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Issue 29
Vol. 4, No. 10
63379 £1.85 in UK

The Journal For Progressive Computing™

Special Games Issue

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Laser Barrage, And Much More*

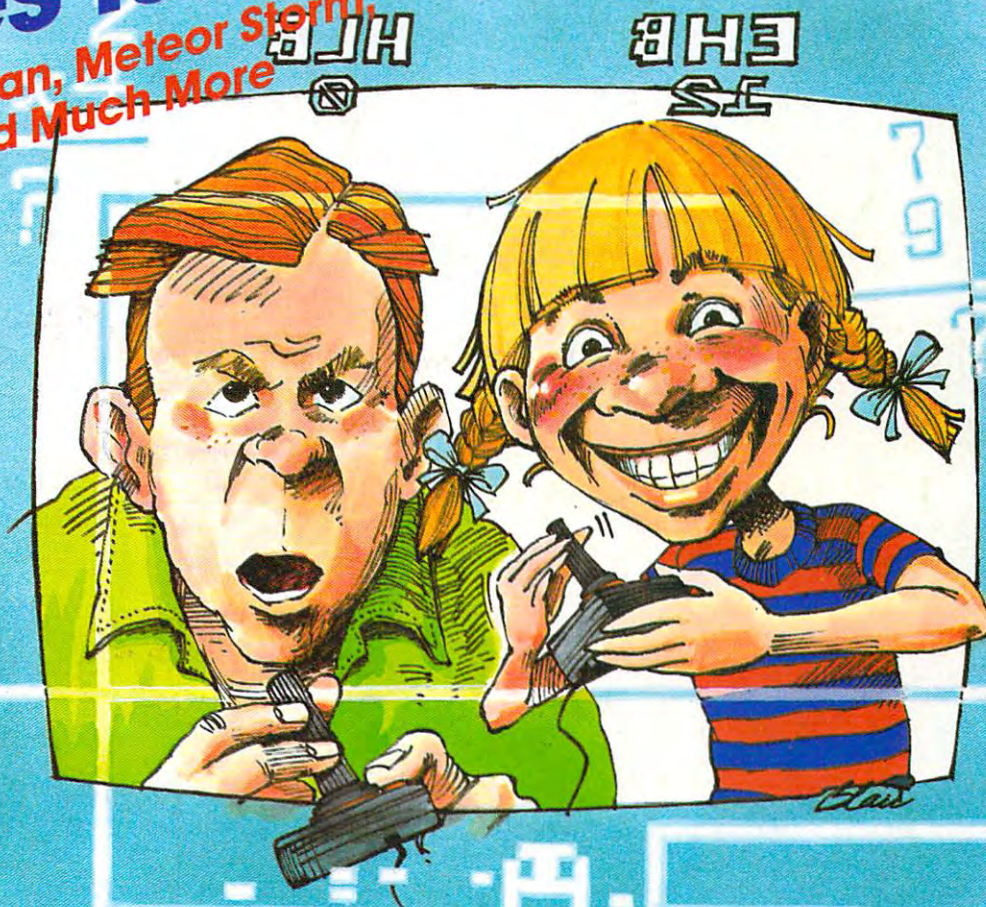
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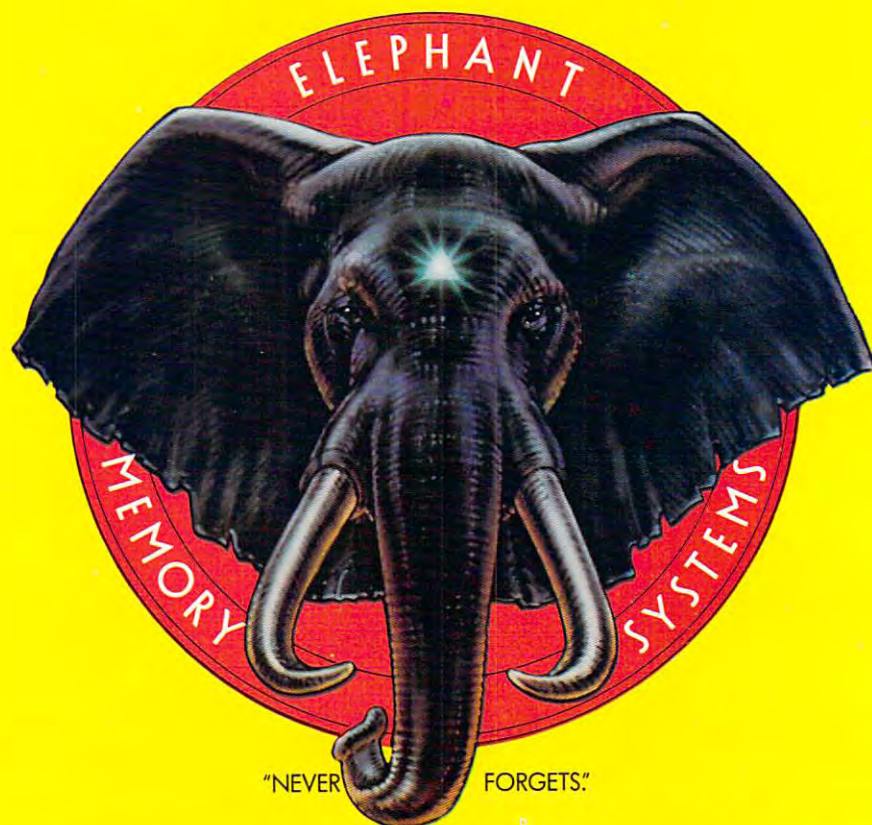


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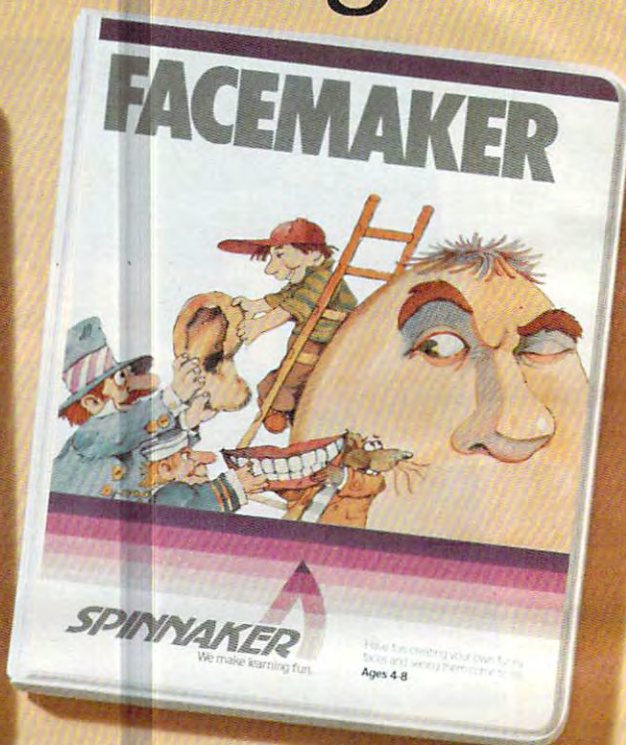
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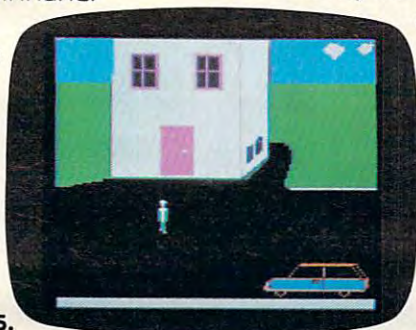
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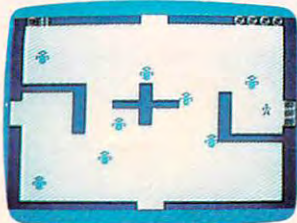
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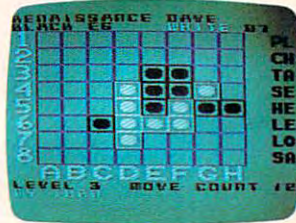
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 puter, 64 Commodore 64,
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The Editor's notes...

Robert Lock, Publisher/Editor-In-Chief

Will The Price Wars Continue?

Texas Instruments announced a \$100 rebate program on the TI-99/4A, thereby bringing its price to \$199. We must confess that we were never aware that TI had moved to \$299, but this was apparently the case. The stock market welcomed all of this news enthusiastically, promptly lowering the price of stock in TI, Commodore, Warner Communications (Atari), and Tandy.

The recent market rally seems to have helped though, and the group is climbing back. Atari has announced a software coupon savings offer on the 400, and Commodore has moved to lower prices on the VIC-20. Predictably, Commodore has slowed down its introduction of the \$179 Max machine, moving instead to dramatically increased VIC production. Their 40,000 units per month will be increased to 70,000 by late fall.

As an aside, we'd like to point out a few things. A personal computer is not, for example, a toaster. It's a sophisticated piece of computing power that, properly used, can teach, entice, amuse, and entertain. This is a rapidly maturing market. It will continue to grow on its strengths. We suspect that those who try to sell it on price alone will suffer in the long run.

West Coast Subscribers, Take Heart

Finally, with this issue, your copies will start arriving earlier. You are now officially in the "pool," meaning your copies are trucked by our printer to three west coast mailing centers, where your copies are mailed. The key is mailing you on the west coast rather than the mid-west. We're expecting this will cause all of your

magazines to arrive by no later than the first week of the month. Imagine – your subscriber copy arriving before retail store copies!

A Record Setting Issue

Not only did our press run break 100,000 with this issue, but we set other new **COMPUTE!** records as well: largest issue, most advertising, most four-color. Equally important, this special games issue is full of excellent articles, and, as always, programs ready to type right in and use. Enjoy it.

A New Atari President

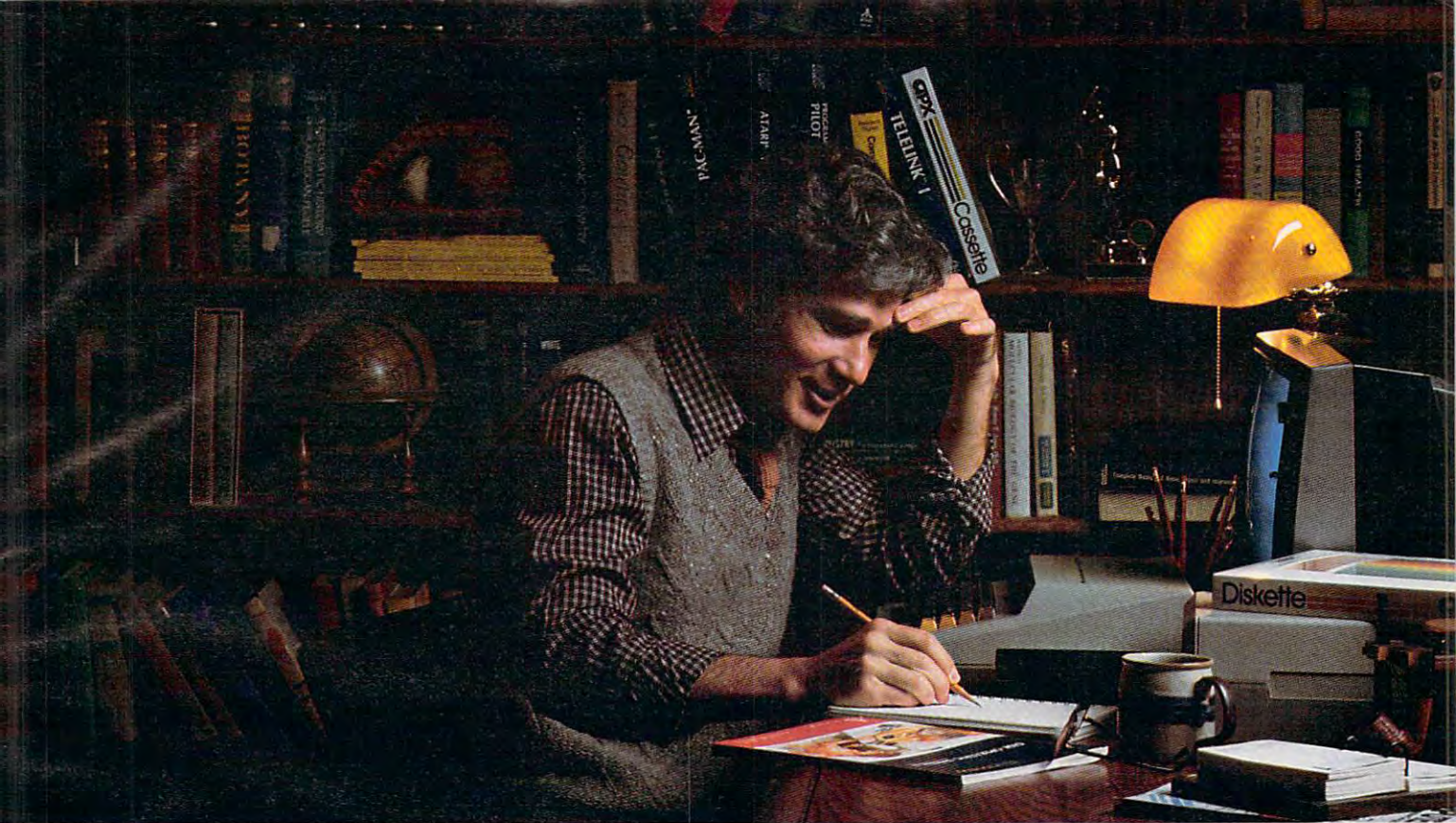
Roger Badertscher, who resigned as president of the Atari, Inc. Home Computer Division in June, has been replaced. Ray Kassar, chairman and CEO of Atari, has announced the appointment of John Cavalier. Mr. Cavalier was previously vice-president and general manager of the Dixie-Dixie /Marathon unit of American Can Company.

Sinclair, Radio Shack Color Computer, and TI-99/4A Owners

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COMPUTE! Books

Corporate office:

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Mailing address: COMPUTE!

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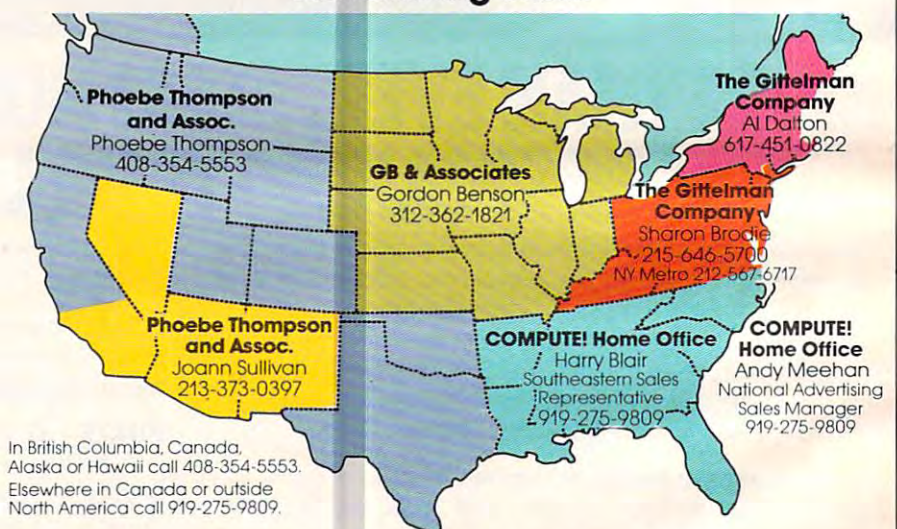
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Ask The Readers

The Editors And Readers of COMPUTE!

AND And WAIT

I've noticed many programs using "AND," such as: IF (Z AND 127) < 32 THEN.... What's being compared when it says "Z AND 127"? Could you also explain to me how the WAIT statement works?

David Zacharuk

*The two numbers are being compared in their binary form: if the variable Z is, say, 15 then it would look like this in binary: 00001111. ANDing it with 127 (01111111) gives 00001111 (15) so the IF THEN in the example would be less than 32. For further explanation of AND, consult any book on machine language or see "The Beginner's Page" last month, **COMPUTE!**, September 1982, p. 24.*

WAIT is infrequently used in BASIC programming (and is not available in some versions of BASIC). If you wrote WAIT 5000,5,1 you would cause the computer to stop operations until it PEEKed address 5000, Exclusive-ORs the number it found there with the 1, ANDs with the 5, and the result is anything other than zero. If it gets a zero after these operations, it continues to wait until the result becomes something other than zero. WAIT's primary value would be for communicating with peripherals when you've added your own interface. It's hard to explain, hard to understand, and, luckily, hardly ever needed.

Reader Requests Assistance

In November 1981 I corresponded with a company named PROTRONICS for the purchase of a memory board for a PET computer. My check has been cashed. To date I have not received a product, nor have I been successful in getting my monies refunded. I have initiated action with the postal authorities and the Washington State Attorney General.

I am requesting that anyone who has had a similar experience with PROTRONICS to please correspond with me. Mail a short letter giving a few particulars of your case. I will then package the information and forward it to the proper authorities along with each person's name. Mail information to:

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Arcade Vs. Adventure

Could you define the difference between an arcade game and an adventure game?

A. Rabin

It's getting less and less easy to define the difference between these two computer game styles. Adventure games are including "arcade" features, and some arcade games now have several different "scenes" of action. Traditionally, an arcade game (named after the rooms in shopping malls where the machines offering these games are located) has one scene or "playfield" like the maze on Pac-Man. There's fast action, color, sound, and you succeed in these games because you have good coordination. It's a physical experience — some say a sport — and things happen in realtime (the time between your moves and the opponent's moves is the same as it would be if you were really running through a maze being pursued by ghosts).

An adventure game, on the other hand, is more like reading an adventure story in a book. There is generally no time limit to your "moves," and there are often many characters and many settings. An adventure game can take hours to play while you wander through a mansion with many rooms or search through forests and caves for a hidden treasure. Frequently your victory will depend on your skill at solving a riddle, or effectively using your available resources. In short, an adventure game is generally a mental rather than an athletic effort.

The trend, though, is toward a merging of adventure and arcade game qualities into what will likely be the supergames of tomorrow. To find out what the experts are forecasting, see "Future Games" on page 20.

Butterfield On RS-232 Interfacing

I have a RS-232 interface made by Quantum Data, Inc., connecting my Data Products DP-50 Daisy Wheel printer to my VIC-20. I am having a problem printing anything in my program. I keep getting out of memory. I am able to use my un-word processor I got from Microdata. It prints fine. However, it's in machine language and my programs are in BASIC. I can also list my programs by using:

10 open 128,2,0,chr\$(4+2):cmd128:list

Here is the buffer Control Protocol for my printer (handshaking).

Data Terminal Ready, goes false (-V) when the interface buffer has less than 16 locations remaining and goes true (+V) when the buffer has more than 96 locations available. Remote/Software Provision: The terminal inspects the incoming data stream for the ASCII ETX control character (67 Coded Decimal Value) and automatically transmits an ACK control character (70 Coded Decimal Value) when the ETX is pulled from the interface buffer. By transmitting the data in blocks separated by ETX characters, the host system can synchronize the rate of block transmissions to the actual average

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printing speed.

So it looks like I have to set up a buffer for handshaking. I am lost; can you help me? I have one other problem in setting up this buffer. If I want to print lower case letters I will need some conversion in setting up my buffer. This is because my printer uses true ASCII characters, not Commodore. Are you still with me or have I lost you as I am lost?

Daryl E. Williams

The August issue of **COMPUTE!** should have been some help on how VIC uses RS-232 (page 99, "VIC Communications: The RS-232 Interface").

First, a little exercise in terminology. Usually, VIC is the "terminal" and is working a communications line through a modem. However, if we want VIC to talk to a printer, VIC can't be the terminal — we already have one of these — so VIC must become the "line," acting the part of the modem. No problem here except that connections change names as they pass between the two units. One device's Send is the other's Receive, of course. The DTR sent by the printer becomes the DSR (Data Set Ready) connection on the VIC, and vice versa. Similarly, the RTS (Ready to Send) output and CTS (Clear to Send) input must be flipped over between the two devices.

RS-232 is hard to pin down; it can be used in many ways. If we wish, we can simply send on the send line and receive on the receive line and not worry about the other wires. This is the basic "three-wire" operation (the third wire is ground); it has no handshake. Alternatively, we can use DSR to see if the other guy is willing to receive from us, and DTR to signal whether we are ready to take from him. This is one of the options on your printer.

Now, VIC reads the handshake lines from the printer (VIC sees them as DSR and CTS) and is capable of restraining traffic. Unfortunately, there's a bug in the present VIC software, and the handshake won't work. Your program can still check this information directly: DSR, the printer's DCD, can be seen with PEEK(37136) AND 128; and CTS, the printer's RTS, can be seen with PEEK(37136) AND 64. But you must do this in your BASIC program.

The alternative you mention is a remote/software handshake. Not hard to do for a printer that is so equipped. Just PRINT#n,CHR\$(67); that sends the ETX. Now wait in a GET#n loop until you get a character back from the printer. The character will be CHR\$(70), but that doesn't matter. When it arrives, you'll know that the printer is "caught up."

No need to set up a buffer: opening the RS-232 does that for you automatically.

Final problem: PETASCII is not the same as ASCII. The conversion rules — assuming your PET is in text mode (upper/lowercase) — are as follows: ASC values less than 65: no change. ASC values from 65 to 96: add 32. ASC values from 193 to 224: subtract 128. Any other

characters are not really ASCII compatible (for example, graphics), and you can make arbitrary decisions on their translation.

This is all very nice as a set of rules, but starts to look clumsy when you want to translate "The quick brown fox..." for the printer. Each character will need to be extracted with MID\$, changed to its ASC number, translated to the new ASCII numeric, and then sent on its way with PRINT#n,CHR\$(.); Slow and unsatisfying, but workable. The translation part can be speeded up somewhat by setting up an array of pre-translated values, so that a PETASCII value of 70 would translate immediately to T(70), in this case 102. We can now start boiling down translation of string S\$ to something like:

```
FOR J = 1 TO LEN(S$):PRINT#n,CHR$(T(ASC(MID$(S$,J)))):NEXT J
```

(Whew!)

The whole thing becomes faster and easier with either of two other solutions: hardware or machine language. It turns out the manipulations above are really simple bit rearrangements. A few hardware gates on the interface will do the job easily. Similarly, a few machine language instructions can test for certain bits and then AND them away or OR extra bits into place. But we must deal with new questions here: how do we get into the information stream to make these changes? It can be done, but there's no space for a brief answer here. Perhaps your word processor can be easily modified for your printer; you might query the supplier.

The following machine language conversion code takes a PETASCII value in the A register and converts it to ASCII before output. The hardware conversion is very similar to this simple machine language process.

```
CMP #$40
BCC NOTALF
CMP #$60
BCS NOTALF
ORA #$20
NOTALF AND #$7F
```

The jargon of RS-232 can intimidate the beginner. It can be puzzling to find that most of the 25 connections are left unused in the average system; they are there for features that we don't need. And the VIC's non-working handshake doesn't help clarify things.

But the pieces are all there, and they can be made to work. The VIC gives you a lot of help on RS-232: a bit more effort might pay real dividends.

Jim Butterfield



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



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A Monthly Column

Computers And Society

David D. Thornburg
Associate Editor

The Game's The Thing

Those who draw a distinction between Education and Entertainment don't know the first thing about either.

(Marshall McLuhan)

I can think of no application of microprocessor technology that has aroused as much controversy as the electronic game. It matters not if the game is in the home or in an arcade; some people feel that such electronically enhanced entertainment is a greater threat to society than, for example, microprocessor controlled smart bombs.

Almost anyone with a sufficiently negative opinion of game arcades seems assured of television exposure on the evening news or front page treatment in the local paper. As an example of the level to which the hysteria has risen, I have only to thank those readers who sent me copies of the front page article from the June 1 issue of the tabloid *Weekly World News*. For those of you who haven't read it, the front page headline blared (in 1 3/8" type) TEEN KILLED BY VIDEO GAME. The article went on to say:

Shocked players at the Calumet, Ill. video center were stunned as they watched the 18-year-old youth suddenly slump at the controls of 'Berserk' and slowly crumple to the ground. His lifeless body was a tragic symbol of the video game's conquest over its human foe.

Of course, the article went on to point out that the coroner found the boy had an undetected heart condition, and that it was the stress that killed him. Had this young man died as a result of overstress on the tennis court, I'm sure the story would not have been nearly as newsworthy.

It was thus with great relief that I received a package of articles in the mail from Peter Favaro — a Long Island psychologist who has spent years carefully studying the effect of video games on children.

You say that you haven't heard of Peter? Well, from what I can tell, he isn't the sort who is going

to be gobbled up by *60 Minutes* or *The Today Show*. He is a scientist who believes in reporting without hysteria what he observes. His writing does *not* contain sentences like:

He could see the beads of sweat reflected in the TV screen as his clammy hand reached for another quarter. Finally, after spending \$85, he was within striking distance of his goal — a free game.

What Peter has done is quite interesting. He explored the skills acquisition potential of video games for his Master's thesis a few years ago. He explored the use of video games as a reinforcement tool for teaching learning disabled and emotionally disturbed children, and he studied the so-called "addictive" aspects of video games.

Coordination Test Findings

What did he find? First, some game proponents (myself among them) have speculated that, if nothing else, prolonged video game play would result in improved eye-hand coordination. Along with three colleagues, Peter devised a test involving 45 nursery school boys aged three to five years. The children were randomly divided into three groups. The experimental group received six, five-minute training sessions on a popular video game; another group received the same amount of personal attention, but did not play any games; and the third group was a control group that received no special treatment.

Prior to the experiment, each group was tested on two video games and one pencil and paper maze-solving task. The results showed that the experimental group did improve their skills in playing other video games, but that these skills did not transfer to the maze-following task. As Peter says,

One might criticize these results by saying that they suggest that children who play video games only get better at playing video games. On the surface, this is certainly true; however, my colleagues and I feel that, if given longer training sessions, the children might have achieved transfer to the maze tasks since there was a trend in this direction and since transfer was shown on a task with different stimulus characteristics.

Note that he did *not* say:

In the diffuse light of the damp basement laboratory, one could see that the children's eyes, once large with excitement and wonder, had hardened to steel as they fought for the right to get just one more quarter.

Peter's more recent work included the use of video games as a reinforcer for good behavior in a

25 of The Hundreds of Reasons You Ought To Be A **COMPUTE!** Magazine Subscriber:

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special education class of six boys who had previously "acted out." (Acting out, for those of you unfamiliar with the term, means doing things like breaking chairs over each other's heads.) Using this class as an opportunity for more research, he discovered that children responded much better when video games were used as the reinforcement tool than when the traditional "snack" reinforcers were used. An incidental benefit (beyond the low sugar content of video games) was that some of the more withdrawn and defensive children gained confidence and peer acceptance through the games.

Of all the criticisms leveled against these games, the idea that children become addicted to them raises considerable concern with the greatest number of people. Accordingly, Peter devised a study to measure social responsibility, impulse control, and compliance among groups of children who played video games. Since these three areas are ones in which addicts display behavior quite different from that displayed by non-addicts (whether the addiction is alcohol, drugs, etc.), it seemed appropriate to measure these things for a group of "heavy game users" and to compare the results with those for a group of "light game users."

In one test, he gave every child 12 quarters and told them that they could use six quarters on a game, but must give the remaining six quarters to a person nearby who was collecting money for charity. While the heavy game users did play more games (7.6 quarters vs. 5.6 for light users), the heavy users showed more social responsibility in giving the balance to charity (5.5 quarters vs. 4.5). My, my — so much for differences in social responsibility.

While Favaro's study is by no means conclusive, it did encourage him to make an interesting observation:

Obviously, anything that is done in an obsessive way can seriously disrupt anyone's life, but the point is: Why focus on video games? A child would be in serious trouble if he practices dribbling a basketball nine hours a day to the exclusion of everything else. Children as well as adults who have "addictive personalities" will always find a target for their addictions. It is unscientific to claim that a causal link exists between video games and maladaptive behavior, simply because a small population of children do both.

Well said, Peter, well said.

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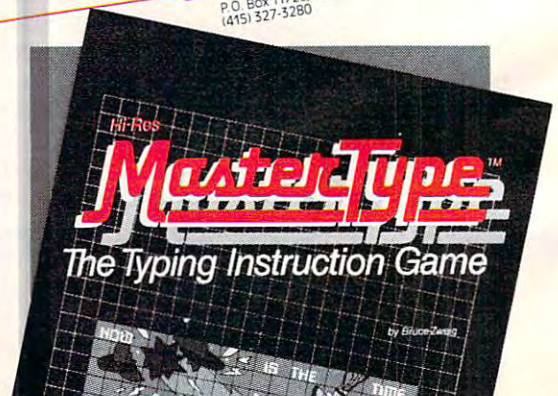
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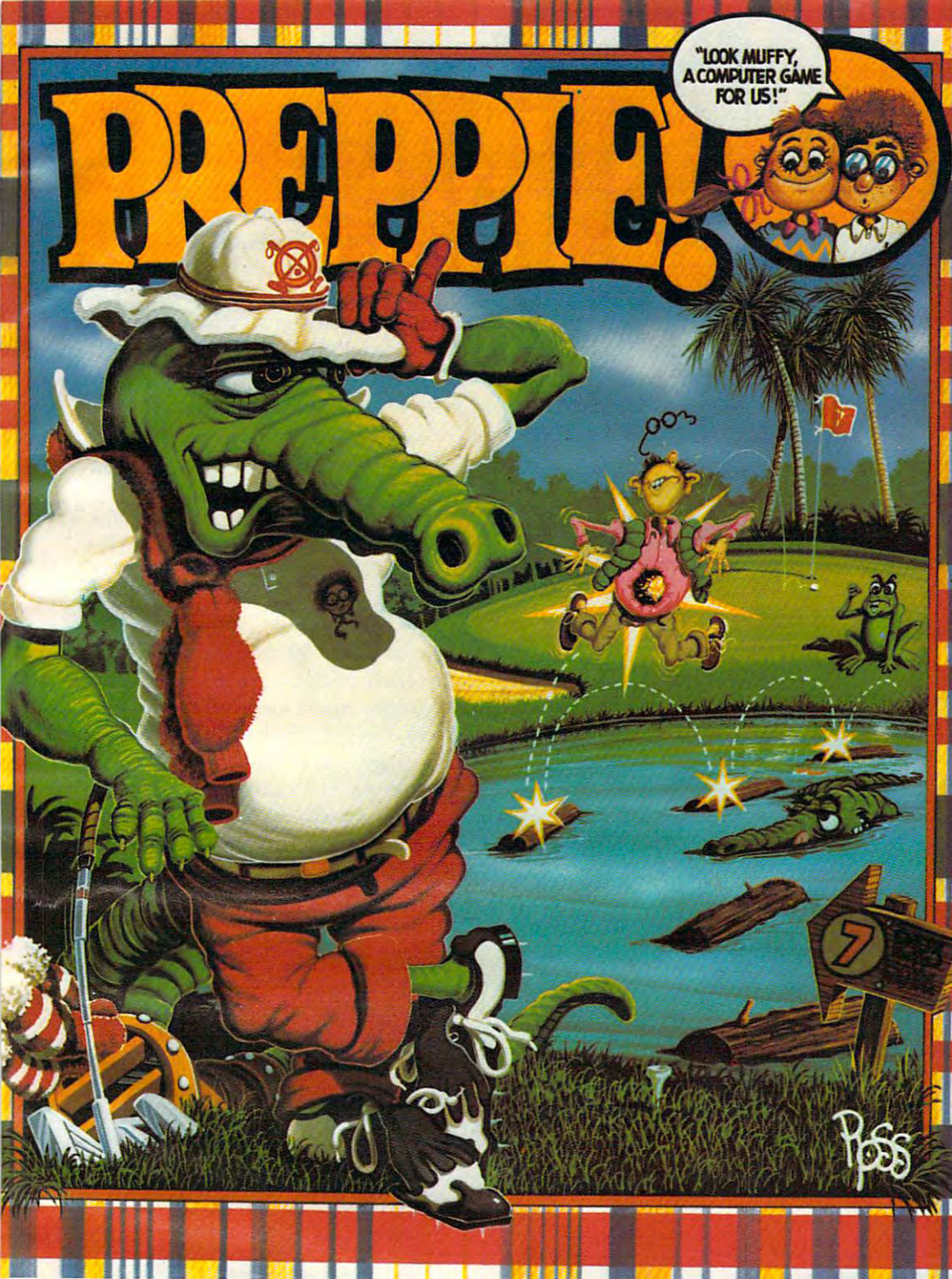
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—Holister Townsend Wolfe

"I had so much fun I almost blew my doughnuts."
—Theodore Boston III

"I haven't had this much fun since Buffy and I went to Princeton for the weekend."
—Martha Vineyard

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Listen to what Scott Adams, Chris Crawford, and other experts have to say about computer games of the future. You're in for some surprises.

The Computer Games Of Tomorrow

Tom R. Halfhill
Features Editor

Harry Buttondown left the office promptly at 5:05 p.m., walked two blocks to the subway stop, dutifully deposited his token in the turnstile, and stepped onto the train.

It was already pretty crowded. Harry decided to squeeze himself next to a seat-hog who was inconsiderately sprawled across two spots, staring obliviously out the window with his back turned. Harry leaned toward the stranger. "Excuse me, sir," said Harry, with the assuming poise of a supervisory executive. "Please move aside."

Slowly the man turned his head. Harry froze in terror as he stared into the stranger's glowing red eyes – all five of them. Foam drooled from laser-sharp fangs and dribbled down a fur-covered chest. Growling like a timber wolf with acid indigestion, the thing reached toward Harry with a pair of six-inch claws.

Harry screamed. All poise forgotten, he hurled his Gucci briefcase at the horrible monster and stumbled over an obstacle course of ankles and feet in his mad scramble down the aisle for the exit.

Suddenly, Harry became aware that people were laughing at him. Were they insane? He turned around, panting, and saw that the creature had mysteriously disappeared. Then Harry noticed a huddle of snickering teen-agers in the back of the train. They were holding one of those newfangled portable holographic computer game machines. (Snick, snicker.)

Harry sheepishly recovered his briefcase and found another seat. How he yearned for the good old days when kids used to board the subways with nothing more than boom boxes.

Forces Shaping The Future

Sounds pretty fantastic, doesn't it? But when you think about it, Harry Buttondown's encounter with the subway creature is a logical extension of two trends in game and entertainment technology: the

trend toward games which more and more closely simulate reality (or unreality), and the trend of miniaturizing entertainment devices until they are portable enough to be carried around almost anywhere. Both of these trends are highly visible today.

On the one hand, technology is making possible increasingly vivid video games, and on the other, it is shrinking stereos and televisions – and computers and electronic games – down to personal size. Appliances that used to occupy immovable living room cabinets can now be carried while jogging. Would anybody have imagined 25 years ago that radio-tape stereos, the "boom boxes," would be toted by kids on subways? Or, even ten years ago, that video games could be worn on your wrist?

Still, it's too easy to get carried away with the possibilities of future technology. Sure, almost anything is possible in 20 or 30 years. The moon landings and other technological feats of the past two decades have pretty much silenced the doubters and nay-sayers. You can get away with predicting practically anything these days, and almost nobody is now willing to go on record saying, "Impossible!"

