

# RAD CAD

CAD HAS HELPED BUILD OUR BRIDGES AND FLY US TO THE MOON.  
WHAT DOES IT OFFER THE NEXT GENERATION?

**C**AD? In the schools? Educators who have enjoyed success with innovative computer simulations like *Voyage of Mimi*, *Balance of Power*, or *The Oregon Trail* shouldn't be surprised to hear that computer-aided design (CAD) is moving into the schools, starting in kindergarten.

CAD was once the exclusive province of engineers and architects. But the aerospace, machining, and electronics industries now share this versatile technology with such diverse fields as clothing and interior design. Even archaeologists have found a use for this tool in the reconstruction of ancient ruins.

Since CAD use is so widespread in the working world, its use is coming to be seen as a basic skill, as important to conceptualizing as English is to communicating.

Kids are discovering that design work can be as competitive and fun as videogames. Teachers are finding all kinds of new ways to put CAD to work in helping students conceptualize, organize, manipulate, and learn.

## Canned CAD

What kind of CAD program is right for young people? Since the introduction of the CAD concept begins early, a "canned" CAD program such as *Stickybear Townbuilder* (Optimum Resources) is used. This program lets a child as young as five construct his or her own town. When the town is completed, the student can drive around in a simulated car to get the feel of the layout.

Slightly older children get into design with *Car Builder* (Optimum Resources). It's organized similarly to *Stickybear Townbuilder*. *Car Builder* challenges students to select components from a database until they have assembled a simulated car. Then the car can be modified and tested for wind drag and overall performance.

Junior high and high schoolers are crazy about *Sim-*

*City* (Maxis Software). Just about everybody seems to like it. This award-winning software has been a bestseller for months. Based on the American Urban Architecture model, *SimCity* allows students to construct a city in an area ten miles on a side. In their simulated cities, students can bulldoze land and place roads, parks, airports, police and fire stations, stadiums, factories, and residential areas.

Once the city has been constructed, the user must act as mayor and deal with all the classic problems of a growing city, including not only predictable urban headaches such as tax flight and pollution, but also disasters like earthquakes and fires and even a marauding sea monster.

## Learning to Love Design

But how do the kids react to these simulations? Do they approach the software as something challenging and fun, or as just one more boring school activity?

The best person to ask is a teacher. David Ellison is a long-time user of introductory CAD programs as a computer coordinator and classroom teacher at Barnard-White Middle School in Union City, California.

"Initially, many of the students balk at the CAD programs when they discover that more thought is required than is needed with most videogames," he comments. "Once they get into it, however, they start to appreciate the value of the computer as a design tool. We even have contests to see what team can design the fastest car or the most efficient city."

Employing a more open-ended format, Lockart Middle School (grades 6-8) in Orlando, Florida, has students use a CAD program called *AutoSketch* (Autodesk) to design monorail trains and then build physical models based on their CAD designs.

*AutoSketch* allows them to create perfectly symmetrical drawings that can be moved, stretched, copied, mir- >



MICHAEL C. PERKINS AND KELLY RIVERS

rored, scaled, or rotated as needed in a two-dimensional format. Using CAD, the Lockart students' drawings are cleaner and more accurate than hand renderings. As a result, they develop more successful physical prototypes of their trains.

Eighth graders at San Jose Middle School in Novato, California, will be using the same kind of CAD software to learn drafting. The plan, however, is to extend these skills into subjects beyond drafting. Principal Nancy Cooley says, "Our goal for the 1990-1991 school year is to develop a more interdisciplinary approach in which, for example, a social studies class studying ancient civilizations could use CAD software to draft up a working model of a Sumerian city and its various structures."

On a high school level, two schools in Ohio—Perry High School in Massillon and the Libby Skill Center in Toledo—have been using a more complex design program, *AutoCAD* (Autodesk).

At Perry, students learn the CAD software by copying shop documents; then they practice creating architectural, electrical, and other types of drawings. The second year of CAD involves real-world drafting assignments that include three-dimensional drawings, shading, and isometric views.

At Libby, students work with flow charts and assembly drawings to develop work-cell models for use in industrial automation.

Students at both schools are assisted in getting summer jobs and internships where they can put their CAD skills to use.

### Synergy

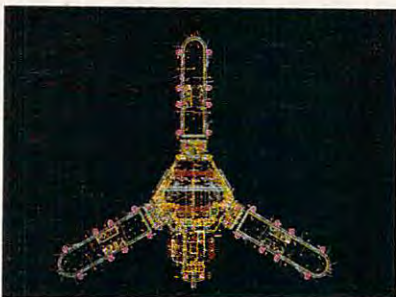
Taking a different approach, tenth graders at Sir Francis Drake High School in San Anselmo, California, like their counterparts at San Jose Middle School in Novato, will be exploring the virtues of computer-aided design through an innovative new program. The program, the Marin Education Collaborative (MEC), was organized by Autodesk, whose company headquarters is in Sausalito, California.

Rather than working in a strict engineering and drafting context like the high school students in Ohio, students in the program at Sir Francis Drake work with data from their biology, math, and English studies.

One proposed project involves a study of the evolution of costume design. Students using CAD software would learn how to create costumes in much the same way modern clothing designers use computers to construct and generate garment patterns.



*SimCity* is a delight for all ages.



*AutoCAD* is professional designware.

Students then study changes in costume and fashion in various historical periods and cultures in the light of physical environmental factors (for example, colder weather in Northern Europe or desert climates in the Near East). Once the study has been completed, students will draw upon their English skills to write a report on the project and make an oral presentation.

Another proposed project involves a study of water conservation at Sir Francis Drake High School and in the San Anselmo community at large. Students will use CAD software to re-create and study the current layout of water pipes. They'll use animation software to study the flow. The students seek to discover how much water is being used, whether the water is being used in the most economical way, and how the use of water can be improved.

Ron Fortunato will be serving as a consultant to the MEC program. Currently he's a technology consultant with the Glenbrook High School District in Glenview, Illinois. As coordinator of the NORSTAR Student Research Institute in Norfolk, Virginia, he helped develop the first space-flight program run by high school students.

According to Fortunato, the main goal of the MEC programs is "to create an educational environment in which students are using technology—including CAD—to generate new data that can ultimately be used to solve real-world problems."

Fortunato will also be assisting the MEC programs to develop ties to NASA's Ames Research Center in Mountain View, California, and the

Christa McAuliffe Center at Stanford University.

Barbara Granicher, principal at Sir Francis Drake, characterizes the program's multisubject, interdisciplinary approach as an experiment in thematic problem solving, rather than a strict computer program limited solely to drafting projects. Other CAD-related ideas include projects focused on urban development, transportation, and pollution control.

The project instructors hope to bring in other computer applications such as database, word-processing, and desktop-publishing software in order to store the data generated by the projects, to produce the reports, and to serve as graphic aids in the presentation of the results.

### In the Material World

Ultimately, the use of CAD by kids can achieve a number of practical goals. It helps all students better understand the use of computers in the everyday working world, and it helps them discover aptitudes in their own use of the computer as an instrument of design.

Student designers should learn CAD for the same reasons budding journalists must learn word-processing skills and future financial analysts must learn the power of the spreadsheet. As students decide to become architects, engineers, molecular chemists, city planners, cartographers, and designers of all kinds, they must learn to use the appropriate CAD program.

Though school computing was once looked down upon as the exclusive province of nerds and dweebs, it is now becoming a basic necessity for all students to have computer skills. □

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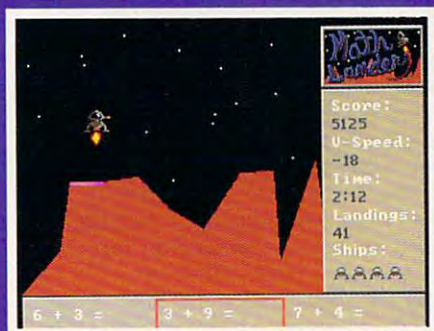
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# GAMEPLAY

O R S O N S C O T T C A R D

**T**ry as they might, gamewrights *don't* have complete control over the way you experience their games. As more and more games rely on nonstandard devices—something besides the keyboard, the screen, and the hard disk—your enjoyment depends more and more on the right tools.

But where to turn for guidance? Where can you find the right tool that will bring life to the game, without interfering with the quality of the play? Ask another game player—like me. Here's my guide for the game player's indispensable toolkit.

**Sticks.** I've used a lot of joysticks over the years, and for a long time I thought there was no such thing as a good PC joystick. Once you've played with that tough old bird, the original Atari joystick, with its firm resistance and delicious tactile feedback, those wimpy little toothpick joysticks you're forced to use on IBM-related machines are faintly disgusting.

Does *any* game actually use the IBM-joystick's capability of registering how far you've moved the stick? I don't think so. They only register the same things that the Atari stick reported so cleanly and simply—up, down, left, right, or center. So we put up with all that wimpiness just so the IBM stick can report information that no game ever uses.

Despite my dislike of the whole idea of the IBM joystick, I'm glad to report that somebody actually makes a good one. Epyx's hand-held joystick, the 500XJ, is the most comfortable, responsive joystick in the IBM world—and it's the only one that belongs in the same league as the Atari stick.

**Balls.** What the IBM joystick's designers didn't anticipate was the little box with the ball in it—the mouse and the trackball. When we want subtle information about *how far* and *how fast*, that's what we use.

I've tried a lot of mice, and for the sheer feel of it, there's no comparison to the Microsoft mouse. It cradles in the palm of your hand, it responds

beautifully to natural and easy wrist movements, and when it gets dirty and binds up, you just pop off the collar, drop out the ball, and blow the box clean.

There is something better, but I don't think it's made its way to the PC world yet. On my Amiga I use the optical Boing Mouse from GfxBase (408-262-1469). It doesn't give quite the tactile feedback of the Microsoft mouse, but it has the advantage of never getting dirty and binding up like a shopping cart wheel.



On my upstairs machine, the portable that I use for my writing, I need a mouse for a few jobs. (Well, all right, for a few monochrome *games*.) But the way I use my desk doesn't work well with a mouse. I surround myself with the piles of books and notes that I'm using for current projects; I can't afford to keep a mouse pad's worth of space free and clear.

