.
4-6	-	-	Not presently used.
7	0	0	Enable self-test ROM.
7	1	128	Disable self-test ROM, enable RAM at \$5000-\$57FF (default after power-up complete).



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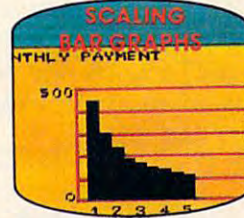
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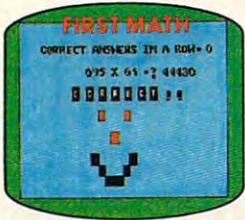
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Thanks for sharing the information. It's also helpful to begin your program with a loader routine that installs DOS 5.1 so you don't have to remember to load the Wedge each time. In addition, this keeps other people who may use your program from complaining about the inexplicable crashes they may encounter otherwise. Make sure DOS 5.1 is on the same disk as your loader routine.

TI POKE?

I own a TI-99/4A and would like to know if there is an equivalent for POKE in TI BASIC or TI Extended BASIC.

Paul Parks

There is no equivalent for POKE or PEEK in standard TI BASIC. This is one example of how TI BASIC differs considerably from other personal computer BASICs. The language designers may have felt that PEEK and POKE commands—which allow programmers to examine and modify individual memory locations—were somehow risky tools to put in the hands of inexperienced programmers. Of course, many inexperienced programmers progress beyond that stage and would find uses for these commands. Constructing a blockade between the programmer and the lower levels of the machine can severely limit a user's control.

Fortunately, TI's Extended BASIC does provide an equivalent for POKE, the CALL LOAD statement. For example, to place the value 100 in location 20000, you'd use CALL LOAD(20000,100). The equivalent to PEEK is CALL PEEK. To place the value from location 20000 into the variable X, you'd use CALL PEEK(20000,X).

Remember that memory for the video display is maintained separately from the microprocessor (and, without expansion, BASIC programs are actually stored in the video memory area), so CALL LOAD and CALL PEEK give you access only to the processor memory or to any attached expansion memory. The ROM in the Mini Memory cartridge also provides for CALL LOAD and CALL PEEK, and in addition provides CALL POKEV and CALL PEEKV, which allow you to store and retrieve data from video memory.

TI also supplies an impressive library of built-in subroutines that accomplish many of the things that PEEK and POKE are used for on other computers. For example, to read the TI joysticks, you can type:

```
100 CALL JOYST(1,X,Y)
```

Other valuable features are CALL CHAR, RESEQUENCE, and NUMBER. These provide built-in character redefinition, renumbering, and automatic line-numbering utilities.

Apple Shape Tables

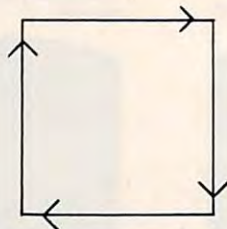
I have an Apple II+ and have been trying to figure out shape tables. How do the data numbers affect a shape? How do the numbers in the DRAW and XDRAW commands make a shape?

Tony Steele

Shape tables can appear very confusing, but they are extremely useful, though in some cases it may be easier to draw complicated figures with HPLLOT.

Basically, a shape table contains plotting vectors to draw a figure. Each vector describes the movement necessary to draw the object.

Let's try constructing a shape table to draw a square to see how it all gets done. The first step is to draw the shape on a piece of paper.



Now you must convert the figure to coded plotting vectors. Vector codes are numbers between 0 and 7 which correspond to a direction of movement, and each byte of a shape definition can hold as many as three vectors. The task now is to reduce the shape to a series of vectors, then place these vectors into memory, where they can be used to draw shapes.

Pick a starting point on the figure you want to code. For our square, we'll start at the bottom-left corner. Make a list of the directions required to draw the shape. Be sure you include all movements necessary, even those not actually drawn on the screen.

Starting at the bottom-left corner, we need these vectors to draw our square:

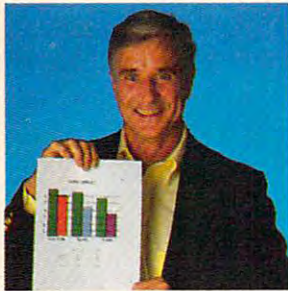
Vector	Plot
up	yes
right	yes
down	yes
left	yes

Now use this table to write the proper binary code next to each vector:

Action	Binary Code	Decimal Code
move up without plotting	000	0
move right without plotting	001	1
move down without plotting	010	2
move left without plotting	011	3
move up with plotting	100	4
move right with plotting	101	5
move down with plotting	110	6
move left with plotting	111	7

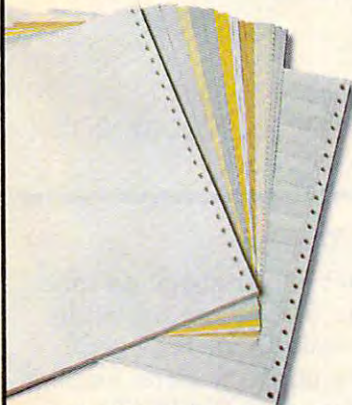
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You should now have a table that looks like this:

Vector	Plot	Code
up	yes	100
right	yes	101
down	yes	110
left	yes	111

The Apple stores information in memory in bytes of eight-bit binary numbers. Usually two, and sometimes three, plotting vectors can be stored in a specific memory address. A memory byte can be thought of as:

7	6	5	4	3	2	1	0
A		B		C			

There are a few rules to follow when packing binary codes into memory:

1. All bytes are read from right to left.
2. When all remaining sections of a byte contain zeros, the rest of the byte will be ignored.
3. Only a move instruction may be placed in section A of a byte.

Now refer to your table and place the binary code for the first vector into section C of the first byte, and place the binary code of the second vector into section B of the byte.

In section A of each byte, a zero always means no movement and no plotting, and a zero value will be ignored by BASIC. The only legal vectors in section A are right, left, and down without plotting. No other plotting vectors are allowed in section A.

The byte should now look like this:

7	6	5	4	3	2	1	0
A		B		C			
0	0	1	0	1	1	0	0

Notice that the vector for move right with plotting was not placed into section A. Start filling in the next byte with the remaining values.

7	6	5	4	3	2	1	0
A		B		C			
0	0	1	0	1	1	0	0
0	0	1	1	1	1	1	0
0	0	0	0	0	0	0	0

This is the table for drawing the square. After each byte has been filled in, set the last byte to zero. This signals BASIC that the end of the shape table has been reached.

Divide the byte into two four-bit portions

(nybbles) and convert the nybbles to hexadecimal numbers:

Binary		Hex
0 0 1 0	1 1 0 0	2 C
0 0 1 1	1 1 1 0	3 E
0 0 0 0	0 0 0 0	0 0

The only information needed to complete the shape table is the Shape Table Directory, which contains the number of shape definitions in the table and which points to a starting location for each shape.

The first byte of the shape table contains the number of shape definitions. The second byte is unused, and starting with the third byte, a table of indices to the starting addresses of each shape definition is stored. This value is the offset that must be added to the starting address of the table to obtain the starting address of a specific shape.

Using the example of our square, we'll store the shape table starting at \$1F00. The completed shape table looks like this:

1	F	0	0	0	1	Directory
1	F	0	1	0	0	
1	F	0	2	0	4	
1	F	0	3	0	0	
1	F	0	4	2	C	Shape Definition
1	F	0	5	3	E	
1	F	0	6	0	0	

This shape table may be stored in memory using the monitor, or by POKEing the values from a table of DATA. The starting address of the shape table must be stored in memory location \$E8. Again, you can place it there with the monitor, or by entering the following in immediate mode:

```
POKE 232,0
POKE 233,31
```

That completes the shape table, and you're ready to save the table and DRAW, XDRAW, ROT, or SCALE to your heart's content.

Atari Self-Loading Tapes

I have tried to load a machine language cassette tape by holding down the START button while turning the machine on, waiting for the beep, and hitting RETURN. The program starts loading into the machine, but I get a BOOT ERROR message. Why? What is the proper way to do this?

Geoffrey C. Bennett

Two possibilities exist. The most obvious explanation is that your tape is defective. But it is more likely that you have a disk drive attached and turned on. After the tape is successfully loaded, the Atari then tries to boot the disk drive. With no disk in the drive, you get the BOOT ERROR. Turn off

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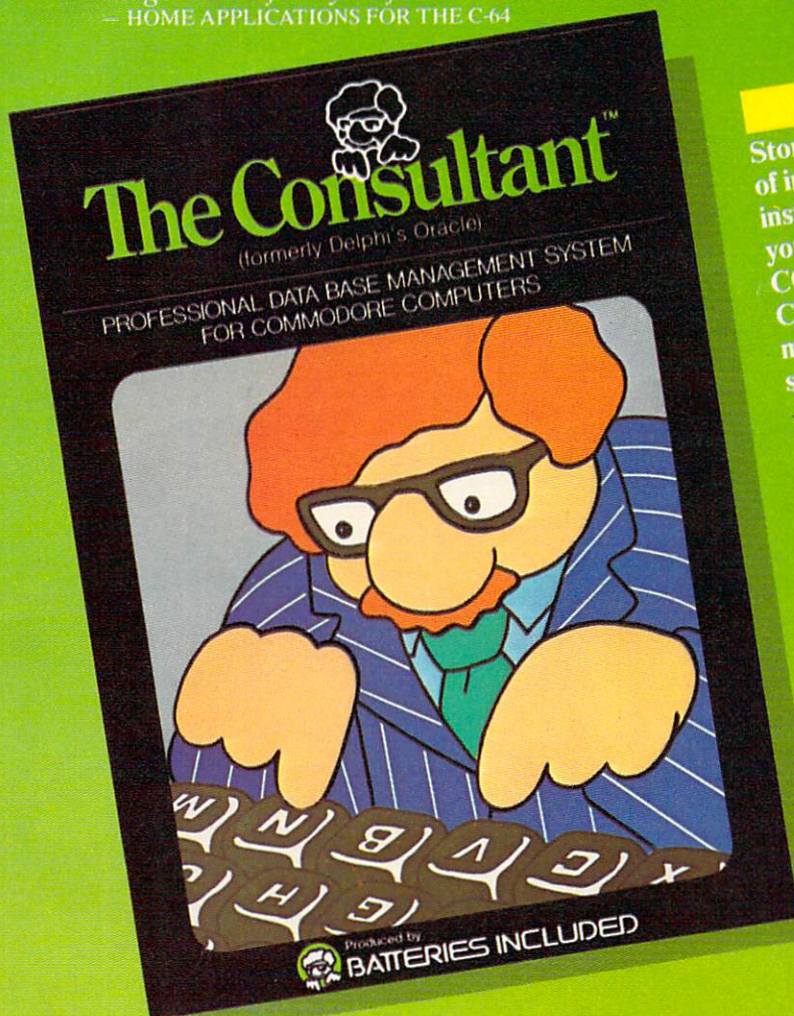
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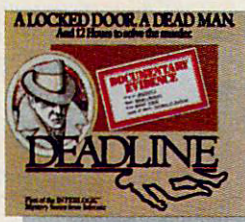
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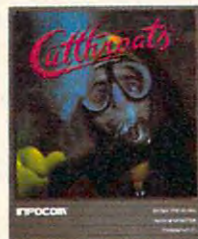
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the drive or disconnect it when you load a boot tape.

Also, many machine language programs on boot tapes won't work with the BASIC cartridge plugged in. Try removing BASIC before loading the tape into Atari 400, 800, and 1200XL computers. On a 600XL or 800XL, you can disable the built-in BASIC by holding down the OPTION button. (Therefore, to auto-boot with a 600XL or 800XL, you would simultaneously hold down OPTION and START while switching on the computer.)

Simultaneous Commodore Graphics And Text

I'm writing an adventure game and would like to mix text with graphics. Is there any way I can divide the screen to leave four lines at the bottom for text?

Peter Goldstein

You didn't mention which computer you're writing your game on, but we'll assume it's the Commodore 64. The Apple, Atari, IBM, and TI have this capability built into BASIC and require no special programming.

On the 64, the best way to divide the screen into two (or more) parts is to use a programming technique called a raster interrupt. Raster interrupts take advantage of the sequential nature of a video image. The image is painted on the screen by a cathode-ray beam which always begins at the top-left corner and sweeps across the screen left to right. When the beam reaches the right edge of the screen, it's turned off for a split second and returned to the left side of the screen. Then the beam is dropped down one line and the process is repeated. When it finally reaches the bottom-right corner of the screen, it's switched off again and returned to the starting position at the upper-left corner. The entire cycle repeats 60 times a second.

On the Commodore 64, you can determine which horizontal line the beam is currently scanning by reading the raster register at location \$D012 (53266). With this information in hand, you can write a program to interrupt the process so you can insert a few lines of text or change screen colors.

However, this takes some advanced programming. The raster interrupt can't be accessed directly from BASIC, because BASIC must be turned off to insert a vector to your interrupt routine.

Here's a demonstration program which loads a machine language routine into memory and allows you to change screen colors and split the screen. To use this routine in your own programs, simply change lines 20 through 50 to define the variables to suit your needs.

```
10 GOSUB130 :rem 117
20 INPUT"SELECT TOP SCREEN COLOR: ";A :rem 222
30 INPUT"SELECT BOTTOM SCREEN COLOR: ";B :rem 194
40 PRINT"WHAT ROW FOR SCREEN DIVISION?" :rem 172
50 INPUTC:IFC<1ORC>23THENPRINT"VALID RANGE IS 0-23{2 SPACES}RE-ENTER":GOTO40 :rem 140
60 SYS49152 :rem 106
70 POKE829,A:REM SET TOP SCREEN COLOR :rem 226
80 POKE830,B:REM SET BOTTOM SCREEN COLOR :rem 190
90 POKE831,21: REM TOP SCREEN UPPERCASE/GRAPHICS :rem 188
100 POKE832,23:REM BOTTOM SCREEN LOWER CASE :rem 70
110 POKE828,50+C*8:REM SET DIVIDING POINT :rem 166
120 STOP :rem 217
130 CK=0:FORI=49152TO49247:READA:CK=CK+A:POKEI,A:NEXT:IFCK=10244THENRETURN :rem 180
140 PRINT"{RVS}ERROR IN DATA STATEMENTS":STOP :rem 59
150 DATA120,169,127,141,13,220 :rem 231
160 DATA169,1,141,26,208,173 :rem 145
170 DATA60,3,141,18,208,169 :rem 96
180 DATA27,141,17,208,169,34 :rem 151
190 DATA141,20,3,169,192,141 :rem 141
200 DATA21,3,88,96,173,18 :rem 1
210 DATA208,205,60,3,208,28 :rem 87
220 DATA169,0,141,18,208,173 :rem 142
230 DATA64,3,141,24,208,173 :rem 89
240 DATA62,3,141,33,208,169 :rem 93
250 DATA1,141,25,208,104,168 :rem 137
260 DATA104,170,104,64,173,60 :rem 187
270 DATA3,141,18,208,173,61 :rem 93
280 DATA3,141,33,208,173,63 :rem 93
290 DATA3,141,24,208,169,1 :rem 43
300 DATA141,25,208,76,49,234 :rem 147
```

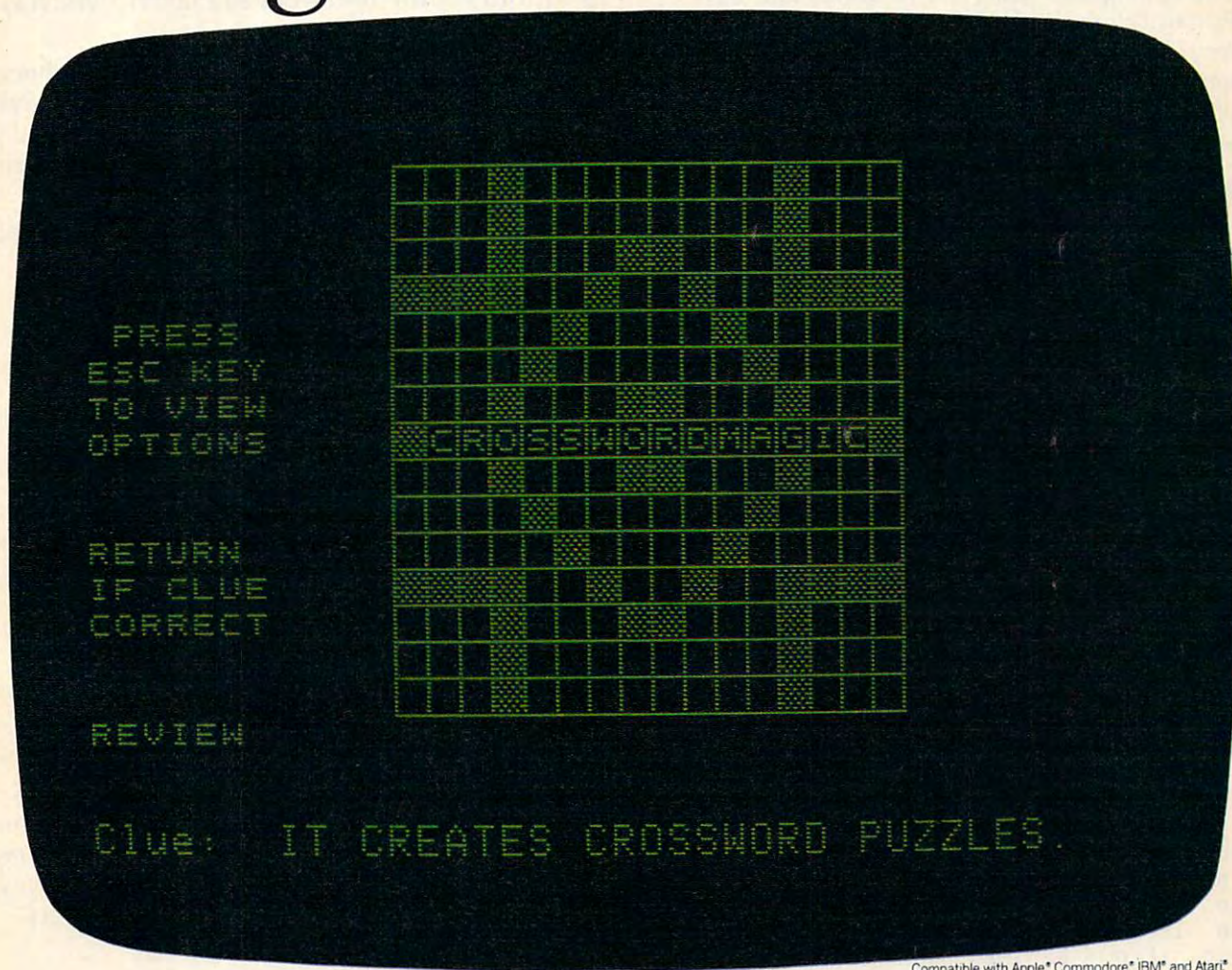
For a thorough discussion on using raster interrupts, see "Split Screens" and "Son of Split Screens" by Jim Butterfield in COMPUTE!'s First Book of Commodore 64.

Atari Modem Update

Your reply to Paul S. Reyes in the November 1984 "Readers' Feedback" column does not appear to be very timely or accurate. The modem currently offered by Atari is the model 1030 direct-connect, autodial, autoanswer modem. If your statement "the Atari modem comes with its own software, but is not compatible with other modem software" is about the 1030, you are incorrect.

Versions of Jim Steinbrecher's AMODEM 4.8, a public domain program, have been specifically written for use with the Atari 835 and 1030 modems, as well as modems connected through the Atari 850 Interface Module. The version I have is called RMODEM and is available on many bulletin boards and from the CompuServe

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Information Service. RMODEM can be compiled, and it provides a 22K buffer that can be dumped to your disk drive or printer.

The Atari 1030 modem has been advertised by a national chain store on sale at \$69.96. At that price it is certainly a best buy.

Note that the Atari 1030 modem uses the T: handler as opposed to the R: handler for the 850 Interface Module. Both handlers are supported by RMODEM.

Howard Stebbins

Thanks for this additional information. COMPUTE! stands by its answer, though, since many Atari owners may lack the programming skill to modify modem programs using the R: device that were written before the introduction of the 1030. In fact, the JTERM Atari terminal program published in last month's issue of COMPUTE! was written for modems which use the R: device, not the T: device.

Apple Joystick To Keys Conversion

I use an Apple II+ for games and educational programming, and would like to change games which require a paddle to keyboard input. How can I do this?

Michael Weaver

Applesoft BASIC has a very handy statement (PDL) for reading the value of the game controller, and you can also read the keyboard buffer to see which key is being pressed (although it's not as handy). The GET statement can read the keyboard, too, but it halts the program while waiting for input.

To convert a program from using a game controller to the keyboard, find all the routines which read PDL, then change those routines to read the keyboard buffer instead. Try using this subroutine:

```
10 A = PEEK ( - 16384)
20 B = PEEK ( - 16368)
40 IF A < 128 THEN 10
50 D = A - 128
60 IF D = 65 THEN PRINT "RIGHT"
70 IF D = 68 THEN PRINT "LEFT"
80 IF D = 87 THEN PRINT "UP"
90 IF D = 88 THEN PRINT "DOWN"
100 IF D = 32 THEN PRINT "FIRE!"
110 GOTO 10
```

This checks for the ASCII values of the A, D, W, X, and space bar, and ignores all other keys. Line 10 reads the keyboard and line 20 resets the keyboard to await the next keypress. Line 40 evaluates A to see if a key was pressed. If bit 7 is set (the value of A is greater than 128), then a key was pressed. Line 50 translates the value of A to an ASCII value, and lines 60 through 110 evaluate the key pressed. Of course, these lines could be changed to read any keys, and values could be included to

check for diagonal movement (the Q, E, C, and Z keys).

Be advised, however, that Apple paddles are resistive, so they return numeric variables that do not correspond directly to directions. The keyboard routine presented above provides for reading directions and is thus not a perfect replacement for an Apple paddle.

Faulty Math?

I have a Commodore 64, and there seems to be an error of some kind in the math logic. If you raise the number 5 to the power of 7 (PRINT 5↑7), you get the result of 78125.0001, which is incorrect.

I have found this error with other numbers, and although these amounts are small, I'm afraid there are others which I haven't found yet which are causing errors in math programs. Could you tell me what causes this?

Bill Briggs

You have come across the phenomenon known as rounding error. Most home computers use the binary system for mathematical calculations. While some fractional numbers translate easily to binary, some do not. The same is true of decimal numbering, the system we're used to. The fraction 1/3 translates into 33 percent (after rounding off all those extra threes). And three times 33 percent comes to 99 percent. The result is off by 1 percent.

You will never be able to translate 1/3 into a perfect percentage in decimal. And your computer will never be exactly accurate when it uses certain functions in binary. But how do fractions occur when raising one whole number to the power of another whole number?

If you were trying to do the expression you mentioned on paper, you'd write $5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$. However, the computer uses a more sophisticated mathematical formula to avoid having to perform the repeated multiplications. To see how it works, try entering the following line in direct mode:

PRINT EXP(7 * LOG(5))

Notice that this gives the same answer as PRINT 5↑7. It's the fractions involved in evaluating the logarithm (LOG) and exponential (EXP) functions that lead to the rounding error. Other functions that suffer the same problem for a similar reason are SIN, COS, TAN, ATN, and SQR.

For a thorough discussion on rounding errors, see "De-Bugging BASIC, Part 2," in the February 1985 issue of our sister publication, COMPUTE!'s GAZETTE.



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Apple Emulator For Commodore 64?

I have heard of an add-on system for the Commodore 64 that will allow you to use any of the Apple hardware and software on the 64. What is it?

Jason Meudt

When the 64 was first introduced, there wasn't very much software available for it, but Apple had thousands of programs available on just about every subject imaginable. It wasn't long before rumors began circulating about an Apple emulator which plugged into the 64 and turned it into an instant Apple. Some companies even advertised them and took orders. As far as we know, none was actually delivered.

The problem of one computer emulating another is complex. Besides having to duplicate the functions of the operating system of the computer being emulated, you must also have a disk drive which can read the other system's disks. Commodore's 1541 normally can read only those disks formatted on disk drives compatible with the 1541, not Apple disks. Hence, you'd need an Apple-compatible disk drive. Even though both the Apple and Commodore use a 6502-family microprocessor, you must still have Apple DOS and a different operating system. All that remains of your original 64 is the keyboard, some RAM chips, and the

microprocessor. Therefore, an Apple emulator for the 64 would end up costing almost as much as an Apple purchased outright.

There's also a possible legal complication. Apple has been very aggressive in bringing lawsuits against vendors who market products with ROMs that Apple feels are close copies of its own operating system. For example, Apple successfully fought a long legal battle with the makers of the Franklin Ace computer. Since the emulator would have to provide an operating system that closely resembled Apple's, it's quite possible that the manufacturer would end up in court.

Moreover, new programs for the 64 have been published or released commercially on almost a daily basis since the 64 was introduced. By now most of the original Apple library has been translated for the 64, with enhancements to take advantage of the 64's more advanced sound and graphics capabilities. Thus, much of the original impetus for the development of an emulator has dwindled. In fact, with the booming library of original software for the 64, a 64 emulator for the Apple might prove more popular.

Nevertheless, one Apple emulator is currently being advertised in COMPUTE!, though at this writing it is not yet available. Mimic Systems Inc., 1112 Fort St., Fl. 6M, Victoria, B.C., Canada V8V 4V2, has announced an Apple emulator and plans to have it ready for the Winter Consumer Electronics Show in January, with sales to begin early in 1985. Mimic's current price estimate is around \$600. For comparison, the Apple IIe is presently available for about \$800.

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TI Rounding Routine

Here's a routine for TI-99/4A users that will round off decimal points to any desired place.

Bill Gardella

```

100 N=0
110 D$=STR$(C)
120 N=N+1
130 E$=SEG$(D$,N,1)
140 IF E$="." THEN 250
150 IF E$<>"." THEN 120
160 E$=SEG$(D$,1,N+2)
170 F$=SEG$(D$,N+3,1)
180 IF F$="." THEN 200
190 G=VAL(F$)
200 H=VAL(E$)
210 IF G<5 THEN 230
220 H=H+.01
230 C=H
240 GOTO 270
250 H=VAL(D$)
260 C=H
270 REM Rest of program from here on.

```

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Q&A

The New Atari

With Sigmund Hartmann
President Of Atari Software

Tom R. Halfhill, Editor, and Selby Bateman, Features Editor



Sigmund Hartmann

Sigmund Hartmann was born in Germany, educated in Belgium and the United States, and is one of the few people who have worked for the volatile Jack Tramiel three times—twice at Commodore, and now at Atari. Before joining Commodore for the first time, Hartmann worked at TRW, a major high-technology corporation. His first stint at Commodore as general manager didn't gel, so he returned to TRW. In all, he spent 18 years at TRW, working as an engineering manager for NASA space projects and running a division which

included hundreds of engineers and programmers. In 1983, Hartmann rejoined Commodore to head Tramiel's newly formed software division. But in early 1984, after a management dispute, Tramiel shocked the industry by leaving the company he had founded in the 1950s and buying Atari—ironically, a firm he had nearly destroyed in the home computer price war of 1982–83. Several top executives and engineers loyal to Tramiel left Commodore in the months afterward and followed their former boss to Atari. In late 1984, Hartmann crossed over, too, taking command of the remnants of Atari's software division.

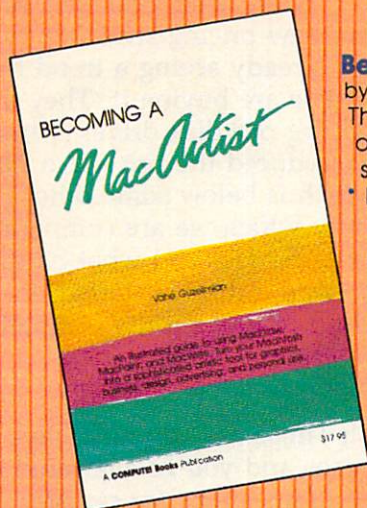
COMPUTE! caught up with Hartmann in November at the COMDEX/Fall computer show in Las Vegas soon after his move. Hartmann was accompanied by two of Tramiel's sons, who now hold top positions at Atari. Although Hartmann had just begun to immerse himself in the herculean task of rebuilding Atari, he agreed to discuss the company's future plans and the new computers it hopes to introduce at the Winter Consumer Electronics Show (CES) in January. It was almost two months before CES, and Hartmann had few technical details, but he was willing to sit down for 20 minutes and sketch out the most important points in his heavy European accent.