So what are the possibilities? What can we realistically expect in the near, and not-so-near, future? Three-dimensional, high-resolution computer graphics on home video game machines? NASA flight simulators in the arcades? Videodisc adventures? Wraparound screens and "smellavision"? Will the teen-agers of tomorrow really carry portable holographic computer game machines onto subways?

Even the experts – the programmers and software producers who will make the future happen – don't agree. What's more, some warn against a narrow vision of the future that considers only technological advances as a vehicle of change. Don't forget, they point out, that psychological factors, fads, styles, marketing considerations, and economics are equally important.

"Five years ago I could never have predicted where things are today," says Scott Adams of Adventure International. "I've been totally amazed. So there's no way I could anticipate what's going to happen five years from now."

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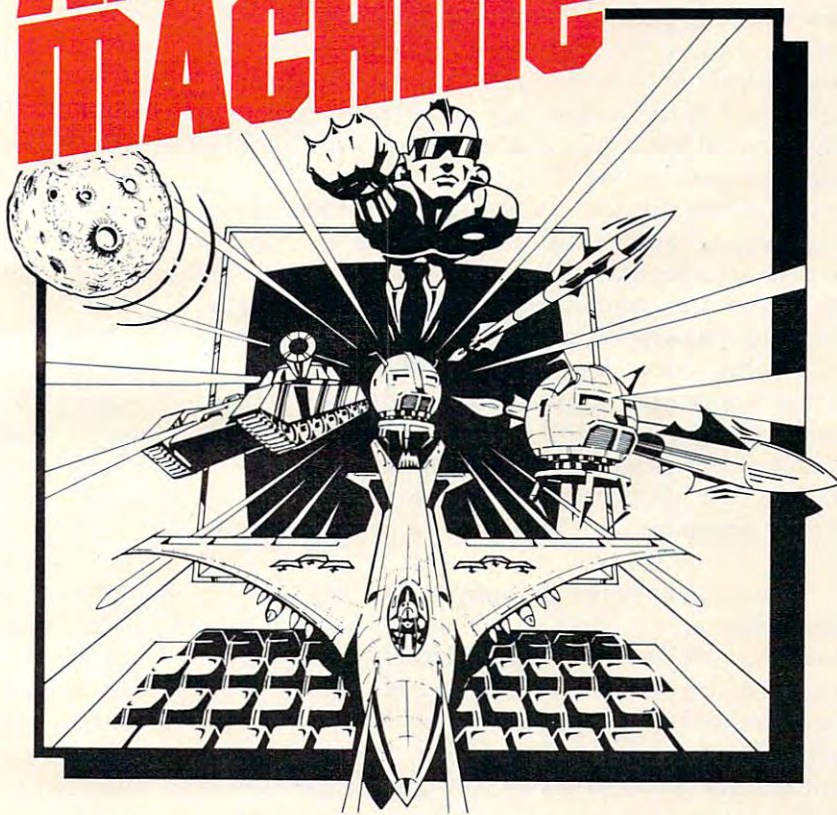
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Are Video Games A Fad?

One thing virtually everyone agrees on is that computer games are here to stay. Individual games will pass on after short lifespans, and certain general types of games may fade in and out of style, but we've only begun to exploit the possibilities of computerized gaming.

"If people today are becoming bored with electronic games, it's because they're becoming too sophisticated for the games," says Michael Tomczyk, product marketing manager for Commodore International. "The whole question is whether the game players will outstrip the technology, or whether the technology will outstrip the players. If the players grow more sophisticated than the games, then the games will fall off for awhile until the technology catches up. On the other hand, if the technology outstrips the game players, we'll see games that only a very few highly skilled people can play."

Tomczyk foresees a general trend of increasing technological sophistication filtering down from the coin arcades to the home. Right now, he says, there's a crying need at the home level for more powerful game machines and better game controllers. Within a year, he predicts, home games will start incorporating simulated three-dimensional graphics, remote-control joysticks, voice-actuated joysticks, and wider use of voice synthesis. "The next big step will be graphics that look just like cartoon animation on TV – I mean very much like it."

Others believe the popularity of computer games does not depend on new technology, that computers are flexible enough already to sustain long-term interest. "I think people always will be fascinated by [computer] games. They'll never tire of those fantasy worlds," says Ernie Brock, product manager for Sirius Software, a top game producer for the Apple. "People still watch TV, don't they? People have hi-fi's and stereos and continue to buy new records and don't tire of them. I think the same thing is true of computers and game software.... If you tire of one world on the computer, you can stick in a new disk and create another one."

This principle of escapism has not been lost on software designers, any more than it has on today's Hollywood filmmakers. That's why space and fantasy themes are so prevalent in both entertainment fields. What better way to escape the day's troubles than to leave the planet altogether, or even the universe? But although escapism will endure, certain methods of achieving it may not. Some already think the "shoot-'em-up" space games

have peaked.

"The key is that the computer can temporarily make you into something you are not," notes Ken Williams of On-Line Systems, a major game software producer. "But even being a spaceship commander gets boring if that's all you do. The games where he just shoots up screens of aliens, and which only give him more aliens when he's done, are going to die. They're OK for now, but they won't be soon."

Several top game designers predict more different types of simulations in the very near future. Chris Crawford, a programmer with Atari, Inc.'s Research and Development Group who has written such games as *Eastern Front*, refers to the "movement of computer games into larger realms of reality," and "broadening our base of fantasies instead of expanding our hardware." He says the current glut of space/fantasy games will be supplanted in part by computer simulations of soap operas, Westerns, detective mysteries, cops and robbers stories, and even gothic romances. In other words, all the escapist paths of pop culture in modern America.

Harlequin romances on disk? Heaven help us.

The Psychology Of Computer Games

But the fear of fading fads is certainly not the only reason why game producers are moving toward wider varieties of simulations. Another reason might be even more important: they want computer games to attract wider audiences.

Think about it. The audience (read: market) for computer games today is really quite narrow – mainly, children and young adults with excellent reflexes and an almost insatiable appetite for space/fantasy themes. Too many people (read: consumers) are left out. For example, millions are addicted to soap operas. What if they could be hooked on a computer-adventure simulation that transports them into *All My Children*? Or if the thousands of *True Detective* readers could be transformed into cops by an interactive adventure game, so they themselves could heroically rescue the innocent victim from the cult-killers? It takes no marketing genius to realize that software sales would skyrocket.

This possibility – the concept of redesigning the *psychology* of computer games to attract a wider audience – is now under close scrutiny by many game designers. If they weren't already thinking about it, something stupendous happened last year which opened their eyes:

Pac-Man.

You see, *Pac-Man* was more than just a hugely successful video game that managed to gobble more money in 1981 than the entire Hollywood



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film industry combined. *Pac-Man* also turned out to be an equal opportunity employer.

Before *Pac-Man*, you saw very few young women playing video games. When you did, they usually were with their boyfriends. But *Pac-Man* was different. Women liked *Pac-Man*. So much, in fact, that although no one has done a formal study, women are believed to have been a major factor in the immense *Pac-Man* phenomenon.

That's exactly why a new version of *Pac-Man* hit the arcades and cafes this summer: *Ms. Pac-Man*, complete with different graphics and colors. The lesson was not lost on other game designers, either. Computer games are no different than any other form of popular entertainment – specific audiences can be psychologically targeted.

"*Pac-Man* is classified as a 'cartoon' game," says Gary Carlston, marketing director and co-founder of Brøderbund Software, a leading game house. "If you're planning a game to appeal to women, you've got to be consistent in your concepts. For example, you couldn't put together *Pac-Man* and *Space Invaders* and expect a game about space warfare and killing aliens to attract women."

Commodore's Tomczyk says his company has gone so far as to informally study the matter. "Men tend to like games that have you destroying aliens and running away from robots and landing landers without crashing them. Women tend to like games which are, well, let's not say nonviolent, but not as grotesque, not involving destruction of animate objects or human life. Like, the ghosts in *Pac-Man* never really die, they just get recycled."

Jim Wylde, vice president-sales for United Microware, Inc., has also noticed these characteristics. "There doesn't seem to be much 'femaleness' in computer games today. They seem to be left out of computer games. I've talked to many, many young women in my own organization and elsewhere, and I always ask them, 'What would you like to see in a computer game?' And I always get a blank stare."

Joanne Lee, a consultant for Tensor Technology Ltd. and a freelance game programmer for United Microware, explains why: "I don't like violence and I am not into science fiction, so I don't like space games. I don't like the little aliens running around on the screen. The only game I

really liked was *Pac-Man*...."

The bottom line is that game designers no longer will ignore the female market, and will scramble to tap other new markets as well. Does this mean we'll see a sharp decline in space/fantasy shoot-'em-ups? No way. The young males still dominate the market. As Lee explains, "Sure, I would prefer to write a more nonviolent type of game, but I have to think about what is marketable."

The forecast: more diversified computer games, each catering to its own audience.

Re-creating Reality

So. Now that we have some idea where computer gaming is headed, what technological form will it take? This is the sort of pie-in-the-sky dreaming that everyone likes to indulge in, but there's a difference between imagination and extrapolation. We can imagine anything – well, quite a lot – but what seems likely to happen, based on current trends?

Practically all the experts agree that computer games will continue to grow increasingly sophisticated, and that sophistication will come in the form of better simulations of environments. That is, the games of tomorrow will seem incredibly real.

Videodiscs are most commonly mentioned. As consumer items, today they're pretty much limited to playing back movies, like videotapes. But videotapes, like computer tape drives, are only *sequential access* devices. Videodiscs, like minifloppy computer disks, allow *random access*. Under computer control, an image (or sequence of images) stored anywhere on a videodisc can be searched out and displayed within seconds. Consider the possibilities of a videodisc interactive adventure game. Instead of watching crude computer drawings of dungeons and caverns on the screen – or text descriptions – the player can see actual film footage of the scene unfold. In fact, filmed motion can be stored on the videodisc and recalled in response to joystick commands. Move the stick forward, and you walk deeper into the cavern. Move it left, and your "eyes" pan left.

Not only is all this possible: it's being done right now in highly advanced flight simulators and trainers. There are even projects underway in which film crews are filming all the streets of entire cities, making every possible turn at every intersection. When the images are stored on high-density videodiscs, they will be linked to computerized driving simulators to train truckers and cabbies.

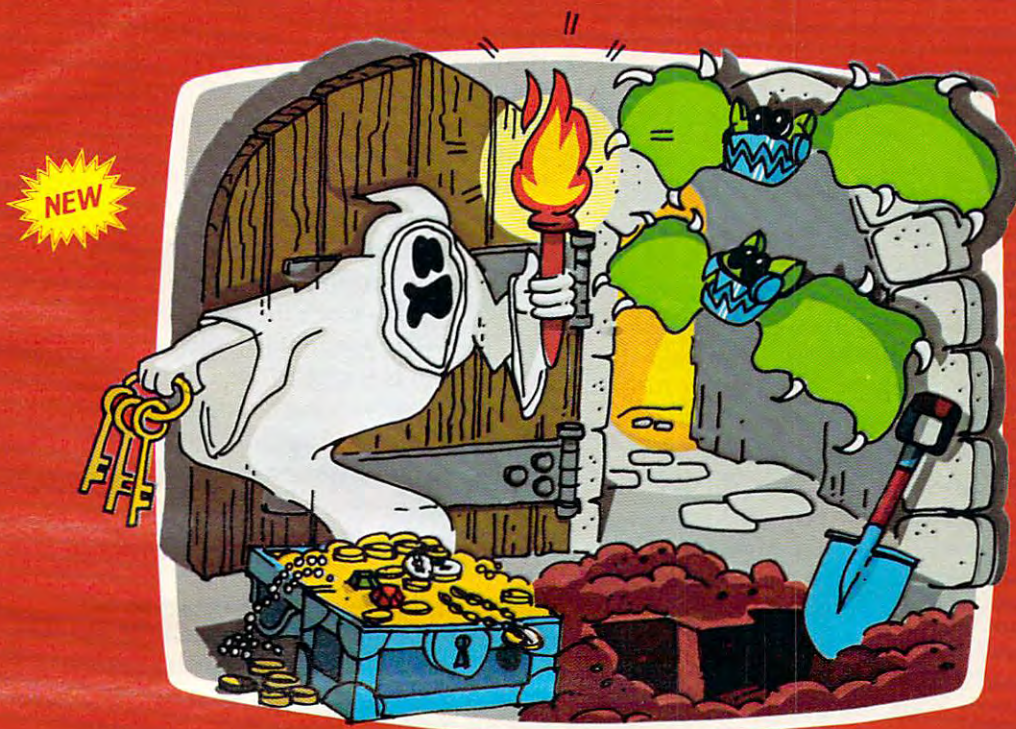
The chief limitations are speed and cost. "We've fooled with that here," says Williams of On-Line Systems, "but the access time just isn't fast enough yet. No one wants to wait four or five seconds for a



Jim Wylde,
United Microware, Inc.

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videodisc to go search out an image. Also, there aren't enough of those [videodisc] units out there yet."

But he is excited over the possibilities of three-dimensional video games. "I've already seen some prototypes of arcade machines which use the same type of 3-D effects as the movies, the red-blue technique. We'll probably see this and also polaroid 3-D, at least in the arcades."

Total Immersion

Fred D'Ignazio, author and **COMPUTE!** columnist, thinks realism will be achieved by isolating the player from extraneous stimuli – of which there is plenty in most arcades – by "immersion" in the game environment. Arcade games would look something like those automatic booths in which people have their pictures taken, and players might even don helmets, headsets, and goggles. "All you would see visually would be your game screen, maybe wraparound," he says. "And you'd have a better environment for sound effects, too, and especially voice synthesis. You could even have voice-responsive commands, which even today's technology would support to a degree. And you'd need more controls, foot pedals and everything."

Nor would you be limited to playing a lifeless computer. D'Ignazio says arcade games could be hooked up to each other so people could play against other humans – maybe in another part of the city, or even another state – absolutely anonymously. "A lot of people play these games – at least, I know I do – because you don't have to compete with another human face-to-face. You can play the computer. But if you could play another person anonymously without having to confront them face-to-face, it would be a new challenge for a lot

of gamers."

What's more, the hook-ups could serve another function: "You could have news bulletins. 'Joe Smith just got a high score on *Galaxians* in Cincinnati.'"

This kind of telecomputing, or "telegaming," is already here in a simpler form. Although communications over phone lines between personal computers are still too slow to permit realtime, multi-player, arcade-style games, a few games are available which allow several players to compete head-to-head using phone modems. CompuServe, a leading information utility, offers two space warfare games, *Megawars* and *Decwars*. Up to ten people can simultaneously play either – a CompuServe subscriber merely signs onto the system and joins the game in progress. Although the game processing is handled by a large PDP-11 computer at CompuServe's base in Columbus, Ohio, the players are pitted against each other, communicating through their keyboards. Both games are text-only (no graphics).

Scott Adams's Adventure International sells a telecomputing game called *Commbat*. *Commbat* is a bit different than *Megawars* or *Decwars*; it allows only two players, but bypasses the need for a central computer. Instead, the players compete against each other using their own computers, linked over the phone lines by modems. Also, the game has graphics. The graphics are very simple, though, since *Commbat* allows Apple, Atari, and TRS-80 users to compete interchangeably, and those computers' graphics systems are normally incompatible.

Still, all of these games allow the sort of anonymous telegaming that D'Ignazio says could someday immerse the gamer in an elaborate environment of sight, sound, and sensation.

On the other hand, if you're the nervous type who would react to this "total immersion" by degrading into a screaming meemie, you might prefer computer games as a spectator sport. You know, Sunday afternoons on NBC. "I think there'd be a great audience for watching world-class video game players," says D'Ignazio. "You could have instant replays, slow-motion, and commentators going over their moves."

What's that, you say the video combat on TV got your adrenalin pumping? Anyone who wanted to work off a little "displacement aggression," as psychologists call it, could take up boxing at the local amusement park. "Instead of driving bump-em cars or riding roller coasters or shooting at ducks in a shooting gallery," suggests D'Ignazio, "you'll be able to have robot wars by controlling your own little robots."

D'Ignazio also says video games will be found in unusual places, not just arcades. They'll be built

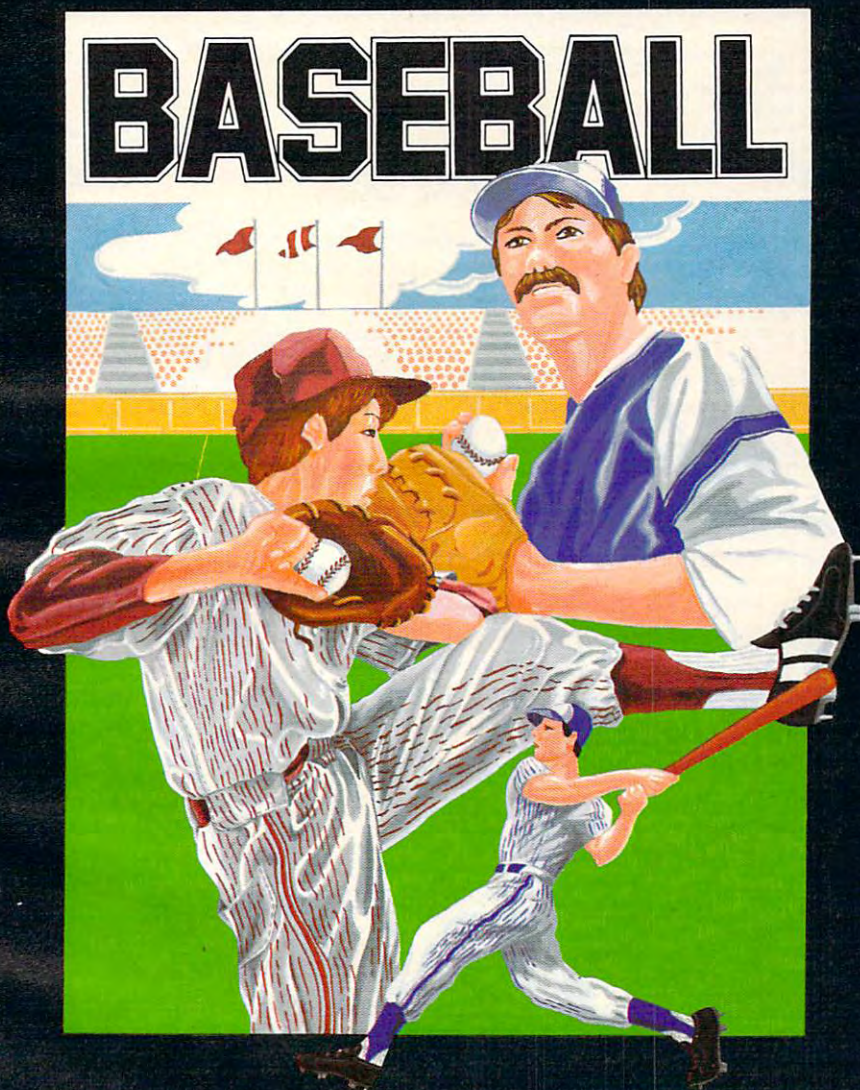


Fred D'Ignazio.

CREDIT: Karen Tam, Raleigh News And Observer

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into the backseats of cars to keep rowdy tots occupied; implanted in the ceilings of bedrooms; reduced to book-size and placed in dentist waiting rooms next to the *National Geographics*; installed in hospital rooms and nursing homes to entertain the bedridden; loaned by public libraries, and, of course, carried by teen-agers onto subways. He thinks they might even be built into eyeglasses, so the true addict can throw a switch and see video games on the inside of the lenses.

Commodore's Tomczyk carries it one step further: "The concept of *TRON*, when you are really the computer – and the computer is you – is definitely going to happen. That's the ultimate. The trends of the pricing and power and technology indicate that is really going to happen. The physics of the fantasy expressed in that movie are probably impossible, but we are moving in that direction. We are moving toward the ultimate *TRON*."

The Future Or Fantasy?

But not everyone agrees with this fantastic view of the future. Crawford, the respected Atari expert, says the role of technology in future computer games is constantly overblown. "All these people predict that in coming years we'll be able to plug into our computers, and be surrounded by colorful 3-D images, and wonderful sound, and we'll just be able to think and all these things will appear, and

it'll be just a gas.... I reject all that. I don't think it's going to happen, and I don't think it has to happen.

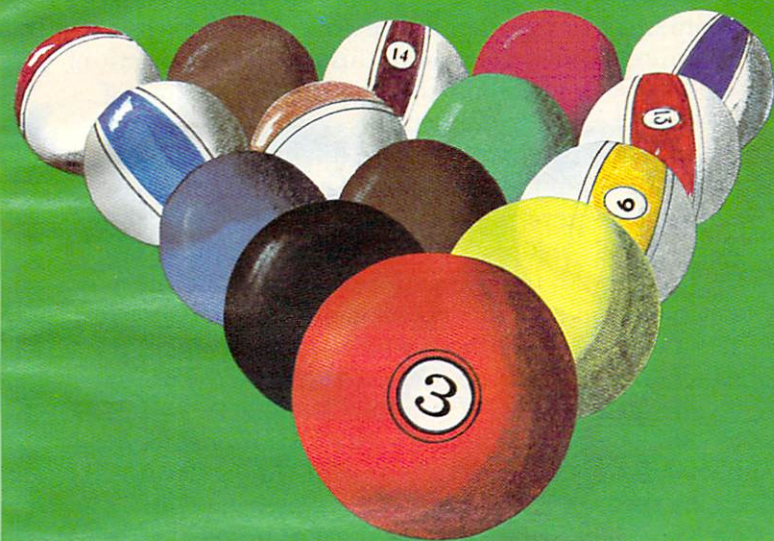
"A lot of people mention new technologies as the engine of change in computer games," explains Crawford. "But I don't see technological developments as the driving force in computer games. I don't even see technology as the limiting constraint in creating computer games. I think the main constraint is lack of creativity and imagination."

Just as the technology of the automobile has not changed drastically over the past 50 years, neither must the technology of computer games, he argues. Technology remains fairly static if it is perceived as adequate, and Crawford believes most people are satisfied with the current state of computer games. "The development of cars since 1932 has been more in the way of polish than the way of new technology.... Although I believe the technology of new hardware will be forced upon us, I don't believe we'll need it to develop the computer games of the future."

Crawford's theory, though apparently the minority viewpoint, might come as welcome relief to those who are less than thrilled with the concepts of "total immersion" and "the ultimate *TRON*." Maybe you won't have to worry about running into a monster on the subway after all.

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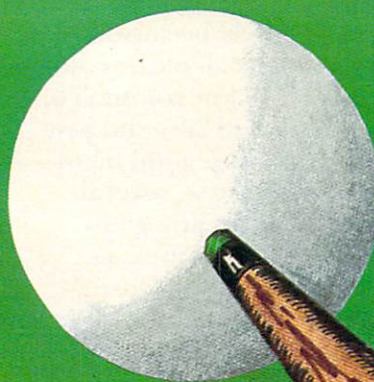
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A Monthly Column

The Beginner's Page

Writing Your First Game

Richard Mansfield
Senior Editor

If you are tempted to write your own games, go ahead. It's a good way to learn to program. Games are basically the same as any other kind of programming.

Computer games fall into two broad categories:

1. imitations of old standards (checkers, Othello) and
2. games (Space Invaders, PacMan) which could not be played without a computer. This second category is more difficult to program for several reasons. For one thing, you've got to think up a whole new, and entertaining, concept and then adjust the action until it is just hard enough to be challenging but not so difficult that people want to give up.

This category (basically "arcade" games) is especially hard to program precisely because a good computer-only game exploits all of the computer's special attributes: speed, color, sound. To do this well, to make things look and respond just the way you imagine them, requires a good bit of programming experience. Usually, too, several things are happening *at once* in an arcade game. This often means that such a program must be written in machine language, which is far faster than BASIC.

High Card Slice

Old standards, on the other hand, can often be the best way to get started programming games. You already know the game concept, and cards or dice or game boards are fairly easily constructed and manipulated on your computer screen. To illustrate, let's take a look at a simple simulation of one of the oldest card games, "High Card." The rules are simple: you place a bet, and then you draw a card from the deck. The computer, your opponent, draws a card too, and the highest card wins the money.

One simplification here is that there is no attempt to represent the cards on the screen. The entire game relies simply on words ("Ace of Spades," for example) when cards are drawn.

Like most computer programs, the program can be visualized as having four distinct zones: initialization, main loop, subroutines, data tables. We can go through the steps in programming this game by looking at each zone separately.

Initialization

From lines 10 through 80 we are "teaching" the computer some basics about this game. Initialization is the activity which must take place before any of the action can begin. Computers are so fast that they will zip up through these lines and start things off in the main loop at line 100 in a flash. However, as programmers, we are aware that several preliminary events took place inside before anything else.

In line 20, the computer discovers that there is a variable called "dollars" which is to equal 500. It sets aside a section (like a small box) in its memory which it labels "dollars." When the game is running, it will add or subtract from this "box" (lines 230-240) to keep a running total of how much money you have left to bet. From time to time (line 110), it will check the box and report to the player how much he has. The box labelled "dollars" is called a *variable* because during the game the amount in it will vary.

Lines 30 through 60 are simple enough – they ask the player to give his or her name. The computer "memorizes" it in another "box" called "name\$" and can now speak more personally to the player in lines 140 and 230. Also, the computer prints the rules of the game in line 60.

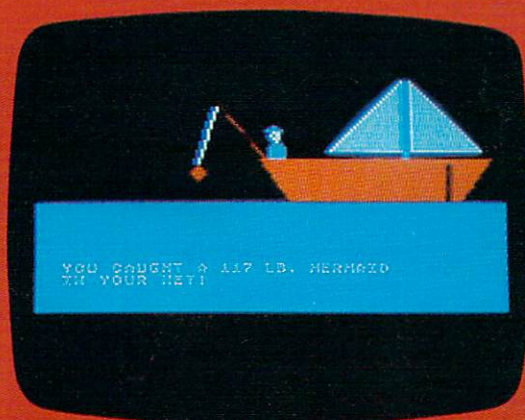
Line 70 "reads" four names (the face cards) from the data tables in lines 510 on. It also makes a "mental note" that it already READ four items. So, when it's asked to READ again (line 80), it will start with the next unread item of data which will be "clubs." By now, the computer has "memorized" a variety of important facts: the player's name, the amount of his or her betting purse, the names of the face cards, and the suits of a standard deck. In less than a second, the computer has grasped and filed away the necessary facts to go on to the main loop where all the action takes place.

The Main Loop

After checking that the player has money to bet, the computer asks for the bet, checks again that the bet is possible, and then runs through one cycle of the game starting in line 160. At this point, a programmer might find it worthwhile to visualize the steps involved in the game: 1. draw a card for the player; 2. draw for the computer; 3. decide who won; 4. adjust the player's purse.

Since both draws are essentially identical actions (the only difference will be that we say "Bob draws a..." instead of "The computer draws"), we don't need to program the draw twice. This is where subroutines come in handy.

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The Subroutine

Twice in the main loop, we GOSUB 300. First the player, then the computer, draws. Line 310 randomly picks two numbers, the card and the suit. If line 320 finds that this selection matches the one drawn just before by the player, it goes back for another draw. Line 330 makes the *name* of the card be the number if it wasn't a number higher than 11 (a face card).

Then line 340 announces the draw using three variables. The first variable (player\$) is set up in either line 160 or 190 as appropriate. Then the card\$ and suit\$ variables are selected from the lists that were "memorized" back in the initialization phase (lines 70-80). The subroutine then RETURNS to the main loop.

Lines 210-240 decide and announce the winner of this round. First, if the variable "card" (the computer's card) is greater than (>) "yourcard," the computer is declared the winner in line 240, the purse is adjusted, and the main loop is restarted (GOTO 100). If the cards are equal, nothing happens to the purse and the next round begins. Notice that we don't need to say "IF YOURCARD > CARD" at the start of line 230 to test if the player has won. It's the only possible thing if the computer has gotten this far.

Once you've solved a particular problem, you'll find you can use the solution in many future games. This subroutine which draws cards, for instance, would work just as well for Poker, or Blackjack, or dozens of other games. Subroutines are handy not only because they can be used repeatedly within a program, but because they can be saved and used repeatedly in future programs. So think up a simple, traditional game and teach it to your computer. There is probably no more pleasurable way to learn programming than to write a game.

Program 1: Apple, PET, VIC, OSI, Radio Shack

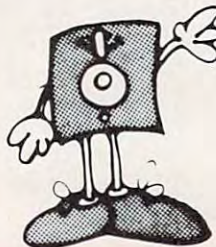
```
10 REM *** NECESSARY INITIAL INFORMATION ***
20 DOLLARS = 500
30 PRINT "WITH WHOM DO I HAVE THE PLEASURE"
40 PRINT "OF PLAYING HIGH CARD SLICE?"
50 INPUT NAMES$
60 PRINT "HIGH CARD WINS IN THIS GAME!"
70 DIM CARDS$(14):FORI=11 TO 14:READ CARDS(I):
  NEXTI
80 FORI=1TO4:READ SUITS(I):NEXTI
90 REM
100 REM *** MAIN PROGRAM LOOP ***
110 PRINT:PRINT "YOU HAVE $" DOLLARS
120 IF DOLLARS <= 0 THEN PRINT "THE GAME IS OVER. YOU ARE OUT OF CASH.":END
130 PRINT "WHAT IS YOUR BET?":INPUT BET
140 IF DOLLARS < BET THEN PRINT "YOU ONLY HAVE $"DOLLARS" TO BET,"NAMES$:GOTO130
150 YOURCARD=0:YURSUIT=0
```

```
160 PLAYERS$=NAMES$
170 GOSUB300
180 YOURCARD=CARD:YURSUIT=SUITS
190 PLAYERS$=" THE COMPUTER"
200 GOSUB300
210 IF CARD > YOURCARD THEN GOTO 240
220 IF CARD = YOURCARD THEN PRINT "A TIE!":GOTO100
230 PRINT NAMES$ " WINS": DOLLARS = DOLLARS + BET:GOTO100
240 PRINT "THE COMPUTER WINS": DOLLARS = DOLLARS - BET:GOTO100
290 REM
300 REM *** SUBROUTINE TO DRAW THE CARDS ***
310 CARD = INT(RND(5)*13)+2: SUIT = INT(RND(5)*4)+1
320 IF CARD = YOURCARD AND SUIT = YURSUIT THEN
  300: REM NO IDENTICAL DRAWS
330 IF CARD < 11 THEN CARDS$(CARD) = STR$(CARD)
340 PRINTPLAYERS$ " DRAWS THE " CARDS$(CARD) " OF " SUITS$(SUIT)
350 RETURN
490 REM
500 REM *** DATA TABLE ***
510 DATA JACK,QUEEN,KING,ACE
520 DATA CLUBS,DIAMONDS,HEARTS,SPADES
```

Program 2: For Atari, make these substitutions to Program 1.

```
20 DOLLARS = 500:DIM NAMES$(20),PLAYERS$(20)
70 DIM CARDS$(14*5),TS$(10):FORI=11 TO 14:READT$:CARDS$(I*5-4,I*5)=T$:NEXTI
80 DIM SUITS$(8*4):FORI=1TO4:READT$:SUITS$(I*8-7,I*8)=T$:NEXTI
330 IF CARD < 11 THEN T$=STR$(CARD):GOTO340
335 T$=CARDS$(CARD*5-4,CARD*5)
340 PRINTPLAYERS$ " DRAWS THE "T$;" OF ";SUITS$(8*SUIT-7,SUIT*8)
510 DATA JACK ,QUEEN,KING , ACE
520 DATA CLUBS ,DIAMONDS,HEARTS , SPADES
```

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It's sometimes a challenge, but very good games can be written for computers with small amounts of free memory. If you're programming on an unexpanded VIC, Atari, Sinclair, or pocket computer or any other system with few bytes of RAM, these suggestions are worth remembering.

Programming Games On Computers With Limited Memory

Charles Brannon, Editorial Assistant

One of the most valuable elements of a computer system is its volatile memory, RAM. This "workspace" holds the program you're working on, its variables, and even the screen display and "system software." Managing memory efficiently becomes vital when writing games of any complexity.

There are many programming tricks you can use to save memory. The following list contains some of my favorite techniques – and many more can be intuited:

- **Emphasize color and change.** Any kind of movement will generate excitement. And don't forget sound. Sound effects can add sparkle to your program very economically. Most computers use no extra memory for sound. Various combinations of FOR/NEXT loops usually suffice for simple, yet pleasing, sound effects.

- **Use "keyboard" graphics, or low-resolution graphics, imaginatively,** and you can save thousands of bytes more than when you use a high-resolution screen. Remember that color changes are as important as movement to stimulate the eye.

- **Abbreviate text and prompts.** Avoid using players' names. Use their initials if possible. Unless unfeasible, never put written instructions into a program. Don't overuse strings, especially when a little math will permit the use of numeric variables. Both of these statements will extract the rightmost character of a number:

```
A = VAL(RIGHT$(STR$(N),1))
```

```
A = 10*(N/10-INT(N/10))
```

- **Limited RAM does not permit the luxury of easy-to-follow programs.** Use REM statements sparingly (or not at all), to document subroutines or obscure program segments. You can write in

REM statements on a paper listing of your program. Use short variable names (not applicable to Atari). If you use a long constant more than once, such as 3.1415927 for pi, define it as a variable (PI = 3.1415927). This technique can save six bytes per use on the Atari, even for simple constants like 0.

- **Compact program lines.** Each use of a colon can save from three to five bytes, depending on the computer. Don't use spaces when entering a program, unless your computer automatically deletes spaces (e.g., Atari BASIC) or unless they are necessary for proper interpretation.

- **Simplify coding.** If a certain routine or formula is used more than once, generalize it into a subroutine or defined function (DEF FN if your computer's BASIC has this command). Don't have long sections of IF/THEN statements. For example: you can use "boolean arithmetic" to reduce the space-wasting IF/THEN statement. Try this line on computer: PRINT 1 = 2. Your system should return with 0, indicating a "false" answer. Now try: PRINT 2*2 = 2 + 2. It should return either 1 or -1, meaning "true" (non-zero, 2*2 = 4 = 2 + 2). You can convert statements like:

```
IF A>0 THEN A = A-1
```

to:

```
A = A-(A>0), or A = A + (A>0)
if your computer returns a -1.
```

- **Program control can be simplified with statements like ON/GOTO.** Break your task into blocks. Each block performs a discrete task, and a given block can "call," or use, another block. Not only is this structured programming technique easier to use, but it also saves memory by encouraging you to develop tight, fast "blocks." A bonus is that you can often use these programming building blocks in other programs.

- **Don't overlook machine language.** It's well worth learning, and the benefits you reap in high speed, programming techniques, and overall efficiency can repay your effort many times. "Hybrid" programs of both BASIC and machine language let you enjoy the best of both worlds.

If worst comes to worst, you can use a technique called "chaining," where one program loads and runs the next. This technique is prone to problems and is awkward to use. On tape, the programs must be contiguous, and the second program can not return to the first. Nevertheless, chaining is valuable for "initialization" code such as loading character sets or machine language, displaying the game's rules at the start, or reading or defining variables (if your BASIC permits chained programs to share variables). Chaining permits you to run programs of almost any size.