So I decided to buy a trackball. I first tried the most traditional design—big ball in the middle, buttons above it. It was awful. What was I supposed to do, move the ball with my palm?

My next try was a nice hefty pool-ball-sized item with big buttons framing the ball on either side. It was much better, but my fingers just aren't dexterous enough to move the ball with speed and assurance.

Then I bought Logitech's Trackman, and I'm happy. This is the trackball that has you move the ball with

your thumb, while your fingers rest on the buttons off to the side. Logitech's promos aren't hype; they're true: The thumb really is more dexterous than the fingers. With the ballistics feature turned on, I can move all over the screen with simple, quick, intuitive movements. It still isn't as comfortable and easy as a mouse, but where a mouse won't do, the Trackman will.

**Sounds.** I always figured that when I wanted good sound, I'd use the Amiga. But then it became clear that too many good games with good sound were being put out for PCs only, and I wanted to hear them. So I sprang for the bucks to buy the Roland MT-32. The only trouble is its memory conflict with the Racet laser drive (a rewritable optical disk drive) I use for backup. When faced with that choice—well, backup comes before play.

When I got my 486, I moved the MT-32 into it and fell in love. It sounds great. In the meantime, I bought an Ad Lib board for my 386 machine, and it had no conflicts with the laser drive. While it isn't quite as lush-sounding as the MT-32, it still sounds great—and many games make good use of both sound boards, either for sound effects or for background music. (Both boards require you to buy a simple amplifier and a pair of speakers.)

There are some peculiarities, at least on my systems. When I'm playing *Railroad Tycoon*, there are times when the Ad Lib board doesn't get the message to turn off a particular sound effect, so I have to spend several minutes listening to a whine or a hiss before I can get the thing to shut down. Very unpleasant.

The MT-32, on the other hand, is consistent: Every time it's first used, no matter where I have the volume set, it turns on at full blast and calms down only after I've fiddled with the knob.

But hey, once you've played with either sound board installed, playing without it feels like watching a movie with the soundtrack turned off. □

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WOLF

# IN HARM'S WAY

**T**he fog was so heavy that the crew of the SS Carlton could barely make out the stern of their ship. Yet despite the fog, the Carlton and 34 other cargo ships were headed single-file out of the harbor at Hvalfiord, Iceland. They were moving toward the Soviet coast with \$700 million worth of war materials.

The Carlton had been unlucky ever since she left Philadelphia several months earlier on Friday the thirteenth. She was towed back from her previous attempt to cross the Barents Sea as a result of a near-miss air attack. That's when her gunner managed to shoot down a British Sea Hurricane aircraft. Now she was headed back out as part of the most disastrous convoy of the war, Convoy PQ-17. ▷

**RICHARD SHEFFIELD**

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Circle Reader Service Number 111

It seemed that no one was very keen on the Iceland-to-Russia convoys, from the British Admiralty, who called the operation "unsound," to Seaman James Atkins, who would write, "We were loaded with . . . 450 tons of high explosive, loaded fore, aft, and amidships: they were not taking any chances on our getting through to Russia."

But Roosevelt, who provided most of the material and ships, and Stalin, who needed that material to stop the German advance along the Russian front, put enormous pressure on Churchill to get the convoy moving, though they had intelligence that the German navy was cooking up

something special for PQ-17.

It was probably too much good intelligence that led the British to believe that the convoy was in imminent danger of attack by a strong surface force. Believing they were out-gunned, the British gave the disastrous order to withdraw the covering warships and disperse the convoy.

### Starting Over

But what if things had been different? Two new simulation games let you set up PQ-17 and see how it plays out. In fact, *WolfPack* from Brøderbund and *Action Stations* from Conflict Analytics let you set up just about any scenario, real or imagined.

The ability to make up your own scenarios finally frees the game player from the designer's view of how the game should be played. Canned scenarios are nice, but once you've played them once or twice, the game starts to lose some of its zip. When you can make up new scenarios and rewrite history, a game can remain interesting almost indefinitely.

With *WolfPack* and *Action Stations*, you can cover both ends of the spectrum when it comes to scenario building. The Mission Construction Set in *WolfPack* is mouse driven, highly graphic, and easy to use; but it's also rather shallow in detail. The Scenario Builder with *Action Stations*, however, is complex and highly detailed, but it's more difficult to use.

Though the Germans' plan was to destroy PQ-17 with a surface force, they also had 11 U-boats (code-named the Ice Devil pack) in the area to track the convoy. What if the Germans had decided to attack the convoy early with Ice Devil instead of tracking? You can easily set up and play this scenario with *WolfPack*. The only problem is the size of the forces and convoy. *WolfPack* tends to slow down when a large number of ships are used. Fortunately, this is easily countered by reducing the forces on both sides by half.

Actually building the scenario is very easy. Using a point-and-click operation, you just pick a patch of ocean and populate it with ships. The convoy of 20 ships is set up to follow one ship as a leader, so you only need to plot the course for that one ship. Around the convoy are placed seven destroyers, either in repeating patrol routes, which move with the convoy, or in advance positions on their own. Then it's just a matter of placing the six U-boats and picking their captains. This feature lets you choose how the U-boats will function when you're not controlling them. Some captains are

### ANATOMY OF A BLUNDER

If you're interested in learning more about Convoy PQ-17, here are two excellent books on the subject:

*The Destruction of Convoy PQ-17*, by David Irving (St. Martin's, New York, 1989). This heavily researched book was initially banned by the British Admiralty, since it explained their blunders in great detail. A superb operational history.

*A Cold Corner of Hell: The Story of the Murmansk Convoys 1941-1945*, by Robert Carse (Doubleday, New York, 1969). The complete story of the Iceland-to-Russia convoys, from inception to completion, with a large section on PQ-17.





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**WolfPack** lets you re-create realistic sub battles.

relentless attackers, and others won't attack at all.

Put the U-boats on an intercept course with the convoy and start the action. Once engaged, you can take control of any U-boat in your group

or watch them operate on their own.

Though the setup is easy, there isn't a lot of detail that can affect the outcome. *WolfPack* makes no provision for setting the level of visibility or sea state. And the convoy

doesn't change course or disperse once the attack starts.

### Call to Action

*Action Stations*, on the other hand, presents a much more balanced surface battle—which the Germans had code-named The Knight's Move. Actually, convoy PQ-17 is one of the scenarios that comes with the game. This turns out to be a good thing, since building the battle from scratch is quite a lengthy and complicated process. Very little is overlooked in the building process. The details include sea state, wind direction and speed, sea direction and speed, day and night visibility, time of day, and optional storms and squalls. And that's before you ever plot your first ship.

There are also quite a few details to fill in for each ship you include, but the most complicated process is placing the ships on the map. Instead of pointing to where you want the ship to be on the map, you provide  $x,y$  coordinates without even seeing the map. It's best to follow the manual's advice and first plot the whole thing out on graph paper.

Because PQ-17 is one of the 30 scenarios included with *Action Stations*, it's much easier to use the Edit function to change a few things in the way the scenario is set up. The scenario comes set up with two German battle groups placed together, attacking the convoy from the south. Set up this way, the British must hold off the Germans until the covering cruiser force can arrive from the north. Playing this way, I got an even battle with heavy losses on both sides.

But when I play *what if* and use an alternate German plan of an enveloping attack, things shift a little to the Germans. In this setup, the German force that's positioned around the battleship *Tirpitz* comes in from the north. Before it can attack the convoy, it engages the British covering force. By staying at long range, the *Tirpitz* can keep this force occupied while the Second Battle Group, consisting of the "pocket battleships" *Lutzow* and *Admiral Scheer*, attacks the convoy and destroyers with 11-inch guns.

You can't add or remove ships with the Edit program, but a program on the optional *Utilities* disk will let you do this. Using the Swap-Add program, you can really start to play what if. What if the *Bismark* wasn't sunk in 1941 and was available for The Knight's Move? What if the convoy had twice as many torpedo-carrying destroyers or a King George V-class battleship? The possibilities and replay value of the game are endless.

Scenario builders are becoming so popular that they're almost a must

### Das Boot

Richard Sheffield

*Das Boot* puts you in command of a German Type VII U-boat, the scourge of the Atlantic during World War II. Type VII boats were responsible for sinking millions of tons of Allied shipping. Had they been used properly and in greater numbers, they might have affected the outcome of the war.

The name *Das Boot* comes as a promotional tie-in with the book (provided free with the game) and movie of the same name. But it should be made clear that there is no attempt made in the game to re-create the action in either.

Learning a game like this is usually very difficult, what with all the various stations and moving around in the boat. But *Das Boot* has an excellent training mode that lets you operate each battle station in an arcadelike combat sequence with plenty of targets. In the training mode, you can use the anti-aircraft gun against Allied planes, shoot the deck gun, make surface and submerged torpedo attacks, maneuver through minefields, and practice sub-versus-sub warfare. The practice sessions are scored to let you know how well you did.

After a little practice you are ready for your command and one of the five missions. From the Arctic to Gibraltar to the North Atlantic to Norway to the Bay of Biscay, you'll find no shortage of enemy contacts. Allied bombers are a constant threat. There are three levels of difficulty, and the introductory level is definitely recommended for new players. You can further fine-tune the difficulty using the Historical Accuracy selections. Torpedo performance, on-board repairs, and new-

equipment introduction can be tailored to make your mission easier or more difficult.

The game fully supports 256-color VGA and does present some interesting graphics. But they fail to take full advantage of this high-powered video adapter by using digitized images of enemy ships as do some of the other sub simulations. Sound-board support includes both Ad Lib and SoundBlaster and is well used. The mouse interface also works well. Gameplay was satisfactory, but I had several system lockups and a recurring bug: The bottom portion of my screen would not paint until I moved the mouse back and forth over it.

Actually, the biggest problem with this game is what is left out. What's there works pretty well but seems incomplete. My biggest complaint is the lack of a Save Game feature. With the ability to call for a *Milch cow* resupply sub, some of these missions can go on for hours. Asking the player to complete them in one sitting is just not realistic, and forcing him or her to scuttle the sub to quit in the middle is downright mean. Also missing is a campaign/career mode along with promotions or medals. It would have been great to see how victories at sea affect the ground war as you sever the Allied supply lines. The manual could use some work as well.