Atari is pegging its comeback on the release of three new machines in the first half of 1985: a 128K RAM, upward-compatible version of the existing 800XL; a powerful 16/32-bit computer built around the Motorola 68000 microprocessor found in the Apple Macintosh; and a superpowerful, full 32-bit machine with perhaps as much as 1000K of RAM (one megabyte). All will be mass-marketed, and the latter two are

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by Vahe Guzelimian

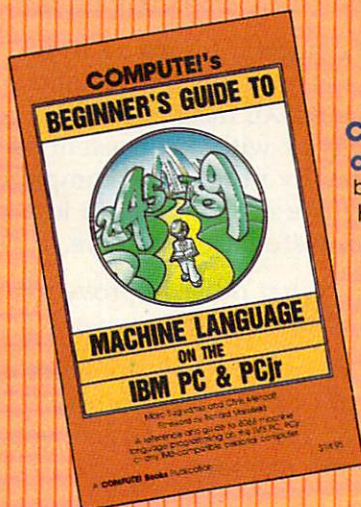
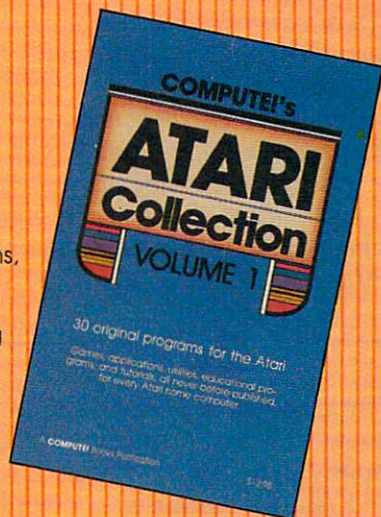
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targeted to cost less than \$1,000.

At least one of the advanced computers also will feature a new operating system licensed from Digital Research—CP/M-86K—and Digital Research's GEM (Graphics Environment Manager). GEM shields users from the operating system with icons, pull-down menus, and a mouse controller, as on the Macintosh. (COMPUTE! will have more details on the new computers and operating systems after CES.)

One week before this interview, Atari had slashed prices on its existing hardware and software to boost Christmas sales and raise much needed cash. List prices (before dealer discounts) were cut to about \$120 for the 64K 800XL and \$199 for the 1050 disk drive. Prices of other peripherals and software were substantially reduced, too.

Although this interview was conducted in a limited amount of time, Hartmann's comments reveal much about his own plans and Jack Tramiel's new direction for Atari.

Q&A

Hartmann: Can I give you a preview of why I joined the company? The major reason I joined Atari is because, knowing Jack, working for him—this is my third time with Jack—and knowing the type of individual he is—that he is a successful individual—I joined a team of people which I worked with previously. And those people are the ones who took Commodore to one billion dollars. So if you are a smart guy, what you do is you join that team, the winning team, and now you take the new company up to a billion-plus. We learned a few things and we should do better than a billion dollars, for certain. So that is one of the major reasons, and Jack and I were always close. Plus the timing was right. And that's why I took the job.

Since I am heading software worldwide for Atari, which includes AtariSoft, the strategy is to continue to sell software for non-Atari products. So we want to continue to sell all types of software packages for the PC, for the Apple, for the Commodore, for every machine. In addition to that, we will also sell, under AtariSoft, peripherals which are non-Atari peripherals. So we are going to be totally in the business of selling software products but also peripheral products and accessories for non-Atari machines.

CI: What kind of peripherals might that include?

Hartmann: Printers, disk drives, etc. OK? So that is the strategy which we are going to follow. In addition to that, if you look in the past of the Atari Corporation, the old Atari, the main emphasis was to be recognized as a game company. We definitely want to change that. We are definitely going to be and will be a microcomputer company. And if you look up microcomputer, it says you've got to have the computer technology, you've got to have software with it, and you've got to have peripherals. We are going to concentrate on all those three areas.

In terms of the existing machine, we have an 800XL machine which you've heard about. That 800XL was cost-reduced. Because of the way we cost-reduced it and eliminated some of the components, we had an opportunity to increase the reliability of it, so we cost-reduced it and maintained compatibility. And as you know, when you reduce parts in a piece of equipment, the reliability goes up. What we did is we took some of the components and made them a gate array. Gate arrays are more reliable types of devices, OK? So we reduced the price to below \$120—I think you know that. But in

addition to that, we geared up our manufacturing to produce a few hundred thousand or more a month. So it's going into high production. And there is no intention of phasing that machine out. It's going to be going on for quite a long period of time. So it's going to be huge for the after-market.

From what I can see, with our new pricing structure, we are already seeing a trend that people are buying it. They're buying our disk drives, which we reduced the price also now, which is below some other company which we are competing with. So Jack did what he said he would do. He started the trend of moving the company to where it is going to be a superprofitable company.

CI: Those are very attractive prices and you've answered a lot of questions for people.

Hartmann: But in addition to that, we are also coming out with another 800 machine which will have 128K of RAM, which is really what you need, OK?

CI: Will that be compatible with the older Atari computers?

Hartmann: It's going to be upward-compatible totally with the 800XL machines. We're going to stick with a consistent capability in terms of compatibility. We do not want to lose that software base out there.

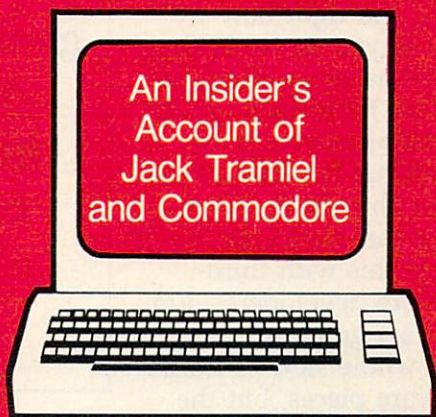
CI: What other improvements will this machine have?

Hartmann: There are other ones but I cannot tell you now. . . . The big thing is to give you more memory.

CI: What is the price going to be?

Hartmann: It will be probably just a little higher, but I do not know now. It's like the philosophy of Jack Tramiel is to make certain that the end-user gets tremendous value for his money. So the price is going to

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be way low in comparison to our competition, for example.

Cl: Is there going to be a different name for this?

Hartmann: Yeah, we'll have a name for it, but right now we don't have anything. At CES we'll have a name to identify it.

So much for what I call the low-end machine, except for one other thing. In terms of the software for the 800XL, what I'm looking for—and I did discuss a lot of this with third-party software developers—I'm hoping we are going to come out with a whole slew of third-party software pieces, but the major emphasis being placed not on recreational or game software, but productivity software and educational software. Because as I pointed out before, if you look at Atari in the old days, it was mainly recognized as a game [company] and they had some excellent game software. I'm pushing the pendulum that other way—education, productivity software. And still do games and recreational software. But the best we can buy we can get. I'd rather have less and have quality.

Another very important emphasis which Jack is placing on all of his guys is quality. He feels that quality comes first for a very simple reason. We didn't start this company to be there for one year, go public, and then get out. We are here for the long haul, and in order to take it up to the billions which we want to take it, you need to establish yourself as a quality house. So Jack is really tough on everyone. He wants to make sure we do not ship a product which does not meet the highest quality standard. Very important. And that goes true with software, peripherals, and so on. And that is so much for the 800-series machines.

Now, let's go up to new products. Jack announced that we would have two machines

Q&A

“We are gearing ourselves to produce half a million computers a month.”

coming out and we'll probably demonstrate at least one of them during CES. That is our 16-bit machine. Now again, everyone says “16-bit” and starts to look at what processor we'll be using. The processor which we're using is really a 68000 Motorola processor, which is really—if you look at the advertising by Macintosh, by Apple—a 32-bit machine. But we don't want to play games, so we say that it is truly a 16-bit machine. From a viewpoint of what you can do with it, it isn't a full-blown 32-bit, so we call it a 16-bit machine.

Now, that machine is going to use as its foundation the GEM hookup. Digital Research came out with GEM. You've heard of Crystal, it's like the Macintosh type. It's a graphical representation of what I call an extension of an operating system. It gives you icons, it gives you graphic representations, pull-down menus, and everything, with a mouse—you use a mouse with it. It's like the Macintosh. Now, we signed a deal with Digital Research, and worked with Digital Research for quite a while. We're using, actually, their operating system, the CP/M-86K, that's the operating system which we're using, OK? And we're using their GEM program. And we're work-

ing very closely with Digital Research to get that product completed so that we can demonstrate it at CES.

Cl: But CP/M-86, isn't that an operating system for the eight-bit Z80 chip?

Hartmann: That's K, CP/M-86K. That's what they call a Macintosh-type operating system. . . . In my opinion it's just fantastic.

Cl: GEM isn't running on any computer right now, is it?

Hartmann: Oh, yes, you could see it, they have it at Tandy . . . pull-down menus, mouse, everything, like the Macintosh, basically. [Editor's note: This is the MS-DOS, IBM-compatible version of GEM.] We believe if you look at the machine in terms of resolution, graphics, it's going to be very powerful. It's going to have features which in my opinion are going to be better than what the Macintosh features are. So that machine will be available, and we'll demonstrate it in January, and within a few months we'll start to ship it. When I say “a few months,” it's tough to predict exactly. I would say within three months or so we'll ship it, I would say not later than that.

Cl: But you'll be demonstrating it at CES?

Hartmann: Yes, I would say we'll be demonstrating it at CES. OK, then the next question would be, How are you going to sell it? All of our 16- and 32-bit machines will be sold through the mass merchants. The price structure is going to be below \$1,000. It is going to be so significant in terms of reduction, that we believe that we will really get a big share of the marketplace. If you look at it, really, with the introduction of the 16-bit machine, we are gearing ourselves to produce a half a million computers a month. That's what Jack Tramiel, what

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Atari is doing, gearing ourselves to produce that many. And as far as we are concerned, price performance is going to be there, the quality of the product is going to be assured, the software will be available on the 16-bit machine. I've been talking in the last few days to third-party software developers, trying to get them to be partners with us. But more important, our philosophy is to give them the development tools, give them all the help possible so they can develop software and they can sell it themselves if they want to. So it's an open system. A similar philosophy with the Macintosh, really, which Apple followed. Different than what I used to do at Commodore. OK? And it makes sense, you have to look at time. When you bring out a 16/32-bit machine, you have no other choice, you have to operate that way.

Cl: Are you getting many takers on this third-party software?

Hartmann: The guys I talked to felt that it sounded very interesting. They also recognize when Jack makes up his mind to do something. So they all said they want to continue talking to us. Some of them will definitely port over the system to our machine, 'cause they've got it running on the Macintosh and they will do it for us. And then we'll decide if they want to sell it to us, or give us a license, or if they're going to sell it themselves. But we do have companies which will do it for us. I can't tell you who yet, because I just talked with them in the last couple of days. And when I get back to my office, we'll continue and get all the data, the specifications, and turn it over to the people.

Cl: There are supposed to be two new computers out for Atari next year, a 16-bit machine and also a 32-bit. What's

the next machine out?

Hartmann: The 32-bit machine, we don't want to tell you yet what the processor is on it. It's going to be coming out about two or three months later, after CES, and you can guess what kind of processor you'll have to put in it. There are many full-blown 32-bit processors. I'll give you a couple of choices which I have in my mind. One is the 68020, which is the Motorola. Another one you can look at is the National, which is the 32032. And then you have Intel and I don't know how many more. But there are a couple of them, and I'm sure you can add a couple of more to them. And we will make our software and write our system in such a way that we can pick either of the two architectures and still make it work. So we have a little time to think about which system to use. We'll make that decision probably within the next four to six weeks.

Cl: If we could come down to Atari sometime in December before CES and take a look at these, because we have a very loyal Atari following and I think they're looking for what's going to come. Plus a loyal Commodore following which is interested, too. . . . Now, the two new computers—these are very powerful computers, more powerful, obviously, than an IBM PC. Will they be marketed as home computers or business computers or something in between?

Hartmann: I'll tell you what Jack says. He doesn't care. He says he sells them. If a guy wants to buy them for home uses, wants to buy them for personal business, wants to buy them to run his business, that's fine. But we'll have the proper support there, we'll have the right software there.

Cl: So the 32-bit machine also will be at the mass merchants?

Hartmann: All mass merchants. I'm telling you, below \$1,000.

Cl: For both machines? How much memory will the 32-bit machine have?

Hartmann: I can't tell you that, but it has to be sufficient for people to use it.

Cl: OK, now you'll mass-merchandise them, but if it's available in K marts and places like that—

Hartmann: But you have to look at K mart. How about if I tell you K mart may have a computer store?

Cl: Like Sears, OK. But will people take seriously for business purposes a computer that's mass-merchandised?

Hartmann: But we are not saying that it should only be for business. Only that a guy can buy a 32-bit machine.

Cl: You're saying an under-\$1,000 computer for anyone who wants to buy it, mass-merchandised.

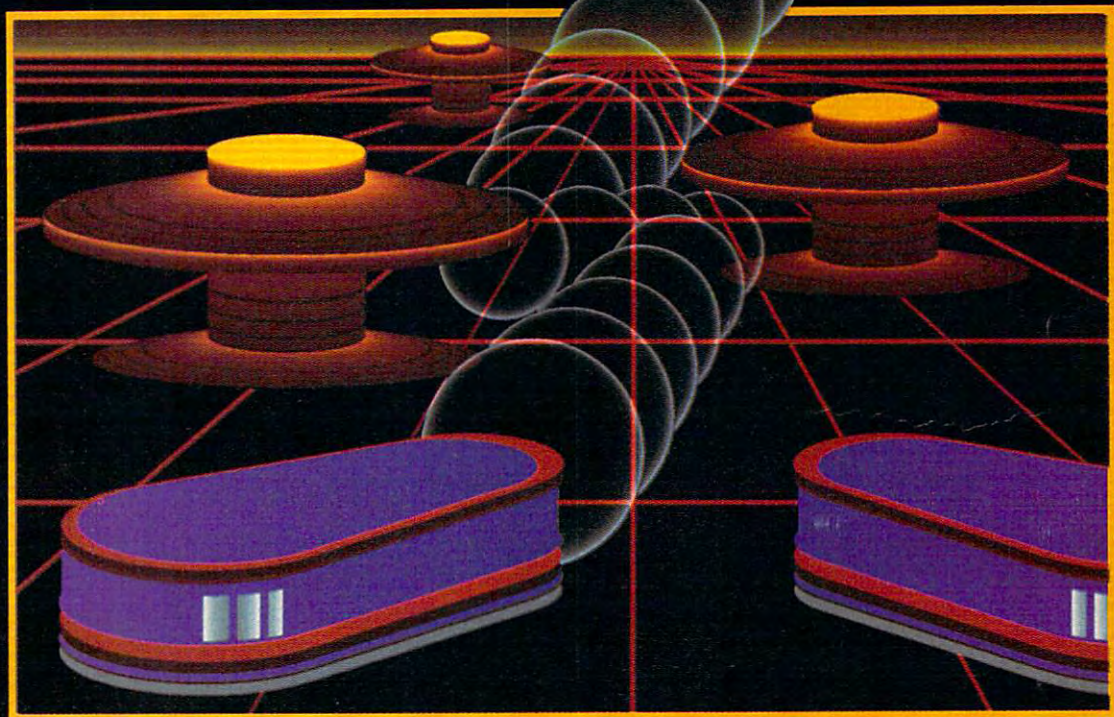
Hartmann: And he can either use it for business, either use it for his home—have fun, do anything—it's up to him. We don't want to tell the guy, "Hey, this is only a business machine."

Cl: Right, but at the same time, you can also use a 64 or an Atari 800XL for some businesses, but no one takes them seriously because they're sold as home computers.

Hartmann: That's why the software. That's why if you look at GEM, and you look at the application software which we'll have with the machine, it's going to be so friendly and so wonderful to use, it's going to make a lot attractive. You don't need all the jillion pieces of support, you don't need a thick manual, like *this* thick. It'll be a lot simpler. ©

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Fame

Kathy Yakal, Feature Writer

Though some authors and stars are lending only their names to entertainment software, others are actively contributing to the game's design. Here's a look at what's happening.

You see it practically every time you flip through a magazine or turn on the television. Fame lending its name to the cause of advertising. Tennis players and movie stars and race-car drivers hawking shampoo and sports equipment and clothing lines.

We've seen the same thing happen with microcomputers, famous faces and voices telling us which one to buy. Some entertainment software publishers are taking it a step farther;

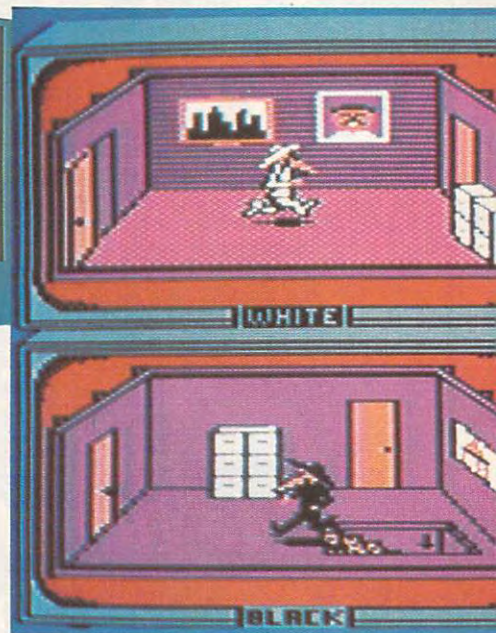
instead of promoting a package, the personality is a major part of the software, either as one of the game's characters, or even its designer.

The Trillium series, produced by a division of Spinnaker Software, is one of the best examples of this trend. It's a series of interactive adventure games for the Commodore 64 and Apple II-series computers, based on novels by well-known science fiction authors.

In each of the games, the



You are on Fifth Avenue between 57th and 58th street. Near you, a manhole cover is set into the pavement. East and west, buildings and other structures line the avenue.



Games

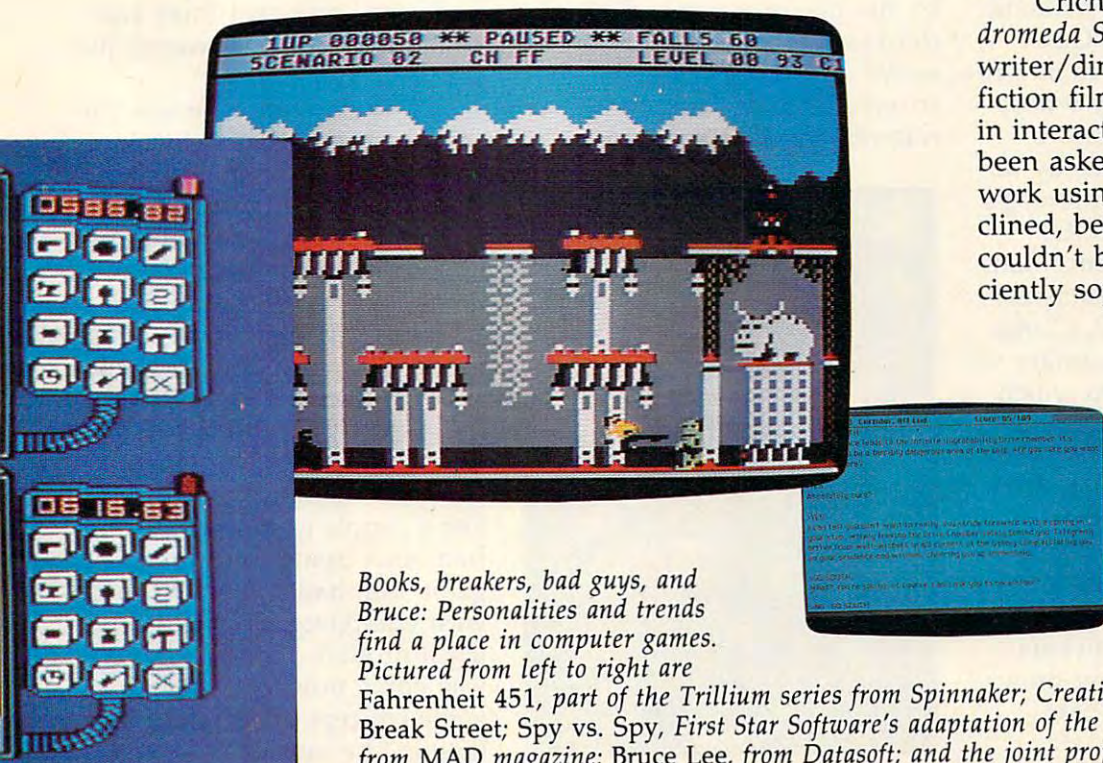
player takes the role of the novel's main character, encountering his or her problems and making decisions. Full-color graphics and a sophisticated parser that

understands several hundred words make the games easy to play. A hint book and word list are included in each package.

In late 1983, Spinnaker approached writer Michael Crichton,

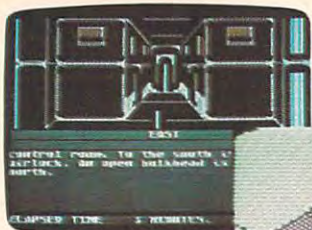
thinking that some of his works might lend themselves well to adventure games. He surprised them. He was just completing work on an adventure game of his own. "They came to acquire book rights and ended up taking a finished game," says Crichton.

Crichton, author of *The Andromeda Strain* and *Congo*, and writer/director of many science fiction films, was very interested in interactive fiction. He had been asked to do some creative work using laser disks but declined, believing that they couldn't be accessed in a sufficiently sophisticated fashion.



Books, breakers, bad guys, and Bruce: Personalities and trends find a place in computer games.

Pictured from left to right are Fahrenheit 451, part of the Trillium series from Spinnaker; Creative Software's Break Street; Spy vs. Spy, First Star Software's adaptation of the comic strip from MAD magazine; Bruce Lee, from Datasoft; and the joint project of Infocom and author Douglas Adams, A Hitchhiker's Guide to the Galaxy.



	Name	Pw	Hit	Name	Pw	Hit
1	Max	18	28	Rogar	15	16
2	Ganda	25	11	Sisly	11	24
3	Vally	31	41	Moxie	18	9

Gratefully she presses something into your hand, then melts into the shadows. You are holding the tooth of a cave wolf.



Spinnaker's Trillium series, pictured from left to right, top row: *Rendezvous With Rama*, *Amazon*, *Shadowkeep*, and *Dragonworld*.

In this scene from *Ghostbusters*, a ghost is being sucked up by a ghost vacuum as the player drives from one building to another.

He had hired programmer Steve Warrady in 1982 to help translate an original story into Apple assembly language. The result was *Amazon*, a graphics and text adventure in which the player is an agent for NSRT, a high-tech research firm. The player must travel to the Amazon and recover valuable emeralds hidden in the Lost City of Chak, with the help of a friendly (and often sarcastic) bird named Paco.

Fahrenheit 451, another game in the Trillium series, is a sequel to Ray Bradbury's book of the same name. As Guy Montag, the player lives in a future totalitarian society whose government is committed to controlling the populace by destroying all literature. Montag's mission is to restore to the world the freedom it once had.

Rendezvous With Rama is based on the Arthur C. Clarke novel. The player, as captain of a small scout spaceship which has just encountered an alien starship hurtling into the solar system, must explore it and try to make contact with alien intelligence. (Clarke wrote a new ending to be used in the game.)

The fantasy *Dragonworld*, by Byron Preiss and Michael Reaves, sends the player on a journey to rescue The Last Dragon from the Duke of Darkness.

And here's an interesting twist: Science fiction writer Alan Dean Foster wrote a novel based on the fantasy game *Shadowkeep*. The player's task is to recapture the Shadowkeep, with its mazes and monsters, and to free the good wizard Nacomodon. Up to nine characters may be chosen by the player while exploring the keep. Designed as an interactive adventure, the game incorporates many aspects of role-playing fantasy software.



Who ya gonna call?

Software designer David Crane, a cofounder of Activision, went to see the movie *Ghostbusters* on the recommendation of a friend. "I think I may have enjoyed it a lot more than some people because it was sprung on me," he says. "From the first special effect, you knew that there was something here that wasn't just stand-up comedy."

Two days after he saw the movie, someone at Activision asked if he'd like to write a computer game based on the movie. He took a day to think about it. "To do justice to any game takes no less than 500 hours of my time, and I was going to get married in six weeks."

His decision to do it was based partly on the fact that he had already been working on the game without knowing it. For a couple of months, Crane had been trying to develop a game that had something to do with equipping a car and driving it around city streets, but it was going nowhere. "It was a game concept in search of a theme," he says.

And the *Ghostbusters* theme

["Hi, we're from Europe. Where's the gold?"]

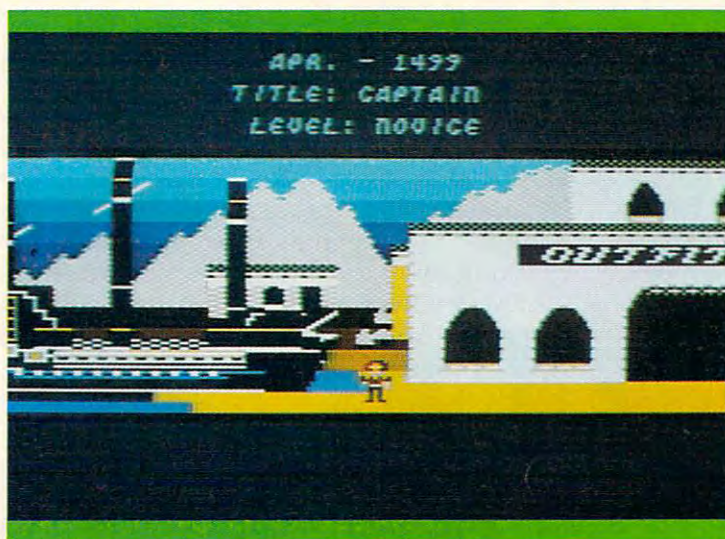
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It's a kind of adventure. An unusually rich and technically impressive one with new continents to explore, natives to encounter, resources to manage and trade routes to establish. But beyond all the neat stuff *Seven Cities* throws up on the screen, there's something else happening here.

It feels quite odd to look at the map and see nothing. Of course you have to explore the more than 2800 screen new world in order to map it. But the way the natives act, the way you get older,



This is Europe, in scrolling 3-D graphics. You outfit, visit the Crown, launch your ships, and if you're cut out for this, you return later to tell all sorts of wild stories about what it's like over there.



There are over 2800 screens to explore in the new world. As you scroll through them, seasons change.



Animated natives surround you. They have no reason to trust you. The drum beat quickens.



Trading with the Aztecs is tricky. You could wind up with enough gold to build an empire. Or as soup.



Home again you view your maps, pat yourself on the back, and consider your place in history.

the way seasons change and your men behave, and the way your reputation precedes you gives you a sort of feeling that's unexpected in computer games. It's deeper. Maybe a little disquieting. It plays as much in your head as it does inside your computer.

Seven Cities does all this with the real world or, better still (since the "new" world really isn't anymore), it will construct any number of completely detailed hemispheres for you to try your hand with.

Designed by Ozark Softscape (the people who made *M.U.L.E.*, *Infoworld's* "Strategy Game of 1983"), *Seven Cities* is about as near a recreation of history as has ever been accomplished, with or without a computer.

Find it. Stomp around in it. See if you can't do a better job than all the celebrated figures who got us into the mess we have to deal with today.

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fit perfectly. The theme song from the movie plays throughout the game (you can sing along by following the bouncing ball at the game's opening) as you buy a car and outfit it with equipment like ghost bait (to trap the marshmallow man) and a ghost vacuum (to suck up ghosts as you drive through the streets of the city). Buildings flashing red are ghost-ridden, and it's your job to maneuver each ghost into a ghost trap before he "slimes" you. The game is won when you've captured enough ghosts to enter Zuul.

"It's an amazing coincidence that what I was doing followed the script of the movie. I was able to put the theme and game together in such a way that I could have what's really an original game concept that embodied the spirit of the movie."

There were no coincidences involved in the development of Infocom's computer game version of *A Hitchhiker's Guide to the Galaxy*, just a lot of mutual admiration. "Most people at Infocom were *Hitchhiker's* fans, and Douglas Adams [author of the book] was an Infocom game player," says Steve Meretzky.

