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$2.95
July
1984
Issue 50
Vol. 6, No. 7
£2.25 UK $3.75 Canada
02193
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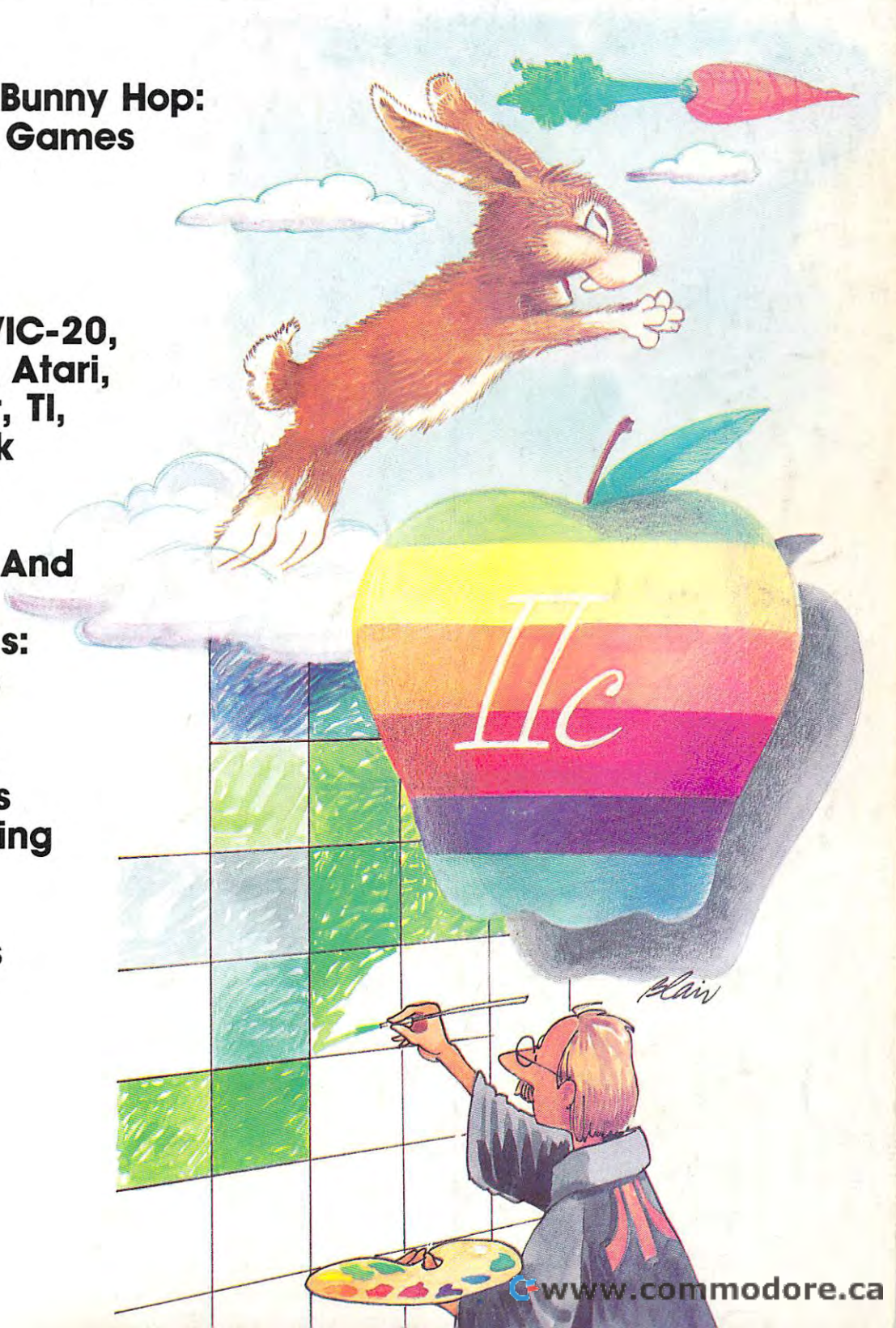

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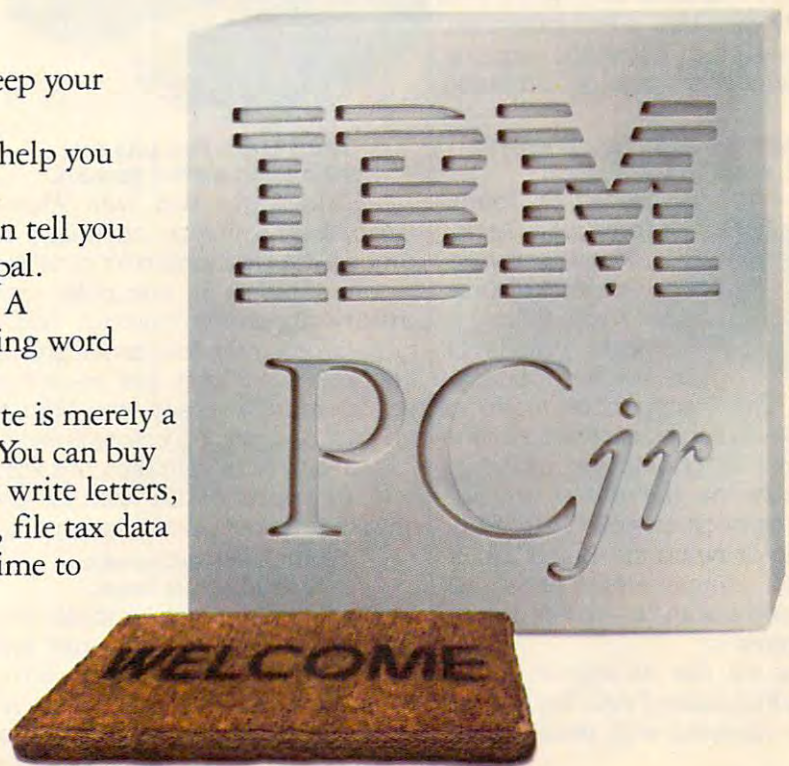

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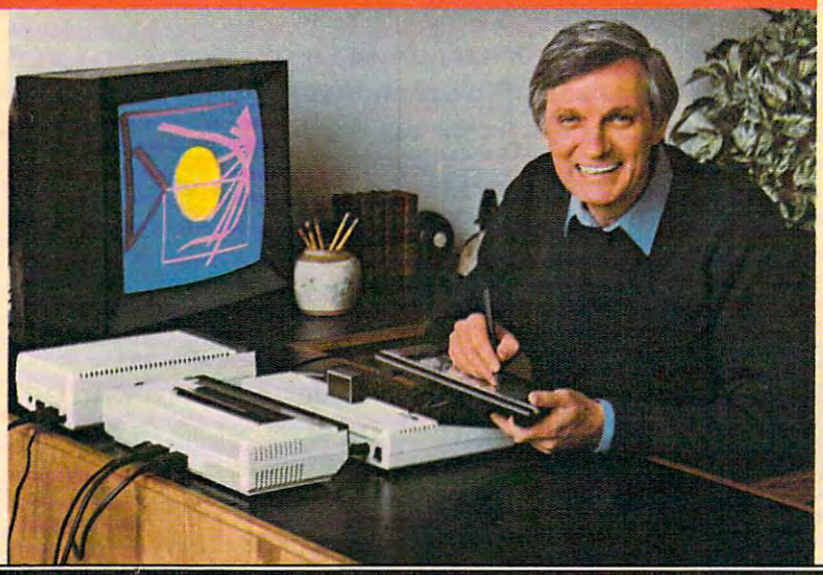

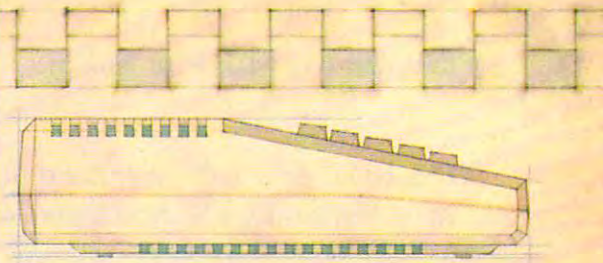

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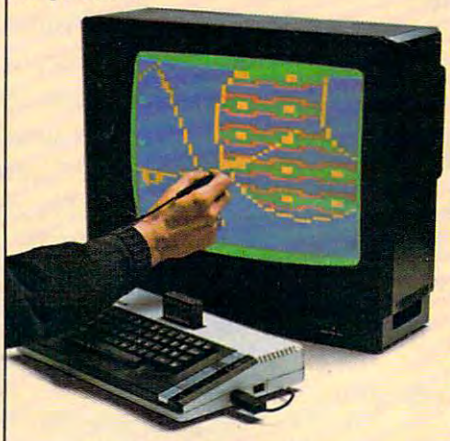

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DISCOVER WHAT YOU AND ATARI CAN DO.

July 1984 Vol. 6, No. 7

FEATURES

EDUCATION AND RECREATION

REVIEWS

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THE JOURNAL

NOTE: See page 152 before typing in programs.

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AP Apple **AT** Atari, **P** PET/CBM, **V** VIC-20, **C** Radio Shack Color Computer, **64** Commodore 64, **TS** Timex/Sinclair, **TI** Texas Instruments, **PCjr** IBM PCjr, **PC** IBM PC, **AD** Coleco Adam, *All or several of the above.

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COMPUTE! The Journal for Progressive Computing (USPS: 537250) is published monthly by COMPUTE! Publications, Inc., P.O. Box 5406, Greensboro, NC 27403 USA. Phone: (919) 275-9809. Editorial Offices are located at 324 West Wendover Avenue, Greensboro, NC 27408. Domestic Subscriptions: 12 issues, $24. Send subscription orders or change of address (P.O. form 3579) to **COMPUTE!** Magazine, P.O. Box 914, Farmingdale, NY 11737. Second class postage paid at Greensboro, NC 27403 and additional mailing offices.

ISSN 0194-357X

EDITOR'S NOTES

This month, Senior Editor Richard Mansfield responds to an attack on personal computing in this guest editorial.

Robert C. Lock
Editor In Chief

A few weeks ago, pundit Andy Rooney launched an astonishing attack on personal computing on CBS's show *60 Minutes*. It was astonishing because he revealed a staggering misunderstanding of computing. But first a bit of background.

There seem to be fewer curmudgeons around these days. It used to be that when an important invention was unveiled, dozens of experts could be counted on to denounce the device as interesting, but impractical. No more. Maybe it was the splitting of the atom or the moon landing. Who knows? For whatever reason, few people are now willing to publicly predict that an invention is fundamentally unimportant, useless, or impossible.

Most people, experts included, still secretly think like that about new technologies. They just won't talk about it with reporters anymore. There is a defect, a weakness in many people, which makes them unable to accept new machines and discoveries. Perhaps we could define this as futureblindness—a skewed view of the potential of new hardware.

Part of the problem is that hardware always precedes software. The car was invented before there were proper roads for it to travel on. TV sets were constructed before there were programs to watch.

So, in the past, when a major new technology was announced, futureblind "experts" would come out of their dwellings and talk with reporters. The experts would acknowledge that the new device was interesting, but that it was also impractical and hardly deserving of all the notice it was getting. Less stodgy experts might have gone so far as to envision a limited use for the device, a very limited use.

It's always amusing to read such pronouncements a decade or two later. For example, when the first telephone was demonstrated, one expert predicted that there would, in fact, be a real use for this new technology. He announced that he could even foresee a day when there would be one in every large city.

Such a prediction likely drew gasps and murmurs from the more severely futureblind in his audience. A phone in every major city was, of course, desirable, but hardly practical. After all, there would have to be a wire strung from city to city across the land. And that was beyond imagining.

It's always this way with hardware. Most people, and many experts, cannot understand that important new hardware is naked at first, but creates a powerful vacuum, eventually pulling in huge amounts of software. Few people realized that the automobile would throw webs of asphalt over entire continents. Or that nets of telephone wires would cover our cities. Before those webs and nets were in place, the car and the phone seemed, if not frivolous, at least pretty limited.

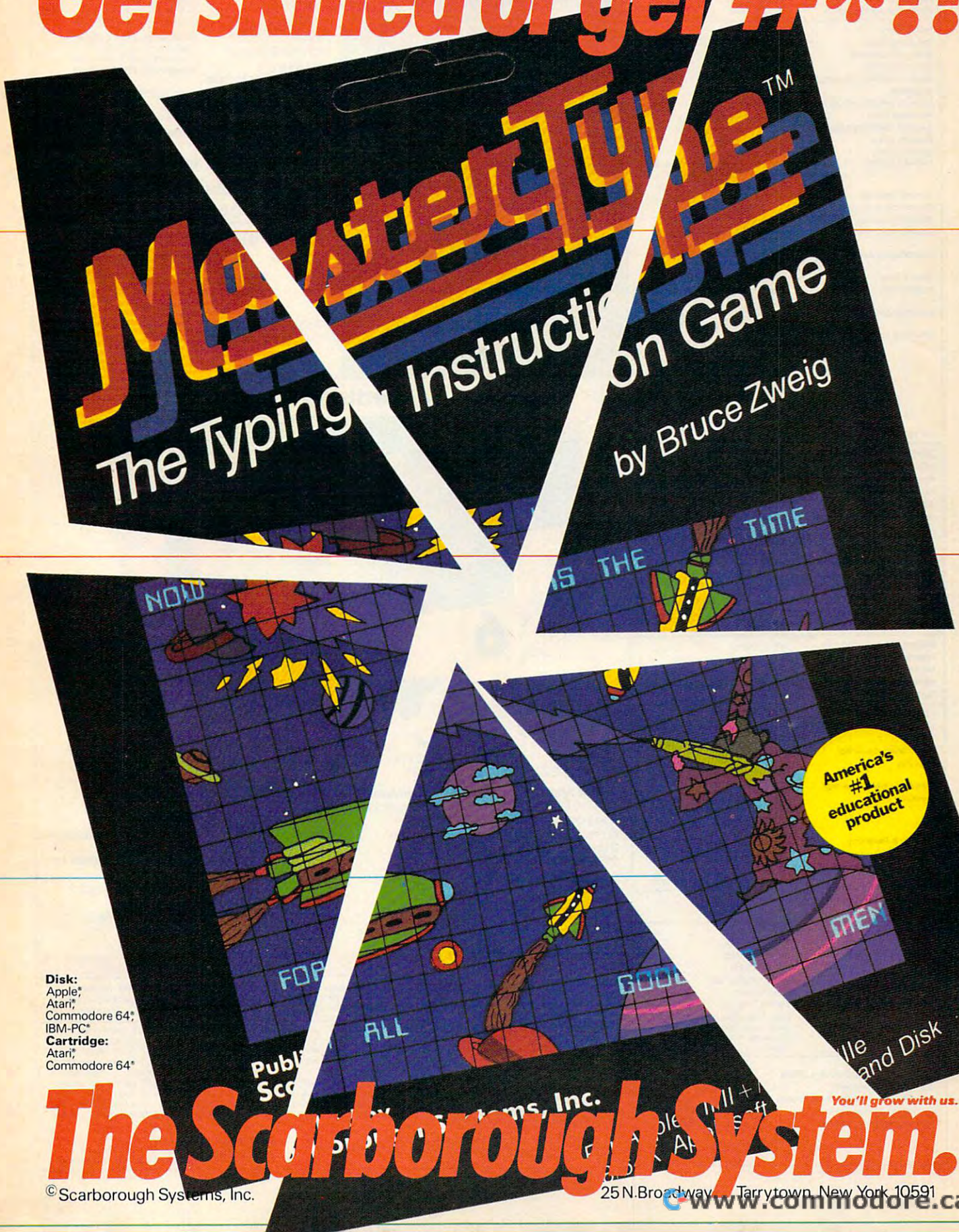
Yet these days very few experts are willing to reflexively denounce new technology. Burned once too often, the average expert will now either refuse to comment or make some mild, rhetorical, anticomment like "I'm excited about the prospects of this, but I must wonder where it will lead us in our modern society." Since remarks like this say nothing whatsoever, they're safe enough.

So it was with mixed emotions that we listened to Andy Rooney attack personal computers on *60 Minutes*. On the one hand, it was touchingly nostalgic to watch him denounce technology in the traditional way by confusing hardware with software. On the other hand, his stance was so grossly confused that his pronouncements cannot take a place alongside the classic, the truly great historical failures of vision.

He decided to test the value of personal computers by seeing if he could make corrections faster via word processor or pencil and paper. He timed himself and found that his pencil was indeed faster. Anyone remotely familiar with computers would immediately say, "So what?" This was not a test of word processing, much less of computers in general. But Rooney went on to draw several increasingly bizarre conclusions about computing.

Curmudgeons do serve a purpose beyond their amusement value. They are a healthy balance against promoters' hype and uncritical technophilia. But an essential prerequisite of any good denunciation is that, at least on the surface, it must appear to make some sense.

Get skilled or get #*?!



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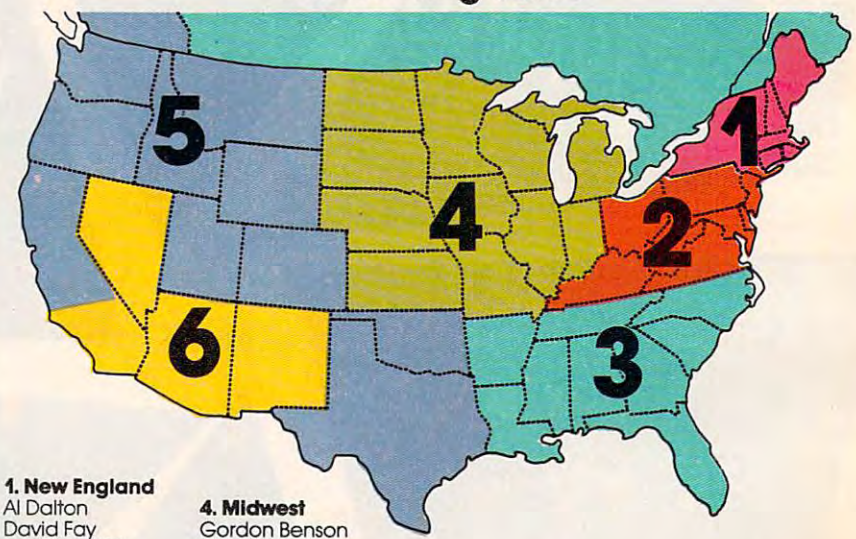

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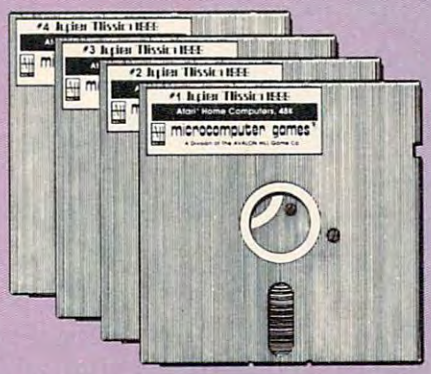
Scott Lamb's Interactive Space Fantasy Adventure



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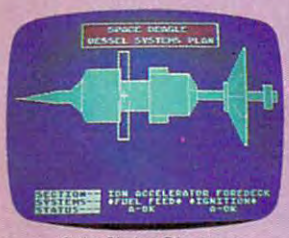

Ship Status Display: Damage report

Navigation Display: Used to plot course

Science Lab Display: Probe report

Science Lab Display: Jupiter system diagramatic

RRRING!!! RRRING!!! RRRING!!!

Too early on a chilly January morning, I was jarred awake by the noxious blaring of my traitorous doorbell. As I moved to accost the unknown aggressor, with the full force of semi-conscious wrath, I pulled on my robe and lost my dignity to the pain of a stubbed toe. Now fully awake, I opened the door, prepared to educate the mysterious interloper on the meaning of manners. My determination to this end was somewhat shattered when I saw two large men clad in long overcoats and wide-brimmed hats. Instinctively, I tried to slam the door. My retreat to safety was denied by the advance of the strangers. Before I could protest their entry, my vision was drawn to the shining silver badges that hung from their now unfolded wallets. They were government agents.

Hesitantly, trying to remember any crimes that I had ever committed, I invited them into my home. At their request, I produced my driver's license and other forms of identification. After examining these credentials, they asked me to pack a bag for an extended journey. After some protest and argument, I was made to understand that my options in this matter were less than limited. My country needs me, they said—with the clear implication that either I pack and dress or I take an extended journey in my robe.

This is how my adventure began. From my cold apartment, I was taken to a towering vehicle for an emergency mission to Jupiter. My very life on the line and, possibly, the survival of the planet Earth as well, and only God knows what other kind of perils await.

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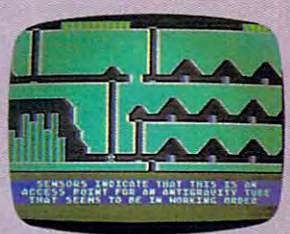
Porthole View of Jupiter and a moon

Lander Approach Display: note descending spaceship



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READERS' FEEDBACK

The Editors and Readers of COMPUTE!

What's An Algorithm?

I have frequently seen the word *algorithm* and would like to know what it means.

I've also heard that you should have a voltage spike protector, because when appliances are turned on, they can produce a surge in the electricity in your house. Is it absolutely necessary to have one?

Andrew S. Hartman

An algorithm is a set of steps or relationships which, taken as a whole, solve a problem. For example, regular pay = regular hours * regular rate of pay *is a standard algorithm that might be found in a payroll program.*

Or: 1. Have user INPUT *his height 2. Look up correct weight for this height. This would be an algorithm for telling people how much they should weigh.*

Using a voltage spike protector couldn't hurt. The electricity in the average home is subject to periodic surges from various sources. A lightning strike, for example, can introduce very high voltage for a few microseconds.

If you see the lights in your house flickering often, you may need one. On the other hand, many people have operated their unprotected microcomputers for years without any problems.

A spike protector is a kind of insurance.

The Commodore Internal Clock

I am trying to write my own game program. I have already programmed my screen display, but I would also like to include an onscreen timer. None of my references mention how I can get a simple TIME REMAINING: XXX SECONDS display on the screen. I have tried loops that subtract 1 from 1000 and print the results on the screen, but so far they either scroll the game display off the screen, or clear the screen. Please help.

Mark Adkins

Try this BASIC line:

```
PRINTTI$
```

This will print a six-digit number to the screen. The format is HHMMSS where HH = hours, MM = minutes, and SS = seconds. Unless you have reset the timer yourself, the six digits you see will reflect how much time has elapsed since you turned on your computer.

To set the timer, use the same HHMMSS format in this manner:

```
TI$="HHMMSS"
```

For example, TI$ = "123335" would set the clock to 12:33 and 35 seconds. Now enter TI$ = "000000" and PRINTTI$ to see the value changed. Setting TI$ with any value between 000000 and 235959 will start the clock running with that value. Enter and RUN the following short BASIC program and you'll be able to watch the clock as it's running:

```
20 PRINT"{HOME}"TI$:GOTO20
```

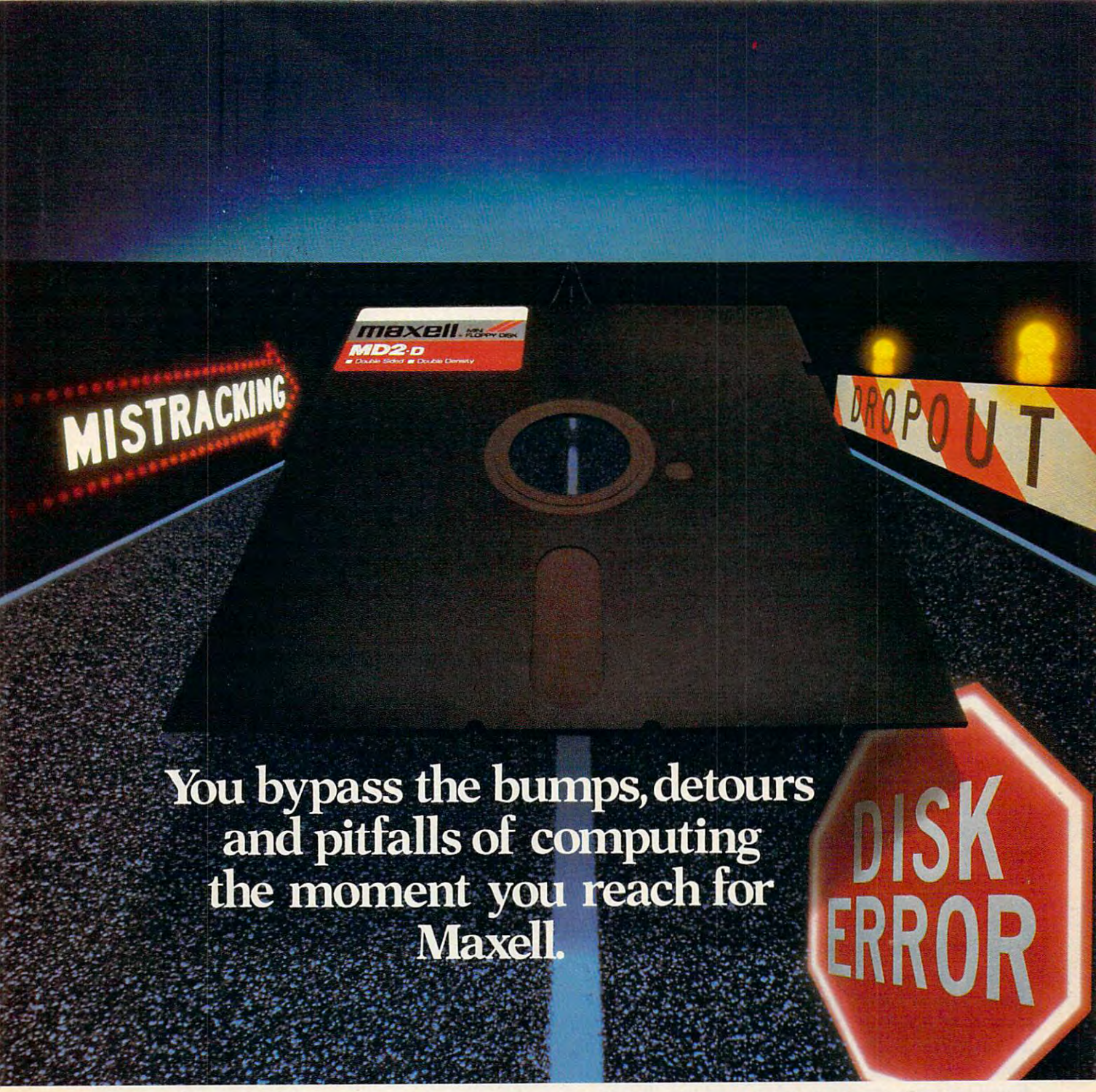
Using the TI$ function to create a timer can be done with an IF–THEN statement. For example, if you desire a 10-second timer, set TI$ to 0, then check for the ten-second limit with: IF TI$ = "000010" THEN... (action desired). *Remember that TI$ returns a string, and its lowest value is seconds.*

The TI command is much like the TI$ command except it returns values in seconds and fractions of seconds. Enter

```
PRINTTI/60
```

The numeric *value returned here is seconds in the format XX.XXXXXXX. Programming a timer with the TI command is much the same as with TI$. The TI value is set with the TI$ command. For example, to set TI at 60 seconds, you would enter: TI$ = "000100" (one minute). To program the same 10-second timer, you would set TI$ to zero then check the TI variable with* IF TI/60 =›10 THEN (action desired).

The problem of the scrolling screen display can be solved with cursor controls within the PRINT statement. For example, you can use the home (upper left corner of the screen) position as a starting point. Each time you want to print your score, timer, etc., simply use the cursor controls to move to that line, print the display, then move back home.



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Atari 400 RAM And Tape

1. Where do you find the RAM that's required to run most programs?

2. Is there a program that will convert Commodore programs to run on the Atari 400?

3. What kind of tapes should I use for the Atari 410 cassette recorder? Every one I try gives me an ERROR –143 when I try to CLOAD from them.

Mike Meyer

1. RAM is user memory, built into your machine. Your computer is equipped with a certain amount, which can usually be expanded (the Atari 400 comes with 16K). Software packages designate the amount of RAM they require for the program and storage, with a notice such as "48K required." Match this with the amount of RAM you have in your machine to see if you have enough. Most large arcade games require the maximum memory your machine can support, such as 48K or 64K. Most cassette-based programs require only a minimum configuration, such as 16K. Don't buy a program that requires more memory than you have—it probably won't work.

2. No conversion programs exist—and there will probably never be any. The Commodore and Atari computers have some things in common: the same type microprocessor (6502 or 6510), a similar BASIC, and similar graphics capabilities. But the differences are overwhelmingly different. Since many programs are inextricably bound to the hardware, no program can be written to reconcile all the differences. An emulator in hardware, essentially a computer on a cartridge, is the only avenue worth pursuing. We know of no Commodore emulators for the Atari computers. As you gain experience, you may want to try converting individual BASIC programs yourself.

3. First, use short tapes. Long, 60-minute tapes are thinner, and are more prone to flaking, binding, and stretching. Although you may not notice these problems with audio tapes, computers can be much more exacting. For the Atari, use a good-quality audio tape. Computer digital tapes are recommended for machines like the Commodore 64 or TI-99/4A, but you should use only audio tape on the Atari, due to the storage technique. Still, if you are using your recorder properly (CSAVEing and CLOADing past the blank leader), you will still be able to get some tapes to work. We've seen tape of marginal quality used with success. Try cleaning and demagnetizing your tape heads. If that doesn't work, you will need to get your recorder replaced or adjusted (this can sometimes be done in audio stores).

Commodore Disk Drive Device Number Update

I am the owner of a 64 and two 1541 disk drives, and was therefore quite interested in the item you published about changing (1541) device numbers in "Readers' Feedback" (April 1984).

Unfortunately, the picture you showed has little relationship to the circuit boards in the newest models of the 1541 disk drive (light brown case).

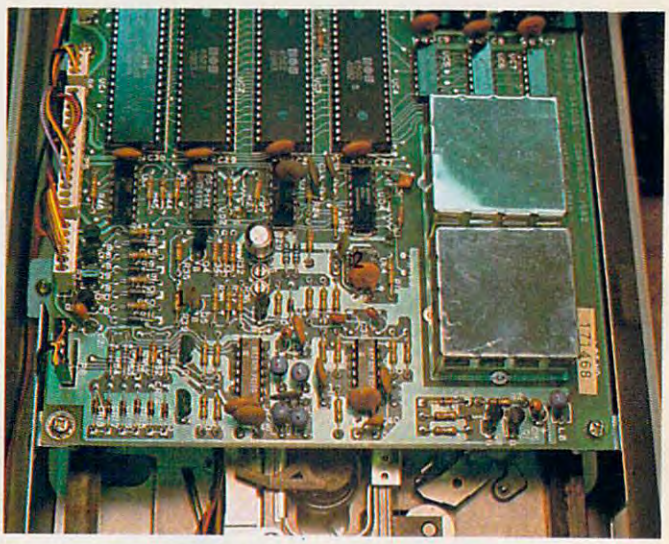
I would appreciate your printing a note showing the jumper locations for the newer model 1541s.

Eric H. Larson

As you pointed out, there are two versions of the 1541 disk drive. The older version, usually with a white case, contains a long circuit board that runs the length of the drive. The newer version, usually in a brown case, contains a shorter board.

The method for changing device numbers on the newer 1541s is the same as we described before, except for the position of the jumpers.

Unplug the drive from the wall and then carefully unscrew and remove the top half of the brown case. Then remove the large silver colored shield inside the disk drive. This will expose the circuit board. As you view the drive with the front toward you, the jumpers are near the center of the circuit board toward the front (see picture below).



The two jumpers look like round spots of silver solder (approximately 3/8-inch diameter each) separated into halves, with the two halves connected by a thin strand of solder. To change the device numbers of the 1541 disk drive, the thin strand connecting the two halves should be scratched away on one or both of the jumpers. As you look from the front of the drive, the jumper nearest the front is jumper number 1, and the rear is jumper 2.

As stated in the 1541 user's manual, cutting jumper one, jumper two, or both, produces different numbers. Following is a chart showing the different combinations.

Jumper Cut	New Device Number
None	8
1	9
2	10
1 and 2	11

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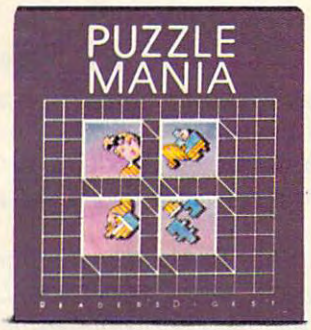

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Remember, though, that unless you're handy with a soldering iron, changing the device number via hardware modifications is permanent.

Also remember that—although not specifically stated in the user's manual—opening the disk drive and performing these modifications yourself may void the warranty. Consult your local Commodore representative and thoroughly read the user's manual before attempting any of these modifications.

If you feel uncomfortable changing the device number using the hardware method, the same thing can be achieved with a software (program) modification. Here is the procedure:

1. *Turn off all disk drives.*
2. *Turn on the disk drive whose device number you want to change.*
3. *Type and enter the following commands:*

```
CLOSE 15: OPEN 15,8,15
PRINT#15,"M-W",CHR$(119)CHR$(0)CHR$(2)CHR$
  (n+32)CHR$(n+64)
CLOSE 15
```

Change the n *in the PRINT#15 command above to the device number you want to assign to the disk drive. It might be best to limit the device numbers to the range between 9 and 14.*

Now you can turn on the other drive(s), and start processing.

Note the syntax of the PRINT#15,"M-"... *command. Contrary to the instructions in the 1541 user's manual, do not include the colon after the memory-write (M-W) command. If the colon is included, the device number change will not be successful.*

The 1541 demo disk that was included with your drive also contains a program to change device numbers. LOAD the program DISK ADDR CHANGE *then RUN. The user prompts will tell you what to do.*

VIC Animation

I am 11 years old and I own a VIC-20. My friend owns a Commodore 64. We both make graphics on them. He has the advantage of sprites, but I have figured out a way for the VIC-20 to have a form of sprites. The VIC-20's graphics are made from top to bottom, which allows vertical sprites. Here's a demonstration program.

Bryan D. Stanton

```
5 DIM A(8):K=7167
10 PRINT"{CLR}"
15 POKE36869,255
20 FORM=7168TO7311:POKEM,0:NEXTM
30 FORX=1TO18:PRINTTAB(9);CHR$(63+X):NEXT
   X
40 FORN=1TO8:READA(N):POKEK+N,A(N):NEXTN
50 FORR=1TO137
55 FORL=1TO8:POKEK+L,A(L):NEXTL:POKEK+1,0
   :K=K+1
60 NEXTR
65 PRINT"{CLR}":POKE36869,240:END
70 DATA 60,24,24,24,255,126,24,24
```

Joystick To Keyboard Control On The TI

Many of your TI-99/4A games require a joystick. Unfortunately, I don't own one. Could you provide a routine that would enable me to convert these programs to keyboard control?

Mike Burgin

Several approaches can be taken to convert a program from joystick to keyboard control on the TI. Probably the simplest approach, in console BASIC, is to GOSUB to a keyboard subroutine whenever the JOYST subprogram is CALLed.

You should locate this keyboard subroutine at the beginning of the program, to speed execution. Let's put such a subroutine at line 10. The entire routine will occupy four lines beginning at line 10, so RESequence your program to begin at line 50.

*Next, find where the subprogram JOYST is CALLed within the program. The general form for this statement is CALL JOYST (*n*,X,Y). Here,* n *refers to the joystick number (either 1 or 2) while X and Y are values returned based on the joystick position.*

X and Y may be represented by any legitimate numerical variable name. Note the variable names used for X and Y in the CALL JOYST statement and then replace this statement with GOSUB 10.

Then, type in the following lines:

```
5 GOTO 50
10 CALL KEY(0,K,SS)
20 X=((K=67)+(K=68)+(K=82))*-4+((K=83)+(K
   =87)+(K=90))*4
30 Y=((K=69)+(K=82)+(K=87))*-4+((K=67)+(K
   =88)+(K=90))*4
40 RETURN
```

Now, substitute the variable names from the CALL JOYST statement into the above subroutine for X and Y. Also, if K and SS are used in the main program, you may need to name them differently here.

Just as with the CALL JOYST statement, X and Y will be returned as –4, 0, or +4 in lines 20 and 30. The standard arrow keys (E, S, D, and X) are tested for in this routine along with W, R, Z, and C for diagonal movement.

Providing a routine for keyboard control in Extended BASIC is even easier. Since we can write our own subprogram (using SUB), we no longer need worry about the variable names for X and Y in the main program. Variables used in a subprogram are local to that subprogram.

Our subprogram, which we'll call JOY, must be placed at the end of the program. Assuming there's room above line 999, type in the following:

```
1000 SUB JOY(Z,X,Y)
1020 X=((K=67)+(K=68)+(K=82))*-4+((K=83)+
     (K=87)+(K=90))*4
1030 Y=((K=69)+(K=82)+(K=87))*-4+((K=67)+
     (K=88)+(K=90))*4
1040 SUBEND
```

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Next, in the main program, change CALL JOYST(n,X,Y) to CALL JOY(n,X,Y) so that our keyboard subprogram will be CALLed rather than the system joystick subprogram (n is 1 or 2).

Last, for either console or Extended BASIC, check to see if the fire button is used. You should find a statement of the form CALL KEY(n,K,S) in the program (n is 1 or 2). Shortly thereafter in the program, a check for the value of K will be made. If K is equal to 18, then the fire button has been pressed.

With keyboard control, we can use the space bar rather than the fire button. Change n (which is 1 or 2) to 0 in the appropriate CALL KEY(n,K,S) statement. Also, change 18 to 32 in the subsequent check for the value of K.

Hex-To-Decimal Conversions

As a faithful reader of your magazine, I'd like to say that I'm surprised at how many computer hobbyists still have not found a simple decimal-to-hexadecimal conversion program. And I haven't noticed one in any issue of your magazine, so I've written this short BASIC program to do the conversions. It will work on most computers with little or no modification.

Frank Sgabellone

```
10 A$="0123456789ABCDEF":INPUT"DEC/HEX";A
   :B=1:C=9:D=16↑C:PRINTA;" = $";:A=A+1
                                  :rem 107
20 IFA-D>0THENA=A-D:B=B+1:GOTO20 :rem 156
30 PRINTMID$(A$,B,1);:B=1:C=C-1:D=16↑C:IF
   C>-1THEN20                     :rem 235
40 PRINT"{5 SPACES}":GOTO10         :rem 9
```

Hexadecimal numbers are widely used in machine language since they are more convenient for that kind of programming than the normal decimal numbers.

Compilers For The 64

I would appreciate some clarification on compilers. I have seen advertisements for several compilers (DTL-BASIC, and Metacompiler for Forth) and would like to know if they actually produce ML code that will run on any 64.

In other words, can I write a program in BASIC or Forth, run it through the compiler, and have ML code that will run on another 64 that doesn't have access to the compiler?

Paul Filiant

There are two types of compilers: those that produce native code *(machine language), and those that generate* pseudocode *(P-code). P-code compilers translate the source program into another, smaller, faster language. This pseudocode must still be interpreted, like BASIC, but it's interpreted much more quickly. Also, P-code interpreters can run the same P-code program on many machines, whatever the microprocessor used. But to run a P-code compiled program, you must have a copy of the P-code interpreter.*

Other compilers generate true machine language. This has the advantage of speed, if not portability. The object code produced by the compiler needs a set of general-purpose subroutines. Otherwise, the compilation of PRINT would expand into a large chunk of machine language each time it is used. Instead, it is more memory-efficient to compile PRINT into a subroutine call to the general PRINT routine. The set of subroutines required is called the runtime package, and is included in the compiled program.

A compiler generally produces a complete program that will run on any machine, without the compiler itself. However, we now run into the problem of copyright. You have written and therefore own the rights to the original, uncompiled program, but who owns the compiled program? You might think you retain the copyright, since compiling is something like translating a book into a different language.

However, you don't own the runtime package. Some companies require you to pay a royalty for selling the compiled program. Other companies require a special security key to run the compiled program. (A security key prevents a program from running without it. It is usually a ROM chip or some device that plugs into a joystick or cassette port.) This is like a royalty; you must buy security keys for every copy of the compiled program you distribute. Still other companies give you the freedom to distribute your compiled code, as long as you include a notice specifying that it was compiled with their product. Be sure you understand what copyright rules are enforced by the compiler company. If in doubt, write them.

Reading The Atari 800 PIA Registers

I am 16 years old and own an Atari 800. Currently, I am trying to use the joystick ports for certain I/O applications. So far, the only problem I've encountered is speed. The registers that store input information from the joyports are updated only every sixtieth of a second. This is too slow for me. Is there any way to read the joystick ports at a faster rate?

Christopher Terpin

Instead of using the shadow locations for the joysticks, you can read the joystick ports directly from the data direction registers in the 6520 PIA chip. These are truly general-purpose input/output ports, with one byte used for two joysticks. Each bit can be programmed independently for input and output. Complete information on this can be found in the Atari Hardware Reference Manual. *Some information is also found in* Mapping the Atari, *available from COMPUTE! Books. In the meantime, examine the information found at $D300.*

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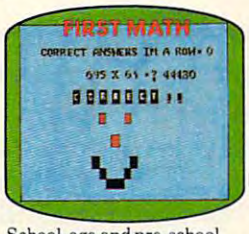

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"Filer" Modification

I have really enjoyed using the "Filer" program which appeared in October 1983 COMPUTE! "Beginner's Page." However, I would like to modify it to store and search any number of items (defined by variable T in line 1) without having to update T each time another item is added. Can you help me with this?

Richard Hamilton

You can allow for a varying number of items in your file by making just a few modifications to this program. First, delete line 1. Then, adjust the DIMension statement in line 3 to some maximum number of entries—say 50. Next, add the following lines:

```
10 I=I+1:READ A$(I),B$(I),C$(I)
12 IF A$(I)<>"END" THEN 10
13 T=I-1
522 DATA END,0,0
```

In line 10, the variable I is the number of the item being READ. Line 12 checks for the end-of-data entry in line 522. If the end-of-data flag is not observed in line 12, the counter I is incremented, and another item (title, date, and author as A$(I), B$(I), and C$(I)) is READ. Otherwise, no more DATA is READ and T, representing the actual number of items, will be set in line 13.

What Is A Scratch Disk?

I have a 1541 disk drive, and have a question about the performance test program included on the *TEST/DEMO* disk that comes with the drive.

When you run the program it instructs you to insert a scratch disk. What is a scratch disk? Is it the *TEST/DEMO* disk, and can I damage the *TEST/DEMO* disk if the program continues with it in the drive?

Harry Metz

Yes, the programs on the disk can be damaged. If the write-protect notch is not covered and you continue running the program with the TEST/DEMO *disk in the drive, all of the programs could be wiped out.*

In computer terminology, scratched *is defined as meaning* empty or available for use. *A scratch disk is one that has no useful programs on it, and can be used to SAVE files. A scratch tape is the same. It's like a "scratch pad."*

When the performance test prompts you for a scratch disk, take out the TEST/DEMO *disk, and place a blank disk into the drive. Do* not *use a disk which has programs on it that you desire to keep.*

Changing The Atari 800 Cursor

I am working on a program for my Atari 800. I would like to know how to change the cursor from the ordinary box shape to a line. I saw this done in an adventure game and I thought it would be something nice to use in my programs.