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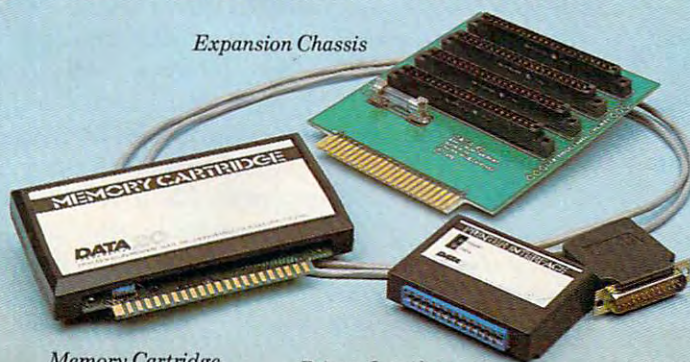
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Don't touch that dial! FM radio could do a lot more than provide background music while you're programming – when a new venture to broadcast software gets under way next year. "We're thinking about transmitting the Top Ten programs each month," says Stephen Wozniak, co-founder of Apple.

Tune In Software (On Your FM Radio)

Tom R. Halfhill
Features Editor

It's another late night and you're slaving over a hot computer, wearily wearing your fingers to the nubs typing in that huge program listing for "Space Marathon V. 98.6." Surely, in this age of computerization, there must be a better way, you think grumpily for the hundredth time. Meanwhile, you tune your FM radio to a favorite station for background music.

An idea strikes: what if you could download programs off the air, much like the way data is transmitted over phone lines between computers with modems?

Your brainstorm is too late. Somebody has already thought of it.

Starting in January – if plans go according to schedule – a pilot project will get under way in the Washington, D.C.-Baltimore area. Computer programs will be broadcast over the FM airwaves by National Public Radio stations into the homes and businesses of charter subscribers. The programs (and other digital information) will be decoded by special "radio modems" leased for a monthly fee, and fed directly into computers, terminals, or printers – maybe even while the subscribers sleep. Six months after this test project, plans call for the service to expand nationally, bouncing the signals off a satellite to all cities reached by NPR stations.

The operation will be run by INC Telecommunications, a newly formed partnership between the nonprofit NPR network and the National Information Utilities Corporation (NIU), a supplier of telecommunications services and information products. The joint venture brings together two vital components: NPR's satellite transmission network and NIU's telecomputer hardware.

NPR, known for its news ("All Things Con-

sidered"), educational programs, and classical and jazz music, broadcasts over a national network of 267 FM stations by leasing 12 channels on Westar IV, a Western Union communications satellite. The new service will take advantage of this same network. NIU is contributing the technology for encoding and decoding the data into radio signals, including the small "radio modems" which subscribers will lease.

For Business And Home

Although the system is designed to have wide business applications, in some cases replacing the use of phone lines for beaming computer information throughout the country, INC is playing up the home applications, too. Significantly, two backers of INC are Stephen Wozniak – co-founder of Apple Computer – and Jack R. Taub, founder of the Source Telecomputing Corporation, which owns The Source. The Source is one of the major information utilities for personal computerists with phone modems. Taub started NIU in 1981. Wozniak is helping on the software end, putting together the programming which will attract home subscribers.

Already they are talking about such things as the "Video Game of the Week." We might even see a new definition of radio's traditional "Top 40": tomorrow's "hit list" may well be the most popular computer programs instead of records. It could open up a huge new market for the cottage software industry, provide specialized information for certain groups of subscribers, and possibly even reduce software prices by drastically cutting distribution costs.

"Wozniak is really excited about this as a way of getting the prices of software down so people are less inclined to steal it," says Jack Ault, president of NIU. "He thinks we can get the software down to the point where it is so inexpensive that it will be actually cheaper and easier for the person to download it at home than to go out and pirate it. Plus you would get all the support inherent in that."

The Little Black Box

The key to the system is what Ault calls a "radio modem," a book-sized black box linking personal computers and terminals to the airwaves. Actually, the box is not a true "modem," which means "modulator-demodulator," a two-way device. The radio modem is strictly a one-way device, a demodulator. Crammed into the eight-inch by four-inch by two-inch deep box with the demodulator is an FM subcarrier receiver controllable from the point of transmission. It's very much like the black boxes leased to subscribers by certain pay-TV stations known as "super TV."

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puter at the transmission source. For example, if subscribers to these "super TV" services pay an extra fee to watch a championship boxing match, the station remotely activates their black boxes – and no one else's – for the duration of the fight. Everyone else gets a scrambled signal. The same thing can be done with the new computer service: highly specialized software and data can be broadcast to only those customers who are interested in receiving it (and in paying for it). Subscribers would receive only the programs or data they have subscribed to.

Because the radio modem is controllable from the transmission point, unattended reception is possible, too. As Ault envisions it, someday the radio modem will be left on 24 hours a day. Just before a transmission is sent to a certain group of subscribers, a signal is broadcast to their modems which switches on their computers or terminals. After the information is received and stored on disk or printed out, another signal is broadcast to turn off the devices. It could all happen while a subscriber sleeps.

The radio modems, now at the working prototype stage, have RS-232 interfaces to be compatible with practically any computer or terminal. Ault says an IEEE-488 interface is in the works, too. The modem includes a buffer memory to temporarily store incoming information, so it will work not only with computers and smart terminals, but also with dumb terminals and stand-alone printers. The modems will be leased, not sold, and will be serviced by INC Telecommunications at regional service centers.

If you're worried about losing your favorite NPR programs to an unintelligible stream of digitally encoded bleeps, don't be. The computer transmissions will be inaudible to regular FM radio listeners. The new service will broadcast on a "sub-carrier," an unused portion of the frequency band assigned to each NPR station. Some NPR stations, for example, now use subcarriers to broadcast special programming for the blind. The new service uses a different subcarrier and will not displace this programming.

Tuning In To VisiCalc

What sorts of services can we expect from INC? Just about everything, it seems. Ault points out that the system can distribute data on a regional, as well as national, basis.

Businesses and the government can lease time to transmit data to remote offices throughout the country, bypassing costly phone lines. Businesses could also subscribe to receive specialized business news and stock reports. School systems could sign up to receive special educational software and

information. Home computer users could subscribe to get the programs and information that interest them. It seems that INC is aiming to do for telecomputing what cable is doing for television: providing a selection of subscription services for specialized audiences.

Wozniak foresees a big future in the mass distribution of software directly to homes and businesses. People could sign up to buy word processing packages or *VisiCalc* over the air, and even games. He thinks this could slash software prices by reducing the packaging and distribution costs, and also by piling up massive sales in a very short time. Instead of selling a program the usual way for \$200, it could be offered to INC subscribers for \$50. If 10,000 subscribers signed up, the software producer would reap \$500,000 – in one day, and without packaging or shipping a single disk.

As a bonus, revisions and patches for bugs could be transmitted at very little cost to everyone who bought the original program, says Wozniak. Demo versions of programs could even be transmitted as advertisements. Video game fanatics could subscribe to the "Game of the Week" and be assured that they're the first on the block to get every new release.

"We're thinking about transmitting the Top Ten programs each month, plus maybe another 100 of the lower-end, lesser-known programs," says Wozniak. "My concept of it is that perhaps all 100 programs that are transmitted every month are sent each day. So users who perhaps don't have much memory could save a few different programs each day of the month, try them out, and decide whether to keep them or not."

That ought to satisfy even the most brain-fried video game freaks.

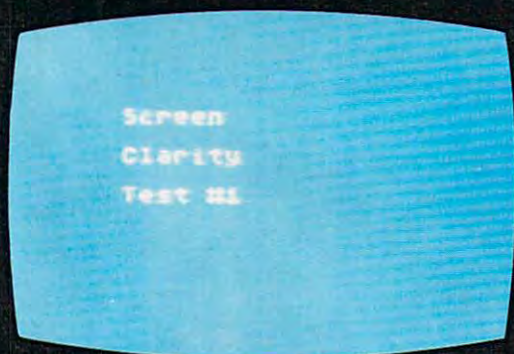
How Much Will It Cost?

At this point, you're probably wondering how much it will cost to subscribe to this new service. The answer isn't clear yet. Wozniak speculates that the monthly subscription fee might be something like \$20 to \$50. INC's backers promise it will be cheaper than mass downloading of programs and information over phone lines from existing utilities such as The Source or CompuServe. Their argument is that a one-way system is inherently cheaper than a two-way system. Anyway, they say, INC is intended to complement, rather than compete with, the phone-linked information utilities. Each system has its own applications. The INC system, which is described as "point-to-multipoint" instead of "point-to-point," is better suited to mass distribution than the phone-line systems.

"There's no way 100,000 people could tie up 100,000 phone lines downloading something from

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The Source," explains Wozniak.

In other words, by its nature, the new service will share all the advantages that mass telecommunications media have over single-channel communications lines. It's more efficient for a radio station to broadcast the news at once to thousands of listeners than it is to individually call up those people on the telephone and tell them what's happening.

"It's such a simple and efficient system, and so obvious, in fact, that you wonder why it hasn't been done before," says Wozniak. "Maybe it just makes

too much sense. Sometimes things that make good sense are so obvious that nobody sees them."

Care to doubt this reasoning? Just remember, Wozniak took another obvious idea in his garage a few years ago and put together the Apple I computer – which made him a millionaire. He thinks the INC service could prove equally popular. So popular, in fact, that he doesn't see the need for a big push to sell the new service to consumers.

"I don't think that'll be necessary, not once word gets around. It'll catch on, just like The Source caught on."

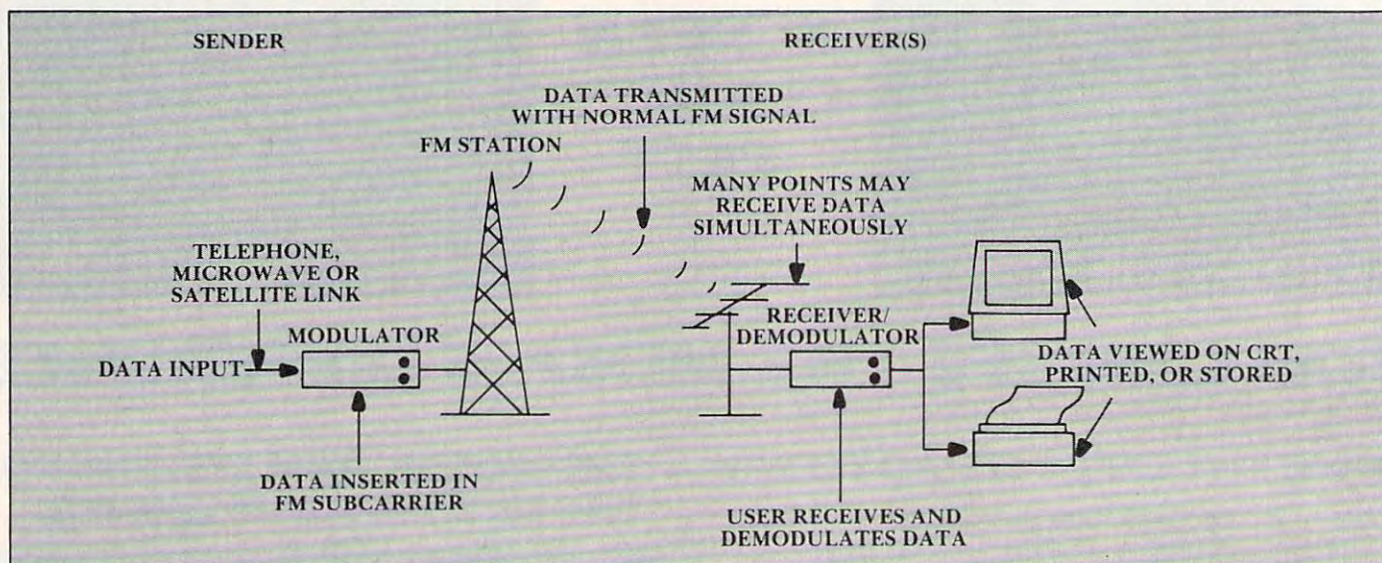


Figure 1. FM SCA Subcarrier Data Delivery – local FM stations are the final link in the transmission.

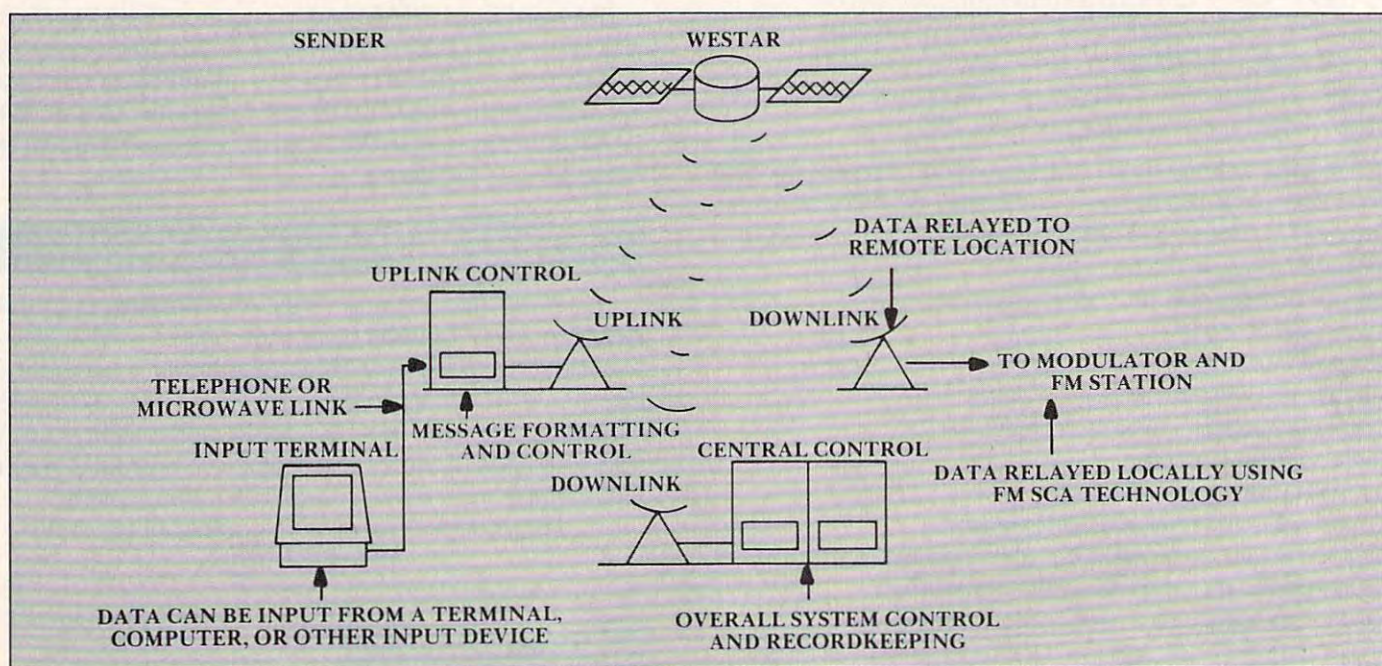


Figure 2. Using a satellite network with the FM SCA Subcarrier System brings a computer program through space to your computer.

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Meteor Storm

Emil Engels
Springfield, VA

In "Meteor Storm," the player must navigate his ship through a dense space disturbance. The player's ship, remaining at the top of the screen, is maneuvered left and right by pressing the (4) and (6) keys, respectively. The player's ship is equipped with a laser, fired by pressing the (F) key. The laser is capable of destroying meteors (10 points each). Hyperspace can be entered by hitting the SPACE bar and can be left by pressing any other key; while in hyperspace, the ship is invulnerable, but no points are awarded. The difficulty factor can be selected by the player, and the game's high score and high scorer are recorded by the computer.

One of the most interesting features of the program itself is the use of scrolling. A random line of meteors is PRINTed at the bottom of the screen at the beginning of each game cycle. This scrolls all the other lines of meteors up one line. (It also scrolls the ship off the screen. The ship is, however, immediately rePOKEd into position.) The effect of this scrolling is that the ship appears to move down through the meteor storm.

Program 1: PET/CBM Version

```

5 GOSUB78
6 PRINT"{DOWN}          GAME BEGINS IN 5 SECOND
   S{UP}"
7 FORSEC=300TO1STEP-1
8 IFSEC/60<>INT(SEC/60)THEN10
9 PRINT"          GAME BEGINS IN";SEC/60;"SECON
   DS{UP}"
10 NEXTSEC
11 B=32786:C=32787:D=32788
12 AS(0)="  Q      Q Q Q Q Q Q      Q Q
   Q "
13 AS(1)="Q  Q Q Q      Q  Q Q Q Q      Q
   Q Q Q"
14 AS(2)="  Q      Q Q      Q Q Q Q      Q Q Q
   Q "
15 AS(3)="  Q Q Q      Q      Q Q Q Q      Q Q
   Q Q"
16 AS(4)="  Q Q      Q Q      Q Q      Q Q Q Q
   Q Q"
17 AS(5)="Q  Q Q      Q Q Q Q      Q      Q Q Q
   Q "
18 AS(6)="  Q Q Q Q Q      Q      Q Q Q Q
   Q "
19 AS(7)="  Q      Q Q Q      Q Q      Q Q Q Q
   Q "
20 AS(8)="Q      Q Q      Q Q Q Q      Q Q
   Q "
21 AS(9)="  Q      Q      Q Q Q Q      Q Q Q
   Q "
22 PRINT"{CLEAR}{24 DOWN}";
23 A=INT(RND(1)*10)
24 PRINTA(A)
25 IFHY=1THENPRINT:PRINT:RETURN
26 GOSUB33:REM*SHIP CONTROL*
27 PRINT
28 GOSUB33:REM*SHIP CONTROL*
29 IFPEEK(B+40)=81ORPEEK(C+40)=81ORPEEK(D+40)
   =81THENPRINT:GOTO58
30 PRINT
31 GOSUB33:REM*SHIP CONTROL*
32 GOTO23
33 POKEB,79:POKEC,22:POKEB,80

```

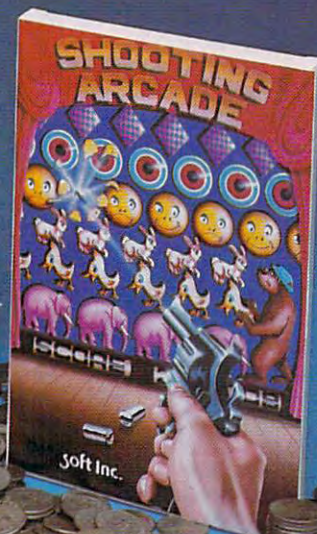
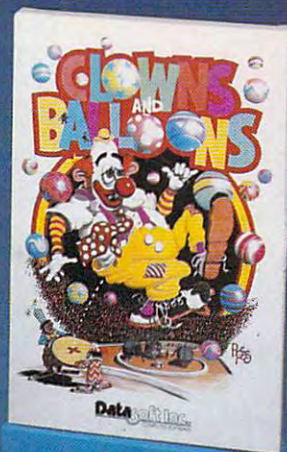
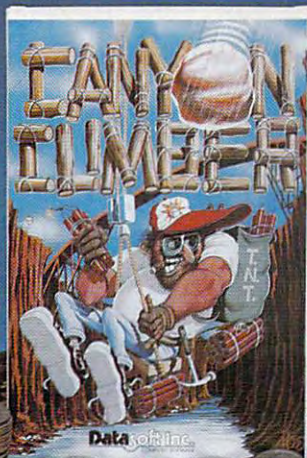
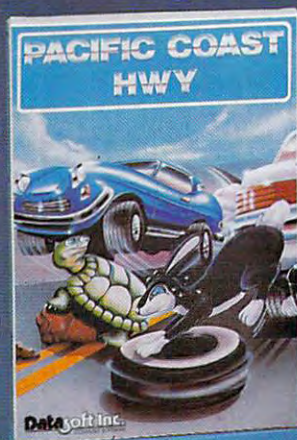
Atari Notes

The Atari version of Meteor Storm, 4.5K in length with all REM statements removed, can barely squeeze into an 8K Atari 400. But it will not run without some code shortening and simplification, since only 5.3K of memory is free on an 8K Atari, and the program reserves additional space for strings and player/missile graphics.

After the game starts, you will see a flashing arrow at the bottom center of the screen. Move it with the joystick to select game difficulty. Moving it to the right makes the game harder; moving it left, easier. This provides about 40 skill levels. After you press the trigger button to select the difficulty, your player – a glowing, wedge-shaped, missile-firing spaceship – will appear at the bottom of the screen facing an

onslaught of descending meteors which scroll from top to bottom. Your only defense is your laser cannon, which is fired with the trigger button. Move your ship left and right with the joystick, evading meteors, and fire on any meteors in your path. You get one point for each meteor hit. If all else fails, and destruction seems imminent, push the joystick forward to enter hyperspace. The meteor field will scroll at high speed, but your ship will be invisible, safe from the meteors. Pull back on the joystick to return from hyperspace. This is no small feat, since you must try to come out of hyperspace into an area free of meteors. Once you've tried hyperspace, you'll see why it's the move only of a desperado. Another feature allows high-scoring players to enter their initials. But you'd better be good – you have only one chance!

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```

34 IFT>1000ANDJ>11THENT=T-1000:J=J-1
35 FORE=1TO5
36 GETB$
37 FORF=1TOJ:NEXTF
38 IFB$<>" "THEN40
39 NEXTE
40 IFB$="F"THEN46
41 IFB$=" "THEN55
42 IFB$="4"ANDB>32768THENB=B-1:C=C-1:D=D-1
43 IFB$="6"ANDD<32807THENB=B+1:C=C+1:D=D+1
44 POKEB,79:POKEC,22:POKED,80
45 T=T+5:SCO=SCO+5:RETURN
46 H=C+40
47 FORG=1TO24
48 IFPEEK(H)=81THENPOKEH,32:SCO=SCO+10:T=T+10
   :RETURN
49 POKEH,93
50 FORI=1TO10:NEXTI
51 POKEH,32
52 H=H+40
53 NEXTG
54 RETURN
55 HY=1:GOSUB23
56 GETB$:IFB$=" "THEN55
57 HY=0:GOSUB23
58 POKEB,32:POKEC,32:POKED,32
59 POKEB+39,79:POKEC+40,22:POKED+41,80
60 FORI=1TO250:NEXTI
61 POKEB+39,32:POKEC+40,32:POKED+41,32
62 POKEB+78,79:POKEC+80,22:POKED+82,80
63 FORI=1TO250:NEXTI
64 POKEB+78,32:POKEC+80,32:POKED+82,32
65 POKEB+117,79:POKEC+120,22:POKED+123,80
66 PRINT"{HOME}{09 DOWN}{07 RIGHT}O#####
   #####P"
67 PRINT"{07 RIGHT}% YOUR SCORE:      '1
   2 LEFT}";SCO
68 IFSCO>HSTHENINPUT"{07 RIGHT}% INITIALS ~
   '{14 LEFT}";HSI$
69 HSI$=LEFT$(HSI$,3)
70 IFSCO>HSTHENHS=SCO
71 PRINT"{07 RIGHT}% HIGH SCORE:      '1
   2 LEFT}";HS;HSI$
72 PRINT"{07 RIGHT}%
   "
73 PRINT"{07 RIGHT}% ANOTHER GAME?(Y OR N)T"
74 PRINT"{07 RIGHT}%L$$$$$$$$$$$$$$$$$$$$"
75 GETDE$:IFDE$=" "THEN75
76 IFDE$="N"THENPRINT"{CLEAR}";:END
77 A=0:B=0:C=0:D=0:E=0:F=0:G=0:H=0:I=0:J=0:T=
   0:SCO=0:GOTO7
78 PRINT"{CLEAR}{04 DOWN}"
79 PRINT"      *** METEOR STORM ***{DOWN}
   "
80 PRINT"      YOUR MISSION IS TO NAVIGATE"
81 PRINT"      YOUR SHIP THROUGH A FIERCE"
82 PRINT"      METEOR STORM . MOVE LEFT BY"
83 PRINT"      PRESSING <4>,RIGHT BY PRESS-"
84 PRINT"      ING <6>,AND FIRE BY PRESSING"
85 PRINT"      <F> . SHOOTING A METEOR IS"
86 PRINT"      WORTH 10 PTS . YOU MAY ENTER"
87 PRINT"      HYPERSPACE BY PRESSING THE"
88 PRINT"      <SPACE> KEY . LEAVE HYPER-"
89 PRINT"      SPACE BY PRESSING ANY OTHER"
90 PRINT"      KEY."
91 PRINT"{DOWN}      DIFFICULTY FACTOR:I
   NPUT"      (1-40/HARD-EASY)";J
92 IFJ<10RJ>40THENPRINT"{03 UP}";:GOTO91
93 RETURN
120 DIM A$(20),B$(200),C$(4),I$(3):IN
   IT=0
130 C$="{0}{0}{0}{0}":REM Characters us
   ed for explosion
140 GOSUB 750:REM INITIALIZATION STUF
   F
150 SCR=0:POKE 53248,0:POKE HITCLR,25
   5:REM Reset collision register
160 POKE 752,1:POKE 82,0:REM Turn off
   cursor and set left margin to ze
   ro
170 SETCOLOR 1,1,12:REM COLOR 2 Gold
180 POKE 87,1:REM Set printing regist
   er to mode 1 (default)
190 R=INT(10*RND(0)):REM Pick a set o
   f dots
200 A$=B$(R*20+1,R*20+20)
210 POSITION 0,2: ? #6;A$;:REM Display
   it
220 REM "POKE 87,0" fools OS into thi
   nking that mode 1 is mode 0. All
   ows cursor control.
230 POKE 87,0:POSITION 0,1: ? CHR$(157
   );:REM PUSH IT DOWN (INSERT LINE)
   TO PERFORM REVERSE SCROLL
240 IF STICK(0)=13*HYP THEN HYP=0:POK
   E 53248,ZP:POKE HITCLR,255:POSITI
   ON 4,0: ? #6;"meteor storm":GOTO 1
   70
250 REM High-speed repeat if in hyper
   space mode
260 IF HYP THEN POKE 709,PEEK(53770):
   GOTO 180
270 REM GO INTO HYPERSPACE IF STICK I
   S UP (SOUND SUBR.)
280 IF STICK(0)=14 THEN POKE 53248,0:
   GOSUB 710:GOTO 180
290 REM Following formula will either
   add or subtract two from the
300 REM current horizontal position,
   ZP, unless such move will place c
   ursor out of range
310 REM (PTRIG is used to return 1 an
   d -1 for horizontal joystick moti
   on)
320 ZP=ZP-2*PTRIG(1)*(ZP>44)+PTRIG(0)
   *(ZP<200)*2
330 REM Update horizontal position
340 REM Location 53770 generates a ra
   ndom # from 0-255. Used to rapid
   ly change Player 0 (704) color.
350 POKE 53248,ZP:POKE 704,PEEK(53770
   )
360 IF PEEK(PFF) THEN 550:REM CHECK F
   OR COLLISION
370 IF STRIG(0)=0 THEN POKE 704,68:GO
   SUB 400:REM Fire missile
380 IF PEEK(20)<DIF THEN 320:REM Chec
   k for time delay
390 POKE 20,0:GOTO 180:REM Scroll and
   ther set of "meteors"
400 REM SHOOT MISSILE
410 MP=(ZP-44)/8:REM Calculate mode 1
   horizontal position (0-19) from
   P/M position (0-255)
420 PP=PEEK(88)+256*PEEK(89)+440+MP:R
   EM PP is location in screen RAM t
   o start missile from
430 REM Location 88/89 contains locat
   ion of upper left corner.
440 POKE 53761,47:REM SOUND 0,?,2,15
   used for high-speed sound POKES

```

Program 2: Atari Version

```

110 HITCLR=53278:PFF=53252:REM P/M CO
   LLISION REGISTERS

```




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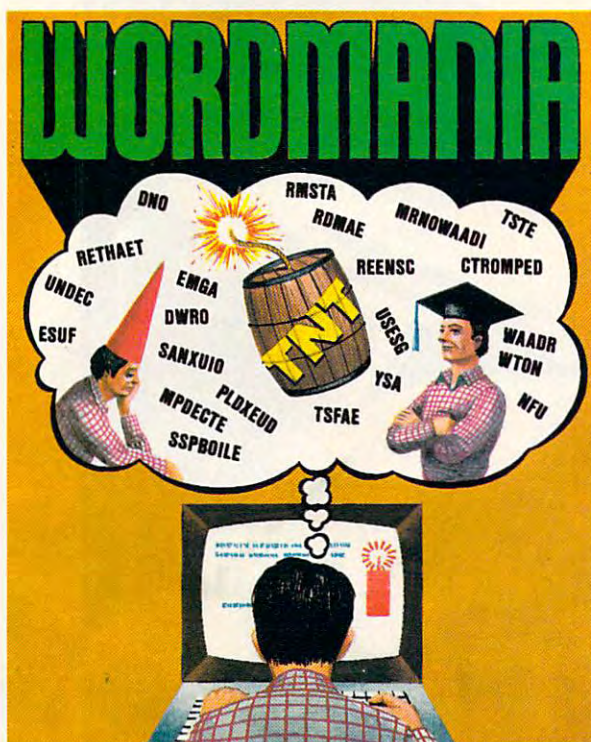
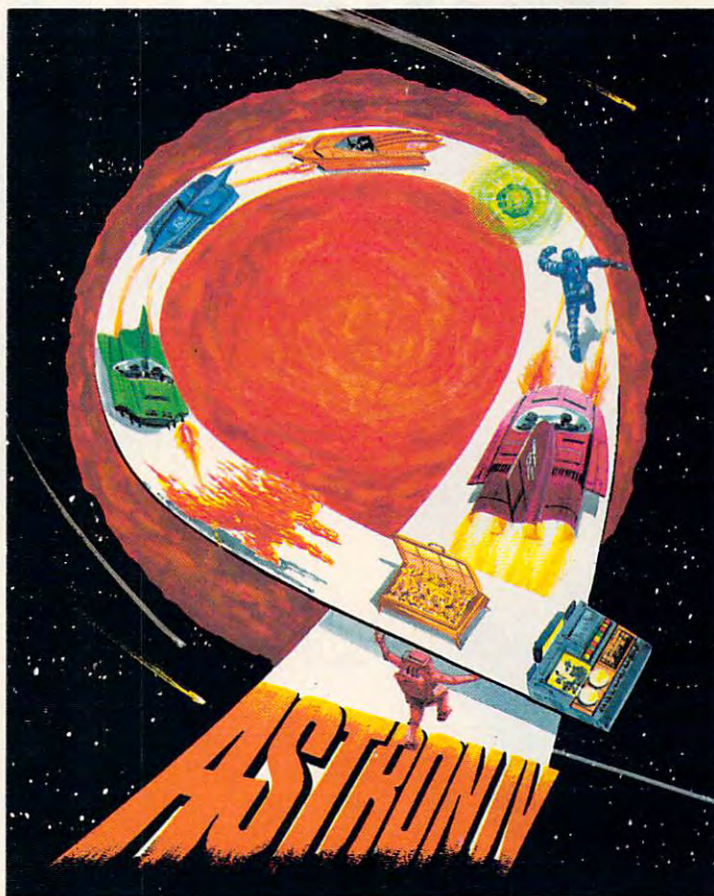
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```

450 FOR I=2 TO 18 STEP 2:NP=PP-20*I:R
    EM Next Position
460 POKE 53760,I*10:REM Make sound
470 P=PEEK(NP):POKE NP,154:POKE NP-20
    ,90
480 REM If missile hit something (P<>
    0, SPACE) then do explosion
490 IF P<>0 THEN I=20:POKE NP-20,0:FO
    R W=1 TO 100 STEP 10:POKE 53760,W
    :K=K*(K<4)+1:POKE NP,ASC(C$(K)):N
    EXT W
500 REM If score divisible by ten, in
    crease difficulty
510 IF P<>0 THEN SCR=SCR+1:IF SCR/10=
    INT(SCR/10) THEN DIF=DIF+2:IF DIF
    <0 THEN DIF=0
520 NEXT I:OP=0:FOR I=PP TO NP-20 STE
    P -20:POKE I,OP:NEXT I:REM ERASE
    "MISSILE" CHARACTERS
530 SOUND 0,0,0,0:POKE 87,1:POSITION
    7,1:? #6;SCR:REM UPDATE SCORE
540 RETURN
550 REM COLLISION
560 REM Essentially reads in "shape"
    data to draw 10 "explosion" scene
    s
570 REM in place of player.
580 RESTORE 610:T=PMBASE+616
590 FOR I=1 TO 10:POKE 704,INT(16*RND
    (0))*16+14:SOUND 0,I*10,8,10-I
600 FOR J=0 TO 3:READ A:POKE T+J,A:NE
    XT J:NEXT I
610 DATA 0,0,24,60,0,0,60,126,0,24,52
    ,90,16,74,32,90,145,68,16,66,65,8
    ,129,0,69,8,0,0,0,129,4,0,0,0,129
    ,4,0,0,0,4
620 POKE 53248,0:POKE 53277,0
630 FOR I=100 TO 255 STEP 5:SOUND 0,I
    ,12,8:FOR W=1 TO 10:NEXT W:NEXT I
    :SOUND 0,0,0,0:REM Sad sound
640 IF SCR<HI THEN 690:REM Check for
    high score
650 GRAPHICS 2+16:SETCOLOR 4,9,4:SETC
    OLOR 2,1,10:SETCOLOR 0,3,12:POSIT
    ION 2,0:? #6;"congratulations!"
660 POSITION 0,2:? #6;"NEW HIGH SCORE
    ";SCR:HI=SCR
670 POSITION 0,6:? #6;"ENTER YOUR NAME
    HERE":POSITION 8,8
680 I$="":CLOSE #1:OPEN #1,4,0,"K":F
    OR J=1 TO 3:GET #1,A:I$(J)=CHR$(A
    ):? #6;CHR$(A);:NEXT J
690 GOTO 130
700 REM TYPE SCREEN
710 FOR I=255 TO 0 STEP -1:SOUND 0,I,
    12,8:POKE 711,PEEK(53770):NEXT I:
    POKE 711,70
720 SOUND 0,0,0,0:FOR I=1 TO 5:SETCOL
    OR 4,4,4:FOR W=1 TO 50:NEXT W:SET
    COLOR 4,0,0:FOR W=1 TO 50:NEXT W:
    NEXT I
730 POSITION 3,0:? #6;" hyperspace "
    :HYP=1:RETURN
740 RETURN
750 GRAPHICS 17:PMBASE=256*(PEEK(106)
    -8):POKE 89,PEEK(89)-8:? #6;"
    (CLEAR)":POKE 89,PEEK(89)+4:GRAPH
    ICS 17
760 SETCOLOR 4,1,12:POSITION 4,2:? #6
    ;"METEORSTORM"
770 REM MOVE PLAYER OFF SCREEN (53248
    IS HORIZ. POSITION)

```

```

780 POKE 53248,0:FOR J=0 TO 9
790 POSITION 1,21:? #6;"easy <--":POSITION 12,21:? #6;"--> RECE":IF IN IT THEN 890
800 POSITION 5,11:? #6;"PATIENCE..."
810 REM Generate ten meteor patterns
820 FOR J=0 TO 9
830 A$="{20 SPACES}"
840 FOR I=1 TO 20:POKE 710,PEEK(53770)
850 IF RND(1)>0.7 THEN A$(I,I)=CHR$(142):REM 0.7 is density of meteors from 0 (all meteors) to 1 (no meteors)
860 NEXT I
870 B$(J*20+1)=A$
880 NEXT J:INIT=1
890 REM SETUP,PMBASE,PMBASE
900 POKE 54279,PMBASE/256
910 POKE 559,46:POKE 53277,3:POKE 53256,1
920 RESTORE 930:FOR I=0 TO 3:READ A:POKE PMBASE+616+I,A:NEXT I
930 DATA 8,28,62,28
940 ZP=124:POSITION 2,11:? #6;"SELECT DIFFICULTY":SETCOLOR 2,0,14
950 POKE 53248,ZP:POKE 704,PEEK(53770)
960 ZP=ZP-2*PTRIG(1)*(ZP>40)+PTRIG(0)*(ZP<200)*2
970 IF STRIG(0) THEN 950
980 DIF=(160-(ZP-40))/4:REM CALCULATE DIFFICULTY
990 ZP=124:? #6;CHR$(125)
1000 POSITION 3,0:? #6;"meteor storm":POSITION 1,1:? #6;"SCORING=0":POSITION 12,1:? #6;"HI ";HI:POSITION 16,0:? #6;I$
1010 REM POKE PMBASE+619,127 MAKES "ARROW" INTO "WEDGE"
1020 POKE 704,106:SETCOLOR 4,0,0:POKE PMBASE+619,127:RETURN

```



Meteor Storm – Atari version

Do you have a mixed-up Rubik's Cube sitting around? Your computer can tell you how to solve it step-by-step. There are versions of the solution here for PET/CBM and Atari – it requires 16K RAM memory. The author will make a tape copy (for Commodore machines only) for \$3 if you don't want to type it in.