A Hitchhiker's Guide to the

Galaxy is the story of Arthur Dent, an ordinary human being who is thrust into some rather extraordinary circumstances. After being told by Ford Prefect (an alien in disguise) that the earth is about to be destroyed, he hitches a ride on a Volgon spaceship, where he is tortured by having poetry read to him. Surviving that, he is ejected into space, and is rescued by the *Heart of Gold*, another spaceship, and brought to the planet Magrathea. Improbable things continue to happen as the zany plot unfolds.

Meretzky, a program designer for Infocom, and Adams worked together to translate the book's themes, characters, and humor into a text adventure. "The game starts out following the book pretty closely, up to your arrival on the Volgon ship," he says. "From that point, until you get to the *Heart of Gold*, the general story line is pretty similar, but a lot of the more specific things that happen aren't the same things that happen in the book."

"By the time you get to the *Heart of Gold*, the story diverges almost completely from the story line of the book. But there are a number of things that are just sort of alluded to in the book that are gone into in much more detail in the game."

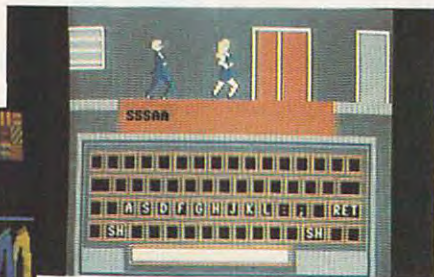
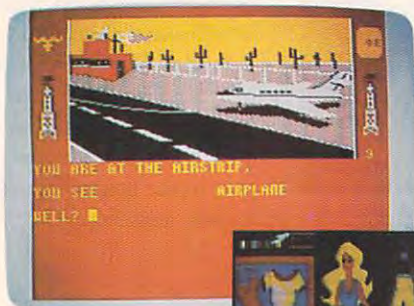
Adams, whose home is in England, visited Meretzky at Infocom for about a week to map out the initial design of the

game. They found that their creative styles differed. Meretzky, who had previously designed *Planetfall* and *Sorcerer* for Infocom, usually came up with an overall concept for a game, then went back and filled in details. Adams did it the opposite way—details first.

So they kept in constant contact via electronic mail as Meretzky was programming, then met again in England for some intense final sessions ("We basically holed ourselves up in a country inn and didn't come out until we had finished").

Meretzky found a different kind of challenge in programming a game whose story line had basically been written by someone else. "In some ways it's easier, and in some ways it's harder," he says. "It's easier because you have some constraints on the universe you're going to be designing, and on the characters you're going to be using, and a lot of the situations, and you don't have to come up with as many ideas."

"But on the other hand, there's more of a challenge because you want to take advantage of the features of an interactive game, and you don't want it to be just a translation of the book, because the book is necessarily linear. You want to take advantage of the features and the power of the computer to do something different."



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Michael Crichton

Reflections Of A

There are new ways of presenting information other than the traditional ways in which the viewer or reader is required to be passive. A few years ago, I realized that I didn't know about these things, and that I'd better find out about them. The only way I could learn was to actually go and do one. So I said, "Well, I'll just make a game and then I'll learn." And I certainly did.

Interactive fiction—the adventure game—is one of those new ways. And Michael Crichton is one of the newest authors in this genre.

Crichton is better known for his work in fiction and films. His novels include *The Andromeda Strain*, *The Terminal Man*, and *Congo*. As a filmmaker, he has been involved in the writing and directing of *Westworld*, *Coma*, *The Great Train Robbery*, *Looker*, and the recently released *Runaway*.

The rapid growth of technology—and the decisions it necessarily forces on societies—has been a major theme in much of Crichton's work. He's been interested in the artistic potential of microcomputers since the start, and owns several himself, including an Apple, a Commodore 64, a Radio Shack Model 100, and several IBM PCs.

Crichton has used his micros primarily for word processing and game playing, but was especially intrigued by the possibilities that lay in adventure gaming, and disappointed that games weren't being more cleverly designed.

I simply didn't understand the mentality that informed them. It was not until I began programming myself that I realized it was a debugger's mentality. They could make you sit outside a door until you said exactly the right words. Sometimes you had to say, "I quit," and then it would let you through.

Well, that's life in the programming world. It's not life in any other world. It's not an accepted dramatic convention in any other arena of entertainment. It's something you learn to do when you're trying to make the computer work.

So in 1982, eager to explore this partici-

patory art form, Crichton started to script his own adventure game. Since the only computer language he knew well was BASIC, he hired programmer Steve Warrady to help translate his story into graphics and text using Apple assembly language.

I wanted to make a game that tended to reflect my own prejudices. My prejudice is that I'm not a fantasist. I don't like magic spells to get me across the river and I don't like to meet trolls and dwarfs. I got tired of that when I was six.

So I wanted to have a more realistic world. In Amazon, when you get to the river and find the boat that has a hole in it, there are three ways to patch it. And they're all things that would work with a real boat. You just use your head and say, "What would I do with the material available to me in the real world—this tangible world we all know about—that would work?"

Another prejudice: In Amazon, you can't solve your problems with violence. In general, as you go along, you'd better be more clever than violent.

And another: The mazes in this game are only there for punitive reasons. I loathe mazes. I think they're a programmer's trick. They make the game slower and longer without being a very complicated programming task and not very interesting. If you make a mistake in Amazon—and it generally has to be a bad mistake—you get dumped in a maze.

Crichton discovered something surprising along the way: There wasn't much difference between writing an adventure game and scripting a movie.

Every consideration in making a movie is to try to see what the audience is thinking. Have I shown them this long enough? Did they get this point? Can they tell what this sound is?

In writing an adventure game, those considerations are merely formalized, since the audience will in fact be literally responding. So I have to think, "If they're outside this door, what will they think? Will they be afraid to go in? What would a person do in this situation?"

New Designer

Here's what I found out early on: You can't have extremely varied choices that don't seem to matter. I can go north, south, east, or west, and who cares? You can only do that for a while, and then if you don't start to have an expectation of what will happen, you'll stop playing the game. You'd better get right going and you'd better start to have something happen.

If I play a game for a half-hour and it doesn't make any sense to me, I'll just quit and never go back. Say I'm locked in this house and I don't know what the point of the house is and why I can't get out and there's no sort of hint to me about the mentality that would assist me in getting out—I don't know. I could say "Shazam!" or I could burn the house down or—give me a break. I just stop.

Crichton, a professional storyteller, took tremendous care with the plot, the actual story line of *Amazon*. I think about a plot as being a story where you can imagine the consequences as you go. It's like the little guy who yells at the screen, "Look behind you, Hoppy!" You must know something the character doesn't. The audience has an expectation—if you go in this room, the bad guy will be there. That's plot.

At a certain point in the process of designing *Amazon*—after all the material was generated, all the possible plot twists, and settings and characters were either accepted or rejected—Crichton started treating the game like a movie. He and his programmer and graphic designer collaborated like the creative and technical forces of a film crew collaborate.

The game took 18 months from start to finish, perhaps a bit longer than most video games, but as Crichton says, they were all learning. We're not a professional software company. We're just some people making a program.

Trillium approached Crichton to acquire book rights about the time he was polishing *Amazon*. They came to me and said they wanted to do a series of adventure games based on novels and I said, "Guess what? I just finished one." It was absolute coincidence.



Amazon has its share of bad guys, but they're generally human, unlike the high-tech villains in many of his other creations. Technology, though, is not the enemy. Crichton thinks that he may have been misunderstood in the past.

Everyone remembers the scene in Westworld where Yul Brynner is a robot that runs amok. But there is a very specific scene where people discuss whether or not to shut down the resort. I think the movie was as much about that decision as anything. They just didn't think it was really going to happen.

I don't see technology as being out there, doing bad things to us people, like we're inside the circle of covered wagons and technology is out there firing arrows at us. We're making the technology and it is a manifestation of how we think. To the extent that we think egotistically and irrationally and paranoically and foolishly, then we have technology that will give us nuclear winters or cars that won't brake. But that's because people didn't design them right.

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Besides characters and stories from books and movies, other famous personalities and trends have been incorporated into entertainment software.

The recent awareness of breakdancing has spawned at least two computer games: *Break Street*, by Creative Software, and *Breakdance*, by Epyx. Both games feature breakdancers performing various steps, and allow you to choreograph your own dances or imitate routines already created.

Epyx has also released three other programs based on famous faces. In *Barbie*, you can do the same things that young girls have done with Barbie dolls for 25 years: shop for or design clothes, style and color Barbie's hair, and dress her up. *G. I. Joe*, taken from the familiar child's toy, lets you select a battle situation and outfit your soldier to fight. And everyone gets to try for revenge on Mr. Hart in *9 To 5 Typing*, a typing tutorial using characters from the movie *9 To 5*.

J.R. haters don't have to wait until Friday night to see their favorite villain. Datasoft's *Dallas Quest*, a text and graphics adventure, puts you in South Fork and pits you against the TV show's bad guys as you try to succeed in a dangerous task given to you by Sue Ellen.

Datasoft has also recently released *Conan*, based on Arnold Schwarzenegger's musclebound hero, and *Bruce Lee*, based on the karate expert of film fame.

Commodore and Marvel Adventures, along with the programming talent of Scott Adams, have designed an adventure game based on the television show *The Hulk*. The player controls the intellect of both Bruce Banner and his alter ego, the big green guy, as he struggles to unlock the riddle of the Chief Examiner.

Cartoon characters continue to show up in games, too. Sierra

On-Line, which brought you *BC's Quest For Tires*, has licensed some of Walt Disney's creations for use in educational software. *Donald Duck's Play-ground* helps develop money-handling skills, as well as shape, color, and letter-matching abilities. *Mickey's Space Adventure* promotes the development of mapping and problem-solving skills while teaching about the solar system. And *Winnie The Pooh In The Hundred Acre Wood* encourages good mapping and reading skills.

Spy vs. Spy, the cartoon strip series from the pages of *MAD* magazine, is now a computer game, published by First Star Software. In it, the White Spy and the Black Spy play tricks on each other and oppose each other in competitive, humorous, and dangerous situations.

A big name doesn't guarantee a superior game, but it may improve sales. And when a personality doesn't just endorse a product, but is actually involved in its design and production, you've probably got a better than average program—if the individual was working within his or her own area of expertise.

Filmmakers and play producers try to get "names" for their shows, not only because they'll draw bigger crowds, but because, generally, that person had to evidence some talent to become a name in the first place.

Will people buy software if a superstar was involved in its making? Does Michael Crichton think that his name will influence people to buy *Amazon*?

"I don't know. What do you think?" he says. "I don't think it matters. I think what's important is that it's a good game."

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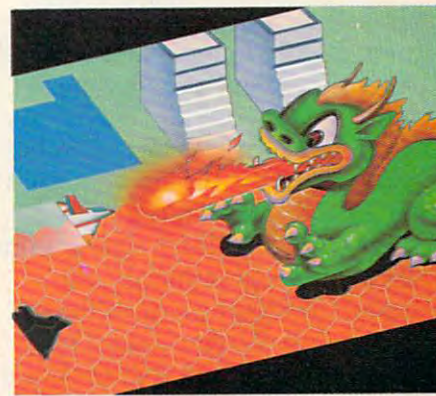
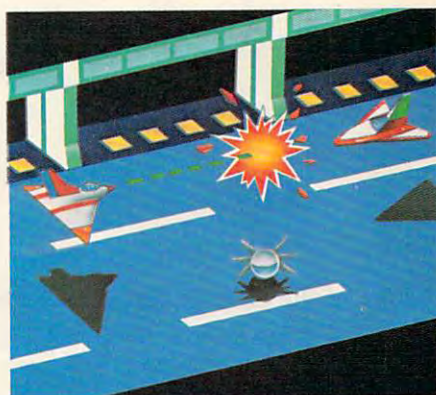
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COMPUTER GAME

Sharon Darling, Research Assistant

Five of the world's best computer game designers talk about how they create their games.

Chris Crawford, Jon Freeman, Bill Budge, Bruce Carver, and Dan Buntin—some of the most famous names in computer game design—don't consider themselves master programmers. It might be more accurate to call them artists who also know how to program a computer.

"I wouldn't characterize myself as a brilliant programmer; I would characterize myself as a competent programmer, and that's about all," says Crawford, the designer behind such critically acclaimed games as *Eastern Front* and *Excalibur*. "Great games don't spring from brilliant programming," he adds. "Brilliant programming can only take you a very short distance. The first real trick is at the design stage."

Budge, who created *Pinball Construction Set*, an innovative,

seminal game, concurs. "It's important not to be just a programmer right now," he says, "and I think the most unique thing I do is in the area of designing, although I also think I'm lucky that I'm a good programmer, so I don't necessarily have to depend on other programmers."

Another vote for the importance of design comes from Bruce Carver, author of the games *Beach Head* and *Raid Over Moscow*. "A programmer has to be some kind of artist in addition to being just a raw programmer," he says. "If he can't sketch and draw pictures, he has to rely on an outsider to help him program the game if he wants it to look good."

"And the problem with that is that an artist just sees the picture in his mind, he doesn't really see things interacting from a programmer's point of view. So we feel that a good programmer has to be three or four different people at the same time if he wants to do this game and make it very cohesive."

While the basic idea for a game may come from anywhere—the name *Raid Over Moscow* sprang up on a trip from Las Vegas to Carver's home in Utah—from that point on, the process becomes very detailed and takes months to complete. "Regardless of how it [an idea] starts, a premise has to be developed," Carver says. "So what we [the design team at Access Software] do is sit down in a meeting, and we talk about this idea that we think has potential."

Moving from the talking stage to the completed game involves many steps, and the game may even be shelved at some point along the way because the original idea just didn't lend itself to a finished product.

"We're firm believers in the storyboard type of approach," says Buntin, whose software development firm, Ozark Softscape, turned out the hit games *M.U.L.E.* and *Seven Cities of Gold*. Using such a system means that "you've worked out

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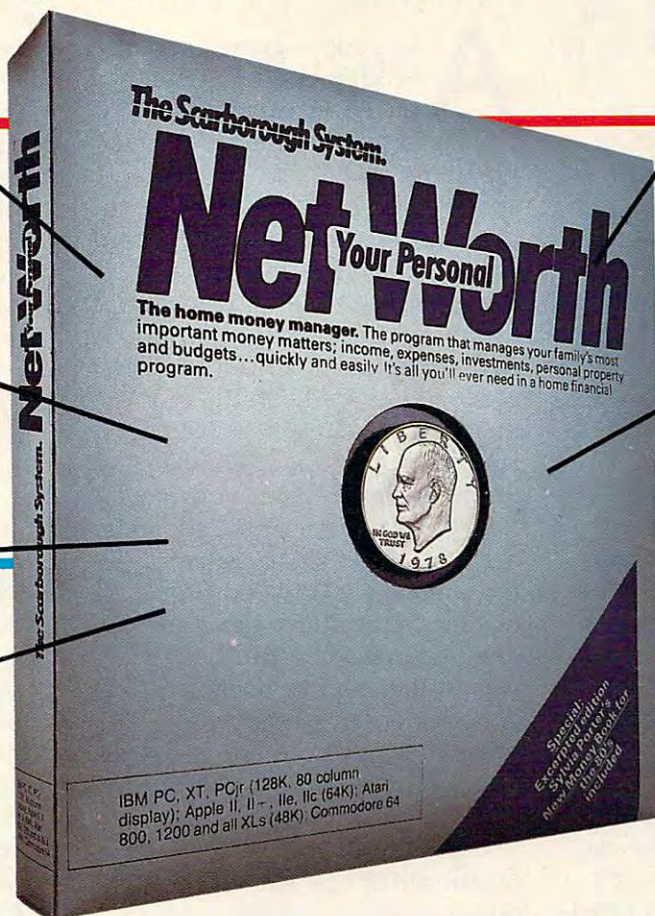
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at that point most of the key conceptual elements, and you work out what the driving motivation is that the player should experience when he's playing," Buntun says. "What's his goal—what is he after, what does he want to get out of this experience? That's one of the first things we want to get. Then we'll figure out, based on that, how the environment has to support the image."

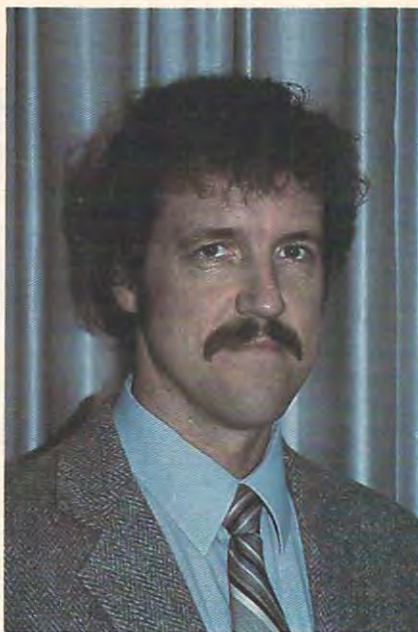
Carver looks for a sweaty-palm feeling. "There's a lot of thought given to what's going to be the most playable screen. You want to take that user to the point where his hands start getting sweaty, and he's always making decisions on what he's going to be firing at, or what he's going to do."

"If you just always have the same thing for him, he's going to get bored really quickly, so you make his mind work, you give him options. . . . We try to very subtly put those all through the game, so it's not really apparent, but it retains the interest for a long time."

Freeman, whose credits include *Archon*, *Archon II: Adept*, and *Murder on the Zinderneuf*, says he starts with an idea "that has become sufficiently clear and sufficiently compelling or attractive—whichever project is nagging me the most." From there, an outline is developed to chart the game's direction.

"We have a good idea where the game is going and what it will look like at the beginning," Freeman says of his software team, Freefall Associates. "But there's a lot of fine-tuning that can only be done after the game has started to take concrete form."

"The design is not something cast in stone that has to be followed to the letter—it's more of a guideline. Many people who start have only a vague idea where they're going. We do have a pretty good idea where we're going, but that doesn't



Bruce Carver

mean we don't run into blockades. We kick out ideas and throw out the bad ones."

Also, some games contain hidden lessons. "Some of the games I've done have had goals of teaching people about nature or warfare—specifically, the goal of quantitative factors versus false factors," Crawford says. "The point of the game *Excalibur* is leadership. I didn't set out to do a King Arthur game—I set out to do a game about leadership. And once you've chosen your goal, you choose a topic that is a theme for expressing your goal."

With *Eastern Front*, he adds, the goal was "to teach people the difference between fire power and military effectiveness—it was something that was bothering me. A lot of Americans have this problem in thinking that the more weapons you have, the more powerful you are."

In *Seven Cities of Gold*, Ozark Softscape embodied three different ideas, Buntun says. "One was that the world was big and enormous, and these people were really brave to head off into the total unknown.

Second, interaction with the natives was a subtle kind of communication; there was always a language barrier. Third," he adds, "there was a moral dilemma built in. Just because you're big enough to take what you want, does that make it right to take it?"

At first, players who field tested the game would take all the goods and gold they could from natives. But soon the testers "began to discover that they didn't feel real good about themselves, so they would get to a point where they would build rules for themselves, like 'Well, I won't kill them unless they kill me first.'"

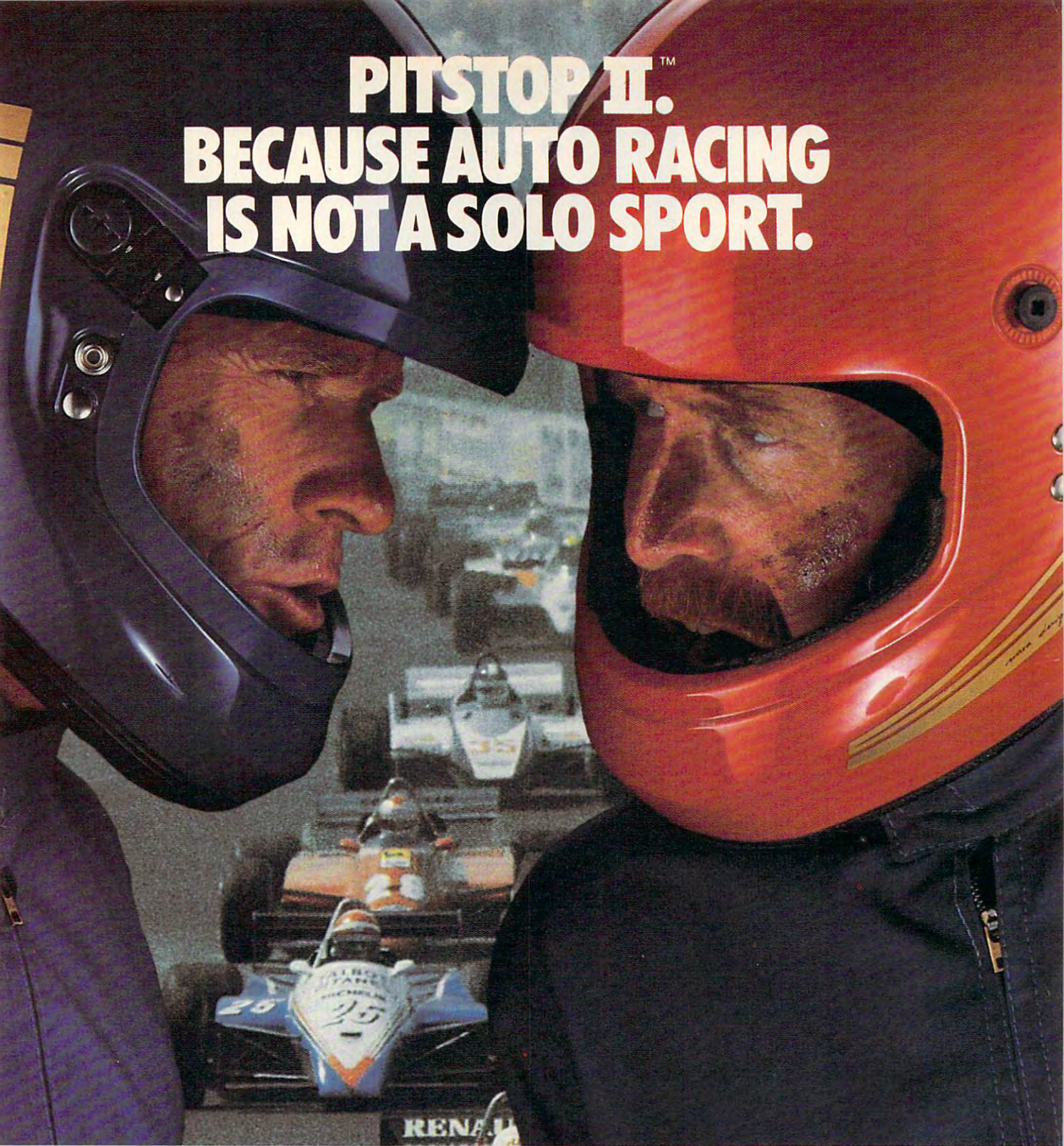
Sometimes, the hidden messages can be as subtle as not using sexist terms, as in *Archon* and *Murder on the Zinderneuf*. "Our documentation is not sexist, not even vaguely," Freeman says. "There are both male and female characters on the board in *Archon*, and female characters are not weaker than the male characters as a group. In *Murder on the Zinderneuf*, there are an equal number of [male and female] suspects, and there is a mix of detectives. Anybody can get killed, and anybody could have done it."

"That's all secondary to the point of having fun," he adds. "But it's in there by design."

If a would-be game designer wants to get started in the field, there are basically two approaches to take, at least judging by these five aces: either try to come up with something that breaks the mold as far as computer games are concerned, or start out using what's been done before as a guide.

Budge found success by improving on what had come before. "The way I got started was by not trying to do anything original at all," he recalls. "I wanted to learn how to write

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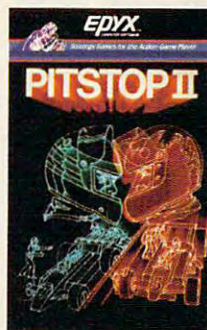
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Bill Budge



Dan Buntin



Jon Freeman and Anne Westfall

videogames. I bought an Apple about five years ago and just went to arcades and copied the games that I saw." He adds that his main interest at the time was in creating "neat pictures and neat sounds."

A really good game, he says, would turn the player into a hacker. "You should provide environments where it's fun to put together things that are structured on a computer, but you don't have all the junk that you have when you're programming. You sort of restrict people to doing things that are like videogames, or pictures and sound, and take away all the busywork part."

Toward that end, a project he is working on now is a construction set to build construction sets. "That's a very difficult program to write, and I could never have written that before *Pinball*. After I did *Pinball*, it seems like there's some faint chance." He also adds that if he hadn't started out the way he did, "I wouldn't be qualified to take the next step."

The environment for that

project, which he says will take several years to complete, "is the sort where you can just play and not worry about the consequences of every single mistake. You can mix and match, you don't have to write something totally new, you can take something from *Pac-Man* and take a piece from *Donkey Kong* and make it work."

Oddly, Budge doesn't like to play arcade and videogames very much. In fact, he says it was "sheer torture" to play pinball steadily for months while working on his construction set. "There are other people who are into games and are better at it than I am, so I had to figure out ways to get around the gaming, but I still wanted to create things that were like videogames," he says.

Buntin also thinks taking a lesson from what's been done by others is useful for new designers. "Typically, my first game was a knock-off of someone else's game, and it was an enhancement of things that I thought were needed. You've got to build some experience

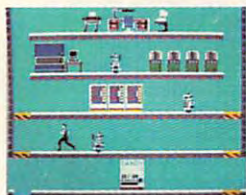
just with the medium and what is possible, before you can jump off into some new territory.

"As long as it doesn't violate any copyright, it's probably a good way to get started. Somebody said there's nothing new under the sun, and there probably isn't."

Carver feels beginning designers need to realize that the process is not all fun and games. "It's not something that's as glamorous as it might sound," he says. "There are times when I want to leave so bad—I tend to get really grouchy—but I know if we're going to get it finished in, say, five months, then I have to stay and get the work done."

He agrees that "if you use other people's stuff, you'll get into a mold and you can't really get out. I find I have to consciously work on changing the things I do, otherwise I'll tend to do them the way I did them before, and the game will tend to have the same feel that it had before."

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Crawford feels the most important consideration in game design is something he calls "artistic honesty." Far too many people, he adds, are writing programs that are imitations of other games. "They say 'Well, I'm going to do games!' Then they say, 'Well, what kind of games do I like right now? Well, I sure liked *Pac-Man*—let me do a variation on that.' And that is just the wrong way to do it.

"The right way to do it is to ask yourself what is an important interest around the world, and then try to capture that attraction," he asserts.

Freeman also feels that some game designers have fallen into a rut. "I think there are all sorts of subjects and lots of techniques and lots of approaches that are available, that haven't been done. I think, on the other hand, that many de-

signers are in a rut—they define their universe too narrowly, in my opinion," he says.

While these five designers may differ in their opinions on how best to approach game writing, there is one point on which they all agree: Right now, it's tough for anyone, no matter how good, to get a game published in today's volatile software market.

Perhaps Crawford says it most gently. "I will point out the sad truth. We have pretty much passed the period where hobbyists could put together a game that would have commercial prospect. It's much more difficult to break in, much less stay in. Right now, in November 1984, I would discourage anyone. If you want to do a game, do it for fun, but don't try to do game designs to make any money. The odds are so much



Chris Crawford

against the individual that I would hate to wish that heart-break on anyone." ©

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Acrobat

Peter Dizzio

"Acrobat" is a realistic, fast-moving arcade-style game. You must guide your alter ego on a perilous journey through mountains, jungles, and underground caves, while avoiding numerous obstacles by jumping, flipping, or sliding under them. You can select any of three different speeds to start off with, but the action will get faster and harder with each new level you reach. Acrobat will challenge your sense of timing as well as your reflexes. Versions for Atari, Commodore 64, and VIC.

The playing field of "Acrobat" is divided into two sections. The top of the screen contains your man, the obstacles, and the background scenery. The scoreboard is located at the bottom of the screen. It contains your current score, the high score so far, and at the far right, the number of men you have left. You begin the game standing in the middle of a mountain valley, ready for your journey.

At the beginning of each game, you can choose between three levels of difficulty by pressing the corresponding number. Level 1 is the easiest. Level 3 is almost impossible.

After you have chosen the difficulty level, press the START button or push the joystick in any direction to start the game.