John Runions

You will need to write your own input routine which accepts keys from the keyboard, puts them into a string, and permits correction. Then, the cursor you use is up to you. Disable the system cursor with POKE 752,1.

You can display a graphics character on the line below the character it is highlighting. You could use a redefined character set, with patterns for letters with the cursor included (you would then alternate between the normal character and the underlined character). You could also use a player or a missile as a cursor (as done in "Scriptor," April 1983). There are so many ways to display graphics on the Atari that these suggestions barely scratch the surface of the possibilities.

Memory Management In IBM, Atari, And Macintosh

Methods of RAM management are among the most important aspects of computer operation, but I can find practically no information on this. How does one computer compare with another in memory management? Why is it that even in the IBM 16-bit computer, BASIC RAM is limited to 60864 bytes with 256K memory installed? How fast would IBM load a program? I am told that IBM drives use 512-byte sectors, 9 per track. Does this mean a fourfold increase in speed (from Atari's 128 bytes per sector)? What about the new Apple Macintosh? More than anything else, the speed with which swaps in memory are made determines the horsepower of a computer.

Orville E. Bean

The factors which determine how effectively a computer can manage memory are the amount of memory the central processing (CPU) chip can address directly, and the number of bits the CPU can transfer to or from memory at one time. To use your phrase, a 16-bit machine has more horsepower, since it can grab 16 bits at a time from memory, instead of 8 bits. Most home computer CPUs, like the 6502 chip used in the Apple, Atari, and Commodore, can directly address 64K bytes and transfer 8 bits at a time. The 8088 CPU in the IBM PC and PCjr can directly address 1024K bytes (or one megabyte). However, it organizes this memory into 16 blocks (called segments) of 64K each. IBM's Microsoft BASIC was written to operate within one segment, which is why only 60K is available for programming after the computer takes away what it needs for its own operations. (There is at least one third-party BASIC for the PC that supports all available memory.) Although the PC and PCjr are usually called 16-bit computers, their CPUs can actually transfer only 8 bits at a time. The CPU in the new Macintosh can directly address 16

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As to disk access, the most important limitation to speed is in the disk interface. Even if you had a hard disk—and they're extremely fast—you would still be limited by how quickly your computer and disk drive could communicate. Many home computers use serial interfaces, both for economy and to comply with FCC regulations. (A serial interface transfers one bit at a time, using few wires, whereas a parallel interface transfers a whole byte (8 bits) at a time, over many wires. Too many wires amplify the tendency of a cable to act as a transmitting antenna of radio-frequency interference.)

The IBM computer uses a parallel, high-speed, direct-memory access (DMA) interface. The computer hardware can directly interact with the disk controller. Other computers have to treat the disk drive as a remote peripheral, communicating and buffering data. Again, the interface limits the speed, but disk formats vary in efficiency. An IBM drive can read one 512-byte sector without moving the head, whereas you have to locate four 128-byte sectors to read as much data on an Atari disk drive. Since the Macintosh uses a small 3¼-inch disk, with data tightly packed (400K), less movement of the head is needed to find information, so these new drives are usually faster.

Automatic SYS For Commodore ML Programs

I really enjoy your programs that are written in machine language. I am accumulating quite a collection of ML programs. The problem I'm having is trying to remember the SYS (beginning) addresses to start them. Is there a way to include a line like 10 SYS 49152 in the program so that all one would have to do is type and enter RUN to start the program?

Kris Wechter

Yes, it is possible. As a matter of fact, many commercial games do just that.

The BASIC program 10 SYS 2064 *uses 14 bytes. You can start writing your machine language program past the end of this short BASIC program (memory location 2064 = $0810, on the Commodore 64, for example).*

After it's completed, SAVE it (with a machine language monitor) from address $0801 to the end of your ML program. This technique enables you to LOAD it like a BASIC program and enter RUN to start it.

When you use this method, you can LOAD the program with either the LOAD "filename",number *or LOAD* "filename",number,*1 format (*number = *device number, 1 for tape or 8 for disk).*

Another nice trick is to SAVE the programs with the SYS addresses in the filename. For example, if you have a game called Saucers *that starts at address 49152, SAVE it to tape or disk with a filename of* Saucers 49152. *That way you'll never forget.*

If you presently have programs on tape or disk, and you can't remember their starting addresses, RUN one of these BASIC programs. It will tell you what the starting address is.

Starting Address For Disk Programs

```
10 INPUT "{CLR}ENTER PROGRAM NAME";PN$
20 OPEN8,8,8,PN$+",P,R"
30 GET#8,A$,B$
40 PRINT"START ADDRESS OF {RVS}";PN$;"
   {OFF} IS:"ASC(A$+CHR$(0))+256*ASC(B$+C
   HR$(0))
50 CLOSE8:END
```

Starting Address For Tape Programs

```
10 INPUT"{CLR}ENTER PROGRAM NAME";PN$
20 OPEN 1,1,0,PN$
30 PRINT"START ADDRESS OF {RVS}";PN$;"
   {OFF} IS:"PEEK(829)+256*PEEK(830)
40 CLOSE1:END
```

Relocating Commodore Programs

If I type in a VIC-20 program from your magazine on my 64 and save it on tape or disk, will the program run on my friend's VIC-20?

Ann Harrison

Yes, it will. Both the VIC-20 and the 64 have the ability to automatically relocate BASIC programs. There is only one restriction. You must LOAD them using this syntax:

LOAD "filename",number

where number *is the device number (1 for tape, 8 for disk). It will not work if you load with the syntax:*

LOAD "filename",number,1

The extra ,1 after the device number tells the computer to load the program back into the exact area of memory from where it was originally SAVEd. This may cause your programs to run abnormally because the beginning of BASIC memory is different for the VIC and 64.

Atari 800 Keyboard Failure

I own an Atari 800 computer with 48K. Five of my console keys (these are 6, 7, T, Y, and N) no longer call a character to the screen when they are pressed. I have tried turning off the computer and then turning it back on, but this does not solve my problem. The 90-day warranty by Atari has expired, so I have to solve the problem myself.

Is this problem simple enough to be solved at home? If not, then where should I take my machine and approximately how much would it cost to get it fixed?

Luis A. Betances

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Of course, we cannot diagnose your problem sight unseen, but we do have a few suggestions. First, you can easily pry off the keycaps with a paper clip. (Be careful: The spring may jump out.) Check to see that the contacts are clean, with no particles preventing closure of the two contacts.

If that doesn't help, and if you don't mind opening your computer, the keyboard is easily accessible. (Be sure the computer isn't plugged into the wall socket.) Check the keyboard cable to see that it is not twisted, frayed, or loose. If this isn't the cure, you'll have to return your computer to an authorized Atari Service Center. Call Atari Customer Service for the name of the dealer nearest you, toll-free: (800) 538-8543.

Expanding Atari 800 To 64K

I have an Atari 800 which I recently expanded to 48K by adding an Intec 32K board. This addition leaves an open slot in my memory compartment. Can I now just add a 16K board in this open slot to bring my machine up to 64K? Or do I need some additional hardware or software to make this upgrade possible?

Neil G. Wyatt II

It's not that easy. The 6502 in your computer can access 64K at a time, but that includes both ROM and RAM. Your machine needs 16K of space for ROM and other system memory, leaving you with a maximum of 48K. Adding another 16K would only hopelessly confuse your machine. There are companies which manufacture 64K RAM boards. Some of these let you rotate segments of your memory with a large bank of extra memory. Others let you temporarily make the ROMs disappear, revealing underlying RAM. This is the technique used in the new Atari XL computers, and on the Commodore 64. At least one company lets you plug your existing RAM chips into a bare board to save you money in the upgrade.

No Easy Conversion From VIC To 64

Being the previous owner of a VIC-20, I have several VIC programs that I would like to use with my new 64. Is there a conversion factor for memory locations available?

Bill Powell

Translating programs from the VIC to the 64 is not always simple. There are many significant differences between the two computers. For example, the SID (Sound Interface Device) chip in the 64 is much more complex than the VIC chip (Video Interface Chip) in the VIC, so sound routines have to be rewritten.

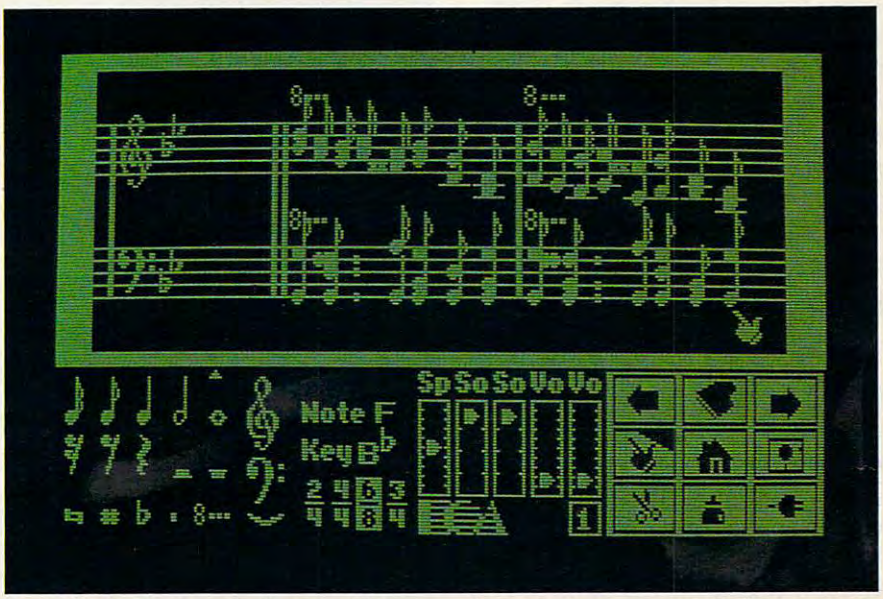
Color and screen memory in the 64 are both 1024 bytes long, while in the VIC they are 512 bytes. Also, the screen and color memory locations in the 64 and VIC are different. This means that all POKEs and PEEKs to screen and color memory have to be changed. There is also the problem of "shifted" ROM. BASIC is stored in permanent memory beginning at address $A000 in the 64, while BASIC starts at address $C000 in the VIC. For example, the print fixed-point value *routine in BASIC ROM is at $BDCD in the 64, and $DDCD in the VIC.*

The way to convert your programs is to go through them one line at a time, and rewrite where necessary.

COMPUTE! welcomes questions, comments, or solutions to issues raised in this column. Write to: Readers' Feedback, COMPUTE! Magazine, P.O. Box 5406, Greensboro, NC 27403. COMPUTE! reserves the right to edit or abridge published letters. ©

The END of DINKETY-DINK.

Announcing the first computer music program that actually sounds like music.



LET'S FACE IT. Up till now, music programs for your home computer have all sounded, well, pretty lame. There were the ones that resembled little electronic music boxes, remember? And then there were those that sounded like so many burps.

Enter Music Construction Set.™ It's the first music program that really makes use of the power of that machine you've got. If you're a serious student, this means you'll be able to work with an intricacy and range of sound quality you've never heard before on a computer. And if you know nothing about music, you'll find something even more important. Namely, that this thing is simple enough to be a lot of fun.

Take a good look at this screen because it, you, and a joystick are the whole story here.

That's you at the right end of the staff of notes — the little hand. Move the joystick, and you move the hand. Use it to carry notes up to the staff. Lay in rests, signatures, clefs, then point to the little piano in the lower right and listen, because you'll hear the whole thing played back.

Move those little scales in the middle up and down to vary the music's speed, sound quality, and volume. Use the scissors to cut out whole measures, then use the glue pot to paste them in somewhere else. Got a printer? Great. Print the score out and show it off to your friends.

But what if you're not up to writing your own stuff yet? No problem. There are twelve pieces of music already in here, from rock 'n roll to baroque. They're fun to listen to, and even more fun to change. (Apologies to Mozart.)

The point is, the possibilities are endless. But if you're still skeptical, visit your nearest Electronic Arts dealer and do the one thing guaranteed to send you home with a Music Construction Set in tow.

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Evolutionary To The Core:

The Apple IIc Heads For Home

Selby Bateman, Features Editor

Apple Computer has made 1984 its year of surprises, first with the "revolutionary" Macintosh and now with the "evolutionary" Apple IIc. The new 7½-pound portable has already achieved critical acclaim and impressive early sales. Is it the computer for you?

The $1295 Apple IIc, with a half-height 5¼-inch built-in disk drive on the right side, 128K RAM, and a 63-key keyboard, is a smaller, enhanced Apple IIe. (All photos courtesy of Apple Computer, Inc.)

"The IIc is not a home computer," says Apple President John Sculley. "It's for the serious user in the home."

Sculley isn't just playing word games with that comment. It is as succinct a statement of Apple's plans for the IIc as you'll find. And it addresses the biggest challenge and the greatest opportunity for the Cupertino, California, company: To convince a huge untapped home market that the IIc is not a low-end computer. And at the same time, Apple is targeting owners of low-end microcomputers who want more power, more software, and more portability.

$15 Million In Advertising

By now you may have heard or read something about the IIc's power (128K RAM), price ($1295), portability (notebook size, 7½ pounds, built-in low-profile 5¼-inch disk drive), and compatibility (it runs thousands of Apple II software programs). And you've probably seen some of the $15 million in advertising that Apple has spent these past few months.

Still, for most people, the important question is: What is Apple offering you in the IIc that you can't get with the IBM, Commodore, Atari, Radio Shack, and other Apple computers?

If market researchers are correct, the number of personal computers in the home will go up from eight million units now to about 50 million by 1988. This would put at least one computer in two out of every three U.S. households in the next four years.

Two Steves In A Garage

To see how Apple plans to exploit that potential market with its new IIc, you have to go back to 1977. Two young men, Steve Jobs and Steve Wozniak, emerged from their garage workshop with the Apple II, the first fully assembled personal computer. It created a sensation, and the two Steves haven't looked back since. The Apple II begat the Apple II+, which begat the Apple III—a business machine. Then, in 1983, the company introduced the Apple IIe (the *e* stands for *enhanced*), a 64K RAM personal computer which continued the evolution of the Apple II line. Almost two million computers in the Apple II family have been sold.

At that point the problems started. Or as John Sculley puts it: "The Apple IIe was a very important technical improvement on the Apple II+, but the real difference in 1983 was that

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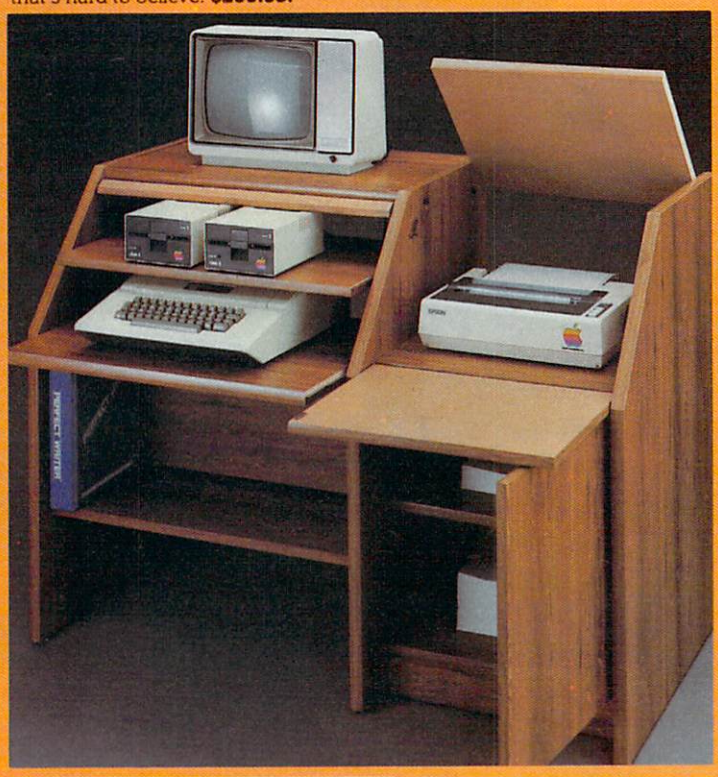

The CS-1632 computer storage cabinets compact yet functional design fits almost anywhere while housing your computer monitor, joysticks, software, books and peripherals all for only $89.95.

The slide out shelf puts the computer at the right height and position for easy comfortable operation.

The fold up locking door keeps unwanted fingers off the key board when not in use.

To store joysticks just turn them upside down and slide them into the inverted storage rack.

Twist tabs on the back of center panel allow for neat concealed grouping of wires, while power packs rest hidden behind center panel on shelf.

The slide out software tray has room for 14 cartridges or cassettes and up to 30 diskettes. Most brands of software will fit between the adjustable partitions with a convenient hook for the spare key at rear.

Stand fits Atari 400 & 800, Commodore 64 & VIC 20, Ti 99/4A and TRS-80.

Cabinet dimensions overall 36" high x 33-7/8" wide x 16" deep.

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The two slide-out shelves put the keyboard at the proper operating height while allowing easy access to the disk drives.

The bronze tempered glass door protecting the keyboard and disk drives simply lifts up and slides back out of the way during use.

Twist tabs on the back of the center panel allow for neat concealed grouping of wires while a convenient storage shelf for books or other items lies below.

The printer sits behind a fold down door that provides a work surface for papers or books while using the keyboard. The lift up top allows easy access to the top and rear of the printer. A slot in the printer shelf allows for center as well as rear feed printers.

Behind the lower door are a top shelf for paper, feeding the printer, and a bottom shelf to receive printer copy as well as additional storage.

Stand fits same computers as the CS-1632 as well as the Apple I and II, IBM-PC, Franklin and many others.

The cabinet dimensions overall: 39-1/2" high x 49" wide x 27" deep.

Keyboard shelf 20" deep x 26" wide. Disk drive shelf 15-34" deep x 26" wide. Top shelf for monitor 17" deep x 27" wide. Printer shelf 22" deep x 19" wide.

HYTEC SYSTEMS

The IIc is about the size of a notebook, and can be configured with optional 9-inch monochromatic monitor (as shown here) and with a variety of compatible peripherals.

for the first time, the Apple II faced real competition."

Apple found itself sandwiched between the low price of the Commodore 64 (and several other low-end computers) and the IBM PC, which quickly established itself as a high-end standard.

"While IIe sales continued to grow," Sculley said, "Apple was quickly becoming positioned as a single-product company with declining importance in business and in the home. That's a very dangerous situation."

The First 100 Days Of The Macintosh

But what a difference a year makes. With the introduction of the Macintosh in January of this year, Apple offered a revolutionary personal computer aimed primarily at the business and college markets. It was designed to be the least intimidating and easiest to use computer on the market. The $2495 128K computer, which has no built-in programming language and features a mouse input device, sold more than 70,000 units in its first 100 days.

By contrast, the original Apple II took 2½ years to sell 50,000 units, and the IBM PC took over 7½ months to sell the same number.

Then, this April, Apple introduced the IIc at a day-long exposition in San Francisco. The event featured a high-tech sound and light show, demonstrations of the new product, presentations of compatible software from a variety of companies, and an unplanned earthquake that rocked the city. Within several hours that day, Apple took more than 50,000 IIc orders from more than two thousand retail dealers. Apple had come some distance from two young men in a garage.

Just Another Appliance

Amidst the carnival hoopla of the IIc's debut, Apple officials restated their argument that the new machine is an evolutionary twist in the Apple II line and that it addresses a new segment of the buying public with a different concept of what a computer should be.

"We should not be judging how convenient the Apple IIc is versus other competitors," says Sculley, "but relative to other consumer appliances that are used by people who have never used any personal computers before. The IIc was designed from the start to demystify the intimidation that personal computers present to so many people." In other words, as with the Macintosh, Apple is trying to make the IIc as easy to use as a toaster, a television, or a stereo system. And the company is trying to do that in the same way that items such as cars,

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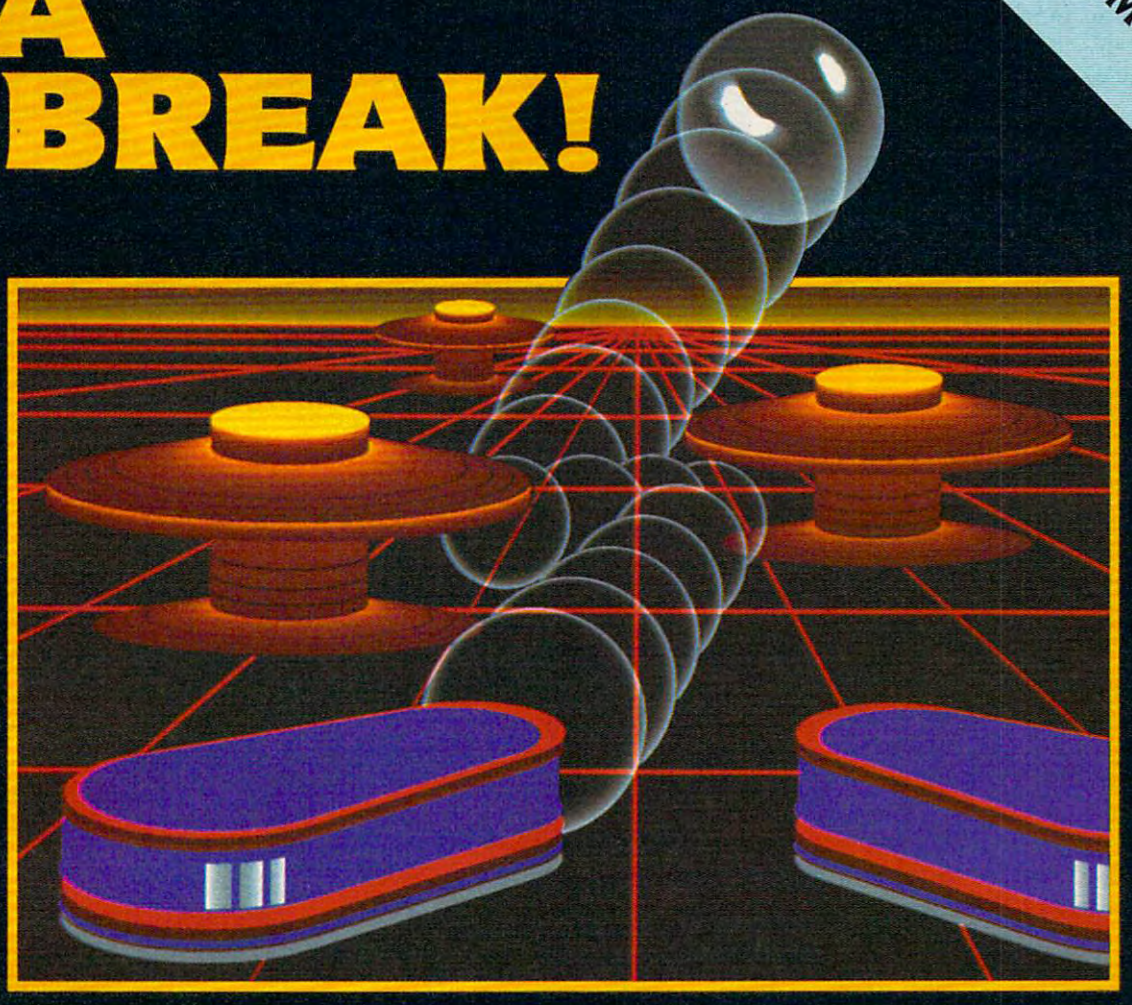

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cameras, and pocket calculators have evolved into mass market products.

Apple estimates that about two-thirds of IIc sales will be to the home market, with the rest going to schools and small businesses.

The Snow White Look

To underscore the novelty of the IIc, Apple has altered the physical appearance of the new machine and all of the optional peripherals that are made for it. The new look is called "Snow White," and it features an ivory color, rounded corners, and a sleek, narrow case with a fine-grained texture. Frog Design, a West German firm which also designed the Sony Walkman, created the new casing for Apple. It marks the biggest exterior design change in the Apple II line, and will be the look of all future Apple products.

The computer, including the keyboard, internal circuit board, built-in disk drive, and rear panel peripheral ports, weighs only about 7½ pounds. A recessed handle mounted on the top rear of the computer swings out for carrying and also locks in place in order to position the machine at a correct typing angle. The body of the computer is only 2½ inches high, 12 inches wide, and 11½ inches long—little more than the size of a notebook.

To emphasize the IIc's simplicity, everything a user needs to get started comes in one box, except a display screen. The absence of a monitor with the new computer will allow consumers to choose between television, composite monitor, and RGB (red-green-blue) displays. And, by September, a new flat liquid crystal display will be available, says Steve Jobs, Apple's chairman of the board. It also keeps the initial price lower and allows dealers to sell the computer in a variety of configurations.

By September, Apple promises this flat LCD screen, which fits on top of the main IIc unit and has full 80-character by 24-line display.

There aren't any ROM cartridge slots either. Jobs calls those cartridges clumsy, and prefers the cheaper, more effective, and more flexible floppy disks.

70 Fewer Chips

Internally, the IIc has a 65C02 central processing unit (CPU)—an eight-bit microprocessor—which Apple says is an enhanced version of the 6502B CPU used by the Apple IIe. Both of those chips are based on the original 6502 manufactured by MOS Technology. The C in 65C02 is taken from CMOS (Complimentary Metal-Oxide Semiconductor), which designates the production process of the chip. The new version reportedly has cooler operation and requires less power, allowing the IIc to use a battery pack that is to be available later.

The 65C02 chip also reportedly includes 27 new programming instructions. If programmers use these instructions in their IIc software packages, those programs will not work on earlier Apple II models with the original 6502 or 6502B chip. Upward compatibility from the earlier Apple II machines to the IIc is not a problem, however, Apple says.

There are only 40 chips within the IIc, quite a reduction from the 110 which are found in the IIe. Apple engineers combined the functions of some chips onto custom large-scale integrated chips to achieve this. They also combined functions: The mouse peripheral port on the rear of the unit, for example, can accept a mouse, joystick, or hand controllers. Although there are fewer chips, the machine has double the usable memory of the Apple IIe—128K, or the equivalent of about 50 double-spaced typed pages of work area. There is 16K of ROM (Read Only Memory), containing among other things the standard Applesoft BASIC programming language.

Ultrahigh Resolution

There are three graphics modes available with the IIc. First, a low-resolution graphics mode of 40 x 48 pixels with 16 available colors and, second, a high-resolution mode of 280 x 192 with 6 colors—both of which are comparable to the IIe's

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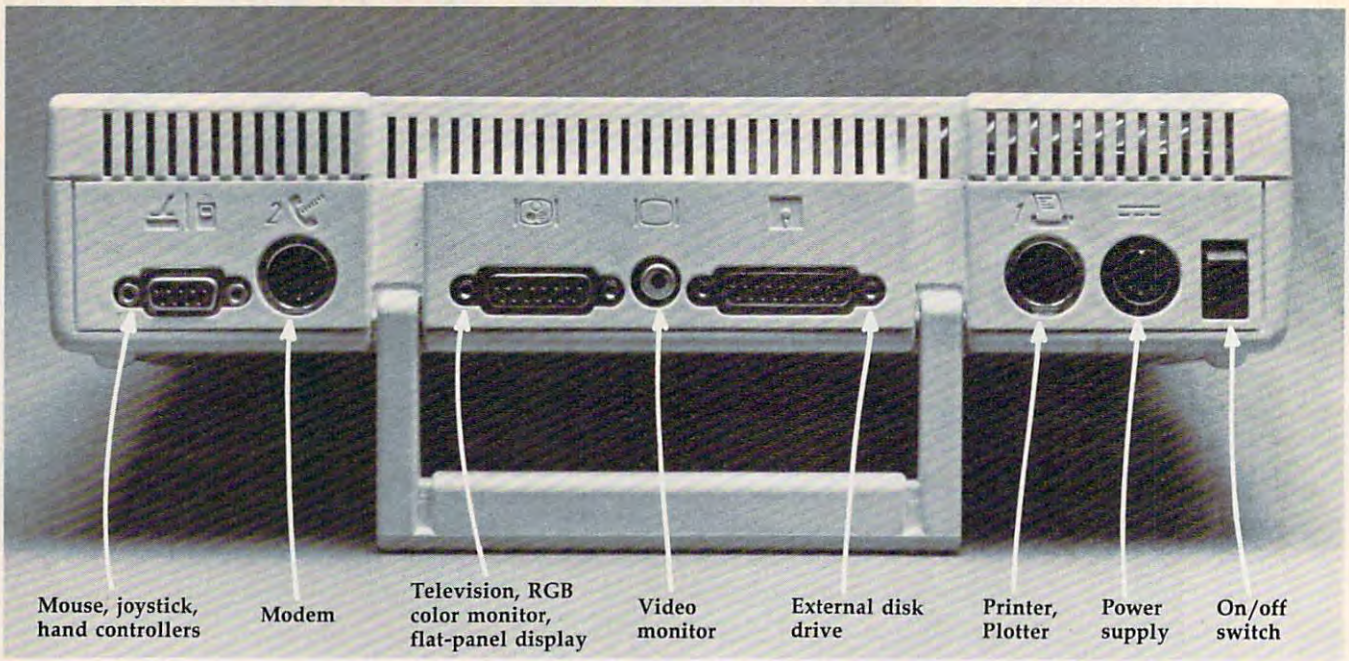


The peripheral ports on the rear of the main panel are virtually foolproof for installation, and feature icons above each socket to show the user the various uses.

graphics modes. The IIc also has an ultrahigh-resolution monochromatic mode of 560 x 192, which approaches but does not match the Macintosh's 512 x 342 pixel monochrome display. Apple says that in the future the ultrahigh-resolution mode will be able to support 16-color graphics.

The IIc also has an internal speaker almost identical to that in the IIe. It allows five octaves of sound. The IIc has a volume control button on the side of the case, which the IIe does not. And there is a plug for headphones in the new machine, next to the volume control button.

The keyboard on the IIc represents a departure from the IIe, although the basic layout and size are virtually identical. There are 63 sculpted keys, but rather than the smooth up and down action of the IIe, the IIc's keys have a breakover effect—a definite toggle—that gives a tactile sense when a key has been hit as well as an audible click. The effect is not unlike the keyboard action on the IBM PC, although the breakover action on the IIc is not as pronounced.

Spillproof

Above the keyboard, starting on the left, are three partially recessed switches: a rectangular reset button, which on the IIe is to be found on the right side of the keyboard; a button that changes the video display from 40 to 80 columns (or vice versa) for text; and another button which will alter the keyboard from the standard QWERTY key configuration found on most typewriters to a DVORAK keyboard. The DVORAK keyboard, which has a faster and more logical key layout than QWERTY, is growing in popularity. Apple will also have replacement key caps for those who wish to install them in the DVORAK layout.

An Apple spokesperson says that six different keyboard prototypes were tested for the IIc, and that on the recommendations of touch typists who tested the various keyboards, the present style was adopted.

Another interesting keyboard feature is a layer of plastic beneath the keys, which will prevent any spilled liquids from penetrating into the computer itself. At typing angle, liquids will drain toward air vents at the front of the machine. An Apple spokesperson called this the "drool" cover.

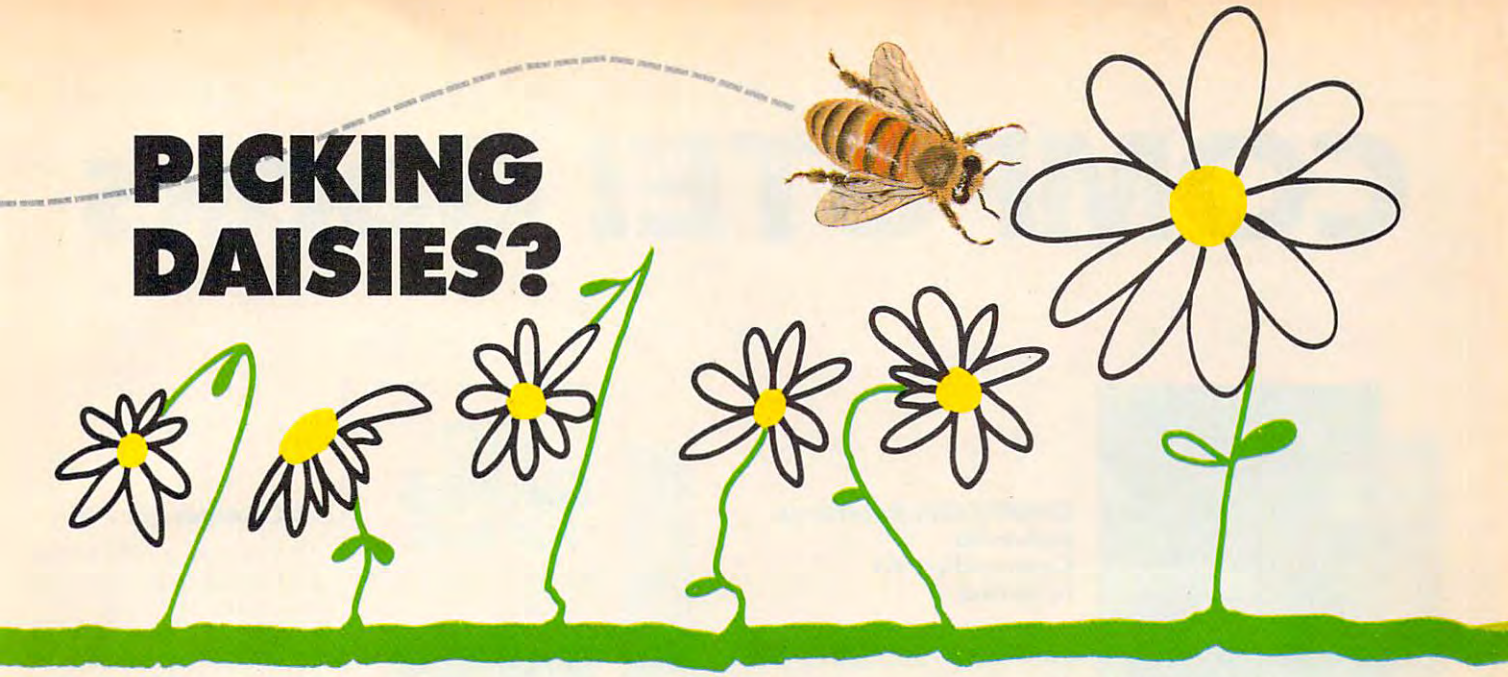
Foolproof Peripheral Ports

Built into the right side of the main unit is a low-profile 5¼-inch disk drive, which has a 140K capacity. A total of 137K of that is available with ProDOS (a Disk Operating System) and with Pascal DOS. 124K of RAM is available with DOS 3.3.

The system uses a 12-volt detachable power supply, which will allow an unmodified IIc to run off a car's cigarette lighter, a battery pack, or international electrical outputs. This power supply, in the same Snow White style, is packaged in the IIc box along with the main unit, cables, RF modulator for TV hookup, and a disk-based owner's manual/computer literacy course aimed at the first-time user.

But one of the IIc's most attractive features for consumers new to computers could well be its back panel of peripheral ports. This also represents a major departure from the IIe. Instead of the add-on card slots

PICKING DAISIES?



BROTHER HR15

Costs about the same—but it's slower, noisier, and needs its own brand of ribbon. To be fair, it's lighter.* (But JUKI eclipses the BROTHER totally!)

SILVER REED EXP500

Okay, it's lighter—but it's more than a whole word slower per second, it's noisier, lacks a buffer memory, and prints only a 10″-wide line.* (JUKI triumphs again!)

SILVER REED EXP550

You pay about $100 more, and it's slower, noisier, has no buffer memory, and lacks the refinement of our linear stepper carriage motor. A little wider print line, yes. A bargain, no.* (JUKI by a mile.)

QUME LP20

Costs about $300 more, needs its own brand of ribbon, and takes only a 96-character wheel. Is it worth it for just 2 more characters per second and a wee bit quieter machine?* (Sorry, QUME, JUKI gets the trophy.)

DIABLO 620

Costs about twice as much, weighs 19 lbs. more, and requires its own brand of ribbon. Pretty steep for a slightly quieter machine and 2 more characters per second.* (The winner: JUKI.)

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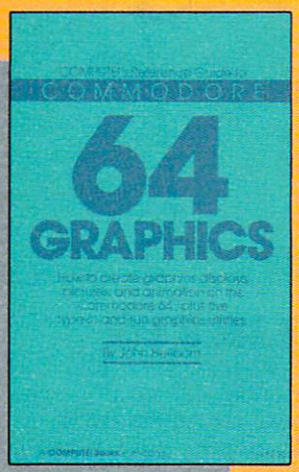

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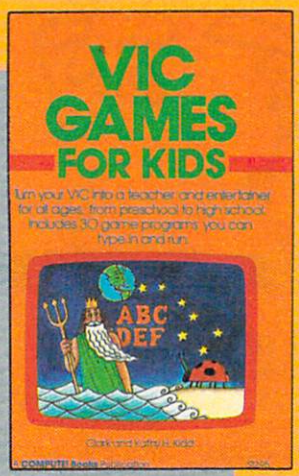

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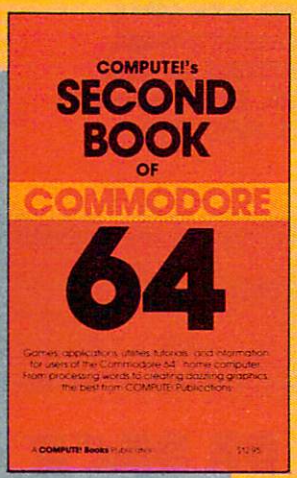

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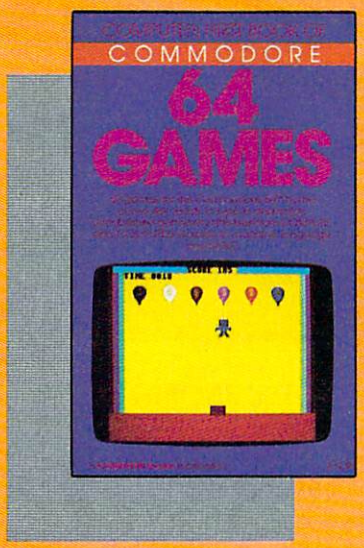

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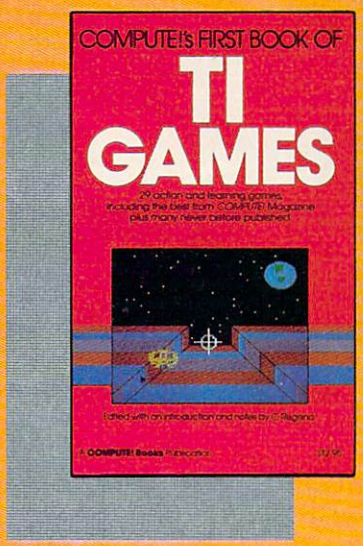

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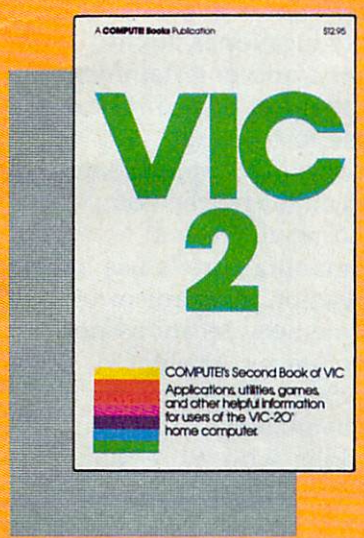

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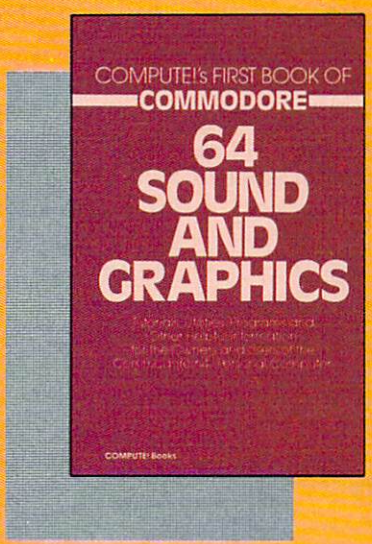

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The Apple IIc, with optional 9-inch monitor, Scribe thermal transfer printer, AppleMouse II, external disk drive, joystick, modem, and carrying case.

found on the back of the IIe, the new computer has a row of plug-in sockets which can simultaneously support a display screen, printer, modem, mouse pointer, joystick, and a second disk drive. And each socket is configured so that only the correct connector can be plugged into it, thus preventing a beginner from making a major error during setup. Each of the sockets, including two high-speed serial ports, is identified by a picture on the case.

Also, Apple computers have traditionally been hobbyists' and hackers' playgrounds, easily opened and modified. Not so with the IIc. The main unit is sealed, representing Apple's philosophy that this computer is for all of those who don't want to have to learn about expansion cards, complex interfaces, and the like.

Flat LCD Display

The IIc is expandable, with a variety of optional accessories. The Scribe printer ($299), for example, is a 13-pound thermal transfer printer that uses regular paper, prints text and graphics in six colors plus black, and has a low-resolution speed of 80 characters per second and a near-letter-quality speed of 50 characters per second.

Other accessories include an 11-pound Apple Monitor IIc ($199) with a nine-inch green phosphor display (a handle is also included for the monitor); the AppleMouse IIc ($99), similar to the mouse used with the Macintosh and Lisa 2 computers (requires no add-on card); an external 5¼-inch disk drive ($329) with 140K capacity; a IIc monitor stand ($39); and a carrying case ($39) with room for the power pack and the mouse.

By September, Apple promises to have a flat liquid crystal display (LCD) screen for the IIc that will fit onto the top of the machine and make the IIc even more portable. Priced at about $600, the LCD screen will hold as much information as a regular monitor—80 characters wide by 24 lines long. Prototypes of the new screen were being demonstrated at the introduction of the IIc in San Francisco. Although the screen image was inferior to the 9-inch monitors in both luminance and ease of use, there's little doubt that the flat screen will be a popular option when available.

In addition, several Apple II-family peripherals will run on the IIc including the Imagewriter dot-matrix printer ($595), both the 300-baud ($225) and 1200-baud ($495) modems, the Apple joystick ($59.95), hand controllers ($34.95), and color plotter ($779).

Thousands Of Programs For The Home

If Apple considers its hardware improvements the key to breaking down buyer resistance among noncomputer users, it's counting on the thousands of compatible software programs available for the IIc to help bring the computer home.

According to Apple, more than 10,000 programs have been written for the Apple II over the past seven years and more than 90 percent of the programs still available will run on the IIc. That is a wealth of business, educational, home productivity, and entertainment software that not even IBM can come close to offering.

Any existing Apple II software that might not be compatible would result from a software manufacturer's use of a copy protection mechanism or reserved memory locations not recommended by Apple.

To drive home the point of software availability, Apple has been working with more than 100 software companies to make sure there are plenty of new programs designed to take advantage of the IIc's larger memory, ultrahigh resolution, and built-in mouse technology.