Rubik's Cube Solved

Dieter Kuespert
Glendale, AZ

Here is a general solution for the problem of the Rubik's Cube. It absolutely does not matter what the combination of colors is on your cube when the program is started. There are differently designed cubes on the market having a variety of color combinations on the various planes.

The only deviation from the generality is the requirement that you use the letter "W" for white. If this is not done, the program assumes a wrong input. There is this required initial condition under all circumstances:

White has to be in the middle of the upper plane! Throughout the whole procedure it is mandatory that only single slices are turned, never the cube as a whole.

The program has been written in BASIC only. It is for use with a PET/CBM computer. As, however, no unusual program techniques are used, it could not cause any difficulties to adapt it to other Microsoft computers. Due to its generality, it was not possible to fit the program into 8K of memory. It takes about 14K instead, which permits use of a 16K computer.

At the start the program requests the color combination of the cube as it exists. A question mark appears in the respective field for which the first letter of the relevant color has to be keyed in. This has to be done carefully, as no correction is possible except to restart the program from the beginning. In practice it has proven unnecessary to provide a correction routine. The cube is displayed as if it were folded open. The letter "W" is also displayed as a reminder. It is easy to assign the fields to the cube accordingly.

After input of the last letter, the program starts to check for the fields of the white plane, which will appear on top of the cube after the appropriate instructions have been executed.

The cube will subsequently be solved in slices from top to bottom. The number of necessary moves is not optimized because this would require more than 16K of memory. Therefore, in order to find a field of a certain color, you are asked to turn slices until this color appears at a certain spot which is the only one checked every time. This will require some additional moves.

The subroutines necessary for keeping track of all fields are grouped at the end of the program. There is one for each kind of turn. The display of the required turn is connected to the exchange routine. After the display is on the CRT, the exchange is performed by the program. At the same time the plane of the actual cube is turned by the player. Thus the time is used in an optimal way. After the cube is solved, the computer so indicates.

As this is a rather long program, I am willing to save you the boring work of typing all those GOSUBs. Just send a tape or disk and \$3 for a copy. (PET/CBM machines only.) Don't forget to include a self-addressed, stamped mailer.

Dieter Kuespert
4333 W. Sandra Circle
Glendale, AZ 85308

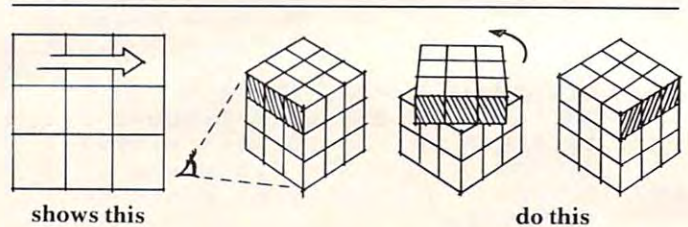


Figure 1: With the arrow pointing right on the top slice, rotate one turn as shown.

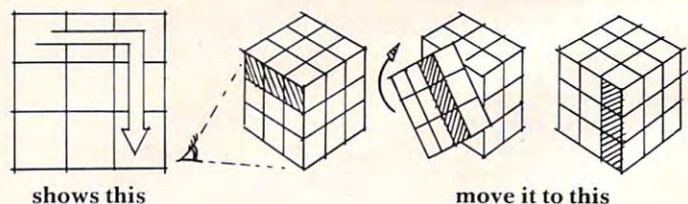
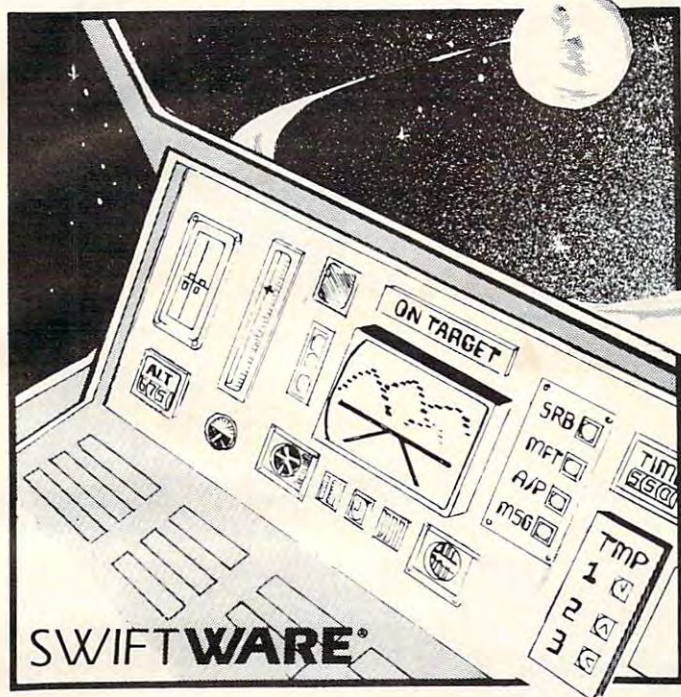


Figure 2: A curved arrow means rotate the front or rear face once in the direction of the arrow.

PET Version

```
150 CLR:DIMA$(9),B$(9),C$(9),D$(9),E$(9)
160 PRINT"{CLEAR}{03 DOWN}THIS PROGRAM SOLVES ~
    ANY RUBIK'S
170 PRINT"{DOWN}CUBE. THE ONLY CONDITION IS :
180 PRINT"{DOWN}{REV}WHITE HAS TO BE IN THE MI
    DDLE OF THE
190 PRINT"{DOWN}{REV}UPPER PLANE.
200 PRINT"{02 DOWN}ALWAYS KEEP IN MIND TO TURN
```


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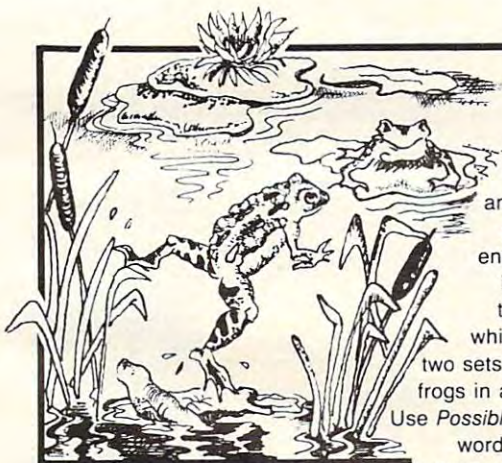
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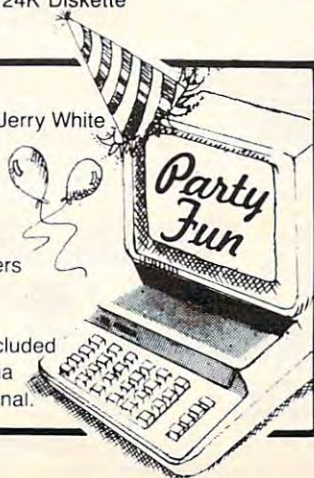
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Also available from JV Software:

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16K Tape or 24K Disk, \$22.95



PREPPIE

By Russ Wetmore from Adventure International
Okay, Preppie: I dare you to cross that alligator-filled river and recover your golf ball. Remember, danger lurks everywhere, from speeding golf carts to monster frogs. With 28 colors and loud sound to match your madras coat. Even the not-so-preppies in your set will love it! 1 or 2 players; multiple skill levels; joystick required.

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BATTLE OF SHILOH

From Strategic Simulations
The first wargame for the Atari! Now Civil War buffs can engage in a realistic simulation of a major battle. Marching through the war-torn countryside, strategically using the forests, creeks, hills for defense, you recreate every facet of the battle on a hex-grid map. If you had been in charge, would we still be whistling "Dixie"? 1 or 2 players.

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AIR TRAFFIC CONTROLLER

By David Mannering from Creative
Wonder if the air traffic controllers are really under stress? Want to see what all the fuss is about? This program will give you a taste of what goes on in those towers as you try to guide 26 aircraft safely through your airspace. This advanced version has five separate control areas from which to choose, as well as other enhancements.

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From Atari
Throw out your file boxes—use the Home Filing Manager instead! Now you can create, edit, print, store and retrieve your files with this one easy-to-use program. Great for organizing books, record albums, tools, antiques, stocks, addresses... and your computer programs.

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THRESHOLD

By Warren Schwader & Ken Williams
You, alone, can save the Earth Federation from the lawless aliens who roam our galaxy. Not only have these invaders been attacking our home planet—they're also raiding our space colonies! Space travel has become increasingly dangerous, as has friendly trade. But supplies must go through. As the pilot of the Federation fighter THRESHOLD, it's all up to you! High resolution graphics and sound plus "save the game" feature. Requires joystick.

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CLOWNS AND BALLOONS

From DataSoft by Frank Cohen
A huge bunch of balloons is stuck at the top of the circus tent. How do you get them down? By bouncing a clown on a trampoline, high enough to burst them, of course! You must break the balloons in order, one row at a time—if you miss any, the whole row fills up again. Aim your clowns where you want them by moving the trampoline to just the right position. 1 or 2 players; multi-skill levels; joystick or paddle required.

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THE COSMIC BALANCE

From Rapid Fire (SSI)
Design your own spaceship, then fight a battle with it to test your design on-the-spot. The goal is to create a ship that's powerful, fast, maneuverable—and armed with the most effective weapons—to tip the COSMIC BALANCE in your favor. 1 or 2 players; requires joystick.

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By Poole, McNiff & Cook from Osborne/McGraw-Hill Comprehensive, all-in-one guide for Atari 400/800 computers that is helpful to the beginning and advanced programmer. Complete operating instructions; detailed BASIC programming, including a handy alphabetical glossary of BASIC statements and functions; advanced BASIC; computer graphics; and tips on hardware, peripherals and compatible software.

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This new book is packed with games and ideas on how to create your own. You'll discover the special Atari capabilities of the keyboard, graphics, sound and color. The book provides an entertaining way to learn more about general programming, too.
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MASTER MEMORY MAP

From Santa Cruz Software
If you are serious about programming the Atari, this booklet could become one of your most important tools. A highly detailed map of the Atari's memory, it details thousands of locations and routines. Using this booklet makes easier the use of display list, player/missile, and interrupt graphics. The "Miscellaneous Notes" section contains a wealth of knowledge picked up by Santa Cruz in their explorations of the Atari. Also included are notes on the new GTIA graphics chip.

Softcover, \$6.95



KATIE AND THE COMPUTER

By D'ignazio; Illustrated by Gilliam from Creative
Delightful, full-color picture book about Katie, who falls into the land of Cybernia, inside her father's home computer. She learns how a computer works during her adventures with Colonel Software, the Bytes and a ferocious Program Bug. Ages 4 to 10.

Hardcover, \$6.95

6502 ASSEMBLY LANGUAGE SUBROUTINES

By Leventhal and Saville from Osborne/McGraw-Hill
If you're interested in using assembly language quickly, this book is ideal. It describes general 6502 programming methods, provides code for more than 40 subroutines to help you improve your programming skills, debug or revise an existing program; add instructions and addressing modes.

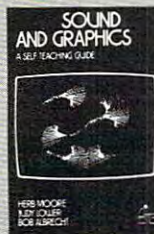
Softcover, \$15.99



ATARI SOUND AND GRAPHICS

By Moore, Lower and Albrecht from John Wiley
This self-paced, self-teaching guide will have you seeing and hearing things on your Atari in no time — even if you're a complete beginner. You'll learn to compose and play melodies, draw cartoons, create sound effects and games. Each section teaches something new in BASIC, the most commonly used computer language.

Softcover, \$9.95



PICTURE THIS! An Introduction to Computer Graphics for Kids of All Ages

By David D. Thornburg from Addison-Wesley
This book promises to become the "modern replacement for coloring books and crayons". It's a learn-by-doing manual that uses PILOT, a simpler language than BASIC, and Turtle Geometry to teach kids to create pictures in full color from simple lines to complex angles and curves. Recommended for use in conjunction with PILOT Cartridge.

Spiral-bound, \$14.95



ATARI ASSEMBLER

By Don & Kurt Inman from Reston
While the Atari Assembler Cartridge comes with an operating manual, it assumes that you already know assembly language. If you're new to the Atari or its 6502 processor, this book is a must. The Inmans guide you through the rudiments of this fascinating type of programming in clear, easy steps. Includes full listing and description of 6502 mnemonics and addressing modes. Recommended for use in conjunction with Assembler Cartridge.

Softcover, \$12.95



INSIDE ATARI DOS

By Bill Wilkinson from Compute
The comprehensive manual on the disk File Manager System (FMS), commonly known as Atari DOS 2.0S. Contains the only complete and official listing for the system, plus a full description of: the external view, charts & tables, various interfaces and functions of individual subroutines.

Spiral-bound, \$19.95



COMPUTERS FOR PEOPLE

By Willis and Miller from Dilithium
Do you need a computer for your business? Your home? Which one would be most useful? Which software should you consider? You don't have to be an electronics wizard to answer these questions... just read this book! It will guide the complete novice, step by step, to the selection of the best system for your needs.

Softcover, \$7.95



DE RE ATARI

From APX
Translated from Latin, the title of this book is "All About Atari" and it means what it says! Used in combination with Atari's Technical Reference Manual, advanced programmers will be able to learn to exploit the many hardware and operating system features that make the Atari 400/800 so tremendously versatile. Includes a useful discussion of the new GTIA chip. Once you know Atari BASIC and assembler, this book is a must.

Loose leaf
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COMPUTERS FOR KIDS

Atari Edition By Sally Larsen from Creative
The BASIC programming manual written for kids, from flowcharts to color graphics, including the sure-to-please program, "Scare Mom with an Elephant." Detailed instructions and sketches plus glossary of statements and commands. With lesson plans and tips for parents and teachers.

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By C.W. Engel from Hayden
A handbook of 12 simulation games including Art Auction, Starship Alpha, Monster Chase and Devil's Dungeon — each complete with listing, sample run, instructions and program documentation, including flowchart and ideas for variations.

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How To Follow The Computer's Instructions:

You must keep the same face of the cube towards you at all times. Start with white in the middle of the upper (facing the ceiling) face. As you make the moves, imagine that the cube is held firmly in a vice in *the same position* throughout. Rotate individual slices, but the whole cube stays in position from start to finish.

An "arrow" will appear on screen for each move, and you respond by turning the slice on which the arrow sits in the direction the arrow points. Turn one rotation only per move. (See Figure 1.) If the computer wants you to turn that slice three times, the arrow will reappear in the same place three times.

There are only two other possible moves: the front (the side closest to your body) and rear faces (the one furthest away from you). If a strange "curved" arrow appears, that means that you should rotate the entire front face *one move* in the direction the arrow curves. To perform the same move for the back side, the computer will announce that you should turn the rear side. The arrow will appear curved as it does for a front-side rotation. (See Figure 2.)

It sounds a little complicated, but it isn't when you get started. There are really only two different types of moves to make. The computer will wait until you have moved; then you hit a key, and it announces the next move.

```

ONLY THE
210 PRINT"{DOWN}DESIGNATED PLANES, NEVER THE W
    HOLE CUBE!"
220 PRINT"NOW INPUT THE COLORS OF ALL PLANES."
    :PRINT:PRINT:PRINT:PRINT
230 GOSUB5440
240 PRINT"{CLEAR}":FORJ=1TO3:GOSUB5350:NEXT
250 PRINT"{HOME}{04 DOWN}{03 RIGHT}{REV}W{OFF}"
260 PRINT"{HOME}{02 DOWN}";:K=1:GOSUB4070
270 FORI=1TO2:GOSUB4070:NEXT
280 PRINT"{HOME}{04 DOWN}";:GOSUB4070
290 FORI=1TO2:GOSUB4070:NEXT
300 PRINT"{HOME}{06 DOWN}";:GOSUB4070
310 FORI=1TO2:GOSUB4070:NEXT
320 PRINT"{HOME}{09 DOWN}";:K=1:GOSUB4080
330 FORI=1TO2:GOSUB4080:NEXT
340 PRINT"{HOME}{11 DOWN}";:GOSUB4080
350 FORI=1TO2:GOSUB4080:NEXT
360 PRINT"{HOME}{13 DOWN}";:GOSUB4080:
370 FORI=1TO2:GOSUB4080:NEXT
380 PRINT"{HOME}{09 DOWN}{08 RIGHT}";:K=1:GOSU
    B4090
390 FORI=1TO2:GOSUB4090:NEXT
400 PRINT"{02 DOWN}{06 LEFT}";:GOSUB4090

```

```

410 FORI=1TO2:GOSUB4090:NEXT
420 PRINT"{02 DOWN}{06 LEFT}";:GOSUB4090
430 FORI=1TO2:GOSUB4090:NEXT
440 PRINT"{02 RIGHT}{04 UP}";:K=1:GOSUB4100
450 FORI=1TO2:GOSUB4100:NEXT
460 PRINT"{02 DOWN}{06 LEFT}";:GOSUB4100
470 FORI=1TO2:GOSUB4100:NEXT
480 PRINT"{02 DOWN}{06 LEFT}";:GOSUB4100
490 FORI=1TO2:GOSUB4100:NEXT
500 PRINT"{02 RIGHT}{04 UP}";:K=1:GOSUB4120
510 FORI=1TO2:GOSUB4120:NEXT
520 PRINT"{02 DOWN}{06 LEFT}";:GOSUB4120
530 FORI=1TO2:GOSUB4120:NEXT
540 PRINT"{02 DOWN}{06 LEFT}";:GOSUB4120
550 FORI=1TO2:GOSUB4120:NEXT
560 PRINT"{HOME}{16 DOWN}";:K=1:GOSUB4110
570 FORI=1TO2:GOSUB4110:NEXT
580 PRINT"{02 DOWN}{06 LEFT}";:GOSUB4110:GOSUB
    4130
590 FORI=1TO2:GOSUB4110:NEXT
600 PRINT"{02 DOWN}{06 LEFT}";:GOSUB4110
610 FORI=1TO2:GOSUB4110:NEXT
620 IFA$(5)="W"THEN650
630 PRINT"{CLEAR}WRONG INPUT, {REV}W{OFF}HITE ~
    HAS TO BE IN CENTER
640 PRINT"OF UPPER PLANE!":FORI=1TO2000:NEXT:G
    OTO150
650 IFA$(2)<>"W"THEN720
660 IFD$(2)=D$(5)THEN720
670 IFD$(2)=C$(5)THEN710
680 IFD$(2)=F$(5)THEN700
690 GOSUB4520
700 GOSUB4520:GOTO720
710 GOSUB4600
720 IFA$(6)<>"W"THEN800
730 IFC$(2)=C$(5)THEN800
740 IFC$(2)=B$(5)THEN790
750 IFC$(2)=D$(5)THEN780
760 GOSUB4290:GOSUB4290:GOSUB4530:GOSUB4530
770 GOSUB4390:GOSUB4390:GOTO800
780 GOSUB4290:GOSUB4290:GOSUB4610:GOSUB4880:GO
    SUB4880:GOTO800
790 GOSUB4290:GOSUB4290:GOSUB4530:GOSUB4770:GO
    SUB4770
800 IFA$(4)<>"W"THEN880
810 IFF$(2)=F$(5)THEN880
820 IFF$(2)=B$(5)THEN870
830 IFF$(2)=D$(5)THEN860
840 GOSUB4270:GOSUB4270:GOSUB4610:GOSUB4610
850 GOSUB4410:GOSUB4410:GOTO880
860 GOSUB4270:GOSUB4270:GOSUB4530:GOSUB4970:GO
    SUB4970:GOTO880
870 GOSUB4270:GOSUB4270:GOSUB4610:GOSUB4670:GO
    SUB4670
880 IFA$(8)<>"W"THEN960
890 IFB$(2)=B$(5)THEN960
900 IFB$(2)=C$(5)THEN950
910 IFB$(2)=F$(5)THEN940
920 GOSUB4770:GOSUB4770:GOSUB4610:GOSUB4610:GO
    SUB4880:GOSUB4880
930 GOTO960
940 GOSUB4770:GOSUB4770:GOSUB4530:GOSUB4390:GO
    SUB4390:GOTO960
950 GOSUB4770:GOSUB4770:GOSUB4610:GOSUB4410:GO
    SUB4410
960 IFB$(2)<>"W"THEN1040
970 IFA$(8)=B$(5)THEN1030
980 IFA$(8)=C$(5)THEN1020
990 IFA$(8)=F$(5)THEN1010
1000 GOSUB4600:GOSUB4670:GOSUB4520:GOSUB4770:GO
    T0960
1010 GOSUB4670:GOSUB4390:GOTO960
1020 GOSUB4770:GOSUB4410:GOTO960
1030 GOSUB4770:GOSUB4520:GOSUB4770:GOSUB4600
1040 IFB$(4)<>"W"THEN1140
1050 IFF$(6)=F$(5)THEN1130

```


BORED?

Here's some great games
to keep you entertained

DATASOFT

Sands of Egypt

It's a high-resolution adventure with a new twist—it's animated. You play the part of an English explorer who is lost in the desert. As you wander through the desert in search of your yet to be determined goal the SANDS OF EGYPT reveal many secrets (if you know the right questions to ask). All screens are in high-resolution, full color graphics.

Cat No. 4285 Atari, 16K, disk \$39.95

SYNAPSE SOFTWARE

Nautilus

Definitely a new type of game for the Atari computer. A one or two player game. NAUTILUS features split-screen play allowing simultaneous action and viewing by the player or players. One player's mission is to destroy the underground city from a submarine while avoiding destruction. The other player (or the computer) is, at the same time, racing to preserve the city by destroying you. Each screen features high-resolution graphics and INDEPENDENT scrolling game maps. Definitely a tough challenge to master.

Cat No. 4255 Atari, 32K, cass \$29.95

Cat No. 4286 Atari, 32K, disk \$29.95

SIRIUS SOFTWARE

Snake Byte

SNAKE BYTE starts out politely. You (the snake) may accept or decline the presence of the Perilous Purple Plums who haphazardly bounce around the screen. Next, simply concentrate on slithering around the screen, chomping down apples as you go. Every time you devour an apple, your snake grows longer. If you're not fast enough, penalty apples appear. As you eat the apples, your snake grows longer, so beware. If you run into the walls, the Perilous Plums, or even your own tail you will break your fangs. If you're a good snake and eat all your apples, a door will appear at the top of the screen which leads to another of the 28 mazes in SNAKE BYTE. You only have three sets of fangs, so be careful.

Cat No. 4256 Atari, 48K, disk \$29.95

AUTOMATED SIMULATIONS

Dragon's Eye

DRAGON'S EYE, an overland adventure, invites the player into a completely detailed world of fantasy involvement. Your mission is to rescue the Seven Provinces from the curse of the Dragon's Eye. It is a perilous task, but the rewards are great. Treasures of true potency will be found by those who seek out the Eye-Treasures that are guarded by foul dragons, golems, ghosts, and a variety of things that go bump in the night. Can you be the mighty One who can forever banish the Evil Necromancer? Only time will tell.

Cat No. 4270 Atari, 40K, disk \$29.95

AVALON HILL

Voyager

A solitaire computer game that challenges the human player to explore the four levels of an alien spacecraft's maze-like corridors and rooms in 3-D simulated graphics, all the while avoiding robots programmed to blast any intruders. In order to win, the human must destroy all power generators and escape or hunt out and annihilate the killer robots. Includes color-animated graphics and sound effects.

Cat No. 4103 Atari, 24K, cass \$29.95

Cat No. 4104 Atari, 32K, disk \$34.95

SYNCR0

Astron IV

You are a space warrior of the galaxy and your assignment is to penetrate and destroy the pirate asteroids. Astron IV. As you enter the asteroid a Power Beam closes the only exit behind you. You are now locked inside and your only hope for escape is to destroy the power panels contained in a multi-level complex deep inside the planet. You battle several types of robots and the deadly ORBITRON with your space vehicle equipped with Z-bolts. One or two players may compete against the computer or against each other for control of ASTRON IV.

Cat No. 4238 Atari, 16K, cass \$19.95

Cat No. 4239 Atari, 24K, disk \$24.95

JV SOFTWARE

Ghost Encounters

GHOST ENCOUNTERS is a 16K assembly language real-time adventure game. You, as a ghost, travel through a network of 30 rooms in search of valuable prizes while, at the same time, try to survive the many perils encountered. Of course, a mere ghost cannot overcome all the evil powers striving to block his journey. Luckily, you are not a mere ghost, but are equipped with the power of transmutation, allowing you to take on the form of other, more useful, objects. Locating all 20 prizes scattered throughout requires a player with fast response and a keen wit.

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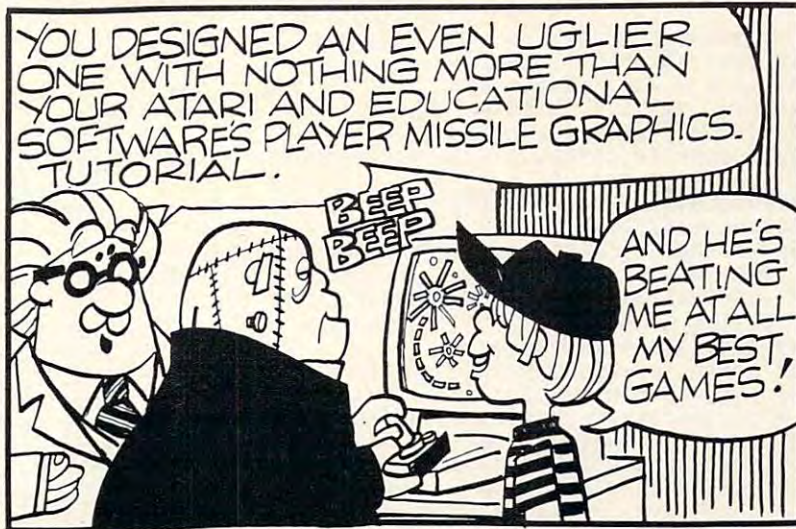
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```