The Unstoppable Runner

After you have started the game, your man will begin to run. He runs forward automatically, and he cannot be stopped. You must maneuver past the various obstacles that come at you. You can push the joystick forward to jump, backward to slide, or press the joystick button to flip. If you manage to stay alive long enough, you will advance a level, and face new challenges. If you touch any of the obstacles, you will collapse in a heap and lose a man. Push the joystick in any direction to continue. You will receive a free man when you reach 2000 points, and at every 1000 points thereafter.

You receive points for everything you do. You get 20 points for a jump, 10 points for a slide, 10 points for a flip, and 2 points for every step you take forward. Your score is updated periodically throughout the game.

Special Features

You will advance a level after playing for a certain length of time. The screen is redrawn and you are placed into a new setting. Bonus points are also awarded depending on the number of men you have left. Push the joystick in any direction, or push START to begin running again.

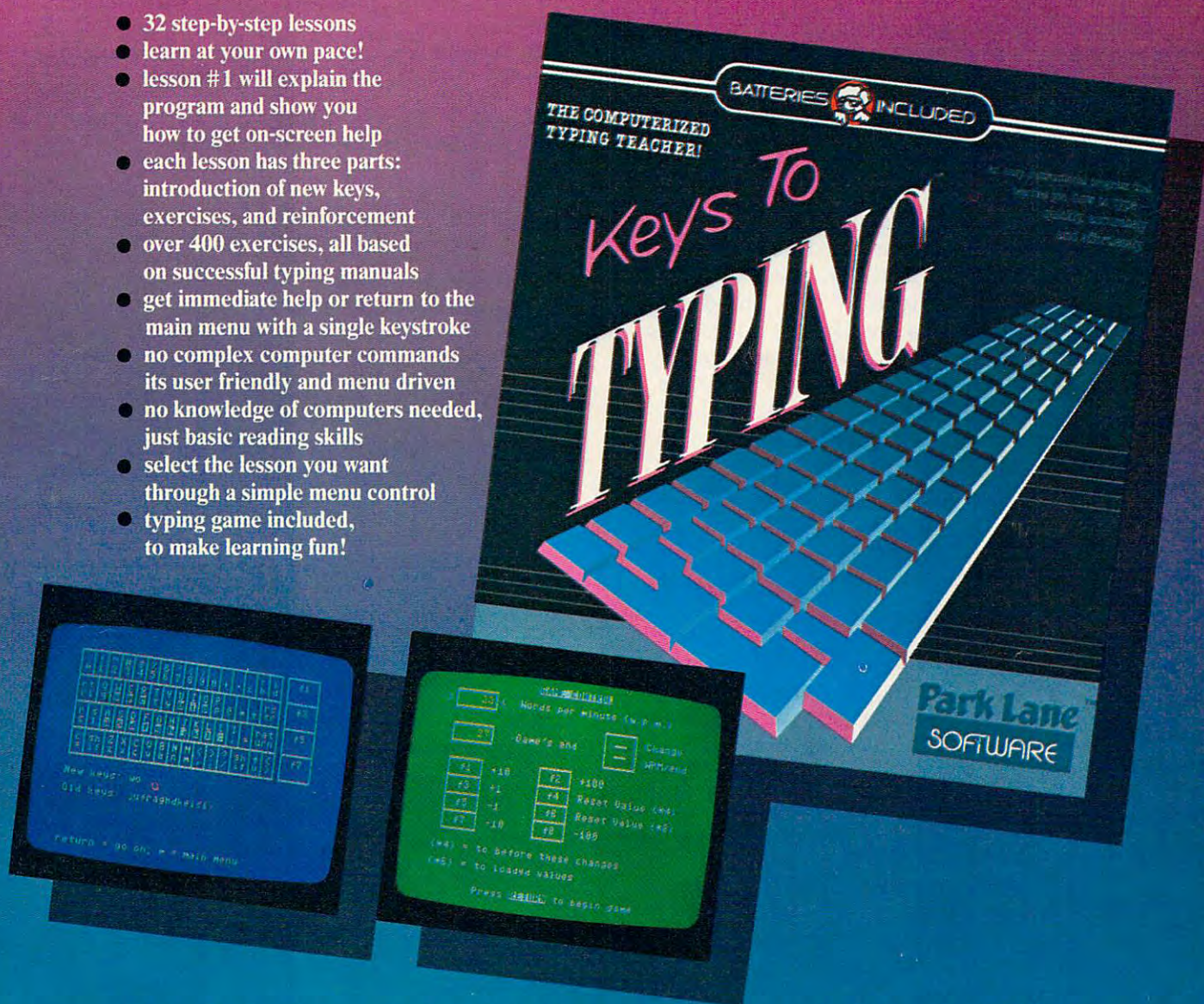
You can also pause Acrobat while you are running. Simply press the space bar. Press CTRL-S or the joystick button to begin again.

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Press START to restart the entire game at any time except during a pause.

Programming Techniques

Acrobat uses several special features of the Atari computers. High speed player/missile graphics and horizontal scrolling create an effective illusion of movement. Vertical blank interrupts, custom display modes, machine language routines, and numerous sound effects are also used to enhance the game.

The routine at line 30000 appeared in the article "Extending Player Missile Graphics" (COMPUTE!, October 1981). This short but extremely powerful routine changes the shape of a player at machine language speed. This helps create smooth animation with just one player. I've used this method throughout the program to animate the acrobat and change the shapes of the obstacles. The data for the different shapes of the acrobat are stored in RAM, and their locations are placed into the array PI(). The data for the numerous obstacles are likewise tucked away in safe RAM, and their locations are placed in the array OB().

The second machine language routine in the program starts at line 30700. This is a slightly modified version of one that appeared in *ANTIC* (June 1982). This routine moves the obstacles horizontally during the Vertical Blank Interrupt, which occurs 60 times per second. Once this routine is set up and called, it will operate continuously until told to stop.

Coarse horizontal scrolling occurs in the subroutine at line 90. Line 50 determines the address of screen memory, and stores it in the variable DL4. Then, in line 90, the value stored in DL4, PDL4, is increased and checked to see if it is too high. If it is, PDL4 is set equal to a much lower number. This causes a wraparound effect. Line 125 POKES PDL4 into DL4, which causes the top half of the GRAPHICS 8 screen to scroll.

Be very careful typing in lines 27000 to 27070. This subroutine uses the Atari forced read mode to erase certain lines after they are not needed anymore. This increases the amount of memory available before going into GRAPHICS 8. If you have a full 40K-64K system, you can replace these lines with 27000 RETURN. If you need to type this section in, *be sure to save the program before running it*. If you forget to save, you will lose almost half of what you had typed in.

If you would rather not spend the time typing in Acrobat, I will make a copy (Atari version only) if you send me a blank tape or disk, a self-addressed, stamped mailer, and \$3.

Peter Rizzuto
9 Idlebrook Lane
Aberdeen, NJ 07747

Program 1: Atari Acrobat

Refer to "COMPUTE!'s Guide For Typing In Programs" article before typing this program in.

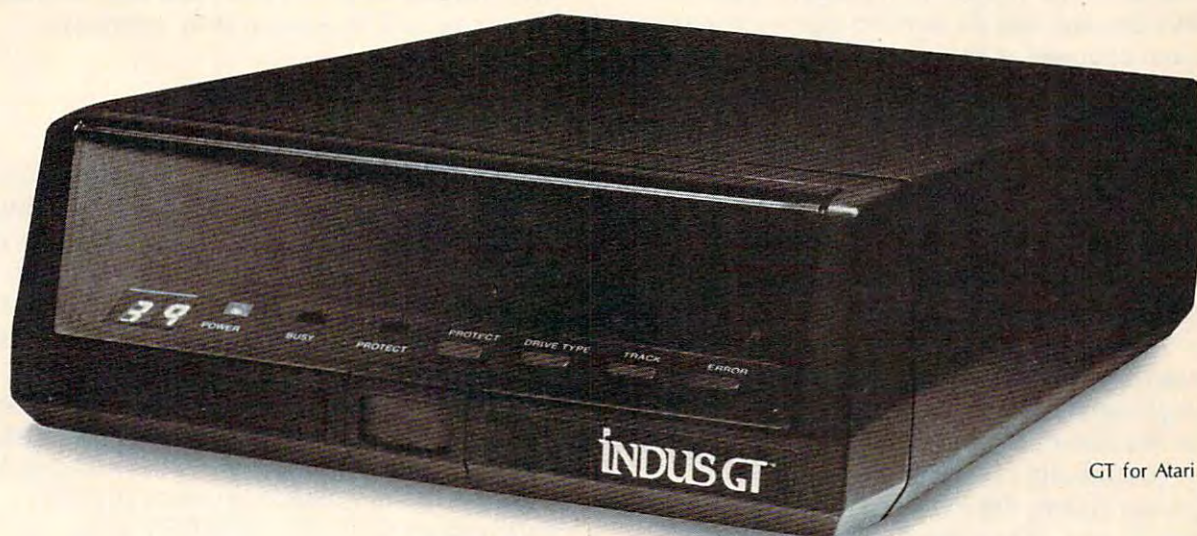
```

JI 10 GOSUB 19000:GOSUB 20000:GOSUB
25000:GOSUB 20100:GOSUB 27000
AG 11 D=USR(1536):GOSUB 21000:GOSUB
21220:GOSUB AD:POKE XP,X:GOSUB
19500:GOTO WT
OI 12 D=USR(ML,MANY,PI(9)):GOSUB MO:
RETURN
AC 20 D=USR(ML,OB2,OB(QW1)):QW1=QW1+
01:IF QW1>MAXQ THEN QW1=MINQ
EH 25 RETURN
AN 30 D=USR(ML,OB1,OB(QW)):QW=QW-01:
IF QW<MINQ THEN QW=MAXQ
EE 31 RETURN
CO 40 POKE C6,01:POKE C7,9: ? SCORE: I
F SCORE>ZIP THEN GOSUB 23500:R
ETURN
EF 41 RETURN
OC 50 DL=PEEK(560)+256*PEEK(561):DL4
=DL+Z:PDL4=PEEK(DL4):POKE DL+1
31,13:POKE DL+132,J:POKE DC,U:
POKE 708,44
LA 55 GOSUB SY:RETURN
GE 90 ST=STICK(0):PDL4=PDL4+J:IF PDL
4>120 THEN PDL4=81:SC=SC+01
DL 100 IF LEVEL<200 THEN IF PEEK(X1P
)<25 THEN POKE X1P,220:GOSUB
B2
DP 110 IF LEVEL>100 THEN IF PEEK(X1P
)>220 THEN POKE X1P,25:GOSUB
B2
CO 120 IF PEEK(X2P)<30 THEN POKE X2P
,255:GOSUB 30
OF 125 POKE DL4,PDL4:RETURN
DC 200 GOSUB MO:SOUND J,150-Y,8,Z:GO
SUB 12:SCORE=SCORE+B2:YF=Y:FO
R Q=01 TO K:YF=YF-J:F=5:GOSUB
JUM:NEXT Q
DJ 205 SOUND J,150-YF,8,Z:FOR Q=01 T
O K:YF=YF-J:F=6:GOSUB JUM:NEX
T Q:SOUND J,150-YF,8,Z:GOSUB
40:FOR Q=01 TO 6
JN 215 YF=YF+J:F=7:GOSUB JUM:NEXT Q:
SOUND J,150-YF,8,Z:F=K:SOUND
J,0,0,0:GOSUB JUM
GE 240 F=Z:IF PEEK(CO) THEN 10000
AK 245 D=USR(ML,MANY,PI(F)):POKE RES
,0:SOUND 1,0,0,0:RETURN
FE 250 D=USR(ML,MAN+YF,PI(F)):GOSUB
MO:SOUND 01,170-YF,E,J:RETURN
EH 300 GOSUB MO:GOSUB U:SOUND J,170-
Y,8,Z:SCORE=SCORE+E:YF=Y
SI 305 FOR A=01 TO J:FOR F=11 TO 14:
YF=YF-J:GOSUB JUM:NEXT F:NEXT
A:SOUND J,170-YF,8,Z:GOSUB 40
EE 310 FOR A=01 TO J:FOR F=11 TO 14:
YF=YF+J:GOSUB JUM:NEXT F:NEXT
A:SOUND J,0,0,0:GOTO 240
GI 315 GOTO 240
PG 2000 GOSUB MO:D=USR(ML,MANY,PI(F)
):IF PEEK(STA)=6 THEN 11100
FL 2005 IF PEEK(KEY)=33 THEN GOSUB 1
3000
JF 2010 SOUND 01,231+F,E,E:SOUND 01,
0,0,0
PP 2015 IF PEEK(CO) THEN GOSUB 10000
BC 2020 IF ST=13 THEN GOSUB 8000

```


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Notes For Commodore Versions

The Commodore versions of "Acrobat" have the same goal as the Atari version; you must slide, flip, and jump to avoid anything that gets in your way.

Both the VIC-20 and Commodore 64 versions use the keyboard rather than the joystick. This permits a more sensitive response to the player. If you don't like the keys chosen, the 64 version allows you to make changes at the start of the program. This feature is not present in the VIC version, but changes can be made by altering the letters J, S, and F in lines 35-45 of Program 4.

The VIC and 64 versions are written primarily in BASIC, with a machine language subroutine used for scrolling and placement of the obstacles.

The 64 version (Program 2) contains an interrupt-driven subroutine to scroll the playfield smoothly. A single sprite is used for the acrobat. Its movement is simulated by continually changing the sprite data pointer (using the FOR-NEXT loop beginning at line 21) to point to each of the acrobat's different positions.

The Night Runner

An interesting addition to the 64 version is a night mode. Here your acrobat runs through the darkness with only a flashlight to light his path. You may have seen this effect in arcade racing games. This was done by filling the color RAM with black (to turn everything invisible) then placing a white sprite in front of the acrobat. To insure that screen objects would be visible in the light, the sprite-to-background display priority register was set to give the background priority over the spotlight sprite.

The scoring of the 64 version is fairly straightforward. Each time the acrobat jumps over or slides under something, you are given 2 points. A flip, because it is much harder to control, is worth 5 points. Later in the game, a chicken will start flying on the screen. Every time you can avoid hitting the chicken, you are given an additional 10 points.

An extra acrobat is awarded for every 100 points; a quick change of border color will indicate that an extra man was earned. The score will be shown only when you lose an acrobat.

VIC Autoload

The VIC version of Acrobat requires no memory expansion. The program is written in two parts (Programs 3 and 4) and chained to make efficient use of the small amount of memory present. Program 3 will automatically load and run Program 4 from disk. To use the programs with tape, change the 8 to a 1 in line 15 of Program 3, and be sure to save Program 4 immediately following Program 3 on the tape. For either disk or tape, you must save Program 4 with the name AC for the autoload feature to work properly. To avoid an OUT OF MEMORY error, do not add any extra spaces to the program lines when typing Programs 3 and 4.

In this version, custom characters were used in place of sprites. Because of this, smooth horizontal scrolling was not possible.

The VIC rules are slightly different from the 64 version. To make the game more challenging, the acrobat now moves forward. There will be a slight flash of the border color to warn that the acrobat will soon move.

Scoring is as follows: For obstacles you jump over or slide under, you are given 2 points. Flips are worth 8 points, and for each block you move forward, you are given an additional bonus of 10 points.

```

OC 2025 IF ST=14 THEN GOSUB 200
EL 2030 IF STPIG(0)=0 THEN GOSUB 300
LD 2035 IF SC>7 THEN MAXQ=MAXQ+01:MI
NQ=MINQ+01:SC=0:IF MAXQ>LIMI
T THEN 24000
BD 2040 F=F+01:IF F>Z THEN F=01
KK 2045 SCORE=SCORE+J:GOTO 2000
EA 8000 SCORE=SCORE+E:D=USR(ML,MANY,
PI(16)):GOSUB MO
CO 8010 FOR T=01 TO 7:D=USR(ML,MANY,
PI(17)):GOSUB MO:NEXT T:GOSU
B 40:D=USR(ML,MANY,PI(16)):F
=01:RETURN
EN 9000 SOUND 01,INT(RND(0)*40),E,J:
RETURN
OP 9100 POKE X1P,0:POKE X2P,30:POKE
G8,0:POKE G9,0:POKE 53249,0:

```

```

POKE 53251,30:POKE 705,BACK
:POKE 707,BACK:RETURN
CH 9200 POKE 705,U:POKE 707,136:POKE
G8,01:POKE G9,01:RETURN
GC 9500 RETURN:READ A,I,R,L:IF A=-0
1 THEN GOSUB 14000:RETURN
AN 9510 SOUND 0,A,E,6:SOUND 01,I,E,6
:SOUND J,R,E,Z:FOR I=01 TO L
:NEXT I:GOTO 9500
AP 10000 GOSUB 14000:D=USR(ML,MANY,P
I(E)):LI=LI-01:GOSUB SY:D=U
SR(ML,MANY,EX(01))
KB 10005 FOR I=01 TO K:D=USR(ML,MANY
,EX(I)):FOR A=01 TO 8:NEXT
A:NEXT I:FOR I=01 TO 65:NEX
T I
JO 10010 D=USR(ML,MANY,EX(Z)):SOUND

```


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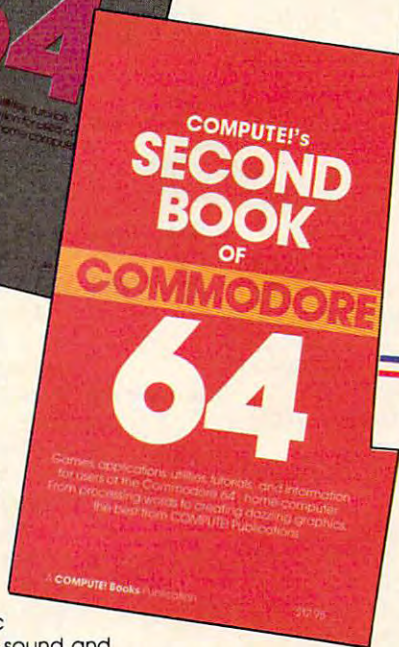
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```

01,255,8,8:GOSUB SY:POKE CC
,K:POKE C7,36:POKE C6,01:
LI:SOUND 01,0,0,0:IF LI=0 T
HEN 11000
IM 10012 FOR I=01 TO 50:NEXT I:RESTO
RE 31700:GOSUB 9500
AJ 10015 IF PEEK(STA)=6 THEN 11100
GJ 10020 IF STICK(0)=15 THEN 10015
DA 10025 POKE RES,0:GOSUB 60:POKE CC
,K:ST=15:RETURN
AD 11000 POKE C6,K:POKE C7,K: ? "*****
*****GAME OVER!*****
****(UP)":POKE C6,01
IK 11002 FOR I=01 TO 50:NEXT I:RESTO
RE 31500:GOSUB 9500
IK 11005 IF STRIG(0)=0 OR PEEK(STA)=
6 THEN SOUND 01,0,0,0:POKE
RES,0:GOTO 11100
KG 11010 GOSUB 9000:GOTO 11005
QL 11100 QW=01:QW1=01:F=E:MINQ=01:MA
XQ=J:LI=K:SC=0:X=120:LIMIT=
6:BACKC=96:LEV=01:SPED=197
JK 11105 POKE BC,BACKC:POKE PC,BACKC
:GOSUB SY:POKE XP,0
IB 11110 POKE DC,BACKC:POKE DL+131,1
5:GOSUB SY:POKE XP,0:POKE 1
552,198:POKE 1554,197:POKE
1565,198:POKE 1567,197
HC 11120 POKE DL4,80:GOSUB 21220:GOS
UB 21038:IF SCORE>HI THEN H
I=SCORE
LN 11125 POKE C6,01:POKE C7,26: ? HI:
SCORE=0:POKE DC,U:POKE DL+1
31,13:IF LEVEL=0 THEN 11130
NL 11128 RESTORE 31000+LEVEL:COLOR 0
:GOSUB 15000:RESTORE 31000:
COLOR 01:GOSUB 15000
IH 11130 LEVEL=0:POKE XP,X:GOSUB AD:
GOSUB 19500
QH 12000 IF STICK(0)<>15 OR PEEK(STA
)=6 THEN 12030
LJ 12005 IF SCORE>0 THEN 12025
IL 12010 IF PEEK(KEY)=31 THEN POKE C
6,K:POKE C7,31: ? "1(UP)":TY
P=01:POKE 1554,197:SPED=197
FL 12015 IF PEEK(KEY)=30 THEN POKE C
6,K:POKE C7,31: ? "2(UP)":TY
P=J:POKE 1554,198:SPED=197
FP 12020 IF PEEK(KEY)=26 THEN POKE C
6,K:POKE C7,31: ? "3(UP)":TY
P=K:POKE 1554,198:SPED=198
CP 12025 POKE RES,0:GOSUB 9000:GOTO
WT
GG 12030 SOUND 01,0,0,0:POKE KEY,255
:GOSUB 19505:RESTORE 31800:
GOSUB 9500:GOSUB 60:POKE CC
,K:GOSUB 300:GOTO 2040
KF 13000 POKE KEY,255:D=USR(ML,MANY,
PI(E)):GOSUB 14000:POKE G8,
0:POKE G9,0
IN 13005 IF PEEK(KEY)<>190 AND STRIG
(0)=1 THEN 13005
OG 13010 POKE RES,0:POKE KEY,255:POK
E G8,01:POKE G9,01:RETURN
AJ 14000 SOUND 0,0,0,0:SOUND 01,0,0,
0:SOUND J,0,0,0:SOUND K,0,0,
0:RETURN
FB 15000 READ XC,YC:PLOT XC,YC
IC 15010 READ XC,YC:IF XC=-01 THEN G
OSUB 14000:RETURN
DD 15015 IF XC=-9 THEN 15000
PP 15020 DRAWTO XC,YC:IF XC>255 THEN
XC=XC-255:SOUND 0,XC,E,J:G
OTO 15010
AJ 15025 SOUND 0,XC,10,J:GOTO 15010
PL 16000 POKE XP,0:POKE 53249,0:POKE
53250,0:POKE 53251,0
MC 16005 POKE 559,62:POKE PC,BACKC:P
OKE DC,BACKC:POKE BC,BACKC:
POKE 752,01:COLOR 01:RETURN
EE 16010 A=PEEK(16):IF A=128 THEN RE
TURN
IK 16015 POKE 16,A-128:POKE 53774,A-
128:RETURN
HC 17000 ? "{CLEAR}":IF LEV>9 THEN P
OKE C6,J:POKE C7,9: ? "You a
re too good for me!":POKE D
C,U:LEVEL=200:GOTO 11000
NI 17001 POSITION 01,01: ? "{Q}{35 R}
{E}":POSITION 01,J: ? "
{6 SPACES}Now advancing to
Level ";LEV:
? "{5 SPACES}:"
PJ 17002 POSITION 01,K: ? "{Z}{35 R}
{C}":POKE C6,01:POKE C7,01:
RETURN
KD 17500 A=100*LI/5:FOR I=01 TO 5:SC
ORE=SCORE+A:POKE C6,01:POKE
C7,9: ? SCORE:FOR R=01 TO
20:SOUND 0,40-R*J,E,8
PN 17505 NEXT R:NEXT I:POKE C6,01:RE
TURN
IB 19000 GRAPHICS 0:GOSUB 16010:POKE
752,1:DL=PEEK(560)+PEEK(56
1)*256:DL=DL+4:POKE 709,96:
POKE 710,96:POKE 712,96
JA 19005 POKE DL+16,6:POKE DL+17,6:P
OKE DL+28,65:POKE DL+29,PEE
K(560):POKE DL+30,PEEK(561)
: ? "{CLEAR}"
BE 19011 POSITION 11,20: ? "ONE MOMEN
T PLEASE..."
BN 19015 POSITION 4,7: ? "{Q}{2 R}
{E} {Q}{2 R} {Q}{2 R}{E}
{Q}{2 R}{E} {Q}{R}{E} {Q}
{2 R}{E} {R}{W}{R}":POSITIO
N 4,8: ? "
| | | {3 SPACES}
| | | | | | |"
AG 19020 POSITION 4,9: ? "{A}{2 R}
{D} | {3 SPACES}{A}{R}{W}
{C} | | {A}{R}{X}{E} {A}
{2 R}{D} |":POSITION 4,10:
? "
| | | {3 SPACES}| {Z}
{E} | | | | | |"
AN 19025 POSITION 4,11: ? "{X} {X}
{Z}{2 R} {X} {X} {Z}{2 R}
{C} {Z}{2 R}{C} {X} {X}
{X}":POKE 709,10:RETURN
EO 19500 POKE C6,3:POKE C7,8: ? "Sele
ct Difficulty ---> 1(UP)":T
YP=1:RETURN
EF 19505 POKE C6,3:POKE C7,8: ? "
{24 SPACES}{UP}":RETURN
KK 20000 X=120:Y=141:F=10:QW=1:QW1=Q
W:LI=3:HI=0:SCORE=HI:SC=HI:
ML=1600:DIM PI(18),OB(17),E
X(4):C6=656:C7=657:Z=4
AH 20005 XP=53248:X1P=206:X2P=207:MO
=90:SY=9100:GO=9200:O=0:O1=
1:PC=710:BC=712:DC=709:CO=5

```

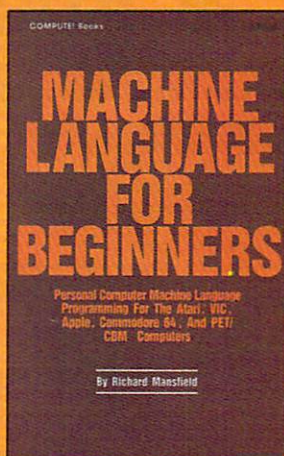

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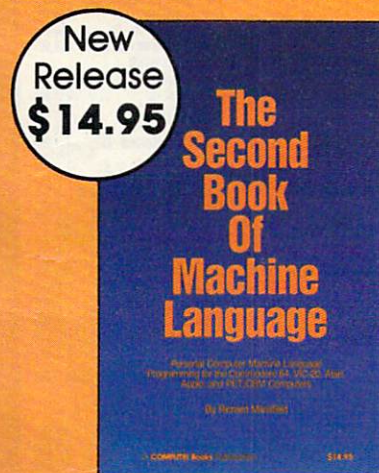
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3260:J=2:G8=208:G9=209
PF 20010 STA=53279:CC=53278:RES=77:K
EY=764:B2=20:WT=12000:AD=50
:JUM=250:SPED=197:LEV=1:ZIP
=2000:K=3:E=10:U=12
PM 20015 FOR A=1600 TO 1624:READ I:P
OKE A,I:NEXT A:FOR A=260 TO
419:READ I:POKE A,I:NEXT A
IF 20020 FOR A=1650 TO 1777:READ I:P
OKE A,I:NEXT A:FOR A=01 TO
18:READ I:PI(A)=I:NEXT A
AE 20025 A=PEEK(106)-40:POKE 54279,A
:F=256*A:POKE 559,62:POKE 6
23,01:POKE 53277,3:POKE XP,
0:POKE 704,30
EE 20030 MAN=P+1024:MANY=MAN+Y:OB1=P
+1280+141:OB2=P+1792+141:FO
R I=MAN TO P+1536:POKE I,0:
NEXT I
KK 20035 FOR I=P+1792 TO P+2048:POKE
I,0:NEXT I:RETURN
NJ 20100 FOR A=P TO P+191:READ I:POK
E A,I:NEXT A
CC 20105 C=01:FOR A=P TO P+159 STEP
16:OB(C)=A:C=C+01:NEXT A:OB
(11)=OB(8):OB(U)=OB(7)
EM 20110 FOR I=P+400 TO P+463:READ A
:POKE I,A:NEXT I:C=01:FOR I
=P+400 TO P+463 STEP 16:EX(
C)=I:C=C+01:NEXT I
FI 20115 FOR I=P+200 TO P+247:READ A
:POKE I,A:NEXT I:OB(13)=P+2
32:OB(14)=OB(01):OB(15)=P+2
16:OB(16)=P+200:OB(17)=OB(0
1)
PI 20120 RESTORE 30700:FOR I=1536 TO
1576:READ A:POKE I,A:NEXT
I:POKE 68,0:POKE 69,0:POKE
X1P,0:POKE X2P,B2:RETURN
MI 21000 GRAPHICS 8:GOSUB 16010:LEVE
L=0:BACKC=96:GOSUB 16000:PO
KE DC,U
HA 21005 MINQ=01:MAXQ=J:SC=0:LIMIT=6
:POKE 1552,198:RESTORE 3100
0:GOSUB 15000
CA 21010 FOR I=01 TO 319 STEP J:PLOT
I,124:DRAWTO I,125:NEXT I:
FOR I=J TO 318 STEP J:PLOT
I,132:DRAWTO I,149:NEXT I
CP 21015 POKE DC,BACKC
KG 21038 ? "{CLEAR}":POSITION 01,01:
? "{Q}{31 R}{W}{3 R}{E}":PO
SITION 01,J:?"{SCORE:0}";
BB 21040 ? "{7 SPACES}HI SCORE:0
{7 SPACES}! 3 !":POSITION 0
1,Z:?"{Z}{31 R}{X}{3 R}
{C}":RETURN
LK 21220 D=USR(ML,OB1,OB(QW)):D=USR(
ML,MANY,PI(F)):D=USR(ML,OB2
,OB(QW)):RETURN
KC 22000 BACKC=196:GOSUB 16000:GOSUB
SY:GOSUB 17000:POKE DC,U:C
OLOR 0:RESTORE 31000:GOSUB
15000:COLOR 01
LO 22010 RESTORE 31100:GOSUB 15000
GE 22020 MINQ=7:MAXQ=8:QW=MINQ:QW1=Q
W:SC=0:LIMIT=U:F=E:POKE 155
2,198:POKE 1567,SPED:IF LEV
=5 THEN LIMIT=E
J6 22030 POKE DC,BACKC:GOSUB 21038:G
OSUB 21220
AK 22035 POKE C6,01:POKE C7,9:?" SCOR
E::POKE C7,26:?" HI::POKE C7
,36:?" LI
PL 22040 POKE DL4,80:D=USR(ML,MANY,P
I(E)):GOSUB SY:POKE XP,120:
POKE CC,K:POKE DC,U:GOSUB A
D:GOSUB 17500:GOTO WT
FD 22100 BACKC=0:GOSUB 16000:GOSUB S
Y:GOSUB 17000:POKE DC,U:COL
OR 0:RESTORE 31100:GOSUB 15
000:COLOR 01
MA 22110 RESTORE 31200:GOSUB 15000
MK 22120 MINQ=13:MAXQ=14:QW=MINQ:QW1
=QW:SC=0:LIMIT=17:F=10:POKE
1552,230:IF SPED=198 OR TY
P=2 THEN POKE 1554,230
CM 22125 GOTO 22030
BE 23500 POKE PC,14:POKE BC,14:LI=LI
+01:ZIP=ZIP+1000:POKE C6,01
:POKE C7,36:?" LI:">{UP}":POK
E PC,BACKC:POKE BC,BACKC:RE
TURN
IO 24000 LEV=LEV+01:LEVEL=LEVEL+100:
IF LEVEL>200 THEN POKE DL+1
31,15:GOTO 24500
BK 24010 POKE DL+131,15:GOTO 21900+L
EVEL
DF 24500 BACKC=96:GOSUB 16000:GOSUB
SY:GOSUB 17000:POKE DC,U
LB 24505 RESTORE 31000+LEVEL-100:COL
OR 0:GOSUB 15000:RESTORE 31
000:COLOR 01:GOSUB 15000:SP
ED=198
MM 24510 LEVEL=0:BACKC=96:POKE 1552,
198:POKE 1554,198:MINQ=01:M
AXQ=J:QW=MINQ:QW1=QW:SC=0:L
IMIT=Z:F=E:GOTO 22030
PC 25000 FOR I=30 TO 108 STEP J:POKE
XP,I:D=USR(ML,MANY,PI(F)):
F=F+01:IF F>Z THEN F=01
JB 25005 NEXT I:D=USR(ML,MANY,PI(9))
:FOR A=01 TO J:FOR F=11 TO
14:Y=Y-J:I=I+J:POKE XP,I
PJ 25015 D=USR(ML,MAN+Y,PI(F)):NEXT
F:NEXT A:FOR A=01 TO J:FOR
F=11 TO 14:Y=Y+J:I=I+J
IC 25020 POKE XP,I:D=USR(ML,MAN+Y,PI
(F)):NEXT F:NEXT A:F=01
KN 25025 FOR I=I+J TO 220 STEP J:POK
E 53248,I:D=USR(ML,MANY,PI(
F)):F=F+01:IF F>Z THEN F=01
JO 25030 NEXT I:F=E:RETURN
HD 27000 GRAPHICS 0:POKE 752,01:POKE
710,96:POKE 712,96:POKE 70
9,96:POKE 842,13:GOSUB 16010
PI 27005 ? "{CLEAR}":POSITION J,6:FO
R I=30000 TO 30010:?" I:NEXT
I:?"CONT":POSITION 0,0:ST
OP
JC 27010 ? "{CLEAR}":POSITION J,6:FO
R I=30080 TO 30098 STEP J:?"
I:NEXT I:?"CONT":POSITION
0,0:STOP
LF 27015 ? "{CLEAR}":POSITION J,6:FO
R I=25000 TO 25030 STEP 5:?"
I:NEXT I:FOR I=19000 TO 19
025 STEP 5:?" I:NEXT I:?"CO
NT"
LK 27020 POSITION 0,0:STOP