AppleWorks For The IIc

Apple also introduced four of its own programs for the IIc: *AppleWorks*, an integrated word processing, spreadsheet analysis, and data base management package; *Apple Access II*, telecommunications software; *Apple Logo II*, a graphics-oriented program-

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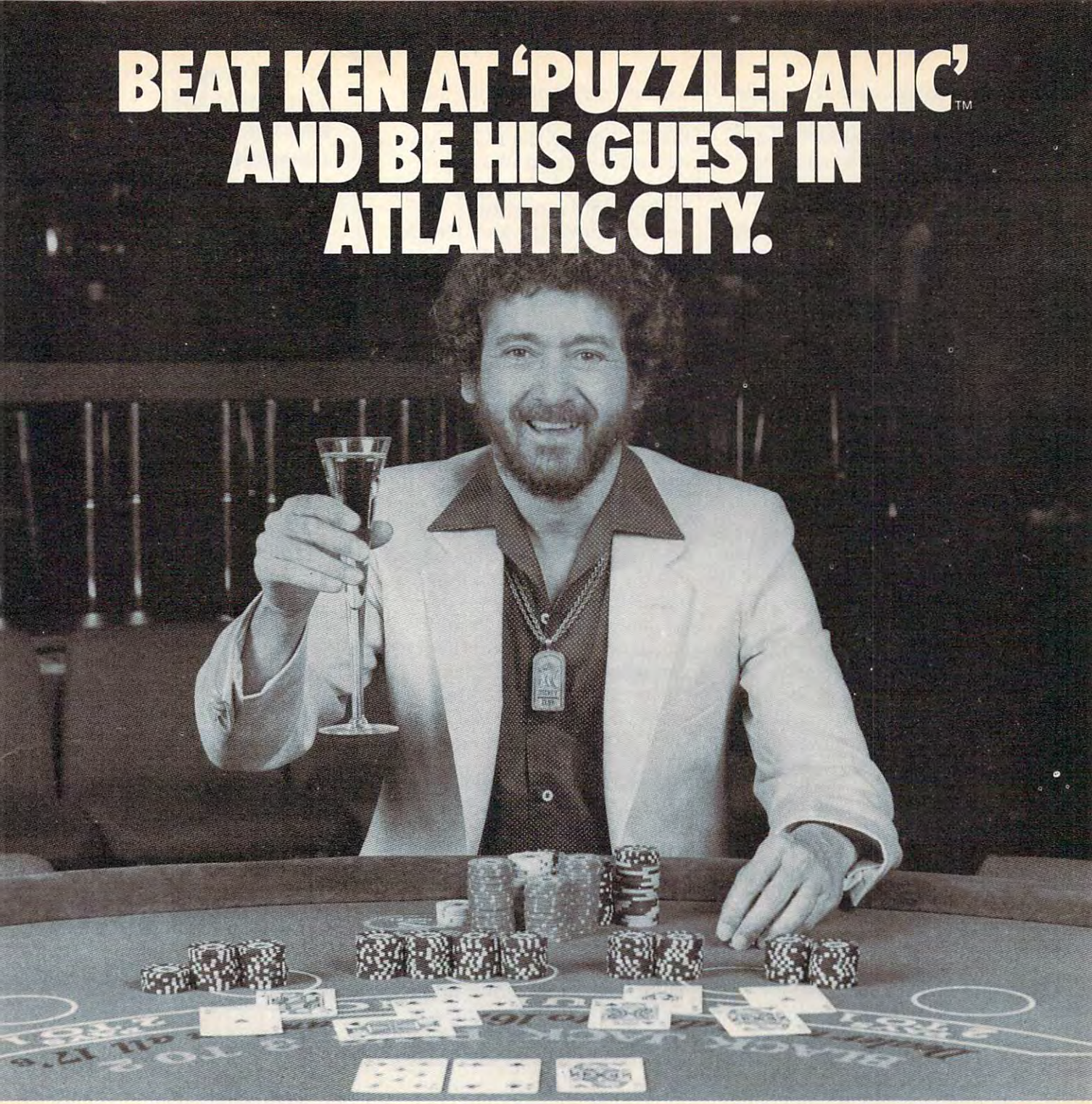

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Here's what you have to do: Solve each puzzle, figure out which symbol will correctly take you to the next puzzle (over 40 puzzles in all) then, use these symbols to find the solution to the Grand Puzzle. Ken will pick a winner from a drawing of all correct entries.

To enter, send your symbol chart listing the correct symbol for each puzzle, along with your name, address and telephone number to: PUZZLEPANIC CONTEST, c/o EPYX, Inc., 1043 Kiel Court, Sunnyvale, CA 94089.

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ming language; and The Apple Education Classics, two popular educational packages—*Elementary, My Dear Apple* and *The Shell Games.*

The 21 third-party programs featured by Apple at the introduction of the IIc included such packages as *Bank Street Writer* by Brøderbund, Inc.; *Financial Cookbook* by Electronic Arts; *Dollars and Sense* by Monogram/Tronix Publishing, Inc.; *Crypto Cube* by Design-Ware, Inc.; *Fact and Fiction Toolkit* by Scholastic Wizware; *Mastering the SAT* by CBS Software, Inc.; *MasterType* by Scarborough Systems; *Rocky's Boots* by The Learning Company; and *Stickybear Shapes* by Xerox Education Publications, among others.

Since something like 70 percent of the computers in schools today are Apple II's and IIe's, the company believes many parents will opt for the IIc because their children are familiar with those machines.

IIe Or IIc?

Apple dealers are less certain about the impact that the IIc will have on sales of the IIe. Concurrent with the announcement of the new computer, Apple cut the price of a IIe almost in half, down to $995. That, according to Apple's Sculley, means that the IIe can be viewed as a thousand-dollar entry machine with exceptional expandability. Admitting that the two machines have a somewhat overlapping target market, Apple nonetheless expects the IIe to continue to have sales in educational (with even deeper discounts), business, and home markets. "IIe or IIc. That is the question" is the advertising phrase Apple has adopted as it attempts to sell—and point out the differences between—the two computers.

With two very different product lines—the Apple II family and the Lisa/Macintosh family—Apple is most obviously squared off against both the IBM PC and the PCjr. Ads for the IIc criticize the PCjr's limited software and its chiclet-style keyboard. As this is written, IBM has already announced to its stockholders that changes will be made in the PCjr, although no specifics were given. While IBM is not about to step away from any of its machines, Apple's giant archrival is scrambling to meet this surprising double onslaught from Apple.

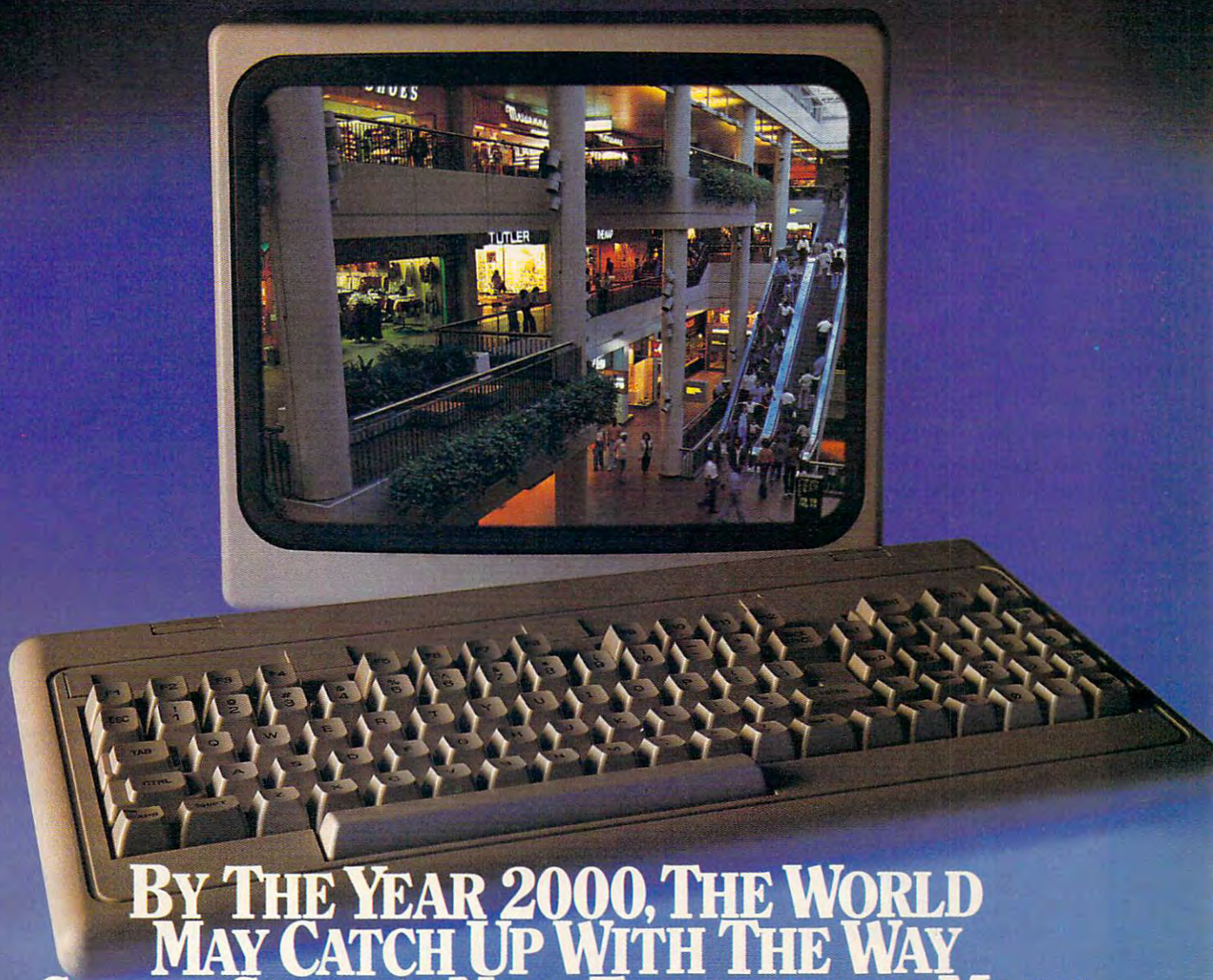
In price and features, the $1295 IIc is closer to the Expanded Model ($1269) PCjr than the PC. The PCjr, like the IIc, has 128K (a 64K plug-in board); switchable 40/80-column video capability; and a built-in 5¼-inch disk drive. However, the IIc is packaged with an RF modulator for television hookup; you must buy a $30 RF modulator for the PCjr as well as cables. The PCjr operates with DOS 2.1, which costs another $65.

Aging Technology

By choosing to use a "c" in the new computer's name, Apple has been able to offer its marketing team a lot to play with: compact, convenient, complete, and comprehensible. The company's advertising is reflecting all of these concepts in an attempt to market the IIc as the first serious *people's* computer.

Many people were ready to write off Apple in 1983, calling the Apple II line an example of overpriced, aging technology. But with the IIc, Apple is betting that it will shake off that label—confounding the company's critics, battling IBM successfully on two fronts, and living up to the "Apple II Forever" slogan it adopted for the IIc's introduction.

Hopes have never been higher at Apple, nor the stakes more important. But, as John Sculley says, "If we're right, and we think we are, Silicon Valley will never be the same again."©



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How To Choose A Home Data Program

Kathy Yakal
Editorial Assistant

Whether or not you realize it, you've probably created and used data bases hundreds of times: every time you filled out a form for a doctor or employer or bank, or bought a new address book. Data base software for personal computers can make the creation, maintenance, and access of data files—information processing—far more efficient.

Have you ever sat near the reference desk of a public library and watched people do research? There's usually one scholarly looking gentleman with eyeglasses perched atop his head, a chewed-down pencil stub behind one ear, and crumpled yellow reference slips falling from his pockets as he looks in the card catalog.

Evolving Methods Of Research

As the computer begins to offer new ways to sift information, however, the techniques of these scholarly gentlemen may eventually become a thing of the past.

Doubtless, computer terminals with improving search software will continue to proliferate in public libraries, airports, department stores—anywhere information needs to be processed.

Our awareness of these data bases is focused on the data itself, not on the software necessary to store and search for it. Once we've learned how to use a particular data base, we tend to forget about the middleman, the data base software.

But if you're thinking of changing the way you file personal information by setting up a data base on your home computer, you may want to consider what kind of software will best suit your needs.

Searchware?

There is some confusion about what the term *data base* actually refers to. It is often used interchangeably to mean both the software used to store the data and the data itself.

Technically, *data base* means the information itself. A data base manager (a computer program) controls and processes that data. It's the manager that you can buy, and that's what we'll be discussing here. The data base is something you enter yourself—a list of your library books, for example.

Impulse buying is rare among software shoppers. Unless there's a two-for-$5 bin, the consumer is usually very cautious, finding out as much as possible about the software before a purchase.

It's especially important to determine your needs prior to purchasing a data base manager. "Maybe that seems too obvious," says Steve Bellinghausen, "but a lot of people don't do that."

Bellinghausen is distribution manager for Professional Software, Inc., publisher of *DataPlus-PC*, a recently released data base manager for the IBM-PC.

A Consumer's Quandary

How do consumers go about matching their needs with an appropriate data base program? In the past, retailers have helped. "Hardware and software dealers traditionally have performed some kind of consulting role to end users," says Bellinghausen. "As new products and companies flood the market, that's becoming increasingly difficult to do."

Bellinghausen describes a scenario where the unprepared consumer walks into a computer dealership and says he needs a data base manager. The dealer points to a flashy display and tells the customer that it's the

best-selling data base on the market.

So he buys it, only to find out that the program does far more than he'll ever need from it, and he's probably wasted a few hundred dollars. "You don't need a sledgehammer to drive a thumbtack," says Bellinghausen. "Or vice versa. You don't want to go the other way, either."

Though it may be easy to end up buying data base software that does more than the consumer needs or not enough, Bellinghausen thinks that asking yourself and the retailer a few simple questions can prevent that. "The consumer should be sharp enough to figure out what he wants to do with it," he says.

Let's look at some of those questions.

An Electronic Filing Cabinet

How many different files do you anticipate creating? If you're buying a data base manager for one use only, like cataloging a stamp collection, this isn't important. But some data base managers allow you to store only one file on a disk. So if you have several small files, you may be wasting disk space if you buy a program with that restriction.

How large do you expect your files to be? With even the most limited data base manager, you can always create new files if you run out of space. But if you have to do any kind of search, you may not be able to merge your files and run a search on the complete file. Try to estimate your storage needs generously.

What provisions does the data base manager make for defining the individual fields (subsections) within each record? Most programs allow you to design the format for each record, to designate how many fields per record, how many characters per field, whether letters only or numbers only or both will be allowed, and so on. Though each data base manager has its limits, a few packages are extremely limiting.

Will you be needing complicated sorts and searches? Most home applications don't require anything very intricate. But if you want to do more than, say, alphabetize, or retrieve by city or state, you'll need a more powerful data base manager.

How about printing reports? You probably want some kind of printer capabilities, which all data base software has. But the extent to which you can design specialized reports varies. Anticipate your future needs.

Remember: You should be able to have all your questions answered either by examining the outside of the package, reading the software documentation, or asking specific questions of the dealer. If you're planning a substantial investment in a data base manager, it might even be worth writing to the publisher if you can't get an important question answered.

A Few Bonuses

Though it's not absolutely necessary, it can be helpful to have a data base that is compatible with a word processing program. The reason for this, believes Bellinghausen, is that mailing lists are "far and away the most widely used application."

Another feature that few data base programs offer is the ability to go back and change field specifications after you've already entered a number of records. To illustrate the value of this, let's set up an imaginary file, a personal mailing list.

Addressing The Problem

It would seem like the best way to set up a file structure for this application would be to imitate the way that an address book is arranged: one line (field) for name, one for street address, one for city, state, and zip, and one for phone number. Maybe an extra line in case the address runs long.

You then specify that each field can accept both alpha and numeric characters, and allow ample characters per field. You transfer all the information from your address book and various scraps of paper lying around on your desk at home.

Then in November you start thinking about sending Christmas cards. You remember that little notebook that you've used to keep track of cards sent and received over the last five years.

At this point it becomes clear that you should have specified extra fields in your address file for the Chrismas list. Also, it would have been nice to have specified fields to keep track of birthdays.

If your data base software does not allow you to go back and add new fields to existing records, your options are to either set up a new file and reenter all of your records, or keep one set of records in a drawer and one on a disk.

Making It Easier

"I used to use data base software on my Atari," said one home computer owner we questioned. "But now I just use a word processing program to keep track of names and addresses."

Your data management needs may not be extensive enough to warrant buying a large, sophisticated data base manager. Or maybe there are some specific applications you could use data base software for, but don't want to take the time to work with a multipurpose data manager.

An alternative to generic data base programs—those that require you to set up your own

The ABC's Of Data Bases

Charles Brannon, Program Editor

There are several "generic" applications for microcomputers. Electronic spreadsheets such as *VisiCalc* helped to spark the microcomputer revolution. Word processing has made many a computer purchase easily justified. And data base programs are now one of the hottest items on the market. The best-selling software, such as *Lotus 1-2-3*, incorporates all three of these applications. Although packages such as *Lotus 1-2-3* (first sold for the IBM PC) have more sophistication and scope (as well as a much higher price tag) than similar programs on home computers, there's still a lot you can do with even a bargain-basement data base.

Just as spreadsheets have made financial analysis easier, faster, and more flexible, just as word processors have blurred the distinction between rough and final drafts, data bases can make all your record keeping simple, streamlined, and fast. But first you have to translate the concepts of manual record keeping to the computer's way of doing things. Since you're bound to encounter new vocabulary and principles as you convert to electronic record keeping, it's useful to have a background in these things as you're searching for the right package for your needs. First, a clarification: Sometimes the program that manages the data is called a *data base*. The set of all your data is also referred to as the *data base*. Context usually makes the meaning clear.

Files, Records, Fields

To understand some of the features of data base management, think of how records are organized if no computer is involved. Short items are usually stored on index cards, then shoved in a box. This whole box of cards would be called a *file* on a data base. Each card is called a *record*. Records are further subdivided into *fields*. Before you can enter any information, you have to set up or define the data base by entering the name, type, and length of each field. To illustrate these subdivisions of a file, we can look at a common type of data base, the mailing list. Each record in such a file would be an individual mailing label. And, within each record, the fields would probably be: *name, address, city, state,* and *zip code*.

Many data bases ask you to estimate the length and type of each field. This way, the data base program can tally up a total for the length of each record. The memory (computer RAM or disk drive) is then subdivided into records of that length. By contrast, other data bases will assume a fixed record length (usually the size of one disk sector), then let you divide the record up into fields. You still have to estimate the length and type of each field. Some data bases can modify the fields at any time, but many data bases can't. It's often wise to set aside some extra fields in case you later want to start including additional information in each record, like telephone numbers.

Field length is based on what kind of information it will be expected to contain. People's names will generally be less than 20 characters. An address can be longer, say 30 characters. Most cities can be spelled in under 15 characters. Using the official abbreviations, the *state* field takes only two characters.

Another aspect of fields is their type—*Name, address, city,* and *state* are all string or alphanumeric fields. The zip code, however, is always a number and so it could be assigned to a *numeric* field. Numeric fields store their numbers in a fixed number of bytes, in the computer's internal floating point format. What this means to you is that no matter how long or short the number is when written out (5.2 or 5,200,000), it will only require, say, five bytes to store. Advanced data bases have several other types. A field requiring a yes/no answer can be stored with only 1 bit (1=yes, 0=no). You could pack eight yes/no answers in one byte. This is often called a boolean, bit, or binary field. Some data bases might support a byte field, which can hold only numbers in the range 0–255.

The *key field* is the primary field you use when accessing records. If the key field is *name*, you can look up any mailing label by the addressee's name. Many data bases will let you sort the entire file. You choose a key field to sort by. If you sort by *zip code*, the file will be ordered according to the zip

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code when printed out. Some data bases let you sort or search with multiple keys. For example, you could print out a list, alphabetized by name, of all addressees living in California. The sort would be keyed to the *name* field, and the printout would be selective by only printing and sorting those fields whose *state* field is CA.

A Range Of Features

Features vary from one data base to another. Their primary purpose is to let you store and retrieve records. But once you have a large data base, you should be able to manipulate and interrogate the data base, with all the speed and power that the computer can bring to bear. We've already mentioned sorting and printing. If you want to keep a mailing list, be sure the data base can print out mailing labels! You should also be able to remove (delete) a record once it is no longer needed. If you are manually keeping the list in a certain order, you want to be able to insert new records between existing ones. It's very handy to have a printout of just one field from every record. A directory function like this can usually print out the key field from each record for future reference. Some data bases permit you to perform math on numeric fields, even across the entire file. Others offer sophisticated report generation, where you can design a custom printout, complete with rows, columns, and calculations like totals and percentages.

You may want to be able to access your data base file from within other programs. To do this, a word processor, for example, must be compatible with the data base, so that information can be retrieved and inserted into the text held by the word processor. Or, if your data base can create files that are compatible with the word processor, you're in business. If this is important to you, try out both the word processor and the data base together before you buy either.

If you have a cassette system, you'll probably want to buy a memory-storage data base. These store the records in RAM. The advantage here is speed. You can sort and search for records much faster in memory than you can with a tape drive. At the end of the session, you save out the entire data base to tape. The disadvantage here is that this limits the amount of data which can be stored to the amount of RAM you have in your computer. Also, memory-based data bases often slow to a crawl when their memory is full.

If you have a lot of data to store, you'll probably need a disk-based data base. The records are stored directly on disk, and any record can be called up without reading through the entire file. You can usually use the whole disk for a single data base, or even link the data base to a second disk or disk drive. The disadvantage with a disk-based data base is the speed of disk access time, which is generally much slower than a memory data base.

Be critical of the data-entry mode. You'll be using that part of the data base more than any other as you type in all the data. Grade a program's entry mode in terms of how easy it is to learn, how easily you can edit and make changes, and how it reacts to errors you make. Does it check to make sure the field you've entered is of the correct type for that field? Does it warn you if you've typed too much for one field, or does it just chop off the extra characters?

Some data bases, like *dBASE II*, are so sophisticated and flexible that they are practically a programming language for data base management. Many people buy templates for them. Templates are like programs for the data base. The template sets up all the fields, and includes the search and calculation descriptions. A template can also control the kinds of printouts allowed. You don't need to be a programmer to use an advanced data base, but you do have to learn the commands and protocols of that particular program. But once you've set up a certain kind of file, a template could create replications of that file type automatically the next time you want to build a similar data base.

files—is application-specific data base software.

Batteries Included offers such a series for the Commodore 64. At $29.95 each, these "mini-data bases" offer tailor-made filing systems ranging from Electronic Address Book to Recipes to Audio/Video Catalog. Eight different packages are currently available.

No one could call data base software faddish. After all, it facilitates one of the fundamental computer functions—information processing. And, in one form or another, data bases have been around for a long time, albeit in low-tech forms like filing cabinets and boxes of index cards. Data managing software offers a fast, effective method of storing, sorting, and searching all kinds of information. ©

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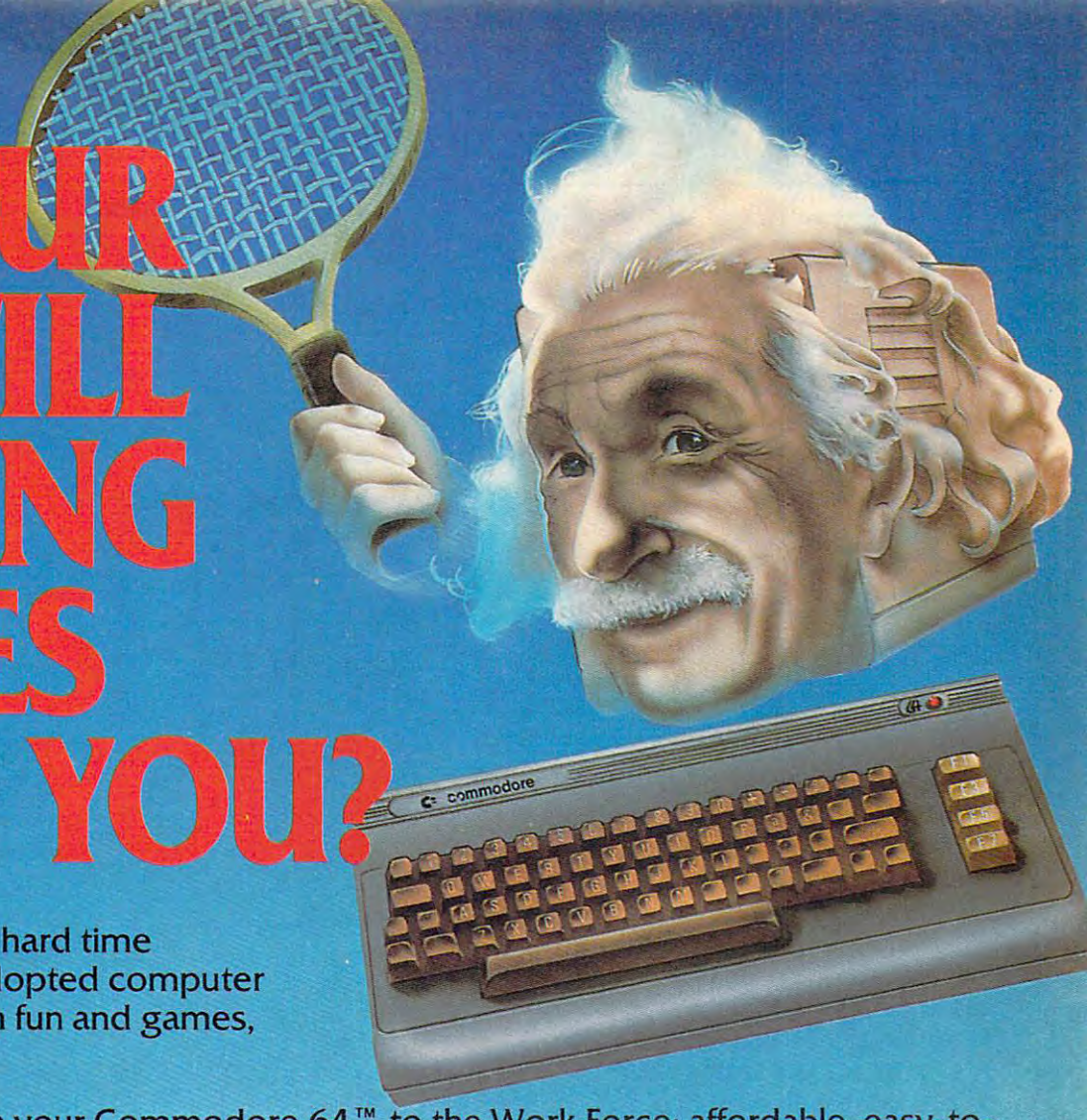

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The Promise Of Things To Come:

Atari's New Lease On Life

Fred D'Ignazio, Associate Editor
Selby Bateman, Features Editor

James Morgan, chairman and chief executive officer of Atari, Inc.

Out of the ashes of a disastrous 1983, a slimmer and more serious Atari, Inc., is fashioning a comeback under the guiding hand of new chairman and CEO James Morgan. In this, the first of a two-part look at Atari and its new products, Morgan talks candidly to COMPUTE! *about his company's mistakes, its strengths, its hopes.*

When an especially strong earthquake recently shook the California city of Sunnyvale, most of the residents shrugged, smiled nervously, and tried not to think about the next one.

But among the hundreds of people who work for Atari in more than two dozen nondescript buildings there, the quake appeared to be hardly noticed. When you've already had the world turned upside down and are feverishly working to restore your corporate footing, a little more trembling scarcely seems worth worrying about.

In retrospect, the earth-shaking that Atari took from the end of 1982, through 1983, and into the early part of 1984, seems to have had the same sort of explosive force that first powered the company into becoming a billion-dollar organization. Almost overnight, Atari went from being king of the videogame and home computer market to being every analyst's example of the boom-and-bust potential inherent in the computer revolution.

World-Class Problems

The litany of problems was indeed world-class: over half a billion dollars in losses for the first three-quarters of 1983, premature announcements of several products that never appeared, the unsuccessful launch of the 1200XL computer, layoffs of hundreds of Atari employees, and a management team wracked with dissension, low morale, and a lack of corporate focus.

Enter James Morgan, a former Phillip Morris marketing executive, who replaced Ray Kassar in September 1983. His mandate from parent company Warner Communications was as simple to state as it was difficult to carry out: Turn Atari around.

"Before I came, this company thought it was a toy company, IBM, and everything in between," says Morgan. "And it was devoting people and resources to all of that."

Energy, Hope, And Resolve

Morgan has not gone about his cleanup at Atari quietly. Instead, he has become one of the most outspoken critics of the company's past policies. He often sounds more like an irate consumer than a computer company president.

In his effort to reshape Atari, Morgan laid off an additional 250 employees last winter, including Chris Crawford, Atari's highly regarded research-and-development director. Also, Atari's chief scientist, Alan Kay, left the company in the spring to join Apple Computer as an Apple Fellow.

Despite these changes—and in some cases because of them—Morgan appears to have brought new energy, new hope,

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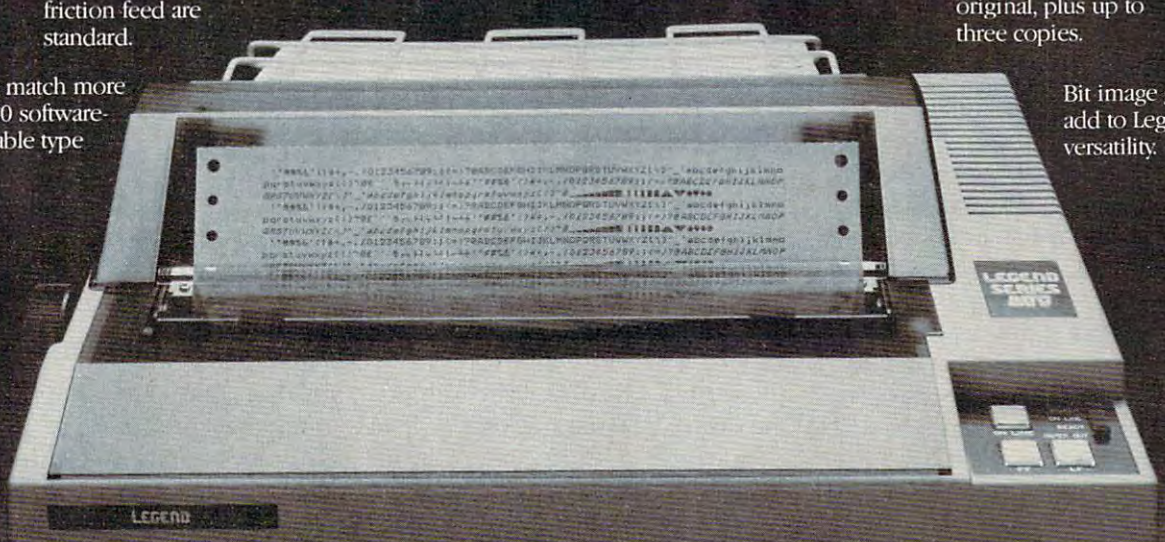

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and a new resolve to Atari's efforts. With an enthusiasm that has been missing for over a year, Atari employees and executives this spring were eagerly preparing for June's Consumer Electronics Show in Chicago and for the 12 months following—commonly acknowledged as the period during which Atari must show the world and Warner Communications that it is back on the right track.

"The Public Still Loves Us"

Morgan is excited—not only about Atari's future plans—but about the company's current strengths, which he believes have been largely overlooked.

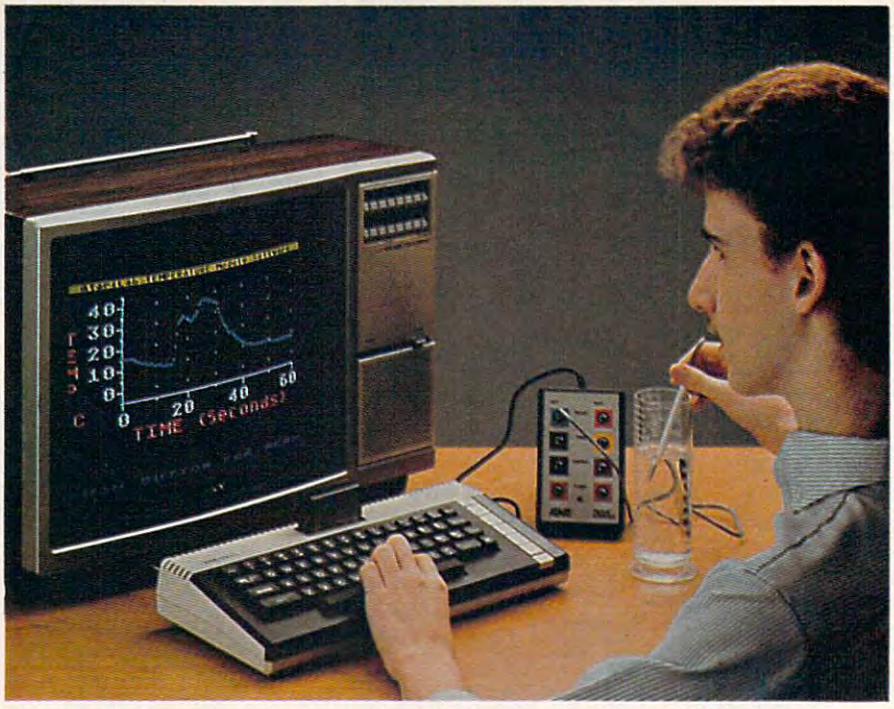
"The financial analysts and the computer press have been disenchanted with Atari for several months, but the public still loves us. This gives us a franchise from the consumer to develop the type of microprocessor products that the consumer will want," he says.

"Before we could announce any products though, we had to get a sense of our own self-identity. Who are we? What are our strengths?"

All has not been bleak for Atari. The 600XL and 800XL computers have sold well. In fact, Morgan told analysts earlier this year that Atari could have sold about 40 percent more computers during the Christmas rush if they had been available to ship. And despite dire predictions about the death of the videogame machine, Atari seems confident that this market is stronger than some analysts have estimated.

AtariSoft And Atari Learning Systems

Atari's market share began climbing this past spring. And the company's software division, AtariSoft, and its educational division, Atari Learning Systems, both appear to be doing well.



The AtariLab computer science kit, with its temperature module, brings science into the real world for computer users and is one indication of Atari's commitment to quality educational software.

Linda Gordon, who directs the Atari Learning Systems Group, has a strong team, including Dorothy K. Deringer, formerly program officer with the National Science Foundation. In the burgeoning educational software field, Atari expects this division of the company to offer some of the most innovative and high-quality products for schools and home learning that will be available in the industry.

Products like the recently released AtariLab, a computerized science kit, and a series of other products similar in scope and quality (being introduced at CES) are creating excitement and momentum within the entire Atari organization.

Morgan is quick to point out what he feels are a few of Atari's underlying strengths. "First, the combination of color graphics and sound in Atari computers is better than in our competitors' computers. Second, more people are familiar with Atari than with any other computer company. Remember, 16 million Americans have an Atari computer—a 2600 video-computer system—in their home," he says.

"Third, when people think of Atari, they think of entertainment. That is a tremendous advantage, but not just so we can sell more videogames. Computers can make learning more entertaining. They can even make work more entertaining—as well as more productive."

The Computer Of 1990

But Morgan is frank about what he feels Atari must do in the future to reestablish itself as a creative and credible force in the microcomputer field. A committee Morgan chairs at Atari, called "The Computer of 1990," meets frequently to brainstorm about future directions. Division heads and product managers reportedly have more communication with one another than in the past. And products or strategies that once went unquestioned, have all undergone Morgan's scrutiny.

For example, the popular

Atari Program Exchange (APX), a division of the company which purchased, produced, and marketed consumer-written programs for Atari computers, has been drastically reshaped.

"Atari has redeployed some of its resources and programs so that they are more consistent with the current goals of the company," says Morgan. "In the case of APX, Atari has discontinued the mail-order portion of the program. Atari lost money in this portion of the business.

"Moreover, Atari had to come to grips with the fact that Atari is not in the mail-order business. However, APX will continue to review products sent to Atari by outside programmers," he says. "If the programs are topnotch, they will be added to the main Atari catalogue. Otherwise, they will not be sold by Atari in any fashion."

The Fate Of The 1450XLD?

Morgan also took a hard look at Atari's plans for a high-end computer. The 1400XL and the 1450XLD, announced at the June 1983 Consumer Electronics Show (CES), were never released. The 1400 was unceremoniously dropped, and the 1450, although exhibited at the January CES, was not yet on the market.

"Atari will sell a high-end computer in 1984," Morgan now says, "but the specific product features of that high-end machine still are under review. We showed the 1450XLD at the Consumer Electronics Show in January of 1984 to demonstrate our intent to market a high-end machine this year."

In fact, by the time you read this, Atari may well be marketing such a computer. And this points to one of the major changes Morgan has instituted at Atari: "We want Atari to be seen as the consumer's friend," he says. "That means we don't announce any products unless we are willing to back them 100 percent."

Enhancing Lives Through Interactive Electronics

Morgan also makes it clear that Atari has no intention of abandoning the computer market.

"That's the real tragedy of Atari. Despite a record of several excellent computers, we are still known as a videogame company" he says. "But we're going to change that. Over the next 18 months, we will be introducing a host of new products that will create an awareness and acceptance of Atari as being a superior computer manufacturer."

While Atari's product line will be more focused than in the past, the company's new strengths will have a broader base, Morgan suggests. "Our goal isn't to just produce computers. It is to produce products that enhance consumers' lives through interactive electronics."

"Invisible" Computers

"To think this way, we have to think beyond user friendliness and beyond desktop computers. We have to think of products that are *invisible.*

"For example, a truly friendly product should not separate you from the task at hand. It should be like a refrigerator—you just reach inside the door and get what you need. After all," he says, "the product, any product, is not a hero. It is just a medium. It is the carrier of what is important."

Morgan clearly expects June's CES show in Chicago to be a major first step in the company's introduction of new products aimed at carrying Atari back to critical and financial success. But he has not limited Atari to the introduction of products at trade shows.

Tuning In To The Consumer

In early May, Atari announced new Lucasfilm games—*Ballblazer* and *Rescue on Fractalus*—which Atari has developed in association with the special-effects wizards at the well-known motion picture company. And by the time you read this, Atari is scheduled to have premiered a new high-end game machine, the 7800 Pro System. Both of these new products were scheduled to be shown at CES in June as well.

"Our major priority at Atari is to tune in to the consumer. Ultimately, the home computer is not an entity unto itself. It is not a question of what a computer can do. It is a question of what a consumer does with it," Morgan says.

"In my opinion, we still have not given consumers a compelling reason to buy a computer. And we haven't spent enough time molding our products to consumers' desires."

Atari's "Smart" Telephone

"For example, most people like to communicate with other people," he says. "That is a real need and a real desire. And computers can help people communicate. But it's not easy. You have to type all sorts of special codes and commands, just to get started. Instead, it should be just as easy as using a phone. You should be able to press a couple of buttons and communicate."

Morgan says that AtariTel, the company's telecommunications division, will introduce "smart telephones" in the second half of 1984. "These telephones will be microprocessor-based. We currently are deciding how we will market the product," he adds.

While redirecting Atari's efforts, Morgan has also studied the microcomputer industry as well. And one of the major

problems still troubling the industry, he emphasizes, is that home computer technology is ahead of the average consumer without matching the consumer's real needs. The challenge, therefore, is for computer manufacturers to translate this new technology, while at the same time giving prospective buyers genuine reasons to purchase a computer.

Alan Alda Is The Bridge

Assisting in Atari's efforts to explain its computers is actor Alan Alda, who represents what Morgan calls a "bridge" to adults by selling the application of Atari technology, and the ease of use.

"He [Alda] always picks one activity, like word processing, or education, and shows you how you can do it on an Atari. Alan doesn't want to make adults buy computers because they feel guilty. He wants them to buy a computer because they're excited about doing something they have seen *him* do," says Morgan.

"Also, he never sells RAM, ROM, or CPUs. The CPU is the least important element in the computer. It is like the engine of a car. Most people buy a car without opening the hood," he says. "There is a common understanding among car owners that the engine will work, and it will get them where they're going. The CPU is like the engine. You've got to have it, but you don't sell computers because of it alone."

Morgan's Open Letter

Morgan's impact at Atari has not only been felt directly by his employees. He has also gone out of his way to be accessible to industry analysts, the press, and—most importantly—the thousands of loyal Atari owners who are both a present and future market and a formidable, knowledgeable circle of critics.

A personal and candid letter from Morgan to Atari owners popped up on the message section of CompuServe earlier this year, for example. In the note, Morgan thanked them for their support and criticism, explained his view of Atari's past problems, and requested their continued interest in Atari's future.

This kind of attention to personal detail, and the simultaneous redirection of Atari's efforts, have done much to restore the morale among Atari employees and have helped give the company valuable time in which to develop, and properly introduce, new products.

Frank Questions And Open Communication

Morgan seems to understand that his role must be multifaceted. "I act as a catalyst to the Atari management team, which has the real job of running this company," he says. "I try to set the tone for the management committee and I help point the group in certain directions.

"As someone who joined this industry as an outsider, I have been able to take a fresh look at the entire consumer electronics field in general and this company, in particular. I'm not afraid to ask frank questions, and also question why we do things the way we do. I encourage all Atari employees to examine their own work in the same way.

"I believe strongly that one of my biggest contributions to Atari will be the implementation of a corporate culture here that inspires teamwork and open communications," Morgan says. "I want to encourage people to take calculated risks and not be afraid to fail. That's part of being an excellent company. If we become an excellent company, then sales and profits will follow."

(Next month, COMPUTE! will take an in-depth look at Atari's new product line from the Summer Consumer Electronics Show.) ©

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Statistics For Nonstatisticians

A Burke Luitich

Basic statistical methods can help you make logical decisions in everyday situations.

For the most part, elementary statistical methods measure a group of similar things to see how these measurements vary when compared to some standard. Another use for statistics is to see how creating a group of objects can cause variations in these objects.

This program, "Statistics," takes your raw data and returns figures which you can use to make everyday decisions, for example, about the best way to build a wall or how much cash you'll need when you go shopping.

As a first example, let's look at two ways to cut a 2 x 4, by using a power table saw and a handsaw. We set the table saw guide to one foot and cut five pieces. We cut five more pieces using a handsaw, then measure the actual lengths of all ten pieces to see how accurately we made the cuts.

If nothing unusual is allowed to affect the cutting, we can expect the length of the pieces to vary depending on the process used. Statisticians call this an *unbiased random sample*.

Assume the measurements are as follows:

Table saw lengths (feet)	Handsaw lengths (feet)
1.05	1.22
.98	.91
1.03	.80
1.07	1.28
.96	.88

The Same Mean

A look at the values alone suggests that cutting with the handsaw is a far less consistent method than using the table saw. However, if you add up the lengths for each method and divide by 5 (the total cuts for each) you will find that both methods give the same *mean* (average) length of 1.018 feet.