1060 IFF$(6)=B$(5) THEN 1120
1070 IFF$(6)=D$(5) THEN 1100
1080 GOSUB 4270:GOSUB 4610:GOSUB 4610:GOSUB 4410:GO
SUB 4410
1090 GOTO 1110
1100 GOSUB 4270:GOSUB 4530:GOSUB 4970:GOSUB 4970
1110 GOSUB 4390:GOTO 960
1120 GOSUB 4600:GOSUB 4670:GOSUB 4520
1130 GOSUB 4390
1140 IFB$(6)<>"W" THEN 1230
1150 IFC$(4)=C$(5) THEN 1220
1160 IFC$(4)=B$(5) THEN 1210
1170 IFC$(4)=D$(5) THEN 1190
1180 GOSUB 4290:GOSUB 4530:GOSUB 4530:GOSUB 4390:GO
TO 1200
1190 GOSUB 4290:GOSUB 4610:GOSUB 4880:GOSUB 4880
1200 GOSUB 4410:GOTO 960
1210 GOSUB 4520:GOSUB 4770:GOSUB 4600:GOTO 960
1220 GOSUB 4410
1230 IFB$(8)<>"W" THEN 1310
1240 IFE$(2)=B$(5) THEN 1300
1250 IFE$(2)=C$(5) THEN 1290
1260 IFE$(2)=D$(5) THEN 1280
1270 GOSUB 4610:GOSUB 4290:GOSUB 4880:GOTO 1200
1280 GOSUB 4770:GOSUB 4390:GOSUB 4670:GOTO 960
1290 GOSUB 4670:GOSUB 4410:GOSUB 4770:GOTO 960
1300 GOSUB 4610:GOSUB 4280:GOSUB 4530
1310 IFC$(2)<>"W" THEN 1380
1320 IFA$(6)=C$(5) THEN 1370
1330 IFA$(6)=B$(5) THEN GOSUB 4290:GOTO 1360
1340 IFA$(6)=D$(5) THEN GOSUB 4410:GOSUB 4880:GOTO 6
20
1350 GOSUB 4290:GOSUB 4770:GOSUB 4530:GOSUB 4390:GO
SUB 4390
1360 GOSUB 4670:GOTO 620
1370 GOSUB 4410:GOSUB 4520:GOSUB 4410:GOSUB 4600
1380 IFC$(4)="W" THEN GOSUB 4410:GOTO 1310
1390 IFC$(6)="W" THEN GOSUB 4290:GOTO 1310
1400 IFC$(8)="W" THEN GOSUB 4410:GOTO 1380
1410 IFD$(2)<>"W" THEN 1490
1420 IFA$(2)=D$(5) THEN 1470
1430 IFA$(2)=C$(5) THEN GOSUB 4970:GOSUB 4290:GOTO 6
20
1440 IFA$(2)=F$(5) THEN GOSUB 4880:GOSUB 4270:GOTO 6
20
1450 GOSUB 4970:GOSUB 4410:GOSUB 4530:GOSUB 4670:GO
SUB 4670
1460 GOSUB 4410:GOTO 620
1470 GOSUB 4970:GOSUB 4970:GOSUB 4530:GOSUB 4410:GO
SUB 4670
1480 GOSUB 4290
1490 IFD$(4)="W" THEN GOSUB 4880:GOTO 1410
1500 IFD$(6)="W" THEN GOSUB 4970:GOTO 1410
1510 IFD$(8)="W" THEN GOSUB 4970:GOTO 1500
1520 IFE$(2)<>"W" THEN 1620
1530 IFB$(8)=B$(5) THEN 1610
1540 IFB$(8)=C$(5) THEN 1590
1550 IFB$(8)=F$(5) THEN 1570
1560 GOSUB 4610:GOSUB 4610:GOTO 1790
1570 GOSUB 4530
1580 GOSUB 4390:GOSUB 4390:GOTO 1520
1590 GOSUB 4610
1600 GOSUB 4410:GOSUB 4410:GOTO 1520
1610 GOSUB 4670:GOSUB 4670
1620 IFE$(4)<>"W" THEN 1710
1630 IFF$(8)=F$(5) THEN 1580
1640 IFF$(8)=B$(5) THEN 1690
1650 IFF$(8)=D$(5) THEN 1670
1660 GOSUB 4610:GOSUB 4610:GOTO 1600
1670 GOSUB 4530
1680 GOSUB 4970:GOSUB 4970:GOTO 1520
1690 GOSUB 4610
1700 GOSUB 4770:GOSUB 4770:GOTO 1520
1710 IFE$(6)<>"W" THEN 1800
1720 IFC$(8)=C$(5) THEN 1600
1730 IFC$(8)=D$(5) THEN 1780
1740 IFC$(8)=B$(5) THEN 1760
1750 GOSUB 4610:GOSUB 4610:GOTO 1580
1760 GOSUB 4530
1770 GOSUB 4770:GOSUB 4770:GOTO 1520
1780 GOSUB 4610
1790 GOSUB 4880:GOSUB 4880:GOTO 1520
1800 IFE$(8)<>"W" THEN 1870
1810 IFD$(8)=D$(5) THEN 1680
1820 IFD$(8)=C$(5) THEN 1860
1830 IFD$(8)=F$(5) THEN 1350
1840 GOSUB 4610:GOSUB 4610:GOTO 1770
1850 GOSUB 4610:GOTO 1580
1860 GOSUB 4530:GOTO 1600
1870 IFF$(2)<>"W" THEN 1940
1880 IFA$(4)=F$(5) THEN 1930
1890 IFA$(4)=B$(5) THEN GOSUB 4270:GOSUB 4770:GOTO 6
20
1900 IFA$(4)=D$(5) THEN GOSUB 4390:GOSUB 4970:GOTO 6
20
1910 GOSUB 4270:GOSUB 4270:GOSUB 4610:GOSUB 4670:GO
SUB 4410
1920 GOSUB 4770:GOTO 620
1930 GOSUB 4270:GOSUB 4520:GOSUB 4270:GOSUB 4600:GO
TO 620
1940 IFF$(4)="W" THEN GOSUB 4270:GOTO 1870
1950 IFF$(6)="W" THEN GOSUB 4390:GOTO 1870
1960 IFF$(8)="W" THEN GOSUB 4390:GOSUB 4390:GOTO 187
0
1970 IFA$(1)="W" THEN 1990
1980 GOTO 2010
1990 IFF$(1)=F$(5) THEN 2010
2000 GOSUB 4390:GOSUB 4530:GOSUB 4270:GOTO 2660
2010 IFA$(3)="W" THEN 2030
2020 GOTO 2050
2030 IFD$(1)=D$(5) THEN 2050
2040 GOSUB 4410:GOSUB 4530:GOSUB 4290:GOTO 2560
2050 IFA$(7)="W" THEN 2070
2060 GOTO 2090
2070 IFB$(1)=B$(5) THEN 2090
2080 GOSUB 4270:GOSUB 4610:GOSUB 4390:GOTO 2640
2090 IFA$(9)="W" THEN 2110
2100 GOTO 2130
2110 IFB$(3)=B$(5) THEN 2130
2120 GOSUB 4290:GOSUB 4530:GOSUB 4410:GOTO 2580
2130 IFE$(1)<>"W" THEN 2250
2140 IFF$(9)=F$(5) THEN 2190
2150 IFF$(9)=B$(5) THEN 2210
2160 IFF$(9)=C$(5) THEN 2230
2170 GOSUB 4610:GOSUB 4290:GOSUB 4610:GOSUB 4410:GO
SUB 4410
2180 GOSUB 4530:GOSUB 4290:GOTO 2130
2190 GOSUB 4530:GOSUB 4530:GOSUB 4970:GOSUB 4610:GO
SUB 4880:GOSUB 4880
2200 GOSUB 4610:GOSUB 4970:GOTO 2130
2210 GOSUB 4530:GOSUB 4390:GOSUB 4610:GOSUB 4270:GO
SUB 4270
2220 GOSUB 4530:GOSUB 4390:GOTO 2130
2230 GOSUB 4670:GOSUB 4610:GOSUB 4770:GOSUB 4770:GO
SUB 4530:GOSUB 4670
2240 GOTO 2130
2250 IFE$(3)<>"W" THEN 2270
2260 GOSUB 4530:GOTO 2130
2270 IFE$(7)<>"W" THEN 2290
2280 GOSUB 4610:GOTO 2130
2290 IFE$(9)<>"W" THEN 2310
2300 GOSUB 4610:GOTO 2230
2310 IFB$(7)<>"W" THEN 2390
2320 IFF$(9)=B$(5) THEN 2380
2330 IFF$(9)=D$(5) THEN 2370
2340 IFF$(9)=C$(5) THEN 2360
2350 GOSUB 4610:GOSUB 4270:GOSUB 4530:GOSUB 4390:GO
TO 2130
2360 GOSUB 4530:GOSUB 4410:GOSUB 4530:GOSUB 4290:GO
TO 2130
2370 GOSUB 4880:GOSUB 4530:GOSUB 4970:GOTO 2130
2380 GOSUB 4610:GOSUB 4610:GOSUB 4770:GOSUB 4530:GO

```


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There are many things that the ATARI computers can do either better, or easier than other small computers. The following series of programs is designed for anyone who is at least familiar with BASIC programming. What each tutorial offers is similar to an extensive magazine article with all discussion in as simple language as possible, plus you get MANY examples already typed in and running. The instruction manuals range from 10 to 50 pages, and some tutorials fill up a complete tape or disk. There is little overlap in what is taught, so anyone wanting to know all they can should buy them all (my banker thanks you). ATARI buys these from us to use in training their own people! Rave reviews have been published in ANTIC, ANALOG, CREATIVE COMPUTING, and even INFOWORLD. You trust INFOWORLD, don't you?

TT #1: DISPLAY LISTS—This program teaches you how to alter the program in the ATARI that controls the format of the screen. Normally, when you say "Graphics 8", the machine responds with a large Graphics 8 area at the top of the screen and a small text area at the bottom. Now, you will be able to mix various Graphics modes on the screen at the same time. The program does all of the difficult things (like counting scan lines). You will quickly be able to use the subroutines included in your own programs.

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TT #4: BASICS OF ANIMATION—This program shows you how to animate simple shapes (with some sound) using the PRINT and PLOT commands, and it also has a nice little PLAYER/MISSILE GRAPHICS game you can learn from. The P/M example is explained and will get you started on this complicated subject (more fully explained in TT #5). This would be an excellent way to start making your programs come alive on the screen with movement! Recommended for beginning users.

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TT #5: PLAYER/MISSILE GRAPHICS—Learn to write your own games and other animated applications! The tutorial begins with many small examples that complement the 50 page manual, then gradually builds up to a complete game where everything you need to know is fully explained. Also included are two machine language utilities that you can use to animate Players with from BASIC. Next we include two of the best editors currently available; one for editing playfield shapes (backgrounds); and one to edit your players, and all in glorious Technicolor!! Everything except the two editors run in 16K Tape or 32K Disk.

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TT #6: SOUND AND MUSIC—Unless you have spent many years experimenting with the four voice channels, you will learn a lot from this one! Learn to play standard notes, chords, and whole songs using some simple "tricks". One of the nicest parts are the examples of special sound effects that you can refer to whenever you need a sound for a program or to impress a friend. This program will be of interest to all ages and levels of experience!

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This book is the most valuable source of information for your ATARI you can buy. It starts out by explaining how to PEEK and POKE values into memory, so that even new computer owners can use many of these "Tricks". Then you are given 32 pages of the memory locations that are the most useful, along with hints on how to use many of the locations. Finally, it includes hints on problems you may be having with the computer and discusses the new Graphics modes 9 to 11. Even ATARI buys this book from us!

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```

SUB4670:GOTO2130
2390 IFB$(9)<>"W"THEN2480
2400 IFC$(7)=D$(5)THEN2440
2410 IFC$(7)=C$(5)THEN2460
2420 IFC$(7)=F$(5)THEN2470
2430 GOSUB4530:GOSUB4530:GOSUB4670:GOSUB4610:GO
SUB4770:GOTO2130
2440 GOSUB4290:GOSUB4530:GOSUB4530
2450 GOSUB4410:GOTO2130
2460 GOSUB4530:GOSUB4290:GOSUB4610:GOSUB4410:GO
TO2130
2470 GOSUB4610:GOSUB4390:GOSUB4610:GOSUB4270:GO
TO2130
2480 IFB$(3)<>"W"THEN2500
2490 GOSUB4290:GOSUB4530:GOTO2450
2500 IFB$(1)<>"W"THEN2520
2510 GOSUB4270:GOSUB4610:GOSUB4390:GOTO2260
2520 IFF$(1)<>"W"THEN2540
2530 GOSUB4880:GOSUB4610:GOSUB4970:GOTO2130
2540 IFF$(3)<>"W"THEN2560
2550 GOSUB4670:GOSUB4530:GOSUB4770:GOTO2270
2560 IFF$(7)<>"W"THEN2580
2570 GOSUB4610:GOTO2310
2580 IFF$(9)<>"W"THEN2600
2590 GOTO2570
2600 IFC$(1)<>"W"THEN2620
2610 GOSUB4770:GOSUB4610:GOSUB4670:GOTO2130
2620 IFC$(3)<>"W"THEN2640
2630 GOSUB4970:GOSUB4530:GOSUB4880:GOTO2130
2640 IFC$(7)<>"W"THEN2660
2650 GOSUB4530:GOTO2310
2660 IFC$(9)<>"W"THEN2680
2670 GOTO2650
2680 IFD$(1)<>"W"THEN2700
2690 GOSUB4410:GOSUB4610:GOSUB4290:GOTO2130
2700 IFD$(3)<>"W"THEN2720
2710 GOSUB4390:GOSUB4530:GOSUB4270:GOTO2130
2720 IFD$(7)<>"W"THEN2740
2730 GOTO2650
2740 IFD$(9)<>"W"THEN2760
2750 GOTO2650
2760 IFB$(8)<>B$(5)THEN2830
2770 IFE$(2)<>C$(5)THEN2800
2780 D=0:GOSUB4530:GOSUB4290:GOSUB4610:GOSUB441
0:GOSUB4610:GOSUB4770
2790 GOSUB4530:GOSUB4670:GOTO2760
2800 IFE$(2)=E$(5)THEN2830
2810 D=0:GOSUB4610:GOSUB4270:GOSUB4530:GOSUB439
0:GOSUB4530:GOSUB4670
2820 GOSUB4610:GOSUB4770:GOTO2760
2830 IFB$(8)<>C$(5)THEN2900
2840 IFE$(2)<>D$(5)THEN2870
2850 D=0:GOSUB4970:GOSUB4610:GOSUB4880:GOSUB461
0:GOSUB4410:GOSUB4530
2860 GOSUB4290:GOTO2760
2870 IFE$(2)=E$(5)THEN2900
2880 D=0:GOSUB4610:GOSUB4610:GOSUB4770:GOSUB453
0:GOSUB4670:GOSUB4530
2890 GOSUB4290:GOSUB4610:GOSUB4410:GOTO2760
2900 IFB$(8)<>F$(5)THEN2970
2910 IFE$(2)<>B$(5)THEN2940
2920 D=0:GOSUB4530:GOSUB4530:GOSUB4670:GOSUB461
0:GOSUB4770:GOSUB4610
2930 GOSUB4270:GOSUB4530:GOSUB4390:GOTO2760
2940 IFE$(2)=E$(5)THEN2970
2950 D=0:GOSUB4880:GOSUB4530:GOSUB4970:GOSUB453
0:GOSUB4390:GOSUB4610
2960 GOSUB4270:GOTO2760
2970 IFB$(8)<>D$(5)THEN3040
2980 IFE$(2)<>F$(5)THEN3010
2990 D=0:GOSUB4610:GOSUB4390:GOSUB4610:GOSUB427
0:GOSUB4610:GOSUB4880
3000 GOSUB4530:GOSUB4970:GOTO2760
3010 IFE$(2)=E$(5)THEN3040
3020 D=0:GOSUB4530:GOSUB4410:GOSUB4530:GOSUB429
0:GOSUB4530:GOSUB4970
3030 GOSUB4610:GOSUB4880:GOTO2760
3040 IFD<3THEND=D+1:GOSUB4530:GOTO2760
3050 IFB$(4)=B$(5)THEN3070
3060 GOTO2810
3070 IFB$(6)=B$(5)THEN3090
3080 GOTO2780
3090 IFD$(4)=D$(5)THEN3110
3100 GOTO2990
3110 IFD$(6)=D$(5)THEN3130
3120 GOTO2950
3130 IFB$(6)=B$(5)THEN3150
3140 GOTO2780
3150 IFB$(4)=B$(5)THEN3170
3160 GOTO2780
3170 IFD$(4)=D$(5)THEN3190
3180 GOTO2990
3190 IFD$(6)=D$(5)THEN3210
3200 GOTO2990
3210 D=0
3220 IFB$(8)=B$(5)ORE$(2)=B$(5)THEN3240
3230 IFD<3THEND=D+1:GOSUB4530:GOTO3220
3240 IFF$(8)=F$(5)ORE$(4)=F$(5)THEN3280
3250 IFD$(8)<>F$(5)ANDES$(8)<>F$(5)THEN3290
3260 GOSUB4610:GOSUB4880:GOSUB4410:GOSUB4610:GO
SUB4290:GOSUB4530
3270 GOSUB4970:GOTO3220
3280 IFD$(8)=D$(5)ORE$(8)=D$(5)THEN3310
3290 GOSUB4610:GOSUB4410:GOSUB4770:GOSUB4610:GO
SUB4670:GOSUB4530
3300 GOSUB4290:GOTO3220
3310 IFE$(2)=E$(5)THEN3330
3320 FORD=1TO4:GOSUB4770:GOSUB4520:NEXT:GOTO331
0
3330 IFE$(4)=E$(5)THEN3350
3340 GOSUB4610:GOTO3320
3350 IFE$(6)=E$(5)THEN3370
3360 GOSUB4530:GOTO3320
3370 IFE$(8)=E$(5)THEN3390
3380 GOSUB4610:GOTO3340
3390 IFB$(8)=B$(5)THEN3420
3400 GOSUB4530:GOTO3390
3410 D=0
3420 IFB$(7)=B$(5)ORF$(9)=B$(5)ORE$(1)=B$(5)THE
N3510
3430 IFB$(9)=B$(5)ORE$(3)=B$(5)ORC$(7)=B$(5)THE
N3530
3440 IFC$(9)=C$(5)ORE$(9)=C$(5)ORD$(7)=C$(5)THE
N3550
3450 IFF$(7)=F$(5)ORE$(7)=F$(5)ORD$(9)=F$(5)THE
N3570
3460 IFD>0THEN3590
3470 GOSUB4770:GOSUB4510:GOSUB4770:GOSUB4770:GO
SUB4510:GOSUB4510:GOSUB4770
3480 GOSUB4770:GOSUB4510:GOSUB4670
3490 IFD=1THENGOSUB4530:GOTO3410
3500 GOSUB4610:D=1:GOTO3470
3510 IFB$(7)=F$(5)ORF$(9)=F$(5)ORE$(1)=F$(5)THE
ND=D+1
3520 GOTO3430
3530 IFB$(9)=C$(5)ORE$(3)=C$(5)ORC$(7)=C$(5)THE
ND=D+2
3540 GOTO3440
3550 IFC$(9)=D$(5)ORE$(9)=D$(5)ORD$(7)=D$(5)THE
ND=D+3
3560 GOTO3450
3570 IFF$(7)=D$(5)ORE$(7)=D$(5)ORD$(9)=D$(5)THE
ND=D+4
3580 GOTO3460
3590 IFD>5THEN3780
3600 IFD>1THEN3660
3610 D=0
3620 GOSUB4880:GOSUB4510:GOSUB4880:GOSUB4880:GO
SUB4510:GOSUB4510
3630 GOSUB4880:GOSUB4880:GOSUB4590:GOSUB4970
3640 IFD=1THEN3490
3650 D=1:GOSUB4610:GOTO3620

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3660 IFD>2THEN3720
3670 D=0
3680 GOSUB4270:GOSUB4510:GOSUB4270:GOSUB4270:GO
SUB4510:GOSUB4510
3690 GOSUB4270:GOSUB4270:GOSUB4590:GOSUB4390
3700 IFD=1THEN3490
3710 D=1:GOSUB4610:GOTO3680
3720 IFD=3THEND=0:GOTO3470
3730 D=0
3740 GOSUB4410:GOSUB4510:GOSUB4410:GOSUB4410:GO
SUB4510:GOSUB4510
3750 GOSUB4410:GOSUB4410:GOSUB4590:GOSUB4290
3760 IFD=1THEN3490
3770 D=1:GOSUB4610:GOTO3740
3780 IFES(1)=ES(5)THEN3800
3790 FORY=1TO2:GOSUB4270:GOSUB4670:GOSUB4390:GO
SUB4770:NEXT:D=0:GOTO3780
3800 IFES(3)=ES(5)THEN3830
3810 IFD=5THEN3790
3820 GOSUB4530:D=5:GOTO3790
3830 IFES(7)=ES(5)THEN3860
3840 IFD=4THEN3790
3850 GOSUB4610:D=4:GOTO3790
3860 IFES(9)=ES(5)THEN3890
3870 IFD=6THEN3790
3880 GOSUB4530:GOSUB4530:D=6:GOTO3790
3890 IFB$(8)=B$(5)THEN3910
3900 GOSUB4530:GOTO3890
3910 IFW<1THENW=1:GOTO620
3930 PRINT"(CLEAR){13 DOWN}{07 RIGHT}*** WE FI
NALLY DID IT ***":PRINT:PRINT:PRINT:
PRINT:PRINT:PRINT:PRINT:PRINT
3940 END
3950 GETA$(K):IFA$(K)=""THEN3950
3960 K=K+1:RETURN
3970 GETB$(K):IFB$(K)=""THEN3970
3980 K=K+1:RETURN
3990 GETC$(K):IFC$(K)=""THEN3990
4000 K=K+1:RETURN
4010 GETD$(K):IFD$(K)=""THEN4010
4020 K=K+1:RETURN
4030 GETES$(K):IFES$(K)=""THEN4030
4040 K=K+1:RETURN
4050 GETF$(K):IFF$(K)=""THEN4050
4060 K=K+1:RETURN
4070 PRINT"{RIGHT}?{LEFT}";:GOSUB3950:GOSUB4130
:PRINTA$(K-1):RETURN
4080 PRINT"{RIGHT}?{LEFT}";:GOSUB3970:GOSUB4130
:PRINTB$(K-1):RETURN
4090 PRINT"{RIGHT}?{LEFT}";:GOSUB3990:GOSUB4130
:PRINTC$(K-1):RETURN
4100 PRINT"{RIGHT}?{LEFT}";:GOSUB4010:GOSUB4130
:PRINTD$(K-1):RETURN
4110 PRINT"{RIGHT}?{LEFT}";:GOSUB4030:GOSUB4130
:PRINTE$(K-1):RETURN
4120 PRINT"{RIGHT}?{LEFT}";:GOSUB4050:GOSUB4130
:PRINTF$(K-1):RETURN
4130 IFA$(K-1)=CHR$(20)THENPRINT "{03 LEFT}?{02
LEFT}";:K=K-2:RETURN
4140 RETURN
4150 PRINT"(CLEAR){02 DOWN}
4160 PRINT"
4170 PRINT"
4180 PRINT"
B$(3)" 1
4190 PRINT"
4200 PRINT"
4210 PRINT"
B$(6)" 1
4220 PRINT"
4230 PRINT"
4240 PRINT"
B$(9)" 1
4250 PRINT"
4260 RETURN
4270 P=15:GOTO4300

4280 P=19:GOTO4300
4290 P=23
4300 GOSUB4150:PRINT"{HOME}":PRINT"{05 DOWN}"TA
B(P)"65"
4310 PRINTTAB(P)"65"
4320 PRINTTAB(P)"65"
4330 PRINTTAB(P)"65"
4340 PRINTTAB(P)"65"
4350 IFP=15THENGOSUB5170
4360 IFP=19THENGOSUB5190
4370 IFP=23THENGOSUB5200
4380 GOSUB5440:RETURN
4390 P=15:GOTO4420
4400 P=19:GOTO4420
4410 P=23
4420 GOSUB4150:PRINT"{HOME}":PRINT"{05 DOWN}"TA
B(P)"{REV}">{OFF}"
4430 PRINTTAB(P)"65"
4440 PRINTTAB(P)"65"
4450 PRINTTAB(P)"65"
4460 PRINTTAB(P)"65"
4470 IFP=15THENGOSUB5110
4480 IFP=19THENGOSUB5130
4490 IFP=23THENGOSUB5140
4500 GOSUB5440:RETURN
4510 P=2:GOTO4540
4520 P=5:GOTO4540
4530 P=8
4540 GOSUB4150:PRINT"{HOME}":FORPP=0TOP:PRINT:N
EXTPP:PRINTTAB(17)"{REV}">{OFF}////{DO
DOWN}{05 LEFT}7777"
4550 IFP=2THENGOSUB5290
4560 IFP=5THENGOSUB5310
4570 IFP=8THENGOSUB5320
4580 GOSUB5440:RETURN
4590 P=2:GOTO4620
4600 P=5:GOTO4620
4610 P=8
4620 GOSUB4150:PRINT"{HOME}":FORPP=0TOP:PRINT:N
EXTPP:PRINTTAB(17)"{REV}">{OFF}////{DO
DOWN}{05 LEFT}7777"
4630 IFP=2THENGOSUB5230
4640 IFP=5THENGOSUB5250
4650 IFP=8THENGOSUB5260
4660 GOSUB5440:RETURN
4670 GOSUB4150:PRINT"{HOME}":PRINTTAB(16)"{05 D
OWN}!"
4680 PRINTTAB(16)"!"
4690 PRINTTAB(16)"!"
4700 PRINTTAB(16)"I{05 RIGHT}{REV}">{OFF}"
4710 PRINTTAB(16)"8888888"
4720 F$(0)=F$(3):F$(3)=A$(9):A$(9)=C$(7):C$(7)=
ES(1):ES(1)=F$(0):F$(0)=A$(7)
4730 A$(7)=C$(1):C$(1)=ES(3):ES(3)=F$(9):F$(9)=
F$(0):F$(0)=A$(8):A$(8)=C$(4)
4740 C$(4)=ES(2):ES(2)=F$(6):F$(6)=F$(0)
4750 FORI=1TO9:U$(I)=B$(I):NEXT:GOSUB5090:FORI=
1TO9:B$(I)=U$(I):NEXT:GOSUB5440
4760 RETURN
4770 GOSUB4150:PRINT"{HOME}":PRINTTAB(15)"{05 D
OWN}{REV}">{OFF}"
4780 PRINTTAB(15)"65"
4790 PRINTTAB(15)"65"
4800 PRINTTAB(15)"65"
4810 PRINTTAB(15)"65"
4820 PRINTTAB(16)"8888888"
4830 A$(0)=A$(9):A$(9)=F$(3):F$(3)=ES(1):ES(1)=
C$(7):C$(7)=A$(0):A$(0)=F$(9)
4840 F$(9)=ES(3):ES(3)=C$(1):C$(1)=A$(7):A$(7)=
A$(0):A$(0)=F$(6):F$(6)=ES(2)
4850 ES(2)=C$(4):C$(4)=A$(8):A$(8)=A$(0)
4860 FORI=1TO9:U$(I)=B$(I):NEXT:GOSUB5070:FORI=
1TO9:B$(I)=U$(I):NEXT:GOSUB5440
4870 RETURN
4880 GOSUB4150:PRINT"{HOME}{REV}REAR{OFF} SURFA
CE!":PRINTTAB(16)"{05 DOWN}!"

```


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Atari Notes

Because of the extreme length of this program, a full converted program is not feasible. Instead, use the following suggestions to convert Rubik's Cube Solver to the Atari as you are typing it in. If you prefer, you can type in the program first, LIST it to tape or disk, and then use an Editor (such as the Atari Assembler/Editor Cartridge) with search and replace to make "global" changes to the text. You can then use ENTER to read the converted program with BASIC.

1. Change all occurrences of "NEXT" without a variable to "NEXT I".

2. Text preceded with "[RVS]" should be entered using the Atari Logo key.

3. PRINT statements with the [HOME] character should be rephrased:

from: PRINT "[HOME][06 RIGHT]"
to: POSITION 0,0:PRINT "[06 RIGHT]"

4. All TAB statements should be converted as in:

from: PRINT TAB(TB);T\$
to: POKE 85,TB:PRINT T\$

5. The PRINT statements to draw the arrows will have to be converted for use with Atari keyboard graphics. (See below.)

6. GET statements such as:

GET B\$(K):IF B\$(K)="" THEN

should be changed to:

GET #1,A:B\$(K+1,K+1)=CHR\$(A) (see below)

7. Substitute line 150 below, and add line 100:

```
100 GRAPHICS 0:POKE 752,1:POKE 82,0:
    OPEN#1,4,0,"K:"
150 DIM A$(10),B$(10),C$(10),D$(10),E$(10),
    F$(10),T$(10),U$(10)
```

8. Strings (of course) will have to be changed. Generally, all references to variable xx\$(n) will become xx\$(n+1,n+1). For example,

1170 IF C\$(4)=D\$(5) THEN 1190

becomes

1170 IF C\$(5,5)=D\$(6,6) THEN 1190

Here's where SEARCH and REPLACE come in handy. Just use ten patterns, such as:

REP\$(0)/\$(1,I)/,A

Watch out for statements like A\$(I), which should become A\$(I+1,I+1), or A\$(10-K), which should be A\$(11-K,11-K).

```
4150 PRINT "(CLEAR)(2 DOWN)"
4160 PRINT "(13 SPACES)(Q)(3 R)(W)(3 R)
    (W)(3 R)(E)"
```

```
4170 PRINT "(13 SPACES)(13 SPACES)
    (3 SPACES)(3 SPACES)"
4180 PRINT "(13 SPACES)";B$(2,2);" "
    ";B$(3,3);" " ";B$(4,4);" "
4190 PRINT "(13 SPACES)(A)(3 R)(S)(3 R)
    (S)(3 R)(D)"
4200 PRINT "(13 SPACES)(3 SPACES)
    (3 SPACES)(3 SPACES)"
4210 PRINT "(13 SPACES)";B$(5,5);" "
    ";B$(6,6);" " ";B$(7,7);" "
4220 PRINT "(13 SPACES)(A)(3 R)(S)(3 R)
    (S)(3 R)(D)"
4230 PRINT "(13 SPACES)(3 SPACES)
    (3 SPACES)(3 SPACES)"
4240 PRINT "(13 SPACES)";B$(8,8);" "
    ";B$(9,9);" " ";B$(10,10);" "
4250 PRINT "(13 SPACES)(Z)(3 R)(X)(3 R)
    (X)(3 R)(C)"
4300 GOSUB 4150:POSITION 0,0:PRINT "
    (6 DOWN)";POKE 85,P:"(B)(V)"
4310 POKE 85,P:"(B)(V)"
4320 POKE 85,P:"(B)(V)"
4330 POKE 85,P:"(B)(V)"
4340 POKE 85,P:"(B)(V)"
4350 IF P=15 THEN GOSUB 5170
4420 GOSUB 4150:POSITION 0,0:"PRI
    NT "(5 DOWN)";POKE 85,P:"(H)
    (J)"
4430 POKE 85,P:"(B)(V)"
4440 POKE 85,P:"(B)(V)"
4450 POKE 85,P:"(B)(V)"
4460 POKE 85,P:"(B)(V)"
4540 GOSUB 4150:POSITION 0,1:FOR PP=0
    TO P:PRINT :NEXT PP:POKE 85,17:
    ? "(H)(4 N)(DOWN)(5 LEFT)(M)(4 M)
    "
4620 GOSUB 4150:POSITION 0,1:FOR PP=0
    TO P:PRINT :NEXT PP:POKE 85,17:
    ? "(4 N)(J)(DOWN)(5 LEFT)(4 M)
    (I)"
4670 GOSUB 4150:POSITION 0,2:POKE 85,
    16:"(5 DOWN)"
4680 POKE 85,16:""
4690 POKE 85,16:""
4700 POKE 85,16:"(5 U)(J)"
4710 POKE 85,16:"(6 I)(I)"
4770 GOSUB 4150:POSITION 0,0:POKE 85,
    15:"(5 DOWN)(H)(J)"
4780 POKE 85,15:"(M)(Y)"
4790 POKE 85,15:"(M)(Y)"
4800 POKE 85,15:"(M)(Y)"
4810 POKE 85,15:"(M)(Y)"
4820 POKE 85,15:"(M)(6 SPACES)"
4880 GOSUB 4150:POSITION 0,0:"REAR
    SURFACE!";POKE 85,16:"(6 DOWN)
    "
4890 POKE 85,16:""
4900 POKE 85,16:""
4910 POKE 85,16:"(5 U)(J)"
4920 POKE 85,16:"(6 I)(I)"
4970 GOSUB 4150:POSITION 0,0:"REAR
    SURFACE!";POKE 85,15:"(4 DOWN)
    (H)(J)"
4980 POKE 85,15:"(M)(Y)"
4990 POKE 85,15:"(M)(Y)"
5000 POKE 85,15:"(M)(Y)"
5010 POKE 85,15:"(M)(Y)"
5020 POKE 85,15:"(M)(6 SPACES)"
5350 POKE 85,TB:"(Q)(R)(W)(R)(W)
    (R)(E)"
5360 T$="I I I";POKE 85,TB:T$
5370 FOR I=1 TO 2:POKE 85,TB:"(A)
    (R)(S)(R)(S)(R)(D)";POKE 85,TB:
    T$:NEXT I
5380 POKE 85,TB:"(Z)(R)(X)(R)(X)
    (R)(C)"
```



```

4890 PRINTTAB(16) "I"
4900 PRINTTAB(16) "I"
4910 PRINTTAB(16) "I{05 RIGHT}{REV}_[OFF]"
4920 PRINTTAB(16) "8888888"
4930 FORI=1TO9:US(I)=DS(I):NEXT:GOSUB5070:FORI=
1TO9:DS(I)=US(I):NEXT
4940 FS(0)=FS(7):FS(7)=AS(1):AS(1)=CS(3):CS(3)=
ES(9):ES(9)=FS(0):FS(0)=FS(4)
4950 FS(4)=AS(2):AS(2)=CS(6):CS(6)=ES(8):ES(8)=
FS(0):FS(0)=FS(1):FS(1)=AS(3)
4960 AS(3)=CS(9):CS(9)=ES(7):ES(7)=FS(0):GOSUB5
440:RETURN
4970 GOSUB4150:PRINT "{HOME}{REV}REAR{OFF} SURFA
CE!":PRINTTAB(15) "{05 DOWN}{REV}_[OFF]
OFF}"
4980 PRINTTAB(15) "65"
4990 PRINTTAB(15) "65"
5000 PRINTTAB(15) "65"
5010 PRINTTAB(15) "65"
5020 PRINTTAB(16) "88888888"
5030 FORI=1TO9:US(I)=DS(I):NEXT:GOSUB5090:FORI=
1TO9:DS(I)=US(I):NEXT
5040 AS(0)=AS(3):AS(3)=FS(1):FS(1)=ES(7):ES(7)=
CS(9):CS(9)=AS(0):AS(0)=AS(2)
5050 AS(2)=FS(4):FS(4)=ES(8):ES(8)=CS(6):CS(6)=
AS(0):AS(0)=AS(1):AS(1)=FS(7)
5060 FS(7)=ES(9):ES(9)=CS(3):CS(3)=AS(0):GOSUB5
440:RETURN
5070 US(0)=US(3):US(3)=US(1):US(1)=US(7):US(7)=
US(9):US(9)=US(0):US(0)=US(6)
5080 US(6)=US(2):US(2)=US(4):US(4)=US(8):US(8)=
US(0):RETURN
5090 US(0)=US(7):US(7)=US(1):US(1)=US(3):US(3)=
US(9):US(9)=US(0):US(0)=US(4)
5100 US(4)=US(2):US(2)=US(6):US(6)=US(8):US(8)=
US(0):RETURN
5110 FORI=1TO7STEP3:GOSUB5160:NEXTI:FORI=1TO9:U
S(I)=FS(I):NEXT:GOSUB5090
5120 FORI=1TO9:FS(I)=US(I):NEXT:RETURN
5130 FORI=2TO8STEP3:GOSUB5160:NEXTI:RETURN
5140 FORI=3TO9STEP3:GOSUB5160:NEXTI:FORI=1TO9:U
S(I)=CS(I):NEXT:GOSUB5070
5150 FORI=1TO9:CS(I)=US(I):NEXT:RETURN
5160 AS(0)=AS(1):AS(1)=BS(1):BS(1)=ES(1):ES(1)=
DS(10-I):DS(10-I)=AS(0):RETURN
5170 FORI=1TO7STEP3:GOSUB5220:NEXTI:FORI=1TO9:U
S(I)=FS(I):NEXT:GOSUB5070
5180 FORI=1TO9:FS(I)=US(I):NEXT:RETURN
5190 FORI=2TO8STEP3:GOSUB5220:NEXTI:RETURN
5200 FORI=3TO9STEP3:GOSUB5220:NEXTI:FORI=1TO9:U
S(I)=CS(I):NEXT:GOSUB5090
5210 FORI=1TO9:CS(I)=US(I):NEXT:RETURN
5220 BS(0)=BS(1):BS(1)=AS(1):AS(1)=DS(10-I):DS(
10-I)=ES(1):ES(1)=BS(0):RETURN
5230 FORI=1TO3:GOSUB5280:NEXT:FORI=1TO9:US(I)=A
S(I):NEXT:GOSUB5090:FORI=1TO9
5240 AS(I)=US(I):NEXT:RETURN
5250 FORI=4TO6:GOSUB5280:NEXT:RETURN
5260 FORI=7TO9:GOSUB5280:NEXT:FORI=1TO9:US(I)=E
S(I):NEXT:GOSUB5070:FORI=1TO9
5270 ES(I)=US(I):NEXT:RETURN
5280 BS(0)=BS(1):BS(1)=FS(1):FS(1)=DS(1):DS(1)=
CS(1):CS(1)=BS(0):RETURN
5290 FORI=1TO3:GOSUB5340:NEXT:FORI=1TO9:US(I)=A
S(I):NEXT:GOSUB5070:FORI=1TO9
5300 AS(I)=US(I):NEXT:RETURN
5310 FORI=4TO6:GOSUB5340:NEXT:RETURN
5320 FORI=7TO9:GOSUB5340:NEXT:FORI=1TO9:US(I)=E
S(I):NEXT:GOSUB5090:FORI=1TO9
5330 ES(I)=US(I):NEXT:RETURN
5340 BS(0)=BS(1):BS(1)=CS(1):CS(1)=DS(1):DS(1)=
FS(1):FS(1)=BS(0):RETURN
5350 PRINTTAB(TB); "022222."
5360 TS=" ] ] ] ]":PRINTTAB(TB); TS
5370 FORI=1TO2:PRINTTAB(TB); "@[03":PRINTTAB(
TB); TS:NEXTI

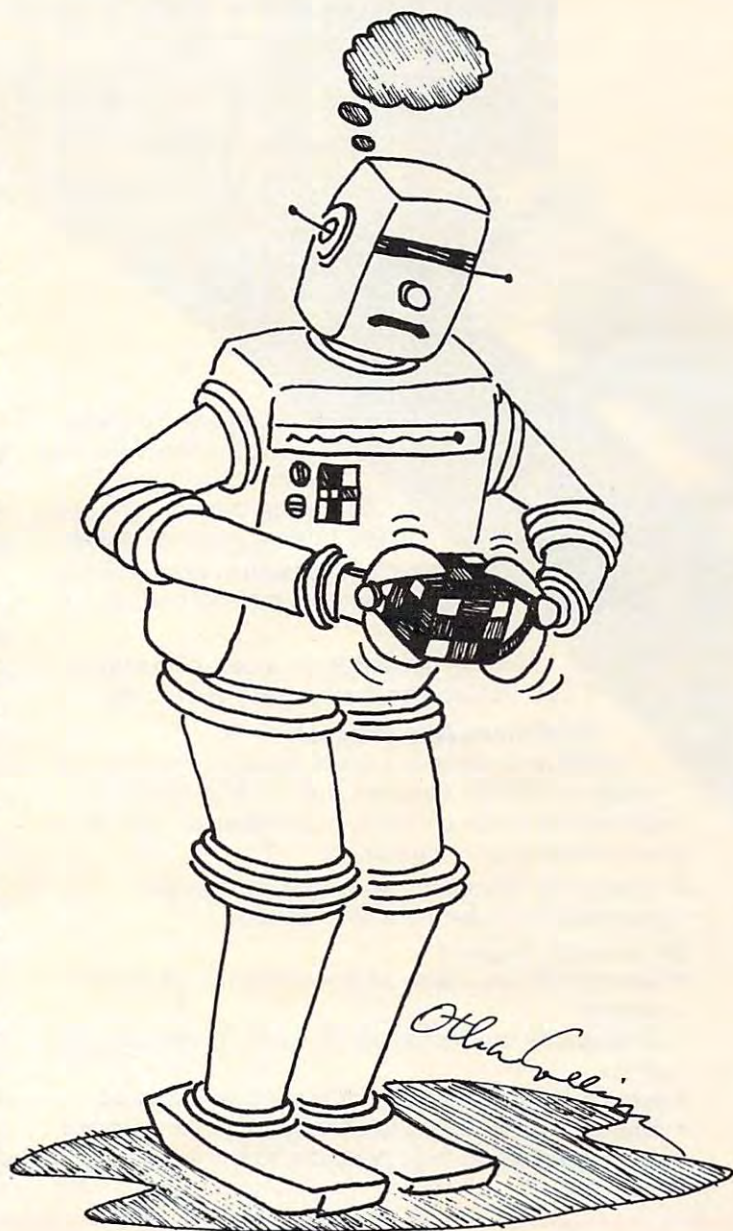
```

```

5380 PRINTTAB(TB); "-@1@1@="
5390 IFJJ=4THENTB=0:RETURN
5400 IFJJ=2ANDJ=2THENTB=16:PRINT "{08 UP}":JJ=3:
GOTO5350
5410 IFJJ=3ANDJ=2THENTB=24:PRINT "{08 UP}":JJ=4:
GOTO5350
5420 IFJ=2THENTB=8:PRINT "{08 UP}":JJ=2:GOTO5350
5430 RETURN
5440 PRINT "{HOME}{20 DOWN}HIT {REV}SPACE{OFF} T
O CONTINUE"
5450 GETRS:IFRS="" THEN5450
5460 IFRS=CHR$(32) THENRETURN
5470 GOTO5450

```

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Superchase

Anthony Godshall
Elkhart, IN

"Superchase" is an arcade-style game where you try to eat all the treasures before the monster of dungeons eats you! Sounds easy, doesn't it? Well, it isn't quite that simple. The faster you go, the faster he goes. What's the point in going fast? If you go fast, you get more points.