The work completed on *Das Boot* is well done, but she seems to have been launched a bit prematurely. Until a few more hatch doors are installed, I'm afraid that she will leak rather badly when compared to other World War II sub simulations.



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Circle Reader Service Number 200

## Product List

Here are the products used by Richard Sheffield, and some other submarine combat products you might enjoy.

### Action Stations

Conflict Analytics  
395 Del Monte Center, Ste. 189  
Monterey, CA 93940  
IBM PC and compatibles, 640K RAM, CGA;  
mouse optional—\$49.95  
Utilities disk—\$12.95

### Ancient Art of War at Sea

Bröderbund Software  
17 Paul Dr.  
San Rafael, CA 94903  
(415) 492-3200  
IBM PC and compatibles, 256K RAM,  
graphics adapter; mouse or joystick optional—\$44.95  
Apple II version—\$44.95  
Macintosh version—\$44.95

### Das Boot

Three-Sixty  
2402 Broadmoor  
Bldg. B, Ste. 201  
Bryan, TX 77802  
(409) 776-2187  
IBM PC and compatibles, 640K RAM, CGA  
(10-MHz 286 or better with VGA recommended); Microsoft mouse supported but not necessary—\$49.95

### 40 Great Submarine Simulator War Adventures

COMPUTE Books  
324 W. Wendover Ave., Ste. 200  
Greensboro, NC 27408  
(919) 275-9809  
Use *Silent Service* to re-create great World War II submarine battles—\$14.95

### Harpoon

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Bryan, TX 77802  
(409) 776-2187  
IBM PC and compatibles, 640K RAM, CGA  
(286 or 386 with EGA or higher recommended); Microsoft mouse recommended—\$59.95  
Amiga version—\$59.95  
Macintosh version—\$59.95

### Hunt for Red October

Software Toolworks  
60 Leveroni Ct.  
Novato, CA 94949  
(415) 883-3000  
IBM PC and compatibles, 512K RAM, CGA or EGA; mouse supported—\$29.95  
Amiga version—\$29.95  
Apple II version—\$29.95  
Atari ST version—\$29.95  
Commodore 64 version—\$29.95  
Macintosh version—\$29.95

### Pirates!

MicroProse  
180 Lakefront Dr.  
Hunt Valley, MD 21030  
(301) 771-1151  
IBM PC and compatibles, 256K RAM, CGA, EGA, and Tandy 16-color—\$44.95  
Amiga version—\$44.95  
Apple II version—\$44.95  
Atari ST version—\$44.95  
Commodore 64 version—\$44.95  
Macintosh version—\$59.95

### Silent Service II

MicroProse  
180 Lakefront Dr.  
Hunt Valley, MD 21030  
(301) 771-1151  
IBM PC and compatibles, 640K RAM, CGA, EGA, VGA, and Tandy 16-color; supports Ad Lib, SoundBlaster, and Roland sound cards—\$59.95

### WolfPack

Bröderbund Software  
17 Paul Dr.  
San Rafael, CA 94903  
(415) 492-3200  
IBM PC and compatibles, 512K RAM, graphics adapter; mouse or joystick optional—\$54.95  
Amiga version—\$54.95

for new military sims of this type. But if the idea is to play what if, I'd like to see the publishers go a step further. They could let you set up a battle, sit back, and watch the computer play both sides. You might even be able to watch the action from a number of vantage points, as in *M1 Tank Platoon*.

### Courting Disaster

So what finally happened to the real-life PQ-17? After the order to disperse the convoy, things got bad in a hurry. Without destroyer cover, many ships were taken individually by U-boats and bombers. A few seaworthy ships were beached and abandoned by their crews on the first patch of dry land they found. In all, 24 ships and 153 Allied seamen were lost.

The SS *Carlton* was torpedoed the day after the convoy scattered, and most of her crew members were taken prisoner. The crew's bad luck continued when their transport ship hit a mine and sank. Having been through this before, the crew of the *Carlton* distinguished themselves by calmly handing out life preservers to the panicked German ground soldiers on board and organizing the rescue. They were later thanked by the ship's captain for saving the lives of hundreds of men. □

## COMPUTE



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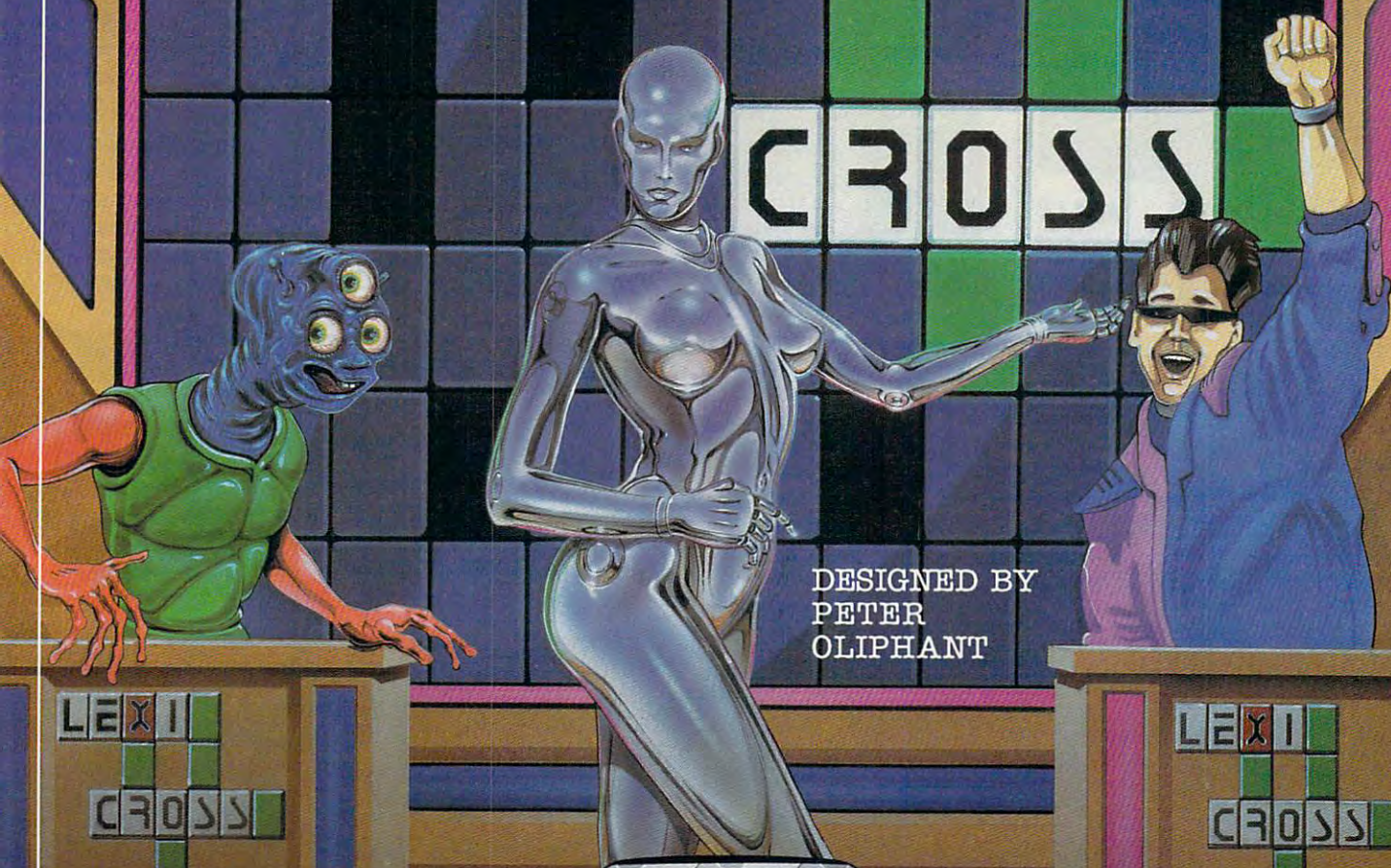
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IBM Screens Pictured.

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Circle Reader Service Number 135



# 64/128 VIEW

T O M N E T S E L

**F**irst of all, I'd like to remind all user groups to get in contact with us if you want to be included in this year's listing. We've sent forms to all the groups on our worldwide list, but you'll be excluded if we don't hear from you. If you haven't received a form by this time, send us a card or letter with your group's name, address, and any BBS information.

Now I'd like to thank all of you who've responded to our Gazette Readership Survey. This is the fourth year we've run such a survey, and your feedback provides us with a good idea of how we're doing. We appreciate your taking the time to mail them in. Incoming survey forms have slowed to a trickle now, so let's take a look at what you've told us.

It comes as no surprise that the majority of you own and use a 64 (77 percent); 42 percent of you own a 128. Of those responding, 3 percent own an Amiga, 2 percent own a Macintosh, and 6 percent own an IBM or compatible. Of course, many of you own more than one computer and have an interest in more than one brand. More than one of you indicated that you own all the brands mentioned in the survey.

Of those who use a computer at work, 57 percent use a PC, 23 percent use a 64, 9 percent use a 128, 8 percent use a Macintosh, and 3 percent use an Amiga.

We were curious about how many of you are computer novices and how many are veterans. It seems 5 percent of you bought your 64 within the past year, and twice that figure have two years' experience. The survey indicates that 3 percent of you bought a 64 the first year it came out. The average length of ownership is 4.7 years. Interestingly enough, ten readers said they bought a 64 the year *before* it was introduced. Maybe they were thinking of the VIC-20.

We also found that you spend quite a few hours each week at your keyboards. The average is 11.5 hours, but a few superusers spend 50 or more hours at their computers. One reader

in Ontario, Canada, spends 20-50 hours keeping church and election records on his 64 and 128, teaching children how to program, and working with handicapped people. Another 50-hour user does everything from playing games to controlling his home's lighting system. Others in the 50-60 hour category say they keep their computers busy doing real estate appraisals, keeping tax records, operating ham radio stations, drawing, writing newsletters, and helping in the classroom.

The champion heavyweight user, who reportedly spends 60-80 hours each week at his 64, says he gets his copy of *COMPUTE* from his father, plans to buy another 64 this year, buys "a lot" of mail-order software, doesn't use Gazette's programs, but might if there were more business programs offered.