```



```

J0 27025 ? "{CLEAR}":POSITION J,6:FO
R I=20000 TO 20035 STEP 5: ?
I:NEXT I:FOR I=20100 TO 20
120 STEP 5: ? I:NEXT I: ? "CO
NT"
LL 27030 POSITION 0,0:STOP
PE 27035 ? "{CLEAR}":POSITION J,6:FO
R I=27000 TO 27035 STEP 5: ?
I:NEXT I: ? "30700": ? "3070
2": ? "GOTO 27070":POSITION
0,0:STOP
HG 27070 POKE 842,12:RETURN
DM 30000 DATA 104,104,133,204,104,13
3,203,104,133,209,104,133,2
08,160,0,177,208,145,203,20
0,192,16,208,247,96
GN 30001 DATA 12,12,8,56,90,156,24,3
0,18,36,72,132,128,0,0,0,12
,12,8,56,88,94,88,24,20,18,
226,130,3,0,0,0
ML 30002 DATA 12,12,8,24,24,24,24,24
,216,56,20,4,4,4,6,0,12,12,
8,24,56,56,60,56,30,18,20,1
6,16,16,24,0
IM 30003 DATA 0,0,24,24,18,52,56,50,
53,56,48,32,64,128,0,0,0,0,
12,12,8,24,60,91,24,24,158,
113,0,0,0,0
LP 30004 DATA 0,0,12,12,8,24,26,28,1
52,88,56,28,2,1,0,0,0,0,12,
12,8,24,26,28,24,24,120,12,
4,4,4,0
HD 30005 DATA 0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,12,12,8,24,24,24,
24,24,24,8,8,8,8,12,0
BC 30006 DATA 0,0,0,192,200,132,204,
248,112,0,0,0,0,0,0,0,0,0,0,
24,4,2,102,108,16,0,0,0,0,
0,0,0
PK 30007 DATA 0,0,0,14,31,51,33,19,1
9,0,0,0,0,0,0,0,0,0,0,8,54,
102,64,32,24,0,0,0,0,0,0,0
FJ 30008 DATA 48,48,16,28,26,122,26,
24,40,72,71,65,192,0,0,0,0,
0,96,96,64,100,56,48,48,58,
29,24,15,0,0,0
GD 30009 DATA 0,0,0,0,0,0,0,0,0,0,19
2,208,144,254,125,0,48,48,1
6,24,28,28,60,28,120,72,40,
8,8,8,24,0
JH 30010 DATA 260,276,292,308,324,34
0,356,372,388,404,1650,1666
,1682,1698,1714,1730,1746,1
762
HN 30080 DATA 0,0,0,0,0,0,0,0,0,0,0,
8,28,62,127,0,0,0,0,0,0,0,0,
0,0,8,8,8,8,8,0
PF 30082 DATA 0,0,0,0,0,0,0,32,64,25
5,64,32,0,0,0,0,0,0,0,0,0,0,
0,8,8,8,8,8,8,8,8,0
BH 30084 DATA 0,0,0,0,32,64,255,64,3
2,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,255,255,255,255,255,255,255,
255,255,0
DM 30086 DATA 0,0,0,0,0,0,64,255,64,
0,0,0,0,0,0,0,0,0,0,0,0,4
8,88,60,4,8,16,34,37,25,0
KN 30088 DATA 0,0,0,0,96,109,255,28,
12,6,0,0,0,0,0,0,0,0,0,48,1
12,248,236,70,3,1,0,0,0,0,0,
0
FM 30090 DATA 0,0,0,0,0,0,0,0,0,0,0,
30,247,255,66,0,0,0,0,0,24,
60,126,219,126,0,0,0,0,0,0,
0
FO 30092 DATA 12,12,24,24,24,24,24,2
4,24,24,8,44,8,16,0,0,0,0,1
2,12,8,24,24,24,24,24,24,8,
4,4,56,0
FD 30094 DATA 0,0,0,0,12,31,27,27,24
,24,24,8,4,4,56,0,0,0,0,0,0,
0,0,4,14,11,9,9,11,11,59,0
MN 30096 DATA 0,0,0,0,0,0,0,0,0,0,25
5,255,126,126,36,0,0,0,0,0,
0,0,36,126,219,129,0,0,0,0,
0,0
DE 30098 DATA 0,0,0,0,0,0,0,0,28,8,8
,28,28,28,28,0
MB 30700 DATA 104,160,10,162,6,169,7
,76,92,228,169,0,197,208,24
0,9,198,206,197,206,166,206
,142,3,208
DM 30702 DATA 197,209,240,9,198,207,
197,207,166,207,142,1,208,7
6,98,228
ME 31000 DATA 1,93,56,55,62,55,100,9
3,134,67,170,93,210,59,245,
80,280,67,319,93,-1,-1
IO 31100 DATA 1,50,4,52,8,53,14,53,1
9,57,23,58,29,57,39,60,45,6
0,45,93,65,93,65,60,71,60,8
1,57,87,58,91,57,96
AC 31102 DATA 53,104,53,108,52,111,5
0,119,40,125,37,130,30,133,
25,132,18,131,13,131,7,128,
3,124,1,-9,-9
IG 31104 DATA 45,60,47,61,49,63,52,6
2,56,63,58,61,60,59,63,61,6
5,60,-9,-9
MC 31106 DATA 115,45,120,48,125,49,1
34,49,140,54,145,56,155,56,
155,93
AC 31108 DATA 175,93,175,56,185,56,1
90,54,196,49,206,49,211,48,
220,45,223,40,227,35,226,34
,-9,-9
DE 31110 DATA 155,56,159,57,165,56,1
70,57,175,56,-9,-9
BC 31112 DATA 220,45,225,50,234,51,2
40,50,250,54,253,54,253,93,
273,93,273,54,280,52
CJ 31114 DATA 286,51,294,52,300,54,3
07,53,310,51,319,48,-9,-9
EF 31116 DATA 319,48,315,46,312,44,3
10,40,308,36,305,35,300,28,
298,24,299,20,300,17,302,12
,303,6,305,2,308,1,-9,-9
NF 31118 DATA 253,54,259,55,266,54,2
70,55,274,54,-1,-1
KG 31200 DATA 1,1,10,10,30,10,38,18,
43,30,50,54,60,65,65,52,70,
72,72,75,74,80,85,80,90,72,
94,66,123,66,123,55,140,40
IO 31202 DATA 135,24,145,15,160,24,1
80,12,170,40,191,82,200,62,
206,70,213,60,200,40,207,35
,213,43,230,24,240,50
OK 31204 DATA 256,50,260,55,273,30,2

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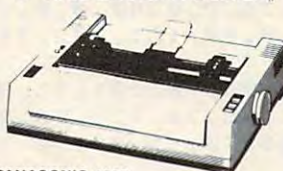
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      80,44,275,60,290,50,295,55,
      300,20,319,1,-1,-1
16 31500 DATA 204,0,0,147,217,0,0,18
      ,204,0,0,91,173,0,0,95,182,
      0,0,90,204,0,0,70
AJ 31502 DATA 217,144,0,25,204,136,1
      02,140,-1,0,0,0
IA 31700 DATA 102,0,0,40,114,0,0,40,
      128,0,0,40,136,0,0,40,0,0,0,
      40,162,108,0,40,153,102,76
      ,80,-1,0,0,0
EL 31800 DATA 162,121,96,70,121,96,8
      1,35,162,121,96,70,121,96,8
      1,35,96,81,60,70,-1,0,0,0

```

Program 2: Commodore 64 Acrobat

Refer to "COMPUTE!'s Guide For Typing In Programs" article before typing this program in.

```

1 POKE55,0:POKE51,0:POKE56,60:POKE52,60:C
  LR:POKE828,0 :rem 155
3 L=54272:FORV=LTOL+24:POKEV,0:NEXT:POKE
  +1,50:POKE+24,143 :rem 128
5 POKE+5,17:POKE+6,0:SY=53253:POKE53252
  ,167:POKE 2042,255:POKE53277,4 :rem 57
7 GOSUB77:GOSUB365:SYS 16436:POKE53265,PE
  EK(53265)OR128 :rem 11
9 GOSUB355:POKE53281,0:POKE53275,4:POKE53
  288,0 :rem 188
11 POKE16645,15:PRINT"{CLR}":SYS 16610:PO
  KE832,0:POKE53289,0:POKE53271,4
      :rem 251
13 POKE53269,7:POKE53248,150:Y=53249:POKE
  Y,173:POKE53280,1 :rem 88
15 PRINT"{HOME}{18 DOWN}{GRN}[40 f]"
      :rem 218
17 LI=3:C=240:D=243:S=1:P=129:POKE828,0:D
  E=0:POKE16404,0:POKE53279,0:SC=0:S1=0
      :rem 1
19 POKE53265,PEEK(53265)AND127:POKE53278,
  0:FM=99 :rem 252
21 FORA=CTOD:POKEV1,A:POKEV2,P :rem 188
23 PO=V3-PEEK(V4):IFPO<V5THENPO=V5
      :rem 188
25 POKEV6,PO:GETA$:IFA$=R$ANDQ<=.THENA=D:
  C=247:D=250:Q=9:S=.9:P=33:S1=5 :rem 65
27 IFA$=J$ANDQ<=.THENA=D:Q=18:S=3:S1=2
      :rem 31
29 IFA$=S$ANDQ<=.THENA=D:C=252:D=252:Q=.4
  :S=.07:P=128:S1=2 :rem 142
31 IF(PEEK(V7)<>V9)OR(PEEK(V8)<>V9)THENSC
  =SC+S1:S1=. :rem 191
33 POKEV2,VA:POKEY,VB-Q:POKESY,VC-Q:Q=Q-S
  :IFQ<=.THENC=240:D=243:Q=0:P=129
      :rem 138
35 IF(PEEK(VD)ANDVF)THEN47 :rem 97
37 U=PEEK(V4)/VE:IFU=INT(U)THENPOKEVG,U+V
  H :rem 247
39 SC=SC+PEEK(VI):POKEVI,. :rem 119
41 IFSC>FMTHENFM=FM+100:LI=LI+1:FORQQ=15T
  O1STEP-1:POKE53280,QQ:NEXT :rem 44
43 IF(PEEK(V7)<>V9)OR(PEEK(V8)<>V9)THENSC
  =SC+S1:S1=. :rem 194
45 NEXT:GOTO 21 :rem 126
47 POKE53265,PEEK(53265)OR128:POKE+6,88:
  POKE53269,3 :rem 5
49 POKE+4,33:FORZ=244TO246:POKE2040,Z:FO
  RTD=1TO75:POKE+1,TD:NEXT:NEXT :rem 28
51 POKE{2 SPACES}L+4,32:POKE+6,0 :rem 67
53 PRINT"{WHT}{HOME}{20 DOWN}{14 SPACES}S

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CORE"SC :rem 183
55 POKE198,0:LI=LI-1:IFLI=0THEN69:rem 255
57 PRINT"{WHT}{DOWN}{11 SPACES}MEN REMAIN
  ING"LI :rem 98
58 FORTD=1TO2000:NEXT :rem 56
59 PRINT"{HOME}{20 DOWN}{39 SPACES}"
      :rem 166
61 PRINT"{DOWN}{36 SPACES}" :rem 73
62 PRINT"{HOME}{2 DOWN}"TAB(12)"HIT SPACE
  BAR":WAIT198,1:PRINT"{HOME}{2 DOWN}"T
  AB(12)"{13 SPACES}" :rem 224
63 POKE 16404,0:POKE53265,PEEK(53265)AND1
  27 :rem 117
65 FORTD=1TO150:NEXT:Q=0:POKE53288,0:POKE
  832,0:POKE53251,0:POKE53278,0 :rem 198
67 POKE53279,0:POKE53269,7:GOTO 25
      :rem 177
69 PRINT"{2 DOWN}{WHT}{4 SPACES}DO YOU WA
  NT TO PLAY AGAIN? (Y/N)" :rem 208
71 GETA$:IFA$<>"Y"ANDAS$<>"N"THEN71
      :rem 205
73 IF AS$="Y"THEN11 :rem 201
75 POKE828,0:SYS828 :rem 116
77 R$="F":J$="J":S$="S":PRINT"{CLR}{WHT}
  {3 DOWN}{15 RIGHT}ACROBAT" :rem 40
79 PRINT"{2 DOWN}{7 SPACES}{RVS}F{OFF}
  {3 SPACES}MAKES THE ACROBAT FLIP"
      :rem 198
81 PRINT"{2 DOWN}{7 SPACES}{RVS}J{OFF}
  {3 SPACES}MAKES THE ACROBAT JUMP"
      :rem 212
83 PRINT"{2 DOWN}{7 SPACES}{RVS}S{OFF}
  {3 SPACES}MAKES THE ACROBAT SLIDE"
      :rem 20
85 PRINT"{3 DOWN}{12 SPACES}HIT E TO EDIT
  KEYS" :rem 160
87 PRINT"{2 DOWN}{10 SPACES}ANY OTHER KEY
  TO START" :rem 230
89 GETA$:IFA$=""THEN89 :rem 5
91 IFA$<>"E"THEN99 :rem 2
92 PRINT"{CLR}{2 DOWN} YOU MUST ENTER LET
  TERS BETWEEN A AND Z" :rem 80
93 PRINT"{2 DOWN}{13 SPACES}KEY TO FLIP?"
  ;:GOSUB600:R$=A$ :rem 50
95 PRINT"{2 DOWN}{13 SPACES}KEY TO JUMP?"
  ;:GOSUB600:J$=A$ :rem 61
97 PRINT"{2 DOWN}{13 SPACES}KEY TO SLIDE?"
  ;:GOSUB600:S$=A$ :rem 125
99 PRINT"{2 DOWN}{13 SPACES}PLEASE WAIT..
  ." :rem 222
101 FORA=15360TO16383:READB:POKEA,B:NEXT
      :rem 199
103 V1=2040:V2=54276:V3=15:V4=828:V5=7:V6
  =16645:V7=1718:V8=1678:V9=32:VA=128
      :rem 52
105 VB=173:VC=164:VD=53279:VE=3:VF=1:VG=5
  1242:VH=49:VI=1000:RETURN :rem 218
107 DATA0,0,0,0,0,0,0,0 :rem 102
109 DATA0,0,0,0,0,28,0,0 :rem 162
111 DATA28,0,0,248,0,3,112,0 :rem 112
113 DATA6,112,0,12,127,0,0,112 :rem 206
115 DATA0,0,112,0,0,112,0,0 :rem 45
117 DATA072,0,0,132,0,0,130,0 :rem 154
119 DATA0,130,0,0,132,0,0,136 :rem 157
121 DATA0,1,4,0,0,128,0,111 :rem 53
123 DATA0,0,0,0,0,0,0,0 :rem 100
125 DATA0,0,0,0,0,28,0,0 :rem 160
127 DATA028,0,0,248,0,1,240,0 :rem 167
129 DATA1,240,0,1,255,0,0,112 :rem 162
131 DATA0,0,112,0,0,112,0,0 :rem 43
133 DATA72,0,0,132,0,0,130,0 :rem 104

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135 DATA1,2,0,2,4,0,4,8	:rem 124	279 DATA0,0,0,0,0,0,0,0	:rem 112
137 DATA0,2,4,0,0,0,0,111	:rem 210	281 DATA0,0,0,0,0,0,0,111	:rem 204
139 DATA0,0,0,0,0,0,0,0	:rem 107	283 DATA0,0,0,0,0,0,0,0	:rem 107
141 DATA0,0,0,0,0,28,0,0	:rem 158	285 DATA0,0,0,0,0,0,0,0	:rem 109
143 DATA28,0,0,248,0,0,240,0	:rem 116	287 DATA0,0,0,0,0,0,0,0	:rem 111
145 DATA0,252,0,0,255,0,0,112	:rem 161	289 DATA0,63,0,12,127,128,6,115	:rem 31
147 DATA0,0,112,0,0,112,0,0	:rem 50	291 DATA128,3,115,128,1,227,128,0	:rem 129
149 DATA72,0,0,136,0,0,136,0	:rem 121	293 DATA238,0,0,14,0,0,0,0	:rem 14
151 DATA1,8,0,2,8,0,4,8	:rem 132	295 DATA0,0,0,0,0,0,0,0	:rem 110
153 DATA0,2,4,0,0,0,0,111	:rem 208	297 DATA0,0,0,0,0,0,0,111	:rem 211
155 DATA0,0,0,0,0,0,0,0	:rem 105	299 DATA0,0,0,0,0,0,0,0	:rem 114
157 DATA0,0,0,0,0,28,0,0	:rem 165	301 DATA0,0,0,0,0,0,0,0	:rem 98
159 DATA28,0,0,248,0,1,112,0	:rem 122	303 DATA0,0,0,0,0,0,0,0	:rem 100
161 DATA2,114,0,4,124,0,0,112	:rem 157	305 DATA0,0,0,0,0,0,0,0	:rem 102
163 DATA0,0,112,0,0,112,0,0	:rem 48	307 DATA0,96,0,0,240,0,0,255	:rem 121
165 DATA96,0,15,192,0,16,64,0	:rem 188	309 DATA248,0,31,254,0,8,133,0	:rem 230
167 DATA0,64,0,0,64,0,0,64	:rem 26	311 DATA7,2,128,0,2,128,0,5	:rem 73
169 DATA0,0,96,0,0,0,0,111	:rem 16	313 DATA0,0,10,0,0,0,27,0,0	:rem 207
171 DATA0,0,0,0,0,0,0,0	:rem 103	315 DATA0,0,0,0,0,0,0,32,224,0,97,16,0,34	:rem 34
173 DATA0,0,0,0,0,28,0,0	:rem 163	8,0,34,8,0,34,8,0,34,8,0,34,8,0,33,1	:rem 11
175 DATA28,0,0,120,0,0,112,0	:rem 108	6	:rem 11
177 DATA0,114,0,0,124,0,0,112	:rem 158	317 DATA0,112,224,0,0,0,0,0,0,0,0,0,0,0,0	:rem 93
179 DATA0,0,112,0,0,112,0,0	:rem 55		:rem 35
181 DATA96,0,0,96,0,0,96,0	:rem 37	319 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	:rem 28
183 DATA0,96,0,0,96,0,0,96	:rem 39	321 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	:rem 129
185 DATA0,0,112,0,0,0,0,111	:rem 51	323 DATA012,0,0,50,7,128,9,8	:rem 234
187 DATA0,0,0,0,0,0,0,0	:rem 110	325 DATA64,6,243,128,2,0,128,1	:rem 54
189 DATA0,0,0,0,0,0,0,0	:rem 112	327 DATA3,0,0,132,0,0,120,0	:rem 16
191 DATA0,0,0,0,0,63,128	:rem 13	329 DATA0,40,0,0,40,0,0,84	:rem 101
193 DATA0,127,192,0,127,248,0,112	:rem 125	331 DATA0,0,0,0,0,0,0,0,0,0	:rem 103
195 DATA56,0,112,56,0,112,0,0	:rem 171	333 DATA0,0,0,0,0,0,0,0,0,0	:rem 105
197 DATA96,0,0,96,0,0,96,0	:rem 44	335 DATA0,0,0,0,0,0,0,0,0,0	:rem 107
199 DATA0,96,0,0,96,0,0,96	:rem 46	337 DATA0,0,0,0,0,0,0,0,0,0	:rem 109
201 DATA0,0,112,0,0,0,0,111	:rem 40	341 DATA0,0,3,255,0,63,255,1	:rem 123
203 DATA0,0,0,0,0,0,0,0	:rem 99	343 DATA255,255,015,255,255,63,255,255	:rem 143
205 DATA0,0,0,0,0,0,0,0	:rem 101		:rem 151
207 DATA0,0,0,0,0,63,0	:rem 160	345 DATA255,255,255,255,255,255,63,255	:rem 191
209 DATA0,127,128,0,127,128,0,115	:rem 122		:rem 178
211 DATA128,0,115,128,0,99,128,0	:rem 76	347 DATA255,15,255,255,1,255,255,0	:rem 103
213 DATA110,0,0,110,0,0,96,0	:rem 103		:rem 105
215 DATA0,96,0,0,96,0,0,96	:rem 35	349 DATA063,255,0,3,255,0,0,0	:rem 92
217 DATA0,0,112,0,0,0,0,111	:rem 47	351 DATA0,0,0,0,0,0,0,0,0,0	:rem 361
219 DATA0,0,0,0,0,0,0,0	:rem 106	353 DATA0,0,0,0,0,0,0,0,0,0	:rem 129
221 DATA0,0,0,0,0,0,0,0	:rem 99	355 REM MOUNTAIN MAKER	:rem 10
223 DATA0,0,0,0,0,0,0,0	:rem 101	357 O=50688:FORA=1TO76:READB:IFB<0THEN361	:rem 6
225 DATA0,63,0,12,127,128,6,115	:rem 21		:rem 37
227 DATA128,3,115,128,1,227,128,0	:rem 128	359 O=O+1:POKEO,78:FORC=1TOB-1:O=O-255:PO	:rem 114
229 DATA238,0,0,14,0,0,0,0	:rem 13	KEO,78:NEXT:NEXT:GOTO363	:rem 129
231 DATA0,0,0,0,0,0,0,0	:rem 100	361 O=O+1:POKEO,77:FORC=1TOABS(B)-1:O=O+2	:rem 10
233 DATA0,0,0,0,0,0,0,111	:rem 201	57:POKEO,77:NEXT:NEXT	:rem 375
235 DATA0,0,0,0,0,0,0,0	:rem 104	363 POKE51238,4:POKE51239,1:POKE51240,25:	:rem 129
237 DATA0,0,0,0,0,0,0,0	:rem 106	RETURN	:rem 38
239 DATA0,0,0,0,0,1,0,0	:rem 109	365 FORA=16384TO16891:READI:POKEA,I:NEXT:	:rem 142
241 DATA1,143,0,0,223,128,0,115	:rem 7	RETURN	:rem 33
243 DATA128,0,35,128,0,195,128,0	:rem 79	367 DATA162,15,169,120,141,23,64,169	:rem 88
245 DATA255,0,0,62,0,0,0,0	:rem 13		
247 DATA0,0,0,0,0,0,0,0	:rem 107	369 DATA4,141,24,64,169,192,141,21	
249 DATA0,0,0,0,0,0,0,111	:rem 208		
251 DATA0,0,0,0,0,0,0,0	:rem 102	371 DATA64,160,39,185,0,0,153,0	
253 DATA0,0,0,0,0,0,0,0	:rem 104	373 DATA0,136,16,247,238,21,64,173	
255 DATA0,0,0,112,0,0,119,0	:rem 57		
257 DATA1,199,128,1,206,192,1,206	:rem 137	375 DATA23,64,24,105,40,141,23,64	
259 DATA96,1,254,48,0,252,0,0	:rem 190	377 DATA173,24,64,105,0,141,24,64	
261 DATA0,0,0,0,0,0,0,0	:rem 103	379 DATA202,208,222,96,32,86,64,169	
263 DATA0,0,0,0,0,0,0,0	:rem 105	381 DATA199,141,22,208,169,16,141,17	
265 DATA0,0,0,0,0,0,0,111	:rem 206		
267 DATA0,0,0,0,0,0,0,0	:rem 109	383 DATA208,169,255,141,15,212,169,128	
269 DATA0,0,0,0,0,0,0,0	:rem 111		
271 DATA0,0,0,124,0,0,255,0	:rem 59	385 DATA141,18,212,169,192,141,21,64	
273 DATA1,195,0,1,196,0,1,206	:rem 180		
275 DATA0,1,251,0,0,0,241,128,0	:rem 167	387 DATA169,0,141,20,64,96,160,0	
277 DATA0,128,0,0,0,0,0,0	:rem 217		


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389 DATA169,32,153,0,192,200,208,250
      :rem 31
391 DATA238,92,64,173,92,64,201,208
      :rem 250
393 DATA208,236,169,192,141,92,64,169
      :rem 105
395 DATA160,141,18,208,169,27,141,17
      :rem 38
397 DATA208,169,127,141,13,220,169,145
      :rem 141
399 DATA141,20,3,169,64,141,21,3 :rem 84
401 DATA169,129,141,13,220,141,26,208
      :rem 69
403 DATA96,234,173,25,208,41,1,240
      :rem 181
405 DATA42,141,25,208,206,22,208,173
      :rem 21
407 DATA22,208,201,192,208,26,238,20
      :rem 23
409 DATA64,173,20,64,201,216,208,8
      :rem 186
411 DATA32,198,64,169,0,141,20,64:rem 135
413 DATA32,0,64,169,199,141,22,208
      :rem 188
415 DATA76,188,254,76,109,65,238,60:rem 6
417 DATA3,173,60,3,74,74,144,18 :rem 41
419 DATA169,255,141,33,65,169,0,32
      :rem 196
421 DATA91,65,169,1,141,41,208,76:rem 141
423 DATA241,64,169,7,32,91,65,169:rem 153
425 DATA192,141,33,65,169,0,141,41
      :rem 183
427 DATA208,32,77,65,160,0,169,41:rem 143
429 DATA133,251,169,206,133,252,32,68
      :rem 87
431 DATA65,24,101,251,105,15,133,251
      :rem 12
433 DATA165,251,201,208,144,1,96,173
      :rem 29
435 DATA27,212,16,35,32,68,65,170:rem 141
437 DATA189,243,65,145,251,173,27,212
      :rem 93
439 DATA201,192,144,214,32,68,65,74
      :rem 246
441 DATA101,251,133,251,32,68,65,170
      :rem 22
443 DATA189,243,65,145,251,208,195,198
      :rem 156
445 DATA252,32,68,65,170,189,243,65:rem 0
447 DATA145,251,208,182,173,27,212,74
      :rem 88
449 DATA74,74,74,74,96,162,0,169 :rem 115
451 DATA32,157,0,206,157,0,205,232
      :rem 173
453 DATA208,247,96,162,0,157,0,216
      :rem 191
455 DATA157,0,217,157,0,218,157,0:rem 136
457 DATA219,232,208,241,96,173,64,3
      :rem 249
459 DATA208,60,173,60,3,201,6,144:rem 134
461 DATA96,74,74,176,92,173,27,212
      :rem 208
463 DATA201,254,144,85,169,254,141,249
      :rem 143
465 DATA7,169,1,141,64,3,173,27 :rem 44
467 DATA212,16,7,169,170,141,3,208
      :rem 189
469 DATA208,5,169,184,141,3,208,169:rem 0
471 DATA80,141,2,208,169,2,141,16:rem 131
473 DATA208,169,1,141,40,208,56,173
      :rem 241

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475 DATA2,208,233,2,144,5,141,2 :rem 26
477 DATA208,208,30,173,30,208,169,255
      :rem 91
479 DATA141,2,208,173,16,208,208,12
      :rem 237
481 DATA169,0,141,2,208,169,0,141:rem 131
483 DATA64,3,240,5,169,0,141,16 :rem 34
485 DATA208,201,145,208,19,173,30,208
      :rem 82
487 DATA41,3,201,3,240,10,169,253:rem 128
489 DATA141,249,7,169,10,141,232,3
      :rem 192
491 DATA76,49,234,42,87,81,88,90 :rem 118
493 DATA83,65,160,255 :rem 71
495 DATA 4,-4,4,-4,4,-4,4,-4 :rem 49
497 DATA 3,-3,4,-4,2,-2,3,-3,2,-2,4,-4,2,
      :rem 253
499 DATA 2,-2,4,-4,4,-3,3,-4,4,-4,3,-3
      :rem 26
501 DATA 3,-3,3,-3,2,-3,3,-2,2,-3,3,-2,4,
      :rem 239
503 DATA 4,-4,2,-4,4,-2,4,-4,4,-2,2,-4
      :rem 12
505 DATA 4,-4,4,-4,4,-4,4,-4,4,-4 :rem 41
507 DATA 4,-4,4,-4 :rem 100
600 POKE198,0 :rem 195
605 GETA$:IFA$<"A"ORA$>"Z"THEN605:rem 123
610 PRINTA$:RETURN :rem 163