Just finding an average length doesn't tell us much. What we need to know is how widespread the values are likely to be, and which method gave us the most lengths that were nearer our standard of one foot. In statistical terms, we need to calculate the *range* and the *standard deviation*.

We find the range by subtracting the shortest length from the longest, for each cutting method. For the handsaw the range is .48 feet (1.28 –.80), and for the table saw the range is .11 feet (1.07 – .96). Immediately, we can see that the table saw cut more consistently, because the range, or variation, is smaller.

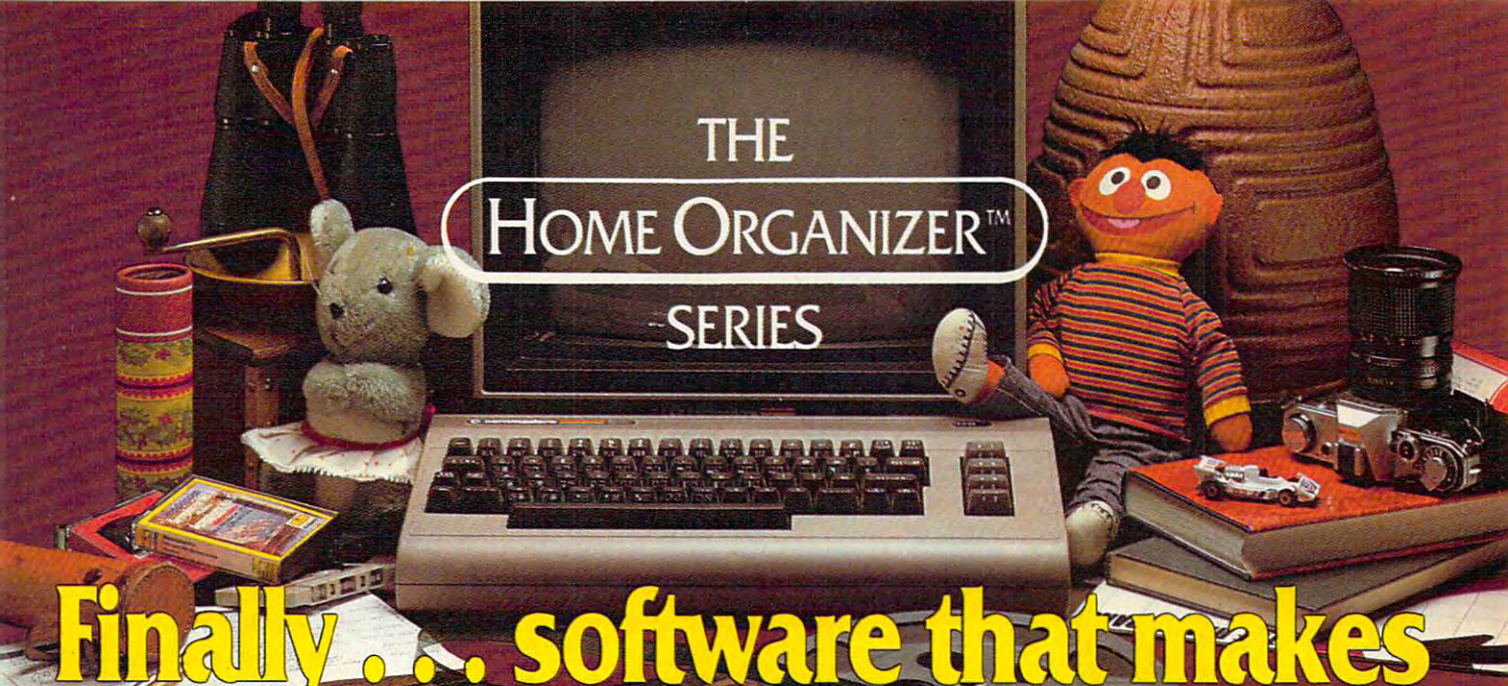
We can use the standard deviation and the mean length to predict how often a given length is likely to occur. You don't have to worry about how to calculate a standard deviation; the program does this for you. If you type in the above lengths for the handsaw, the program will return a standard deviation of .217 feet. The standard deviation for the table saw is .047 feet.

Degree Of Accuracy

If we made a large number of cuts, then measured and graphed the lengths, the graph would form a bell curve, or normal distribution. By combining the standard deviation and the mean length, we get a range of lengths that includes 68.3 percent of all lengths (again, you don't have to know the theory; just use the number). To illustrate, first take the mean length, 1.018 feet, and subtract from it the standard deviation for the handsaw, .217 feet, to get .801 feet. Then add the standard deviation to the mean length to get 1.235 feet. This means that 68.3 percent of our lengths fall in the range between .801 and 1.235 feet.

By adding and subtracting the standard deviation (.047 feet) with the mean length of the table saw cuts (1.018 feet), we find that 68.3 percent (roughly two-thirds) of these lengths fall in the range from .971 to 1.065 feet.

If you want a wider sample, you must increase



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the number of standard deviations. To include 95.4 percent of all lengths, use two standard deviations. For the handsaw, we now have .434 feet, two standard deviations. Combining it with the mean length, we get a range of .584 to 1.452 feet. Our table saw range becomes .924 to 1.102 feet (1.018 plus and minus .094).

Food For Thought

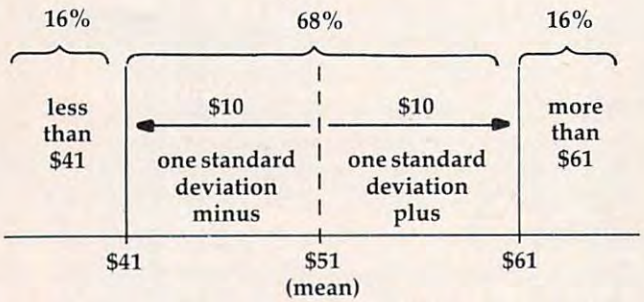
You can use the same methods to calculate a food budget. In this case, your data consists of the amounts you spent on groceries over a 13-week period (one-fourth of a year):

Week	Amount	Week	Amount
1	$42	8	47
2	50	9	65
3	75	10	49
4	37	11	43
5	51	12	52
6	45	13	54
7	56		

If you type this data into the Statistics program, you will find that your mean amount spent was about $51; that your spending varied from $37 to $75, for a range of $38; that you spent more than $50 (your median amount) as often as you spent less than that; and your standard deviation is about $10.

Applying The Statistics

Combining one standard deviation and the mean (or average) amount spent, we find that two-thirds of the weeks you spend between $41 and $61 at the grocery store. One-sixth of the time you spend less than $41; one-sixth of your bills are more than $61. So, if you budget $61 for groceries, you'll have enough 84 percent of the time.



If you want to be sure you'll have enough in case prices rise, you might want to use two standard deviations. By adding two standard deviations ($20) to the mean amount ($51), you will find that, to be about 98 percent sure, you should budget $71 each week.

There are other factors to be considered, of course, such as vacations, birthday parties, or visiting relatives, that can affect your food budget. The Statistics program does not take these kinds of things into account. But it does give you a tool which takes some of the guesswork out of everyday decision-making.

The Statistics program requests input of the size of the sample, or number of items to be entered (line 410), then requests the values of the sample measurements (lines 500–550). All the statistics referred to in this article are then calculated, that is, mean, standard deviation, median, and range.

Lines 325–350 and 4900–5610 give the user a thumbnail sketch of the information to be calculated and a description of each of the statistics. While the sample size is limited to 100 for the VIC version (other versions allow up to 300), this should be more than adequate in most cases.

Error Correction

An error correction routine is included in lines 555–580 and 5900–6190. This provides for the change of any entry before the calculation. While the program is running, a delay of up to two minutes will be experienced while the program performs several sorts on the data. This is normal for BASIC and may be longer for sample sizes in the 80 to 100 range or greater.

Program 1 requires at least 3K of expansion memory in the VIC computer. If the instructions, error correction routine, and headings are eliminated, the program will run on an unexpanded VIC. Specifically, the following lines should be deleted if the program is to run without memory expansion: 95–180, 325–350, 555–580, 4900–5610, and 5900–6190.

Further reductions can be made by reducing the sample size, redimensioning the array in line 90 to the new sample size (SA), and changing the value of 100 in line 420 to the new maximum sample size.

Statistics for a sample of 100 readings requires about 30–45 minutes to calculate by hand. This program requires about 8–10 minutes, including input.

Program 1: VIC Statistics

Refer to the "Automatic Proofreader" article before typing this program in.

```
90 DIM SA(100)                          :rem 185
95 REM GENERAL INTRODUCTION             :rem 242
100 PRINT "{CLR}":POKE 36879,126:PRINT "
    {BLK}"                              :rem 207
110 FOR K=1 TO 3:PRINT:NEXT K           :rem 147
120 PRINT TAB(4);"{4 DOWN}{RVS}VIC STATIS
    TICS{OFF}"                          :rem 208
130 PRINT TAB(9);"{DOWN}FOR"            :rem 249
140 PRINT TAB(2);"{DOWN}{RVS}NON-STATISTI
    CIANS{OFF}"                         :rem 171
180 FORK=1TO2000:NEXTK                   :rem 98
190 PRINT"{CLR}"                        :rem 254
200 PRINT TAB(4);"{2 DOWN}THIS PROGRAM"
                                        :rem 108
210 PRINT TAB(3);"CALCULATES THE":rem 188
220 PRINT "{2 SPACES}FOLLOWING VALUES"
                                        :rem 230
```

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```
230 PRINT "FROM DATA YOU INPUT:" :rem 123
240 PRINT TAB(4);"{2 DOWN}1. MEAN"
                                 :rem 160
250 PRINT TAB(4);"{DOWN}2. STANDARD"
                                 :rem 193
260 PRINT TAB(7);"DEVIATION"     :rem 166
290 PRINT TAB(4);"{DOWN}3. MEDIAN":rem 35
300 PRINT TAB(4);"{DOWN}4. RANGE":rem 219
310 PRINT"{3 DOWN} PRESS {RVS}C{OFF} TO C
    ONTINUE"                     :rem 20
320 GET Z$:IF Z$<>"C" THEN 320   :rem 255
325 REM INSTRUCTION REQUEST       :rem 9
330 PRINT"{CLR}":POKE214,10:PRINT:POKE211
    ,5:PRINT"DO YOU NEED"        :rem 99
340 PRINT"{DOWN} INSTRUCTIONS (Y/N)?":GOS
    UB7010                       :rem 22
350 IF Z$="Y" THEN GOSUB 5010    :rem 244
355 REM DATA ENTRY               :rem 45
370 PRINT"{CLR}ENTER YOUR DATA ONE"
                                 :rem 199
380 PRINT"VALUE AT A TIME,"      :rem 26
390 PRINT"THEN PRESS RETURN."    :rem 55
410 POKE214,10:PRINT:POKE211,0:INPUT"ENTE
    R SAMPLE SIZE";N             :rem 26
420 IFN>100ORN<2THEN5710         :rem 155
430 PRINT:PRINT"{CLR}{4 DOWN}{RIGHT}IF YO
    U MAKE AN ERROR"             :rem 230
440 PRINT"{2 DOWN}{RIGHT}CONTINUE WITH EN
    TRY."                         :rem 9
450 PRINT"{2 DOWN}{RIGHT}YOU WILL BE ABLE
     TO"                         :rem 28
460 PRINT"{2 DOWN}{RIGHT}CORRECT LATER."
                                 :rem 98
470 PRINT"{2 DOWN}{RVS}{BLK}{4 RIGHT}PRES
    S ANY KEY{OFF}"              :rem 148
480 GETZ$:IFZ$=""THEN480         :rem 141
500 FOR I=1 TO N                  :rem 36
520 PRINT"{CLR}":POKE214,11:PRINT:POKE211
    ,0:PRINT"DATA ENTRY #";I;:INPUTR$
                                 :rem 130
530 SA(I)=VAL(R$)                :rem 173
550 NEXT I                        :rem 34
555 REM ERROR CORRECTION REQUEST  :rem 46
560 PRINT"{CLR}":POKE214,11:PRINT:POKE211
    ,0:PRINT"DO YOU WISH TO MAKE" :rem 68
570 PRINT"ANY CORRECTIONS(Y/N)?":GOSUB 70
    10                           :rem 136
580 IF Z$="Y" THENPRINT"{CLR}":GOTO6000
                                 :rem 80
585 REM CALCULATION OF MEAN AND STD. DEVI
    ATION                        :rem 250
587 PRINT"{CLR}":POKE214,9:PRINT:POKE211,
    5:PRINT"{RVS}PLEASE WAIT{OFF}":rem 48
588 POKE214,11:PRINT:POKE211,3:PRINT"STAT
    ISTICS BEING"                :rem 151
589 POKE214,13:PRINT:POKE211,6:PRINT"CALC
    ULATED"                      :rem 255
590 FOR I=1 TO N                  :rem 45
600 SUM=SUM+SA(I)                 :rem 22
610 NEXT I                        :rem 31
620 MEAN=SUM/N                   :rem 104
630 FOR I=1 TO N                  :rem 40
640 DFF=DFF+(SA(I)-MEAN)↑2       :rem 255
650 NEXT I                        :rem 35
660 SDDEV=SQR(DFF/(N-1))         :rem 146
665 REM SORT OF DATA INTO NUMERIC ORDER
                                 :rem 69
670 FL=0                         :rem 187
680 FOR I=1 TO N-1               :rem 139
690 IF SA(I)<=SA(I+1) THEN 740    :rem 41
700 Q=SA(I)                       :rem 83
710 SA(I)=SA(I+1)                :rem 141
720 SA(I+1)=Q                    :rem 177
730 FL=1                         :rem 154
740 NEXT I                        :rem 35
750 IF FL=1 THEN 670             :rem 247
755 REM CALCULATION OF RANGE     :rem 182
760 RG=SA(N)-SA(1)               :rem 233
765 LR=SA(1)                     :rem 147
767 HR=SA(N)                     :rem 174
805 REM CALCULATION OF MEDIAN    :rem 243
810 IF N/2 <>INT(N/2) THEN 814     :rem 8
811 IF SA(N/2)=SA(N/2+1) THEN MDD=SA(N/2)
                                 :rem 191
812 IF SA(N/2)<>SA(N/2+1) THEN MDD=(SA(N/
    2)+SA(N/2+1))/2              :rem 202
813 GOTO 1310                    :rem 154
814 MDD=SA(INT(N/2+1))           :rem 219
1290 REM PRINT RESULTS TO SCREEN :rem 210
1310 PRINT"{CLR}CALCULATION RESULTS"
                                 :rem 138
1320 PRINT"**********************";
                                 :rem 110
1330 PRINT "{DOWN}SAMPLE SIZE";SPC(3);N
                                 :rem 212
1340 PRINT"{DOWN}MEAN (X BAR)";SPC(2);INT
     (MEAN*10000+.5)/10000       :rem 78
1350 PRINT"{DOWN}STD. DEV.";SPC(5);INT(SD
     DEV*10000+.5)/10000         :rem 46
1360 PRINT"{DOWN}MEDIAN";SPC(8);INT(MDD*1
     0000+.5)/10000              :rem 25
1370 PRINT"{DOWN}RANGE";SPC(9);RG:rem 153
1375 PRINT"{DOWN}LOWEST SAMPLE";SPC(1);LR
                                 :rem 206
1380 PRINT"{DOWN}HIGHEST SAMPLE";HR
                                 :rem 81
1480 POKE214,21:PRINT:POKE211,4:PRINT"
     {RVS}PRESS ANY KEY{OFF}";   :rem 142
1490 GET A$:IF A$="" THEN 1490   :rem 191
1495 REM REQUEST TO CONTINUE OR END
                                 :rem 96
1510 PRINT"{CLR}":POKE214,11:PRINT:POKE21
     1,0:PRINT"DO YOU WISH TO PROCESS"
                                 :rem 113
1520 PRINT"MORE DATA (Y/N)?":GOSUB 7010
                                 :rem 206
1530 IF Z$<>"Y" THEN POKE36879,27:PRINT"
     {CLR}":END                  :rem 160
1540 CLR:GOTO 330                :rem 180
4900 REM INSTRUCTION SUBROUTINE   :rem 35
5010 PRINT"{CLR}{DOWN}THE MAXIMUM NUMBER"
                                  :rem 3
5020 PRINT "OF ENTRIES YOU CAN"   :rem 22
5030 PRINT "MAKE IS 100. THE"    :rem 243
5035 PRINT "MINIMUM IS 2."       :rem 182
5040 PRINT "{DOWN}**********************"
                                 :rem 29
5050 PRINT "{DOWN}THE MEAN IS THE":rem 43
5060 PRINT "ARITHMETIC AVERAGE"  :rem 129
5070 PRINT "OF THE NUMBERS YOU"   :rem 44
5080 PRINT "ENTER."               :rem 74
5090 PRINT "{DOWN}**********************"
                                 :rem 34
5100 PRINT "{DOWN}STANDARD DEVIATION"
                                 :rem 156
5110 PRINT "IS A MEASURE OF HOW"  :rem 10
5120 PRINT "WIDELY YOUR NUMBERS" :rem 210
5130 PRINT "SPREAD FROM THE AVG.":rem 122
5140 PRINT"{2 DOWN}{2 RIGHT}PRESS 'M' FOR
      MORE"                      :rem 57
5150 GET A$:IF A$<>"M" THEN 5150  :rem 67
5160 PRINT "{CLR}{DOWN}SINCE THE VALUES Y
```

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```
     OU"                              :rem 97
5170 PRINT "ENTER TEND TO FORM A"     :rem 95
5180 PRINT "BELL CURVE(NORMAL"        :rem 52
5190 PRINT "DISTRIBUTION), THE"       :rem 118
5200 PRINT "STD. DEVIATION IS A"      :rem 49
5210 PRINT "MEASURE OF THE AREA"      :rem 58
5220 PRINT "UNDER THE BELL CURVE."
                                      :rem 203
5230 PRINT "{DOWN}NO. OF STD.{4 SPACES}%
     {SPACE}AREA"                     :rem 99
5240 PRINT "DEV.(+/-)"                :rem 129
5245 PRINT "-----------{4 SPACES}------"
                                      :rem 158
5250 PRINT TAB(4);"{DOWN}1";TAB(16);"68.3
     "                                :rem 142
5260 PRINT TAB(4);"{DOWN}2";TAB(16);"95.5
     "                                :rem 146
5270 PRINT TAB(4);"{DOWN}3";TAB(16);"99.7
     "                                :rem 154
5280 PRINT TAB(4);"{DOWN}4";TAB(16);"99.9
     "                                :rem 158
5290 PRINT"{DOWN}{2 RIGHT}PRESS 'M' FOR M
     ORE";                            :rem 105
5300 GET A$:IF A$<>"M" THEN 5300      :rem 61
5430 PRINT"{CLR}{DOWN}**********
     **"                              :rem 179
5435 PRINT "{DOWN}THE MEDIAN IS THE"
                                      :rem 191
5440 PRINT "VALUE AT THE MID-"        :rem 152
5450 PRINT "POINT OF YOUR DATA."      :rem 85
5460 PRINT"{3 DOWN}PRESS 'M' FOR MORE"
                                      :rem 21
5470 GET A$:IF A$<>"M" THEN 5470      :rem 77
5490 PRINT "{CLR}{2 DOWN}THE RANGE IS THE
     "                                :rem 35
5500 PRINT "DIFFERENCE BETWEEN"       :rem 112
5510 PRINT "YOUR LOWEST DATA"         :rem 227
5520 PRINT "VALUE AND THE HIGHEST.":rem 8
5530 PRINT "{DOWN}THE RANGE IS A QUICK-"
                                      :rem 132
5540 PRINT "AND-DIRTY ESTIMATE"       :rem 135
5550 PRINT "OF THE SPREAD."            :rem 3
5560 PRINT "{2 DOWN}THE STD. DEVIATION"
                                      :rem 96
5570 PRINT "IS MORE RELIABLE."        :rem 223
5580 PRINT "{4 DOWN}{2 RIGHT}PRESS 'S' TO
      START"                          :rem 128
5590 PRINT "{5 RIGHT}THE PROGRAM"     :rem 46
5600 GET A$:IF A$<>"S" THEN 5600      :rem 73
5610 RETURN                           :rem 172
5700 REM ERROR TRAP FOR TOO LARGE A SAMPL
     E                                :rem 184
5710 POKE214,10:PRINT:POKE211,18:PRINT"
     {4 SPACES}"                      :rem 132
5720 GOTO 410                         :rem 156
5730 REM DISPLAY CORRECTION OPTIONS
                                      :rem 237
5740 PRINT"{CLR}":POKE214,21:PRINT:POKE21
     1,0:PRINT"{RVS}{BLK}A=AMEND T=TABLE
     {SPACE}Q=QUIT{OFF}";:RETURN      :rem 36
5810 GETZ$:IFZ$=""OR(Z$<>"A"ANDZ$<>"T"AND
     Z$<>"Q")THEN5810                 :rem 35
5820 KL=0:IFZ$="T"THENKL=1:GOTO 6130
                                      :rem 96
5830 IFZ$="Q"THEN587                  :rem 130
5840 PRINT"{CLR}"                     :rem 53
5900 REM ERROR CORRECTION SUBROUTINE
                                      :rem 68
6000 POKE214,11:PRINT:POKE211,0:PRINT"REM
     EMBER INCORRECT{4 SPACES}SAMPLE # (Y
     /N)?":GOSUB 7010                 :rem 10
6020 IFZ$="N"THEN6130                 :rem 157
6030 PRINT"{CLR}":POKE214,6:PRINT:POKE211
     ,1:INPUT"THE SAMPLE #";EN$       :rem 118
6040 EN=VAL(EN$):IFEN>NOREN<1OREN<>INT(EN
     )THEN 6030                       :rem 131
6070 POKE214,8:PRINT:POKE211,1:PRINT"SAMP
     LE";EN                           :rem 179
6075 POKE214,10:PRINT:POKE211,1:PRINT"VAL
     UE=";SA(EN)                      :rem 190
6080 POKE214,12:PRINT:POKE211,1:INPUT"YOU
     R NEW VALUE";C:SA(EN)=C          :rem 184
6090 POKE214,14:PRINT:POKE211,1:PRINT"
     {2 DOWN}MORE CHANGES (Y/N)?":GOSUB 7
     010                              :rem 136
6110 IFZ$="Y"THENPRINT"{CLR}":GOTO 6000
                                      :rem 123
6120 GOTO 587                         :rem 166
6130 GOSUB5740:POKE214,0:PRINT:POKE211,0
                                      :rem 150
6140 IFKL=0THENPRINT"THESE ARE THE FIRST
     {3 SPACES}TEN VALUES.":K=1:GOTO 6150
                                      :rem 47
6145 PRINT"THESE ARE THE NEXT{4 SPACES}TE
     N VALUES."                       :rem 247
6150 POKE214,3:PRINT:POKE211,1:PRINT"ENTR
     Y";SPC(5);"VALUE"                :rem 82
6160 FF=0:FORK=KTOK+9:FF=FF+1         :rem 247
6165 IFK>100THENK=K+9:NEXT:GOTO587
                                      :rem 113
6170 POKE214,FF+5:PRINT:POKE211,1:PRINTK;
     TAB(11);SA(K)                    :rem 15
6180 NEXT K                           :rem 89
6190 GOTO 5810                        :rem 215
7010 GETZ$:IFZ$=""OR(Z$<>"Y"ANDZ$<>"N")TH
     EN 7010                          :rem 201
7020 RETURN                           :rem 169
```

Program 2: 64 Statistics

Refer to the "Automatic Proofreader" article before typing this program in.

```
80 POKE53280,0:POKE53281,0            :rem 189
90 DIM SA(300)                        :rem 187
95 REM GENERAL INTRODUCTION           :rem 242
120 PRINT"{CLR}":POKE214,10:PRINT:POKE211
    ,14:PRINT"{RVS}STATISTICS{OFF}"
                                      :rem 147
130 POKE214,12:PRINT:POKE211,17:PRINT"
    {RVS}FOR{OFF}"                    :rem 215
140 POKE214,14:PRINT:POKE211,10:PRINT"
    {RVS}NON-STATISTICIANS{OFF}"      :rem 231
180 FORK=1TO2000:NEXT                  :rem 23
200 PRINT"{CLR}":POKE214,4:PRINT:POKE211,
    14:PRINT"{CYN}THIS PROGRAM"       :rem 165
210 POKE214,5:PRINT:POKE211,13:PRINT"CALC
    ULATES THE"                       :rem 219
220 POKE214,6:PRINT:POKE211,12:PRINT"FOLL
    OWING VALUES:"                    :rem 213
240 POKE214,10:PRINT:POKE211,15:PRINT"1.
    {SPACE}MEAN"                      :rem 202
250 POKE214,12:PRINT:POKE211,15:PRINT"2.
    {SPACE}STANDARD"                  :rem 254
260 POKE214,13:PRINT:POKE211,18:PRINT"DEV
    IATION"                           :rem 245
290 POKE214,15:PRINT:POKE211,15:PRINT"3.
    {SPACE}MEDIAN"                     :rem 99
300 POKE214,17:PRINT:POKE211,15:PRINT"4.
    {SPACE}RANGE"                      :rem 29
310 POKE214,22:PRINT:POKE211,10:PRINT"PRE
    SS 'C' TO CONTINUE"               :rem 108
320 GETZ$:IFZ$<>"C"THEN 320           :rem 255
322 REM INSTRUCTIONS REQUEST           :rem 89
```

```
325 SUM=0:MEAN=0:DFF=0:SDDEV=0:RG=0
                                :rem 152
330 PRINT"{CLR}":POKE214,12:PRINT:POKE211
    ,5:PRINT"DO YOU NEED INSTRUCTIONS (Y/
    N)?"                        :rem 128
340 GOSUB 7010                  :rem 223
350 IF Z$="Y"THEN GOSUB 5010    :rem 244
355 REM DATA ENTRY               :rem 45
410 PRINT"{CLR}":POKE214,10:PRINT:POKE211
    ,6:INPUT"ENTER SAMPLE SIZE";N:rem 190
420 IF N>300ORN<=1THENFORI=1488TO1498:POK
    EI,32:NEXT:GOTO410          :rem 139
425 PRINT"{CLR}"                :rem 255
430 POKE214,2:PRINT:POKE211,1:PRINT"IF YO
    U MAKE AN ERROR, CONTINUE WITH"
                                :rem 119
440 POKE214,4:PRINT:POKE211,1:PRINT"DATA
    {SPACE}ENTRY. YOU CAN CORRECT LATER."
                                :rem 75
500 FOR I=1 TO N                :rem 36
520 POKE214,9:PRINT:POKE211,10:PRINT"DATA
     ENTRY #{4 SPACES}{4 LEFT}";I;:INPUTR
    $                           :rem 96
530 SA(I)=VAL(R$)               :rem 173
550 FORJ=1450TO1468:POKEJ,32:NEXTJ:NEXT I
                                :rem 17
555 REM ERROR CORRECTION REQUEST  :rem 46
560 PRINT"{CLR}":POKE214,12:PRINT:POKE211
    ,2                          :rem 176
561 PRINT"WISH TO MAKE ANY CORRECTIONS (Y
    /N)?"                        :rem 2
570 GOSUB 7010                  :rem 228
580 IFZ$="Y"THENPRINT"{CLR}":GOTO6000
                                :rem 80
585 REM CALCULATION OF MEAN AND STD. DEVI
    ATION                       :rem 250
587 PRINT"{CLR}":POKE214,11:PRINT:POKE211
    ,14:PRINT"{RVS}PLEASE WAIT{OFF}"
                                :rem 137
588 POKE214,13:PRINT:POKE211,6:PRINT"STAT
    ISTICS BEING CALCULATED"    :rem 110
590 FOR I=1 TO N                 :rem 45
600 SUM=SUM+SA(I)                :rem 22
610 NEXT I                       :rem 31
620 MEAN=SUM/N                  :rem 104
630 FOR I=1 TO N                 :rem 40
640 DFF=DFF+(SA(I)-MEAN)↑2      :rem 255
650 NEXT I                       :rem 35
660 SDDEV=SQR(DFF/(N-1))        :rem 146
665 REM SORT OF DATA INTO NUMERIC ORDER
                                :rem 69
670 FL=O                        :rem 187
680 FOR I=1 TO N-1              :rem 139
690 IF SA(I)<=SA(I+1) THEN 740   :rem 41
700 Q=SA(I)                      :rem 83
710 SA(I)=SA(I+1)               :rem 141
720 SA(I+1)=Q                   :rem 177
730 FL=1                        :rem 154
740 NEXT I                       :rem 35
750 IF FL=1 THEN 670            :rem 247
755 REM CALCULATION OF RANGE    :rem 182
760 RG=SA(N)-SA(1)              :rem 233
765 LR=SA(1)                    :rem 147
767 HR=SA(N)                    :rem 174
805 REM CALCULATION OF MEDIAN   :rem 243
810 IF N/2 <>INT(N/2) THEN 814    :rem 8
811 IF SA(N/2)=SA(N/2+1) THEN MDD=SA(N/2)
                                :rem 191
812 IF SA(N/2)<>SA(N/2+1) THEN MDD=(SA(N/
    2)+SA(N/2+1))/2             :rem 202
813 GOTO 1310                   :rem 154
814 MDD=SA(INT(N/2+1))          :rem 219
1290 REM PRINT RESULTS TO SCREEN :rem 210
1310 PRINT"{CLR}":POKE214,3:PRINT:POKE211
    ,10:PRINT"CALCULATION RESULTS"
                                :rem 69
1320 POKE214,4:PRINT:POKE211,9:PRINT"****
    ****************"          :rem 146
1330 POKE214,6:PRINT:POKE211,7:PRINT"SAMP
    LE SIZE";SPC(10);N          :rem 122
1340 POKE214,8:PRINT:POKE211,7   :rem 25
1345 PRINT"MEAN(X BAR)";SPC(10);INT(MEAN*
    10000+.5)/10000             :rem 113
1350 POKE214,10:PRINT:POKE211,7  :rem 67
1355 PRINT"STD. DEVIATION";SPC(7);INT(SDD
    EV*10000+.5)/10000          :rem 186
1360 POKE214,12:PRINT:POKE211,7  :rem 70
1365 PRINT"MEDIAN";SPC(15);INT(MDD*10000+
    .5)/10000                   :rem 59
1370 POKE214,14:PRINT:POKE211,7:PRINT"RAN
    GE";SPC(16);RG              :rem 110
1375 POKE214,16:PRINT:POKE211,7:PRINT"LOW
    EST SAMPLE VALUE";SPC(2);LR :rem 245
1377 POKE214,18:PRINT:POKE211,7:PRINT"HIG
    HEST SAMPLE VALUE";SPC(1);HR :rem 34
1480 POKE214,22:PRINT:POKE211,13:PRINT"
    {RVS}{YEL}PRESS ANY KEY{OFF}{CYN}"
                                :rem 193
1490 GET A$:IF A$="" THEN 1490   :rem 191
1495 REM REQUEST TO CONTINUE OR END
                                :rem 96
1510 PRINT"{CLR}":POKE214,12:PRINT:POKE21
    1,3                         :rem 221
1520 PRINT"WISH TO PROCESS MORE DATA (Y/N
    )?"                          :rem 73
1530 GOSUB 7010                  :rem 17
1535 IFZ$="N"THENPRINT"{CLR}":END :rem 78
1540 FORI=1TON:SA(I)=0:NEXT:GOTO 325
                                :rem 180
4900 REM INSTRUCTION SUBROUTINE   :rem 35
5010 PRINT"{CLR}":POKE214,3:PRINT:POKE211
    ,6                          :rem 175
5020 PRINT"THE MAXIMUM NUMBER OF ENTRIES
    {SPACE}YOU"                  :rem 12
5030 POKE214,5:PRINT:POKE211,1:PRINT"CAN
    {SPACE}MAKE IS 300. MINIMUM NUMBER I
    S 2."                       :rem 73
5050 POKE214,9:PRINT:POKE211,5:PRINT"THE
    {SPACE}MEAN IS THE ARITHMETIC AVERAG
    E"                          :rem 137
5070 POKE214,11:PRINT:POKE211,1:PRINT"OF
    {SPACE}THE NUMBERS YOU ENTER."
                                :rem 135
5100 POKE214,15:PRINT:POKE211,5:PRINT"STA
    NDARD DEVIATION IS A MEASURE OF"
                                :rem 198
5120 POKE214,17:PRINT:POKE211,1:PRINT"HOW
     WIDELY YOUR NUMBERS SPREAD FROM"
                                :rem 104
5130 POKE214,19:PRINT:POKE211,1:PRINT"THE
     AVERAGE."                   :rem 91
5140 PRINTTAB(9);"{2 DOWN}{RVS}{GRN}PRESS
     ANY KEY FOR MORE{OFF}{CYN}" :rem 50
5150 GET A$:IF A$="" THEN 5150   :rem 185
5155 PRINT"{CLR}"                :rem 52
5160 POKE214,1:PRINT:POKE211,6:PRINT"SINC
    E THE VALUES YOU ENTER TEND TO"
                                :rem 140
5180 POKE214,3:PRINT:POKE211,1:PRINT"FORM
     A BELL CURVE (NORMAL DIST.), THE"
                                :rem 193
```

```
5200 POKE214,5:PRINT:POKE211,1:PRINT"STD.
     DEVIATION IS A MEASURE OF THE AREA"
                                    :rem 84
5220 POKE214,7:PRINT:POKE211,1:PRINT"UNDE
     R THE BELL CURVE."             :rem 79
5230 POKE214,9:PRINT:POKE211,5:PRINT"NO.O
     F STD.DEV.";SPC(6);"% AREA"    :rem 16
5245 POKE214,10:PRINT:POKE211,5:PRINT"---
     ----------";SPC(6);"------":rem 254
5250 PRINTTAB(10);"{DOWN}1";SPC(15);"68.3
     "                              :rem 201
5260 PRINTTAB(10);"{DOWN}2";SPC(15);"95.5
     "                              :rem 205
5270 PRINTTAB(10);"{DOWN}3";SPC(15);"99.7
     "                              :rem 213
5280 PRINTTAB(10);"{DOWN}4";SPC(15);"99.9
     "                              :rem 217
5290 PRINTTAB(9);"{2 DOWN}{RVS}{GRN}PRESS
      ANY KEY FOR MORE{OFF}{CYN}"   :rem 56
5300 GET A$:IF A$="" THEN 5300      :rem 179
5430 PRINT"{CLR}"                   :rem 48
5435 POKE214,3:PRINT:POKE211,5:PRINT"THE
     {SPACE}MEDIAN IS THE VALUE AT THE"
                                    :rem 37
5450 POKE214,5:PRINT:POKE211,1:PRINT"MID-
     POINT OF YOUR DATA."           :rem 222
5490 POKE214,9:PRINT:POKE211,5:PRINT"THE
     {SPACE}RANGE IS THE DIFFERENCE BETWE
     EN"                            :rem 205
5510 POKE214,11:PRINT:POKE211,1:PRINT"YOU
     R LOWEST DATA VALUE AND THE HIGHEST.
     "                              :rem 253
5530 POKE214,13:PRINT:POKE211,1:PRINT"THE
      RANGE IS A QUICK-AND-DIRTY ESTIMATE
     "                              :rem 12
5540 POKE214,15:PRINT:POKE211,1:PRINT"OF
     {SPACE}THE SPREAD. THE STD. DEVIATIO
     N IS"                          :rem 238
5560 POKE214,17:PRINT:POKE211,1:PRINT"MOR
     E RELIABLE."                   :rem 247
5580 PRINTTAB(4);"{2 DOWN}{RVS}{GRN}PRESS
      'S' TO START THE PROGRAM{OFF}{CYN}"
                                    :rem 21
5600 GET A$:IF A$=""OR(A$<>"S")THEN 5600
                                    :rem 33
5610 RETURN                         :rem 172
5810 GETZ$:IFZ$=""OR(Z$<>"C"ANDZ$<>"N"AND
     Z$<>"Q")THEN 5810              :rem 31
5820 FL=0:IFZ$="N"THENFL=1:GOTO6130
                                    :rem 80
5830 IFZ$="Q"THEN587                :rem 130
5840 PRINT"{CLR}"                   :rem 53
5900 REM ERROR CORRECTION SUBROUTINE
                                    :rem 68
6000 POKE214,12:PRINT:POKE211,3:PRINT"REM
     EMBER INCORRECT SAMPLE # (Y/N)?"
                                    :rem 140
6010 GOSUB 7010                     :rem 15
6020 IFZ$="N"THEN6130               :rem 157
6030 PRINT"{CLR}":POKE214,6:PRINT:POKE211
     ,6:INPUT"WHAT IS THE SAMPLE NUMBER";
     EN$                            :rem 241
6040 EN=VAL(EN$):IFEN>NOREN<1OREN<>INT(EN
     )THEN6030                      :rem 131
6070 POKE214,8:PRINT:POKE211,6:PRINT"SAMP
     LE";EN;SPC(5);"VALUE=";SA(EN):rem 75
6080 POKE214,11:PRINT:POKE211,6:INPUT"ENT
     ER YOUR NEW VALUE";C           :rem 8
6090 SA(EN)=C                       :rem 199
6096 POKE214,14:PRINT:POKE211,6:PRINT"ANY
      MORE CHANGES (Y/N)?"          :rem 215
6100 GOSUB 7010                     :rem 15
6110 IF Z$="Y" THEN PRINT"{CLR}":GOTO6000
                                    :rem 123
6120 GOTO587                        :rem 166
6130 PRINT"{CLR}"                   :rem 46
6132 POKE214,21:PRINT:POKE211,0     :rem 65
6134 PRINT"{RVS}{WHT}{2 SPACES}C=CHANGE D
     ATA{2 SPACES}N=NEXT TABLE{2 SPACES}Q
     =QUIT{2 SPACES}{OFF}";         :rem 198
6137 POKE214,2:PRINT:POKE211,5      :rem 26
6140 IFFL=0THENPRINT"THESE ARE THE FIRST
     {SPACE}TEN VALUES.":K=1:GOTO6150
                                    :rem 42
6145 PRINT"THESE ARE THE NEXT TEN VALUES.
     "                              :rem 247
6150 POKE214,6:PRINT:POKE211,10:PRINT"ENT
     RY";SPC(12);"VALUE"            :rem 179
6160 FF=0:FOR K=K TO K+9:FF=FF+1    :rem 247
6165 IFK>300THENK=K+9:NEXT:GOTO587
                                    :rem 115
6170 POKE214,FF+7:PRINT:POKE211,10:PRINTK
     ;TAB(27);SA(K)                 :rem 72
6180 NEXT K                         :rem 89
6190 GOTO5810                       :rem 215
7010 GETZ$:IF Z$=""OR(Z$<>"Y"ANDZ$<>"N")T
     HEN 7010                       :rem 201
7020 RETURN                         :rem 169
```