Here's how the game works. You get to choose your skill level. Hit a key between 1 and 9. After this, the maze is drawn. Following this, the treasures are put in, and you appear in the upper left-hand corner. Take off!

If you clear the maze of all the treasures, you will receive a bonus, depending on your skill level and score, and will start a new screen with a higher skill level. Don't be disappointed if you don't get a good score the first time. I find that most people learn quickly.

The monster will follow in your exact footsteps, so you can duck into a side passageway and let him go past if you know where you have been. If you are trapped, try to make him accelerate. When he is accelerating, you can run past him. Do this by moving back and forth as fast as you can.

If you don't want to spend the time to type the VIC version in, send me a cassette, a self-addressed, stamped mailer, and \$3:

Anthony Godshall
137 Wagner
Elkhart, IN 46516

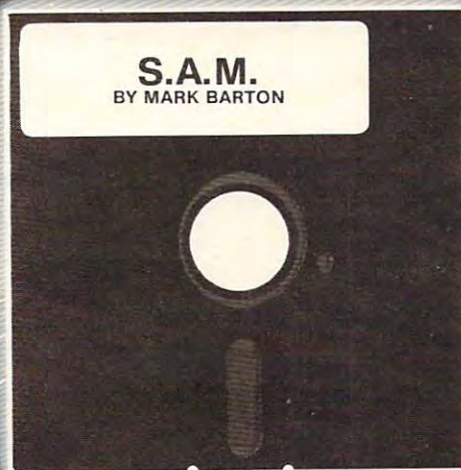
Program 1: VIC Version

```
10 REM{"07 DEL"}00000000000000000000. 1 SUP
   ERCHASE 1 1 BY ANTHONY GODSHALL
22 REM{"07 DEL"}-00220000000000000000= 88888888
   88888888888888
40 GOSUB14000
42 POKE1,0:POKE2,0
45 GOSUB12000:CLR:SK=PEEK(0):P=PEEK(1)*256+PE
   EK(2)
100 GOTOL0000
1000 M$=""
1110 POKEDD,127:P1=PEEK(D1)ANDAD:P2=PEEK(D2)
1120 IFP1=58THENM$="+{LEFT}{UP}":PRINTM$;Y=Y-1
   :C$="{DOWN}":CX=0:CY=1:GOTO1160
1130 IFP2=119THENM$="+{LEFT}{RIGHT}":PRINTM$;X
   =X+1:C$="{LEFT}":CX=-1:CY=0:GOTO1160
1140 IFP1=46THENM$="+{02 LEFT}":PRINTM$;X=X-1:
   C$="{RIGHT}":CX=1:CY=0:GOTO1160
```

```
1150 IFP1=54THENM$="+{LEFT}{DOWN}":PRINTM$;Y=Y
   +1:C$="{UP}":CY=-1:CX=0:GOTO1160
1155 GOTOL300
1160 IFFNCH(S)=WLTHENPRINTC$;X=X+CX:Y=Y+CY:GOT
   OL300
1170 F$=F$+RIGHT$(M$,1)
1180 IFFNCH(S)=DITHENP=P+100*(EL-S):PC=PC+1
1190 IFFNCH(S)=SPTHENP=P+50*(EL-S):PC=PC+1
1200 IFFNCH(S)=CLTHENP=P+30*(EL-S):PC=PC+1
1210 IFFNCH(S)=HETHENP=P+20*(EL-S):PC=PC+1
1220 IFFNCH(S)=CITHENP=P+10*(EL-S):PC=PC+1
1250 J$=STR$(P*SK):FORJ=1TOLEN(J$):POKESC+J+489
   ,ASC(MID$(J$,J,1)):NEXT
1300 PRINT"Q{LEFT}";
1310 IFPC>=61THENPRINTDN$"NO MORE TREASURE.";:G
   OTO7000
1900 RETURN
2000 IFLEN(F$)>=30THENGOSUB3000
2005 FM=FM+1:IFFM/S<>INT(FM/S)THENRETURN
2006 FORH=1TOSKL:
2007 POKEFNPL(0),32
2010 J$=LEFT$(F$,1):F$=MID$(F$,2)
2030 POKEV,15:POKES1,254-LEN(F$):FORM=1TO10:NEX
   T:POKE36875,0
2100 IFJ$="{UP}"THENYF=YF-1:GOTO2200
2110 IFJ$="{RIGHT}"THENXF=XF+1:GOTO2200
2120 IFJ$="{DOWN}"THENYF=YF+1:GOTO2200
2130 IFJ$="{LEFT}"THENXF=XF-1:GOTO2200
2150 GOTO2200
2200 POKEFNPL(0),42
2205 NEXT
2210 RETURN
3000 POKEFNPL(0),32
3007 S=S-1:IFS<1THENS=1
3008 J$=STR$(EL-S):FORJ=1TOLEN(J$):POKESC+J+502
   ,ASC(MID$(J$,J,1)):NEXT
3010 FORC=1TO10:J$=MID$(F$,C,1):IFJ$="{UP}"THEN
   YF=YF-1:GOTO3100
3020 IFJ$="{DOWN}"THENYF=YF+1:GOTO3100
3030 IFJ$="{RIGHT}"THENXF=XF+1:GOTO3100
3040 IFJ$="{LEFT}"THENXF=XF-1:GOTO3100
3100 POKEFNPL(0),42
3150 IFC/SK=INT(C/SK)THENGOSUB1000
3310 FORM=CTOC+2:POKES2,M*3+130:FORN=1TO10:NEX
   T:POKES2,0
3350 POKEFNPL(0),32
3400 NEXT
3500 F$=MID$(F$,EL):RETURN
4000 IFX=XFANDY=YFTHENPRINTDN$"A TASTY MORSEL I
   NDEED!";:GOSUB6000:GOTO11000
4500 RETURN
6000 POKE36877,220:FORL=15TO0STEP-1:POKE36878,L
   :FORM=1TO300:NEXT:NEXT:POKE36877,0:PO
   KE36878,15
6010 RETURN
7000 FORK=1TO30
7005 POKE36876,220:FORL=1TO5:NEXT:POKE36876,0:F
   ORL=1TO5:NEXT:POKE36876,200:FORL=1TO5
   :NEXT
7010 POKE36876,0:FORL=1TO5:NEXT:NEXT
7100 J=INT(P/256):POKE1,J:POKE2,P-J*256
7200 SK=PEEK(0)+1:POKE0,SK:GOTO45
7999 GOTO7000
8000 FORM=1TO500:GOSUB1000:IFLEN(F$)<20THENNEXT
8010 FORJ=8142TO8142+20:POKEJ,32:NEXT
8100 GOSUB1000:GOSUB2000:GOSUB4000:GOTO8100
10000 DN$="{HOME}{21 DOWN}{REV}{WHT}"
10030 S=10:PC=0:SC=7680:RO=22
10050 DEFFNPL(XX)=(YF*RO+XF)+SC
10060 DEFFNCH(XX)=PEEK((Y*RO+X)+SC)
10077 SO=10:POKE36878,15
10100 DD=37154:D1=37151:D2=37152:AD=63
10110 WL=102:DI=90:SP=65:CL=88:HE=83:CI=87:EL=11
10120 V=36878:S1=36875:S2=36876
10500 TI$="000000"
10600 PRINTDN$ GO !!!!!
10700 PRINTDN$"{OFF}{DOWN}{BLK}SCORE:{WHT}
   {BLK}SPEED:{WHT} 1{HOME}"
10800 PRINT"{HOME}{RIGHT}{DOWN}";:X=1:Y=1:XF=1:Y
```


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```

F=1
10900 GOTO8000
11000 REM GAME OVER
11010 POKE37154,255
11105 PRINT:PRINT"{DOWN}TIME WAS ";MID$(TI$,3,2)
      ;" MINUTES,";RIGHT$(TI$,2);" SECONDS
      "
11110 PRINT"PLAY AGAIN ? $(LEFT}";
11120 GETJ$:IFJ$="N"THEN11120
11130 PRINTJ$:IFJ$="N"THENEND
11140 IFJ$="Y"THENRUN
11150 PRINT:PRINT"{UP}";:GOTO11110
12000 DIMA(3):A(0)=2:A(1)=-44:A(2)=-2:A(3)=44:WL
      =102:HL=32:SC=7680:A=SC+23:J=RND(-TI)

12010 POKE36879,110
12100 PRINT"{CLEAR}{YEL}{OFF}";CHR$(142):FORI=1T
      O21:PRINT"#####":NEXT
      :POKEA,4
12200 J=INT(RND(1)*4):X=J
12205 B=A+A(J)
12210 IFPEEK(B)=WLTHENPOKEB,J:POKEA+A(J)/2,HL:A=
      B:GOTO12200
12240 J=(J+1)*-(J<3):IFJ<>XTHEN12205
12250 J=PEEK(A):POKEA,HL:IFJ<4THENA=A-A(J):GOTO1
      2200
12300 PRINT"{HOME}{DOWN}{RIGHT}V"
12305 READJ,K,C:IFJ<0THEN12500
12310 FORA=1TOJ
12320 B=INT(RND(1)*410):IF(B-21)/22=INT((B-21)/2
      2)THEN12320
12330 IF PEEK(B+7702)<>32THEN12320
12340 POKEB+7702,K:POKEB+38422,C
12350 NEXT:GOTO12305
12400 DATA2,90,1,4,65,0,7,88,5,9,83,2,39,87,3,-1
      ,0,0
12450 PRINT"12450:P="P
12500 RETURN
14000 POKE36879,46
14010 PRINTCHR$(14)"{CLEAR}{WHT}{04 DOWN}{02 RIG
      RIGHT} $$$$$$ {REV}
      SUPERCHASE{OFF}"
14020 PRINT"{03 DOWN}{02 RIGHT} BY TONY GODSHALL
      "
14050 PRINT"{03 DOWN} SKILL LEVEL (1-9): {REV} {
      OFF}{02 LEFT}";
14060 GETJ$:IFJ$="N"THEN14060
14070 SK=VAL(J$):IFSK<1ORSK>9THEN14060
14075 POKE0,SK
14080 PRINTSK:POKE0,SK:RETURN

```

Program 2: Atari Version

```

40 GOTO 14000
42 POKE 1,0:POKE 2,0
45 TRAP 47:DIM F$(40):TRAP 40000
47 F$="":GOSUB 12000:SK=PEEK(0):P=PEE
      K(1)*256+PEEK(2):GOSUB 10000:GOTO
      8000
990 REM READ JOY, MOVE
1000 REM
1010 PA=STICK(0)
1020 S3=(PA=7)
1030 S0=(PA=14):S1=(PA=13):S2=(PA=11)
1100 IF S0 THEN POKE X,7+128:C=20:GOT
      O 1160
1130 IF S3 THEN POKE X,6+128:C=-1:GOT
      O 1160
1140 IF S2 THEN POKE X,8+128:C=1:GOTO
      1160
1150 IF S1 THEN POKE X,9+128:C=-20:GO
      TO 1160
1155 FOR J=1 TO 50:NEXT J:GOTO 1300
1160 X=X-C:IF PEEK(X)=129 THEN X=X+C:

```

```

      GOTO 1300
1165 SOUND 0,100,10,8
1170 F$(LEN(F$)+1)=CHR$(-C+99)
1180 J=PEEK(X):POKE X,2+64:IF J=10 TH
      EN K=100:GOSUB 9000
1190 IF J=11 THEN K=50:GOSUB 9000
1200 IF J=12 THEN K=30:GOSUB 9000
1210 IF J=13 THEN K=20:GOSUB 9000
1220 IF J=14 THEN K=10:GOSUB 9000
1230 SOUND 0,0,0,0
1250 POSITION 6,22:?" #6;P;" ";
1300 POKE X,3+64:RETURN
1990 REM " MOVE MONSTER
2000 IF LEN(F$)>=30 THEN GOSUB 3000
2005 O=O+1:IF O/S<>INT(O/S) THEN RETU
      RN
2010 FOR J=1 TO SK:GOSUB 4000:POKE F,
      O:F=F+(ASC(F$)-99):F$=F$(1+((LEN
      (F$)>1)))
2030 POKE F,5+192:SOUND 0,120,0,8:FOR
      M=1 TO 50:NEXT M:POKE F,4+192:S
      OUND 0,80,0,8:NEXT J:SOUND 0,0,0
      ,0:RETURN
2990 REM " SPEED UP MONSTER
3000 POKE F,0:S=S-1:IF S<1 THEN S=1
3005 POSITION 18,22:?" #6;E-S;
3010 FOR N=1 TO 10:POKE F,0:F=F+(ASC(
      F$)-99):F$=F$(2):POKE F,5+192
3150 IF (N/SK=INT(N/SK)) AND PP THEN
      GOSUB 1000
3310 FOR M=N TO N+2:SOUND 0,M*3,0,8:N
      EXT M:NEXT N:SOUND 0,0,0,0
3500 RETURN
3990 REM " CHECK IF EATEN
4000 IF X<>F THEN RETURN
4005 POKE F,8:SOUND 0,0,0,0
4010 GOSUB 18000:POSITION 0,22:?" #6;"
      A TASTY MORSEL{8 SPACES}INDEED_"
      ;
4015 FOR J=1 TO 2000
4025 NEXT J
4027 IF PP=0 THEN 16800
4060 GOTO 11000
6990 REM " GET PROMOTED
7000 J=INT(P/256):POKE 1,J:POKE 2,P-J
      *256
7100 SK=PEEK(0)+1:POKE 0,SK
7200 POSITION 0,23:?" #6;"CONGRATULATI
      ONS !!"
7400 PRINT "{CLEAR}{3 DOWN} ONE AS F
      LEET-FOOTED AS YOU DESERVES":?"
      MORE CHALLENGE.{2 DOWN}"
7405 FOR J=1 TO 1000:NEXT J
7410 PRINT " YOU ARE THEREFORE PROMO
      TED TO":?" SKILL LEVEL ";SK
7420 FOR J=1 TO 1000:NEXT J
7500 GOTO 45
7990 REM " MAIN LOOP!
8000 FOR M=1 TO 500:GOSUB 1000:IF LEN
      (F$)<20 THEN NEXT M
8100 GOSUB 1000:GOSUB 2000:GOSUB 4000
      :GOTO 8100
8990 REM " PICKED UP TREASURE
9000 FOR I=1 TO 10:SOUND 0,10*RND(0),
      10,8:NEXT I:SOUND 0,0,0,0
9010 P=P+K*(E-S):PC=PC+1:IF PC>=61 TH
      EN 7000
9100 RETURN
9990 REM " SET VARIABLES, ETC.
10000 REM
10030 S=10:PC=0:RO=22:PP=1
10110 W=5:E=11:GOSUB 18000
10600 POSITION 8,23:?" #6;"E{INSERT}"
10700 POSITION 0,22:?" #6;"SCORES
      {6 SPACES}speed:1"

```




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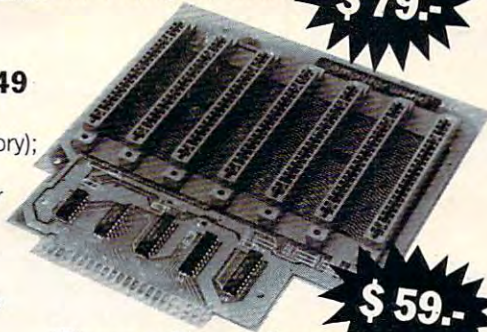
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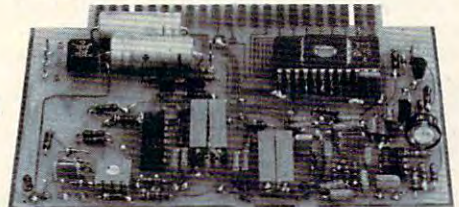
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```

10800 X=SC+21:F=X
10900 RETURN
11000 REM " GAME OVER
11105 PRINT :? "SCORE:";P:~
11110 PRINT "PLAY AGAIN ? (Y/N): ";
11120 OPEN #1,4,0,"K:":GET #1,A:CLOSE
#1
11130 IF A=ASC("N") THEN END
11140 RUN
11990 REM " MAKE MAZE (ALGORITHM FROM
M COMPUTE!)
12000 GRAPHICS 17:POKE 756,CHSET/256
12010 TRAP 12015:DIM A(3):A(0)=2:A(1)
=-40:A(2)=-2:A(3)=40:WL=129:HL=
0:TRAP 40000
12015 A=SC+21
12100 FOR I=1 TO 21:~ #6;"XXXXXXXXXXXX
XXXXXXXXXX":NEXT I:POKE A,5
12150 ? #6;"the dwarves mined":? #6;"
here many years ago";
12200 J=INT(RND(1)*4):X=J
12205 B=A+A(J)
12210 IF PEEK(B)=WL THEN POKE B,J+1:P
OKE A+A(J)/2,HL:A=B:GOTO 12200
12240 J=(J+1)*(J<3):IF J<>X THEN 1220
5
12250 J=PEEK(A):POKE A,HL:IF J<5 THEN
A=A-A(J-1):GOTO 12200
12255 GOSUB 18000
12260 POSITION 0,22:~ #6;"XXXXXXXXXXXX
XXXX":? #6;"XXXXXXXXXXXXXXXXXXXXXXXX
";
12270 RESTORE
12300 FOR K=10 TO 14:READ J,C
12310 FOR A=1 TO J
12320 B=SC+40+INT(20*RND(0))*20+INT(1
9*RND(0))
12330 IF PEEK(B)<>0 THEN 12320
12340 POKE B,K
12350 NEXT A:NEXT K
12500 RESTORE :RETURN
12600 DATA 1,1,7,3,12,7,15,6,26,0
13990 REM " TITLE PAGE, ETC.
14000 GRAPHICS 17
14005 SC=PEEK(88)+256*PEEK(89):CHSET=
PEEK(106)-8:CHSET=CHSET*256
14007 FOR I=0 TO 512:POKE CHSET+I,PEE
K(57344+I):NEXT I
14010 ? #6;"{5 SPACES}XXXXXXXXXXXX
{INSERT}":? #6
14020 ? #6
14030 GOTO 16000
14050 ? #6:~ #6;"XXXXXXXXXXXX <1..9>"
14060 OPEN #1,4,0,"K:":GET #1,A:CLOSE
#1
14070 SK=A-48:IF SK<1 OR SK>9 THEN 14
060
14080 POKE 0,SK:GOTO 42
15990 REM " SHOW & DEFINE CHARACTERS
16000 FOR J=1 TO 7:POKE SC+J*40+80,J:
NEXT J
16010 FOR J=8 TO 15:POKE SC+19+80+40*
(J-7),J:NEXT J
16020 POKE 756,CHSET/256
16150 FOR J=0 TO 7:POKE CHSET+J,0:NEX
T J
16160 FOR J=1 TO 10:READ K:NEXT J
16200 X=256:FOR J=0 TO 119:READ K
16250 X=X-0.81:SOUND 0,X,10,8
16300 POKE CHSET+8+J,K:NEXT J
16305 FOR I=0 TO 7:READ A:POKE CHSET+
63*8+I,A:NEXT I
16310 SOUND 0,0,0,0:GOTO 14050
17111 REM " CHARACTER DATA
17112 DATA 85,42,85,42,85,42,85,0

```

```

17115 DATA 28,42,62,34,28,36,68,38
17120 DATA 28,42,62,34,28,21,18,24
17130 DATA 60,90,126,74,66,60,36,102
17140 DATA 60,90,126,74,126,66,66,195
17150 DATA 0,224,240,224,14,15,14,0
17160 DATA 4,14,14,14,32,112,112,112
17170 DATA 0,112,240,112,7,15,7,0
17180 DATA 14,14,14,4,112,112,112,32
17190 DATA 0,8,34,8,93,8,34,8
17200 DATA 1,76,18,34,68,72,50,128
17210 DATA 0,73,42,0,216,28,60,0
17220 DATA 0,2,24,36,36,24,64,0
17230 DATA 0,0,12,28,56,48,0,0
17235 DATA 0,126,126,126,122,126,126,
0
17300 DATA 0,7,15,14,24,48,0,64
18000 COLOR 0:PLOT 0,21:DRAWTO 19,21:
PLOT 0,22:DRAWTO 19,22:PLOT 0,2
3:DRAWTO 19,23:RETURN

```

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- V151 **BIZZ-BUZZ**
Math game that tests the student on division by 2&3. Good for elementary school students. With color and sound. \$9.95

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You have three bases and you must destroy as many space ships as you can before you run out of missiles. \$9.95

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Just like the biorhythm charts you find in books. \$9.95
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Just like Blackjack in the casinos. \$14.95
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This program finds the equation for the best straight line through the desired points on a graph. \$9.95
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Pacman for the VIC. \$24.95
- V197 **ASTROBASE-2001**
Destroy the alien invaders from space as they attack your planet. Requires 3K memory expander. \$9.95
- V199 **SUBROUTINES**
The use of this standard programming technique allows you to save much room and effort. Typical uses are stressed. \$14.95
- V299 **ACAT HAS NINE LIVES**
You're an alley cat who is trying desperately to defend himself from unidentified deadly objects. Fast paced game. \$7.95
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The object of the game is to guess where the target will be, then fire the missile! This program will exercise your psychic ability. Requires \$9.95
- V301 **BEECHA GOTCHA**
By Richard Leiman
Play "Beecha Gotcha." If the harpoon hits the monster fish, I "beechea." If the monster eats the boat, I "gotcha." Requires 3K expander. \$9.95
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Here is a game for VIC and Atari that teaches math while it entertains.

MathMan

Andy Hayes
San Jose, CA

Here's a program which proves that computer-aided math practice need not be boring. In the guise of a game, MathMan teaches multiplication facts by presenting random problems. The player (or student) types in the answer and presses RETURN. If he is correct, his friends gathered below cheer, but if the player fails to guess correctly, one of his friends will run away in shame. If all six friends flee, the game is over.

A good player can advance to the next level by successfully completing ten problems. The problems get successively more difficult, so this single program will provide challenge for almost any elementary school child. (Adults may also enjoy the animation!)

Program 1: VIC Version

```

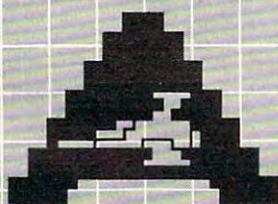
0 A=6
1 LV=1
10 PRINT "{WHT}{CLEAR}"
20 POKE36879,110
30 CSS="{HOME}{21 DOWN}"
200 PRINTLEFT$(CSS,16)"{REV} {OFF} N"
220 PRINTLEFT$(CSS,17)"{REV} {OFF}"
230 PRINTLEFT$(CSS,18)"{REV} {OFF}"
240 PRINTLEFT$(CSS,19)"{REV} {OFF}"
250 PRINTLEFT$(CSS,20)"{REV} {OFF}"
260 PRINTLEFT$(CSS,21)"{REV} {OFF}"
270 IFA=6THENPRINT "{HOME}{17 DOWN}{07 RIGHT}UI
UIUIUIUI"
271 IFA=6THENPRINT "{07 RIGHT}JKJKJKJKJK"
272 IFA=6THENPRINT "{07 RIGHT}POPOPOPOPO"
273 IFA=6THENPRINT "{07 RIGHT}NMNMNMNMNM"
274 IFA=5THENPRINT "{HOME}{17 DOWN}{07 RIGHT}
UIUIUIUI"
275 IFA=5THENPRINT "{07 RIGHT} JKJKJKJKJK"
276 IFA=5THENPRINT "{07 RIGHT} POPOPOPOPO"
277 IFA=5THENPRINT "{07 RIGHT} NMNMNMNMNM"
278 IFA=4THENPRINT "{HOME}{17 DOWN}{07 RIGHT}
UIUIUIUI"
279 IFA=4THENPRINT "{07 RIGHT} JKJKJKJKJK"
280 IFA=4THENPRINT "{07 RIGHT} POPOPOPOPO"
281 IFA=4THENPRINT "{07 RIGHT} NMNMNMNMNM"
282 IFA=3THENPRINT "{HOME}{17 DOWN}{07 RIGHT}
UIUIUIUI"
283 IFA=3THENPRINT "{07 RIGHT} JKJKJKJKJK"
284 IFA=3THENPRINT "{07 RIGHT} POPOPOPOPO"
285 IFA=3THENPRINT "{07 RIGHT} NMNMNMNMNM"
286 IFA=2THENPRINT "{HOME}{17 DOWN}{07 RIGHT}
UIUIUI"
287 IFA=2THENPRINT "{07 RIGHT} JKJKJKJKJK"
288 IFA=2THENPRINT "{07 RIGHT} POPOPOPOPO"
289 IFA=2THENPRINT "{07 RIGHT} NMNMNMNMNM"
290 IFA=1THENPRINT "{HOME}{17 DOWN}{07 RIGHT}
UI"
291 IFA=1THENPRINT "{07 RIGHT} JKJKJKJKJK"
292 IFA=1THENPRINT "{07 RIGHT} POPOPOPOPO"
293 IFA=1THENPRINT "{07 RIGHT} NM"
294 IFA=0THENPRINT "{HOME}{17 DOWN}{07 RIGHT}
"
295 IFA=0THENPRINT "{07 RIGHT} "
296 IFA=0THENPRINT "{07 RIGHT} "
297 IFA=0THENPRINT "{07 RIGHT} "
03000
298 IFA=6THENML=7688:MM=7710
299 PRINT "{HOME}LEV.{REV}"LV
300 IFA=5THENML=7690:MM=7712
302 IFA=4THENML=7692:MM=7714
304 IFA=3THENML=7694:MM=7716
306 IFA=2THENML=7696:MM=7718
308 IFA=1THENML=7698:MM=7720
322 IFO=10THENLV=LV+1:GOTO2000
350 LETS=LV*2
355 O=O+1
360 B=INT(RND(1)*S)+1
370 C=INT(RND(1)*9)+1
375 PRINTLEFT$(CSS,23)"{REV}{PUR}SCORE-SC"{WH
WHT}"
380 PRINTLEFT$(CSS,5)"{09 RIGHT}"B"{LEFT} "
390 IFB<10THENPRINTLEFT$(CSS,7)"{08 RIGHT}X"C"
{LEFT} " :GOTO400
393 IFB<100THENPRINTLEFT$(CSS,7)"{08 RIGHT}X "
C"{LEFT} " :GOTO400
395 IFB<1000THENPRINTLEFT$(CSS,7)"{08 RIGHT}X "
"C"{LEFT} " :GOTO400
400 PRINTLEFT$(CSS,8)"{08 RIGHT}@@@@@"
410 PRINT "{HOME}{08 DOWN}{07 RIGHT} "
415 INPUT "{HOME}{08 DOWN}{08 RIGHT}";AS
430 IFAS=B*CTHEN700
440 IFAS<>B*CTHEN1000
700 SC=SC+5*LV
711 PRINTLEFT$(CSS,16)"{07 RIGHT}{REV}THANK YO
U!!!{OFF}"
715 X=X+1
720 POKE36878,15
730 E=INT(RND(1)*30)+210
740 POKE36875,E
742 FORT=1T0100:NEXT:POKE36878,0
744 IFX=10THENX=0:GOTO760
750 GOTO715
760 FORT=1T0500
770 PRINTLEFT$(CSS,23)"{12 RIGHT} "
772 PRINTLEFT$(CSS,10)" "
775 PRINTLEFT$(CSS,16)"{07 RIGHT} "
776 IFO=10THEN790
780 F=0:GOTO355
790 LV=LV+1:GOTO2000
1000 Q=7992
1005 POKEQ,32:Q=Q-21:POKEQ,78
1010 IFQ=7866THEN1030
1020 GOTO1005
1030 POKEQ,160:POKEQ+1,160:POKEQ-1,160:POKEQ+22
,160:POKEQ-22,160
1040 POKE36877,220
1041 Z=15
1042 Z=Z-1
1044 POKE36875,0:POKE36878,Z
1046 FORT=1T0100:NEXT
1048 IFZ=0THENZ=15:GOTO1060
1050 GOTO1042
1060 POKE36877,0:POKE36878,0:POKEQ+22,32:POKEQ-
22,64:POKEQ,32:POKEQ-1,32:POKEQ+1,32
1070 Q=7992
1075 POKEQ,32:Q=Q-21:POKEQ,78
1080 IFQ=7866THEN1200
1085 GOTO1075
1199 END
1200 Y=Y+1
1205 PRINT "{HOME}{08 DOWN}{09 RIGHT}{REV}"B*C"{
LEFT}{REV} "
1210 FORT=1T0150:NEXTT
1220 PRINT "{HOME}{08 DOWN}{09 RIGHT} "
1230 FORT=1T0150:NEXTT
1235 IFY=8THENY=0:GOTO1300
1240 GOTO1200

```


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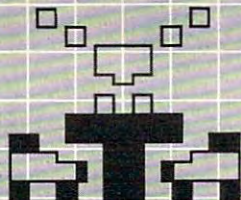
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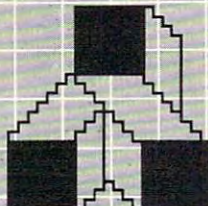
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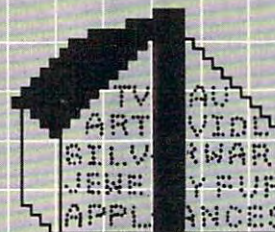
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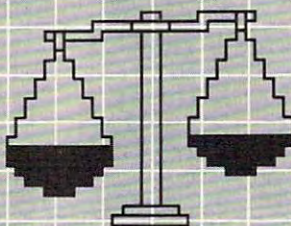
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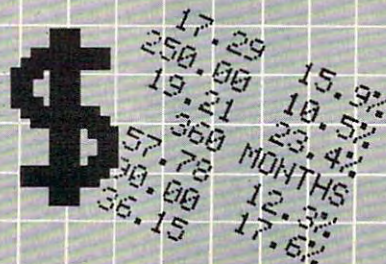
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```

1300 PRINTLEFT$(CS$,5)"
1310 IFB<10THENPRINTLEFT$(CS$,7)"
1320 IFB<100THENPRINTLEFT$(CS$,7)"
1330 IFB<1000THENPRINTLEFT$(CS$,7)"
1340 PRINTLEFT$(CS$,8)"
1345 PRINTLEFT$(CS$,9)"
1400 W=MM+22:A=A-1
1430 IFO=10THEN2000
1500 POKEW,32:GOTO10
2000 FORT=1TO2000:NEXT
2001 PRINT"[CLEAR]{HOME}{06 DOWN} YOU MADE IT T
HROUGH"
2005 PRINT"    LEVEL"LV-1
2010 PRINT"[02 DOWN] YOU NOW ADVANCE TO"
2015 PRINT"    LEVEL"LV:O=0:FORT=1TO4000:NEXT
:GOTO10
3000 FORT=1TO2000:NEXT
3010 PRINT"[CLEAR]{HOME}{04 DOWN}SORRY BUT YOU ~
LOST ALL";
3020 PRINT"[02 DOWN]    YOUR MEN"
3030 PRINT"[04 DOWN]    {REV}YOUR SCORE WAS{OFF
OFF}"
3040 PRINT"[02 DOWN]    "SC

```

Program 2: Atari Version

```

0 A=6
1 LV=1
10 GRAPHICS 0:POKE 82,0:POKE 752,1:~
"[CLEAR]"
20 POSITION 0,16
200 ? "[F]"
220 ? "[3 SPACES]"
230 ? "[4 SPACES]"
240 ? "[5 SPACES]"
250 ? "[6 SPACES]"
260 ? "[7 SPACES]"
270 IF A=0 THEN 3000
275 FOR I=1 TO A
280 POSITION I*3+6,17
290 ? "[RIGHT]{Q}{E}{DOWN}{2 LEFT}
{Z}{C}{DOWN}{2 LEFT}{E}{Q}{DOWN}
{2 LEFT}{F}{G}"
295 NEXT I
298 SC=PEEK(88)+256*PEEK(89)
299 POSITION 0,0:?"LEVEL ";LV
322 IF O=10 THEN LV=LV+1:GOTO 2000
350 S=LV*2
355 O=O+1
360 B=INT(RND(1)*S)+1
370 C=INT(RND(1)*9)+1
375 POSITION 0,22:?"SCORE-";SC0
380 POSITION 10,5:?"B:"
390 POSITION 8,7:?"X ";C
400 POSITION 8,8:?"{6 R}"
410 POSITION 8,9:?"{6 SPACES}"
415 TRAP 415:POSITION 8,11:INPUT AS:T
RAP 40000
430 IF AS=B*C THEN 700
440 IF AS<>B*C THEN 1000
700 SC0=SC0+5*LV
711 POSITION 10,14:?"[F] "
715 X=X+1
730 E=INT(RND(1)*30)+210
742 FOR T=1 TO 10:POKE 710,PEEK(53770
):SOUND 0,T,10,8:NEXT T
743 SETCOLOR 2,9,4:SOUND 0,0,0,0
744 IF X=10 THEN X=0:GOTO 760
750 GOTO 715

```