```

Program 3: VIC Acrobat, Part 1

Refer to "COMPUTE!'s Guide For Typing In Programs" article before typing this program in.

```

0 POKE52,26:POKE56,26:POKE55,0:POKE51,0:P
  RINT"{CLR}{3 DOWN}{8 SPACES}ACROBAT"
      :rem 233
1 PRINT"{2 DOWN}{5 SPACES}USE THESE KEYS"
      :rem 198
2 PRINT"{2 DOWN}{7 SPACES}{RVS}J{OFF} TO
  {SPACE}JUMP":PRINT"{DOWN}{7 SPACES}
  {RVS}S{OFF} TO SLIDE":PRINT"{DOWN}
  {7 SPACES}{RVS}F{OFF} TO FLIP" :rem 237
3 PRINT"{2 DOWN}{6 SPACES}PLEASE WAIT
  {WHT}" :rem 26
8 FORA=7168TO7679:POKEA,PEEK(A+25600):NEX
  T :rem 33
10 READA:IFA=-1THEN12 :rem 245
11 FORB=7168+A*8TO7175+A*8:READC:POKEB,C:
  NEXT:GOTO10 :rem 177
12 READA:IFA=-1THEN15 :rem 250
13 Q=Q+1:POKE6655+Q,A:GOTO12 :rem 157
15 S$="LO"+CHR$(34)+"AC"+CHR$(34)+",8:"+C
  HR$(131):REM CHANGE 8 TO 1 FOR TAPE
      :rem 52
16 FORI=1TOLEN(S$):POKE630+I,ASC(MID$(S$,
  I)):NEXT:POKE198,I:END :rem 94
21 DATA23,0,12,12,24,24,28,30,14 :rem 54
31 DATA24,12,10,10,10,18,50,34,1 :rem 48
41 DATA25,0,0,6,6,8,29,46,76 :rem 140
51 DATA26,12,12,12,60,72,8,8,12 :rem 19
61 DATA27,0,0,3,3,30,44,76,143 :rem 224
71 DATA28,12,10,17,18,20,18,32,16:rem 120
81 DATA29,0,0,6,6,4,28,28,30 :rem 133
91 DATA30,140,10,18,17,34,68,130,64
      :rem 225
101 DATA33,0,28,62,51,27,12,120,0:rem 105
111 DATA34,0,64,76,94,118,38,28,24
      :rem 189
121 DATA35,0,30,48,216,204,124,56,0
      :rem 214
131 DATA36,24,56,100,110,122,50,2,0

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:rem 200
141 DATA37,192,192,124,62,3,2,4,8:rem 130
151 DATA38,36,24,255,133,135,133,135,255
:rem 227
161 DATA39,60,124,205,255,252,207,125,60
:rem 222
171 DATA40,63,71,253,133,133,133,134,252
:rem 216
181 DATA41,60,126,223,127,63,255,126,60
:rem 173
191 DATA42,4,6,5,4,116,252,248,112
:rem 177
201 DATA43,195,231,126,60,60,126,231,195
:rem 220
211 DATA44,24,24,102,102,24,24,60,0
:rem 202
221 DATA45,0,60,126,126,126,126,60,0
:rem 8
231 DATA46,1,2,4,8,16,32,64,128 :rem 26
241 DATA47,128,64,32,16,8,4,2,1 :rem 28
251 DATA58,127,251,192,192,192,192,192,22
4 :rem 85
261 DATA59,120,252,204,196,220,220,192,22
4,-1 :rem 201
271 DATA169,30,133,252,169,44,133,251
:rem 82
281 DATA162,16,160,1,177,251,136,145
:rem 28
291 DATA251,200,200,192,22,208,245,189
:rem 125
301 DATA60,3,136,145,251,24,165,251
:rem 225
311 DATA105,22,133,251,165,252,105,0
:rem 7
321 DATA133,252,202,208,221,96,169,32
:rem 75
331 DATA160,16,153,60,3,136,16,250
:rem 173
341 DATA173,240,3,201,6,208,18,173
:rem 177
351 DATA241,3,201,46,208,3,238,240
:rem 174
361 DATA3,169,46,141,241,3,76,113:rem 135
371 DATA26,201,15,208,18,173,241,3
:rem 178
381 DATA201,47,208,3,206,240,3,169
:rem 182
391 DATA47,141,241,3,76,113,26,32:rem 133
401 DATA148,224,165,141,16,231,76,63
:rem 29
411 DATA26,173,241,3,172,240,3,153
:rem 173
421 DATA60,3,206,242,3,208,36,32 :rem 73
431 DATA148,224,165,141,74,74,74,74
:rem 249
441 DATA74,168,24,109,243,3,141,242
:rem 235
451 DATA3,74,144,9,185,167,26,141:rem 146
461 DATA61,3,76,163,26,185,167,26:rem 150
471 DATA141,62,3,32,0,26,96,38 :rem 242
481 DATA39,40,41,42,43,44,45,-1 :rem 28

```

Program 4: VIC Acrobat, Part 2

Refer to "COMPUTE!'s Guide For Typing In Programs" article before typing this program in.

```

0 B1=48:B2=50:B3=9:B4=8039:B5=8061:B6=670
2:B7=36879 :rem 254
1 GOSUB500:GOTO5 :rem 238
2 PRINT"{HOME}{WHT}{2 SPACES}SCORE"SC"
{3 SPACES}MEN"LI:RETURN :rem 0

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5 POKE36879,8:POKE1008,9:POKE1009,47
:rem 58
10 GOSUB160:POKE36878,15:POKE36869,255
:rem 196
15 C=1:D=4:T=240:D1=8041.1:D2=8063.1:Z=32
:Y=37:LI=3:FL=-1:V1=36876:V2=36877
:rem 204
17 SC=0:GOSUB2 :rem 87
20 PRINT"{HOME}{2 DOWN}{3 SPACES}PRESS SP
ACE BAR":WAIT198,1:PRINT"{HOME}
{2 DOWN}{19 SPACES}":GOSUB 165 :rem 58
25 FORA=CTOD:OQ=Q:OW=W:IFA<5ORA>8THENR1=P
EEK(D2+W-Q):POKED2-Q+W,L%(A,2):rem 236
30 IFA<>B3THENR2=PEEK(D1+W-Q):POKED1+W-Q,
L%(A,1) :rem 103
35 POKEV,T:GETA$:IFA$="J"ANDQ<=.THENA=D:D=
=22:R=3:S1=2:T=0 :rem 241
37 IFG/B2=INT(G/B2)THENW=W+1:IFW>11THENW
=11 :rem 219
40 POKEV,,:IFA$="F"ANDQ<=.THENA=D:C=5:D=8
:Q=.1:S=.025:S1=8:V=V1 :rem 19
45 IFA$="S"ANDQ<=.THENA=D:C=9:D=9:Q=.1:S=
.03:S1=2:T=0 :rem 126
50 IFPEEK(B4)<>ZORPEEK(B5)<>ZTHENSC=SC+S1
:S1=0:GOSUB2 :rem 116
60 IFR1>YORR2>YTHENA=D:FL=. :rem 243
65 G=G+1:IFG/B1=INT(G/B1)THENPOKEB7,B3
:rem 30
75 Q=Q-S:IFQ<=.THENQ=.:C=1:D=4:T=245:V=V2
:rem 12
80 R=R-1:IFR=.THENQ=. :rem 24
85 IFA<5ORA>8THENPOKED2-OQ+OW,Z :rem 254
90 IFA<>B3THENPOKED1+OW-OQ,Z :rem 31
95 SYSB6:NEXT:POKEB7,8:IFFLGOTO25:rem 159
100 POKE8040,32:POKE8062,32:FL=-1:POKE804
0+W,32:POKE8062+W,32:R1=0:R2=0:rem 55
105 POKE8041+W,32:POKE8063+W,58:FORU=180T
O110STEP-1:POKEV1,U:IFU=145THENPOKE80
63+W,59 :rem 198
110 NEXT:LI=LI-1 :rem 208
111 FORJ=38805TO38805++W:POKEJ,2:FORR=1TO
3:FORTD=250TO255:POKEV1,TD:NEXT:SC=SC
+10 :rem 81
114 GOSUB2:NEXT:NEXT:POKEV1,0:IFLI=0THEN1
20 :rem 19
115 GOTO20 :rem 50
120 POKE36879,8:GOSUB2 :rem 35
130 PRINT"{HOME}{20 DOWN}{6 SPACES}GAME O
VER" :rem 34
135 PRINT"{DOWN} S TO START Q TO QUIT";
:rem 113
140 GETA$:IFA$<>"S"ANDA$<>"Q"THEN140
:rem 36
145 IFA$="S"THENRUN :rem 134
150 POKE828,0:SYS828 :rem 158
160 FORA=1TO9:READL%(A,1),L%(A,2):NEXT:RE
TURN :rem 223
165 PRINT"{CLR}{18 DOWN}{GRN}((((((((((((
((((((((("W=0:GOSUB2 :rem 170
170 POKE1010,30:FORA=1TO22:SYS6702:NEXT:R
ETURN :rem 138
175 DATA23,24,25,26,27,28,29,30,33,32,34,
32,35,32,36,32,32,37 :rem 223
500 POKE36869,240:POKE36879,8 :rem 116
505 PRINT"{CLR}{4 DOWN}{WHT}{2 SPACES}CHO
OSE DIFFICULTY":PRINT"{DOWN} (1-3) 1
{SPACE}IS THE MOST":PRINT"{DOWN}
{2 SPACES}DIFFICULT" :rem 160
510 GETA$:IFA$<"1"ORA$>"3"THEN510 :rem 58
520 PRINT"{CLR}":POKE1011,VAL(A$)+2:POKE3
6869,255:RETURN :rem 164 ©

```


Dinosaurs

M. C. Ware

Requirements: Apple II-series with at least 48K RAM and a disk drive, or a Commodore 64 with a disk drive.

Many computer programs targeted at preschoolers have been disappointing: They either teach alphabet letters or numbers, or merely "do something" for each keypress.

But *Dinosaurs* is different. It's a set of educational games designed for children 2½ to 5 years old which is significantly more interesting than many earlier programs.

Dinosaurs comes in a slip-case containing a disk, an instruction booklet for parents, descriptions of the games, some suggestions for additional (noncomputer) activities for the children, and primary-level reading material about dinosaurs.

When Katherine, my tester, arrived, I had the disk booted and the colorful title screen showing on the monitor. Katherine appeared to enjoy the title page, which is complete with a large dinosaur. I advanced to the menu screen by pressing RETURN. The five choices are arranged by difficulty, and each is represented on the menu by a picture indicating what the game is about.

Identifying Dinosaurs

In the first game, there are five dinosaurs across the top of the screen and a simple scene (trees,

land) below them. One dinosaur then appears in the bottom scene and rises to an area just below the silhouettes. The child's task is to line up the dinosaur with the matching picture (using left and right arrow keys) and then press RETURN.

When all five dinosaurs have been matched, dinosaurs parade across the bottom of the screen, accompanied by unusual music. If uninterrupted, the same game begins again. If you don't want the same game, a keypress returns you to the menu. To save time, I made all the menu selections in my trial with Katherine.

We went immediately to the second game (which became Katherine's favorite). In this one, the child must distinguish herbivores from carnivores. The screen shows a pile of bones and a pile of plants. When a dinosaur appears, the child must move it one step to the right (for bones) or one step to the left (for plants), then press RETURN. If the child selects correctly, the dinosaur gets a bite of dinner. This game has the best animation of all the games in the package.

Matching The Habitats

The third game reveals a scene with land, water, and air. After a dinosaur appears, the goal is to move it to its proper habitat. To move a dinosaur to another setting (that is, air for the pteranodon and water for the ichthyosaurus and brontosaurus), you press the left and right arrow keys. After each correct answer, the dinosaur briefly moves back and forth in its environment.

However, there are two

problems with this game. First, the dinosaur originally appears on land, but the scene looks more like an underground tunnel. In fact, Katherine often said "underground" when I asked her where something lived. Second, the creatures have all been designed facing to the right. They parade from left to right, in part to reinforce the child's reading patterns, but any child knows that when something swims or flies back and forth, it turns rather than just going forward and backing up.

The fourth game, though touted as more complex, does not actually seem so—at least not without adult intervention. Several rotating windows at the top of the screen randomly reveal dinosaurs (slot machine-style) until each window stops. There will be one, two, or three windows with matching dinosaurs. A scene appears at the bottom, showing an opening to a cave or tunnel. The opening shows a random parade of dinosaurs moving by, one at a time. When the child sees a match, he or she is supposed to press the RETURN key. Then the dinosaur hops up and appears at the top of the screen. The child continues until all the windows are full. Then another parade of dinosaurs marches by as a reward.

With adult intervention, the child could be encouraged to count the windows, thus revealing how many matching dinosaurs are needed. When all are matched, the child could be asked to count them all, or count the pairs. Without such assistance, however, this is not significantly different from the first game.

The last game also involves trial and error, unless the child already knows something about dinosaurs and the alphabet. This time the child must position a bouncing ball above a dinosaur whose name is shown on the screen. If correct, the name and dinosaur move to the bottom of the screen. When all are matched, the reward is, once again, a dinosaur parade.

Extra Activities

As mentioned above, *Dinosaurs* includes a set of pictures to color, some easy-reading text about the dinosaurs, and a list of additional activities. It's hard to imagine many parents wanting to tackle some of these activities (for example, making mock fossils with plaster of Paris). However, they might be useful in a preschool setting.

Like most educational programs for the very young, *Dino-*

saurus requires an adult to get the program up and running. However, some children could probably learn to use it independently or semi-independently after an adult carefully introduces it.

As a home-educational package, *Dinosaurs* would serve families with children aged 4 to 7, and younger children may also want to try it. If you're buying it for home use, you should realize that (as with many educational programs for young children) you should spend some time encouraging the child, clarifying the games, and reinforcing the learning. Overall, *Dinosaurs* is a worthwhile package.

Dinosaurs
Advanced Ideas, Inc.
2550 Ninth Street, Suite 104
Berkeley, CA 94710
\$34.95 Commodore
\$39.95 Apple

©

share the same data files. Also, the three application programs are compatible with *AtariWriter* so that data can be embedded within reports and cosmetically formatted. However, in the wake of Jack Tramiel's purchase of Atari, Synapse will be distributing the entire Syn Series after all.

Let's take a closer look at these programs' strengths and weaknesses.

SynFile+

SynFile+ is an outgrowth of two previous Synapse data base programs. The original one, *FileManager 800*, has been around for several years. It was fairly easy to use but lacked sophisticated features such as field totaling. This problem was addressed by the improved program, *FileManager+*, which became quite popular.

SynFile+ shares many features with the earlier programs, but has been totally rewritten in Forth, resulting in faster sorting and record access. Also, it uses the full 48K of memory to add significant features (the new XL computers have 64K, but Synapse apparently wanted to keep the program compatible with older Ataris as well).

SynFile+ is totally menu-driven and memory-resident. It is very easy to use and does not require you to swap disks when accessing different functions of the program. One of the more useful new features is that your data file disk can be formatted in any of three disk densities: single density, Atari 1050 enhanced density, and true double density. Choosing enhanced or double density allows you to store more records on the disk than allowed by previous versions of the program. You can store your data on up to 16 disks—a lot of capacity, but also a lot of swapping.

There are other new and useful features in *SynFile+*. Mailing labels can now be

The Syn Series For Atari: *SynCalc, SynTrend, And SynFile+*

Arthur Leyenberger

Requirements: Any Atari computer with at least 48K RAM and a disk drive. Part of SynTrend also requires Atari BASIC.

It was a year and a half ago that Synapse announced the Syn Series of software at the June 1983 Summer Consumer Electronics Show (CES). This very ambitious collection of software was going to include programs for word processing, data base management, spreadsheets, telecommunications, stock charting, graphics, and calendar-keeping. All of the programs were going to use similar file structures so they could share data. Prototypes of several of the programs

were shown, and they looked easy to use and full of features.

By January 1984, at the Winter CES in Las Vegas, Synapse had struck a deal with Atari for the three major programs in the series. *SynCalc*, *SynTrend*, and *SynFile+* would be produced by Synapse and marketed exclusively by Atari. The word processor, *SynText*, was canceled to keep it from competing with Atari's *AtariWriter*, and Synapse was free to market the remainder of the Syn Series on its own.

After a long wait, the spreadsheet, graphics, and data base programs are finally available. As promised, *SynCalc*, *SynTrend*, and *SynFile+* can

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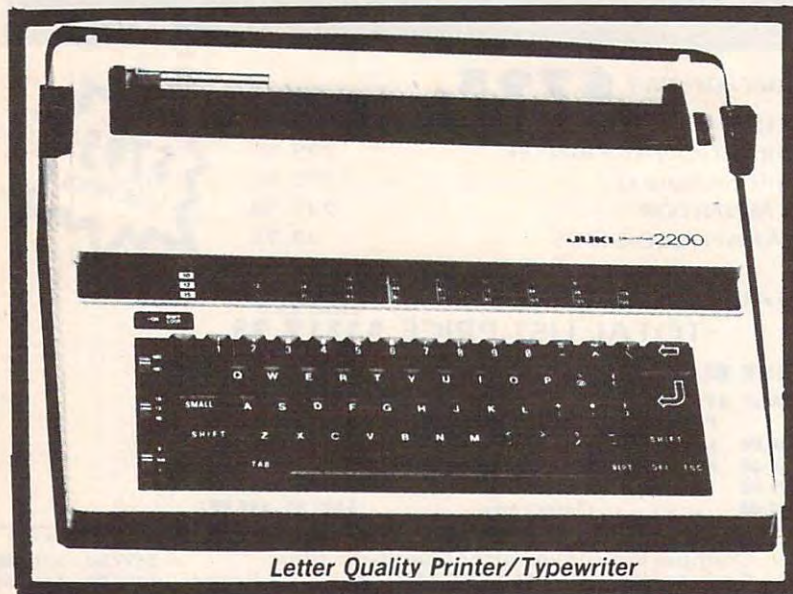
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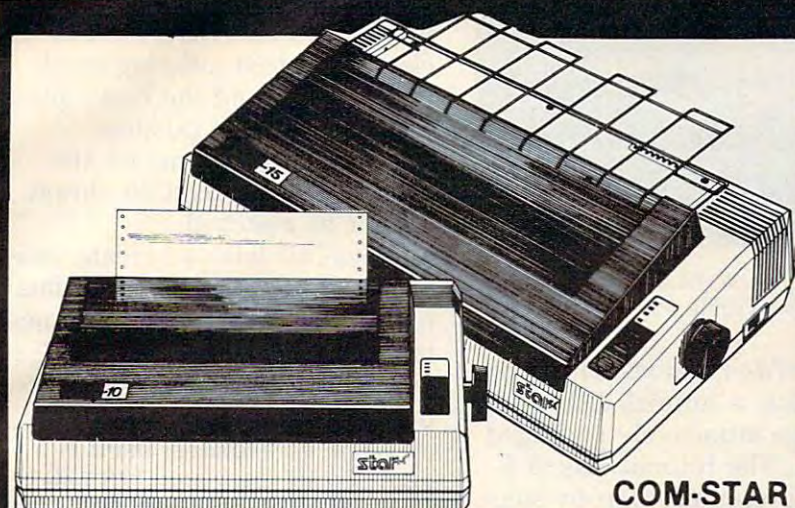
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ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890**

printed from one to four labels across. When setting up labels or reports, the screen can be scrolled horizontally up to 232 characters. The print format line is a template for specifying the horizontal layout of your report. The location of field names under the print format line determines how the columns will be placed horizontally. You can use up to 40 field names.

Another worthwhile feature of *SynFile+* is that it can read and write data files in DIF (data interchange format). This lets you pass your data base information to such programs as *SynCalc*, *SynTrend*, and *VisiCalc*. Also, you can bring DIF data into *SynFile+*. In addition, when creating a report or mailing list, you can direct the output to the screen, printer, or a text file on disk. This text file has a .TXT name extension and can be accessed by *AtariWriter*.

Versatile Field Types

SynFile+ contains quite a few new field types. In addition to the usual text, numeric, computed, and dollar fields, conditional and table lookup fields are allowed. Conditional fields contain a code that is cross-referenced to a text entry. Based upon the value of a previously specified relationship, one of several text entries will be printed in your report. Similarly, table lookup fields contain a code that is cross-referenced to a list of previously defined alternatives. At report time, the matching table entry is printed instead of the particular code.

Other new field types include record numbers initially assigned and incremented by the computer, counters (similar to record numbers except you specify the starting value and the increment), and the date. Once a date has been entered, it will automatically appear on succeeding records so you don't have to enter it for each record. A handy feature.



Retrieving a record with Synapse Software's *SynFile+*.

SynFile+ comes with a program disk, a tutorial disk, and a 121-page attractively packaged manual. The tutorial disk is a clearly presented, step-by-step introduction to all aspects of the program. The manual is well-written and contains such useful features as a quick reference card, glossary, and index.

SynFile+ does have some inadequacies, though. First, it cannot read previously created *FileManager 800* and *FileManager+* files. If you're converting to *SynFile+*, you have to retype all of the data into the new program. Fortunately, Synapse is working on a utility that will convert the older format files into *SynFile+* format and also provide backups. It's expected to be available late this year.

Another weakness is that *SynFile+* has no report-writer function to let you generate multiple sublevels in a report, each with its own subtotal. Again, Synapse promises a utility/enhancement disk by the end of the year with a sophisticated report generator.

These few complaints aside, *SynFile+* is an excellent data base program for the Atari computer. Its compatibility with the other Syn series software, ease of use, and number of new features make it definitely worthy of consideration for Atari users seeking a quality data base manager. *SynFile+* also works automatically with the Axlon 128K Rampower and Mosaic 64K Select boards.

SynCalc

Of the three Syn Series programs reviewed here, *SynCalc* is clearly the best, offering excellent features and the best value. Compared to the existing spreadsheet programs for the Atari computer, *SynCalc* simply cannot be matched.

SynCalc lets you create various worksheets of text and data for such applications as income taxes, budgets, checkbook balancing, forecasting, and preparing tables.

The spreadsheet itself is a grid of 255 rows and 128 columns, forming over 32,000 cells for entering data. Each cell can contain text, numbers, or a formula. As numbers are entered, results are recalculated and displayed instantly.

Text and data can be easily manipulated throughout the grid. Formulas, numbers, and labels can be copied from one position to other positions. Two parts of the spreadsheet can be viewed simultaneously by using the vertical and horizontal split-screen feature.

What makes *SynCalc* especially attractive is its ease of use. Pop-up menus display the current mode and available functions. With experience, you can eventually issue direct commands without referring to the menus.

When using the menus, the commands are always displayed at the top of the screen. For example, to copy cells A1 through A5 to locations B1 through B5, you'd have to select a total of six menu entries. Alternatively, you can type /C A1:A5 B1:B5. You can type cell addresses directly or move the cursor to a cell and press RETURN.

Flexible Formatting

There are several features unique to this spreadsheet program for the Atari computer. Variable-width columns let you format and display your

worksheet more flexibly. If a particular cell's contents exceed the width of the column, you can still display the entire entry. This text overflow feature may be turned off if desired. Cells can be justified left, right, or centered. If you change column widths, the justifications are automatically readjusted.

Numeric cells can be displayed in a variety of formats: Fixed-point, floating-point, engineering, and scientific notation, each with up to ten decimal places displayed. A leading dollar sign can be added and commas inserted to make large numbers more readable. There are just too many format options to describe here.