While most of you are satisfied with your computers, 18 percent of you plan to buy a new one within the next year. The PC market will get the biggest share, with 28 percent of you moving to an IBM or clone. Brand loyalty is reflected by the 45 percent who say they'll stick with Commodore. Of those planning to buy a new computer, 16 percent say they'll get another 64, and 17 percent plan to upgrade to an Amiga. An interesting note is that 12.5 percent plan to buy a 128. Since Commodore no longer makes the 128, people interested in this gone-but-not-forgotten computer will have to turn to the used-equipment market to buy the computer they want. (Montgomery-Grant advertises that it still has 128s in stock, but that's the only 128 ad I've seen recently.) With this much interest in an orphaned machine, count on Gazette to continue its 128 support. Now's a good time to remind programmers that we actively solicit 128-specific programs.

Next month, we'll take a look at some of the other information provided by the survey, including what you want to see in Gazette in the future and how you feel about our new format. □

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More than a replacement for the deskTop, the gateWay offers a unique, streamlined approach to file management under GEOS. With a resizable Note Pad, proportional slider and fuel gauge, the gateWay makes it easier to get where you're going. In designing the gateWay, we took a good hard look at the deskTop to make sure that none of the functionality would be lost. Then we added feature after feature - capabilities that you, the serious GEOS user, have found lacking in the deskTop. At CMD, there's a lot more going on than powerful new hardware development - we're creating new ways to use it.

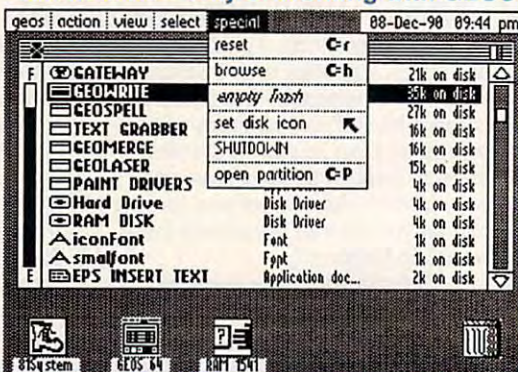
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 JiffyDOS: Add \$5.00 per order (UPS ground), \$9.00 (2nd-Day Air), plus \$4.50 for APO, FPO, AK, HI, and Canada, or \$15.00 for overseas orders. No additional shipping if ordered with any hard drive. COD's to US only - add'l \$4.00  
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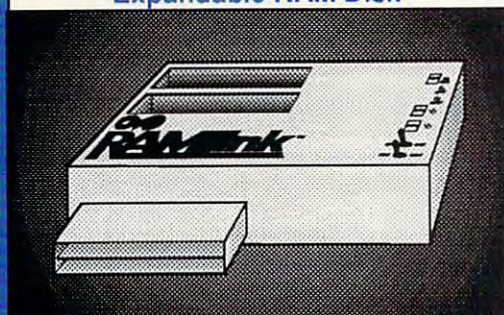
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- Supports Commodore 1700, 1764, 1750, Berkeley Softworks GEORAM and PPI's RAMDrive.
- Optional RAMCard allows RAMLink to be used as a RAM Disk with or without a separate REU. User Expandable from 1 Mb to 16 Mb using standard SIMMs.
- Pass-Thru connector allows use of cartridge port peripherals such as utility cartridges.
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- RAM port provides power back-up to REU's.
- Parallel port provides ultra-fast data transfer when connected to CMD HD series hard drives.
- Includes separate power supply - optional battery available to protect against power failure.

RAMLink (without RAMCard)	\$179.95	RAMLink Battery back-up unit	\$24.95
RAMLink w/ RAMCard (0 Mb)	\$219.95	Parallel Cable for CMD HD	\$14.95
RAMCard w/ 0 Mb (if purchased separately)	\$59.95	1 Mb RAM SIMMs (CALL for current price)	*\$59.95

\*RAM price when Ad was created. For current prices on all capacities - CALL. Prices and specifications subject to change without notice.  
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### Both RAMLink and RAMDrive Include RL-DOS

- Allows commercial software to access all available RAM as a high-performance RAM Disk.
- gateWay software for GEOS use available at no additional charge.
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Both RAMLink and RAMDrive give Commodore users powerful features never before available in a RAM expander. RAMDrive is intended mainly for those who do not require the high RAM capacity of RAMLink (up to 16 Mb), RAMLink's Pass-Thru port or the parallel port for communicating with the CMD HD Series of hard drives. RAMDrive is an excellent choice for those who desire portability since the internal battery pack can keep the contents of RAMDrive intact for several days. RAMLink is the perfect choice for GEORAM owners who want the ability to use that device with programs other than GEOS. RAMLink has a built-in RAM Port for easy use with a GEORAM or Commodore REU. No matter which CMD RAM device you select, you'll benefit from the fantastic capabilities of a high speed RAM disk equipped with RL-DOS and the outstanding value of CMD support.

## RAMDrive - A High Performance Battery Backed RAM Cartridge

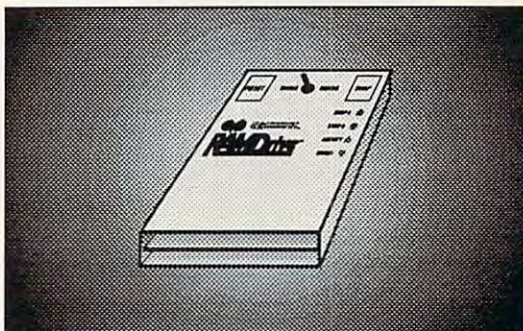
RAMDrive is a fresh new approach to RAM expansion for the Commodore 64 and 128. RAMDrive is a self contained battery backed cartridge with capacities of 512K, 1 Mb and 2 Mb. RAMDrive incorporates RL-DOS, an ultra-fast, easy-to-use operating system similar to the HD-DOS found in CMD HD Series hard drives. This DOS allows various types of partitioning along with compatibility and speed unsurpassed by previous RAM Expansion systems.

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- Reset, Disable and SWAP functions are all standard features.

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# RAMDrive™



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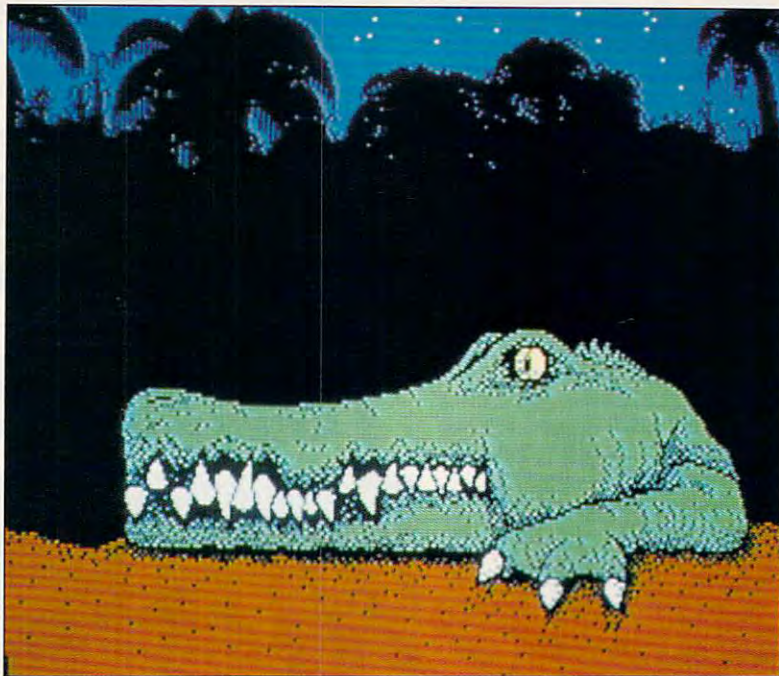


# NEWS & NOTES

## Ultimately Bad

Origin (110 Wild Basin, Suite 230, Austin, Texas 78746) announces the release of two new titles for the 64: Lord British's *Ultima VI* (\$69.95) and Chris Roberts's *Bad Blood* (\$49.95). Uncover the mystery of the gargoyles in the sixth episode of the Ultima saga. As Avatar, you and your trusty band of friends venture forth from the shores of Britannia to the dark reaches of the underworld.

In *Bad Blood* you must save the mutant survivors of a nuclear holocaust from the hatred of their human foes. The new leader of the pureblood humans seeks to enslave, and eventually destroy, the entire race of mutants. You have been sent from your tribal village to scour the bombed-out cities in search of a way to overcome centuries of bad blood. Just be sure to arm yourself to the teeth for battles against gun-toting slavers and airborne buzzards.



## Croc

**Croc by Vincent D. Zahnle of Martinez, Georgia,  
is this disk's Picture of the Month.**

Welcome to "Gazette Gallery." Each month *Gazette Disk* features a collection of the best 64/128 artwork submitted by our readers. We pay \$50 for each piece of art we accept and an extra \$50 for the one selected as Picture of the Month. Send original art to Gazette Gallery, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

## Fast Hat Trick

Hatronics (145 Lincoln Street, Montclair, New Jersey 07042) announces its HART (Hatronics Asynchronous Receiver/Transmitter) interface for the 64 and 128. This high-speed RS-232 interface is capable of sustaining interrupt-driven serial-to-parallel and parallel-to-serial data conversions at speeds in excess of 19.2K baud.

HART connects via the computer's cartridge port and is fully programmable in BASIC, 6502 and 8502 assembler, and other languages. Although still under development, HART will be provided with programming information, terminal software, and file-transfer programs for use with most modems and IBM PCs.

## Great Balls of Fire

A multitude of colored balls are falling from the sky, and it's your job to make them disappear. That's the aim of *Pick 'n Pile* (\$29.95), a new release this spring from the French company Ubisoft and distributed by Electronic Arts (1820 Gateway Drive, San Mateo, California 94404).