Program 3: Atari Statistics

Refer to the "Automatic Proofreader" article before typing this program in.

```
JJ 100 GRAPHICS 0:CLOSE #1:OPEN #1,4,0
       ,"K:":POKE 752,1:SETCOLOR 2,0,0
QE 110 DIM SA(300)
QY 120 REM GENERAL INSTRUCTIONS
DM 130 POSITION 15,6:? "STATISTICS":PO
       SITION 18,10:? "FOR":POSITION 1
       1,14:? "NON-STATISTICIANS"
AG 140 FOR K=1 TO 300:SA(K)=0:NEXT K
LJ 150 ? "{CLEAR}":POSITION 14,3:? "TH
       IS PROGRAM":POSITION 13,4:? "CA
       LCULATES THE":POSITION 12,5:? "
       FOLLOWING VALUES"
FV 160 POSITION 9,6:? "FROM THE DATA Y
       OU INPUT:"
CN 170 POSITION 14,9:? "1. MEAN":POSIT
       ION 14,11:? "2. STANDARD":POSIT
       ION 17,12:? "DEVIATION"
AD 180 POSITION 14,14:? "3. MEDIAN":PO
       SITION 14,16:? "4. RANGE"
LJ 190 POSITION 9,20:? "PRESS 'C' TO C
       ONTINUE"
QF 200 GET #1,A:IF A<>67 THEN 200
HF 210 REM REQUEST INSTRUCTIONS
JC 220 SUM=0:MEAN=0:DFF=0:SDDEV=0:RG=0
EM 230 ? "{CLEAR}":POSITION 5,12:? "Do
        you need instructions (y/n)?"
NP 240 GOSUB 1350
FP 250 IF A=89 THEN GOSUB 830
EI 260 REM DATA ENTRY
FK 270 ? "{CLEAR}":POSITION 9,11:? "En
       ter sample size ";:INPUT N
HJ 280 IF N>300 OR N<=1 THEN FOR I=28
       TO 38:POSITION I,11:? CHR$(32):
       NEXT I:GOTO 270
EM 290 ? "{CLEAR}":POSITION 5,2:? "Ent
       er data one value at a time,
       {4 SPACES}then press return."
EC 300 POSITION 5,6:? "In case of an e
       rror, continue to{3 SPACES}ente
       r data. You will be able to
       {7 SPACES}correct later."
CD 310 FOR I=1 TO N
```

```
HJ 320  POSITION 7,12:? "DATA ENTRY # "
        ;I;:INPUT SA
JF 330  SA(I)=SA
LE 340  FOR J=22 TO 38:POSITION J,12:?
        CHR$(32):NEXT J:NEXT I
GH 350  REM ERROR CORRECTION REQUEST
HM 360  ? "{CLEAR}":POSITION 3,12:? "Wi
        sh to make any corrections (y/n
        )?"
QD 370  GOSUB 1350
EF 380  IF A=89 THEN GOTO 1120
PE 390  REM CALCULATION OF MEAN AND STD
        .DEVIATION
FJ 400  ? "{CLEAR}":POSITION 15,12:? "P
        LEASE WAIT":POSITION 6,14:? "ST
        ATISTICS BEING CALCULATED"
CE 410  FOR I=1 TO N
NI 420  SUM=SUM+SA(I):NEXT I
GH 430  MEAN=SUM/N
CH 440  FOR I=1 TO N
MA 450  DFF=DFF+(SA(I)-MEAN)^2:NEXT I
JA 460  SDDEV=SQR(DFF/(N-1))
QA 470  REM SORTING THE DATA
JL 480  FL=0
IK 490  FOR I=1 TO N-1
BD 500  IF SA(I)<=SA(I+1) THEN 550
FC 510  Q=SA(I)
IM 520  SA(I)=SA(I+1)
LA 530  SA(I+1)=Q
JJ 540  FL=1
CC 550  NEXT I
PF 560  IF FL=1 THEN 480
PB 570  REM CALCULATION OF RANGE
QJ 580  RG=SA(N)-SA(1)
ND 590  LR=SA(1):HR=SA(N)
HM 600  REM CALCULATION OF MEDIAN
AE 610  IF N/2<>INT(N/2) THEN 650
LH 620  IF SA(N/2)=SA(N/2+1) THEN MDD=S
        A(N/2)
MI 630  IF SA(N/2)<>SA(N/2+1) THEN MDD=
        (SA(N/2)+SA(N/2+1))/2
HA 640  GOTO 670
NJ 650  MDD=SA(INT(N/2+1))
KP 660  REM PRINT RESULT TO SCREEN
KA 670  ? "{CLEAR}":POSITION 10,2:? "CA
        LCULATION RESULTS":POSITION 9,4
        :? "**********************"
NN 680  POSITION 4,6:? "SAMPLE SIZE:":P
        OSITION 26,6:? N
FC 690  POSITION 4,8:? "MEAN (X BAR)":P
        OSITION 26,8:? INT(MEAN*10000+0
        .5)/10000
AQ 700  POSITION 4,10:? "STD. DEVIATION
        ":POSITION 26,10:? INT(SDDEV*10
        000+0.5)/10000
CP 710  POSITION 4,12:? "MEDIAN":POSITI
        ON 26,12:? MDD
LH 720  POSITION 4,14:? "RANGE":POSITIO
        N 26,14:? RG
HB 730  POSITION 4,16:? "LOWEST SAMPLE
        VALUE":POSITION 26,16:? LR
KA 740  POSITION 4,18:? "HIGHEST SAMPLE
         VALUE":POSITION 26,18:? HR
CA 750  POSITION 13,22:? "PRESS ANY KEY
        "
DO 760  GET #1,A
PL 770  REM REQUEST TO CONTINUE OR END
DO 780  ? "{CLEAR}":POSITION 4,12:? "Wi
        sh to process more data (y/n)?"
QJ 790  GOSUB 1350
NF 800  IF A=78 THEN GRAPHICS 0:END
MG 810  FOR I=1 TO N:SA(I)=0:NEXT I:GOT
        O 220
BA 820  REM INSTRUCTION SUBROUTINE
MK 830  ? "{CLEAR}":POSITION 5,5:? "The
         maximum number of entries is
        {3 SPACES}300, while the minimu
        m number is 2."
IH 840  POSITION 5,9:? "The MEAN is the
         arithmetic average of the numb
        ers you enter."
PB 850  POSITION 5,13:? "The STANDARD D
        EVIATION is a measureof how wid
        ely your numbers spread fromthe
         average."
HB 860  POSITION 10,21:? "Press a key f
        or more"
EA 870  GET #1,A
EL 880  ? "{CLEAR}":POSITION 6,3:? "Sin
        ce the values you enter tend to
         form a bell curve (Normal dist
        .), the Std. Deviation"
ML 890  POSITION 17,5:? " is a measure
        of the{4 SPACES}area under the
        bell curve."
PG 900  POSITION 3,9:? "No of Std.Dev.(
        +/-)":POSITION 3,10:? "--------
        ----------"
NJ 910  POSITION 29,9:? "% Area":POSITI
        ON 29,10:? "-------"
GN 920  POSITION 4,12:? "(+/-) 1 Std.De
        v.":POSITION 31,12:? "68.3"
HF 930  POSITION 4,14:? "(+/-) 2 Std.De
        v.":POSITION 31,14:? "95.5"
IB 940  POSITION 4,16:? "(+/-) 3 Std.De
        v.":POSITION 31,16:? "99.7"
IJ 950  POSITION 4,18:? "(+/-) 4 Std.De
        v.":POSITION 31,18:? "99.9"
HC 960  POSITION 10,21:? "Press a key f
        or more"
EB 970  GET #1,A
LO 980  ? "{CLEAR}":POSITION 4,5:? "The
         MEDIAN is the value at the mid
        - point of your data."
NJ 990  POSITION 4,10:? "The RANGE is t
        he difference between your lowe
        st data value"
LH 1000 POSITION 25,11:? "and the high
        est. The range is a quick-and-
        dirty"
AB 1010 ? "estimate of the spread. The
         standard  deviation is more r
        eliable than the{3 SPACES}spre
        ad."
KD 1020 POSITION 10,20:? "Press 'S' to
         start"
EH 1030 GET #1,A:IF A<>83 THEN 1030
YF 1040 RETURN
CE 1050 REM DISPLAY CORRECTION OPTIONS
BC 1060 ? "{CLEAR}":POSITION 1,23:? "C
        =CHANGE DATA{3 SPACES}N=NEXT T
        ABLE{4 SPACES}Q=QUIT":RETURN
EF 1070 GET #1,A:IF A<>67 AND A<>78 AN
        D A<>81 THEN 1070
DP 1080 IF A=78 THEN 1280
AL 1090 IF A=81 THEN 390
MC 1100 ? "{CLEAR}"
PJ 1110 REM ERROR CORRECTION SUBROUTIN
        E
DF 1120 ? "{CLEAR}":POSITION 3,12:? "R
        emember incorrect sample # (y/
        n)?"
AQ 1130 GOSUB 1350
DH 1140 IF A=78 THEN 1230
LN 1150 ? "{CLEAR}":POSITION 7,9:? "Wh
        at is the sample #";:INPUT EN
```

```
IK 1160 IF EN>N OR EN<1 OR EN<>INT(EN)
        THEN 1150
PO 1170 POSITION 7,11:? "Sample ";EN:P
        OSITION 22,11:? "Value ";SA(EN
        )
KN 1180 POSITION 7,13:? "Enter your ne
        w value":POSITION 7,14:INPUT C
        :SA(EN)=C
CE 1190 POSITION 7,19:? "Any more chan
        ges (y/n)?"
AM 1200 GOSUB 1350
DF 1210 IF A=89 THEN 1120
JC 1220 GOTO 400
LH 1230 GOSUB 1060:POSITION 5,2:? "The
        se are the first ten values:"
PM 1240 POSITION 11,5:? "ENTRY":POSITI
        ON 22,5:? "VALUE"
GM 1250 FOR K=1 TO 10
JJ 1260 POSITION 12,K+7:? K:POSITION 2
        4,K+7:? SA(K):NEXT K
ML 1270 GOTO 1070
GH 1280 POSITION 5,2:? "These are the
        next ten values:{DELETE}":IF K
        <=300 THEN GOSUB 1340
BO 1290 CT=8:FOR K=K TO K+9
KA 1300 IF K>300 THEN K=K+9:NEXT K:GOT
        O 400
KF 1310 POSITION 12,CT:? K:POSITION 24
        ,CT:? SA(K)
FB 1320 CT=CT+1:NEXT K
MI 1330 GOTO 1070
JJ 1340 FOR J=1 TO 10:POSITION 12,J+7:
        ? "{3 SPACES}":POSITION 24,J+7
        :? "{15 SPACES}":NEXT J:RETURN
FE 1350 GET #1,A:IF A<>89 AND A<>78 TH
        EN 1350
KK 1360 RETURN
```

Program 4: TI-99/4A Statistics

```
100 DIM SA(300)
110 CALL CLEAR
120 PRINT TAB(10);"STATISTICS"
130 PRINT : : :
140 PRINT TAB(13);"FOR"
150 PRINT : : :
160 PRINT TAB(7);"NON-STATISTICIANS
    "
170 PRINT : : : : : :
180 FOR K=1 TO 400
190 NEXT K
200 CALL CLEAR
210 PRINT "THIS PROGRAM CALCULATES
    THE": :
220 PRINT "FOLLOWING VALUES FROM DA
    TA": :
230 PRINT "YOU INPUT:"
240 PRINT : :
250 PRINT TAB(4);"1. MEAN"
260 PRINT : :
270 PRINT TAB(4);"2. STANDARD DEVIA
    TION"
280 PRINT : :
290 PRINT TAB(4);"3. MEDIAN"
300 PRINT : :
310 PRINT TAB(4);"4. RANGE"
320 PRINT : : :
330 PRINT TAB(2);"PRESS ANY KEY TO
    CONTINUE"
340 PRINT :
350 GOSUB 2170
360 SUM=0
370 MEAN=0
380 DFF=0
390 SDDEV=0
400 RG=0
410 REM INSTRUCTIONS REQUEST
420 PRINT TAB(6);"INSTRUCTIONS (Y/N
    )?"
430 PRINT : : : : : : : : : :
440 GOSUB 2170
450 IF (K<>89)*(K<>78)THEN 440
460 IF K=78 THEN 490
470 GOSUB 1330
480 REM DATA ENTRY
490 CALL CLEAR
500 PRINT TAB(3);"ENTER SAMPLE SIZE
    ";
510 INPUT N
520 IF (N>300)+(N<=1)THEN 490
530 CALL CLEAR
540 PRINT TAB(3);"ENTER YOUR DATA O
    NE VALUE": :
550 PRINT "AT A TIME, THEN PRESS":
    :
560 PRINT "RETURN.": : : :
570 PRINT TAB(3);"IF YOU MAKE AN ER
    ROR,": :
580 PRINT "CONTINUE WITH DATA ENTRY
    .": :
590 PRINT "YOU WILL BE ABLE TO MAKE
    ": :
600 PRINT "CORRECTIONS LATER.": : :
    : :
610 PRINT TAB(2);"PRESS ANY KEY TO
    CONTINUE": :
620 GOSUB 2170
630 FOR I=1 TO N
640 CALL CLEAR
650 PRINT "DATA ENTRY #";I;
660 INPUT R$
670 SA(I)=VAL(R$)
680 NEXT I
690 REM ERROR CORRECTION REQUEST
700 CALL CLEAR
710 PRINT TAB(3);"ANY CORRECTIONS (
    Y/N) ?"
720 PRINT : : : : : : : : : :
730 GOSUB 2170
740 IF K<>89 THEN 770
750 GOSUB 1800
760 REM CALCULATION OF MEAN AND STD
    . DEVIATION
770 PRINT TAB(9);"PLEASE WAIT": : :
780 PRINT "STATISTICS BEING CALCULA
    TED"
790 PRINT : : : : : : : : :
800 FOR I=1 TO N
810 SUM=SUM+SA(I)
820 NEXT I
830 MEAN=SUM/N
840 FOR I=1 TO N
850 DFF=DFF+(SA(I)-MEAN)^2
860 NEXT I
870 SDDEV=SQR(DFF/(N-1))
880 REM SORT OF DATA INTO NUMERIC O
    RDER
890 FL=0
900 FOR I=1 TO N-1
910 IF SA(I)<=SA(I+1)THEN 960
920 Q=SA(I)
930 SA(I)=SA(I+1)
940 SA(I+1)=Q
950 FL=1
```

```
960 NEXT I
970 IF FL=1 THEN 890
980 REM CALCULATION OF RANGE
990 RG=SA(N)-SA(1)
1000 LR=SA(1)
1010 HR=SA(N)
1020 REM CALCULATION OF MEDIAN
1030 IF N/2<>INT(N/2)THEN 1090
1040 IF SA(N/2)<>SA(N/2+1)THEN 1060
1050 MDD=SA(N/2)
1060 IF SA(N/2)=SA(N/2+1)THEN 1080
1070 MDD=(SA(N/2)+SA(N/2+1))/2
1080 GOTO 1110
1090 MDD=SA(INT(N/2+1))
1100 REM PRINT RESULTS TO SCREEN
1110 CALL CLEAR
1120 PRINT TAB(5);"CALCULATION RESU
     LTS": :
1130 PRINT "**************************
     *****": : :
1140 PRINT "SAMPLE SIZE";TAB(19);N:
      :
1150 PRINT "MEAN (X BAR)";TAB(19);I
     NT(MEAN*100000+.5)/100000: :
1160 PRINT "STD. DEVIATION";TAB(19)
     ;INT(SDDEV*100000+.5)/100000: :
1170 PRINT "MEDIAN";TAB(19);INT(MDD
     *100000+.5)/100000: :
1180 PRINT "RANGE";TAB(19);INT(RG*1
     00000+.5)/100000: :
1190 PRINT "LOWEST VALUE";TAB(19);L
     R: :
1200 PRINT "HIGHEST VALUE";TAB(19);
     HR: : : :
1210 PRINT TAB(8);"PRESS ANY KEY"
1220 GOSUB 2170
1230 REM REQUEST TO CONTINUE OR END
1240 PRINT " WISH TO PROCESS MORE D
     ATA": :
1250 PRINT TAB(12);"(Y/N)?": : : :
     : : : : : :

1260 GOSUB 2170
1270 IF K=78 THEN 1320
1280 FOR I=1 TO N
1290 SA(I)=0
1300 NEXT I
1310 GOTO 360
1320 END
1330 PRINT TAB(3);"THE MAXIMUM NUMB
     ER OF EN-": :
1340 PRINT "TRIES YOU CAN MAKE IS 3
     00.": :
1350 PRINT "THE MINIMUM NUMBER IS 2
      ": : :
1360 PRINT TAB(3);"THE MEAN IS THE
     ARITH ": :
1370 PRINT "METIC AVERAGE OF THE NU
     MBERS": :
1380 PRINT "YOU ENTER.": : :
1390 PRINT TAB(3);"STANDARD DEVIATI
     ON IS A": :
1400 PRINT "MEASURE OF HOW WIDELY Y
     OUR": :
1410 PRINT "NUMBERS SPREAD FROM THE
     ": :
1420 PRINT "AVERAGE.": : :
1430 GOSUB 2160
1440 CALL CLEAR
1450 PRINT TAB(3);"SINCE THE VALUES
      YOU ENTER": :
1460 PRINT "TEND TO FORM A BELL CUR
     VE": :
1470 PRINT "(NORMAL DISTRIBUTION)
     THE": :
1480 PRINT "STD. DEVIATION IS A MEA
     SURE": :
1490 PRINT "OF THE AREA UNDER THE B
     ELL": :
1500 PRINT "CURVE.": : :
1510 PRINT TAB(4);"NO. OF STD.
     (4 SPACES)% AREA"
1520 PRINT TAB(5);"DEV.(+/-)"
1530 PRINT TAB(4);"----------
     (4 SPACES)------": :
1540 PRINT TAB(8);"1(11 SPACES)68.3"
1550 PRINT TAB(8);"2(11 SPACES)95.5"
1560 PRINT TAB(8);"3(11 SPACES)99.7"
1570 PRINT TAB(8);"4(11 SPACES)99.9"
     : : :
1580 GOSUB 2160
1590 PRINT TAB(3);"THE MEDIAN IS TH
     E VALUE AT": :
1600 PRINT "THE MID-POINT OF YOUR D
     ATA.": : :
1610 PRINT TAB(3);"THE RANGE IS THE
      DIF-": :
1620 PRINT "FERENCE BETWEEN YOUR LO
     WEST": :
1630 PRINT "DATA VALUE AND THE HIGH
     EST.": :
1640 PRINT "IT IS A QUICK-AND-DIRTY
     ": :
1650 PRINT "ESTIMATE OF THE SPREAD.
     ": :
1660 PRINT "STANDARD DEVIATION IS M
     ORE": :
1670 PRINT "RELIABLE, HOWEVER.": :
     : :
1680 PRINT TAB(3);"PRESS ANY KEY TO
      START"
1690 GOSUB 2170
1700 RETURN
1710 REM DISPLAY CORRECTION OPTION
1720 GOSUB 2170
1730 IF (K<>67)*(K<>78)*(K<>81)THEN
      1720
1740 FL=0
1750 IF K<>78 THEN 1780
1760 FL=1
1770 GOTO 1980
1780 IF K=81 THEN 770
1790 REM ERROR CORRECTION SUBR
1800 PRINT "REMEMBER INCORRECT SAMP
     LE #": :
1810 PRINT TAB(11);"(Y/N) ?": : : :
      : : : : : :
1820 GOSUB 2170
1830 IF K=78 THEN 1980
1840 INPUT "WHAT IS THE SAMPLE # ?
     ":EN$
1850 EN=VAL(EN$)
1860 IF (EN>N)+(EN<1)+(EN<>INT(EN))
     THEN 1840
1870 PRINT : :
1880 PRINT "SAMPLE";EN;"(3 SPACES)"
     ;"VALUE=";SA(EN)
1890 PRINT : :
1900 PRINT "ENTER YOUR NEW VALUE :
     "
1910 INPUT SA(EN)
```

```
1920 PRINT : : : : : :
1930 PRINT TAB(3);"ANY MORE CHANGES
     (Y/N)?": : : : :
1940 GOSUB 2170
1950 CALL CLEAR
1960 IF K=78 THEN 770
1970 GOTO 1800
1980 IF FL=1 THEN 2020
1990 PRINT "THESE ARE THE FIRST TEN
     ": :
2000 L=1
2010 GOTO 2040
2020 CALL CLEAR
2030 PRINT "THESE ARE THE NEXT TEN"
     : :
2040 PRINT "VALUES.": : :
2050 PRINT TAB(5);"ENTRY";TAB(15);"
     VALUE": :
2060 FF=0
2070 FOR L=L TO L+9
2080 FF=FF+1
2090 IF L>300 THEN 770
2100 PRINT TAB(5);L;TAB(15);SA(L)
2110 NEXT L
2120 PRINT : :
2130 PRINT "C=CHANGE DATA
     (3 SPACES)N=NEXT TABLE": :
2140 PRINT TAB(12);"0=QUIT"
2150 GOTO 1720
2160 PRINT TAB(3);"PRESS ANY KEY FO
     R MORE";
2170 CALL KEY(0,K,S)
2180 IF S=0 THEN 2170
2190 CALL CLEAR
2200 RETURN
```

Program 5: PC/PCjr Statistics

```
100 DIM SA(300)
110 REM GENERAL INTRODUCTION
120 WIDTH 40
130 KEY OFF
140 CLS:LOCATE 9,15,0:PRINT "STATISTICS"

150 LOCATE 11,18:PRINT "FOR"
160 LOCATE 13,12:PRINT "NON-STATISTICIAN
S"
170 FOR K=1 TO 1500:NEXT K
180 CLS:LOCATE 5,8:PRINT"This program ca
lculates the":LOCATE 7,5:PRINT"following
 from data you input:"
190 LOCATE 10,10:PRINT "1. Mean":LOCATE
13,10:PRINT"2. Standard Deviation"
200 LOCATE 16,10:PRINT "3. Median":LOCAT
E 19,10:PRINT"4. Range"
210 GOSUB 1190
220 REM INSTRUCTION REQUEST
230 SUM=0:MEAN=0:DFF=0:SDDEV=0:RG=0
240 LOCATE 13,4 :PRINT "Do you need inst
ructions (Y/N) ?"
250 GOSUB 1160
260 IF A$="Y" OR A$="y" THEN GOSUB 730
270 REM DATA ENTRY
280 LOCATE 11,9:INPUT "Enter sample size
";N
290 IF N>300 OR N<=1 THEN 280
300 CLS:LOCATE 3,4:PRINT"If you make an
error, continue with":LOCATE 5,4:PRINT"t
he with data entry. You will be"
310 LOCATE 7,4:PRINT"able to correct it
later."
320 FOR I=1 TO N:LOCATE 13,22:PRINT STRI
NG$(19,32):LOCATE 13,10:PRINT"Data entry
 #    "STRING$(4,29)I;:INPUT R$
330 SA(I)=VAL(R$):NEXT I
340 REM ERROR CORRECTION REQUEST
350 CLS:LOCATE 12,2:PRINT"Wish to make a
ny corrections (Y/N)?"
360 GOSUB 1160
370 IF A$="Y" OR A$="y" THEN 950
380 REM CALCULATION OF MEAN AND STD. DEV
IATION
390 LOCATE 11,14:PRINT"PLEASE WAIT"
400 LOCATE 13,6:COLOR 0,7:PRINT"Statisti
cs being calculated":COLOR 7,0
410 FOR I=1 TO N:SUM=SUM+SA(I):NEXT I
420 MEAN=SUM/N
430 FOR I=1 TO N:DFF=DFF+(SA(I)-MEAN)^2:
NEXT I
440 SDDEV=SQR(DFF/(N-1))
450 REM SORT OF DATA INTO NUMERIC ORDER
460 FL=0:FOR I=1 TO N-1:IF SA(I)<=SA(I+1
) THEN 480
470 Q=SA(I):SA(I)=SA(I+1):SA(I+1)=Q:FL=1

480 NEXT I
490 IF FL=1 THEN 460
500 REM CALCULATION OF RANGE
510 RG=SA(N)-SA(1):LR=SA(1):HR=SA(N)
520 REM CALCULATION OF MEDIAN
530 IF N/2<>INT(N/2) THEN 570
540 IF SA(N/2)=SA(N/2+1) THEN MDD=SA(N/2
)
550 IF SA(N/2)<>SA(N/2+1) THEN MDD=(SA(N
/2)+SA(N/2+1))/2
560 GOTO 590
570 MDD=SA(INT(N/2+1))
580 REM PRINT RESULTS TO THE SCREEN
590 CLS:LOCATE 3,10:PRINT"CALCULATION RE
SULTS"
600 LOCATE 5,4:PRINT"**********************
***************"
610 LOCATE 7,7:PRINT"Sample Size";SPC(10
);N
620 LOCATE 9,7:PRINT"Mean (X Bar)";SPC(9
);INT(MEAN*10000+.5)/10000
630 LOCATE 11,7:PRINT"Std. Dev.";SPC(12)
;INT(SDDEV*10000+.5)/10000
640 LOCATE 13,7:PRINT"Median";SPC(15);MD
D
650 LOCATE 15,7:PRINT"Range";SPC(16);RG
660 LOCATE 17,7:PRINT"Lowest Sample Valu
e";SPC(2);LR
670 LOCATE 19,7:PRINT"Highest Sample Val
ue";SPC(1);HR:GOSUB 1190
680 REM REQUEST TO CONTINUE OR END
690 LOCATE 12,3:PRINT"Wish to process mo
re data (Y/N) ?":GOSUB 1160
700 IF A$="N" OR A$="n" THEN CLS:END
710 FOR I=1 TO N:SA(I)=0:NEXT I:CLS:GOTO
 230
720 REM INSTRUCTION SUBR
730 LOCATE 3,5:PRINT "The maximum number
 of entries you"
740 LOCATE 5,2:PRINT"can make is 300. Th
e minimum is 2."
750 LOCATE 9,5:PRINT"The mean is the ari
thmetic average":LOCATE 11,2:PRINT"of th
e numbers you enter."
760 LOCATE 15,5:PRINT"Standard deviation
 is a measure":LOCATE 17,2:PRINT"of how
```

```
widely your numbers spread from"
770 LOCATE 19,2:PRINT"the average."
780 GOSUB 1170
790 CLS:LOCATE 1,5:PRINT"Since the value
s you enter tend to":LOCATE 3,2:PRINT"fo
rm a bell curve (normal"
800 LOCATE 5,2:PRINT"distribution), the
standard deviation":LOCATE 7,2:PRINT"is
a measure of the area under the bell"
810 LOCATE 9,2:PRINT"curve.":LOCATE 11,9
:PRINT"No. of Std.     % Area"
820 LOCATE 13,10:PRINT"Dev. (+/-)":LOCATE
 14,9:PRINT"-----------    ------"
830 LOCATE 16,14:PRINT"1"SPC(10)"68.3":L
OCATE 18,14:PRINT"2"SPC(10)"95.5":LOCATE
 20,14:PRINT"3"SPC(10)"99.7":LOCATE 22,1
4:PRINT"4"SPC(10)"99.9"
840 GOSUB 1170
850 CLS:LOCATE 4,5:PRINT"The median is t
he value at the mid-":LOCATE 6,2:PRINT"p
oint of your data."
860 LOCATE 9,5:PRINT"The range is the di
fference between":LOCATE 11,2:PRINT"your
 lowest data value and the highest."
870 LOCATE 13,2:PRINT"The range is a qui
ck-and-dirty estimate":LOCATE 15,2:PRINT
"of the spread. The standard deviation"
880 LOCATE 17,2:PRINT"is a more reliable
 estimate of spread":LOCATE 19,2:PRINT"t
han range."
890 LOCATE 23,9:PRINT"Press any key to s
tart":GOSUB 1180:RETURN
900 REM DISPLAY CORRECTION OPTIONS
910 Z$=INKEY$:IF Z$="" OR (Z$<>"c" AND Z
$<>"C" AND Z$<>"n" AND Z$<>"N" AND Z$<>"
q" AND Z$<>"Q") THEN 910
920 CLS:FL=0:IF Z$="n" OR Z$="N" THEN FL
=1:GOTO 1060
930 IF Z$="q" OR Z$="Q" THEN 390
940 REM ERROR CORRECTION SUBR
950 LOCATE 12,3:PRINT"Remember incorrect
 sample # (Y/N) ?":GOSUB 1160
960 IF A$="N" OR A$="n" THEN 1060
970 LOCATE 7,6:INPUT "What is the sample
 number ";EN$
980 EN=VAL(EN$):IF EN>N OR EN<1 OR EN<>I
NT(EN) THEN 970
990 LOCATE 9,6:PRINT"Sample";EN;SPC(5);"
Value=";SA(EN)
1000 LOCATE 12,6:INPUT"Enter your new va
lue";C
1010 SA(EN)=C
1020 LOCATE 16,6:PRINT"Any more changes
(Y/N) ?"
1030 GOSUB 1160
1040 IF A$="Y" OR A$="y" THEN 950
1050 GOTO 390
1060 CLS:COLOR 0,7:LOCATE 22,2:PRINT"  C
=CHANGE DATA  N=NEXT TABLE  Q=QUIT  ":CO
LOR 7,0
1070 LOCATE 2,5
1080 IF FL=0 THEN PRINT"These are the fi
rst ten values.":K=1:GOTO 1100
1090 PRINT"These are the next ten values
."
1100 LOCATE 6,10:PRINT"Entry";SPC(12);"v
alue"
1110 FF=0:FOR K=K TO K+9:FF=FF+1
1120 IF K>300 THEN CLS:GOTO 390
1130 LOCATE FF+7,10:PRINT K;TAB(27);SA(K
)
1140 NEXT K
1150 GOTO 910
1160 A$=INKEY$:IF A$="" OR (A$<>"Y" AND
A$<>"y" AND A$<>"N" AND A$<>"n") THEN 11
60 ELSE CLS:RETURN
1170 LOCATE 24,10:PRINT"Press any key fo
r more";
1180 A$=INKEY$:IF A$="" THEN 1180 ELSE C
LS:RETURN
1190 LOCATE 22,7: PRINT "Press any key t
o continue"
1200 IF INKEY$="" THEN 1200 ELSE CLS:RET
URN
```

Program 6: Apple Statistics

```
100  HOME : DIM SA(300)
110  INVERSE : VTAB 9: HTAB 17: PRINT
     "STATISTICS": VTAB 13: HTAB 20: PRINT
     "FOR"
120  VTAB 17: HTAB 13: PRINT "NON-STAT
     ISTICIANS"
130  FOR K = 1 TO 300:SA(K) = 0: NEXT
     K: NORMAL
140  HOME : VTAB 2: PRINT "THIS PROGRA
     M CALCULATES THE FOLLOWING:"
150  VTAB 6: HTAB 15: PRINT "1. MEAN":
      VTAB 10: HTAB 15: PRINT "2. STAN
     DARD": VTAB 11: HTAB 18: PRINT "D
     EVIATION"
160  VTAB 15: HTAB 15: PRINT "3. MEDIA
     N": VTAB 19: HTAB 15: PRINT "4. R
     ANGE"
170  VTAB 23: HTAB 10: PRINT "PRESS 'C
     ' TO CONTINUE": VTAB 23: HTAB 17
180  GET Z$: IF Z$ <  > "C" THEN 180
190  REM  INSTRUCTIONS REQUEST
200 SUM = 0:MEAN = 0:DFF = 0:SDDEV = 0
     :RG = 0
210  HOME : VTAB 12: HTAB 5: PRINT "DO
      YOU NEED INSTRUCTIONS (Y/N)?": VTAB
     12: HTAB 35
220  GOSUB 1180
230  IF Z$ = "Y" THEN  GOSUB 700
240  HOME : REM  DATA ENTRY
250  VTAB 12: HTAB 9: INPUT "ENTER SAM
     PLE SIZE :";N$:N =  VAL (N$)
260  IF N > 300 OR N <  = 1 THEN  FOR
     I = 26 TO 35: VTAB 12: HTAB I: PRINT
      CHR$ (32): NEXT : GOTO 250
270  HOME : PRINT "IN CASE OF AN ERROR
     , CONTINUE WITH THE  ENTRY."
280  VTAB 2: HTAB 8: PRINT "YOU CAN CO
     RRECT LATER."
290  FOR I = 1 TO N: VTAB 12: HTAB 10:
      PRINT "DATA ENTRY #";I;: INPUT R
     $:SA(I) =  VAL (R$)
300  FOR J = 24 TO 39: VTAB 12: HTAB J
     : PRINT  CHR$ (32): NEXT J: NEXT
     I
310  REM  ERROR CORRECTION REQUEST
320  HOME : VTAB 12: PRINT "WISH TO MA
     KE ANY CORRECTIONS (Y/N)?": VTAB
     12: HTAB 35
330  GOSUB 1180
340  IF Z$ = "Y" THEN  GOTO 970
350  REM  CALCULATIONS OF MEAN AND STD
     . DEVIATION
360  HOME : VTAB 11: HTAB 16: PRINT "P
     LEASE WAIT"
370  VTAB 13: HTAB 8: PRINT "STATISTIC
     S BEING CALCULATED"
380  FOR I = 1 TO N:SUM = SUM + SA(I):
      NEXT I
```

```
390 MEAN = SUM / N
400  FOR I = 1 TO N:DFF = DFF + (SA(I)
     - MEAN) ^ 2: NEXT I
410 SDDEV =  SQR (DFF / (N - 1))
420  REM  SORTING THE DATA
430 FL = 0: FOR I = 1 TO N - 1: IF SA(
     I) <  = SA(I + 1) THEN 450
440 Q = SA(I):SA(I) = SA(I + 1):SA(I +
     1) = Q:FL = 1
450  NEXT I: IF FL = 1 THEN 430
460  REM  CALCULATION OF RANGE
470 HR = SA(N):LR = SA(1):RG = HR - LR

480  REM  CALCULATION OF MEDIAN
490  IF N / 2 <  > INT (N / 2) THEN 5
     20
500  IF SA(N / 2) = SA(N / 2 + 1) THEN
     MDD = SA(N / 2): GOTO 540
510 MDD = (SA(N / 2) + SA(N / 2 + 1)) /
     2: GOTO 540
520 MDD = SA( INT (N / 2 + 1))
530  REM  PRINT RESULTS TO SCREEN
540  HOME : VTAB 2: HTAB 10: PRINT "CA
     LCULATION RESULTS": VTAB 3: HTAB
     9: PRINT "**********************"
550  VTAB 6: HTAB 6: PRINT "SAMPLE SIZ
     E"; TAB( 28);N
560  VTAB 8: HTAB 6: PRINT "MEAN (X-BA
     R)"; TAB( 28); INT (MEAN * 10000 +
     .5) / 10000
570  VTAB 10: HTAB 6: PRINT "STD. DEVI
     ATION"; TAB( 28); INT (SDDEV * 10
     000 + .5) / 10000
580  VTAB 12: HTAB 6: PRINT "MEDIAN"; TAB(
     28);MDD
590  VTAB 14: HTAB 6: PRINT "RANGE"; TAB(
     28);RG
600  VTAB 16: HTAB 6: PRINT "LOWEST SA
     MPLE VALUE"; TAB( 28);LR
610  VTAB 18: HTAB 6: PRINT "HIGHEST S
     AMPLE VALUE"; TAB( 28);HR
620  VTAB 23: HTAB 10: PRINT "PRESS 'P
     ' TO PROCEED": VTAB 23: HTAB 17
630  GET Z$: IF Z$ = "" OR Z$ <  > "P"
      THEN 630
640  REM  REQUEST TO CONTINUE OR END
650  HOME : VTAB 12: HTAB 3: PRINT "WI
     SH TO PROCESS MORE DATA (Y/N)?": VTAB
     12: HTAB 34
660  GOSUB 1180
670  IF Z$ = "N" THEN  HOME : END
680  FOR I = 1 TO N:SA(I) = 0: NEXT I:
      GOTO 200
690  REM  INSTRUCTIONS SUBROUTINE
700  HOME : VTAB 4: PRINT "THE MAXIMUM
      SAMPLE SIZE IS 300, WHILE  THE
     MINIMUM IS 2."
710  VTAB 10: PRINT "THE MEAN IS THE A
     RITHMETIC AVERAGE OF  THE NUMBER
     S YOU ENTER."
720  VTAB 16: PRINT "THE STANDARD DEVI
     ATION IS A MEASURE OF  HOW WIDELY
      YOUR DATA SPREADS FROM THE  AVE
     RAGE."
730  VTAB 22: HTAB 12: PRINT "PRESS 'M
     ' FOR MORE": VTAB 22: HTAB 19
740  GET Z$: IF Z$ = "" OR Z$ <  > "M"
      THEN 740
750  HOME : PRINT "SINCE THE VALUES YO
     U ENTER TEND TO FORM A BELL CURVE
      (NORMAL DIST.), THE STD.  DEVIA
     TION IS A MEASURE OF THE AREA UND
     ERTHE BELL CURVE."
760  VTAB 8: PRINT "NO. OF STD.DEV. (+
     /-)": VTAB 9: PRINT "------------
     ---------"
770  VTAB 8: HTAB 28: PRINT "% AREA": VTAB
     9: HTAB 28: PRINT "-------"
780  VTAB 11: HTAB 2: PRINT "(+/-) 1 S
     TD.DEV."; TAB( 30);"68.3"
790  VTAB 13: HTAB 2: PRINT "(+/-) 2 S
     TD.DEV."; TAB( 30);"95.5"
800  VTAB 15: HTAB 2: PRINT "(+/-) 3 S
     TD.DEV."; TAB( 30);"99.7"
810  VTAB 17: HTAB 2: PRINT "(+/-) 4 S
     TD.DEV."; TAB( 30);"99.9"
820  VTAB 22: HTAB 12: PRINT "PRESS 'M
     ' FOR MORE": VTAB 22: HTAB 19
830  GET Z$: IF Z$ = "" OR Z$ <  > "M"
      THEN 830
840  HOME : VTAB 4: PRINT "THE MEDIAN
     IS THE VALUE AT THE MID-POINT OF
     YOUR DATA."
850  VTAB 8: PRINT "THE RANGE IS THE D
     IFFERENCE BETWEEN YOURLOWEST DATA
      VALUE AND THE HIGHEST. THE  RANG
     E IS A QUICK-AND -DIRTY ESTIMATE
     OF THE SPREAD."
860  VTAB 11: HTAB 13: PRINT "THE STD.
      DEVIATION IS MORE  RELIABLE."
870  VTAB 22: HTAB 5: PRINT "PRESS 'S'
      TO START THE PROGRAM": VTAB 22: HTAB
     12
880  GET Z$: IF Z$ = "" OR Z$ <  > "S"
      THEN 880
890  RETURN
900  REM  DISPLAY CORRECTION OPTIONS
910  HOME : INVERSE : VTAB 24: PRINT "
     C=CHANGE DATA      N=NEXT TABLE
      E=EXIT": NORMAL : RETURN
920  GET Z$: IF Z$ = "" OR (Z$ <  > "C
     " AND Z$ <  > "N" AND Z$ <  > "E"
     ) THEN 920
930  IF Z$ = "N" THEN 1120
940  IF Z$ = "E" THEN 350
950  GOTO 970
960  REM  ERROR CORRECTION SUBROUTINE
970  HOME : VTAB 12: HTAB 3: PRINT "RE
     MEMBER INCORRECT SAMPLE # (Y/N)?"
     : VTAB 12: HTAB 36
980  GOSUB 1180
990  IF Z$ = "N" THEN 1080
1000  HOME : VTAB 8: HTAB 6: PRINT "WH
     AT IS THE SAMPLE NUMBER";: INPUT
     E$:EN =  VAL (E$)
1010  IF EN > N OR EN < 1 OR EN <  >  INT
     (EN) THEN 1000
1020  VTAB 11: HTAB 6: PRINT "SAMPLE "
     ;EN; TAB( 22);"VALUE "SA(EN)
1030  VTAB 15: HTAB 6: PRINT "ENTER YO
     UR NEW VALUE";: INPUT C:SA(EN) =
     C
1040  VTAB 22: HTAB 6: PRINT "ANY MORE
      CHANGES (Y/N)?": VTAB 22: HTAB 2
     8
1050  GOSUB 1180
1060  IF Z$ = "Y" THEN 970
1070  GOTO 360
1080  GOSUB 910: VTAB 2: PRINT "THESE
     ARE THE FIRST TEN SAMPLE VALUES:"

1090  VTAB 6: HTAB 10: PRINT "ENTRY"; TAB(
     25);"VALUE"
1100  VTAB 7: HTAB 10: PRINT "-----"; TAB(
     25);"-----"
1110  FOR K = 1 TO 10: VTAB K + 8: HTAB
```

```
     11: PRINT K; TAB( 26);SA(K): NEXT
     K: GOTO 920
1120  VTAB 2: PRINT "THESE ARE THE NEX
     T TEN SAMPLE VALUES:": VTAB 2: HTAB
     38: PRINT " "
1130  IF K < 300 THEN  GOSUB 1170
1140 L = 9: FOR K = K TO K + 9: IF K >
     300 THEN K = K + 9: NEXT K: GOTO
     360
1150  VTAB L: HTAB 10: PRINT K; TAB( 2
     6);SA(K)
1160 L = L + 1: NEXT K: GOTO 920
1170  FOR M = 9 TO 18: VTAB M: HTAB 10
     : PRINT "    "; TAB( 26);"
                    ": NEXT M: RETURN
1180  GET Z$: IF Z$ = "" OR (Z$ <  > "
     Y" AND Z$ <  > "N") THEN 220
1190  RETURN
```

Program 7: Color Computer Statistics

```
100 DIM SA(300)
110 REM GENERAL INTRODUCTION
120 CLS:PRINT@ 171,"STATISTICS":PRI
    NT@ 238,"FOR":PRINT@ 295,"NON-S
    TATISTICIANS"
130 FOR K=1 TO 1000:NEXT K
140 CLS:PRINT@ 32,"THIS PROGRAM CAL
    CULATES THE{5 SPACES}FOLLOWING:
    "
150 PRINT@ 139,"1. MEAN":PRINT@ 203
    ,"2. STANDARD":PRINT@ 238,"DEVI
    ATION"
160 PRINT@ 299,"3. MEDIAN":PRINT@ 3
    63,"4. RANGE"
170 PRINT@ 454,"PRESS 'C' TO CONTIN
    UE"
180 Z$=INKEY$:IF Z$="" OR Z$ <>"C"
    THEN 180
190 SUM=0:MEAN=0:DFF=0:SDDEV=0:RG=0
200 CLS:PRINT@ 224,"DO YOU NEED INS
    TRUCTIONS (Y/N)?"
210 GOSUB 1050:IF Z$="Y" THEN GOSUB
     600
220 REM DATA ENTRY
230 CLS:PRINT@ 229,"ENTER SAMPLE SI
    ZE";:INPUT N$:N=VAL(N$)
240 IF N>300 OR N<=1 THEN  230
250 CLS:PRINT"  IN CASE OF AN ERROR
     CONTINUE. YOU CAN CORRECT LATE
    R."
260 FOR I=1 TO N:PRINT@ 224,"DATA E
    NTRY #";I;:INPUT R$:SA(I)=VAL(R
    $)
270 FOR J=242 TO 250:PRINT@ J,CHR$(
    32):NEXT J:NEXT I
280 REM ERROR CORRECTION REQUEST
290 CLS:PRINT@ 224,"WISH TO MAKE CO
    RRECTIONS (Y/N)?"
300 GOSUB 1050:IF Z$="Y" THEN GOSUB
     870
310 REM CALCULATIONS OF MEAN AND ST
    D. DEVIATION
320 CLS:PRINT@ 202,"PLEASE WAIT":PR
    INT@ 258,"STATISTICS BEING CALC
    ULATED"
330 FOR I=1 TO N:SUM=SUM+SA(I):NEXT
     I:MEAN=SUM/N
340 FOR I=1 TO N:DFF=DFF+(SA(I)-MEA
    N)^2:NEXT I:SDDEV=SQR(DFF/(N-1)
    )
350 REM SORTING THE DATA
360 FL=0:FOR I=1 TO N-1:IF SA(I)<=S
    A(I+1) THEN 380
370 Q=SA(I):SA(I)=SA(I+1):SA(I+1)=Q
    :FL=1
380 NEXT I:IF FL=1 THEN 360
390 REM CALCULATION OF RANGE
400 HR=SA(N):LR=SA(1):RG=HR-LR
410 REM CALCULATION OF MEDIAN
420 IF N/2 <> INT(N/2) THEN 450
430 IF SA(N/2)=SA(N/2+1) THEN MDD=S
    A(N/2):GOTO 470
440 MDD=(SA(N/2)+SA(N/2+1))/2:GOTO
    470
450 MDD=SA(INT(N/2+1))
460 REM PRINT RESULTS TO SCREEN
470 CLS:PRINT@6,"CALCULATION RESULT
    S":PRINT@37,"**********
    ***"
480 PRINT@ 100,"SAMPLE SIZE";TAB(20
    );N
490 PRINT@164,"MEAN (X-BAR)";TAB(20
    );INT(MEAN*10000+.5)/10000
500 PRINT@228,"STD.DEVIATION";TAB(2
    0);INT(SDDEV*10000+.5)/10000
510 PRINT@292,"MEDIAN";TAB(20);MDD
520 PRINT@356,"RANGE";TAB(20);RG:PR
    INT@397,"(";LR;"-";HR;")"
530 PRINT@456,"PRESS ANY KEY"
540 Z$=INKEY$:IF Z$=""THEN 540
550 REM REQUEST TO CONTINUE OR END
560 CLS:PRINT@224,"WISH TO PROCESS
    MORE DATA (Y/N)?"
570 GOSUB 1050:IF Z$="N" THEN CLS:E
    ND
580 FOR I=1 TO N:SA(I)=0:NEXT I:GOT
    O 190
590 REM INSTRUCTIONS SUBROUTINE
600 CLS:PRINT@65,"THE MAXIMUM NUMBE
    R OF ENTRIES  IS 300. THE MINIM
    UM IS 2."
610 PRINT@193,"THE MEAN IS THE ARIT
    HMETIC{5 SPACES}AVERAGE OF THE
    DATA."
620 PRINT@322,"THE STANDARD DEVIATI
    ON IS A{4 SPACES}MEASURE OF HOW
     WIDELY YOUR DATA SPREADS FROM
    THE AVERAGE."
630 PRINT@453,"PRESS ANY KEY FOR MO
    RE"
640 Z$=INKEY$:IF Z$=""THEN 640
650 CLS:PRINT" SINCE THE VALUES YOU
     ENTER TENDTO FORM A BELL CURVE
     (NORMAL{4 SPACES}DIST.), THE S
    TD.DEVIATION IS A  MEASURE OF A
    REA UNDER THE BELL  CURVE."
660 PRINT@192,"NO. OF STD.DEV. (+/-
    )";TAB(25);"% AREA"
670 PRINT@224,"--------------------
    -";TAB(25);"------"
680 PRINT@290,"(+/-) 1 STD.DEV.";TA
    B(26);"68.3"
690 PRINT@322,"(+/-) 2 STD.DEV.";TA
    B(26);"95.5"
700 PRINT@354,"(+/-) 3 STD.DEV.";TA
    B(26);"99.7"
710 PRINT@386,"(+/-) 4 STD.DEV.";TA
    B(26);"99.9"
720 PRINT@453,"PRESS ANY KEY FOR MO
    RE"
730 Z$=INKEY$:IF Z$="" THEN 730
```

```
740 CLS:PRINT:PRINT:PRINT" THE MEDI
    AN IS THE VALUE AT THE MID-POIN
    T OF YOUR DATA."
750 PRINT@ 193,"THE RANGE IS THE DI
    FFERENCE{4 SPACES}BETWEEN YOUR
    LOWEST DATA VALUE  AND THE HIGH
    EST. IT IS A QUICK- AND-DIRTY E
    STIMATE OF THE"
760 PRINT@320,"SPREAD. STD. DEVIATI
    ON IS MORE  RELIABLE THAN RANGE
    ."
770 PRINT@449,"PRESS 'S' TO START T
    HE PROGRAM"
780 Z$=INKEY$:IF Z$="" OR (Z$<>"S")
     THEN 780
790 RETURN
800 REM DISPLAY CORRECTION OPTION
810 CLS:PRINT@480,"C=CORRECT
    {3 SPACES}N=NEXT TABLE  E=EXIT"
    ;:RETURN
820 Z$=INKEY$:IF Z$="" OR (Z$<>"C"
    AND Z$<>"N" AND Z$<>"E") THEN 8
    20
830 IF Z$="N" THEN 990
840 IF Z$="E" THEN 310
850 GOTO 870
860 REM ERROR CORRECTION SUBROUTINE
    "
870 CLS:PRINT@224,"REMEMBER INCORRE
    CT SAMPLE (Y/N)?"
880 GOSUB 1050:IF Z$="N" THEN 960
890 CLS:PRINT@165,"WHAT IS THE SAMP
    LE #";:INPUT E$:EN=VAL(E$)
900 IF EN>N OR EN<1 OR EN<>INT(EN)
    THEN 890
910 PRINT@229,"SAMPLE ";EN;TAB(20);
    "VALUE ";SA(EN)
920 PRINT@293,"ENTER YOUR NEW VALUE
    ":PRINT"{5 SPACES}";:INPUT C$:S
    A(EN)=VAL(C$)
930 PRINT@453,"ANY MORE CHANGES (Y/
    N)?"
940 GOSUB 1050:IF Z$="Y" THEN 870
950 GOTO 1040
960 GOSUB 810:PRINT@0,"THESE ARE TH
    E FIRST TEN VALUES:"
970 PRINT@69,"ENTRY";TAB(17);"VALUE
    "
980 I=1:FOR K=101 TO 389 STEP 32:PR
    INT@K,I;TAB(17);SA(I):I=I+1:NEX
    T K:GOTO 820
990 PRINT@0,"THESE ARE THE NEXT TEN
     VALUES":IF I<300 THEN GOSUB 10
    30
1000 FOR K=101 TO 389 STEP 32:IFI>3
    00 THEN 1020
1010 PRINT@K,I;TAB(17);SA(I):I=I+1
1020 NEXT K:GOTO 820
1030 FOR K=101 TO 389 STEP 32:PRINT
    @K,"{3 SPACES}";TAB(18);"
    {6 SPACES}":NEXT K:RETURN
1040 RETURN
1050 Z$=INKEY$:IF Z$="" OR (Z$<>"Y"
     AND Z$<>"N") THEN 1050
1060 RETURN
```

M'FILE For The Commodore 64

Stan Fenster

M'FILE is a set of data management programs for the Commodore 64. A 1541 disk drive and a printer are required. The manual indicates that there's also a tape version, but it was not tested for this review. Any serial port or user port (RS-232 or parallel) printer can be used.