A very powerful feature of *SynCalc* is the ability to sort data entries in alphabetic or numeric order. Sorts can be either ascending or descending. Once you define the block of cells to be sorted, you specify a column for sorting and the upper-left cell of the destination block. Although *SynCalc* can sort on only one column, you can perform multiple sorts by repeating the process.

SynCalc also lets you use one- or two-drive systems; select menus and filenames by pressing just the cursor key (without the CONTROL key); and perform table lookups, conditional tests, and statistical functions. Also, you can format disks from the main menu and save worksheets in either DIF format (for use with *SynFile+* and *SynTrend*) or text format (for use with *AtariWriter*). I've used the *AtariWriter* output feature many times and think it is one of the best features of *SynCalc*.

The 148-page manual is divided into introductory, tutorial, reference, and index sections. Screen shots help clarify examples, and a quick-reference card is included.

SynCalc is an excellent product. It has many more features than *VisiCalc* and is much easier

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Setting up a home budget spreadsheet with *SynCalc*.

to use. The ability to access *VisiCalc* files and to integrate with the other Syn products and *AtariWriter* makes *SynCalc* a "must-have" program for nearly everybody. Once you start using the program, you'll find more uses for it than you expected.

SynTrend

SynTrend is actually composed of two separate programs, *SynGraph* and *SynStat*. *SynGraph* is a high-resolution, color-graphing program, and *SynStat* is a statistical program for analyzing trends in your data. The package comes with two program disks and a two-section manual.

SynGraph can be used to create four different types of graphs: line plot, bar chart, scatter plot, and pie chart. It will accept data in *SynStat*, *SynFile+*, *SynCalc*, and *VisiCalc* file formats. Once generated, graphs can be saved to a disk and printed.

SynGraph requires BASIC and works with either one or two disk drives. Working with the program is essentially a two-step process. First, you compile the data files that will be used to create the graphs. Second, you choose the type of graph to make.

The line graph, scatter plot, and bar chart can each display up to three different factors (sets of data). Each factor must exist in a separate data file. The pie chart is created from a single data file, and compares the data points against others within the

same file. You can choose labels for titles, X-Y axes, factor names, and pie chart slices. X-Y coordinates may be displayed in either whole numbers or decimals.

Specific scales can be entered for all but the pie charts. When displaying line and scatter plots, autoscaling results in numbers in integer format and divisions of 5 and 10 for X and Y, respectively. Autoscaled bar graphs yield decimal format numbers, Y divisions of 10, and a cluster pattern. A cluster pattern places the factors (a maximum of three) next to each other along the X axis, whereas a stacked pattern places the factors atop each other. Any of the graphs can be rescaled at any time.

Labeled Pie Charts

Pie charts may contain up to 12 slices and are used for graphing one factor. Each slice is labeled (up to seven characters) with its percentage of the whole. If you don't name the slices, the program defaults to labeling them A, B, C, etc.

The strengths of *SynGraph* are the ease of entering and editing the data and creating the graphs, and the straightforward documentation. Also, the ability to save graphs for future use and a slide-show program that can recall the saved graphs in sequence are useful features.

Unfortunately, *SynGraph* has a few weaknesses. Files cannot be deleted, renamed, or catalogued without exiting to DOS. The only printers it supports are those from Epson, NEC, and C. Itoh. There is no support for Okidata printers, and problems have been reported using the C. Itoh 8510 Prowriter. Synapse is aware of these problems and is working on a fix. And finally, the program requires the BASIC cartridge but does not alert users of the older 800 and up-graded 400 computers if they forget to plug it in.

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Overall, SynGraph is a usable program for graphing data, assuming you have a compatible printer. Its ability to access *SynCalc*, *SynFile+*, and *VisiCalc* data make it more than just another graphics program.

SynStat

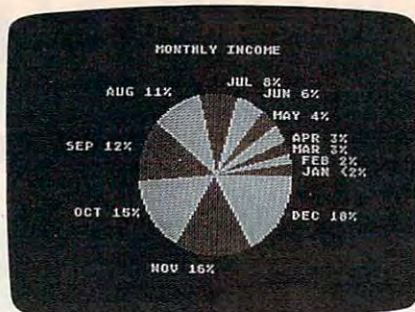
SynStat is a completely menu-driven program for manipulating and analyzing data. You have a choice of descriptive analysis, or simple or multiple regression analysis. Up to four disk drives may be used.

Since SynStat can read or write DIF format files, you can analyze *VisiCalc* data and use *VisiCalc* to read files created with the SynStat data editor. Also, you can format disks directly from the main menu without going to DOS.

The data editor contains several useful commands for transforming columns. Data in one column may be added to data in a second column, with the results appearing in a third column. Likewise, columns of data may be subtracted, multiplied, or divided and the results placed in a third column. You can add or multiply columns by a constant, with the results replacing the original numbers. The natural logarithm of a column of data can also be obtained.

SynStat's descriptive analysis displays eight pieces of information: The number of observations, minimum and maximum values, the range of values, the average, standard deviation, variance, and the standard error.

Regression analysis is a common statistical technique to confirm or deny a hypothesis concerning the relationship between two or more variables. A separate file is used for the independent and dependent variables, and they must contain exactly the same number of observations. SynStat first displays a summary of the data. The coefficient and standard error of



A proportioned pie chart created with SynGraph.

the estimate are given for each of the variables. It also displays an overall r-squared (coefficient of determination), adjusted r-squared, and standard error.

If you use two independent variables, SynStat displays a screen of partial correlation coefficients. This information is used to determine how closely the two independent variables are related to each other. The final screen is called the residual analysis screen. Here the actual, predicted, and residual values are shown for the data being analyzed.

The documentation contains some tutorial information on regression analysis, but you should already be familiar with the topic before using the program. Any introductory statistics textbook should do.

The SynStat manual contains a glossary and index in addition to its tutorial and reference section. Since SynStat is part of the *SynTrend* package, careful thought should be given to its usefulness in meeting your needs.

Syn Series Quality

As a whole, *SynFile+*, *SynCalc*, and *SynTrend* represent quality software for the Atari computer. Each has useful features, such as rapid cursor movement and straightforward menu screens, and is easy to use. Their ability to share data with each other and to work with *AtariWriter* are valuable assets. The only feature one might wish for is 80-column capability with the Bit-3 and Austin-Franklin 80-column boards. According to Synapse, there will be new versions of the programs that will work with Atari's 80-column board in the 1090XL expansion box, when or if the box is released. These programs have taken a long time to finally arrive, but the wait has been worth it.

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PC-Write is not commercial software in the usual sense. It is distributed via the *shareware* concept. You're allowed to copy and share the *PC-Write* disk, which contains both the programs and documentation. Indeed, such copying is encouraged, because it's the primary means of distributing the program.

If you don't know anyone who can share *PC-Write* with you, it is available from many user groups, bulletin board systems, and from the publisher, Quicksoft. Quicksoft charges a minimal \$10 fee to cover the cost of the disk, postage, and handling. That's a price that is hard to beat.

However, shareware—or user-supported software, as it is also known—is not just an exercise in altruism. Rather, it is a marketing approach that some software authors developed as an alternative to the more traditional channels of commercial software distribution. Its proponents like to compare it with public television. Under the shareware concept, quality software is made freely available to the public without obligation. You can make as many backup copies as you want and try out the program at your leisure. If, after using the program for a while, you decide that it's suitable, you're encouraged to support the efforts of the software developer by making a voluntary contribution. Though a specific amount is usually suggested, any contribution is appreciated.

Chain-Letter Software

PC-Write gives the shareware concept a special twist. If you're satisfied with *PC-Write*, you're asked to register your copy of

the program by sending \$75 to Quicksoft. This \$75 fee is rather modest compared to the price of comparable word processors, and it buys you more benefits than you usually get with commercial software. You receive not only a copy of *PC-Write* personalized with your registration number and a bound manual, but also a telephone number you can call with questions about the software, a copy of the Pascal and machine language source code, and the next major update of the program.

The personal registration number is the key to the most unusual benefit. Whenever you share your personalized copy of *PC-Write* with someone, their copy will bear your registration number. If that person subsequently registers *PC-Write*, Quicksoft mails you a \$25 commission. There's no limit to the number of commissions you can earn. Therefore, an aggressive registrant can actually make money by distributing the program to friends and associates, like the software equivalent of a (legal) chain letter.

As attractive as this innovative marketing concept sounds, it is bound to generate some skepticism about the quality and commercial value of the program. You get what you pay for, right? Well, not always.

First, *PC-Write* was programmed by a pro. Designer Bob Wallace has been writing text editors since 1969. He has a master's degree in computer science and worked for Microsoft for a number of years, where he wrote much of the MS-Pascal compiler and runtime package. (*PC-Write* and many other commercial programs are written in MS-Pascal.)

Second, a careful examination of *PC-Write* bears out Wallace's observation that in order to make money from voluntary contributions, a program must be very good indeed.

Separate Editor And Printer Driver

Like all word processing programs, *PC-Write* lets you enter, edit, and format text to print it exactly the way you want it. Unlike most word processors, however, *PC-Write* splits these functions between two separate programs to save memory. This requires you to save your file, exit the editor program, and then load the printer driver program before you can print your document. Fortunately, if you have more than 128K of memory and are using DOS 2.0 or higher, you can keep the editor and your text in memory while running the printer program.

The editor program does most of the real work. It lets you enter text and format the appearance of each line on the screen. All the usual capabilities are supported, such as adjustable margins, centering, and right-margin justification. The *PC-Write* printer driver is used only to divide these lines of text into pages and to properly place headers and footers. Except for special features such as boldfacing, underlining, and subscripts, your text is printed exactly as it looks on the screen. Any line length can be specified, but only 80 columns will appear on the screen at once. To see widths greater than 80 characters, you must scroll the text window right or left.

The editor portion of *PC-Write* is responsive and very powerful, boasting a wide range of features. You can enter text in either insert mode (new characters make room by pushing old characters to the right), or overstrike mode (new characters replace old characters). You toggle between the two modes with the Scroll Lock key on the PC or the Function-S combination on the PCjr.

The wide range of cursor control commands is very logically assigned to the special

keys on the IBM keyboard or to double-key combinations. For example, the left and right arrow keys by themselves move the cursor left or right one character; when pressed with a Shift key, they move the cursor to the left or right of the screen; and when pressed with Shift and Control, they move the cursor left or right one word. Other combinations let you move the cursor to the top or bottom of the screen, the beginning or end of the document, forward or backward one paragraph, and allow you to scroll the whole screen up or down one line or page at a time. You can even mark the current cursor position so you can return there later by pressing another double-key combination. In addition, the program internally numbers each line of text. You can see the current line number by pressing Shift-F9 and jump directly to another line by entering its number.

For all of the editing commands, *PC-Write* makes special provisions for the PCjr keyboard so multiple keystrokes aren't required to emulate the full PC keyboard.

On-Line Help Screen

Since so many cursor commands may be a little hard to keep track of, pressing the F1 key brings up a help screen that details all of the special key assignments. You can customize the program, too—permanently assigning any command sequence to one of the Control key combinations. That way, if you are already used to another word processor, you can set up *PC-Write* to emulate it (the default assignments correspond to those used by *WordStar*).

PC-Write also lets you move the cursor to a specific word or series of words using the Search command. You merely designate a search string by pressing F9 and typing in the word or phrase. From then on, a single

keypress moves the cursor either forward or backward to the next occurrence of that string in the document. You can even use certain wild card characters in your search string. An F5 character will match any letter or digit, an F6 will match any character except a letter or number, an F7 will match any one character, and an F8 will match an end-of-line character. For example, the search string "comput[F5]" could be used to find both "computer" and "computing"

You can also designate a replacement string. Hitting the F10 key replaces the next occurrence of the search string with the replacement string, and Shift-F10 replaces all occurrences of the search string within the text. There is even an *unreplace* feature so you can switch them back in case you made a mistake!

PC-Write makes it easy to delete, move, and duplicate text. There are single-key commands for deleting a character, a word, or a line. For deleting or moving larger blocks of text, the F6 key lets you start defining sections of your document (this text appears in inverse video). You can use all of the program's powerful cursor movement keys to extend the defined area. For example, a whole paragraph can be marked by pressing F6 and Control-PgDn (next paragraph). When you've defined the paragraph, you can delete it by pressing a single key.

Whenever you delete more than one character at a time, the erased text is moved to a holding area so it can be inserted somewhere else. This feature can also be used to retrieve text that was removed by mistake. Defined blocks can be saved on disk or printed out, and text can be merged into a document from a disk file. You can also duplicate a defined block of text elsewhere in the document.

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Convenience Features

In addition to its clean implementation of standard editing features, *PC-Write* contains many nice extras which are usually found, if at all, in only the most comprehensive (and expensive) word processors. There is a single keystroke combination which transposes two letters, rather than making you delete one letter, move the cursor, and type it in again. Likewise, the F8 key switches lowercase letters to uppercase and vice versa.

When loading a file, the program lets you choose whether you want an automatic backup file created. A keyboard macro feature lets you define any key or combination of keys as any series of characters. This means you can insert commonly used phrases, such as your name, with a single keystroke. It also means you can customize the program's command sequences to make them easier to remember, and frequently used combinations of these commands can be available by pressing one key. The keyboard macros can even be made a permanent part of the *PC-Write* editor by saving them in a disk file.

The level of customization possible with *PC-Write* is truly staggering. You can create special characters which will send any sequence of command codes to the printer, allowing you to create overstrike characters or even dot-matrix graphics characters. You can designate how special characters will appear on the screen, so that underlined text, for example, can be displayed in boldface, inverse, or blinking characters. If you're using a color monitor, you can set the foreground and background colors for regular text, marked text, text which appears between printer control characters, and the status line.

If you're a programmer, the

possibilities are endless. Because you can obtain the source code for *PC-Write* by registering your copy, virtually any modification can be made.

Excellent Support

The author's commitment of support is as important as the program's many fine features. One of the advantages of the shareware system is that it opens up dialogue between the software author and users. You can report bugs and suggest improvements, and the unconventional method of distribution frees the author to make changes as often as he wishes. *PC-Write* has undergone a number of revisions within a short period of time. Some of the more recent enhancements include the keyboard macros and the special font characters for turning on boldfacing and underlining.

Inevitably, there are still

some features of *PC-Write* that aren't perfect. Even if your computer has enough RAM (at least 128K) to hold both the editor program and printer driver in memory at once, you still can't switch back and forth. It's also inconvenient to have to exit the editor to DOS whenever you need to see a disk directory. And it would be nice if microspace justification were added to the printer driver.

These problems are less important, however, when viewed in context of the program's overall excellence. Moreover, because of the ongoing support of *PC-Write*, there is a pretty fair chance that even these flaws will be cleaned up in a future revision.

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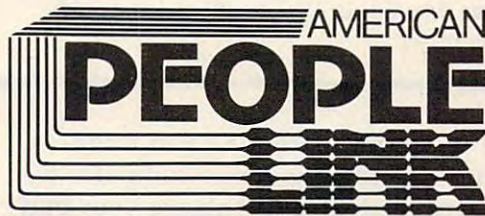
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Plus/Term For VIC & 64

Gregg Peele, Assistant Programming Supervisor

Here's a top-notch terminal program that lets you access almost any computer or information service over the phone with your Commodore 64 or VIC-20. Its features include key redefinition, word wrapping, 1200 bps support, uploading, and downloading. Written in BASIC and machine language, the program works on any 64 or VIC with at least 16K RAM and a modem.

There's a lot more out there than you think.

Sure, you can use your home computer to play games, write letters, and balance your budget. But *telecomputing*—communicating with other computers over the phone lines—can let you do even more. "Plus/Term" and a modem turns your home computer into a full-fledged communications terminal. You can link up with the personal computers of your friends, the mainframe computer at work or at school, electronic bulletin boards, on-line data bases, and commercial information services such as CompuServe, The Source, and Dow Jones News/Retrieval.

Plus/Term is designed to make your computer emulate an *asynchronous ASCII terminal*. An asynchronous terminal does not require special timing (sync) characters, and doesn't require the receiving terminal to operate in step with your system. ASCII (American Standard Code for Information Interchange) is a standard character code that computers use to understand each other. Most microcomputer communications are asynchronous and in ASCII.

Typing Plus/Term

Plus/Term consists of two parts: a BASIC program that displays menu options, and a machine language routine that handles the actual communications. The BASIC program (Program 1) is the same for both the VIC and 64, but the machine

language programs are different.

First, type in the BASIC portion (Program 1) and save it on tape or disk. To type in the machine language portion, you must use the MLX machine language editor located elsewhere in this issue. Starting and ending addresses for Plus/Term are 50152 and 52561 for the Commodore 64 (Program 2), and 6144 and 8456 for the VIC-20 (Program 3). Before loading MLX to enter Program 3, VIC users must enter the following line in direct mode (without a line number) and press RETURN:

```
POKE 44,35:POKE 256*35,0:NEW
```

Save the machine language portion on tape or disk using the filename referenced in line 100 of the BASIC program (*PLUS/TERM.ML*).

To start Plus/Term, run the BASIC program. It automatically loads the machine language part from tape or disk using the filename in line 100. If you're using tape, change the ,8,1 listed after the filename to ,1,1.

Important: Before loading the BASIC portion into the VIC, enter this line without a line number and press RETURN:

```
POKE 44,35:POKE 256*35,0:NEW
```

You must enter this line every time you start the VIC version of Plus/Term.

Entering Terminal Mode

When you run Plus/Term, the program asks you to specify a *baud rate*. The baud rate, more properly known as *bps* (bits per second), is the speed at which a modem communicates. Inexpensive modems—including most of those sold for the Commodore 64 and VIC-20—can transmit and receive information at speeds ranging from 110 to 300 bps (about 10 to 30 characters per second). Modems costing \$400 or more can usually be switched to 1200 bps to speed up communications by a factor of four.

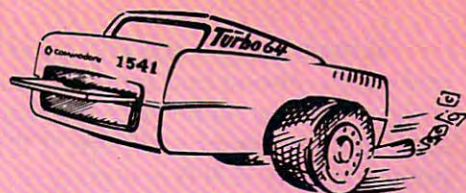
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Remember that the computer at the other end of the phone line must be transmitting and receiving at the same speed as yours. You can't send and receive at 1200 bps if the other computer has only a 300 bps modem. Many electronic bulletin boards and commercial information services are capable of communicating at both 300 and 1200 bps. Some even recognize your baud rate when you first sign on and adjust themselves accordingly. But you still have to set Plus/Term for the proper baud rate each time you run the program.

After you specify the baud rate, Plus/Term enters terminal mode. A cursor appears at the upper-left corner of the screen. The Commodore 64 version of Plus/Term has a blinking underline cursor, and the VIC version has a solid block cursor.

To see how terminal mode works, try typing these two sentences:

This is a test of the Plus/Term software. It is designed to provide lots of options for use with many systems.

Notice how Plus/Term handles words that are typed at the end of a line. Rather than splitting words, Plus/Term moves the entire word to the next line. This feature, known as *word wrap*, makes text easier to read. It's found on most word processors.

You can turn word wrap on or off at any time by calling up a menu. All the main features in Plus/Term are controlled from a main menu and its submenus. When you're in terminal mode, you can flip the screen to the main menu whenever you want by pressing the f7 special function key.

Plus/Term Main Menu

Here's what it looks like:

PARAMETERS

1. WORD LENGTH
2. STOP BITS
3. BAUD RATE
4. PARITY
5. DUPLEX
6. DEFINE KEY
7. TERMINAL OPTIONS
8. RETURN TO TERMINAL
9. RETURN TO BASIC

The first five options control communication parameters. Plus/Term defaults to these settings:

*8-bit word length
1 stop bit
300 baud
No parity
Half duplex*

Always set your modem to full duplex while using Plus/Term. That way you can control the

duplex setting with the program. To change Plus/Term from half duplex to full duplex, press the numeral 5 key to select option 5 from the main menu. The menu goes away and a submenu appears. Again, press the appropriate key to select the option you want (half or full duplex); your choice will be highlighted in reverse video. Press RETURN to go back to the main menu.

All of the other options in Plus/Term work the same way. Just select an option from the main menu and usually another menu will appear.

If you change baud rates from within Plus/Term, all other parameters revert to their default values. Usually you need to set the baud rate only when first running the program.

Never press RUN/STOP-RESTORE in the 64 version of Plus/Term when the menu is on the screen. If you do, the program halts. You can restore it by typing POKE 648,4 and pressing RETURN, but you'll have to type blindly because the operating system thinks the screen is at a different location.

Terminal Mode Commands

You can return to terminal mode from the main menu by selecting option 8 (option 9 exits Plus/Term to BASIC). Notice that the text you left on the screen is still there.

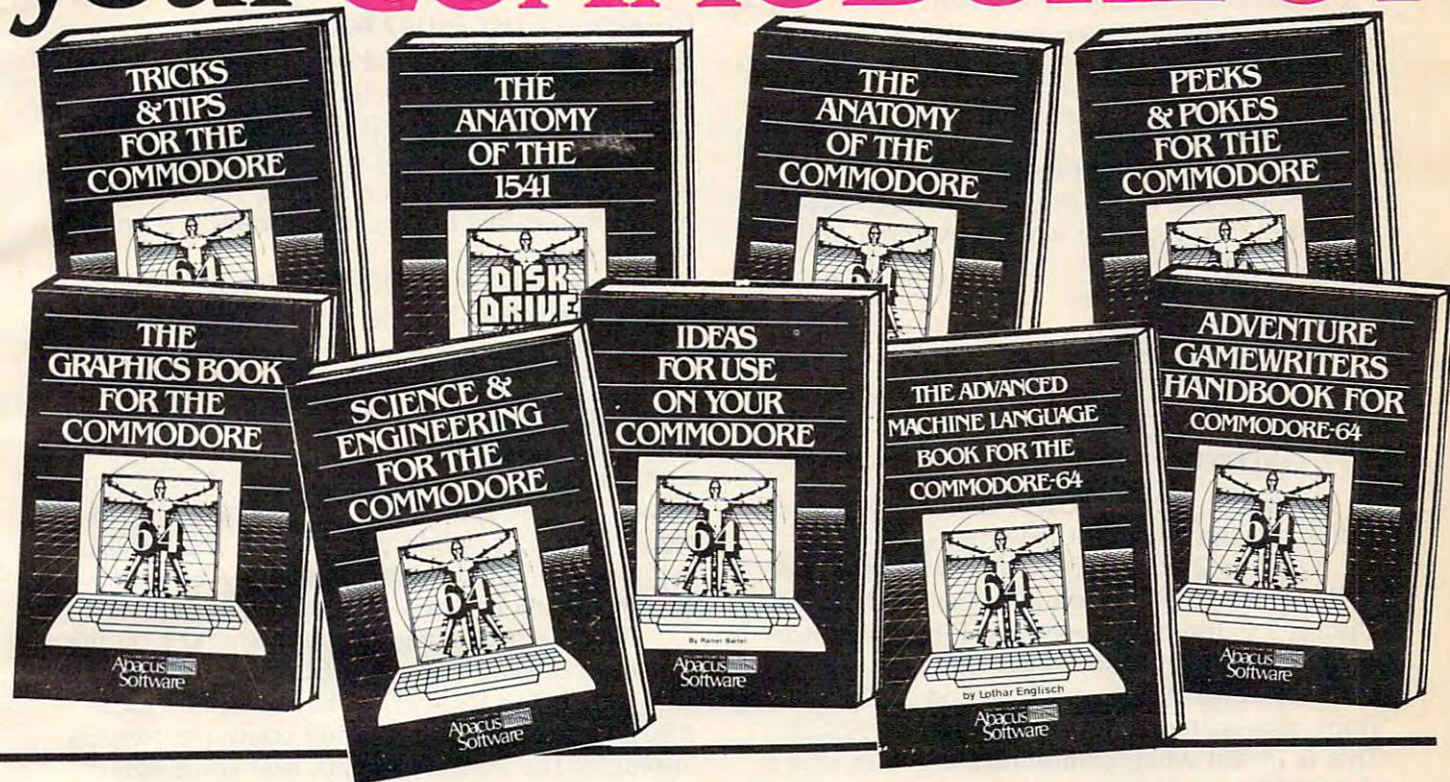
Other keys besides f7 execute commands in terminal mode. You must press three keys simultaneously: Hold down SHIFT and CTRL, then press the appropriate command key (this sequence makes it possible for you to send special control codes in terminal mode by pressing CTRL and a character key). Here are the terminal mode commands:

CTRL-SHIFT-B:	Change background color.
CTRL-SHIFT-F:	Change border color.
CTRL-SHIFT-K:	Change text color.
CTRL-SHIFT-O:	Open buffer (start storing characters in memory).
CTRL-SHIFT-C:	Close buffer (stop storing characters in memory).
CTRL-SHIFT-S:	Save buffer contents on disk or tape.
CTRL-SHIFT-L:	Load buffer contents from disk or tape.
CTRL-SHIFT-Z:	Zero (erase) buffer.

Notice that some of these commands involve the manipulation of a *buffer*. A buffer is an area in memory set aside to store data. If the buffer is open (CTRL-SHIFT-O), all the characters sent and received by your computer are stored in memory. The contents of the buffer can then be saved on disk or tape or sent to a printer. This feature lets you *download* (receive) text files and programs from remote computers. You can also *upload* (send) files to other computers. We'll discuss these procedures in a moment.

The buffer is 30,720 bytes long (about 30K) on a Commodore 64, and 7860 bytes long (about

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7.6K) on a VIC-20 with the 16K memory expander. The file you plan to upload or download must fit in the buffer, unless you handle it in pieces to be assembled later. If the buffer fills up when you're downloading, a screen prompt asks: SAVE BUFFER, YES OR NO? *If you answer no, the contents of the buffer are erased.* Press CTRL-Q to continue your conversation with the other system.

Terminal Options

Option 7 on the main menu, TERMINAL OPTIONS, controls some of the most useful features of Plus/Term. Here's what the terminal options submenu looks like:

1. DIRECTORY (DISK)
2. COMM TO COMM
3. COMM TO ASCII
4. WORD WRAP
5. NORMAL SCREEN
6. PRINT BUFFER
7. LINEFEED WITH RETURN

Option 1 (DIRECTORY) simply lets you call a disk directory without leaving Plus/Term.

Options 2 and 3 (COMM TO COMM and COMM TO ASCII) toggle between each other. Option 3 is the default setting. Plus/Term normally translates Commodore codes into ASCII and vice versa. If you select option 2, Plus/Term stops converting Commodore codes to ASCII. This is useful when communicating with other Commodore systems or when transferring files, as we'll see in a moment. Option 3 also lets you save or load key redefinitions with a tape or disk drive. After you've customized the keys as described below, select option 3 and follow the screen prompts.

Options 4 and 5 (WORD WRAP and NORMAL SCREEN) also toggle back and forth to turn word wrap on or off.

Option 6 (PRINT BUFFER) lets you access the most powerful features of Plus/Term. You can print the contents of the buffer on the screen or a printer, or send it through the RS-232 port (which may be connected to your modem or a serial printer). Whenever you're printing the buffer, you can pause the action by pressing the SHIFT key, slow it by pressing CTRL, or stop it by pressing the space bar. Since some printers may enter graphics mode if certain character codes are sent, you may need to modify the OPEN statement in line 1900 to lock your printer into text mode.

Option 7 (LINEFEED WITH RETURN) lets you disable the linefeed character that normally accompanies the RETURN character. Normally when you press RETURN, two things happen: The cursor jumps to the left side of the screen and also moves down a line. The downward

cursor movement is a linefeed. Some remote computers automatically send a linefeed when they receive a RETURN, so the extra linefeed is unnecessary. If option 7 is highlighted, the RETURN character will include a linefeed. Selecting this option toggles linefeeds on and off.

Customizing Plus/Term

We've already mentioned key redefinition briefly. This is a feature usually found only on the better terminal programs, and it requires some explanation. Basically it lets you customize Plus/Term for communicating with a specific remote computer. To use this feature, select option 6 on the main menu.

Here's why it's important. When Plus/Term is in normal ASCII mode, all characters you type are translated into the standard ASCII codes before they are sent over the phone line. This assumes that the other computer also is sending and receiving the same ASCII codes. But some computers occasionally depart from ASCII. For instance, some systems use ASCII code 127 as a delete character, while pressing the INST/DEL key on a Commodore 64 generates ASCII code 20. The result will be a failure to communicate.