To make the balls disappear, you must stack columns of identical balls. The column must be surrounded by others in order to make it vanish. Once a column has been completed, it disappears. If you are skillful enough to clear the screen of the balls, you're off to the next level. This exciting and frustrating game is designed for one or two players. Joysticks required. □

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# FEEDBACK

E D I T O R S   A N D   R E A D E R S

## Pope Gregory Did It

I realize *Module 64* (January 1991) is not primarily a calendar program, but rather a demonstration of how the program can load routines from a disk and link them together. I take issue, however, with the statement that *Module 64* will print any month between the years 0 and 2300. The years 1700, 1800, 1900, 2100, and 2200 are not leap years, as the demo indicates. Also, I see no notice of the fact that in the year 1582, ten days were omitted from the calendar when we switched from the Julian to the Gregorian calendar. In 1582, the day following October 4 was October 15. The *Module 64* calendar is correct only from March 1900 to January 2100.

RUSSELL E. HOLT  
CANDIA, NH

*You're right, Russell. While time may flow in a continuous stream (if we discount what some science fiction writers may say), trying to track it with calendars introduces a few holes and gaps. Pope Gregory made calendars more accurate when he devised his calendar with a leap year adjustment, but he unwittingly made it tough for computer programmers. Several readers pointed out these and other problems. See the following letter.*

A shortcoming with the *Module 64* calendar is that the program allows for years prior to 1582 to be selected. For the Gregorian calendar, these years didn't exist. Also, for use in the United States and Canada, the program should limit the dates prior to 1752—September 14 to be exact. This was the date that the Gregorian calendar came into use in the British colonies.

ROBERT C. MARCUS  
ST. THOMAS, ON  
CANADA

*That's an interesting historical point you don't see mentioned with most perpetual calendars. We're glad to know that *Module 64* works, even if the demonstration's accuracy*

*is questionable. For those readers who may need to know the day of the week for any date on the Gregorian calendar, including those pesky end-of-century, nonleap years whose numbers end in 00 but are not evenly divisible by 400, COMPUTE programmer Bruce Bowden offers this simple program. By the way, Romania didn't accept the Gregorian calendar until 1917.*

```
MJ 5 REM GREGORIAN DAY OF THE
      {SPACE}WEEK - BRUCE BOWDEN
MH 10 D$="MM/DD/YYYY"
RB 20 PRINT"ENTER THE DATE AS
      {SPACE}";D$:INPUT RS
QJ 30 IF LEN(R$)<>LEN(D$) THEN
      20
CC 40 M=VAL(LEFT$(R$,2)):D=VAL
      (MID$(R$,4,2)):Y=VAL(RIG
      HT$(R$,4))
BJ 50 F=365*Y+D+31*(M-1)
FS 60 IF M<3 THEN F = F+INT((Y
      -1)/4)-INT(.75*(INT((Y-
      1)/100)+1))
GB 70 IF M>2 THEN F = F-INT(.4
      *M+2.3)+INT(Y/4)-INT(.75
      *(INT(Y/100)+1))
PM 80 DY = F-INT(F/7)*7
KC 90 PRINT"WITH SATURDAY=0, T
      HE DAY IS";DY
```

## A Different Calendar Lament

Can you help me with *Monthly Calendar* (March 1989)? Various lines in the calendar printout don't line up. I have a 128D, a Star SG-10 printer, and a G-Whiz interface.

R. H. LENTZ  
JOSHUA TREE, CA

I have a fix for *Monthly Calendar*. The program won't work with the setup that I have. I have a Star NP-10 printer and a G-Whiz interface. I had to change the following two lines to make it come out right.

```
1030 PRINT#4,CHR$(18);"(2 SPACES)
      SUNDAY(6 SPACES)MONDAY(5
      SPACES)TUESDAY(3 SPACES)
      WEDNESDAY(2 SPACES)";
1040 PRINT#4,CHR$(18);"THURSDAY
      (4 SPACES)FRIDAY(4 SPACES)
      SATURDAY(3 SPACES)";GMS
```

I hope this helps some people who may have had trouble with the printouts.

RICHARD BUTTERFIELD  
ATASCADERO, CA

*Thanks, Richard. That seems to be just the fix that Mr. Lentz needs. When readers with certain hardware configurations have problems getting programs to run, it's difficult for us to offer solutions when we don't have the same hardware on hand. That's why we encourage readers to send in tips or Bug-Swat- ters that can help others with similar problems.*

## Best CAD

What are the best CAD programs for the 64 and the 128, and who makes them?

BRIAN TREASE  
ERIE, MI

*It's tough to say which of any kind of program is best, and we would hesitate to try. Since there aren't too many CAD programs available for the 64 or 128, however, we can mention a few titles. Chances are we'll leave one or two out—and I'm sure we'll hear about the ones we do—but the following programs are still readily available.*

CADPak 64 (\$39.95) and CADPak 128 (\$59.95) from *Abacus Software* (5370 52nd Street SE, Grand Rapids, Michigan 49512) are fine programs that have been around for some time. CAD-3D (\$53.95) from *IHT Software* (2269 Chestnut Street, Suite 162, San Francisco, California 94123) is another.

For more specialized programs, there's *Home Designer 128* (\$39.95) from *Free Spirit Software* (58 Noble Street, Kutztown, Pennsylvania 19530). If you want to design printed circuit boards, check out *Printed Circuit Board 64* (\$75.00) from *Microsentinel Systems* (P.O. Box 4135, San Pedro, California 90731-4135). □

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# Painting with Light

## USE YOUR COMPUTER TO UNLEASH YOUR ARTISTIC TALENTS

If you're an artist who wants to express your creative talents, your 64 can be an exciting medium. Let's take a look at the wonderful world of Commodore graphics. To begin with, there are benefits and advantages of creating art on a computer over using more traditional methods. Unlike using tools such as brush, pen, pencil, charcoal, or pastels, which wear out and have to be cleaned, drawing on a computer's digital canvas isn't messy, and the medium is renewable. Also, there's no additional expense for new supplies.

You can create unlimited patterns and textures with different brush tips and nibs that you can save and use many times. The ability to experiment and change your mind as you work is open to you. By generating art on your computer, you can save the stages of your work in progress to disk for later retrieval. If you make a mistake, you can easily undo the last action. If you "spill" color somewhere, you don't have to grab a cloth and worry that your painting is ruined. You have the freedom to let your creativity flow, to make decisions as you work, and not to feel locked into a particular route.

If you decide that an earlier course was a better one, call up the last image and start with a fresh new approach, rather than starting from scratch. Also, by saving in stages, you'll have a visual record of sequences from sketch to finished artwork and learn from past efforts.

### Cut-and-Paste Artist

The ability to duplicate portions of your image by cutting and pasting sections saves you from the tedious task of re-drawing multiple objects by hand. Because you are working on an exact replica of the original, you can share your images with fellow computer users. So it is very easy to duplicate your electronic images and share originals by swapping disks or uploading to a BBS.

### Tools of the Trade

As with traditional artists, choosing the right tools is important to a computer graphic artist. As a traditional artist chooses the right brushes and nibs, you'll have to decide which is the best input device to suit your needs. Then you'll have to decide on a paint program.

A joystick is fine for arcade and maze games in which up, down, left, right, and diagonal movements are required, but it is not well designed as a drawing implement. A trackball might be more useful for drawing smooth free-hand curves, but it is very slow and unstable for doing straight lines.

Using a touch tablet and stylus that emulate pen and paper might seem more natural to some; unfortunately, they are not very accurate and are rather jittery. The Koa-laPad touch tablet is popular but no longer made, but the pad that comes with *Animation Station* is a good replacement.

Using a lightpen is very close to drawing with an air-brush or paintbrush, but be careful of static when touching the monitor screen. Also, your hand and arm may become cramped by holding the lightpen in the air without support. The lightpen pointer, or cursor, may get lost in dark or red areas of the image, and you will be unable to move it. Many lightpens are cheaply made and are not precise. An exception of high quality is the Flexidraw Inkwell Lightpen.

The input device that provides the most accurate responsiveness and best follows the movements of your hand is a true-proportional 1351 mouse. Many computer artists find this to be the optimal input device.

### Two Graphic Modes

The 64 has two graphic resolution modes. Multicolor, sometimes referred to as medium resolution, is the most



FRED SCHRIER

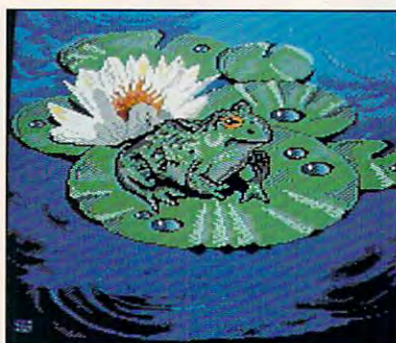
popular format and is often used for game title screens and graphics. It has a 160 × 200 pixel display and allows more colors to be used closer together.

High-resolution mode is composed of a bitmap image of 320 × 200 pixels. This mode allows for more pixel detail but limits placing colors in close proximity. Hi-res mode is used mostly for printer output rather than for screen displays. Koala is the standard format for multicolor, and *Doodle* is the popular format for high-resolution graphics. These programs were the first to exploit the graphics capabilities of the 64. (See "Bitmap Graphics on the Commodore 64.")

Many of the graphics packages that have followed *Koala* and *Doodle* have advanced to the point that they include many state-of-the-art drawing tools that would have been found only on programs for more expensive graphic computers. Each of the programs mentioned includes the basic drawing tools of freehand, line, box, circle, zoom, copy and paste, and undo. But they also have their own unique features that set them apart.

### Graphics Galore

Because the 64 is a powerful yet inexpensive computer for creating graphics, a plethora of paint programs quickly sprang up, but only a handful



Excellent examples of a 64's black-and-white and color graphics are these pictures of a cabin, by Perry Miller, and a frog, by T. Preston Chesser.

of them have endured the test of time. In the past if you wanted to draw in both multicolor and high-resolution modes, you had to buy two separate packages. *Advanced Art Studio* is an easy-to-use menu-driven, multicolor program that supports multiple input devices. This British import also comes with *Advanced OCP Art Studio*, which is basically the same program, but in high-resolution mode.

*Advanced Art Studio* is unique because of its pull-down menu system. It offers three levels of magnification in zoom mode (2×, 4×, 8×), as well as scaling, mirroring, and rotating sections of the screen and saving them for later access. It includes a spray-paint feature and built-in editors for defining custom pens, brushes, patterns, and fonts. It includes a grayscale printer dump option.