The package contains a 7-inch x 9-inch loose-leaf manual, a software key, and a program disk. The programs on the disk can be copied to a backup disk. The key, which plugs into Control Port 1 (front joystick port), is required to run the program. The disk contains the main routines, a SORT program, a COPY program, and a TEXT'MERGE program. No data files go on this disk. Instead, each data file occupies a separate data disk. This might discourage the use of *M'FILE* for small jobs.

The manual is well written and generally easy to follow, though more examples would have been helpful. However, the menus within the program lead the user so effectively through all the necessary steps that you'd rarely need to refer to the manual.

Major Characteristics

Data is stored on the data disk, not in RAM. This allows for either 1000 records of 125 characters each or 500 records of 250 characters each. Each record is limited to 32 fields of no more than 78 characters each. Fields can be either numeric or alphanumeric. All alphabetic characters are in uppercase, but a new version which supports both upper- and lowercase has been announced. Numeric fields can be used in formulas allowing arithmetic calculations among fields. Within formulas, an if-then syntax is available. Up to ten user-defined interfield formulas can be used.

Selection of records for updates, reports, or text merges can be made using any or all fields. One field is designated as the keyfield. Searches using the keyfield are especially fast, and offer extensive comparison capabilities (=, <, >, <=, >=, or <>) between fields.

Report formats are very flexible, and up to 15 such formats can be saved for reuse later. Fields can be printed in columns or horizontally, and special ASCII control codes can be sent to the printer.

Main Menu Options

The main menu gives the following options:

1. Access a File.
2. Print a Report.
3. Create a File.
4. Sort a File.
5. Exit.

To get started, select Create a File. Next, format a data disk and set it up to receive the record specifications. After a

title is entered, the program leads the user through the steps of choosing field names, types, sizes, and decimal settings. When setup is complete, it is stored on disk, and the user proceeds to Access a File.

Access a File is used to enter new data, to change or inspect data, or to add fields and formulas.

Print a Report allows the user to create a new report format, to call up a saved report format, to add temporary fields or formulas, to display totals on the screen, or to set printer control characters. After a report format is chosen and edited as desired, it may be saved. The report is then printed. Many options are available in setting up the print format.

Use Of Function Keys

The screens displayed by *M'FILE* are either menus or data screens. Data screens have a line at the bottom indicating the functions available by use of function keys. These generally include f1=ACCEPT, f3=DELETE, and f5=EXIT. On a data entry or modification screen, f7=ADD/SUB (modify a numeric field) also appears.

When a record selection is made by record number, the f2 key advances the pointer to the next sequential record, and f4 moves to the previous sequential record. Note that if records have been deleted, there may be missing record numbers. When a record selection is done by searching, the f8 key advances to the next matching record. However, none of these even-numbered function keys is indicated in the screen prompts.

Sorting

Sorting is done by a separate program (SORT) loaded from the main menu. Sorting is performed on any single field, in either ascending or descending order. The result is a new, sorted data file on the disk. The exit from SORT is to the BASIC environment, not back to the main menu. To continue processing—for example, to prepare a report—the user must load and run *M'FILE* again.

Text Merging

A separate program, TEXT'MERGE, is provided to create files which can be used by most major word processing programs. The selection menu lists Quick Brown Fox, WordPro, EasyScript, Script 64, Totl Text, Busiwriter, Paper Clip, and Other. Other is intended to work with any word processors which can read sequential files. I found that I could not generate mailing lists and labels in the format I wanted with the *M'FILE* report generator. However, using TEXT'MERGE in conjunction with my word processor (EasyScript), it was easy to get single-column labels. Additional columns are not supported by *M'FILE* but I was able to do it with word processor manipulations—but only because my printer has reverse-line motion.

Copy Program

A separate program, COPY, is provided to make backup copies of *M'FILE* data disks, using a single disk drive. The file title of the new disk can be different from the old title. As with other backup programs, frequent disk swaps are required to make the backup disk. COPY also allows the user to copy the format only. This feature is useful for expanding the file onto a second disk, or creating a new file with the same format.

Other Features And Considerations

Another capability of *M'FILE* is a screen dump to the printer at almost any time, by pressing the British pound key.

When the file structure is accepted by the user, the file character limit is set at 125 if no more than 125 characters are required; otherwise, the limit is 250 characters. After this, the original field names and structures can't be changed, although new fields can be added later, as long as the maximum character limit (125 or 250) is not exceeded.

In report mode, additional temporary numeric fields can be added. Their contents are created by using formulas involving other numeric fields. The menu allows the user to add alphanumeric fields, but there is no way to enter data into them.

Reports have an optional total line at the end. However, the number of characters for each numeric field is the same for the totals as for individual entries. This leads to possible truncation in a total if extra digits would have been generated. I had this problem, and I found a solution by creating a temporary field equal to my original field, but with extra width. Then I used the new field instead of the old one and got a correct total. Of course, it would have been easier if the original field had been wider, but I didn't know that at the time. A related feature is Screen Totals. This allows display of totals on the screen, but has the same width limitation as printed totals.

Because the main data is kept on the data disk, there are frequent disk reads and writes. In particular, when an exit is made from the file access mode after changes are made, the data file on disk is rewritten, which takes a few minutes. When the user enters a new mode, a read is required, even if a write was just performed.

Field selection and searching are easy and fast. Sorting on keyfields is fast too, but limited in speed by disk accesses. Other sorts are slower.

Even with the limitations discussed above, *M'FILE* is a

powerful and versatile data management system.

M'FILE
by m'soft
Double E. Electronics, Inc.
12027 Pacific Street
Omaha, NE 68154
(402) 334-7870
$79.95 ©

AtariWriter

John Heilborn

A few years ago, Atari introduced a program called *Atari Word Processor*. It was a fairly expensive word processor that had an enormous number of functions and features. It was versatile and almost totally menu-driven. In other words, while you were using it, the computer displayed a menu of program functions at the top of the screen.

Unfortunately, if you decided you wanted to do something that was on another, undisplayed, menu you would have to know how to find the menu (the menus were nested and could be accessed by pressing different options) and would have to go through all of the other menus to get there.

The old word processor was very versatile, but was also rather cumbersome.

A New Generation

Today there is a new Atari word processor called *AtariWriter*. It's obviously a descendant of the original *Atari Word Processor*, but all of the "fat" has been trimmed. *AtariWriter* is easy to use (no menus to wallow through), easy to understand (all of the commands are logically accessed), and very responsive (when you press a key, the computer responds quickly).

One additional feature that makes this program far better than the old one is that it is in a cartridge, not on disk, and it will work with as little as 16K memory. You can use it with *any* of the existing Atari computers and

you don't need to have a disk drive or a tape drive. Of course, if you run the word processor without a device to store your text, you will lose it after writing it. However, for people just using the system as an enhanced typewriter, this is enough.

Functions And Features

Although I am used to writing on an expensive professional word processing system, *AtariWriter* has all of the features that I would normally use on the larger system. I wrote this article on *AtariWriter* and found, in fact, that *AtariWriter* has some very nice extra features not usually found on other systems, such as a single toggle function which allows you to switch displayed characters from upper- to lowercase automatically. The program has more features than I can cover in a review, so I'll just give you the highlights.

When you turn *AtariWriter* on, it displays the Atari logo for a few moments and then switches to a menu of functions. The functions are:

- **[C]REATE** File is used to begin writing a new file. If you have some text in memory left over from another file and you select this option, the computer responds by asking you if you wish to delete the file in memory. This way you will not accidentally erase a file that you want to SAVE. If there is no file in memory, the computer simply goes to the editing page.
- **[D]ELETE** File erases a file from the disk drive. When you select this option, the computer asks for the name of the file you wish to delete. Once you have selected the file to delete, it checks with you one more time by asking, "ARE YOU SURE?" This makes it almost impossible to erase a file by accident.
- **[E]DIT** File is similar to [C]REATE File, but is used to continue working on an existing file.
- **[F]ORMAT** Disk erases all of the information a disk contains, so the program asks you, "ARE YOU SURE?" before executing this command too.
- **[I]NDEX** of Disk Files displays the names of all the programs and text files on your disk. After the files have been displayed, the computer asks if you want to print the index. If you press Y or enter YES (and have a printer connected), the index will be printed.
- **[L]OAD** File transfers any file you have on disk (or cassette) into the computer's memory.
- **[P]RINT** File prints the file that is currently in memory. This routine will not print a file directly from disk (or cassette). The file *must* first be transferred to memory.
- **[S]AVE** File transfers any file you have in memory onto the disk (or cassette).

Editing

In the editing mode, *AtariWriter* displays a blank screen with a

series of letters and numbers across the top. Below the blank screen is a black area with arrows indicating the tab positions and two indicators (L and C) which are used to keep track of the line and column of the cursor location.

Print Formatting Controls

The letters and numbers across the top of the screen are print controls and can be changed at any time during your editing session. This means that you can have text that varies in width, spacing, or any other parameter that can be set with these controls. The print functions that you can control are bottom margin, paragraph spacing, print style, paragraph indention, right justification, left margin position, right margin position, line spacing, top margin, and page length.

Block Functions

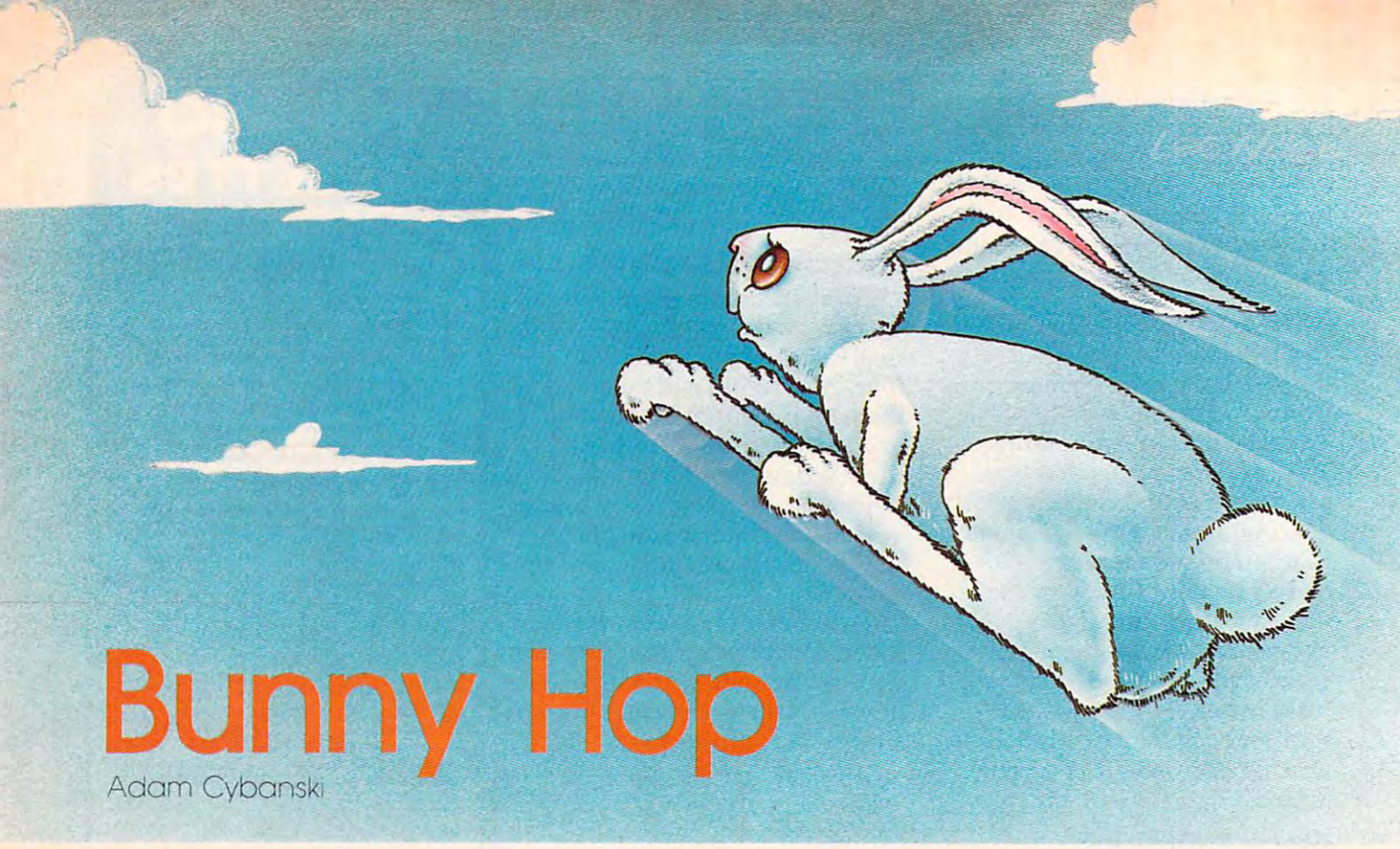
Block functions are controls that allow you to move or delete entire blocks of text. To move a block of text, you would simply mark the beginning and end of the block you wish to move (or delete); *AtariWriter* will do the rest for you automatically.

Search and Replace

With search and replace you can specify a word (or several words) that you want the computer to find. *AtariWriter* will then look through the entire document and locate each occurrence of the word (or words) you specify. Once each word has been found, you can continue editing from that point, replace that word or delete it.

AtariWriter is a very good, low-cost word processing system that can provide you with virtually every feature you could want from a word processor.

AtariWriter
Atari, Inc.
1265 Borregas Ave.
Box 427
Sunnyvale, CA 94086
(408) 745-2000
$99.95



Bunny Hop

Adam Cybanski

Airborne carrots and a cloud-hopping rabbit add a dash of whimsy to this joystick-controlled game for the Commodore 64, VIC, and Atari.

It's harvest time in that great big carrot patch in the sky and Copernicus, a rather hungry rabbit, is on the prowl for his favorite vegetable.

Unfortunately, due to a fluke of nature as well as incredibly bad air pollution, the carrots are suspended in midair. This, however, can be turned into an advantage for Copernicus, since he is able to hop around on the dense clouds in pursuit of his meal.

He may also jump around on platforms which have been dispersed across the sky for absolutely no reason at all.

Watch That Brier Patch

The only thing Copernicus cannot do is land in the brier patch below—he would be transported back to his initial position. This would not be so bad if he had an unlimited number of transport passes—unfortunately, he has not. After they are exhausted, he is condemned to the brier patch for the rest of his life.

If he clears the sky of carrots, then benevolent forces disperse a new set of carrots for him, and his friends in the brier patch become so happy for him that they usually jump around in a rabbit euphoria. Meanwhile, Copernicus continues to collect carrots until he runs out of transport passes.

One Tricky Carrot

Once in a while our hero eats a jumping bean which has been disguised as a carrot by some unknown troublemaker. This causes him to hop continuously, hampering his ability to gather carrots. In addition, the more he eats, the heavier he becomes, until he finds that he can no longer jump as high as he used to. But then, it just adds more challenge to his hare-raising adventures.

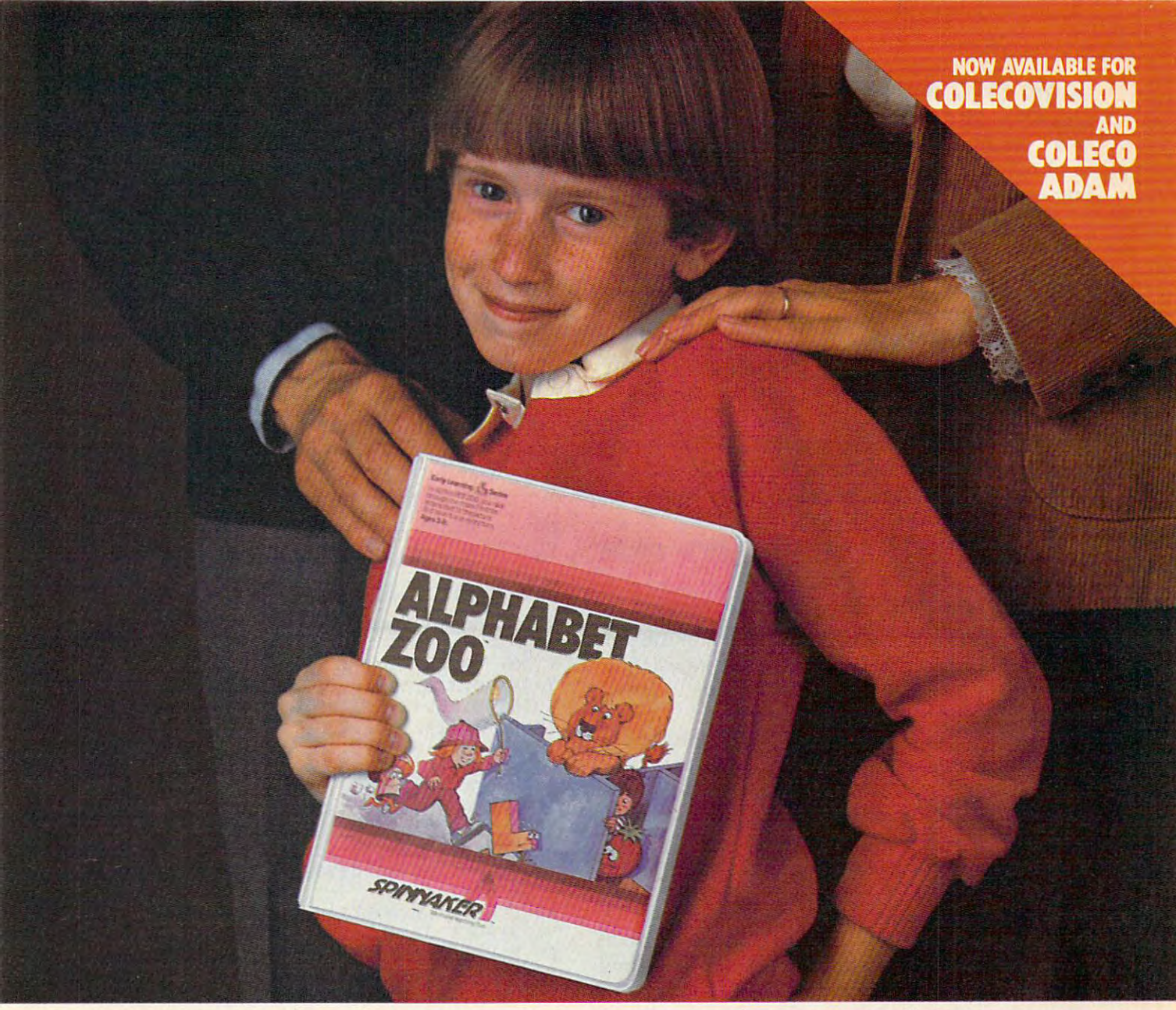
Joystick Controls

The object of the game is to collect all the carrots. Copernicus jumps when you press the fire button or push the joystick forward. He moves either left or right when you push the joystick in either of those directions.

Clearing the screen of carrots starts you on a new level. Every fifth level is a "jumper round" during which the rabbit jumps continuously. At the completion of every tenth level, a new rabbit is earned. Rabbits are displayed at the top center of the screen, and one is lost every time you fall into the brier patch at the bottom of the screen. When all rabbits are exhausted, the game is over.

You have 60 seconds to collect the carrots. If your time runs out, the clouds speed up and you forfeit an extra time bonus. If you still do not collect all the carrots within 30 seconds, the clouds and platforms will start disappearing.

The score is displayed on the top right. Try to beat a score of 10,000! The key to high scoring is to clear the carrots quickly and collect the extra time bonus.



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Logic (VIC And 64 Versions)

Lines 5 to 20 set the custom characters. Lines 30 to 55 produce a short machine language routine to move the clouds. Lines 100 to 150 initialize the screen for each new level.

Lines 200 to 280 are the main game loop. Lines 400 to 410 are a subroutine which increases the game difficulty when the timer reaches zero. Lines 500 to 520 are called when the game ends.

Lines 600 to 635 control the interlevel features like the jumper round and game speed. Lines 700 and 705 are called when a carrot is gathered.

Lines 800 to 840 are a routine which is called when all carrots have been gathered. It controls the extra time bonus and the bouncing rabbit.

Lines 900 and 905 are called when a rabbit hits the brier patch.

Bunny Hop (VIC And 64 Versions)

Line 20 contains the variable I, which is the general speed of the game. Decreasing it makes the game faster but also causes Copernicus to remain on the screen for less time.

Line 25 has CT, which is the number of carrots you must collect initially. LI is one less than the number of rabbits you start off with. L is the number of cloud pieces that are placed in each row.

The platform pieces in line 115 and also in line 117 of the 64 version are character number 183.

Line 150 has the variable D, which contains the initial bunny character. It is either 33, facing right, or 34, facing left. Line 150 also increases CT by one. Changing this to CT=CT+0 will keep the number of carrots to be collected at four.

Use Either Joystick Port

The statement in line 200 of the 64 version, Y=PEEK(56320)AND PEEK(QQ) combines the joystick ports, enabling use of either.

Changing the number 36 to the number 1 in line 245 will enable a person to jump on the brier patch without losing a bunny.

Z of line 400 is the cloud speed switch. If Z is zero, the clouds remain slow. They speed up when Z is changed to −1.

Line 610 increments LE, which is the level counter. If LE is greater than 19, W is set to one instead of zero, which makes Copernicus' jumps shorter.

An Extra Rabbit

The tens in line 615 give you an extra rabbit every ten levels. Changing this to INT(LE/5)=LE/5 will give extra rabbits every five levels.

Line 620 makes V true (−1) every five levels, which produces a jumper round.

Line 625 resets the number of carrots to 4 every ten levels.

Line 630 decreases the number of cloud pieces per row. Changing it to L=L−0 will keep the number of clouds constant.

20 Points For A Carrot

You are given 20 points for a carrot in line 700. Changing this to FORX=1TO55 would give you 55 points for each carrot.

If you are tired of the large number of bunny hops at high levels, just revise line 800 with FORC=1TO2, which will perform only two hops each level throughout the game.

To change the number of extra bonus points, simply revise line 830 to something like SC=SC+2.

Program 1: 64 Bunny Hop

Refer to the "Automatic Proofreader" article before typing this program in.

```
1 QQ=56321                                :rem 17
5 DATA0,0,0,0,0,0,0,0,8,12,6,189,127,124,
  56,70,16,48,96,189,254,62,28,34:rem 241
10 DATA0,102,255,255,102,0,0,0,66,40,134,
   51,136,102,102,102                     :rem 78
15 DATA0,48,188,255,255,188,48,0,0,102,25
   5,255,102,0,0,0                        :rem 228
16 POKE56334,0:POKE1,51                   :rem 35
17 FORX=0TO1023:POKEX+13312,PEEK(X+53248)
   :NEXT:POKE1,55:POKE56334,1             :rem 2
20 FORX=12544TO12599:READY:POKEX,Y:NEXT:S
   =54272:I=75                            :rem 243
23 POKES+5,9:POKES+6,9:POKES,115:POKES+1,
   3:POKE53280,5:POKE53281,6              :rem 190
25 POKE53272,28:K=54272:L=18:CT=3:LI=3:GO
   SUB600:POKES+24,15                     :rem 208
30 DATA160,40,177,253,200,145,253,136,136
   ,192,255,208,245,160,40,177,253,160
                                          :rem 207
31 DATA 0,145,253,160                     :rem 253
35 DATA40,169,32,145,253,96,160,41,177,25
   3,136,145,253,200,200,192,81,2:rem 216
40 DATA245,160,40,177,253,160,80,145,253,
   160,40,169,32,145,253,96,169,5,133,254
                                          :rem 110
45 DATA169,63,133,253,32,96,47,169,184,13
   3,253,32,68,47,169,47,133,253,169,6
                                          :rem 254
50 DATA133,254,32,96,47,169,168,133,253,3
   2,68,47,169,31,133,253,169,7,133,254
                                           :rem 32
53 DATA32,96,47,96                        :rem 180
55 FORX=12100TO12203:READY:POKEX,Y:NEXT
                                          :rem 227
100 PRINT"{HOME}{15 RIGHT}{WHT}{RVS}BUNNY
    {2 SPACES}HOP":PRINT"{WHT}{RVS}
    {2 RIGHT}TIME":PRINT"{7 LEFT}{RVS}SCO
    RE"                                   :rem 33
105 FORX=1944TO2023:POKEX,36:POKEX+K,5:NE
    XT                                    :rem 181
110 FORX=55496TO56215:POKEX,1:NEXT:I=I-3
                                          :rem 193
115 PRINT"{HOME}{7 DOWN}{YEL}{RVS}[Y]
```

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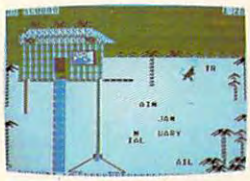
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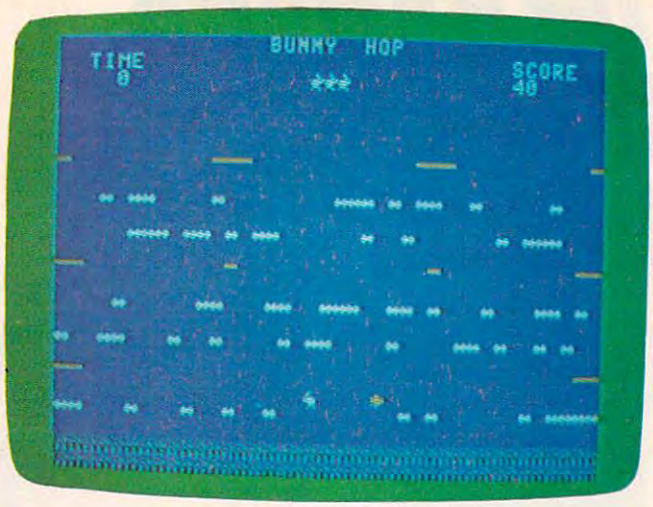


The bunny is about to fall into the brier patch (64 version of "Bunny Hop").

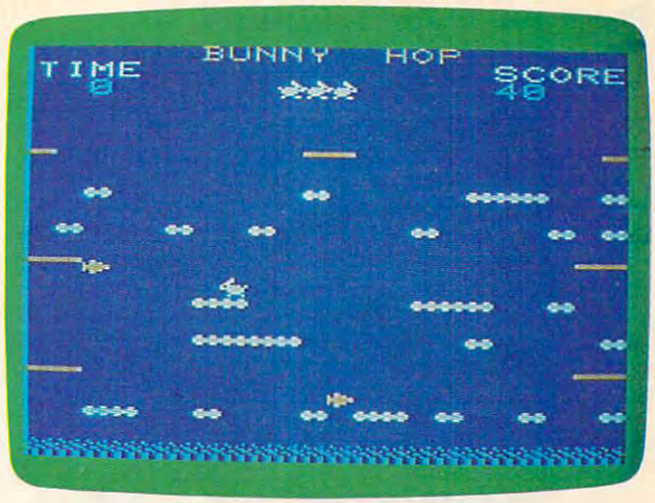
```
    {DOWN}{2 LEFT}{Y}{5 DOWN}{2 Y}{DOWN}
    {4 LEFT}{2 Y}{5 DOWN}{2 Y}{DOWN}
    {4 LEFT}{2 Y}"                    :rem 199
117 PRINT"{HOME}{RVS}{7 DOWN}{11 RIGHT}
    {3 Y}{12 RIGHT}{3 Y}{6 DOWN}{2 LEFT}
    {Y}{16 LEFT}{Y}"                  :rem 201
120 FORX=9TO21STEP6:FORY=1TOL:POKE1024+X*
    40+RND(1)*40,35:NEXTY,X           :rem 225
125 FORX=11TO17STEP6:FORY=1TOL:POKE1024+X
    *40+RND(1)*40,38:NEXTY,X          :rem 23
130 C=CT:FORX=1TOC                    :rem 120
135 Y=INT(RND(1)*639)+1224:IFPEEK(Y)<>32O
    RY=1505THEN135                    :rem 210
140 IF(Y<1905ANDY>1862)OR(Y<1746ANDY>1702
    )OR(Y<1666ANDY>1622)THEN135       :rem 248
145 IF(Y<1425ANDY>1382)OR(Y<1506ANDY>1462
    )THEN135                          :rem 101
150 POKEY,37:POKEY+K,7:NEXTX:P=1505:D=33:
    CT=CT+1                           :rem 212
155 TI$="000000":POKES-1,130          :rem 215
200 POKEP,32:POKE37154,127:Y=PEEK(56320)A
    NDPEEK(QQ):IF(YAND8)=0THENP=P+1:D=3
                                      :rem 71
205 IFPEEK(P+40)=38AND(NOT(B)ORZ)THENP=P+
    1                                 :rem 46
210 IF(YAND4)=0THENP=P-1:D=34         :rem 204
215 POKES+4,32:IFPEEK(P+40)=35AND(NOT(B)O
    RZ)THENP=P-1                      :rem 218
220 B=(B=0):IFBORZTHENSYS12156:POKES+4,33
                                      :rem 243
225 IFA=0ANDPEEK(P+40)<>32THENIF(YAND16)=
    0OR(YAND1)=0ORVTHENA=7-W*2:POKES+11,3
    3                                 :rem 62
230 IFA<4-WANDPEEK(P+40)=32ORPEEK(P+40)=3
    7THENP=P+40                       :rem 91
233 POKES+1,3:IFZTHENPOKES+1,15       :rem 151
235 IFA<>0THENA=A-1:IFA>3-WTHENP=P-40:POK
    ES+8,PEEK(S+8)+2                  :rem 208
240 IFPEEK(P)=37THEN700               :rem 88
245 IFPEEK(P+40)=36THEN900            :rem 237
250 IFPEEK(P)<>32THENP=P+40:GOTO260:POKES
    ,PEEK(S)-20                       :rem 177
255 POKES,70                          :rem 177
260 IFPEEK(P)=37THEN700               :rem 90
265 POKEP,D:POKEP+K,1:FORX=1TOI:NEXT
                                      :rem 100
270 PRINT"{HOME}{3 DOWN}{8 LEFT}{RVS}
    {WHT}";SC                         :rem 128
275 PRINT"{HOME}{2 DOWN}{RVS}{2 RIGHT}";:
    T=60-VAL(TI$):IFT<1THEN400        :rem 203
280 PRINTT;"{LEFT} ":GOTO200          :rem 156
400 PRINT"{HOME}{2 DOWN}{4 SPACES}{WHT}
    {RVS}0{2 SPACES}":Z=-1:IFTI$<"000130"
    THENGOTO200                       :rem 56
405 Y=1224+INT(RND(1)*719):IFPEEK(Y)=37OR
    (PEEK(Y)=32ANDRND(1)>.2)THEN405
                                      :rem 209
410 POKEY,32:GOTO200                  :rem 179
500 PRINT"{12 DOWN}{16 RIGHT}{RVS}{CYN}AG
    AIN ?"                            :rem 82
505 GETA$:IFA$=""THEN505              :rem 87
510 IFA$="Y"THENRUN                   :rem 136
515 IFA$="N"THENEND                   :rem 100
520 GOTO505                           :rem 106
600 IFLI<0THEN500                     :rem 234
605 PRINT"{CLR}{2 DOWN}{18 RIGHT}{WHT}";:
    IFLI>0THENFORX=1TOLI:PRINT"!";:NEXT
                                      :rem 43
610 PRINT" ":LE=LE+1:Z=0:W=0:V=0:IFLE>19T
    HENW=1                            :rem 79
615 IFINT(LE/10)=LE/10THENLI=LI+1:rem 216
620 IFLE/5=INT(LE/5)THENV=-1          :rem 170
625 IFLE/10=INT(LE/10)THENCT=4        :rem 30
630 L=L-1:IFL<3THENL=10               :rem 105
635 RETURN                            :rem 126
700 FORX=1TO20:POKES+4,129:SC=SC+1:PRINT"
    {HOME}{3 DOWN}{8 LEFT}{RVS}";SC:POKES
    +4,128:NEXT                       :rem 162
705 C=C-1:ON-(C=0)+1GOTO265,800       :rem 184
800 POKES,0:FORC=1TOLE:Y=0:X=0:V=0
                                      :rem 120
805 Z=1904+X+Y:X=X+1:POKES+4,33:IFX=39THE
    N825                              :rem 209
810 POKES+1,ABS(Y/20)+10:IFV=0THENY=Y-40:
    IFY=-160THENV=1                   :rem 145
815 IFV=1THENY=Y+40:IFY=0THENV=0       :rem 31
820 POKEZ,32:POKE1904+X+Y,33:POKE1904+X+Y
    +K,1:POKES+4,32:GOTO805           :rem 81
825 POKEZ,32:NEXTC:POKES+1,3          :rem 236
830 IFT>0THENFORX=TT0STEP-1:POKES+4,129:
    PRINT"{HOME}{2 DOWN}{RVS}{2 RIGHT}";X
    :SC=SC+T                          :rem 124
835 IFT>0THENPRINT"{HOME}{3 DOWN}{7 LEFT}
    {RVS}";SC:POKES+4,128:NEXTX       :rem 24
840 POKES,0:GOSUB600:GOTO100          :rem 206
900 FORY=1TOLE:POKES+1,10:FORX=1TO150STEP
    5:POKES+4,33:POKES+1,X/10         :rem 138
905 POKES+4,32:NEXTX,Y:POKES+1,3:LI=LI-1:
    GOSUB600:GOTO100                  :rem 48
```

Program 2: VIC Bunny Hop

Refer to the "Automatic Proofreader" article before typing this program in.

```
5 DATA0,0,0,0,0,0,0,0,8,12,6,189,127,124,
  56,70,16,48,96,189,254,62,28,34:rem 241
10 DATA0,102,255,255,102,0,0,0,66,40,134,
   51,136,102,102,102                 :rem 78
15 DATA0,48,188,255,255,188,48,0,0,102,25
   5,255,102,0,0,0                    :rem 228
20 FORX=7424TO7479:READY:POKEX,Y:NEXT:S=3
   6876:I=100                         :rem 196
25 POKE36869,255:POKES+3,109:K=30720:L=10
   :CT=4:LI=3:GOSUB600:POKES+2,15:rem 172
30 DATA160,22,177,253,200,145,253,136,136
   ,192,255,208,245,160,22,177,253,160,0,
   145                                :rem 241
```

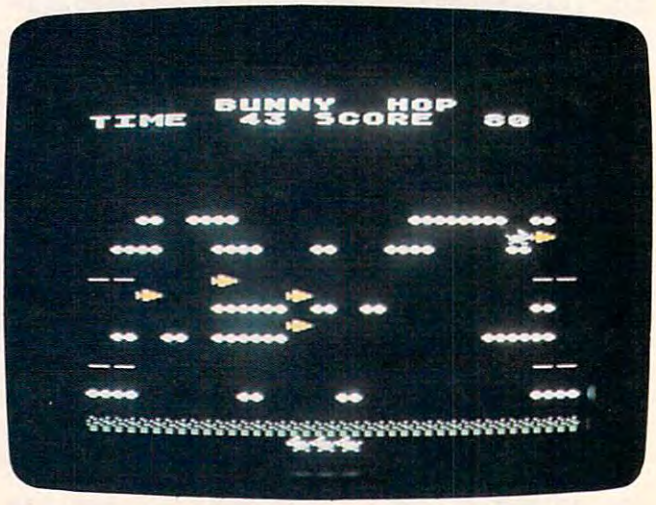
```
35 DATA253,160,22,169,32,145,253,96,160,2
   3,177,253,136,145,253,200,200,192,45,2
   08                                :rem 201
40 DATA245,160,22,177,253,160,44,145,253,
   160,22,169,32,145,253,96,169,30,133,25
   4,169                             :rem 104
45 DATA153,133,253,32,184,28,169,220,133,
   253,32,156,28,169,29,133,253,169,31,13
   3                                 :rem 164
50 DATA254,32,184,28,169,96,133,253,32,15
   6,28,169,161,133,253,32,184,28,96
                                     :rem 141
55 FORX=7324TO7423:READY:POKEX,Y:NEXT
                                     :rem 151
100 PRINT"{HOME}{6 SPACES}{YEL}{RVS}BUNNY
    {2 SPACES}HOP":PRINT"{WHT}{RVS}TIME":
    PRINT"{5 LEFT}{RVS}SCORE"        :rem 147
105 FORX=8164TO8185:POKEX,36:POKEX+K,5:NE
    XT                               :rem 197
110 FORX=38576TO38861:POKEX,1:NEXT:I=I-3
                                     :rem 200
115 PRINT"{HOME}{6 DOWN}{YEL}{RVS}{Y}
    {9 RIGHT}{2 Y}{9 RIGHT}{Y}{5 DOWN}
    {2 Y}{4 LEFT}{DOWN}{2 Y}{5 DOWN}{2 Y}
    {4 LEFT}{DOWN}{2 Y}"             :rem 227
120 FORX=8TO20STEP6:FORY=1TOL:POKE7680+X*
    22+RND(1)*22,35:NEXTY,X          :rem 237
125 FORX=10TO16STEP6:FORY=1TOL:POKE7680+X
    *22+RND(1)*22,38:NEXTY,X         :rem 35
130 C=CT:FORX=1TOC                   :rem 120
135 Y=INT(RND(1)*351)+7768:IFPEEK(Y)<>320
    RY=8055THEN135                   :rem 227
140 IF(Y<8143ANDY>8118)OR(Y<8056ANDY>8030
    )OR(Y<8011ANDY>7986)THEN135      :rem 6
145 IF(Y<7879ANDY>7854)OR(Y<7924ANDY>7898
    )THEN135                         :rem 159
150 POKEY,37:POKEY+K,7:NEXTX:P=8055:D=33:
    CT=CT+1                          :rem 219
155 TI$="000000":POKES-1,130         :rem 215
200 POKEP,32:POKE37154,127:Y=PEEK(37152):
    IF(YAND128)=0THENP=P+1:D=33      :rem 244
205 IFPEEK(P+22)=38AND(NOT(B)ORZ)THENP=P+
    1                                :rem 46
210 POKE37154,255:Y=PEEK(37137):IF(YAND16
    )=0THENP=P-1:D=34                :rem 127
215 IFPEEK(P+22)=35AND(NOT(B)ORZ)THENP=P-
    1                                :rem 46
220 B=(B=0):IFBORZTHENSYS7380:POKES-1,PEE
    K(S-1)+20:IFPEEK(S-1)=170THENPOKES-1,
    130                              :rem 167
225 IFA=0ANDPEEK(P+22)<>32THENIF(YAND32)=
    0OR(YAND4)=0ORVTHENA=7-W*2:POKES,195
                                     :rem 235
230 IFA<4-WANDPEEK(P+22)=32ORPEEK(P+22)=3
    7THENP=P+22                      :rem 91
235 IFA<>0THENA=A-1:IFA>3-WTHENP=P-22:POK
    ES,PEEK(S)+20                    :rem 58
240 IFPEEK(P)=37THEN700              :rem 88
245 IFPEEK(P+22)=36THEN900           :rem 237
250 IFPEEK(P)<>32THENP=P+22:POKES,PEEK(S)
    -20:GOTO260                      :rem 177
255 POKES,70                         :rem 177
260 IFPEEK(P)=37THEN700              :rem 90
265 POKEP,D:POKEP+K,1:FORX=1TOI:NEXT
                                     :rem 100
270 PRINT"{HOME}{3 DOWN}{6 LEFT}{RVS}";SC
                                     :rem 65
275 PRINT"{HOME}{2 DOWN}{RVS}";:T=60-VAL(
    TI$):IFT<1THEN400                :rem 145
280 PRINTT;"{LEFT} ":GOTO200         :rem 156
400 PRINT"{HOME}{2 DOWN}{2 SPACES}{CYN}
    {RVS}0{2 SPACES}":Z=-1:IFTI$<"000130"
    THENGOTO200                      :rem 210
405 Y=7746+INT(RND(1)*417):IFPEEK(Y)=37OR
    (PEEK(Y)=32ANDRND(1)>.5)THEN405
                                     :rem 222
410 POKEY,32:GOTO200                 :rem 179
500 PRINT"{10 DOWN}{7 RIGHT}{RVS}{GRN}AGA
    IN ?"                            :rem 170
505 GETA$:IFA$=""THEN505             :rem 87
510 IFA$="Y"THENRUN                  :rem 136
515 IFA$="N"THENEND                  :rem 100
520 GOTO505                          :rem 106
600 IFLI<0THEN500                    :rem 234
605 PRINT"{CLR}{2 DOWN}{9 RIGHT}{WHT}";:I
    FLI>0THENFORX=1TOLI:PRINT"!";:NEXT
                                     :rem 38
610 PRINT" ":LE=LE+1:Z=0:W=0:V=0:IFLE>19T
    HENW=1                           :rem 79
615 IFINT(LE/10)=LE/10THENLI=LI+1:rem 216
620 IFLE/5=INT(LE/5)THENV=-1         :rem 170
625 IFLE/10=INT(LE/10)THENCT=4       :rem 30
630 L=L-1:IFL<3THENL=10              :rem 105
635 RETURN                           :rem 126
700 FORX=1TO20:POKES+1,126+(20-X)*3:SC=SC
    +1:PRINT"{HOME}{3 DOWN}{6 LEFT}{RVS}"
    ;SC:NEXT                         :rem 64
705 C=C-1:ON-(C=0)+1GOTO265,800      :rem 184
800 POKES,0:FORC=1TOLE:Y=0:X=0:V=0
                                     :rem 120
805 Z=8142+X+Y:X=X+1:POKES-1,188-Y:IFX=21
    THEN825                          :rem 137
810 IFV=0THENY=Y-22:IFY=-66THENV=1
                                     :rem 133
815 IFV=1THENY=Y+22:IFY=0THENV=0      :rem 31
820 POKEZ,32:POKE8142+X+Y,33:POKE8142+X+Y
    +K,1:GOTO805                     :rem 167
825 POKEZ,32:NEXTC:POKES-1,0         :rem 235
830 IFT>0THENFORX=TT0STEP-1:PRINT"{HOME}
    {2 DOWN}{RVS}";X:SC=SC+T:PRINT"{HOME}
    {3 DOWN}{5 LEFT}{RVS}";SC        :rem 164
835 IFT>0THENPOKES,0:POKES,170+T:NEXTX
                                     :rem 206
840 POKES,0:GOSUB600:GOTO100         :rem 206
900 FORY=1TOLE:POKES-1,0:FORX=255TO200STE
    P-1:POKES,X:NEXTX,Y:POKES,0      :rem 192
905 LI=LI-1:GOSUB600:GOTO100         :rem 183
```



Time has run out for the bunny (VIC version).