Plus/Term lets you redefine any key on the keyboard to send out any ASCII code you want. To redefine the INST/DEL key to send the ASCII code 127 that the other computer expects instead of the ASCII code 20, first you'd select option 6 from the main menu. The following submenu appears:

CHANGE VALUES

1. GOING OUT
2. COMING IN

Since you want to change the value you're sending out, select option 1. A screen prompt asks you to press the key you want to redefine; press INST/DEL. Plus/Term tells you that the key currently sends an ASCII 20 and asks you to type in the code you want. Type 127 and press RETURN. The main menu reappears.

It's that easy. Now the INST/DEL key sends an ASCII 127 instead of 20.

Two-Way Translating

You're only half done, though. When Plus/Term sends the 127 over the phone line, the other computer will accept it as a delete key, all right. But then the remote computer echoes the code back to *your* computer (we won't get into the technical reasons). Plus/Term knows that it's supposed to send a 127 instead of a 20, but it doesn't know how to translate the 127 coming back into the 20 that your computer recognizes as a delete key. Instead of deleting characters on your screen, pressing INST/DEL would make back-arrows appear.

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The solution, as you may have guessed, is to customize Plus/Term further so it translates the key in both directions. Select option 6 from the main menu again, then choose option 2 on the submenu (COMING IN). Now you can match the incoming code with the appropriate Commodore code. When the program asks you which code you want to change, type 127. When it asks you for the new value, type 20. Pressing RETURN brings you back to the main menu.

Don't forget that the function keys (except for f7, which calls the main menu) can also be redefined. If you want to save the new definitions so you don't have to repeat the process each time you run Plus/Term, select option 3 from the terminal options menu as described above.

Uploading And Downloading

As we mentioned, one of Plus/Term's most powerful features is the ability to exchange files with other computers.

Downloading is as simple as opening the buffer (CTRL-SHIFT-O in terminal mode), clearing it out if necessary (CTRL-SHIFT-Z), and closing it when you've received everything you want (CTRL-SHIFT-C). Then you can save the buffer on tape or disk by pressing CTRL-SHIFT-S, or print it out from the terminal options menu.

Since the RS-232 routines share zero page locations with the tape input/output routines, tape users must be off-line to perform any type of tape I/O.

To upload a file, reverse the process. Clear the buffer if necessary by pressing CTRL-SHIFT-Z; load the file you wish to transmit by pressing CTRL-SHIFT-L; go to the terminal options menu and select option 6 (PRINT BUFFER); and send the file to the RS-232 port, where your modem is connected.

However, there are some complications—imposed by the computer, not the program. Transferring text files is easy: Usually they're already stored in ASCII format by the word processor, and they can be loaded into another word processor after the transfer is complete. But BASIC program files present a problem.

Most computers, including Commodores, can store programs on tape or disk in two formats: ASCII and *tokenized*. Tokenized files are abbreviated versions of ASCII files. A program must be tokenized before it will run on a VIC or 64. Unfortunately, the VIC and 64 lack a command to load an ASCII file back into the computer and convert it to a tokenized file. After you transfer a program you won't be able to run it.

The Tokenizer Solution

To overcome this limitation, we've included a

short tokenizer utility (Program 4) which converts ASCII files to tokenized files. However, it only works if you have a disk drive. Therefore, if you're using a tape drive, you can upload BASIC programs with Plus/Term but not download them in a form your computer can execute.

To convert a tokenized BASIC program file into an ASCII file for uploading, use the following procedure. First, before running Plus/Term, load the program you wish to transfer into the computer. Then type the following and press RETURN:

```
OPEN 8,8,"0:FILENAME,P,W":CMD8:LIST [for disk]
OPEN 8,1,8,"0:FILENAME,P,W":CMD8:LIST [for tape]
```

(Replace *FILENAME* with your own filename, of course.)

When the cursor returns, type the following and press RETURN:

```
PRINT#8:CLOSE8
```

The program has now been converted into a Commodore ASCII file which can be uploaded.

Sending A File

Now follow these steps:

1. Run Plus/Term and enter terminal mode.
2. Zero (erase) the buffer (press CTRL-SHIFT-Z).
3. Load your file into the buffer (press CTRL-SHIFT-L). A screen prompt will ask you to enter the filename, and another prompt asks if you want to load from tape or disk.
4. When the disk stops whirring (and the red busy light goes off), close the buffer (press CTRL-SHIFT-C).
5. Establish your communications link with the remote computer (you could have done this during step 1, if desired). Notify the person at the other end of the line that you're ready to send the program file. The other system must be set to receive Commodore ASCII. If the other person has Plus/Term, both of you should adjust your parameters for COMM TO COMM (selection 2 on the terminal options menu described above). The person at the other end should then open and zero his buffer (CTRL-SHIFT-O and CTRL-SHIFT-Z).
6. Now press the f7 key to exit terminal mode and reach the main menu. Select option 7 to call up the terminal options menu. Choose option 6 (PRINT BUFFER) and send the file through the RS-232 port (where your modem is connected). After a while, you'll be asked to press any key to continue. After you press a key, the transfer is complete.

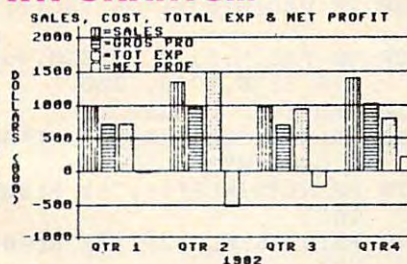
As the file is transmitted, it is listed on the screen of the remote computer. When the word READY appears, the upload is finished. The

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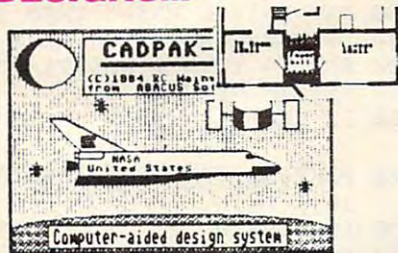


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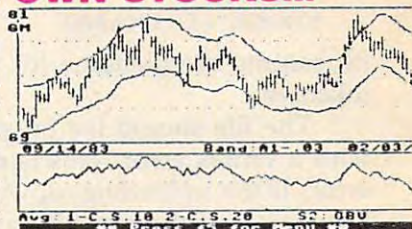
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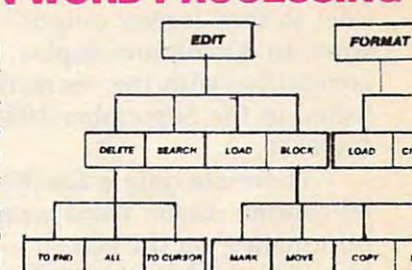
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buffer can then be closed (CTRL-SHIFT-C) and saved on tape or disk (CTRL-SHIFT-S). If the file is a BASIC program, remember to use the Tokenizer utility to convert it from ASCII to a tokenized file before running it.

Using The Tokenizer

Type in Program 4 with MLX. Use a starting address of 828 and ending address of 971.

To use the Tokenizer, load the file produced by MLX into memory. Type NEW, press RETURN, type the following line, and press RETURN:

```
SYS 828,"0:FILENAME"
```

(Substitute the filename for the file you wish to tokenize.)

The file should list on your screen and end with a syntax error. This is normal; ignore the error. If the uploading/downloading process has been successful, you will have a ready-to-run BASIC program in memory that you can save on disk or tape.

80-Column Compatibility

Many mainframe computers expect communications terminals to display 80 columns of text per line, so they format output in that fashion. If you want an 80-column display, Plus/Term is compatible with the "Screen-80" program published in the September 1984 issue of COMPUTE!'s GAZETTE.

There are only a few operating differences in 80-column mode: Word wrap doesn't work, any information on the screen is erased when you leave terminal mode to access the menu, and you must restart the computer to switch back to 40 columns. Otherwise, Plus/Term and Screen-80 make a good team.

Program 1: Plus/Term BASIC Portion For VIC & 64

Refer to "COMPUTE!'s Guide To Typing In Programs" before entering this listing.

```
100 CLOSE2:IF Q=0 THEN Q=1:LOAD"PLUS/TERM
.ML",8,1 :rem 127
110 POKE680,1:PRINT"{CLR}";:SYS 65517:IF
{SPACE}PEEK(781)=22THEN LO=6144:QC=46
08:GOTO130 :rem 16
120 LO = 50152:QC=52736 :rem 122
130 FU = 787 :rem 18
140 NA = 831:RT$="{RVS}" :rem 148
150 WL$(1)="{RVS}":SB$(1)="{RVS}":PA$(1)=
"{RVS}":DI$(2)="{RVS}":CA$(2)="{RVS}"
:FS$(1)="{RVS}" :rem 131
160 POKE53281,12:POKE53280,12:PRINT"{CLR}
{BLK}":POKE646,0:A$=CHR$(13)+"{DOWN}
{10 RIGHT}" :rem 25
170 PRINTCHR$(14);CHR$(8) :rem 161
180 IF PEEK(185)<>99THENFZ=1:GOTO200
:rem 106
190 SYSLO+6 :rem 149
200 SYS65517:IF PEEK(781)=22THEN A$=CHR$(
13)+"{DOWN}":GOTO220 :rem 39
```

```
210 A$=CHR$(13)+"{DOWN}{10 RIGHT}"
:rem 141
220 IF FZTHENFZ=0:GOTO540 :rem 11
230 POKE53281,12:POKE53280,12:PRINT"{CLR}
";A$;"{2 RIGHT}PARAMETERS" :rem 59
240 PRINTA$;"1. WORD LENGTH";A$;"2. STOP
{SPACE}BITS";A$;"3. BAUD RATE";
:rem 94
250 PRINTA$;"4. PARITY";A$;"5. DUPLEX";A$
;"6. DEFINE KEY"; :rem 233
260 PRINTA$;"7. TERMINAL OPTIONS";A$;"8.
{SPACE}RETURN TO TERMINAL"; :rem 149
270 PRINTA$;"9. RETURN TO BASIC" :rem 86
280 GET M1$:IF M1$=""THEN 280 :rem 209
290 IF VAL(M1$)<1 OR VAL(M1$)>9 THEN 280
:rem 36
300 ON VAL(M1$) GOTO 310,450,540,710,860,
970,1230,1760,1800 :rem 152
310 REM WORD LENGTH :rem 118
320 PRINT"{CLR}";A$;"{3 RIGHT}{6 DOWN}WOR
D LENGTH" :rem 211
330 PRINTA$;WL$(1);"{2 RIGHT}1. 8 DATA BI
TS" :rem 168
340 PRINTA$;WL$(2);"{2 RIGHT}2. 7 DATA BI
TS" :rem 170
350 PRINTA$;WL$(3);"{2 RIGHT}3. 6 DATA BI
TS" :rem 172
360 PRINTA$;WL$(4);"{2 RIGHT}4. 5 DATA BI
TS" :rem 174
370 POKE198,0 :rem 199
380 GET MA$:IF MA$=""THEN 380 :rem 243
390 IF MA$=CHR$(13)THEN200 :rem 145
400 FOR T= 1 TO 4:WL$(T)="" :NEXT:WL$(VAL(
MA$))= "{RVS}" :rem 127
410 IF VAL(MA$)<1 OR VAL(MA$)>4 THEN 380
:rem 58
420 POKE659,(PEEK(659)AND159)OR(VAL(MA$)*
16) :rem 219
430 POKE198,0 :rem 196
440 GOTO310 :rem 101
450 PRINT"{CLR}";A$;"{RIGHT}{11 DOWN}STOP
BITS ";SB$(1);"1";"{OFF} OR ";SB$(2)
;"2";"{OFF}?" :rem 247
460 POKE198,0 :rem 199
470 GET MB$:IF MB$=""THEN470 :rem 245
480 IF MB$=CHR$(13)THEN200 :rem 146
490 FOR T= 1 TO 2:SB$(T)="" :NEXT:SB$(VAL(
MB$))= "{RVS}" :rem 107
500 IF VAL(MB$)<1OR VAL(MB$)>2THEN470
:rem 58
510 IF VAL(MB$)=1THENPOKE659,(PEEK(659)AN
D127):GOTO 530 :rem 139
520 POKE659,PEEK(659)OR128 :rem 236
530 POKE198,0:GOTO450 :rem 209
540 PRINT"{CLR}";A$;"{UP}{RIGHT}BAUD RATE
S";A$;BR$(1);"1. 50 BAUD"; :rem 20
550 PRINTA$;BR$(2);"2. 75 BAUD";A$;BR$(3)
;"3. 110 BAUD"; :rem 73
560 PRINTA$;BR$(4);"4. 134.5 BAUD";A$;BR$(
5);"5. 150 BAUD"; :rem 229
570 PRINTA$;BR$(6);"6. 300 BAUD";A$;BR$(7)
;"7. 600 BAUD"; :rem 134
580 PRINTA$;BR$(8);"8. 1200 BAUD";A$;BR$(
9);"9. 1800 BAUD"; :rem 242
590 PRINTA$;BR$(10);"10. 2400 BAUD";A$;
:rem 0
600 MC$="" :INPUT"ENTER SELECTION";MC$
:rem 236
610 IF MC$=""THENMC$=STR$(PEEK(645))
:rem 254
620 IF VAL(MC$)<1OR VAL(MC$)>10THEN540
:rem 108
```



```

630 SYS65517:IFPEEK(781)=22THEN POKE659,(
    PEEK(659)AND240)ORVAL(MC$) :rem 171
640 TM(1)=50:TM(2)=75:TM(3)=110:TM(4)=134
    .5:TM(5)=150:TM(6)=300:TM(7)=600
    :rem 200
650 TM(8)=1225:TM(9)=1800:TM(10)=2400
    :rem 199
660 NT=1022730/TM(VAL(MC$))*5-100:POKE66
    2,NT/256 :rem 207
670 POKE661,(NT/256-INT(NT/256))*256:POKE
    645,VAL(MC$):CLOSE2 :rem 240
680 OPEN2,2,3,CHR$(PEEK(659))+CHR$(PEEK(6
    60))+CHR$(PEEK(661))+CHR$(PEEK(662))
    :rem 7
690 FOR T= 1 TO 10:BR$(T)="" :NEXT:BR$(PEE
    K(645))= "{RVS}" :rem 200
700 GOTO110 :rem 98
710 PRINT"{CLR}";A$;"{5 DOWN}PARITY";A$;P
    A$(1);"1. NO PARITY"; :rem 234
720 PRINTA$;PA$(2);"2. ODD PAR SNT/RCVD";
    :rem 37
730 PRINTA$;PA$(3);"3. EVN PARITY";
    :rem 221
740 PRINTA$;PA$(4);"4. MRK PAR SNT/NO CHK
    "; :rem 130
750 PRINTA$;PA$(5);"5. SPC PAR SNT/NO CHK
    "; :rem 129
760 GET MD$:IF MD$=""THEN 760 :rem 253
770 IF MD$=CHR$(13)THEN200 :rem 150
780 FOR T= 1 TO 5:PA$(T)="" :NEXT:PA$(VAL(
    MD$))= "{RVS}" :rem 106
790 IF VAL(MD$)<1OR VAL(MD$)>5THEN760
    :rem 78
800 ON VAL(MD$)GOTO 810,820,830,840
    :rem 69
810 POKE660,(PEEK(660)AND31)OR32:GOTO850
    :rem 64
820 POKE660,(PEEK(660)AND31)OR96:GOTO850
    :rem 75
830 POKE660,(PEEK(660)AND31)OR160:GOTO850
    :rem 116
840 POKE660,(PEEK(660)AND31)OR224:rem 102
850 GOTO710 :rem 110
860 PRINT"{CLR}";A$;"{6 DOWN}{4 RIGHT}DUP
    LEX";A$; :rem 168
870 IF PEEK(787)THENDIS(1)="{RVS}":DIS(2)
    ="" :GOTO890 :rem 66
880 DIS(1)="" :DIS(2)="{RVS}" :rem 85
890 PRINT DIS(1);"1. FULL DUPLEX";A$;DIS(
    2);"2. HALF DUPLEX" :rem 228
900 GET ME$:IF ME$=""THEN900 :rem 247
910 IF ME$=CHR$(13)THEN200 :rem 147
920 FOR T= 1 TO 2:DIS(T)="" :NEXT:DIS(VAL(
    ME$))= "{RVS}" :rem 92
930 IF VAL(ME$)<1OR VAL(ME$)>2THEN900
    :rem 69
940 IF VAL(ME$)=1THENPOKE660,PEEK(660)AND
    239:POKEFU,1:GOTO960 :rem 160
950 POKE660,PEEK(660)OR16:POKE FU,0
    :rem 15
960 GOTO860 :rem 118
970 PRINT"{CLR}";A$;"{6 DOWN}CHANGE VALUES
    ";A$; :rem 159
980 PRINT"1. GOING OUT";A$;"2. COMING IN"
    ; :rem 75
990 GET MF$:IF MF$=""THEN990 :rem 11
1000 IF MF$=CHR$(13)THEN200 :rem 187
1010 IF VAL(MF$)<1ORVAL(MF$)>2THEN990
    :rem 118
1020 ONVAL(MF$)GOTO 1030,1120 :rem 56
1030 PRINT"{CLR}{8 DOWN}";"PRESS THE KEY
    {SPACE}YOU WANT TO CHANGE":POKE198,0
    :rem 109
1040 GET KY$:IF KY$=""THEN1040 :rem 115
1050 KY = PEEK(QC+256+ASC(KY$)) :rem 148
1060 PRINT"{4 DOWN}THAT SENDS A CHR$(";
    :rem 47
1070 PRINTRIGHT$(STR$(KY),LEN(STR$(KY))-1
    )+"") :rem 190
1080 INPUT"{4 DOWN}REPLACE WITH";RK$
    :rem 21
1090 IF VAL(RK$)>255THEN 1030 :rem 27
1100 POKEQC+256+ASC(KY$),VAL(RK$):rem 137
1110 GOTO 200 :rem 142
1120 INPUT"{CLR}{8 DOWN}CODE TO CHANGE";I
    C$ :rem 2
1130 IF IC$=""THEN970 :rem 84
1140 IF VAL(IC$)>255ORVAL(IC$)=0 THEN 112
    0 :rem 248
1150 PRINT"{4 DOWN}NOW A CHR$("; :rem 117
1160 IC = PEEK(QC+VAL(IC$)) :rem 170
1170 PRINTRIGHT$(STR$(IC),LEN(STR$(IC))-1
    )+"") :rem 143
1180 INPUT "{4 DOWN}CHANGE TO CHR$";NK$
    :rem 36
1190 IF NK$=""THEN970 :rem 103
1200 IF VAL(NK$)>255THEN 1120 :rem 16
1210 POKE QC+VAL(IC$),VAL(NK$) :rem 179
1220 GOTO200 :rem 144
1230 PRINT "{CLR}";A$;"{4 DOWN}{4 RIGHT}O
    PTIONS";A$;"1. DIRECTORY (DISK)";
    :rem 23
1240 PRINTA$;CA$(1);"2. COMM TO COMM";
    :rem 51
1250 PRINTA$;CA$(2);"3. COMM TO ASCII";
    :rem 115
1260 PRINTA$;FS$(1);"4. WORD WRAP";
    :rem 199
1270 PRINTA$;FS$(2);"5. NORMAL SCREEN";
    :rem 221
1280 PRINTA$;"6. PRINT BUFFER"; :rem 34
1290? PRINTA$;RT$;"7. LINEFEED W/ RETURN"
    :rem 73
1300 GET OP$:IF OP$=""THEN 1300 :rem 103
1310 IF OP$=CHR$(13)THEN200 :rem 203
1320 IF VAL(OP$)=2THENCAS(1)="{RVS}":CAS(
    2)="" :rem 141
1330 IF VAL(OP$)=3THENCAS(2)="{RVS}":CAS(
    1)="" :rem 143
1340 IF VAL(OP$)=4THENFSS(1)="{RVS}":FSS(
    2)="" :rem 187
1350 IF VAL(OP$)=5THENFSS(2)="{RVS}":FSS(
    1)="" :rem 189
1360 IF VAL(OP$)=7 THEN POKE 680,-(PEEK(6
    80)=0) :rem 235
1370 IF PEEK(680)THENRT$="{RVS}":GOTO1390
    :rem 58
1380 RT$="" :rem 23
1390 IF VAL(OP$)<1OR VAL(OP$)>7THEN1300
    :rem 192
1400 ON VAL(OP$)GOTO 1410,1540,1550,1780,
    1790,1810,1230 :rem 38
1410 PRINT"{CLR}":OPEN1,8,0,"$0" :rem 75
1420 GET #1,T$,T$ :rem 67
1430 GET #1,T$,T$ :rem 68
1440 S=ST:IF S<>0 THENCLOSE1:GOTO 1500
    :rem 213
1450 GET #1,LU$,HI$: :rem 10
1460 LU=ASC(LU$+CHR$(0)):HI=ASC(HI$+CHR$(
    0)):LN=LU+HI*256:LN$=MID$(STR$(LN),2
    ) :rem 244

```



```

1470 PRINTLN$+" "; :rem 193
1480 GET#1,B$:IF B$="" THEN PRINT:GOTO143 :rem 192
0 :rem 58
1490 PRINTB$;:GOTO1480 :rem 141
1500 OPEN15,8,15:INPUT#15,EN,EM$,ET,ES:CL :rem 68
OSE15:IF ENTHENPRINTEN;EM$;ET;ES :rem 56
:rem 42
1510 PRINT"{RVS}PRESS RETURN TO CONTINUE :rem 16
{OFF}" :rem 177
1520 GET T$:IF T$<>CHR$(13)THEN1520 :rem 165
:rem 136
1530 GOTO1230 :rem 200
1540 POKE NA,1:GOTO1230 :rem 30
1550 POKENA,0 :rem 229
1560 PRINT"{CLR}{6 DOWN}";A$;"ASCII OPTIO :rem 217
NS";A$;"1. LOAD CONFIG"; :rem 94
1570 PRINTA$;"2. SAVE CONFIG";A$; :rem 184
1580 PRINT"3. RETURN TO MENU" :rem 97
1590 GET CN$:IF CN$=""THEN1590 :rem 165
1600 IF VAL(CN$)<1ORVAL(CN$)>3THEN1590 :rem 165
:rem 165
1610 ON VAL(CN$)GOTO1620,1630,1640:rem 61
1620 GOSUB 1650:SYS PEEK(764)+256*PEEK(76 :rem 46
5):GOSUB1740:GOTO1230 :rem 51
1630 GOSUB 1650:SYS PEEK(766)+256*PEEK(76 :rem 202
7):GOSUB1740:GOTO1230 :rem 104
1640 GOTO1230 :rem 147
1650 PRINT"{CLR}";A$;"{RVS}D{OFF}ISK OR :rem 209
{RVS}T{OFF}APE";A$; :rem 227
1660 GET DV$:IF DV$<>"T"ANDDV$<>"D"THEN16 :rem 3
60 :rem 122
1670 INPUT"FILENAME";FI$ :rem 214
1680 IF LEN(FI$)>16THEN 1670 :rem 171
1690 IF LEFT$(DV$,1)="D"THEN D=8:GOTO 171 :rem 48
0 :rem 160
1700 D=1 :rem 76
:rem 160
1710 FOR T= 684 TO 684+LEN(FI$)-1:POKET,A :rem 239
SC(MID$(FI$,T-683,1)):NEXT :rem 110
1720 POKE679,D:POKE763,D:POKE681,LEN(FI$) :rem 89
:POKE682,172:POKE683,2 :rem 104
1730 RETURN :rem 255
1740 OPEN15,8,15:INPUT#15,EN,EM$,ET,ES:CL :rem 104
OSE15:PRINT:IF ENTHENPRINTEN;EM$;ET;E :rem 107
S :rem 252
1750 FOR T=1 TO 1500:NEXT:RETURN :rem 252
1760 PRINT"{CLR}":SYSLO :rem 252
1770 GOTO200 :rem 252
1780 POKE703,0:GOTO1230 :rem 252
1790 POKE703,1:GOTO1230 :rem 252
1800 END :rem 252
1810 BY=PEEK(706)+256*PEEK(707)-(PEEK(55) :rem 252
+256*PEEK(56)):PRINT"{CLR}{DOWN}";A$ :rem 252
;BY; :rem 252
1820 PRINT"BYTES IN BUFFER";A$;:PRINT" TO :rem 252
TAL BYTES"; :rem 252
1830 PRINT(PEEK(249)+256*PEEK(250))-(PEEK :rem 252
(55)+256*PEEK(56)) :rem 252
1840 PRINTA$;"PRINT TO" :rem 252
1850 PRINTA$;"1. RETURN";A$;"2. RS232 ";A :rem 252
$;"3. SCREEN";A$;"4. PRINTER"; :rem 252
:rem 89
1860 GET ZE$:ZE=VAL(ZE$):IF ZE<1OR ZE>4 T :rem 252
HEN 1860 :rem 4
1870 PRINT"{CLR}":IF ZE=1 THEN1230 :rem 252
:rem 255
1880 IF ZE=2 THEN 1910 :rem 104
1890 IF BY=0THEN1990 :rem 107
1900 OPEN5,ZE :rem 107
1910 FOR T= PEEK(55)+256*PEEK(56)TO(PEEK :rem 107
(706)+256*PEEK(707))-1:POKE212,0 :rem 187
:rem 187
1920 IF PEEK(653)=1 THEN1920 :rem 216
1930 IF PEEK(197)=60THENFORT=0TO0:rem 192
1940 IF PEEK(653)=4 THEN FOR J= 1 TO 1000 :rem 141
:NEXT :rem 68
1950 IF ZE = 2 THENPRINT#2,CHR$(PEEK(T)); :rem 56
:GOTO1970 :rem 16
1960 PRINT#5,CHR$(PEEK(T)); :rem 165
1970 NEXT :rem 224
1980 IF ZE<>2 THEN PRINT#5:CLOSE 5 :rem 185
:rem 194
1990 POKE198,0:PRINTA$;"PRESS ANY KEY TO :rem 224
{SPACE}CONT" :rem 185
2000 GET J$:IF J$=""THEN2000 :rem 194
2010 GOTO 1230 :rem 194

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Program 2: Plus/Term ML Portion For 64

Refer to the "MLX" article before entering this listing.

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50152 :032,075,204,076,251,196,042
50158 :169,000,141,100,196,141,217
50164 :103,196,141,084,205,133,082
50170 :002,141,191,002,141,063,022
50176 :003,169,231,141,252,002,030
50182 :169,204,141,253,002,169,176
50188 :008,141,254,002,169,205,023
50194 :141,255,002,169,001,141,215
50200 :021,208,169,006,141,033,090
50206 :208,173,038,003,201,210,095
50212 :208,015,173,039,003,201,163
50218 :002,208,008,169,001,141,059
50224 :094,205,076,127,196,169,147
50230 :000,141,094,205,169,004,155
50236 :141,136,002,169,023,141,160
50242 :024,208,169,003,013,002,229
50248 :221,141,002,221,169,003,061
50254 :013,000,221,141,000,221,162
50260 :120,169,051,133,001,169,215
50266 :208,141,101,196,141,104,213
50272 :196,160,000,185,255,255,123
50278 :153,255,255,200,208,247,140
50284 :238,101,196,238,104,196,157
50290 :173,104,196,201,224,208,196
50296 :234,169,055,133,001,088,032
50302 :152,162,064,157,064,003,216
50308 :202,016,250,169,255,141,141
50314 :085,003,169,013,141,248,029
50320 :007,032,168,196,169,000,204
50326 :141,194,002,133,055,141,048
50332 :019,003,169,038,133,056,062
50338 :141,195,002,076,008,197,013
50344 :160,255,152,192,219,176,042
50350 :024,192,193,144,006,056,021
50356 :233,128,076,201,196,192,182
50362 :065,144,012,192,096,176,103
50368 :006,024,105,032,076,201,124
50374 :196,169,000,153,000,207,155
50380 :136,192,255,208,217,160,092
50386 :255,152,192,128,176,024,113
50392 :192,096,144,006,056,233,175
50398 :032,076,242,196,192,065,001
50404 :144,012,192,091,176,008,083
50410 :024,105,128,076,242,196,237
50416 :169,000,153,000,206,136,136
50422 :192,255,208,217,096,174,108
50428 :094,205,240,008,169,147,091
50434 :141,085,205,032,248,201,146
50440 :032,048,200,032,204,255,011
50446 :032,228,255,201,000,208,170
50452 :003,076,202,197,141,107,234

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