*Digital Artist* is an all-purpose, state-of-the-art, full-featured, high-resolution graphic design program that supports a 1351 mouse or joystick and RAM expansion units and allows for editing on a virtual page larger than the viewing screen. Many features set this program apart from its competitors. These include a unique graphical user interface, digital parameter display of coordinates for precise alignment, rotation of selected object at any arbitrary angle, turbo-

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DOS, an improved disk-operating system, and printer support. Its drawing tools feature right-angle lines, arc, multiple lines, measuring ruler, user-definable patterns and brushes, excellent text control, and hollow or filled ellipses, triangles, or parallelograms.

### Graphics from Overseas

Many of the more powerful paint programs are imports from Europe. *Masterpiece*, also known as *64 Image System*, is imported from Europe by Scorpion Software. It supports both high-resolution and multicolor modes. Some of its unique features are its ability to twist, bend, rotate, stretch, and distort objects for strange and unusual special effects.

*Artist 64* is an outstanding multicolor paint program from England that has many features found only on Amiga paint programs. It supports joysticks and a mouse. There is a 1351 mouse driver for it available on QuantumLink.

It features multisided polygons from three to ten sides, the ability to draw with a cycle or rainbow of selected colors at a specified rate of speed, and protection and priority for colors to weave over and under each other (for those who decide to add a tree after drawing a brick wall and want to place it in the background). Other unusual drawing commands include remember cursor position (RCP) for drawing concentric circles, use last option for repeating an action, grab a section of the screen with or without colors to use much as you might a cookie cutter or rubber stamp, repeat paste, draw continuously, and draw text with a pattern.

*Artist 64* also has an editor for unlimited brush tips and textures for shading. The most amazing feature of *Artist 64* is that its 13 commands can each be affected by one or more of 21 other options, for a total of more than 250,000 possible effect combinations.

*AMICA Paint (Advanced Multicolor Computer Aided Paint)* is an impressive and innovative graphics package from Germany, which I hope will be imported into the U.S. It pulls Amiga-like performance out of the 64.

It loads and saves standard Koala files, as well as its own compressed picture format. Its unique pop-up, multilevel menus can be accessed by function keys or hot keys.

*AMICA Paint* also has color protection and priority for selectively stenciling and masking certain colors, a repeat option, and a macro mode to load and save frequently used mouse movements and command sequences. It supports many hollow and filled shapes such as polygons, rays, ellipses, arcs, and cutout pie shapes. You can

adjust the size and power of the spray command. The block option allows you to mirror, rotate, enlarge, reduce, scale, stretch, bend, slant, skew, tip, or tilt into perspective any section of the screen for 3-D effects.

Other advanced features let you extrude, add a drop shadow, contour, thicken or smooth, create random gradient fills, mix, blend, or smear an area of the screen. You can load and save custom configurations such as cursor speed, movement and acceleration, keyboard support, or pixel movements. You can save to disk parts of the screen to use as custom brushes. There's an excellent built-in pattern and line editor, and it has the ability to rub through a second work area onto the current workscreen.

An excellent zoom mode either magnifies the full screen or shows a small 1/4-screen zoom of the area around the cursor while the full screen is normal size. This last option allows all features to be used while in zoom mode. There is an excellent smooth-scrolling slideshow feature built in. A true-color cycling animation feature

allows volcanoes to erupt and spheres to rotate. If that is not enough, there is the ability to load in animation, printer, and expansion modules.

Both *Artist 64* and *AMICA Paint* are truly extraordinary graphics packages for experienced 64 computer-graphics artists who are serious about their work and want many Amiga-like features. Too bad these European programs are hard to find in the U.S.

### Graphics Conversions

No one paint program can possibly provide all the features and tools you might want. So the ability to create a drawing with one paint package and then enhance the picture with features found in another program is to your advantage. Moving from one format to another can present problems, however.

Unlike the Amiga IFF (Interchange File Format) standard file format that allows exchanging of images between different programs, each 64 graphic program has a different file format. You can't simply load one image into another program and edit it.

## Bitmap Graphics on the Commodore 64

How does your 64 translate data in memory to pictures on screen? The answer is *bit-mapping*. This term means that no translation takes place—the data *is* the image.

Memory on the 64 is composed of 65,536 cells, called *registers*. As a group, these registers constitute the computer's RAM (Random Access Memory). Any register can be accessed randomly by merely giving its address to the microprocessor. The register, which we refer to in the abstract as a byte, is the fundamental unit of computer memory. Does this mean that no smaller memory units exist? No, simply that no smaller unit can be individually addressed. In fact, there is a smaller unit of prime concern to graphics programming.

Each byte carries with it eight digits. Each digit can have a value of either 0 or 1, similar to the off or on state of a light switch. These digits are called *bits*.

When a bitmap is used to make a computer picture, the bits affect what is seen. On the 64, there are two kinds of bitmaps. One sees each bit as a screen dot that will be placed on the screen (high-resolution mode). These dots, or picture elements, are called pixels. The other kind of bitmap uses two bits side by side to represent a pixel (multicolor mode). The difference has to do with the way the 64 handles color.

When each bit corresponds to a pixel, the bit is either off or on. Hence, there are two possible colors, a foreground color for the pixel whose bit has a value of 1 (on) and a background color where the pixel bit is 0 (off). But if there are two bits to every pixel, then there are four color possibilities. The first two bits correspond to 10 in binary; that is, the first bit is on, and the second is off. The second pair is 01, the third is 11, and the fourth is 00.

The 64's microprocessor, the VIC (Video Interface Chip), is specially designed for doing bitmapped graphics, but it has some peculiarities. The major one is the way it maps those bits to the screen. Remember that the bits are packaged eight to a byte and, although the VIC displays in bits, it accesses memory in byte groupings.

It starts with the pixel image at the top left of the screen as the 1st byte of the memory region to be mapped. Instead of assembling the byte images straight across the screen to the end and continuing on the next line, it deposits subsequent bytes below the 1st until there are 8 in the stack. The 9th is then placed next to the 1st and starts a new stack; then the 17th is placed next to the 9th, and so on.

When the end of the current row of 8-high stacks is reached, a new line is built in similar fashion below it, starting with the 321st byte. There are 25 of these 320-byte lines on a screen, resulting in 8000 bytes per bitmap. Since there are 8 bits per byte, that makes a total of 64,000 bits, or pixels—320 across by 200 down. It isn't by chance that this stacking arrangement, 8 bits across by 8 bytes deep, has the same dimensions as a character.

So far, we have a monochrome image. The 8 × 8 character blocks are also the fundamental units for color assignment. Whether an image is 2-color or 4-color, the colors are decided within the 8-byte character block grouping. Once a new character block is reached, a new set of colors may apply. That's why all 16 colors can be seen on the screen at once but there are only 2 colors within a character-sized region in *Doodle* art and 4 colors within the same region in *Koala* art.  
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There are approximately 50 known graphic file formats for the 64. Without a conversion program that supports these different file formats, you could be lost. The best is *Auto-graph* by David DeSimone, known as Fuzzy Fox on QuantumLink. This graphics management utility may be downloaded from QuantumLink's Graphic Support Group Libraries. It will automatically display, convert, copy, scratch, and rename many of the popular high-resolution and multicolor picture formats.

The other program is *Pixelmaster* by Steve Emsley, Q-Link graphics formats expert, which is available from Silvasoft. It's a truly comprehensive graphic-translation, image-manipulation, and processing program for the 64. It supports over 40 graphic formats so you can easily exchange graphics between your favorite paint programs.

### Create Video Titles

Because this is the video age, you can create video-creating cards or video titles for your home videos with packages like *Video Title Shop* and *Home Video Producer* by recording the 64 composite video output onto a video cassette recorder. You can also use any paint package with large fonts from GEOS or *Print Shop* to caption your home videotapes.

### Graphics Support and Information

After you've created your masterpieces, how can you share them with others? Where do you go for graphic utilities? Where do you get to chat with fellow artists, share ideas, and get questions answered and problems solved? The best place to get all of these things is the QuantumLink Graphic Support Group on QuantumLink. Hook up your modem, and you can tap into this graphics resource and electronically transmit your picture just about anywhere in the United States. You can also chat with the masters of 64/128 graphics and other

graphic programmers who host the Starving Artists Cafe chat room each night on QuantumLink from 10 p.m. to 1 a.m.

Another outlet for your artwork is "Gazette Gallery," a feature found each month on *COMPUTE's Gazette Disk*. Accepted submissions earn \$50, and the artwork selected as the Picture of the Month earns \$100. Artists retain the rights to their creations. □

Paul Hughes and his twin brother, Peter, are the editors of *Geoworld* magazine. Paul is also one of the sysops (SYSOP PH) of QuantumLink's Graphic Support Group.

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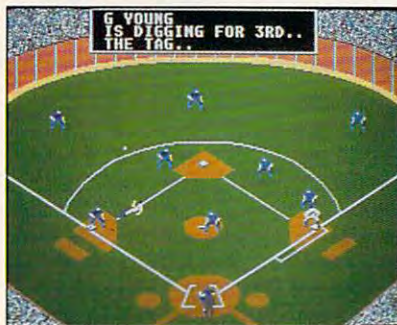
**Y**es, baseball fans, you, too, can become a part of a time-honored and elite fraternity. They are the few, the proud, the loud. Here's your chance to assume the role of the sometimes not-so-polite gentlemen who frequently explode from the dug-out, sprint across the baseball diamond, and accost the kindly, slightly nearsighted umpires, yelling just inches from their faces and kicking dirt on their shoes. Ah, the life of a major league manager!

Before you position your favorite baseball cap backward on your pate and ready yourself for a full-fledged rhubarb, there are other demands of America's favorite pastime that a good baseball manager must master. Can your starting pitcher last the remaining innings, or should you bring in a relief from the bullpen? Should you send the runner at first base to steal second? Do you signal the batter on deck to hit away or sacrifice bunt? These are but a few of the management skills featured in the new *Micro League Baseball II Enhanced* by Micro League Sports.

As in the original *Micro League Baseball* version, the object of the simulation is to manage a baseball team of your choice. Whether you win or lose depends on the managerial moves you make. The new and improved version, written especially for the 64, features improved ballpark graphics, pop-up screens for easy mid-game substitutions, stealing and base-running ratings, pitching/hitting stats vs. lefty or righty, a Quickplay option, and many other extras.