```

760 FOR T=1 TO 500
770 COLOR 32:PLOT 0,23:DRAWTO 39,23
772 PLOT 0,10:DRAWTO 39,10
775 PLOT 0,16:DRAWTO 39,16
776 IF O=10 THEN 790
780 F=0:GOTO 10
790 LV=LV+1:GOTO 2000
1000 Q=SC+604
1005 POKE Q,0:Q=Q-39:POKE Q,10
1010 IF Q-SC<=409 THEN 1030
1020 GOTO 1005
1030 FOR I=1 TO 10:SOUND 0,I,0,10-I:S
OUND 1,I*10+50,2,8
1040 POKE Q,128:POKE Q+1,128:POKE Q-1
,128:POKE Q+40,128:POKE Q-40,128
1050 POKE Q+40,0:POKE Q-40,0:POKE Q,0
:POKE Q-1,0:POKE Q+1,0
1060 NEXT I:SOUND 1,0,0,0
1080 REM MAN RUNS AWAY
1090 REM
1100 FOR I=A*3+6 TO 35
1110 POSITION I,17:?"{Q}{E}{DOWN}
{3 LEFT}{A}{C}{DOWN}{3 LEFT} ;
{F}{DOWN}{3 LEFT}{F}{G}"
1115 SOUND 0,100,0,8
1120 FOR W=1 TO 5:NEXT W
1125 SOUND 0,10,0,8
1130 POSITION I,17:?"{Q}{E}{DOWN}
{3 LEFT}{A}{C}{DOWN}{3 LEFT} ;
{R}{DOWN}{3 LEFT}{F}{G}"
1140 FOR W=1 TO 5:NEXT W
1145 SOUND 0,0,0,0
1150 NEXT I
1160 A=A-1:GOTO 10
1199 END
1413 NEXT K
2000 PRINT "[CLEAR]{6 DOWN} YOU MADE
IT THROUGH"
2005 PRINT "[6 SPACES]LEVEL ";LV-1
2010 PRINT "[2 DOWN] YOU NOW ADVANCE
TO"
2015 PRINT "[6 SPACES]LEVEL ";LV:O=0:
FOR T=1 TO 500:NEXT T:GOTO 10
3000 REM
3010 PRINT "[CLEAR]{4 DOWN}SORRY BUT
YOU LOST ALL";
3020 PRINT "[2 DOWN]{7 SPACES}YOUR ME
N"
3030 PRINT "[4 DOWN]{4 SPACES}YOUR SC
ORE WAS"
3040 PRINT "[2 DOWN]{7 SPACES}";SC0 ©

```

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There are versions of this exciting adaptation of Tag for the Atari (16K required) and PET/CBM with Upgrade or 4.0 BASIC. Each game involves a special extra feature which makes the action all the more challenging: the pursuer can become the pursued without warning and without tagging the other player!

TAG

Ed Davis
Rumford, ME

When playing real-life tag with only two players, nobody really wins because the number of tags per player remains constant. But in computer Tag, the clock decides who will be the champion. Every 15 seconds, if the person who is *It* cannot tag the other, the computer will reverse the *It* player. This feature allows a real fight for points. If you are not skilled in attacking, you can become skilled in evasive tactics and win the game.

Before the game starts, the players must input their names. Then, the computer will ask for the "color" of the playing arena. "Color" simply describes which keyboard character will appear as the border of the arena.

Then, you set a point limit by inputting a number from one to infinity. Game length is determined by the amount of time it takes for any one player to amass the predefined number of points.

The computer then draws a large square area the length and width of the screen and fills this area with 180 obstacles that players must dodge in their quest for victory.

The Controls

The PET number pad serves as the control for the right-side player. The "QWE", "ASD", and "ZXC" keys serve as the controls for the left-side player. These are movement controls, and the "5" or the "s" keys will stop the player from going further than he wishes. To quit a game in progress, typing "%" will cease all function, and no points will be given to either player. This feature exists because the computer will sometimes surround a player with obstacles before battle, causing a shutdown of the afflicted player's actions.

Sound Effects

The sound effects in Tag are mostly simple loops. The sound output is for CB2 sound users. If you

are not using sound, or just want to make the game movements a little faster by eliminating the sound loops, just remove the sound GOSUBs (lines 10-81) and install RETURNS. There are six different sound effects.

Machine Language

The machine language program built into Tag will work on all 40-column Commodore PETs. Even though the starting address is 826, and starting here on 4.0 ROMs sometimes messes things up, the program always works on the Fat-Forty that I use, and it works on the 4016, 2001, and 8032 models as well. The machine language program simply reverses all the characters on the screen by SYS826. (Typing SYS826 again will restore the screen to normal.)

Program 1: PET Version

```
0 POKE59467,16:POKE59466,15
1 POKE59464,0:POKE59468,12:GOTO100
10 FORT=0T0127STEP5
20 FORX=T*2TOTSTEP-3:POKES1,X:NEXT
21 NEXT
30 POKES1,0:RETURN
32 FORT=255T0100STEP-1:POKES1,T:NEXT
33 POKES1,100:FORX=1T0100:NEXT
34 FORT=100T0255STEP2:POKES1,T
35 POKES2,T:NEXT:POKES1,0:RETURN
50 FORT=255T00STEP5:POKES1,T:NEXT
55 POKES1,142:FORT=1T0100:POKES2,T:NEXT
56 FORT=1T018:FORX=3T030STEP3:POKES1,X
57 NEXT:NEXT:POKES1,0:RETURN
60 POKES1,30:POKES1,0:RETURN:REM AAA
70 POKES1,170:POKES1,0:RETURN:REM ZZZ
75 FORT=1T013:REM GALAXIAN WIPETHEOUT
80 FORT=200T0100STEP-20:POKES1,T:NEXT
81 NEXT:POKES1,0:RETURN
100 A=32809:Z=33726:AA=81:ZZ=87:TT=900
101 S1=59464:S2=59466
110 DATA39,40,41,-1,0,1,-41,-40,-39
120 FORT=1T09
130 READX
140 AM(T)=X:ZM(T)=X:NEXT
150 PRINT"{CLEAR}";
160 IFG=1THEN600
200 READAB,BM
201 FORT=ABT0BM:READX:POKET,X:NEXT
210 PRINT"{CLEAR}{10 RIGHT}TAG!"
220 PRINT"{DOWN}RACE FOR POINTS!!"
230 PRINT"{DOWN}ASSUMING YOU KNOW THE ";
231 PRINT"KEYBOARD GAME CONTROLS..."
250 PRINT
260 PRINT"Q WILL BE NUMBER CONTROL'S MAN"
270 PRINT"W WILL BE LETTER CONTROL'S MAN"
280 PRINT"{DOWN}IF EITHER MAN IS {REV}RVS{OFF}
'D,HE IS IT!!"
290 PRINT"IT' TAGS OTHER MAN FOR 1 POINT AND
WHO IS 'IT' CHANGES. "
300 PRINT"IN 15 SECONDS DURING GAME, IF NO TAG
S ARISE, THEY CHANGE ANYWAY!"
310 PRINT"{DOWN}YOU'LL BOTH GO BACK TO START A
FTER EACH TAG."
315 PRINT:PRINT"WINNER OF EACH ROUND IS INDICA
TED "
316 PRINT"BY A {REV}B{OFF} AFTER A WINNING HIT
!"
320 PRINT"{DOWN}{REV}RETURN{OFF} TO CONTINUE..
."
350 GETTS:IFTS=CHRS(13)THEN390
355 PRINT"{HOME}";TAB(21);"{REV}WITH SOUND{OFF}
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TEXT MASTER is a general purpose text editor for the Apple II computer. It features powerful, English-oriented commands which permit the complete manipulation of textual information. The information treated may be correspondence, computer programs, data to be used by other programs, and more. TEXT MASTER also interfaces with any printer connected to your Apple. The minimum system requirements are 32K of RAM, AppleSoft on ROM, at least one disk, and a lower case adapter. TEXT MASTER can process any length file segment by segment. Thus it is possible to process files as large as a diskette. Comes complete with an efficient 16 page manual. TEXT MASTER is equivalent in capability to many other text processing systems costing 3 or more times as much. The commands available in TEXT MASTER are: COLLECT, USE, EXECUTE, NONUM, INSERT, MERGE, STOP, RENUM, DELETE, SAVE, COPY, FREE, REPLACE, WAIT, MOVE, LENGTH, LIST, RESAVE, CLEAR, AUTO, RETRY, APPEND, SET, MANUAL, CHANGE, SCRATCH, SHOW, CATALOG, MODIFY, COMPARE, NUM, DISPLAY, HELP.

INTELINK (Atari only) Price: \$49.95 Diskette
This software package contains a menu-driven collection of programs for facilitating efficient business communications through a full duplex modem (required for use). In one mode of operation you may connect to a data service (e.g. SOURCE or MicroNet) and quickly load files such as stock quotations onto your diskette for later viewing. This greatly reduces "connect time" and thus the service charge. You may also record the complete contents of a communications session. Additionally, programs written in BASIC, FORTRAN, etc. may be built off-line using the support text editor and later "uploaded" to another computer, making the Atari a very smart terminal. Even Atari BASIC programs may be uploaded. Further, a command file may be built off-line and used later as controlling input for a time-share system. That is, you can set up your sequence of time-share commands and programs, and the Atari will transmit them as needed, batch processing. All this adds up to saving both connect time and your time.

PAYFIVE (Apple II plus, diskette, two drives required) Price: \$149.95
This is an enormously flexible employee payroll system with extraordinarily good human engineering features. PAYFIVE prints checks and compiles the required federal, state and local forms for up to 148 employees. The pay methods may be hourly, salary, commission or any combination. There are multiple options for pay periods, and they also can be used in any combination. PAYFIVE includes many other features and comes extremely well documented with a 200 page manual. The manual may be purchased separately for \$30, and that payment later applied to the software purchase.

SHOPPING LIST (Atari only) Price: \$12.95 Cassette \$16.95 Diskette
SHOPPING LIST stores information on items you purchase at the supermarket. Before going shopping, it will remind you of all the things you might need, and then display (or optionally print) your shopping list and the total cost. Adding, deleting, changing and storing data is very easy. Runs with 16K.

TAX OPTIMIZER (Available for all computers) Price: \$59.95 Diskette
The TAX OPTIMIZER is an easy-to-use, menu-oriented software package which provides a convenient means for analyzing various income tax strategies. The program is designed to provide a quick and easy data entry. Income tax is computed by all tax methods including: marginal, average, maximum and minimum tax. The user may immediately observe the tax effect of critical financial decisions. TAX OPTIMIZER has been thoroughly field tested in CPA offices and comes complete with the current tax tables in its data files. TAX OPTIMIZER is tax deductible!

STOCK MASTER STOCK PLOT (Apple 48K) Price: \$59.95 Diskette
This is a full-featured stock portfolio management and analysis system. Ten years of records on up to thirty stocks may be maintained. You may record prices, revenue, earnings, share, ROI, quarterly earnings and dividends, transactions, long short term gains, P.E. ratios (DJ, S & P, NASDAQ) and MORE! You may plot (HIRE) the price history of any stock against any other, time, or the indexes. Portfolio value may be evaluated at any time. Comes complete with superbly written instructions and sample files on a second diskette.

TURKEY AND MENU (Atari only) Price: \$17.95 Diskette
TURKEY is a utility program which allows you to create auto-boot/autorun diskettes easily. Simply load and run TURKEY, load the program diskette to be made into the menu, and the TURKEY diskette will be created. It also comes with DOS 2.0 and includes another program, MENU. MENU lists the contents of your diskette alphabetically, and permits the running of any BASIC program on the diskette by typing a single key. TURKEY and MENU provide you with the ability to run any program on your diskette by simply turning on the computer and pressing a single key.

STOCKAID (Atari only) Price: \$29.95 Diskette
STOCKAID provides a powerful set of tools for stock market analysis. With STOCKAID you can display point and figure charts, as well as bar charts with oscillators. You can also examine long term moving averages and on-balance volume features. STOCKAID allows you to input daily data with a single diskette capacity of 239 days x 16 stocks. Included are stock dividend and split adjustment capabilities. A very professional package!

NYINDEX (Atari only) Price: \$39.95 Diskette
NYINDEX is a comprehensive software package for storing, retrieving and plotting New York Stock Exchange information. The daily data stored includes the composite index, advances, declines, new highs and new lows. Graphical displays include the above plus the index oscillator, cumulative advances, declines and moving averages. Data entry and editing is easy. The diskette includes more than two years of daily data. NYINDEX is an excellent companion to STOCKAID.

PLAYER-MISSILE GRAPHICS TABLET (Atari only) Price: \$19.95 Diskette
The PLAYER-MISSILE GRAPHICS TABLET was designed to take the drudgery out of developing four color displays in GRAPHICS MODE 7. No longer will you have to read the locations of those tiny blocks on your graph paper and calculate PLOTS and DRAWTOS. With PMG you will be able to easily design colorful graphic displays with your joystick and save them on diskette for later recall.

LIFE CYCLE ANALYSIS AND DEPRECIATION (Apple diskette only) Price: \$39.95 Diskette
This software package contains a data file of business expenses for equipment which can later be used to calculate and display a variety of reports. You may project annual costs, find the present worth, create depreciation schedules and justify tax deductions. The evaluation techniques conform to standards set by federal agencies. This is an invaluable package for any businessman who has invested in equipment. LIFE CYCLE ANALYSIS features an easy to use data file creation screen and provides formatted hardcopy reports for use in presentations or for tax record keeping purposes. When used for generating tax information, this package is tax deductible! Requires 48K. Comes on two diskettes.

MICROMAGIC (Apple diskette only) Price: \$39.95 Diskette
The emphasis of this program is clearly the MAGIC! MICROMAGIC offers outstanding versatility in its ability to function as a stand alone entertainment package or as a utility program for creating stunning animated graphics for use in other programs. The secret lies in MICROMAGIC's special screen graphics editor. You control a graphics cursor directly from the keyboard, creating high resolution images using all 16 available colors. When you are done with a picture, it can be saved on disk with a single key command. Up to 24 images can be saved as "frames" of a movie, and then played back at high speed to create animated sequences. The effects are truly stunning. This package comes complete with demonstration programs, so that you can see exactly what you can get. No programming skills are necessary to use MICROMAGIC. If you have been frustrated by the effort required to create graphics images with your computer, MICROMAGIC will delight you.

SHAPE MAGICIAN (Apple II, 48K, diskette only) Price: \$29.95
At last! A utility for painlessly creating graphics shapes for the Apple. Create, edit and save up to 30 shapes which can then be used to develop arcade games or to simply enhance your programs. Add that professional touch!

ORDERING INFORMATION

All orders are processed and shipped within 48 hours. Please enclose payment with order and include the appropriate computer information. If paying by VISA or MasterCard, include all numbers on card. Purchase orders accepted.

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All software available on 8" CP/M disks is also available on 5 1/4" disks. North Star, Osborne, Superbrain and NEC format.

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EDUCATION

HODGE PODGE (Apple 48K only) Price: \$14.95 Cassette \$18.95 Diskette
Let HODGE PODGE be your child's teacher. Pressing any key on your Apple will result in a different and intriguing "happening" related to the study of the three R's. The program's graphics, color and sound are a delight for children from ages 15 to 7. HODGE PODGE is a non-intimidating teaching device which brings a new dimension to the use of computers in education. See the excellent reviews of this very popular program in INFO WORLD and SOFTALK.

TEACHER'S AIDE (Atari and PET only) Price: \$13.95 Cassette \$17.95 Diskette
TEACHER'S AIDE consists of three basic modules contained in one program. The first module provides addition and subtraction exercises of varying levels of difficulty. The second module consists of multiplication problems in which the student may be tested both on the final answer and on the subtotal answers in the long hand procedure. Several levels of complexity are provided here as well. The third module consists of division problems; one particularly nice feature of the division module is that the long hand division steps can be displayed along with the remainder in order to clearly demonstrate the procedure by which the remainder is derived. Using TEACHER'S AIDE is not merely a drill, but rather a learning experience.

STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) Price: \$39.95 Cassette \$43.95 Diskette
DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function or choose from a menu of filter forms. In the explicit design mode the shape of the frequency, transfer function is specified by directly entering points along the desired filter form. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to varying degrees according to the number of points used in the calculation. These filters may, optionally, also be smoothed with a Hanning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter functions. Also included are convenient data storage, retrieval and editing procedures.

DATA SMOOTHER (Not available for Atari) Price: \$19.95 Cassette \$23.95 Diskette
This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally noisy. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

FOURIER ANALYZER (Available for all computers) Price: \$19.95 Cassette \$23.95 Diskette
Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) Price: \$19.95 \$23.95 Diskette
This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) Price: \$24.95 Cassette \$28.95 Diskette
HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage; retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced or in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm. FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of \$51.95 (three cassettes) and \$63.95 (three diskettes).

REGRESSION I (Available for all computers) Price: \$19.95 Cassette \$23.95 Diskette
REGRESSION I is a unique and exceptionally versatile one-dimensional least squares "polynomial" curve fitting program. Features include very high accuracy; an automatic degree determination option; an extensive internal library of fitting functions; data editing; automatic data, curve and residual plotting; a statistical analysis (e.g. standard deviation, correlation, coefficient, etc.) and much more. In addition, new fits may be tried without reentering data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (Available for all computers) Price: \$19.95 Cassette \$23.95 Diskette
PARAFIT is designed to handle those cases in which the parameters are imbedded (possibly nonlinearly) in the fitting function. The user simply enters the data, including the parameters (N1, N2, etc.) and one or more BASIC statement lines. Data, results and residuals may be manipulated and plotted as with REGRESSION I. Use REGRESSION I for polynomial fitting, and PARAFIT for those complicated functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) Price: \$24.95 Cassette \$28.95 Diskette
MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides easy in-use data entry, storage, retrieval and editing facilities. In addition, the user may interrogate the solution by displaying values for the independent variables. The number of variables and data size is limited only by the available memory. REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for \$51.95 (three cassettes) or \$63.95 (three diskettes).

ANOVA (Not available on Atari cassette or for PET/IBM) Price: \$39.95 Cassette \$43.95 Diskette
In the past the ANOVA (analysis of variance) procedure has been limited to the large mainframe computers. Now DYNACOMP has brought the power of this most powerful of small systems. For those conversant with ANOVA, the DYNACOMP software package includes the 1-way, 2-way and N-way procedures. Also provided are the Yates 2K-P factorial designs. For those unfamiliar with ANOVA, do not worry. The accompanying documentation was written in a simple and fashion by a professor in the field. The DYNACOMP package includes a complete introduction to the use of ANOVA as a support program for building the data base. Included are several convenient features including data editing, deleting and appending.

BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 (Not available for Atari)
DYNACOMP is the exclusive distributor for the software keyed to the popular Texas Instruments BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 by T. Ruckdeschel (see advertisements in BYTE magazine). These subroutines have been assembled according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Volume 1:
Collection #1: Chapters 2 and 3 - Data and function plotting; complex variables and functions.
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Collection #3: Chapters 5 and 6 - Random number generators (Poisson, Gaussian, etc.); series approximations.
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Volume 2:
Collection #1: Chapter 1 - Linear, polynomial, multidimensional, parametric least squares.
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Collection #3: Chapter 3 - Functional approximations by iteration and recursion.
Collection #4: Chapter 4 - CORDIC approximations to trigonometric, hyperbolic, exponential and logarithmic functions.
Collection #5: Chapter 5 - Table interpolation, differentiation and integration (Newton, Lagrange, splines).
Collection #6: Chapter 6 - Methods for finding the real roots of functions.
Collection #7: Chapter 7 - Methods for finding the complex roots of functions.
Collection #8: Chapter 8 - Optimization by steepest descent.

Price per collection: \$14.95 Cassette \$18.95 Diskette
All eight collections are available for \$99.95 (eight cassettes) and \$129.95 (eight diskettes). Because the texts are a vital part of the documentation, BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 are available from DYNACOMP.

BASIC SCIENTIFIC SUBROUTINES, Vol. 1 (319 pages): \$19.95 + 75¢ postage
BASIC SCIENTIFIC SUBROUTINES, Vol. 2 (790 pages): \$23.95 + \$1.50 postage
See reviews in KILBAUD, Dr. Dobbs, and ACCESS.

SOFTNET (Apple II and TRS 80 48K diskette only) Price: \$129.95
SOFTNET may be used to create models of liquid pipe flow systems to evaluate their flow performance. Up to 150 nodes with up to 150 connecting elements may be simulated and the models may be combined to form yet larger models. If you are involved in water distribution systems, chemical fluid flow problems, building plumbing, or similar situations, this is an ideal analysis tool.

FILTER ANALYSIS (Apple only) Price: \$19.95 Cassette \$23.95 Diskette
FILTER ANALYSIS is the ideal program for determining the frequency response of passive filters. Any number of RLC components may be included, and any number of poles treated. FILTER ANALYSIS features its own mini-language which makes circuit description simple. Results may be printed in tabular form or plotted in HIRE'S graphics (decibels versus log-frequency).

ACTIVE CIRCUIT ANALYSIS (Available for all computers) Price: \$35.95 Cassette \$39.95 Diskette
With ACAP you may analyze the response of an active or passive component circuit. The circuit may be probed at equal signal frequency, and the resulting complex voltages and currents at each component node (or even examined) the circuit response at a filter or amplifier may be completely determined with respect to both amplitude and phase. In addition, ACAP provides a statistical analysis of the range of frequency responses which result from tolerance variations in the components. ACAP is easy to learn and use. Circuit descriptions may be saved onto cassette or diskette to be recalled at a later time for execution or editing. ACAP should be purchased with the program designer's manual.

LOGIC SIMULATOR (Available for all computers) Price: \$35.95 Cassette \$39.95 Diskette
Test your complicated digital logic design with respect to given set of inputs to determine how well the circuit will operate. The elements which may be simulated include multiple input AND, OR, NOR, EXOR, EXNOR and NAND gates, as well as inverters, J-K and D flip-flops, and one-shots. Inputs may be clocked in with varying clock cycle lengths, delay elements and delays may be introduced to probe for glitches and race conditions. A timing diagram for any given set of nodes may be plotted. Save your breadboarding until the circuit is checked by LOGIC SIMULATOR. Requires 48K.

BEAM DEFLECTION (Available for all computers) (disk, diskette only) Price: \$29.95 Cassette \$32.45 Disk
BEAM DEFLECTION is the first in DYNACOMP's new series of structural analysis software packages. It consists of two programs. The first program permits the development of data files which describe the problem. For example, the ends of the beam may be joined, clamped or free. The beam may be uniformly supported or have a single support. Springs variously placed and having different spring constants. The elastic and cross section of the beam may vary along its length. The load may be uniformly distributed or it may include discrete forces. The beam may be pinned at various points along its length. And so on. All this information may be easily entered and edited using the data input program.

Following this the analysis program is called. The calculated results are the stress and deflections of the beam, both in numerical and graphical form, since the input data is saved, cases may be easily re-run with modification, thereby permitting iterative design. The documentation which comes with BEAM DEFLECTION clearly shows how to use the software. In addition, three test problems are described and demonstrated to ensure that you understand how to use the program. Also, helpful theoretical information is supplied in the appendix.

STATTEST (Not available on Atari cassette or for PET/IBM) Price: \$19.95 Cassette \$23.95 Diskette
This is a statistical inference package which helps you make wise decisions in the face of uncertainty. In an interactive fashion you can build and edit data files and test the differences in means, variances and proportions. STATTEST will also perform data analysis as well as do linear correlation and regression. This menu-driven statistical software is rounded out with a chi-square contingency test and a uniform and normal random sample generator. The documentation is written by a college professor who guides you through the various tests.

ABOUT DYNACOMP

DYNACOMP is a leading distributor of small system software with sales spanning the world (currently in excess of 50 countries). During the past three years we have greatly enlarged the DYNACOMP product line, but have maintained and improved our high level of quality and customer support. The achievement in quality is apparent from our many repeat customers and the software reviews in such publications as COMPUTERS, 80 Software Engineer, ANALOG, Softalk, Creative Computing and KILBAUD. DYNACOMP's team may be contacted by phone, mail, or by computer terminal or television. Our customer support is as close as your phone. Please write or call today to discuss products or give advice.

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```

OFF}:FORT=1TO200:NEXT:GOSUB60
356 PRINT "{HOME}";TAB(21);"WITH SOUND":FORT=1T
O200:NEXT:GOSUB70:GOTO350
390 SYS(826):GOSUB10:SYS(826)
500 GETT$:IFT$<>"THEN500
600 INPUT "{CLEAR}PLAYER WITH LETTER CONTROLS ~
LETTER{10 LEFT} ";LL$
601 INPUT "{CLEAR}PLAYER WITH NUMBER CONTROLS ~
NUMBER{10 LEFT} ";NUS$
602 PRINT "{CLEAR}"
1000 PRINT "{CLEAR}NOW, PUSH A KEY FOR THE PLAYI
NG
1010 PRINT "FIELD. THE KEY YOU PUSH WILL BE
1020 PRINT "THE OUTLINE OF THE FIELD. YOU MAY US
E THE {REV}RVS{OFF} KEY."
1030 GETT$:IFT$="THEN1030
1040 IFT$=CHR$(13)THEN1030
1050 IFT$="{REV}"THENKK=128:GOTO1030
1060 IFT$="{OFF}"THENKK=0:GOTO1030
1070 PRINT "{HOME}";T$:FF=PEEK(32768)+KK
1071 GOSUB55
1072 IFFF=32THENFF=96
1100 X=INT(RND(1)*2)+1:IFX<2THENAA=AA+128:GOTO1
300
1200 ZZ=ZZ+128
1300 PRINT "{CLEAR}SET POINT LIMIT 1-THRU: 5{03
LEFT}";:INPUTPL:IFPL<1THEN1300
1400 GOSUB32:M=32768
1410 FORT=1TO39:POKEM,FF:M=M+1:NEXT:GOSUB60:FOR
T=1TO24:POKEM,FF:M=M+40:NEXT
1420 FORT=1TO39:POKEM,FF:M=M-1:NEXT:GOSUB60:FOR
T=1TO24:POKEM,FF:M=M-40:NEXT
1430 C=0:FORT=1TO180
1440 M=INT(RND(1)*1000)+1
1450 IFPEEK(32767+M)<>32THENGOSUB60:GOTO1440
1460 GOSUB70:POKE32767+M,FF:NEXT
1500 TI$="000000":POKEA,32:POKEZ,32
2000 GETT$:IFT$<>"THEN4000
2010 L=PEEK(A+B):IFL=FFTHEN2050
2020 IFL=ZZTHEN5000
2030 GOSUB60:POKEA,32:A=A+B:POKEA,AA
2050 Y=PEEK(Z+W):IFY=FFTHEN2000
2060 IFY=AATHEN5000
2070 GOSUB70:POKEZ,32:Z=Z+W:POKEZ,ZZ
2080 IFTI>TTTHENTI$="000000":SYS(826):GOSUB55:S
YS(826):GOTO3000
2090 GOTO2000
3000 IFAA>128THENAA=AA-128:ZZ=ZZ+128:GOTO2050
3010 ZZ=ZZ-128:AA=AA+128:GOTO2010
4000 IFVAL(T$)THENV=VAL(T$):W=ZM(V):GOTO2050
4005 IFT$="%"THENPRINT "{CLEAR}":GOTO8000
4010 IFT$="Z"THENC=1
4020 IFT$="X"THENC=2
4030 IFT$="C"THENC=3
4040 IFT$="A"THENC=4
4050 IFT$="S"THENC=5
4060 IFT$="D"THENC=6
4070 IFT$="Q"THENC=7
4080 IFT$="W"THENC=8
4090 IFT$="E"THENC=9
4100 B=AM(C):GOTO2010
5000 SYS(826):GOSUB10
5100 IFAA>128THENPA=PA+1:GOTO5200
5150 PZ=PZ+1:GOTO5210
5200 IFPA=PLTHENGOSUB20001:GOTO6010
5210 IFPZ=PLTHENGOSUB20010:GOTO6020
5300 SYS(826):POKEA,32:POKEZ,32:A=32809:Z=33726
5310 B=0:W=0:TI$="000000":SYS(826):SYS(826)
5320 IFAA>128THENAA=AA-128:ZZ=ZZ+128:GOTO2000
5330 AA=AA+128:ZZ=ZZ-128:GOTO2000
6010 GOSUB50:GOSUB32:GOSUB75:GOSUB10:PRINT "{CLE
CLEAR}"LL$;" WON!!! BY ";PA-PZ;
6011 IFPA-PZ<>1THENPRINT "POINTS!!":GOTO6033
6012 PRINT "POINT!!!":GOTO6033
6020 GOSUB75:GOSUB50:GOSUB32:GOSUB10:PRINT "{CLE
CLEAR}";NUS$;" WON!!! BY ";PZ-PA;
6021 IFPZ-PA<>1THENPRINT "POINTS!!":GOTO6033

```

```

6022 PRINT " POINT!!!"
6033 GETT$:IFT$<>"THEN6033
8000 PRINT:PRINT:PRINT:PRINT "PLAY AGAIN Y OR N
?";
8010 GETT$:IFT$="Y"THENSYS(826):PRINT "{CLEAR}":
GOSUB10:CLR:G=1:GOTO0
8011 PRINT "{REV} {OFF} {LEFT}";:FORN=1TO50:NEXT:
IFT$="THENGOSUB20000:GOTO8010
8012 PRINT "{CLEAR}"
8020 AS$="{REV}THANKS{OFF} FOR {REV}PLAYING{OFF}
"
8022 O=LEN(AS$):PRINT "{05 DOWN}{11 RIGHT}";
8033 FORZ=1TOO:FORY=1TOINT(RND(1)*30)+70:NEXT
8040 PRINTMID$(AS$,Z,1);:GOSUB70:NEXT
9000 POKE59468,14
9010 PRINT "{HOME}{07 DOWN}{18 RIGHT}TAG":SYS(82
6)
9020 GOSUB32:GOSUB50
9050 DATA826,849,162,128,160,0,132,33,134,34,17
7,33,73,128,145,33
9051 DATA200,208,247,232,224,132,208,240,96,0
10000 POKE59467,0:POKE59466,255:POKE59464,60:POK
E59468,12:SYS(826)
10001 END
20000 PRINT "Q{LEFT}";:FORN=1TO50:NEXT:RETURN
20001 FORT=100TO130:POKEA,T
20002 POKE59468,14:POKE59468,12:NEXT
20003 RETURN
20010 FORT=100TO130:POKEZ,T
20011 POKE59468,14:POKE59468,12:NEXT
20012 RETURN

```

Program 2: Atari Version

```

100 REM *****ATARI*****
110 GOSUB 1170:REM INITIALIZE
120 PLR=1-PLR:IF PEEK(53279)=6 THEN R
UN:REM ALLOW RESTART
130 IF PEEK(20)+256*PEEK(19)>900 THEN
IT=1-IT:POKE 20,0:POKE 19,0:FOR
W=15 TO 0 STEP -0.1:SOUND 0,10,12
,W:NEXT W
140 BLINK=BLINK-(BLINK>0):GOSUB 530
150 S=STICK(PLR):T=STRIG(PLR):POKE PO
KEHERE+1,VV+IT
160 IF S=15 AND T=1 THEN S=S(PLR)
170 S(PLR)=S
180 SOUND PLR,S*5+100,10,4
190 TEST=POS(PLR)
200 TEST=TEST-20*(S=10 OR S=14 OR S=6
)+20*(S=5 OR S=9 OR S=13)-(S>8 AN
D S<12)+(S>4 AND S<8)
210 IF TEST<SCR+20 OR TEST>SCR+439 TH
EN SOUND PLR,0,0,0:GOTO 120
220 CHR=(S>4 AND S<8)+3*(S>8 AND S<12
)+2*(S=14 OR S=13)
230 SOUND PLR,0,0,0
240 P=PEEK(TEST):IF P=0 THEN POKE POS
(PLR),0:POKE TEST,CHR+PLR*64:POS(
PLR)=TEST:GOTO 120
250 Z=P-(PLR=0)*64:IF Z<1 OR Z>3 THEN
280
260 IF PLR=IT THEN 310:REM GOTCHA
270 PLR=1-PLR:GOTO 310:REM WHOOPS!
280 IF P=196 THEN PLR=1-PLR:GOTO 310:
REM "MONSTER" GOT PLAYER
290 GOTO 120
300 REM PLAYER CAUGHT ROUTINE
310 RESTORE 340:SOUND 3,0,0,0
320 POSITION 0,1:?" #6;" " PLAYER ";(1-
PLR)+1;" *****"
330 POKE POS(0),0:POKE POS(1),0
340 DATA 100,1,100,1,115,1,90,1,100,2
,120,3

```


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```

1410 POSITION 8,1: ? #6; "E "; ESCORE; "
";
1420 IF PEEK(53279) < > 3 THEN 1400
1430 IF PEEK(53279) = 3 THEN 1430
1440 ESCORE = ESCORE + 1; IF ESCORE > 10 THEN
    ESCORE = 1
1450 GOTO 1400
1460 COLOR 32: PLOT 5,0: DRAWTO 15,0: PL
    OT 5,1: DRAWTO 15,1
1470 POSITION 9,0: ? #6; "E "; IF = 0: PLR
    = IT
1480 POSITION 0,2: ? #6; " (20 E) "
1490 DIM POS(1), S(1), SCR(1), MPOS(8), D
    IR(7), MCUR(8), MNERGY(8): SCR(0) = 0
    : SCR(1) = 0
1500 DIR(0) = 20: DIR(1) = 20: DIR(2) = 19: DI
    R(3) = -19: DIR(4) = 21: DIR(5) = -21: DI
    R(6) = 1: DIR(7) = -1
1510 POKE 20,0: POKE 19,0: MONSTERS = 0: D
    URATION = 70
1520 POS(0) = SCR + 20: POS(1) = SCR + 419: S(0
    ) = 7: S(1) = 11: Z = 0
1530 RETURN

```

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Laser Barrage

Sean Igo
Ogden, Utah

Here is a one-player game for 40-column PETs. It is packed with action and fun. [To run it on the 80-column machines, use the program on pg. 130 of **COMPUTE! #12** — Ed.]

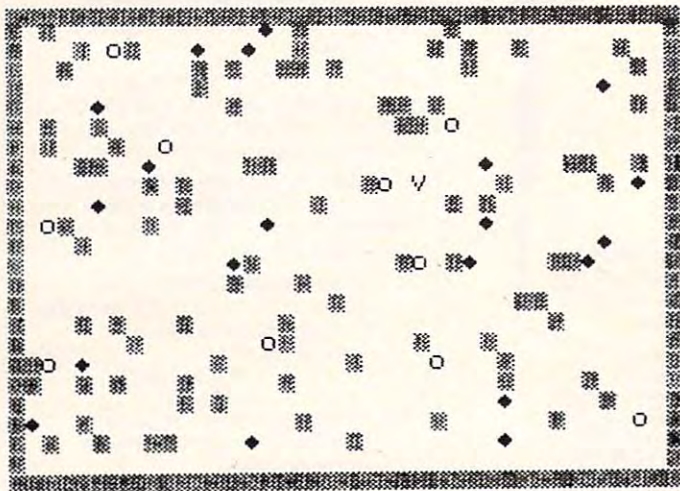
The Idea

In this game, 15 enemy robots are after some fuel pods of yours. You must defend the ten pods. The robots must touch a pod to eat it, but you may zap robots with a laser.

All the robots pick a pod to pursue. They will flatten anything in their way (except each other) to get it. This includes the barriers that are scattered about (which you will bounce off).

When a robot destroys a pod, whether or not it was his objective pod, he will pick a new one to go after.

Figure 1



A sample playfield. Robots are Diamonds, Barriers are Grids, Fuel Pods are Circles, and the Player is the V.

Laser Barrage has eight main routines, and all are noted in the program by a REM statement.

Set Up Playfield – draws playfield, initializes variables, places pods, robots, barriers, and player, defines functions.

Move Player – increments the position of the

player and scans the upcoming space in the event that the player is moving.

Fire Player – shoots the player's laser. The laser spans five spaces and will destroy pods as well as robots. Watch where you shoot! The ray will not destroy barriers.

Move Robots – moves one robot one space toward its target pod. The player and robots alternate moving, so the game goes a lot faster than if the player waited for all the robots to move.

Rotate Player – rotates player clockwise, counterclockwise, or 180°.

You Win You Lose – deliver a message of appropriate nature.

Instructions – instructions preceded by a small graphic laser effect.

Tips For Playing

When the game starts, it is OK to patrol around and blast robots at your leisure. But when the game winds down to the last few robots or pods, it is wise to guard a single pod or a small group of them and attack robots approaching. If you can keep your laser between them and their target pods, you will do better. Even if you save only one pod from destruction, that is better than losing.