Program 3: Atari Bunny Hop

```
CE 0 POKE 752,1:PRINT "{CLEAR}":POSI
     TION 15,10:PRINT "BUNNY HOP":PO
     SITION 10,12:PRINT "USE JOYSTIC
     K PORT 1":POSITION 14,14
AF 1 FOR A=1536 TO 1536+126:READ B:P
     OKE A,B:NEXT A
CP 2 PRINT "PLEASE WAIT":FOR T=1 TO
     1000:NEXT T:GRAPHICS 17:SETCOLO
     R 0,0,14:SETCOLOR 2,12,8:SETCOL
     OR 3,2,8:DIM T$(3)
FM 3 SND=150:OPEN #1,4,0,"K:"
MG 11 CHBAS=57344:CHSET=(PEEK(106)-8
     )*256:FOR I=0 TO 1023:POKE CHS
     ET+I,PEEK(CHBAS+I):NEXT I:POKE
      756,CHSET/256
CF 12 READ NCHR:FOR I=1 TO NCHR:READ
      RPLC:FOR J=0 TO 7:READ A:POKE
      CHSET+8*RPLC+J,A:NEXT J:NEXT
     I
FL 25 LE=1:L=10:CT=4:LI=3:GOSUB 600
MN 100 POSITION 5,0:PRINT #6;"BUNNY
       HOP":PRINT #6;"TIME";:PRINT
     #6;"{5 SPACES}SCORE"
PG 105 COLOR 199:PLOT 0,22:DRAWTO 19
     ,22
LO 115 POSITION 0,12:PRINT #6;"{2 M}
     ":POSITION 18,12:PRINT #6;"
     {2 M}":POSITION 0,18:PRINT #6
     ;"{2 M}":POSITION 18,18
BH 116 PRINT #6;"{2 M}"
EL 120 FOR Y=8 TO 20 STEP 6:FOR X=1
     TO L:POSITION RND(1)*19,Y:PRI
     NT #6;"F":NEXT X:NEXT Y
ID 125 FOR Y=10 TO 16 STEP 6:FOR X=1
       TO L:POSITION RND(1)*19,Y:PR
     INT #6;"K":NEXT X:NEXT Y
HC 130 C=CT:FOR R=1 TO C
IG 135 Y=INT(RND(1)*10)+6:X=RND(1)*19
BF 136 LOCATE X,Y,PEEK:IF PEEK<>32 T
     HEN 135
CL 137 IF Y=8 OR Y=10 OR Y=14 OR Y=1
     6 OR Y=20 THEN 135
CO 150 POSITION X,Y:PRINT #6;CHR$(234)
FC 152 NEXT R:D=76:CT=CT+1
OF 155 POKE 18,0:POKE 19,0:POKE 20,0
JB 190 X=0:Y=11
IN 200 COLOR 32:PLOT X,Y:SND=50
CJ 205 IF STICK(0)=7 THEN X=X+1:D=76
     :IF X>19 THEN X=0:POKE 77,0
OE 206 LOCATE X,Y+1,Z:IF Z=75 AND (
     NOT (B) OR Z1) THEN X=X+1:IF
     X>19 THEN X=0
FB 210 IF STICK(0)=11 THEN X=X-1:D=6
     8:IF X<0 THEN X=19:POKE 77,0
NP 215 LOCATE X,Y+1,Z:IF Z=70 AND (
     NOT (B) OR Z1) THEN X=X-1:IF
     X<0 THEN X=19
HC 220 B=(B=0):IF B OR Z1 THEN QQ=US
     R(1536)
JO 225 LOCATE X,Y+1,Z:IF A=0 AND Z<>
     32 THEN IF STICK(0)=14 OR STR
     IG(0)=0 OR V THEN A=7-W*2:SOU
     ND 3,150,12,15
HD 230 IF A<4-W AND Z=32 OR Z=234 TH
     EN Y=Y+1
KB 235 IF A<>0 THEN A=A-1:IF A>3-W T
     HEN Y=Y-1:SND=SND-2:SOUND 3,S
     ND,10,15
CE 240 LOCATE X,Y,ZZ:IF ZZ=234 THEN
     700
CM 245 IF Z=199 THEN 900
DC 250 IF ZZ<>32 THEN Y=Y+1:SND=SND+
     20:SOUND 3,SND,10,15:GOTO 260
AD 255 SOUND 3,150,10,0
HH 260 IF ZZ=234 THEN 700
DI 265 COLOR D:PLOT X,Y:FOR G=1 TO I
     :NEXT G
MD 270 POSITION 16,1:PRINT #6;SC
NL 275 T=INT(60-(PEEK(19)*256+PEEK(2
     0))/60):IF T<1 THEN 400
IE 277 T$=STR$(T):IF LEN(T$)=1 THEN
       POSITION 6,1:PRINT #6;T$;" ":
     GOTO 200
FG 280 POSITION 6,1:PRINT #6;T:GOTO
     200
EI 400 POSITION 4,1:PRINT #6;"  0  "
     :Z1=1:IF T>-30 THEN 200
LL 405 XX=RND(1)*16:YY=RND(1)*16+4:L
     OCATE XX,YY,Z:IF Z=234 OR (Z=
     32 AND RND(1)>0.5) THEN 405
IF 410 COLOR 32:PLOT XX,YY:GOTO 200
ME 500 SOUND 3,0,0,0:POSITION 4,11:P
     RINT #6;"ANOTHER TRY?"
FJ 503 DIM A$(1)
DL 505 GET #1,A
FE 510 IF A=ASC("Y") THEN CLR :DIM T
     $(3):SND=150:GOTO 25
GI 515 IF A=ASC("N") THEN END
GK 520 GOTO 505
IH 599 GOTO 599
OK 600 IF LI<0 THEN 500
ME 605 PRINT #6;"{CLEAR}":POSITION 8
     ,23:IF LI>0 THEN FOR X=1 TO L
     I:PRINT #6;"D";:NEXT X
HF 610 LE=LE+1:Z1=0:W=0:V=0:IF LE>19
       THEN W=1
NI 615 IF INT(LE/10)=LE/10 THEN LI=L
     I+1
KK 620 IF LE/5=INT(LE/5) THEN V=-1
BO 625 IF LE/10=INT(LE/10) THEN CT=4
GJ 630 L=L-1:IF L<3 THEN L=10
HO 635 RETURN
MC 700 FOR S=20 TO 1 STEP -1:SOUND 3
     ,126+S*3,10,15:SC=SC+1:POSITI
     ON 16,1:PRINT #6;SC:NEXT S
LI 705 C=C-1:ON -(C=0)+1 GOTO 265,800
LO 800 SOUND 3,130,10,0:FOR C=1 TO L
     E:Y=0:X=0:NEXT C
AE 840 SOUND 0,0,0,0:GOSUB 600:GOSUB
       100
```



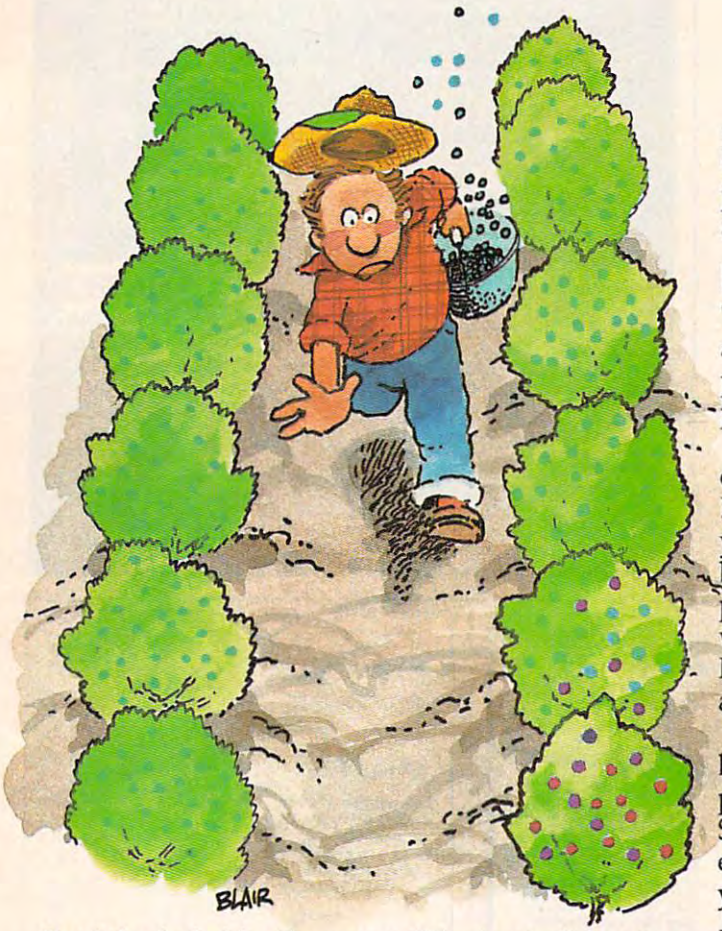
The bunny prepares to eat a carrot (Atari version).

```
ND 900  FOR Y=1 TO LE:FOR X=205 TO 20
        0 STEP -1:SOUND 3,X,10,15:NEX
        T X:NEXT Y
MB 905  SOUND 3,0,0,0:LI=LI-1:GOSUB 6
        00:GOTO 100
PJ 1536  DATA 104,24,165,88,105,160
MB 1542  DATA 133,203,165,89,105,0
GA 1548  DATA 133,204,32,82,6,24
CF 1554  DATA 165,88,105,200,133,203
MC 1560  DATA 165,89,105,0,133,204
GL 1566  DATA 32,105,6,24,165,88
PK 1572  DATA 105,24,133,203,165,89
IO 1578  DATA 105,1,133,204,32,82
HA 1584  DATA 6,24,165,88,105,64
MF 1590  DATA 133,203,165,89,105,1
IP 1596  DATA 133,204,32,105,6,24
CG 1602  DATA 165,88,105,144,133,203
MG 1608  DATA 165,89,105,1,133,204
NN 1613  DATA 32,82,6,96
NL 1615  DATA 160,0,177,203,170,160,1
         ,177,203,136,145,203,200,200
         ,192,20,208,245,136,138,145,
         203,96,160,19,177,203,170
KE 1616  DATA 136,177,203,200,145,203
         ,136,136,192,255,208,245,200
         ,138,145,203,96
OC 2500  DATA 7,32,0,0,0,0,0,0,0,0,44
         ,8,12,6,189,127,124,56,70,36
         ,16,48,96,189,254,62,28,34,3
         8,0,102,255,255
KG 2505  DATA 102,0,0,0,39,66,40,134,
         51,136,102,102,102
FP 2506  DATA 42,0,48,188,255,255,188
         ,48,0
MN 2507  DATA 43,0,102,255,255,102,0,
         0,0
```

©

Blueberries

Bill Root



Don't be fooled by the name. "Blueberries" is a fast-paced strategic game for one or two players. Originally written for Atari computers with at least 16K memory, versions are included for Commodore 64, IBM PC, and PCjr. Two joysticks required.

Picking blueberries might seem to be a pleasant task for children on a hot dusty summer day. But not in this game. You won't have time for a nap in the shade.

First you must plant the seeds for the blueberries. And once they grow into blueberries, you must pick them before they grow into redberries or rot altogether.

When you run the Atari version of "Blueberries," you will first see a title screen which says: GTIA/CTIA (G/C)? Push either G or C depending on which chip you have. (Computers purchased after January 1982 probably have the GTIA chip.) If you don't know which you have, just choose one—you can stop the program later and rerun it if the colors are wrong.

Dividing Up The Farm

Then, in the middle of the screen you'll see the actual playing field, which is split up into two planting fields. Player 1 plays on the upper field; player 2 plays on the lower field.

The very bottom of the screen displays the current options. Pressing the OPTION and SELECT keys will change these. Select the options you want for the game. HANDS means the number of farmhands you'll have to help with the picking. The various LIMITs mean that the game will end once one player reaches that LIMIT. A NO LIMIT game continues until one player loses all of his farmhands.

Once the options are chosen and each player has a joystick (player 1 uses port 1, player 2 uses port 2), the game can be started by pressing START. (One-player games can be played from either joystick port, depending on which field you want to play.)

Meet The Farmhands

Player 1 controls the small farmhand standing in the lower left corner of the top field (that's Farmer Jack). Player 2 controls the farmhand standing in the upper right corner of the bottom field (that's Farmer Bob). Moving the joysticks in the four compass directions moves the farmers similarly.

Try moving the farmers around their fields. You will notice that you can't go through the bushes separating the fields. If you try to do so you hear a noise.

In the upper right or lower left corner of each field, you'll see a small shed where the blueberry seeds are stored. In order to get the seeds, you must maneuver your farmer into the shed. Once you go into the shed, you will be placed outside of it automatically, and you will hear a short, razzy sound.

It's Planting Time

Now you can plant the seeds by moving your farmer while holding down the fire button of your joystick. The seeds are small, long, and light green.

You will have to return to the shed periodically to get more seeds, as your farmer can get only a limited number of seeds each time.

Once the seeds are planted, they should soon start growing into blueberries. The growth of the blueberries is random, however; the seeds that have been planted the longest will not necessarily grow into blueberries first.

Harvesting

Picking the blueberries is even easier than planting the seeds—simply move your farmer over the blueberries.

You may notice, while picking blueberries, that when you run over the seeds they disappear. You are not picking the seeds back up when you do this. What you are doing is destroying them, and they can no longer grow into blueberries.

You may also notice that some of the blueberries turn red after a while. This is actually the second stage of the berry metamorphosis: redberries. The redberry stage represents the degradation (due primarily to age) of the blueberries. Redberries, while they can be picked, aren't worth as many points as the blueberries.

Redberries are less desirable not only because of their lower point value, however. Because blueberries have already aged by the time they turn into redberries, redberries are susceptible to rotting.

Once a redberry has rotted it turns white (although it may appear a very light green on your TV). Whiteberries are not to be picked; in fact, any farmhand attempting to do so will be forced to retreat to the farmhouse to recover from the ill effects.

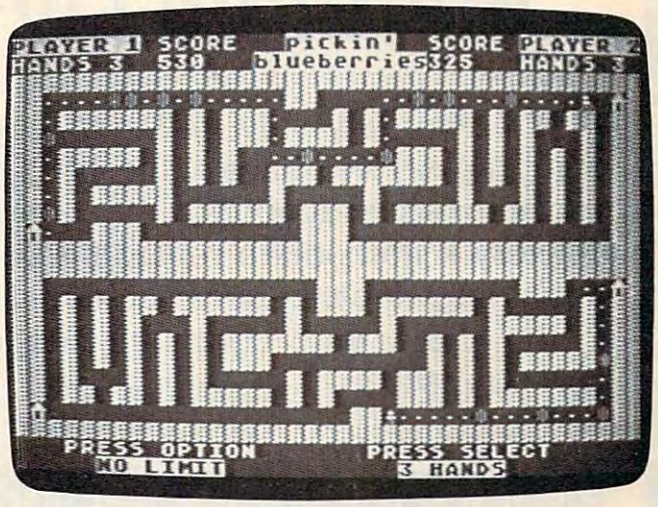
The Payoff

Each player gains 10 points for each seed planted, 50 points for each blueberry picked, and 25 points for each redberry picked. In turn, each player loses 5 points for each seed run over and 200 points for running into a whiteberry.

The game will end once one player loses all of his farmhands or when one player reaches the set LIMIT. At this point PLAYER 1 or PLAYER 2 at the top of the screen will flash to show who won the game.

Blueberries can be restarted at any time while the program is running by pressing START (on the Atari). This, however, puts you in the option-selecting mode. Press START again to begin game play.

Blueberries can also be played with just one player, and since the speed increases as the game progresses, it can be just as challenging as the two-player game. The player can play on either field by plugging the joystick into port 1 or port 2. The object of a one-player game is simply to beat a high score.



One berry has turned overripe (Atari version).

Program 1: Atari Blueberries

Refer to the "Automatic Proofreader" article before typing this program in.

```
FP 10 GOTO 5000
IM 100 S1=PEEK(632):S=PEEK(633):ST1=
       PEEK(644):ST=PEEK(645):POKE 7
       7,0:IF S=15 AND S1=15 THEN 39
       0
OL 110 DXY1=(S=7)-(S=11)+40*((S=13)-
       (S=14)):DXY2=(S1=7)-(S1=11)+4
       0*((S1=13)-(S1=14))
BO 120 Z=(S1=7)-(S1=11):IF Z THEN FB
       =68+Z
MP 130 IF ST OR (ST=0 AND SD=0) THEN
        POKE XY1,0:XY1=XY1+DXY1
IB 140 IF ST=0 AND SD>0 THEN POKE XY
       1,70:SOUND 0,25,10,8:SD=SD-1:
       XY1=XY1+DXY1:SC1=SC1+10:SOUND
        0,0,0,0
GK 170 IF ST1 OR (ST1=0 AND SD1=0) T
       HEN POKE XY2,0:XY2=XY2+DXY2
EL 180 IF ST1=0 AND SD1>0 THEN POKE
       XY2,70:SOUND 1,10,10,8:SD1=SD
       1-1:XY2=XY2+DXY2:SC2=SC2+10:S
       OUND 1,0,0,0
KK 200 A=PEEK(XY1):A1=PEEK(XY2)
MN 210 IF A=65 THEN SOUND 0,250,8,14
       :XY1=XY1-DXY1:FOR X=1 TO 2:NE
       XT X:SOUND 0,0,0,0
PP 220 IF A1=65 THEN SOUND 1,200,8,1
       4:XY2=XY2-DXY2:FOR X=1 TO 2:N
       EXT X:SOUND 1,0,0,0
DO 250 IF A=66 THEN SOUND 0,200,6,10
       :FOR Q=1 TO 50:NEXT Q:GOSUB 8
       00:XY1=XY1-DXY1:SOUND 0,0,0,0
```

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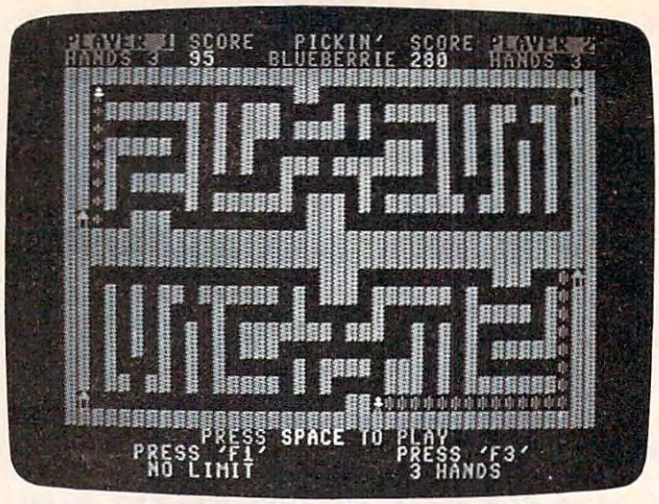
```
HC 260 IF A1=66 THEN SOUND 1,200,6,1
      0:FOR Q=1 TO 50:NEXT Q:GOSUB
      850:XY2=XY2-DXY2
EG 300 POKE XY1,68:POKE XY2,FB:SOUND
       1,0,0,0
HE 310 IF A=71 THEN SC1=SC1+50:U=USR
      (1630)
KN 320 IF A1=71 THEN SC2=SC2+50:U=US
      R(1653)
HJ 330 IF A=72 THEN SC1=SC1+25:U=USR
      (1630)
LC 340 IF A1=72 THEN SC2=SC2+25:U=US
      R(1653)
FO 350 IF A=73 THEN C=38:GOTO 2000
FN 360 IF A1=73 THEN C=6:GOTO 2020
BC 370 IF A=70 THEN SOUND 0,100,10,8
      :SC1=SC1-5:SOUND 0,0,0,0
CD 380 IF A1=70 THEN SOUND 1,75,10,8
      :SC2=SC2-5:SOUND 1,0,0,0
IF 390 POSITION 26,1:? SC1;" ":POSIT
      ION 9,1:? SC2;" ":POKE SAVMSC
      +55,226:POKE SAVMSC+72,40

AP 400 IF PEEK(53279)=6 THEN 2170
AA 410 IF SC1>=LIM OR SC2>=LIM THEN
      2100
JB 420 LV=210+(SC1+SC2)*1.7E-03+0.5
EM 430 IF LV>255 THEN LV=255
DB 440 POKE 255,LV
GD 450 GOTO 100
HA 800 SD=INT(50*RND(0)+51)-INT(SC1/
      5000)+INT(SC2/1000)
CG 810 IF SD<25 THEN SD=INT(50*RND(0
      )+51)
HK 820 RETURN

KG 850 SD1=INT(50*RND(0)+51)-INT(SC2
      /5000)+INT(SC1/1000)
IN 860 IF SD1<25 THEN SD1=INT(50*RND
      (0)+51)
HP 870 RETURN
EB 1000 POKE 559,0:? "PLAYER 1 SCORE
        {3 SPACES}Pickin' SCORE PLA
        YER 2";
DG 1010 ? "HANDS 3  0{5 SPACES}blueb
        erries0{5 SPACES}HANDS 3 ";
KK 1030 ? "{40 A}";
IK 1040 ? "{2 A}{15 SPACES}{2 A}
        {19 SPACES}{B}{A}";
JP 1050 ? "{2 A} {7 A} {A} {3 A}
        {4 SPACES}{A} {A} {5 A} {A}
        {2 A} {2 A} {2 A}";
JH 1060 ? "{2 A}{7 SPACES}{A} {A}
        {3 A} {4 A} {A}{5 SPACES}
        {A} {A} {A}{3 SPACES}{A}
        {2 A}";
JK 1070 ? "{2 A} {5 A} {A} {A} {A}
        {10 SPACES}{3 A} {A} {A} {A}
        {A} {A} {2 A}";
JO 1080 ? "{2 A} {A}{5 SPACES}{A}
        {A} {A}  {3 A} {7 A} {A}
        {A} {A} {A} {A} {2 A}";
JI 1090 ? "{2 A} {A} {5 A}
        {6 SPACES}{A}{5 SPACES}{A}
        {5 SPACES}{A}{3 SPACES}{A}
        {A} {A} {2 A}";
JK 1100 ? "{2 A} {A}{5 SPACES}{A}
        {6 A} {3 A} {A} {6 A} {2 A}
        {A} {A} {2 A}";
IM 1110 ? "{A}{B}{3 SPACES}{3 A}
        {10 SPACES}{3 A}{17 SPACES}
        {2 A}";
KK 1120 ? "{40 A}";
KL 1130 ? "{40 A}";
IP 1140 ? "{2 A}{17 SPACES}{3 A}
        {10 SPACES}{3 A}{3 SPACES}
        {B}{A}";
JP 1150 ? "{2 A} {A} {A} {2 A} {6 A}
         {A} {3 A} {6 A} {A}
        {5 SPACES}{A} {2 A}";
JG 1160 ? "{2 A} {A} {A} {A}
        {3 SPACES}{A}{5 SPACES}{A}
        {5 SPACES}{A}{6 SPACES}{5 A}
         {A} {2 A}";
JO 1170 ? "{2 A} {A} {A} {A} {A}
        {A} {7 A} {3 A}  {A} {A}
        {A}{5 SPACES}{A} {2 A}";
JM 1180 ? "{2 A} {A} {A} {A} {A}
        {A} {3 A}{10 SPACES}{A} {A}
        {A} {5 A} {2 A}";
JL 1190 ? "{2 A} {A}{3 SPACES}{A}
        {A} {A}{5 SPACES}{A} {4 A}
        {3 A} {A} {A}{7 SPACES}{2 A}
        ";
JM 1200 ? "{2 A} {2 A} {2 A} {A}
        {5 A} {A} {A}{4 SPACES}{3 A}
         {A} {7 A} {2 A}";
IJ 1210 ? "{A}{B}{19 SPACES}{2 A}
        {15 SPACES}{2 A}";
KL 1220 ? "{40 A}";
LM 1250 SAVMSC=PEEK(88)+256*PEEK(89)
        :XY1=SAVMSC+557:XY2=SAVMSC+4
        02:FB=67:POKE XY1,68:POKE XY
        2,FB
BB 1260 U=USR(1676):SC1=0:SC2=0:GOTO
         6
PG 1300 POKE 84,22:? "{3 SPACES}PRES
        S OPTION";:POKE 85,20:? "  P
        RESS SELECT";
ME 1305 A$="{3 SPACES}NO LIMIT":LIM=
        1.0E+95:A1$=" 3 HANDS":L=3:L
        1=3:POKE 84,23:POKE 85,2:? A
        $;:POKE 85,23:? A1$;
AB 1310 POKE 559,34:POKE 53279,8
BO 1320 PK=PEEK(53279)
OK 1330 IF PK=6 THEN POKE 559,0:FOR
        Q=1 TO 125:NEXT Q:POKE 559,3
        4:QID=L:GOTO 100
KB 1340 IF PK=3 THEN SOUND 0,200,10,
        10:GOSUB 1400
KE 1350 IF PK=5 THEN SOUND 0,100,10,
        10:GOSUB 1500
MI 1360 GOTO 1310
EH 1400 IF A$="{3 SPACES}NO LIMIT" T
        HEN A$="  5000 LIMIT":LIM=50
        00:GOTO 1600
EI 1410 IF A$="  5000 LIMIT" THEN A$
        =" 10000 LIMIT":LIM=10000:GO
        TO 1600
PN 1420 IF A$=" 10000 LIMIT" THEN A$
        =" 50000 LIMIT":LIM=50000:GO
        TO 1600

NK 1430 IF A$=" 50000 LIMIT" THEN A$
        =" 100000 LIMIT":LIM=100000:
        GOTO 1600
IP 1440 IF A$=" 100000 LIMIT" THEN A
        $=" 500000 LIMIT":LIM=500000
        :GOTO 1600
FE 1450 IF A$=" 500000 LIMIT" THEN A
        $="{3 SPACES}NO LIMIT":LIM=1
        .0E+95:GOTO 1600
```

```
HB 1500 IF A1$=" 3 HANDS" THEN A1$="
        5 HANDS":L=5:L1=5:POKE SAVM
        SC+46,L+16:POKE SAVMSC+78,L1
        +16:GOTO 1600
GO 1510 IF A1$=" 5 HANDS" THEN A1$="
        3 HANDS":L=3:L1=3:POKE SAVM
        SC+46,L+16:POKE SAVMSC+78,L1
        +16:GOTO 1600
ED 1600 POKE 84,23:POKE 85,2:? A$;"
        {4 SPACES}";:POKE 85,23:? A1
        $;:SOUND 0,0,0,0:FOR Q=1 TO
        50:NEXT Q:RETURN
GG 2000 FOR Q=74 TO 79:POKE XY1,Q:SO
        UND 0,2*Q,8,7:SOUND 1,250-2*
        Q,6,6:FOR T=1 TO 15:NEXT T:N
        EXT Q:GOSUB 2200
NK 2010 SOUND 0,0,0,0:SOUND 1,0,0,0:
        POKE XY1,CO:GOTO 2040
GO 2020 FOR Q=74 TO 79:POKE XY2,Q:SO
        UND 0,2*Q,8,7:SOUND 1,250-2*
        Q,6,6:FOR T=1 TO 15:NEXT T:N
        EXT Q:GOSUB 2250
KE 2030 SOUND 0,0,0,0:SOUND 1,0,0,0:
        POKE XY2,CO
NK 2040 IF C=6 THEN L1=L1-1:SC2=SC2-
        200:POSITION C,1:? L1
HL 2050 IF C=38 THEN L=L-1:SC1=SC1-2
        00:POSITION C,1:? L
AA 2060 IF L1=0 OR L=0 THEN POSITION
         9,1:? SC2:POSITION 26,1:? S
        C1:GOTO 2100
JE 2080 GOTO 100
PM 2100 IF SC1>SC2 THEN B$="PLAYER 2
        ":B1$="PLAYER 2":C=32:GOTO 2
        120
AD 2110 B$="PLAYER 1":B1$="PLAYER 1"
        :C=0
EO 2120 POSITION C,0:? B$;:FOR X=1 T
        O 25:NEXT X:POSITION C,0:? B
        1$;
GD 2130 POKE 53279,8
BP 2140 PK=PEEK(53279)
JM 2150 IF PK<>7 THEN 2170
QE 2160 COL=COL+1:IF COL>15 THEN COL
        =1
BB 2165 SETCOLOR 4,COL,6:GOTO 2120
LG 2170 GRAPHICS 0:POKE 752,1:POKE 7
        56,CHBAS:POKE 16,64:POKE 537
        74,64
PF 2180 SETCOLOR 2,15,6:SETCOLOR 1,1
        5,14:SETCOLOR 4,10,4:POSITIO
        N 0,0:L=QID:L1=L:G=2190:GOTO
         1000
GC 2190 POKE 84,22:? "{3 SPACES}PRES
        S OPTION";:POKE 85,20:? "  P
        RESS SELECT";:POKE 84,23:POK
        E 85,2:? A$;:POKE 85,23:? A1
        $;
KP 2195 POKE SAVMSC+46,L+16:POKE SAV
        MSC+78,L1+16:GOTO 1310
GO 2200 IF PEEK(53770)>127 THEN POKE
         XY1,0:XY1=SAVMSC+557:GOTO 2
        220
BN 2210 POKE XY1,0:XY1=SAVMSC+802
JH 2220 IF L=1 THEN CO=79:RETURN
IH 2230 FOR Q=79 TO 74 STEP -1:SOUND
         0,2*Q,8,6:SOUND 1,250-2*Q,6
        ,7:POKE XY1,Q:FOR T=1 TO 15:
        NEXT T:NEXT Q
CO 2240 SOUND 0,0,0,0:SOUND 1,0,0,0:
        CO=68:RETURN
GP 2250 IF PEEK(53770)>127 THEN POKE
         XY2,0:XY2=SAVMSC+402:GOTO 2
        270
CH 2260 POKE XY2,0:XY2=SAVMSC+157
MN 2270 IF L1=1 THEN CO=79:RETURN
IN 2280 FOR Q=79 TO 74 STEP -1:SOUND
         0,2*Q,8,6:SOUND 1,250-2*Q,6
        ,7:POKE XY2,Q:FOR T=1 TO 15:
        NEXT T:NEXT Q
EN 2290 SOUND 0,0,0,0:SOUND 1,0,0,0:
        CO=FB:RETURN
BO 5000 CHBAS=PEEK(742)-4:D=(PEEK(74
        2)-4)*256
KL 5010 RESTORE 5040:FOR X=1536 TO 1
        591
IC 5020 READ Y:POKE X,Y
EF 5030 NEXT X:U=USR(1536)
JG 5040 DATA 104,173,244,2,133,204,1
        69,0,133,203,133,205,173,230
        ,2,56,233,4,133,206,133,207,
        162,0,160,0,177,203
AI 5050 DATA 145,205,192,255,240,4,2
        00,24,144,244,224,3,240,8,23
        2,230,206,230,204,24,144,230
        ,165,207,141,244,2,96
OO 5100 GRAPHICS 17:POKE 16,64:POKE
        53774,64
LJ 5110 ? #6:? #6:? #6:? #6;"
        {7 SPACES}PICKIN'"
GF 5120 ? #6:? #6;"{5 SPACES}BLUEBER
        RIES"
FM 5130 ? #6:? #6:? #6:? #6:? #6:? #
        6:? #6:? #6;"  GTIA/CTIA (G/
        C)?"
GC 5140 POKE 764,255
DA 5150 IF PEEK(764)=18 THEN C1=71:C
        2=72:? #6;"{4 SPACES}ctia":G
        OTO 5200
OD 5160 IF PEEK(764)=61 THEN C1=72:C
        2=71:? #6;"{4 SPACES}gtia":G
        OTO 5200
NA 5170 GOTO 5140
PL 5200 ? #6:? #6:? #6;"  PLEASE WAI
        T . . ."
HL 5300 DATA 104,169,255,141,0,210,1
        69,164
KO 5310 DATA 141,1,210,32,79,6,169,2
        00
AE 5320 DATA 141,0,210,169,162,141,1
        ,210
LD 5330 DATA 32,79,6,169,150,141,0,2
        10
LI 5340 DATA 169,162,141,1,210,32,79
        ,6
EP 5350 DATA 32,79,6,169,0,141,0,210
HM 5360 DATA 162,0,232,224,150,208,2
        51,169
AP 5370 DATA 125,141,0,210,169,172,1
        41,1
FC 5380 DATA 210,32,79,6,169,0,141,0
OE 5390 DATA 210,169,0,141,1,210,96,
        162
AJ 5400 DATA 0,232,160,0,200,192,255
        ,208
MG 5410 DATA 251,224,3,208,244,96
BJ 5420 DATA 169,155,141,2,6,169,100
        ,141
JB 5430 DATA 15,6,169,50,141,28,6,16
        9
```

```
GF 5440 DATA 75,141,56,6,76,0,6
BO 5450 DATA 169,255,141,2,6,169,200
   ,141
MF 5460 DATA 15,6,169,150,141,28,6,1
   69
JE 5470 DATA 125,141,56,6,76,0,6
CI 5480 DATA 104,169,255,133,254,160
   ,155
GJ 5490 DATA 162,6,169,7,32,92,228,9
   6,165
FO 5500 DATA 255,197,254,240,5,198,2
   54,24
FH 5510 DATA 144,59,169,255,133,254,
   162,0
IK 5520 DATA 134,253,165,88,133,252,
   24,165
HH 5530 DATA 89,101,253,133,253,172,
   10,210
CH 5540 DATA 177,252,201,70,208,7,16
   9,71
EO 5550 DATA 145,252,24,144,19,201,7
   1,208
MI 5560 DATA 7,169,72,145,252,24,144
   ,8
CG 5570 DATA 201,72,208,4,169,73,145
   ,252
CM 5580 DATA 232,224,4,208,203,76,98
   ,228
LI 5590 RESTORE 5300:FOR X=1536 TO 1
   763
FH 5600 READ Y:POKE X,Y:NEXT X
NJ 6000 FOR X=1 TO 15:READ A:IF A=-1
    THEN A=C1
FF 6010 IF A=-2 THEN A=C2
AC 6020 Z=A*8
CJ 6030 FOR Y=0 TO 7:READ N1:POKE Z+
   D+Y,N1:NEXT Y:NEXT X
LD 6040 POKE 82,0:POKE 83,40:DIM A$(
   15),A1$(10),B$(8),B1$(8):COL
   =0
LH 6050 GRAPHICS 0:POKE 752,1:POKE 7
   56,CHBAS:POKE 16,64:POKE 537
   74,64
AN 6060 SETCOLOR 2,15,6:SETCOLOR 1,1
   5,14:SETCOLOR 4,10,4:POSITIO
   N 0,0:G=1300:GOTO 1000
IK 6070 DATA 65,127,246,127,246,127,
   246,127,246
AB 6080 DATA 66,24,60,126,255,102,10
   2,102,102
FC 6090 DATA 67,0,4,14,4,30,36,74,17
CE 6100 DATA 68,0,8,28,8,62,8,20,36
DP 6110 DATA 69,0,32,112,32,120,36,8
   2,136
GG 6120 DATA 70,0,0,0,0,48,0,0,0
AK 6130 DATA -1,0,8,42,42,42,42,8,0
IC 6140 DATA -2,0,16,84,84,84,84,16,
   0
EA 6150 DATA 73,0,24,126,126,126,126
   ,24,0
IB 6160 DATA 74,0,16,56,16,56,16,40,
   0
IH 6170 DATA 75,0,0,16,56,16,56,56,4
   0
HO 6180 DATA 76,0,0,0,16,56,124,56,4
   0
IC 6190 DATA 77,0,0,0,0,16,56,254,23
   8
ED 6200 DATA 78,0,0,0,0,0,16,186,255
KF 6210 DATA 79,0,0,0,0,0,0,16,56
```



The blueberries have just ripened in this 64 version of "Blueberries."

Program 2: Blueberries, 64 Version

Refer to the "Automatic Proofreader" article before typing this program in.

```
10 GOTO5000                                    :rem 95
100 S1=PEEK(J1):S=PEEK(J0):SV=(S1AND16)/1
    6:SU=(SAND16)/16:S1=S1AND15:S=SAND15
                                               :rem 99
105 IFS=15ANDS1=15THEN380                      :rem 223
110 D1=(S=11)-(S=7)+40*((S=14)-(S=13)):D2
    =(S1=11)-(S1=7)+40*((S1=14)-(S1=13))
                                               :rem 137
130 IFSUOR(SU=0ANDSD=0)THENPOKEX1,32:X1=X
    1+D1                                       :rem 74
140 IFSU=0ANDSD>0THENPOKEX1,70:SD=SD-1:X1
    =X1+D1:SA=SA+10:F=25:GOSUB 2500
                                               :rem 135
170 IFSVOR(SV=0ANDSE=0)THENPOKEX2,32:X2=X
    2+D2                                       :rem 85
180 IFSV=0ANDSE>0THENPOKEX2,70:SE=SE-1:X2
    =X2+D2:SB=SB+10:F=10:GOSUB 2600
                                               :rem 144
200 A=PEEK(X1):A1=PEEK(X2)                     :rem 248
210 IFA=65THENX1=X1-D1:F=250:GOSUB 2500
                                               :rem 0
220 IFA1=65THENX2=X2-D2:F=200:GOSUB 2600
                                               :rem 49
250 IFA=66THENGOSUB800:X1=X1-D1:F=200:GOS
    UB 2500                                    :rem 82
260 IFA1=66THENGOSUB850:X2=X2-D2:F=200:GO
    SUB 2600                                   :rem 141
300 POKEX1,68:POKEX1+CO,7:POKEX2,68:POKEX
    2+CO,7                                     :rem 151
310 IFA<70ORA>73THEN350                        :rem 88
320 ON(A-69)GOTO330,331,332,333                :rem 123
330 SA=SA-5:F=100:GOSUB2500:GOTO350
                                               :rem 55
331 SA=SA+25:GOTO350                           :rem 153
332 SA=SA+50:GOTO350                           :rem 152
333 C=0:GOTO2000                               :rem 126
350 IFA1<70ORA1>73THEN380                      :rem 193
360 ON(A1-69)GOTO370,371,372,373               :rem 192
370 SB=SB-5:F=75:GOSUB2600:GOTO380:rem 28
371 SB=SB+25:GOTO380                           :rem 162
372 SB=SB+50:GOTO380                           :rem 161
```

Notes On The Commodore 64 And IBM PC/PCjr Versions Of Blueberries

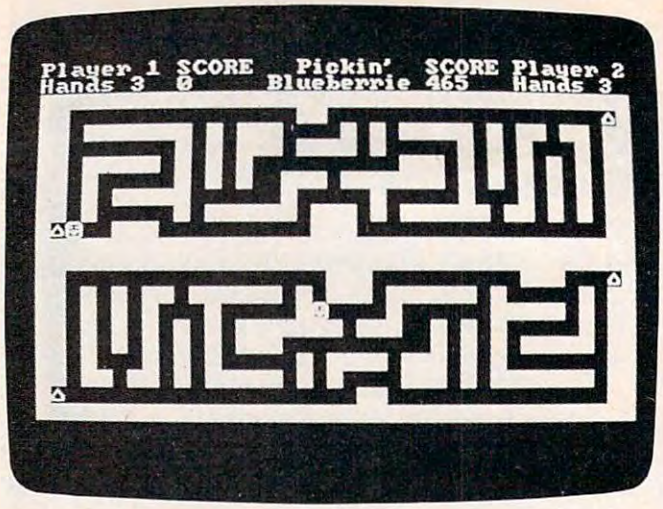
The 64 and PC/PCjr versions are the same as the Atari version except for the scoring routine and the berry development routine. The blueberries in these versions have four stages of development: the seed, the undeveloped berry, the mature berry, and the overripe berry.