*Micro League Baseball II Enhanced* is absolutely great, and noth-

ing I've seen comes closer to the real thing. If you've always wondered what it would be like to manage the power hitters of the 1927 Yankees or how they would fare against the speed and athletic ability of the 1988 Dodgers, this is your vehicle. The simulation comes with a listing of 26 legendary teams of the past that you may pair as the home and visiting teams. Choose the stadium, the length of the series, and the rosters of your choice; and then play ball.



Two managers may guide their respective teams to victory, or one manager can challenge the management skills of the computer. If you like, both teams can be managed by the computer while you sit back (beer and hot dog in hand) and watch as the game unfolds before you.

Each manager is given the opportunity to choose his or her offensive and defensive moves. When your team is at bat, you tell the batter to bunt, to swing away, or to hit and run—and whether to take the extra bases or not. Engineering a squeeze play or having a runner steal a base depends on your individual player's athletic ability, the throwing-arm capabilities of the opposing team, and, of course, luck.

On defense, you size up the ability of the batter in the box. You decide whether you should instruct your pitcher to pitch an aggressive fastball, pitch out in anticipation of a stolen

base, or intentionally walk the dude at the plate. You position the outfield shallow or deep, and you shift the infielders to guard the line or to play in at the corners.

How deeply you will want to delve into this miniverse is up to you. *Micro League Baseball II Enhanced* lets you keep and compile stats on players, teams, leagues—you name it. You can trade players, create new rookies, and manufacture farm teams.

STEVE HEDRICK

Playability . . . . .	4
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Based on the Grand Tour of professional tennis, which includes Wimbledon, the French Open, the U.S. Open, and the Australian Open, *Pro Tennis Tour* lets you play matches at some of the world's most famous courts and to play in several modes of difficulty.

For me, the primary difficulty came in mastering the joystick moves. To serve, you must click the fire button, position a black cursor to where you want the ball to land in your opponent's court, and then release the button (in Advanced and Professional modes, you click again) to hit the ball.

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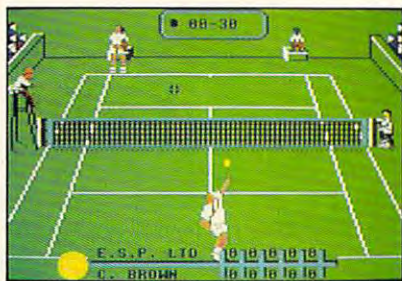
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Easy enough? Almost. But to return a ball, you must press the joystick button to swing the racket back and then release to hit the ball. The problem here is that your player stops



moving once you cock your racket arm. An added complication is choosing the desired return. For a lob, you move the joystick back; for a smash, you move it forward.

Moves of this type are not uncommon in computer games, and I've found they work well in slower games such as golfing simulations. Here, if you want the fast action associated with tennis, you'll have to put in so many hours of practice that you'll probably feel like Jimmy Connors.

Once you've passed this obstacle, however, the game can be enjoyable. You can practice your returns against

an automatic serving machine, practice serving, and play against the computer or a friend; but best of all, you can play the various world courts without having to play at championship levels.

Graphics and animation are very good, and care was taken to emulate the different playing surfaces found on the tour. The sound is so-so.

In addition to documentation that is adequate without being ostentatious, the game's booklet contains a section on tennis techniques, complete with diagrams. There's also a brief history of the game.

Had it not taken me several hours of practice to achieve a mediocre rating, I probably would've enjoyed the game more. But it's a game, not an avocation, and I usually find myself feeling no more than lukewarm toward any game that demands I put in it more than I'll get out of it.

If the user interface (in this case, the joystick moves) can be made as simple as a fast-action game demands, *Pro Tennis Tour* could be one of the great ones. As it stands, it's an average exercise that demands almost as much practice and skill to master as the real game of tennis.

ERVIN BOBO

Playability . . . . .	3
Documentation . . . . .	4
Originality . . . . .	3
Graphics . . . . .	4

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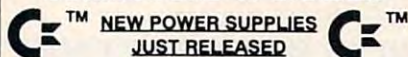
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## MEGA PACK

I have this recurring nightmare. I'm being pursued by a loose stack of quarters, skittering after me in a Slinky-like motion. They're coming at me, shouting obscenities, trying to mow me down and bury me beneath their silver-and-copper sandwiched selves. They're angry with me, for now they'll never know the numismatic ecstasy of sliding down the roller-coaster innards of an arcade game money box. I've got *Mega Pack*.

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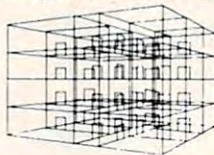
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in which you are a tennis ball bouncing across a scrolling landscape. Next is Jack the Nipper II, the adventures of a diaper-sporting brat (according to the manual—my game would not run). Monty on the Run is the third—a game a la *Goonies*, in which Monty the Bear tries to escape to freedom. Bulldog is your basic flying space jet trying to outmaneuver and outblast alien space stations. Krakout is next, a fancy pong game with a kick and a twist: You try to obliterate blocks and aliens with your ball and bat. Be the hero in Future Knight and try to save your maiden fair.

The second disk brings you Cosmic Causeway, a rolling marble game; Trailblazer, a sort of Cosmic Causeway for two; and Northstar, where you're responsible for resuming control of space station Northstar, which has been overrun by aliens. Finally, taking up all of side 2 of the second disk is Thing Bounces Back—a rather indescribable game of mazes and slides, pipes and surprises, in which Thing (as apt a description of this springy gremlin as any) needs to collect parts of a computer program.

Of the nine I could play, I found Monty, Krakout, Cosmic Causeway, and Thing to be the most fun, with Future Knight, Northstar, and Trailblazer next. Rebounder and Bulldog were OK, too (they bear a close resemblance to games designed with *Shoot 'Em Up Construction Kit*). Music and graphics on all the games, though differing in content and styles, were excellent.

Krakout provides the most adjustable variables, including options for screen color changes in time to the music's beat, scrolling, and bat speeds. It also boasts 100 screens. Monty on the Run is cute but challenging. I'm sure it can be done, but to be honest, I didn't make it past the second screen. Cosmic Causeway is real arcade fun and masterable enough to be satisfying rather than frustrating. Thing Bounces Back is incredible. It's fun and playable, and it's charismatic along the lines of *Tower Toppler*.

The manual to *Mega Pack* is brief but gives a pretty good rundown

of each game—better than having a friend tell you how to play them. And hey—how often do you get on-the-spot instructions to arcade games anyway?

*Mega Pack* provides a good cross section of games, something for everybody. It saves quarters, it saves wear and tear on the family car, and it keeps arcade addicts available for emergencies, like dinner and work, or school. It's a good value—and a lot of fun.

ROBIN MINNICK

Playability .....	4
Documentation .....	3
Originality .....	4
Graphics .....	4
Sound .....	5

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An enemy bunker in the jungle returns fire, and the plane is hit. Its oil pressure drops, and the pilot struggles in vain to keep the plane's nose up. There's no chance of making it back to the carrier, and the Hellcat plows into the jungle floor. Smoke engulfs the plane, and its ammunition explodes.

One plane down, two to go. The action is hotter than the Hellcat's six machine guns in *Wings of Fury*, Broderbund's new World War II action game for the 64.

The time is 1944, and you are a Navy pilot aboard the USS *Wasp*, somewhere in the Pacific. After the game loads, cycle through seven naval ranks to select your mission. Midshipmen have it the easiest with but one enemy-held island to attack. Move up in rank, and you go against enemy ships and fighter planes, plus numerous well-defended islands.

Before takeoff, arm your Hellcat with bombs, rockets, or torpedoes. Bombs and rockets are good against the machine guns, but you'll need a torpedo to have any chance of sinking an enemy ship. Don't worry if you run out of ammunition before you complete your mission; you can always return to the carrier and reload. You can land on a carrier, can't you?

Carrier landings are tough. I've crashed into my ship more frequently than enemy bombs have. Taking off is a snap. Just give the plane full throttle and hope you have enough speed to stay in the air once you leave the flight deck. Everything is controlled with your joystick.

You don't fly this game from the cockpit. Instead, you observe and control the action from the side as your plane scrolls left and right. It's almost like watching a war movie.

The graphics in *Wings of Fury* are pretty good. Your plane dips and dives over palm-covered islands as you try to eliminate enemy machine-gun bunkers that are firing at you. You have 30 bombs and plenty of bullets. The falling bombs, explosions, and plane crashes are detailed and entertaining.

The game's sound effects don't come close to taxing the 64, however. Engine noises, enemy fire, and explosions are fine, but your machine guns are almost silent. Most of the innovative sound work comes from plane crashes and ditchings at sea, but your Hellcat's six machine guns sound much too puny.

A panel at the bottom of the screen keeps track of your fuel, oil

pressure, and number of bombs remaining. It also keeps track of your score and the number of enemy planes you've shot down. There's also a small, forward-looking view that helps you with landing.

Landings are the toughest part of this arcade game, but they don't detract from its overall appeal. You will have to hone your timing and reflexes, however, if you expect to bomb anything other than palm trees.

The Hellcat is easy to fly, the action is fast paced, the missions range from easy to impossible, and the game restarts very quickly. I just wish I could stop playing kamikaze with my own carrier every time I try to land.

TOM NETSEL

Playability .....	4
Documentation .....	3
Originality .....	4
Graphics .....	3

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# MACHINE LANGUAGE

J I M B U T T E R F I E L D

Let's set aside serious study for the moment and have a little fun with a simple race game. Four horses will race across the screen, and the winner will be selected at random.

One of the best ways to learn programming techniques is with a game, because once you have finished entering the bare-bones listing, you'll certainly come up with ideas to make the game more elaborate.

The BASIC loader will set up the program. The computer will wait for the jiffy clock to tick. The A register will contain the value of the low-order byte of this clock. We'll wait in a tight loop until the clock changes.

033C CMP \$A2  
033E BEQ \$033C

Now the time has come to move a horse. Which horse? Pick it randomly by tapping the noise oscillator.

The noise oscillator will give a random value from 0 to 255. That's too large a range, since we have only four horses. The obvious thing to do would be AND #03, which would zero out unwanted bits and leave a random value from 0 to 3. For reasons that will become clear soon, it's better to start with an even number (0, 2, 4, or 6). You can AND #06 to get an even number in the right range.