When patrolling around, you must remember these guidelines. When in doubt, STOP. Don't run into a robot because that causes instant destruction. Running into pods is alright because that only stops you. Barriers are treacherous, for you will bounce off them, possibly into a robot.

```

10 REM *** LASER BARRAGE ***
20 REM
30 REM      BY SEAN IGO
40 REM
50 POKE 59468,12
60 PRINT"{CLEAR}NEED INSTRUCTIONS ~
   (Y/N) ";CHR$(160);"{03 LE
   LEFT}";:INPUT A$
70 IF LEFT$(A$,1)="Y" THEN 1110
80 IF LEFT$(A$,1)<>"N" THEN 60
90 REM ---SET UP PLAYFIELD---
100 PRINT"{CLEAR}":RN=0
110 DIM P(10),P1(10),R(15),R1(15),D
   I(8),DX(8),LB(8),DP(15)
120 DEF FNY(X)=INT((X-32768)/40):DE
   F FNX(X)=40*((X-32768)/40-
   INT((X-32768)/40))
130 DI(1)=-39:DI(2)=1:DI(3)=41:DI(4
   )=40:DI(5)=39:DI(6)=-1:DI(
   7)=-41:DI(8)=-40
140 DX(1)=80:DX(2)=62:DX(3)=122:DX(

```




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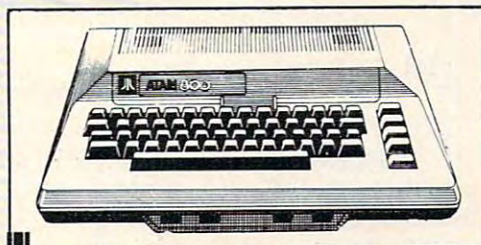
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Atari

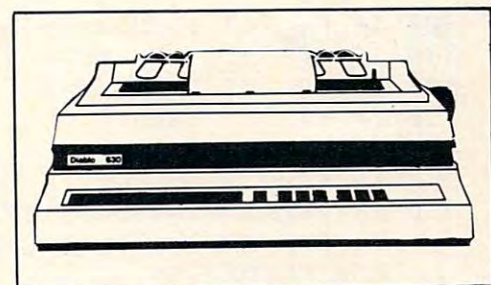
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```

4)=22:DX(5)=76:DX(6)=60:DX
(7)=79:DX(8)=1
150 LB(1)=78:LB(2)=64:LB(3)=77:LB(4)
)=93:LB(5)=78:LB(6)=64:LB(
7)=77:LB(8)=93
160 FORJ=0 TO 39:POKE 32768+J,230:P
OKE 33767-J,230:NEXT
170 FORJ=0 TO 24:POKE 32807+40*J,230:
POKE 33728-40*J,230:NEXT
180 DEF FNF(X)=32809+INT(38*RND(1))
+40*INT(22*RND(1))
190 FORJ=1 TO 100:POKE FNF(1),102:N
EXT
200 FORJ=1 TO 10:P(J)=1
210 P1(J)=FNF(1):IF PEEK(P1(J))<>32
THEN 210
220 POKE P1(J),87:NEXT
230 FORJ=1 TO 15:R(J)=1
240 R1(J)=FNF(1):IF PEEK(R1(J))<>32
THEN 240
250 POKE R1(J),90:DP(J)=INT(10*RND(
1)+1):NEXT
260 PP=FNF(1):IF PEEK(PP)<>32 THEN ~
260
270 DR=INT(8*RND(1)+1):POKE PP,DX(D
R)
280 REM ---MOVE PLAYER---
290 GET C$:IF C$="4" THEN A=-1:GOSU
B 900
300 IF C$="6" THEN A=1:GOSUB 900
310 IF C$="5" THEN MS=1
320 IF C$="0" THEN MS=0
330 IF C$="8" THEN GOSUB 420
340 POKE PP,DX(DR)
350 IF MS=0 THEN 640
360 X1=PEEK(PP+DI(DR)):IF X1=32 THE
N POKE PP,32:PP=PP+DI(DR):
POKE PP,DX(DR)
370 IF X1=90 THEN 1770
380 IF X1=87 THEN MS=0
390 IF X1=102 OR X1=230 THEN A=4:GO
SUB 900
400 GOTO 640
410 REM ---FIRE PLAYER---
420 X2=0:MS=0
430 X2=X2+1:IF X2>5 THEN 480
440 X3=PEEK(PP+X2*DI(DR)):IF X3=102
OR X3=230 THEN 480
450 IF X3=87 THEN 530
460 IF X3=90 THEN 580
470 POKE PP+X2*DI(DR),LB(DR):GOTO 4
30
480 IF X2=1 THEN 500
490 FORJ=1 TO X2-1:POKE PP+J*DI(DR)
,32:NEXT
500 IF PG=10 THEN 1040
510 IF RG=15 THEN 940
520 RETURN
530 POKE PP+X2*DI(DR),42
540 FORJ=1 TO 10:IF PEEK(P1(J))=42 ~
THEN P(J)=0
550 NEXT:POKE PP+X2*DI(DR),32
560 PG=PG+1
570 GOTO 480
580 POKE PP+X2*DI(DR),42
590 FORJ=1 TO 15:IF PEEK(R1(J))=42 ~
THEN R(J)=0
600 NEXT:POKE PP+X2*DI(DR),32
610 RG=RG+1
620 GOTO 480
630 REM ---MOVE ROBOTS---
640 RN=RN+1:IF RN>15 THEN RN=RN-15
650 IF P(DP(RN))=0 THEN 870
660 IF R(RN)=0 THEN 640
670 Z8=P1(DP(RN))
680 X=INT(FNX(Z8)+.5):Y=FNY(Z8)
690 X0=INT(FNX(R1(RN))+.5):Y0=FNY(R
1(RN))
700 IF X0<X THEN X9=1:GOTO 730
710 IF X0>X THEN X9=-1:GOTO 730
720 X9=0
730 IF Y0<Y THEN Y9=1:GOTO 760
740 IF Y0>Y THEN Y9=-1:GOTO 760
750 Y9=0
760 Z9=X9+40*Y9:Z0=PEEK(R1(RN)+Z9)
770 IF Z0=90 THEN 290
780 IF Z0=DX(DR) THEN 1770
790 IF Z0=87 THEN 820
800 POKE R1(RN),32:R1(RN)=R1(RN)+Z9
:POKE R1(RN),90
810 GOTO 290
820 POKE R1(RN)+Z9,42:FORJ=1 TO 10
830 IF PEEK(P1(J))=42 THEN P(J)=0:P
OKE P1(J),32
840 NEXT:PG=PG+1:IF PG=10 THEN 1040
850 DP(RN)=INT(10*RND(1)+1):IF P(DP
(RN))=0 THEN 850
860 GOTO 800
870 DP(RN)=INT(10*RND(1)+1):IF P(DP
(RN))=0 THEN 870
880 GOTO 660
890 REM ---ROTATE PLAYER---
900 DR=DR+A:IF DR>8 THEN DR=DR-8
910 IF DR<1 THEN DR=DR+8
920 RETURN
930 REM ---YOU WIN!!---
940 FORJ=1 TO 2000:NEXT
950 PRINT"{CLEAR}YOU HAVE DEFEATED ~
THE 15 ROBOTS!!!"
960 PRINT:PRINT"GOOD FOR YOU."
970 PRINT:PRINT"YOU MANAGED TO SAVE
";10-PG;"OF THE"
980 PRINT"PODS."
990 PRINT:PRINT"PLAY AGAIN? (Y/N)"
1000 GET YN$:IF YN$="Y" THEN CLR:GOT
O 100
1010 IF YN$<>"N" THEN 1000

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```

1020 END
1030 REM ---YOU LOSE.---
1040 FORJ=1 TO 2000:NEXT
1050 PRINT"{CLEAR}YOU HAVE BEEN DEFE
ATED!!!"
1060 PRINT:IF PG=10 THEN PRINT"ALL Y
OUR PODS WERE DESTROYED!"
1070 IF PD=1 THEN PRINT"YOU WERE DES
TROYED!!"
1080 PRINT:PRINT"YOU ZAPPED";RG;"OF ~
THE 15 ROBOTS."
1090 GOTO 990
1100 REM ---INSTRUCTIONS---
1110 X$=""
1120 GOSUB 1750:GOSUB 1760
1130 FORJ=1 TO 13:READ Q:X$=X$+CHR$(
Q):NEXT:GOSUB 1760:GOSUB 1
750:GOSUB 1760
1140 DATA 76,65,83,69,82,32,66,65,82
,82,65,71,69
1150 FORJ=1 TO 13:READ Q:X$=X$+CHR$(
Q):NEXT:GOSUB 1760:GOSUB 1
750:GOSUB 1760
1160 DATA 192,66,89,32,83,69,65,78,3
2,73,71,79,192
1170 FORJ=1 TO 13:X$=X$+CHR$(32):NEX
T
1180 PRINT"{CLEAR}0(((@";:POKE 32787
,90
1190 FORJ=1 TO 2000:NEXT:PRINT"*";
1200 FORJ=1 TO 143:PRINTMID$(X$,J,1)
;:FORK=1 TO 25:NEXT:NEXT
1210 POKE 32773,32:POKE 32787,42:FOR
J=1 TO 250:NEXT:POKE 32787
,32
1220 PRINT:PRINT:PRINT" THE OBJECT ~
OF THIS GAME IS"
1230 PRINT"TO DEFEND 10 FUEL PODS FR
OM 15"
1240 PRINT"ROBOTS. PRESS THE RETURN ~
KEY TO"
1250 PRINT"GO ON."
1260 GET R$:IF R$<>CHR$(13) THEN 126
0
1270 PRINT"{CLEAR}YOUR FUEL PODS LOO
K LIKE THIS: W"
1280 PRINT"THE ROBOTS LOOK LIKE THIS
: Z"
1290 PRINT
1300 PRINT"THERE ARE BARRIERS HERE A
ND THERE WHICH LOOK ~
LIKE THIS: &"
1310 PRINT
1320 PRINT"YOU LOOK LIKE:"
1330 X$="AV<>L:PO"
1340 FORJ=1 TO 8:PRINTMID$(X$,J,1);C
HR$(32);"IF YOU ARE FACING
";CHR$(32);
1350 IF J=1 THEN PRINT"UP"
1360 IF J=2 THEN PRINT"DOWN"
1370 IF J=3 THEN PRINT"RIGHT"
1380 IF J=4 THEN PRINT"LEFT"
1390 IF J=5 THEN PRINT"LEFT & DOWN"
1400 IF J=6 THEN PRINT"RIGHT & DOWN"
1410 IF J=7 THEN PRINT"RIGHT & UP"
1420 IF J=8 THEN PRINT"LEFT & UP"
1430 PRINT:NEXT
1440 PRINT"PRESS RETURN TO GO ON."
1450 GET R$:IF R$<>CHR$(13) THEN 145
0
1460 PRINT"{CLEAR}YOUR CONTROLS:"
1470 PRINT:PRINT"{REV}4{OFF} - ROTAT
E COUNTERCLOCKWISE"
1480 PRINT"{REV}6{OFF} - ROTATE CLOC
KWISE"
1490 PRINT"{REV}5{OFF} - MOVE FORWAR
D"
1500 PRINT"{REV}0{OFF} - STOP MOVING
"
1510 PRINT"{REV}8{OFF} - {REV}FIRE L
ASER"
1520 PRINT:PRINT"WHEN YOU ENTER A 5,
YOU WILL"
1530 PRINT"MOVE FORWARD UNTIL YOU EI
THER"
1540 PRINT"STOP OR FIRE YOUR LASER."
1550 PRINT"IF YOU RUN INTO A BARRIER
, YOU WILL"
1560 PRINT"BOUNCE OFF AND BEGIN TRAV
ELING"
1570 PRINT"THE OPPOSITE DIRECTION."
1580 PRINT"YOU CANNOT DESTROY BARRIE
RS OR WALL"
1590 PRINT"SECTIONS. IF YOU HIT A WA
LL, YOU WILL BOUNCE OFF."
1600 PRINT"ROBOTS WILL MOVE TOWARD A
TARGET POD."
1610 PRINT"THEY WILL SMASH ANYTHING ~
IN THEIR"
1620 PRINT"PATH (INCLUDING BARRIERS ~
AND YOU!)"
1630 PRINT"TO GET THERE. THEY DESTRO
Y THINGS BY"
1640 PRINT"TOUCHING THEM, SO IF YOU ~
TOUCH ONE-"
1650 PRINT"BYE BYE!!"
1660 PRINT"PRESS RETURN TO GO ON."
1670 GET R$:IF R$<>CHR$(13) THEN 167
0
1680 PRINT"{CLEAR}GOOD LUCK!!"
1690 PRINT:PRINT"YOU WILL LOSE IF AL
L YOUR PODS"
1700 PRINT"ARE EATEN OR IF YOU ARE!!
"
1710 PRINT:PRINT"YOU MUST BLAST ALL ~

```


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```

THE ROBOTS TO WIN!"
1720 PRINT:PRINT"PRESS THE SPACE BAR
    TO PLAY."
1730 GET R$:IF R$<>CHR$(32) THEN 173
    0
1740 GOTO 100
1750 FORJ=1 TO 13:X$=X$+CHR$(192):NE
    XT:RETURN
1760 FORJ=1 TO 13:X$=X$+CHR$(157):NE
    XT:RETURN
1770 FORX=-2 TO 2:POKE PP+40*X,93:NE
    XT
1780 FORX=-2 TO 2:POKE PP+X,64:NEXT
1790 POKE PP-81,85:POKE PP-41,85:POK
    E PP-42,85

```

```

1800 POKE PP-79,73:POKE PP-39,73:POK
    E PP-38,73
1810 POKE PP+42,75:POKE PP+41,75:POK
    E PP+81,75
1820 POKE PP+38,74:POKE PP+39,74:POK
    E PP+79,74:POKE PP,42
1830 PD=1:GOTO 1040

```

Atari Version

```

100 GOSUB 1070:REM INITIALIZE CHARACT
    ER SET
110 GOSUB 1460:REM MORE INITIALIZATIO
    N
120 R=0:FOR I=1 TO 200:POKE PPOS,0:PO
    KE PPOS,DIR+64:NEXT I
130 IF ROBOTS<5 THEN FOR W=1 TO 50:NE

```

Atari Notes

Charles Brannon
Editorial Assistant

The Atari version of Laser Barrage requires 16K and a joystick. When you RUN the program for the first time, you'll see the message "PLEASE WAIT", and if you turn up your TV volume control, you'll hear a series of random tones as the custom character set for the game is initialized.

Subsequent RUNs will not require the initialization, thanks to line 1080, which checks if the character set is already POKEd in. This technique is very useful if a program will be RUN many times at one sitting. It can be used with machine language programs to PEEK a certain location to see if a particular opcode is present. If not, a READ/POKE loop can be called to put the machine language code into memory.

Go After The Amok Robots With Z-Beams

You start the game with three ships. The screen is filled with "energy pods," blue robots, and brick-like obstacles. Each robot picks a pod to attack, and then moves towards it with deadly deliberation. If a robot contacts a pod, the pod bursts and collapses, and the robot instantly picks another target to destroy.

Your ship, which can be controlled in eight directions with the joystick, can fire a powerful "Z-beam" in whatever direction it is currently facing. Your mission is to clear the screen of robots by destroying each one with your Z-beam. You get one point for each robot you eliminate, and when you

clear the screen, five points for each surviving pod.

You then face a new screen of pods and robots, but each new level challenges you with two additional robots. You know you're really good (but in big trouble) when you have 15 or more robots to deal with. The game can handle up to 64 robots, but it is inconceivable that anyone could withstand the "Laser Barrage" that long. (But if you're superhuman and manage to, you can change lines 1640 and 1650, memory permitting.)

A Speedy Technique

One interesting thing about this game is its fast execution speed, a feat normally impossible in BASIC. Character graphics (with a custom character set) allows you to create detailed, colorful games, but you are limited (without using special techniques, such as fine scrolling) to a single character of resolution. This makes motion seem rather coarse compared to player/missile graphics.

Nevertheless, character graphics in modes one and two provides a great deal of flexibility. Unlike player/missile graphics, a single POKE to "screen RAM" determines the X,Y position of a character. PEEK can be used like LOCATE to check for collisions. This simplicity allows you to program games in BASIC that will run pretty fast.

One last note on the importance of positioning BASIC subroutines to maximize speed. Laser Barrage has a large section of "initialization" code, which is run only once at the beginning of the program. When all this code was moved to the end of the program, the game ran twice as fast!

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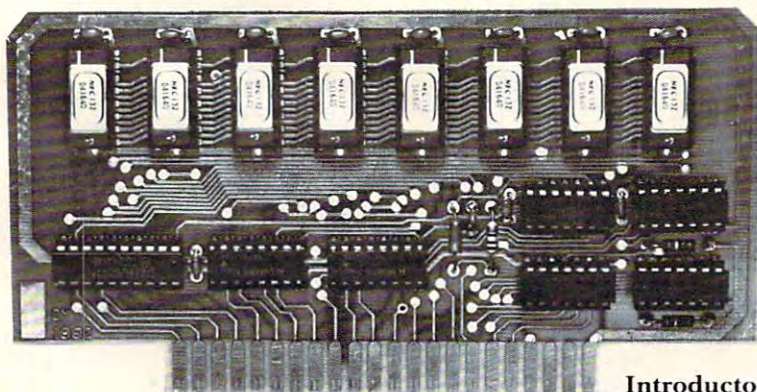
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```

XT W
140 GOSUB 200:REM MOVE PLAYER
150 R=R+1:IF R>ROBOTS THEN R=0
160 GOSUB 410:GOSUB 200:REM MOVE A RO
BOT, THEN GIVE PLAYER ANOTHER TUR
N
170 IF MPOS THEN GOSUB 710:GOSUB 710:
REM UPDATE "MISSILE" IF IN FLIGHT
180 GOTO 130
200 REM PLAYER MOVEMENT
210 IF STRIG(0)=0 AND MPOS=0 THEN 370
220 GOTO 220+STICK(0)
225 DIR=4:GOTO 320
226 DIR=2:GOTO 320
227 DIR=3:GOTO 320
229 DIR=6:GOTO 320
230 DIR=8:GOTO 320
231 DIR=7:GOTO 320
233 DIR=5:GOTO 320
234 DIR=1:GOTO 320
235 RETURN
320 NPOS=PPOS+DIR(DIR-1):POKE 77,0
330 PK=PEEK(NPOS):IF PK=31 OR PK=158
OR PK=PC THEN RETURN
340 IF PK=63+192 THEN 590
350 POKE PPOS,0:POKE NPOS,DIR+64
360 PPOS=NPOS:RETURN
370 REM FIRE MISSILE
380 SIGN=-1
390 MPOS=PPOS:MDIR=DIR-1:IF MDIR>3 TH
EN MDIR=DIR-5:SIGN=1
400 RETURN
410 REM ROBOT MOVEMENT
420 REM Given R, Robot Index
430 IF ROBOT(R)=0 THEN RETURN
440 IF POD(TARGET(R))=0 THEN TARGET(R)
=INT(8*RND(0)):GOTO 440
450 RX=RX(R):RY=RY(R):TX=PX(TARGET(R)
):TY=PY(TARGET(R))
460 RX=RX+SGN(TX-RX):RY=RY+SGN(TY-RY)
470 NPOS=CRT+RX+20*RY:P=PEEK(NPOS)
480 IF P=158 OR P=31 THEN RX=RX+1-INT
(3*RND(0)):RY=RY+1-INT(3*RND(0)):
GOTO 470
490 IF P<>PC THEN 560
500 PK=CRT+RX+20*RY
510 FOR I=59 TO 62:POKE PK,I:SOUND 0,
I*2,0,8:FOR W=1 TO 20:NEXT W:NEXT
I:SOUND 0,0,0,0
520 FOR I=0 TO 7:IF RX=PX(I) AND RY=PY
(I) THEN KP=I:GOTO 540
530 NEXT I:STOP
540 POKE PK,0:POD(KP)=0
550 PODS=PODS-1:IF PODS=0 THEN 590
560 IF P>64 AND P<73 THEN 590
570 POKE ROBOT(R),0:POKE NPOS,63+192:
ROBOT(R)=NPOS:RX(R)=RX:RY(R)=RY
580 RETURN
590 REM PLAYER KILLED ROUTINE
600 FOR I=1 TO 8
610 FOR J=0 TO 3:POKE PPOS,I+COLMSK(J
):NEXT J
620 SOUND 0,I*8+K*64,12,16-I*2:SOUND
1,I*4,8,16-I*2:NEXT I
630 FOR I=1 TO 4 STEP 0.5:FOR J=0 TO
3:POKE PPOS,15+COLMSK(J):POKE PPO
S,32+COLMSK(J):POKE PPOS,0
640 SOUND 0,I*4+J,8,15-4*3+J:NEXT J:N
EXT I
650 SOUND 0,0,0,0:LIFE=LIFE-1:IF LIFE
THEN 110
660 POSITION 5,10: ? #6;"{11 SPACES}":P
OSITION 5,11: ? #6;"GAME OVER":P
OSITION 5,12: ? #6;"{11 SPACES}"
670 POSITION 7,0: ? #6;"SCORE":POSITIO
N 6,1: ? #6;"SCORE":F=0
680 IF PEEK(20)>15 THEN POKE 20,0:F=1
-F:POSITION 0,1: ? #6;"{5 SPACES}"
:IF F THEN POSITION 0,1: ? #6;SCR$
690 IF PEEK(53279)<>6 THEN 680
700 ROBOTS=3:SCR=0:SCR$="SCORE":LIFE=
3:GOTO 110
710 REM UPDATE MISSILE
720 IF MPOS=0 THEN RETURN
730 NPOS=MPOS+LDIR(MDIR)*SIGN
740 KK=PEEK(MPOS):IF KK<65 OR KK>72 T
HEN KK=0
750 PK=PEEK(NPOS):ALT=1-ALT
760 IF PK=255 THEN GOSUB 820
770 IF PK>0 THEN POKE MPOS,0:MPOS=0:R
ETURN
780 POKE MPOS,KK:POKE NPOS,LC(MDIR*2+
ALT)
790 MPOS=NPOS
800 GOTO 730
810 RETURN
820 REM KILLED ROBOT
830 POKE MPOS,0
840 POKE NPOS,0
850 FOR I=0 TO ROBOTS:IF ROBOT(I)=NPO
S THEN KR=I:I=ROBOTS:NEXT I:GOTO
870
860 NEXT I:STOP
870 FOR I=0 TO 7:POKE NPOS,LC(I)+128:
SOUND 0,I*10,8,14-I*2:NEXT I:POKE
NPOS,0
880 SCR=SCR+1:ROBOT(KR)=0
890 SCR$="00000":SCR$(6-LEN(STR$(SCR)
))=STR$(SCR)
900 FOR Z=1 TO 5:SCR$(Z,Z)=CHR$(ASC(S
CR$(Z))+128):NEXT Z:POSITION 0,1:
 ? #6;SCR$
910 IF SCR<HIGH THEN 940
920 HIGH=SCR:HI$="00000":HI$(6-LEN(ST
R$(HIGH)))=STR$(HIGH)
930 FOR Z=1 TO 5:HI$(Z,Z)=CHR$(ASC(HI
$(Z))-32):NEXT Z:POSITION 15,1: ?
#6;HI$
940 KILLED=KILLED+1:IF KILLED=ROBOTS+
1 THEN 960
950 RETURN
960 REM ALL ROBOTS KILLED, HURRAY
970 FOR J=1 TO 20:FOR I=0 TO 4:POKE 7
08+I,PEEK(53770):NEXT I:NEXT J
980 FOR I=0 TO 7
990 IF POD(I)=0 THEN 1020
1000 FOR J=0 TO 3:SCR=SCR+5:POKE POD(
I),PC+1+COLMSK(J):GOSUB 1050:GOS
UB 890
1010 POKE POD(I),PC:GOSUB 1060:NEXT J
1020 FOR J=0 TO 4:POKE 708+J,PEEK(537
70):NEXT J
1030 NEXT I
1040 ROBOTS=ROBOTS+2:GOTO 110
1050 FOR W=14 TO 0 STEP -2:SOUND 0,W*
10,12,W:NEXT W:RETURN
1060 FOR W=14 TO 0 STEP -2:SOUND 0,15
0-W*10,12,W:NEXT W:RETURN
1070 GRAPHICS 2+16:SETCOLOR 4,9,6:POK
E 53770,27
1080 CHSET=(PEEK(106)-8)*256:IF PEEK(
CHSET+11)=56 THEN RETURN
1090 POSITION 3,4: ? #6;"LASER BARRAGE"
1100 POSITION 4,6: ? #6;"please wait"

```



```

1110 FOR I=0 TO 512:POKE CHSET+I,PEEK
      (57344+I):POKE 708,PEEK(53770)
1120 SOUND 0,PEEK(53770),10,8:NEXT I
1130 RESTORE 1180
1140 READ A:IF A=-1 THEN RETURN
1150 FOR J=0 TO 7:READ B:POKE CHSET+A
      *8+J,B:POKE 708,PEEK(53770):SOUN
      D 0,B,10,8:NEXT J
1160 GOTO 1140
1170 SOUND 0,A,10,INT(I/34):NEXT I
1180 DATA 1,16,16,56,56,124,124,84,0
1190 DATA 2,3,31,62,14,22,4,0,0
1200 DATA 3,0,28,14,31,14,28,0,0
1210 DATA 4,0,0,4,22,14,62,31,3
1220 DATA 5,84,124,124,56,56,16,16,0
1230 DATA 6,0,0,32,104,112,124,248,19
      2
1240 DATA 7,0,56,112,248,112,56,0,0
1250 DATA 8,192,248,124,112,104,32,0,
      0
1260 DATA 9,56,68,130,130,68,56,56,12
      4
1270 DATA 10,56,68,186,186,68,56,56,1
      24
1280 DATA 11,192,64,112,16,28,4,7,1
1290 DATA 12,1,7,4,28,16,112,64,192
1300 DATA 13,128,224,32,56,8,14,2,3
1310 DATA 14,3,2,14,8,56,32,224,128
1320 DATA 15,0,64,1,48,56,80,0,4
1330 DATA 16,16,8,16,8,16,8,16,8
1340 DATA 17,8,16,8,16,8,16,8,16
1350 DATA 18,0,0,0,170,85,0,0,0
1360 DATA 19,0,0,0,85,170,0,0,0
1370 DATA 20,255,149,255,169,255,149,
      255,255
1380 DATA 21,255,255,255,255,255,255,
      255,255
1390 DATA 22,0,36,2,160,0,2,136,34
1400 DATA 23,59,60,66,129,129,129,66,60,
      0
1410 DATA 24,0,60,66,66,66,66,60,0,0
1420 DATA 25,0,0,24,36,24,0,0,0,0
1430 DATA 26,0,0,0,24,0,0,0,0,0
1440 DATA 27,24,36,126,129,60,0,60,10
      2
1450 DATA -1
1460 GRAPHICS 17:POKE 756,CHSET/256:P
      OKE 559,0
1470 RESTORE 1460:FOR I=0 TO 4:READ A
      ,B:POKE 708+I,A*16+B:NEXT I
1480 DATA 6,8,1,10,4,6,7,10,0,14
1490 KILLED=0
1500 FOR I=0 TO 3:SOUND I,0,0,0:NEXT
      I
1510 CRT=PEEK(88)+256*PEEK(89)
1520 FOR I=0 TO 21:POKE CRT+40+I*20,3
      1:POKE CRT+479-I*20,31
1530 IF I<20 THEN POKE CRT+40+I,31:PO
      KE CRT+479-I,31
1540 NEXT I
1550 IF NOT DIMMED THEN DIM SCR$(5),
      HI$(5):HI$="(5 P)":HIGH=0:SCR$="
      #####":SCR=0:LIFE=3
1560 POSITION 7,0:PRINT #6;"LASER":POSITI
      ON 6,1:PRINT #6;"#####":
1570 IF LIFE>1 THEN POSITION 13,0:PUT
      #6,131:IF LIFE>2 THEN POSITION
      13,1:PUT #6,131
1580 POSITION 0,0:PRINT #6;"SCORE":POSITI
      ON 16,0:PRINT #6;"HIGH"
1590 POSITION 0,1:PRINT #6;SCR$:POSITI
      ON 15,1:PRINT #6;HI$

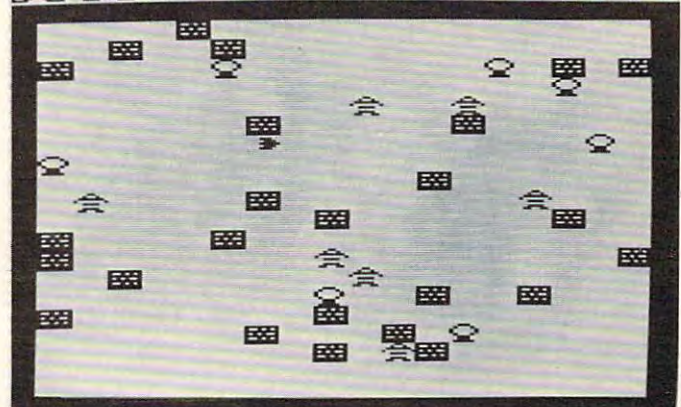
```

```

1600 FOR I=1 TO 25:A=INT(18*RND(1)+1)
      :B=INT(19*RND(1)+3)
1610 POKE CRT+B*20+A,30+128:NEXT I
1620 IF DIMMED THEN 1760
1630 DIM POD(7),PX(7),PY(7):REM 8 POD
      S
1640 DIM ROBOT(64),RX(64),RY(64):REM
      UP TO 64 ROBOTS
1650 DIM TARGET(64):REM CHANGE 64 TO
      ANY OTHER UPPER LIMIT DESIRED
1660 DIM LC(7)
1670 DIM LDIR(3):REM LASER DIRECTION
1680 DIM DIR(7):REM 8 DIRECTIONS
1690 DIM COLMSK(3)
1700 COLMSK(0)=0:COLMSK(1)=64:COLMSK(
      2)=128:COLMSK(3)=192
1710 LI=0:REM LASER INDEX
1720 LC=0:REM LASER CHARACTER
1730 PC=9:REM POD CHARACTER
1740 PPOS=0:REM PLAYER POSITION
1750 ROBOTS=3:LET DIMMED=1
1760 FOR I=0 TO 7
1770 PX(I)=INT(18*RND(0)+1):PY(I)=INT
      (19*RND(0)+3)
1780 POD(I)=CRT+PX(I)+PY(I)*20:IF PEE
      K(POD(I))>0 THEN 1770
1790 POKE POD(I),PC
1800 NEXT I:PODS=8
1810 FOR I=0 TO ROBOTS
1820 RX(I)=INT(18*RND(0)+1):RY(I)=INT
      (19*RND(0)+3)
1830 ROBOT(I)=CRT+RX(I)+RY(I)*20:IF P
      EEK(ROBOT(I))>0 THEN 1820
1840 POKE ROBOT(I),63+192
1850 TARGET(I)=INT(8*RND(0))
1860 NEXT I
1870 FOR I=0 TO 7:READ A:DIR(I)=A:NEX
      T I
1880 DATA -20,-19,1,21,20,19,-1,-21
1910 FOR I=0 TO 7:READ A:LC(I)=A:NEXT
      I
1920 DATA 26,27,12,14,28,29,11,13
1930 FOR I=0 TO 3:READ A:LDIR(I)=A:NE
      XT I
1940 DATA 20,19,-1,-21
1950 PPOS=CRT+INT(18*RND(0)+1)+INT(19
      *RND(0)+3)*20:IF PEEK(PPOS)>0 TH
      EN 1950
1960 DIR=1:REM DIRECTION OF PLAYER, 0
      -7
1970 POKE PPOS,DIR+64:MPOS=0:POKE 559
      ,34
1980 RETURN

```

SCORE LASER HIGH
BARRAGE



Laser Barrage - Atari Version



Teaching With Games

Harvey B. Herman
Associate Editor

Sometime ago I took part in a "District Day" for gifted and talented elementary school students. The program was hosted by the University of North Carolina at Greensboro. Workshops were organized by 32 university faculty members on topics ranging from computer technology to Appalachian folk music. I collaborated with a colleague from the Physics Department in a presentation, to a group of very bright kids, of small computers. Our objective was to give the students, in the short time available, some appreciation of the laboratory uses of computers in the physical sciences. I thought it might be useful to others to describe the rationale behind my part in the program.

Realtime Clocks

The computers used in the workshop were various model Commodore PET/CBMs. One of the features of these computers, as I am sure regular **COMPUTE!** readers are aware, is their built-in, realtime clocks. One of the variables in BASIC, TI\$, is set aside (reserved) to keep track of hours, minutes, and seconds. Typically, the clock is set by equating this variable to the current time; e.g., at 9:30 a.m. type TI\$ = "093000". If the value of TI\$ reads 094502 after using the computer for a short time, the user would know that 15 minutes and two seconds have elapsed since the clock was last set.

Another reserved variable, TI, keeps track of 1/60th second intervals (jiffies) since the PET was turned on, or TI\$ was set. Either variable can be used in a program in which the computer interacts with the environment at specified time intervals. Let us take as an example a program written to make measurements every ten minutes. Ten minutes translates to 36,000 jiffies. When the jiffy counter (TI) has increased by this amount, or the minutes segment of the string variable TI\$

has increased by ten, the program should then take whatever action is required to make the measurement.

Attract Them With Games

Elementary students love to play games; *Pac-man* alone is a billion dollar industry. I decided to write an original game for the workshop in which time is an integral part. The students would play this game, the time guessing game, first. Later, when we had their attention, a discussion could begin on the laboratory uses of small computers where keeping track of time is essential. A scientific computer program used in a laboratory setting will undoubtedly have similar algorithms. We tried to focus on these aspects of the program without attempting in any way to make sophisticated programmers of the students – virtually impossible in the limited time for the workshop. I believe that it was indeed possible, however, to impart some understanding of scientific applications of computers to bright kids, many of whom already have home computers.

Time Guessing

A listing of the program accompanies this article. Readers should feel free to use it just as a game, or as a point of departure for a discussion on measurements with computers, as we did.

The program is relatively short and should be easy to follow. It begins with optional instructions. The object is to start and stop a clock, with a key press, coming as close to ten seconds as possible without going over. A player enters his or her name, and then presses any key. When players feel ten seconds is up, they press any key again. It takes some practice before one can reliably reach 9.90 seconds or greater, while still staying below ten. The last and best player's score for that session is displayed after each turn. At the conclusion of the game, all the students' names and their times are displayed in summary fashion.

There are two features of this program which perhaps should be incorporated in most applications at this level:

1. A return without data in response to an input statement will not stop the program. In my experience, this is the single most confusing part of PET BASIC to non-computerists. (It has been corrected in the VIC.)
2. The time values are not displayed to nine significant figures, but are rounded to a more realistic 1/100 of a second. It always bothers me to see unnecessary digits reported for an experimental measurement. Of course, rounding has an additional benefit; it makes for neater and easier to read tables at the conclusion of the program.

The time guessing program was developed on