If you pick the berry before it has had a chance to sprout, you have five points deducted from your score. If you pick an undeveloped berry, you only get 25 points. If you pick the berry when it is ripe, you receive the full 50 points. If you pick an overripe berry, your farmhand becomes sick and you lose 200 points.

In the Atari version, berries ripen at random times, but in the 64 and PC/PCjr versions all the berries on the screen ripen at the same time. However, the amount of time required for the berries to ripen is determined randomly. Both versions require two joysticks to play, and the Color/Graphics Monitor Adapter board is required to use Program 3 on an IBM PC.

```
373 C=1:GOTO2000                          :rem 131
380 PRINT"{HOME}{DOWN}{25 RIGHT}"SB"
    {LEFT} "                              :rem 219
385 PRINT"{HOME}{DOWN}{8 RIGHT}"SA"{LEFT}
     "                                    :rem 242
390 IFSA>=LIORSB>=LITHEN2100               :rem 7
395 GOSUB 2700                            :rem 234
400 CN=CN+1:IFCN<30+RND(1)*20THEN100
                                          :rem 37
410 CN=0:SYS49152:GOTO100                 :rem 213
800 SD=INT(50*RND(1)+51):RETURN            :rem 72
850 SE=INT(50*RND(1)+51):RETURN            :rem 78
1000 POKE53280,0:POKE53281,0               :rem 22
1005 PRINT"{CLR}{7}{RVS}PLAYER 1{OFF} SCO
     RE{3 SPACES}PICKIN'{2 SPACES}SCORE
     {RVS}PLAYER 2{OFF}";                 :rem 33
1010 PRINT"HANDS 3{2 SPACES}0{5 SPACES}BL
     UEBERRIES0{5 SPACES}HANDS 3 ";
                                          :rem 164
1020 PRINT"{2}AAAAAAAAAAAAAAAAAAAAAAAAAAAA
     AAAAAAAAAAAAA";                      :rem 140
1030 PRINT"AA{15 SPACES}AA{19 SPACES}BA";
                                          :rem 87
1040 PRINT"AA AAAAAAA A AAA{4 SPACES}A A
     {SPACE}AAAAA A AA AA AA";            :rem 44
1060 PRINT"AA{7 SPACES}A A AAA AAAA A
     {5 SPACES}A A A{3 SPACES}A AA";
                                          :rem 101
1070 PRINT"AA AAAAA A A A{10 SPACES}AAA A
      A A A A AA";                        :rem 232
1080 PRINT"AA A{5 SPACES}A A A{2 SPACES}A
     AA AAAAAAA A A A A A AA";            :rem 44
1090 PRINT"AA A AAAAA{6 SPACES}A
     {5 SPACES}A{5 SPACES}A{3 SPACES}A A
     {SPACE}A AA";                        :rem 230
1100 PRINT"AA A{5 SPACES}A AAAAAA AAA A A
     AAAAA AA A A AA";                    :rem 104
1110 PRINT"AB{3 SPACES}AAA{10 SPACES}AAA
     {17 SPACES}AA";                      :rem 90
1120 PRINT"AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
     AAAAAAAAAA";                         :rem 248
1130 PRINT"AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
     AAAAAAAAAA";                         :rem 249
1140 PRINT"AA{17 SPACES}AAA{10 SPACES}AAA
     {3 SPACES}BA";                       :rem 93
1150 PRINT"AA A A AA AAAAAA A AAA AAAAAA
     {SPACE}A{5 SPACES}A AA";             :rem 109
1160 PRINT"AA A A A{3 SPACES}A{5 SPACES}A
     {5 SPACES}A{6 SPACES}AAAAA A AA";
                                          :rem 228
1170 PRINT"AA A A A A A AAAAAAA AAA
     {2 SPACES}A A A{5 SPACES}A AA";
                                          :rem 44
1180 PRINT"AA A A A A A AAA{10 SPACES}A A
      A AAAAA AA";                        :rem 234
1190 PRINT"AA A{3 SPACES}A A A{5 SPACES}A
      AAAA AAA A A{7 SPACES}AA";          :rem 105
1200 PRINT"AA AA AA A AAAAA A A{4 SPACES}
     AAA A AAAAAAA AA";                   :rem 42
1210 PRINT"AB{19 SPACES}AA{15 SPACES}AA";
                                          :rem 87
1220 PRINT"AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
     AAAAAAAAAA";                         :rem 249
1250 X1=1426:X2=1581:CO=54272:POKEX1,68:P
     OKEX1+CO,7:POKEX2,68:POKEX2+CO,7
                                          :rem 118
1260 SA=0:SB=0:J0=56321:J1=J0-1            :rem 194
1270 FORI=COTOCO+24:POKEI,0:NEXT           :rem 22
1280 POKECO+24,15:POKECO+5,16:POKECO+6,24
     0:POKECO+12,16:POKECO+13,17           :rem 245
1300 PRINT"{GRN}{HOME}{22 DOWN}
     {10 SPACES}PRESS {6}SPACE{GRN} TO PL
     AY"                                  :rem 197
1301 PRINT"{CYN}{5 SPACES}PRESS 'F1'
     {10 SPACES}PRESS 'F3'"               :rem 219
1305 A$="{3 SPACES}NO LIMIT":LI=1E38:A1$=
     " 3 HANDS":L=3:L1=3                  :rem 199
1306 PRINT"{3 SPACES}"A$"{3 SPACES}","
     {5 SPACES}"A1$"{UP}"                 :rem 31
1310 GETI$:IFI$=""THEN1310                :rem 189
1330 IFI$=" "THEN100                       :rem 4
1340 IFI$="{F1}"THEN1400                  :rem 190
1350 IFI$="{F3}"THEN1500                  :rem 193
1360 GOTO1310                             :rem 200
1400 IFA$="{3 SPACES}NO LIMIT"THENA$="
     {2 SPACES}5000 LIMIT";LI=5000:GOTO13
     06                                   :rem 189
1410 IFA$="{2 SPACES}5000 LIMIT"THENA$="
     {2 SPACES}10000 LIMIT":LI=10000:GOTO
     1306                                 :rem 62
1420 IFA$="{2 SPACES}10000 LIMIT"THENA$="
     {2 SPACES}50000 LIMIT":LI=50000:GOTO
     1306                                 :rem 115
1430 IFA$="{2 SPACES}50000 LIMIT"THENA$="
      100000 LIMIT":LI=100000:GOTO1306
                                          :rem 208
1440 IFA$=" 100000 LIMIT"THENA$=" 500000
     {SPACE}LIMIT":LI=500000:GOTO1306
                                           :rem 5
1450 IFA$=" 500000 LIMIT"THENA$="
     {3 SPACES}NO LIMIT":LI=1E38:GOTO1306
                                          :rem 62
```

```
1500 IFA1$=" 3 HANDS"THENA1$=" 5 HANDS":L
     =5:L1=5:GOTO1600                  :rem 81
1510 IFA1$=" 5 HANDS"THENA1$=" 3 HANDS":L
     =3:L1=3:GOTO1600                  :rem 78
1600 POKE1070,L+48:POKE1102,L1+48:GOTO130
     6                                 :rem 119
2000 IFCTHENL1=L1-1:SB=SB-200:POKEX2,32:X
     2=1581:GOTO2020                   :rem 67
2010 L=L-1:SA=SA-200:POKEX1,32:X1=1426
                                       :rem 164
2020 POKE1070,L+48:POKE1102,L1+48      :rem 55
2021 POKEX1,68:POKEX1+CO,7:POKEX2,68:POKE
     X2+CO,7                           :rem 201
2025 GOSUB2700                         :rem 18
2026 POKECO+4,33:FORI=200TO10STEP-5:POKEC
     O+1,I:FORJ=1TO5:NEXTJ,I:GOSUB2700
                                       :rem 143
2030 IFL<>0ANDL1<>0THEN100             :rem 4
2040 PRINT"{HOME}{DOWN}{25 RIGHT}"SB"
     {LEFT} "                          :rem 6
2050 PRINT"{HOME}{DOWN}{8 RIGHT}"SA"
     {LEFT} "                          :rem 25
2060 FORTD=1TO3000:NEXT                :rem 148
2100 B$="1":IFSA<SBTHENB$="2"          :rem 81
2110 PRINT"{CLR}{10 DOWN}{13 RIGHT}PLAYER
      "B$" WINS"                       :rem 3
2130 PRINT"{4 DOWN}{8 SPACES}PRESS SPACE
     {SPACE}TO CONTINUE"               :rem 220
2140 GETA$:IFA$<>" "THEN2140           :rem 238
2150 GOTO1000                          :rem 194
2500 POKECO+1,F:POKECO,0:POKECO+4,33:FORI
     =1TO20:NEXT:RETURN                :rem 9
2600 POKECO+8,F:POKECO+7,0:POKECO+11,33:F
     ORI=1TO20:NEXT:RETURN             :rem 161
2700 POKECO+4,0:POKECO+11,0:RETURN:rem 67
5000 PRINT"{CLR}{13 DOWN}{9 SPACES}REDEFI
     NING CHARACTERS"                  :rem 193
5010 POKE55,0:POKE56,48:CLR            :rem 66
5020 POKE56334,PEEK(56334)AND254:POKE1,PE
     EK(1)AND251                       :rem 232
5030 FORI=0TO2047:POKEI+12288,PEEK(I+5324
     8):NEXT                           :rem 76
5040 POKE1,PEEK(1)OR4:POKE56334,PEEK(5633
     4)OR1                             :rem 184
5050 FORI=0TO71:READA:POKE12808+I,A:NEXT
                                       :rem 207
5060 POKE53272,(PEEK(53272)AND240)OR12
                                       :rem 96
5070 FORI=0TO40:READA:POKE49152+I,A:NEXT:
     GOTO1000                          :rem 3
6000 DATA 127,246,127,246,127,246,127,246
                                       :rem 236
6010 DATA 24,60,126,255,102,102,102,102
                                       :rem 98
6020 DATA 0,0,0,0,0,0,0,0              :rem 150
6030 DATA 0,8,28,8,62,8,20,36          :rem 140
6040 DATA 0,0,0,0,0,0,0,0              :rem 152
6050 DATA 0,0,0,0,48,0,0,0             :rem 213
6060 DATA 0,0,8,42,42,8,0,0            :rem 22
6070 DATA 0,16,84,84,84,84,16,0        :rem 249
6080 DATA 0,24,126,126,126,126,24,0
                                       :rem 172
7000 DATA 160,0,169,0,133,251,169,4,133,2
     52,177,251,201,70,240,8,201,71
                                       :rem 145
7010 DATA 240,4,201,72,208,5,170,232,138
                                       :rem 162
7015 DATA 145,251,200,208,234,230,252,165
                                       :rem 220
7020 DATA 252,201,8,208,226,96         :rem 198
```



Player 2 has got a good start (IBM version).

Program 3: PC/PCjr Blueberries

```
2 DEF SEG=0:SCREEN 0,1
3 LOCATE 1,1,0
4 WIDTH 40:KEY OFF
5 GOSUB 5000
6 DEF SEG=&HB800
7 STRIG ON
10 GOTO 1000
100 J1=STICK(0):J2=STICK(1):S=-1*(J2>80)
-2*(J1<30)-3*(J1>80)-4*(J2<30):ST=NOT(ST
RIG(1))
105 J1=STICK(2):J2=STICK(3):S1=-1*(J2>80
)-2*(J1<30)-3*(J1>80)-4*(J2<30):ST1=NOT(
STRIG(3))
110 DXY1=(S=2)-(S=3)+40*((S=4)-(S=1))
115 DXY2=(S1=2)-(S1=3)+40*((S1=4)-(S1=1)
)
120 DXY1=DXY1*2:DXY2=DXY2*2
130 IF ST OR (ST=0 AND SD=0) THEN POKE X
Y1,32:XY1=XY1+DXY1
140 IF ST=0 AND SD>0 THEN POKE XY1,176:P
OKE XY1+1,1:SOUND 200,1:SD=SD-1:XY1=XY1+
DXY1:SC1=SC1+10
170 IF ST1 OR (ST1=0 AND SD1=0) THEN POK
E XY2,32:XY2=XY2+DXY2
180 IF ST1=0 AND SD1>0 THEN POKE XY2,176
:POKE XY2+1,1:SOUND 210,1:SD1=SD1-1:XY2=
XY2+DXY2:SC2=SC2+10
200 A=PEEK(XY1):A1=PEEK(XY2)
210 IF A=219 THEN SOUND 500,1:XY1=XY1-DX
Y1
220 IF A1=219 THEN SOUND 510,1:XY2=XY2-D
XY2
250 IF A=127 THEN SOUND 300,1:GOSUB 800:
XY1=XY1-DXY1
260 IF A1=127 THEN SOUND 310,1:GOSUB 850
:XY2=XY2-DXY2
300 POKE XY1,1:POKE XY2,1
305 POKE XY1+1,14:POKE XY2+1,14
310 IF A=178 THEN SC1=SC1+50
320 IF A1=178 THEN SC2=SC2+50
330 IF A=177 THEN SC1=SC1+25
340 IF A1=177 THEN SC2=SC2+25
350 IF A=15 THEN C=38:GOTO 2000
```

```
360 IF A1=15 THEN C=6:GOTO 2000
370 IF A=176 THEN SOUND 100,1:SC1=SC1-5
380 IF A1=176 THEN SOUND 110,1:SC2=SC2-5
390 LOCATE 2,26:PRINT SC1" ":LOCATE 2,9:
PRINT SC2" "
410 IF SC1>=LIM OR SC2>=LIM THEN 2100
450 CNT=CNT+1:IF CNT>30+RND*20 THEN CNT=
0 ELSE 100
455 DEF SEG:CALL ZZ:DEF SEG=&HB800
456 GOTO 100
800 SD=INT(50*RND+51)-INT(SC1/5000)+INT(
SC2/1000)
810 IF SD<25 THEN SD=INT(50*RND+51)
820 RETURN
850 SD1=INT(50*RND+51)-INT(SC2/5000)+INT
(SC1/1000)
860 IF SD1<25 THEN SD1=INT(50*RND+51)
870 RETURN
1000 CLS:COLOR 7,0,0:PRINT"Player 1 SCOR
E   Pickin'  SCORE Player 2";
1010 PRINT"Hands 3  0      Blueberries0
   Hands 3 ";
1020 W$=CHR$(219):B$=CHR$(32)
1030 COLOR 6,0,0:PRINT STRING$(40,219);
1040 PRINT W$W$STRING$(15,32)W$W$STRING$
(19,32)CHR$(127)W$;
1050 PRINT W$W$B$STRING$(7,219)B$W$B$W$W
$W$STRING$(4,32)W$B$W$B$STRING$(5,219)B$
W$B$W$W$B$W$W$B$W$W$;
1060 PRINT W$W$STRING$(7,32)W$B$W$B$W$W$
W$B$STRING$(4,219)B$W$STRING$(5,32)W$B$W
$B$W$B$B$B$W$B$W$W$;
1070 PRINT W$W$B$STRING$(5,219)B$W$B$W$B
$W$STRING$(10,32)W$W$W$B$W$B$W$B$W$B$W$B
$W$B$W$W$;
1080 PRINT W$W$B$W$STRING$(5,32)W$B$W$B$
W$B$B$W$W$W$B$STRING$(7,219)B$W$B$W$B$W$
B$W$B$W$B$W$W$;
1090 PRINT W$W$B$W$B$STRING$(5,219)STRIN
G$(6,32)W$STRING$(5,32)W$STRING$(5,32)W$
B$B$B$W$B$W$B$W$B$W$W$;
1100 PRINT W$W$B$W$STRING$(5,32)W$B$STRI
NG$(6,219)B$W$W$W$B$W$B$STRING$(6,219)B$
W$W$B$W$B$W$B$W$W$;
1110 PRINT W$CHR$(127)B$B$B$W$W$W$STRING
$(10,32)W$W$W$STRING$(17,32)W$W$;
1120 PRINT STRING$(40,219);
1130 PRINT STRING$(40,219);
1140 PRINT W$W$STRING$(17,32)W$W$W$STRIN
G$(10,32)W$W$W$B$B$B$CHR$(127)W$;
1150 PRINT W$W$B$W$B$W$B$W$W$B$STRING$(6
,219)B$W$B$W$W$W$B$STRING$(6,219)B$W$STR
ING$(5,32)W$B$W$W$;
1160 PRINT W$W$B$W$B$W$B$W$B$B$B$W$STRIN
G$(5,32)W$STRING$(5,32)W$STRING$(6,32)ST
RING$(5,219)B$W$B$W$W$;
1170 PRINT W$W$B$W$B$W$B$W$B$W$B$W$B$W$B$STR
ING$(7,219)B$W$W$W$B$B$W$B$W$B$W$STRING$
(5,32)W$B$W$W$;
1180 PRINT W$W$B$W$B$W$B$W$B$W$B$W$B$W$W
$W$STRING$(10,32)W$B$W$B$W$B$STRING$(5,2
19)B$W$W$;
1190 PRINT W$W$B$W$B$B$B$W$B$W$B$W$STRIN
G$(5,32)W$B$STRING$(4,219)B$W$W$W$B$W$B$
W$STRING$(7,32)W$W$;
1200 PRINT W$W$B$W$W$B$W$W$B$W$B$STRING$
(5,219)B$W$B$W$STRING$(4,32)W$W$W$B$W$B$
STRING$(7,219)B$W$W$;
1210 PRINT W$CHR$(127)STRING$(19,32)W$W$
STRING$(15,32)W$W$;
1220 PRINT STRING$(40,219);
1250 XY1=1114:XY2=804:POKE XY1,1:POKE XY
2,1:POKE XY1+1,14:POKE XY2+1,14
1260 SC1=0:SC2=0
1290 LOCATE 23,7:COLOR 2,0,0:PRINT"Press
 SPACE to start play"
1300 LOCATE 24,1:COLOR 7,0,0:PRINT"   Pr
ess '1'          Press '2'";
1305 A$="   No Limit":LIM=9.999999E+37:A
1$=" 3 Hands":L=3:L1=3:LOCATE 25,1:PRINT
 A$,"       "A1$;
1310 I$=INKEY$:IF I$="" THEN 1310
1320 IF I$=" " THEN LOCATE 23,1:PRINT SP
ACE$(79);:LOCATE 25,1:PRINT SPACE$(39);:
GOTO 100
1330 IF I$="1" THEN GOSUB 1400
1340 IF I$="2" THEN GOSUB 1500
1350 GOTO 1310
1400 IF A$="   No Limit" THEN A$="  5000
 Limit":LIM=5000:GOTO 1600
1410 IF A$="  5000 Limit" THEN A$=" 1000
0 Limit":LIM=10000:GOTO 1600
1420 IF A$=" 10000 Limit" THEN A$=" 5000
0 Limit":LIM=50000!:GOTO 1600
1430 IF A$=" 50000 Limit" THEN A$=" 1000
00 Limit":LIM=100000!:GOTO 1600
1440 IF A$=" 100000 Limit" THEN A$=" 500
000 Limit":LIM=500000!:GOTO 1600
1450 IF A$=" 500000 Limit" THEN A$="   N
o Limit":LIM=9.999999E+37:GOTO 1600
1500 IF A1$=" 3 Hands" THEN A1$=" 5 Hand
s":L=5:L1=5:POKE 92,L+48:POKE 156,L1+48:
GOTO 1600
1510 IF A1$=" 5 Hands" THEN A1$=" 3 Hand
s":L=3:L1=3:POKE 92,L+48:POKE 156,L1+48:
GOTO 1600
1600 LOCATE 25,1:PRINT A$,"       "A1$;:
RETURN
2000 FOR I=270 TO 250 STEP -2:SOUND I,1:
NEXT
2040 IF C=6 THEN L1=L1-1:SC2=SC2-200:LOC
ATE 2,C:PRINT L1:POKE XY2,32:XY2=804:POK
E XY2,1:POKE XY2+1,14
2050 IF C=38 THEN L=L-1:SC1=SC1-200:LOCA
TE 2,C:PRINT L:POKE XY1,32:XY1=1114:POKE
 XY1,1:POKE XY1+1,14
2060 IF L1=0 OR L=0 THEN LOCATE 2,9:PRIN
T SC2:LOCATE 2,26:PRINT SC1:GOTO 2100
2080 GOTO 100
2100 IF SC1<SC2 THEN C=1:B$="1" ELSE C=3
3:B$="2"
2200 COLOR 23,0:LOCATE 1,C:PRINT"PLAYER
"B$:COLOR 3,0:LOCATE 23,1:PRINT"
Press SPACE to continue"
2210 A$=INKEY$:IF A$=" " THEN 1000 ELSE
2210
5000 DEF SEG:ML$=SPACE$(48):V=VARPTR(ML$
):ZZ=PEEK(V)+256*PEEK(V+1)
5010 FOR I=0 TO 47:READ A:POKE ZZ+I,A:NE
XT:RETURN
10000 DATA &H55, &H1E, &HBE, &H00, &H00,
 &HBB, &H00, &HB8, &H8E, &HDB
10010 DATA &H8A, &H04, &H3C, &HB0, &H75,
 &H04, &HFE, &H04, &HEB, &H0F
10020 DATA &H3C, &HB1, &H75, &H04, &HFE,
 &H04, &HEB, &H07, &H3C, &HB2
10030 DATA &H75, &H03, &HC6, &H04, &H0F,
 &H46, &H46, &H81, &HFE, &HE0
10040 DATA &H0E, &H72, &HDF, &H1F, &H5D,
 &HCA, &H00, &H00
```

Computing Together

Fred D'Ignazio, Associate Editor

New research suggests that infants are much brighter than we once thought. This research has prompted anxious parents who are worried about their children's ability to cope with a high-tech future, to enroll their infants in computer courses before they are even out of diapers. After class, the parents bring the kids home and drill them using flash cards. On the cards are written words like RAM, ROM, BITS, and BYTES. The parents think that early familiarity with computer technology and jargon will be the youngsters' ticket to a good college and a successful career.

Unfortunately, these parents are teaching their kids skills that may soon be obsolete. After all, it will be the twenty-first century before today's infants enter college or the job market. Between now and then, computers are going to change drastically.

Instead of concentrating on bits and bytes, parents of young children should concentrate on more general skills. They should strive to build a relaxed, comfortable relationship between their children and computers—a constructive relationship that enhances the child's self-image and self-confidence. As the child gets older, this sort of relationship will be more enduring and more valuable than specific skills which may quickly go out of date.

Toddler Burnout

Understandably, parents want their children to do something productive on the computer. For example, they may buy drill-and-practice software that will help give the child a boost in a school subject with which he is struggling.

At first, this approach works well. The child diligently works at the computer and seems to be making progress. But then boredom sets in, the software's novelty fades, and the child loses interest in the computer. The parents' natural reaction is to make the child sit at the computer and continue drilling.

Unfortunately, this approach may lead to *toddler burnout*. For many kids, the joy of computing is replaced by the drudgery of computing. Computers are no longer fun, they are pure work. If kids are "strapped to their computer" every afternoon (as I was once strapped to my piano), they could develop a lifelong negative attitude toward computers and a mental block about using them.

The Computer Playground

We have so many computers around our house that people think we must be a futuristic family. They think that our computers are plugged into everything, including the coffee maker, the thermostat, the bathroom scales, and the toaster oven. They think we live computerized lives.

Fred D'Ignazio is a computer enthusiast and author of several books on computers for young people. His books include Katie and the Computer *(Creative Computing),* Chip Mitchell: The Case of the Stolen Computer Brains *(Dutton/Lodestar),* The Star Wars Question and Answer Book About Computers *(Random House), and* How To Get Intimate With Your Computer (A 10-Step Plan To Conquer Computer Anxiety) *(McGraw-Hill).*

As the father of two young children, Fred has become concerned with introducing the computer to children as a wonderful tool rather than as a forbidding electronic device. His column appears monthly in COMPUTE!.

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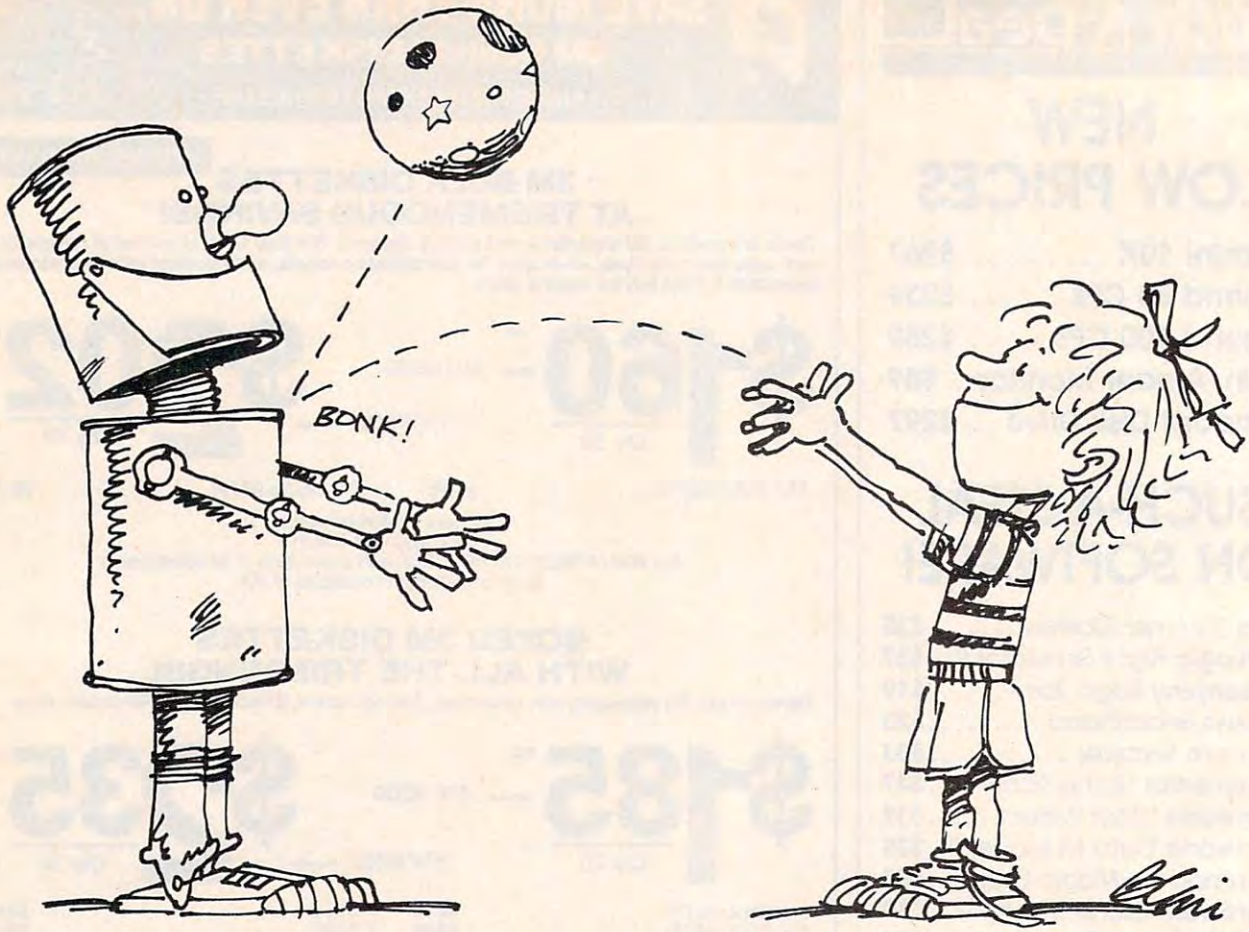

Nothing could be further from the truth. When I get the chance to tell people what really goes on, I say that we have an Erma Bombeck household. Sure we use computers, but not to make our lives more rigid, organized, and mechanical. Instead, we use them as an electronic *playground*—and not just for Catie and Eric, but for me and my wife, Jan, too.

When people ask me what kind of software we buy for the kids, I say that we buy the software that turns *us* on. Then when the kids see us using the computer and having a good time, it gets them excited, too.

At my house we don't think of play as trivial. To us, play is a product of love. If we love to do something, it isn't work, it is play.

I would like my children to love to use computers, to use them playfully and creatively. I never want my kids to feel that computers are chains tying them to a hateful task. Instead, I want them to see computers as wings that enable them to swoop, dive, and have fun, and take them to new heights and soar to the limits of their abilities and imaginations.

The Computer As A Babysitter

The computer makes a great babysitter—even better than TV (unless you have cable, a VCR, and lots of tapes). It will soon be a big temptation for parents to turn on the computer to get their little kids out of their hair.

The computer can make a healthful babysitter—to a point. It can provide a much-needed break for a harried parent. And it can become a child's companion and a patient teacher. Also, *flying solo* on a computer can be a very positive experience for a child. It can give them a sense of control, mastery, and responsibility that they seldom experience at such a young age.

However, it is easy for little kids to get too much of a good thing. More than computing they need time to play with other children, get lots of exercise, fresh air, and experience the joy of swinging, digging in sand, and getting elbow-deep in finger paints.

Most important of all, they need to spend time with their parents. Computers make great toys, but they cannot replace parents. Parents are children's first and most important toys. Computers make a very poor substitute.

New games are starting to appear (including many programs from Children's Television Workshop, Spinnaker, Sunburst, and Counterpoint Software) that encourage parents and children to play on the computer *together*. Then the computer changes from being a babysitter that isolates the child to an *electronic hearth* that brings the whole family together actively and

happily. In fact, studies at New York University suggest that computers *encourage* families to spend more time together.

Computer Elevator Shoes

Computers are like booster shoes. They can give handicapped people a boost so they can go about their lives on par with the rest of the world. Computers can also play this role with young children.

My children are always at the bottom of the family totem pole, *except when they use the computer.* I encourage five-year-old Eric and eight-year-old Catie to do things on the computer that enhance their abilities, that increase their self-respect and self-confidence, and give them a leg up on the rest of us. Here are some of the things our kids do on their computers:

• Gobbledygook Processing. Five-year-old Eric bangs on the keys of the computer and gets it to print out page after page of gobbledygook. Eric is learning how to type, he thinks he is doing work, and he takes his gobbledygook to school and sends it to both his grandmothers. Remarkably, the gobbledygook is gradually starting to make sense. Real words, phrases, and sentences are starting to appear. Most important of all, Eric is developing the habit of using the computer as a *tool* to help him think better and not as a crutch to do his thinking for him.

•Training The Family Pet. Catie and Eric treat our computers like pets. Sometimes they pull their tails, but mostly they are learning "computer manners"—how to treat the computers kindly and responsibly. They can turn on all the computers, use the floppy disks and cartridges, and call up all their favorite programs. Eric, for example, is so good that when I hired a housekeeper and a secretary, he taught them how to use the family computers.

• Computer Scribbling. Catie and Eric have a skill that Janet and I have lost: They can scribble! When we turned Catie and Eric loose on a computer touch tablet—like the PowerPad from Chalk Board and the KoalaPad from Koala Technologies—it was incredible. The tablets enhanced the kids' motor skills, allowed them to make fine, detailed changes to their drawings and pictures, and gave them the freedom to creatively scribble. We now have a slideshow of the children's computer pictures and a door full of their drawings on the new Macintosh computer.

• The Computer Sandbox. The children play games on the computer that give them the most control. *They* control the computer, rather than the other way around. One of the children's most popular games is to play on the keyboard, pushing buttons just to see what happens. They call this "Flying the Cursor." Doing this they have discovered how to get the computer to make moving rainbows, colorful letters, upside-down letters, pictures, and sounds—all without writing or buying a single program.

• The Electronic Picturebook. The kids have both learned how to read by using computer adventure games for young children like Sierra On-Line's *Troll's Tale* and *Dragon's Keep*. They enter the microworlds inside the computer and instantly become the heroes at center stage. To journey through the world they have to remember where they are, and read the signs in the pictures and the messages at the bottom of the screens. In these games, words gain real meaning and power. They are the keys Catie and Eric use to outwit an ugly troll or rescue small animals from a mean dragon.

Robots: Bag Ladies And Alarm Clocks

We have lots of computers around the house, but we also have robots. In fact, we run a flophouse for robots. We never know when a robot will come to our door looking for a home. Then I write an article about the robot, and, pretty soon, we have to send the robot along to another writer so they can write about the robot, too.

My children love robots—not as servants, but as pets. When TOPO the robot came to visit us, for example, my children noticed that TOPO was naked and dressed it in various costumes. My son tied his blanket to TOPO and turned it into a superhero. My daughter dressed TOPO as a New York bag lady, as a little girl, and as a witch, complete with a long pointed hat, a black cape, and vampire teeth.

TOPO never washed any dishes, made any beds, or took out the trash, but it was still useful. Every school morning, I turned TOPO on and sent it into the children's bedrooms to wake them up. When Jan and I wake up the kids they growl, whine, and complain. But when TOPO appeared, did a silly jig, and said, "Wake up, sleepyheads. Time to get out of bed," the kids got up smiling and gave the robot a hug.

Robots may never be good as maids or butlers, but they make great pets and alarm clocks. ©

THE BEGINNER'S PAGE

Richard Mansfield, Senior Editor

Trapping Bugs

It was a moth, according to legend, that caused a program to crash in the early days when computers were built of vacuum tubes and tons of copper wire. The critter had flown into the machine. From this we get the term *bug*, meaning that there is an error, a problem in a computer program. And tracking down bugs is called *debugging*.

As all programmers soon learn, there is no permanent cure for bugs—they are always hiding inside a freshly written program of any complexity. Some bugs are obvious and will show up the first time a program is tried out. Some are hidden away and permit most of the program to run without error. A complex program might run well for weeks or months and then a particular sequence of events will trigger a well-hidden bug.

Program Sketches

For many, programming is similar to painting or sculpting. First you jump in and roughly create the outlines, the main ideas. At this point you've essentially made a sketch of the final program. Then you start testing the program by RUNning it, refining it until it performs as it should.

What are the best ways to look for bugs? Luckily, the most common bugs, typos, are reported to you by BASIC itself. On the Atari, if you try to enter a line like this: PRINF X, you will get an immediate SYNTAX ERROR report. Other versions of BASIC wait to report typos until after you RUN the program, but the effect is the same. Your computer tells you what's wrong and which line to fix.

Many other bugs show up quickly when you first try out the program: Nothing appears onscreen; things appear, but in the wrong places; or the numbers are all wrong. In other words, the program isn't even coming close to your expectations. These are often easy bugs to work with because they aren't usually caused by the interaction of two parts of your program. There's some gross failure somewhere. You've simply got to look at your formatting routine or your mathematical definitions to see where the problem is.

Between The Cracks

Some of the hardest bugs to find are hidden in the cracks. They are usually the result of a clash between two otherwise perfectly functional subroutines. For example, if your program uses the variable *T* to stand for the total of an addition problem and then you use a subroutine with a loop that also uses T:

```
10 T = BOLTS + WASHERS
.
.
.
800 FOR T = 1 TO 500
```

As you can see, no matter what your total of bolts and washers is, it will be left at 500 anytime you use the subroutine at line 800.

A similar interaction between variables can be even more subtle. In many versions of BASIC, only the first two letters of a variable name have any significance. So, if you name one thing BOLTS and another thing BOWLING, these two things will appear to the computer as a single variable called *BO*. And, as in the example above, the most recent number assigned to BO will be the *only* value that variable can have.

The Worst Bugs

But the worst bugs are not in the computer at all. They're in the programmer's mind. And since you must use your brain to ferret out the errors

caused by that brain—you can see the paradox. These errors tend to be of two types: incorrect setups and bad logic.

An example of an incorrect setup would be thinking you've defined a variable when, in fact, you haven't, or using > when you mean <. The variations on this theme are endless and you can look at > dozens of times and not even stop to think about it as a possible source of error.

Bad logic would include such things as subroutines which exit via GOTO instead of RETURN; INPUT at the wrong time; or forgetting about the first or last item in a sequence like a DATA list.

Sometimes there's only one way to find a deeply hidden bug: stepping through the program. There are two levels of step testing. You can insert STOP in various places, then check to see that the variables are what they should be at these stopping points. Then CONT to the next STOP and ask to have the variables printed again (type: ? X,Y,Z$). This rough test is often enough to pinpoint the place where the program has gone wrong.

Alternatively, you can use the single-stepping TRACE function found in many programmer's aid programs. These aids add commands to BASIC like RENUMBER, DELETE, and usually have a single-stepping function as well.

When you activate a TRACE command, your program executes step by step, one command at a time. After each command, the status of all active variables is displayed on screen along with the program line so you can locate where things begin to come unglued. Often, a TRACE function permits you to define how fast it will execute and even allows you to turn it on or off from within the program. TRACEing is a slow, but nearly always successful way to trap the most devious bugs.

If all else fails, it's sometimes advisable to ask for help from a friend. His brain won't have been implicated in the original error, and he can therefore often spot the > you keep ignoring. ©

Computers And Society

David D. Thornburg, Associate Editor

Technostress

Craig Brod is a psychotherapist who is seeing a disturbing trend in his patients. He is seeing a new malaise that he calls *technostress*. His concern over this ailment was apparently so severe that he felt obliged to write a book about it (*Technostress: The Human Cost of the Computer Revolution*, Addison-Wesley, $16.95). Whether technostress is a serious malady is not for me to ponder, but there is little question in my mind that Dr. Brod's book will induce stress in many of its computer-literate readers.

According to Dr. Brod, our societal fabric is being reshaped as a result of our headlong push into the information age. It is astounding to see the nature of the ailments that appear to be caused by the mere use of computers in society:

> The wife of a director of computer services for a large bank reports that when she first met her husband, he was a warm and sensitive man. Today he has no close friends and his only recreational activity is watching television. He no longer has patience for the easy exchange of informal conversation. One night, she asked him to slow down as they walked home.
>
> "Walk faster," he replied.
>
> "I *can't* walk faster. My legs are shorter than yours."
>
> "That's no excuse," he said. "You have to learn to walk more *efficiently*."

But Is It Pervasive?

Now, seriously, folks, this man has problems—but I can't believe that the computer is the cause of them. The fact is that, as a therapist, Dr. Brod is more likely than the rest of us to encounter people who are having difficulty adapting to change—and we are definitely going through a period of intense change. Nonetheless, rather than suggesting that he is observing the aberrant behavior of a minority, Dr. Brod goes so far as to suggest that we are *all* potential victims of the onslaught of computer technology.

As one example of this, he suggests that the reason we as a nation have purchased so many computers is because we fear them:

> Ironically, we are motivated by fear to accept what is supposed to bring security and hope. Workers and managers fear obsolescence if they are not at the technological forefront. Parents, concerned about the demands of future educators and employers, feel compelled to make sure their children are computer-literate at an early age. Those who do not join the revolution will, we are told, become relics of a backward culture.

I seriously question whether any readers of this magazine felt that society compelled them to buy a computer. If it is considered a "negative sell" to encourage people to become facile with the tools of their future, then so be it.

David Thornburg is an author and speaker who has been heavily involved with the personal computer field since 1978. His main interest is in making computers responsive to people's needs. He is the inventor of the KoalaPad graphics tablet and is the author of nine books about programming. His recent series Computer Art and Animation *(Addison-Wesley) includes four books on Logo for the Atari, Commodore, Radio Shack, and TI computers.* Discovering Apple Logo *(Addison-Wesley) shows how Logo can be used as a tool for exploring the art and pattern of nature. He has been called "an enthusiastic advocate for a humanistic computer revolution," and his editorial opinions have appeared in* COMPUTE! *since its inception.*

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I, for one, see things in a much more positive light.

The Best Tool Available

The fact of the matter is that I use computers for several reasons. I use a word processor for all my correspondence, books, and articles because it is, quite simply, the best tool available for the job. The fact that some authors can whip out books in front of an old Underwood is fine with me—but I'm not one of those authors. Dr. Brod suggests that authors who use word processors do not produce as finely crafted works as those who have to completely retype their early drafts.

I think he is confusing technology with writing style. Yes, it is easier to change a line or paragraph with a word processor—one doesn't have to retype an entire page. But if I have written something that just doesn't hang together, I rewrite it from scratch, and so do many other authors with whom I have talked. In fact, I have found that college students often hand in essays that they would really like to change, simply because the time associated with retyping the complete document is prohibitively long. The presence of a word processor may, in fact, make better writers of all of us.

Parents are right to be interested in their children's education, and they are right to realize that the computer can be an important educational tool. But to suggest that the success of Apple and Commodore and IBM has arisen out of a fear in the buying public is (and this is *not* a medical opinion on my part) pure hogwash.

Yes, guilt has been used to sell computers, especially in the late 1970s ("Make an investment in your child's future—buy a computer"), but this isn't any different from the time-honored approach for selling encyclopedias.

True, It's Not Perfect

Now I know that some of you must be saying that the computer revolution isn't all it's cracked up to be, that computers are frustrating to use, that they cause disruptions in offices when they are installed, and that computers and robots are likely to change the very nature of our workforce—especially in the blue and pink collar areas.

You are right, of course. Many of us use computers in spite of their poor user interfaces (even though these are improving all the time), and, yes, a lot of jobs are going to disappear in the near future. But, after all, we have been down this road before in our history. Many buggy whip manufacturers must have either changed their business or gone bankrupt when the automobile replaced the horse.

The computer will be no more or less traumatic in its impact on society. Dr. Brod is quick to point out, of course, that the convenience of automobiles has brought with it 50,000 annual deaths on our nation's highways, and some severe smog problems as well.

I would be the last to suggest that the automobile has been an unqualified blessing, but I can't imagine our culture surviving, let alone growing, if we went back to the horse and buggy.

A Heavier Workload

One of Dr. Brod's points is that many of the labor-saving aspects of computers haven't been realized by the people who are using them. Secretaries who, according to the word processor ads, should now have time for "that extra cup of coffee" are finding that their ability to generate letter-perfect documents is increasing their workload as their managers ask for work to be redone until it is perfect. Organizations that functioned adequately when financial statements were generated quarterly are now using electronic spreadsheets to do financial statements on a weekly basis, thus increasing the workload for that department.

Dr. Brod is correct in assuming that more isn't necessarily better, but one must ask how much the computer contributed to the increased flow of information. From my own experiences inside Fortune 500 companies, the information backlog has been there all the time—all the computer is doing is helping to handle a preexisting problem.

As I mentioned a few months ago, John Naisbitt's concept of high-tech/high-touch (as expressed in his book *Megatrends*) showed that as we became more involved with the use of technology in our work and play, we have also become more interested in those things that make us uniquely human. Dr. Brod claims that the reverse is true—that the computer world is symbol-intensive, not sensual, and that this constricts us in our ability to interpret and create in a human way.

If this is the case, then how was Michelangelo able to create such a sensitive work of art as the *Pietà* using such cold and inhuman tools as the hammer and chisel? Once again, I feel that Dr. Brod has confused the technology with its use. The two are quite different from each other.

The Computer As Scapegoat

And yet, in chapter after chapter, we find that computer technology is the purported cause of much that is "wrong" with our society. His chapter on computers and kids, for example, is filled with the typical hand-wringing about videogames that has appeared in all the tabloids. This is surprising, considering that many of his col-