0340 LDA \$D41B  
0343 AND #06

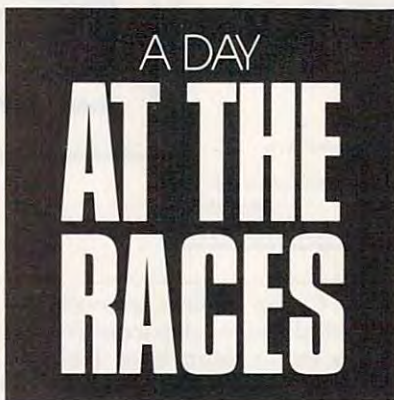
The x position of the sprites may be found at \$D000 and successive even addresses. Can you see how the even-number gimmick works? That's right; you slip the horse number into the X register and bump its position with an INC. After it's moved, you'll copy its position into Y.

0345 TAX  
0346 INC \$D000,X  
0349 LDY \$D000,X

Divide the random horse number by 2 with a Logical Shift Right (LSR) to reduce it to a number from 0 to 3.

Your objective is to change the sprite drawing to make the legs appear to move.

The drawing for each sprite is set in the video matrix (screen memory). The standard address for sprite 0 is \$07F8 or 2040 decimal. For the horse in question, the picture number will switch. The EOR instruction is ideal for this kind of flip operation.



034C LSR  
034D TAX  
034E LDA \$07F8,X  
0351 EOR #\$01  
0353 STA \$07F8,X

The selected horse has moved a pixel, and its legs have been adjusted. The horse's position is in register Y. If the value has reached \$FF, the horse has reached the finish line, and you can stop the race. You'll note that x position \$FF is not the right-hand edge of the screen, by the way. The race could go further if you would write the routines necessary to adjust the x-position high bit. But, in the interests of program simplicity, that project is left to you. To test Y, increment it, and if it becomes 0, you'll know that the horse has run the course.

0356 INY  
0357 BEQ \$035E

Assuming we have not branched ahead to end the race, we need to go back to the start and wait for the next

jiffy (1/60 second). Load the jiffy clock into the A register and hop back to the beginning.

0359 LDA \$A2  
035B CLC  
035C BCC \$033C

If the race is over, return to BASIC, where the program will pause.

035E RTS

```
100 DATA 197,162,240,252,173
110 DATA 27,212,41,6,170,254
120 DATA 0,208,188,0,208,74
130 DATA 170,189,248,7,73,1
140 DATA 157,248,7,200,240,5
150 DATA 165,162,24,144,222
160 DATA 96
170 FOR J=828 TO 862:READ X
180 T=T+X:POKE J,X:NEXT J
190 IF T<>4770 THEN STOP
200 DATA 0,2,0,63,255,255,63
210 DATA 247,63,243,63,240,56
220 DATA 48,24,48,12,96,6,192
230 FOR J=0 TO 18 STEP 3
240 READ X,Y
250 POKE 896+J,X:POKE
897+J,Y:POKE 898+J,0
260 POKE 960+J,X:POKE
961+J,Y:POKE 962+J,0
270 NEXT J
280 FOR J=21 TO 27 STEP 3
290 READ X,Y
300 POKE 896+J,X:POKE
897+J,Y:POKE 898+J,0
310 POKE 961+J,X:POKE
960+J,Y:POKE 962+J,0
320 NEXT J
330 FOR J=30 TO 60 STEP 3
340 POKE 896+J,0:POKE
897+J,0:POKE 898+J,0
350 POKE 960+J,0:POKE
961+J,0:POKE 962+J,0
360 NEXT J
370 FOR J=0 TO 3
380 POKE 53248+J*2,25
390 POKE 53249+J*2,J*30+80
400 POKE 53287+J,1
410 POKE 2040+J,15
420 NEXT J
430 POKE 54287,55
440 POKE 54290,129
450 POKE 54296,128
460 POKE 53269,15
470 PRINT CHR$(147)
480 FOR J=1 TO 20:PRINT
TAB(31);CHR$(165):NEXT J
490 SYS 828
500 FOR J=1 TO 5000:NEXT J
510 POKE 53269,0
```



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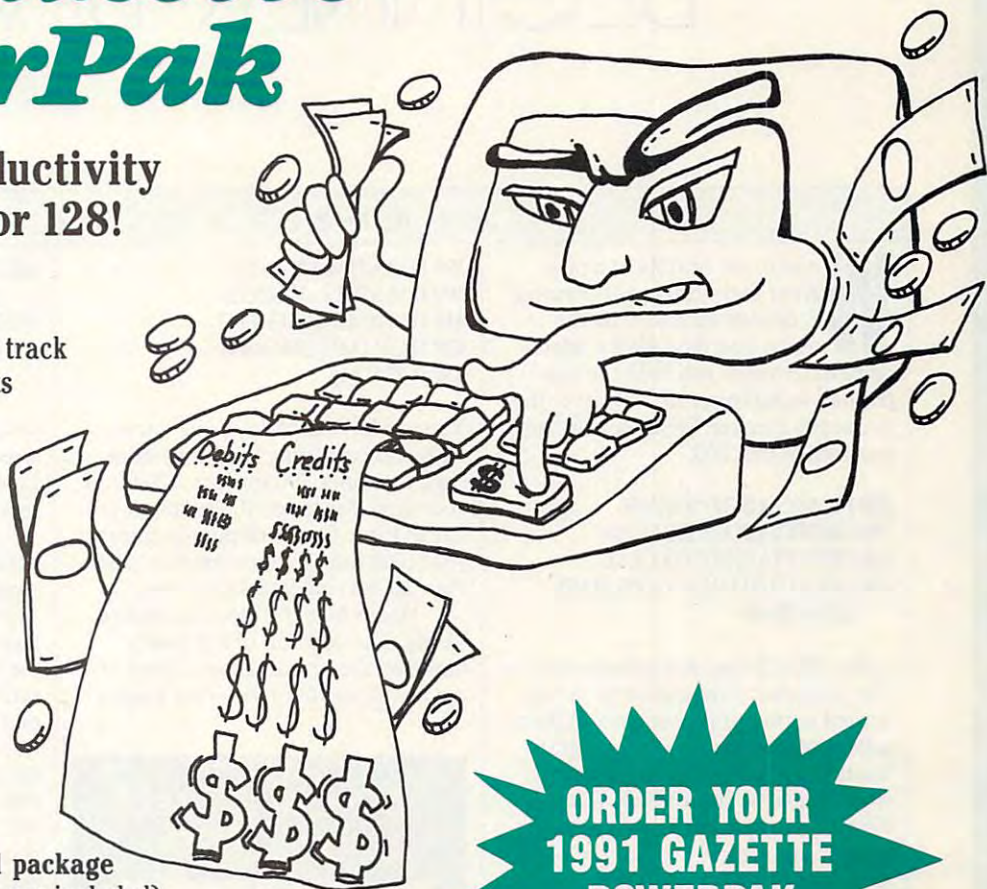
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# BEGINNER BASIC

L A R R Y C O T T O N

**W**e're in the middle of a program that prints your personal telephone directory on the screen and then dials a selected number when you hold the telephone's mouthpiece directly over the monitor's speaker. We'll pick up the program at line 200.

```
200 PRINTTAB(30)"PRESS
210 PRINTTAB(30)"RETURN
220 PRINTTAB(30)"TO DIAL
230 PRINT"[HOME]":GOSUB350:
    GOSUB440
```

Lines 200-220 are self-explanatory; line 230 returns the cursor to the upper left corner of the screen and then calls two subroutines. This program has been renumbered, so I know which lines the subroutines will use. Normally, when you're writing a program from scratch, just put the subroutines at high line numbers, such as 1000 or 5000; you can then renumber the program later if you wish. Here's the first subroutine.

```
350 READN$,NU$(C):IFN$="Q"THEN
    RETURN
360 PRINTSPC(3)N$TAB(18)NU$(C)
370 C=C+1:IFC>22THENPRINT"NO
    MORE THAN 22 NAMES AND
    NUMBERS!":END
380 GOTO350
```

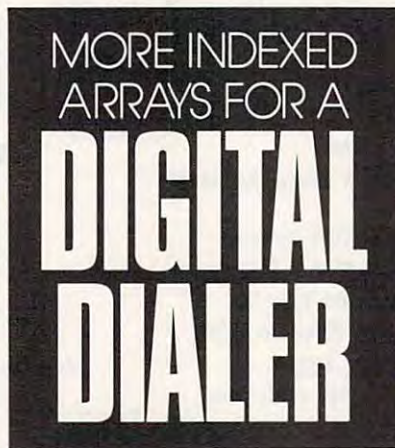
This is a four-line loop that reads and prints on the screen the names and numbers from lines of DATA while incrementing counter C. N\$ is the person's name; NU\$(C) becomes his or her corresponding telephone number. For each READ, an IF-THEN checks for a Q, which is an out-of-data signal. If a Q is read, the subroutine returns to line 230. Another IF-THEN in line 370 checks for more than 22 names and numbers.

We are filling what's called an *indexed array*, NU\$(C), with telephone numbers; C is the index to that array. We'll discuss that in more detail in a moment. Now let's add some fake data to read, which you should replace with real names and numbers.

```
390 DATAJIM,111-1111
400 DATABILL,222-2222
410 DATAMIKE,333-3333
420 DATADAVE,444-4444
430 DATAQ,Q
```

You can have as many as 22 names with corresponding telephone numbers. Use lines 390 through 429 for your data. Since you'll probably want to call more than four people, number your data lines in increments smaller than 10, leaving line 430 as it is.

Here's how the index variable C works. The position of a person's name on the screen, from the top of the list, determines the array's index



number, beginning with 0. In our ersatz example, Jim's name, N\$(0), will be printed on the first line from the top of the screen (line 0); his phone number, NU\$(0) is 111-1111. Likewise, Mike's name, N\$(2), will be printed on the third line from the top of the screen; his phone number is 333-3333, NU\$(2). We'll use the those critical line numbers later to generate the telephone dialing tones. Here's the second subroutine, which controls a symbol (\*) that points to the names.

```
440 POKE214,Y:PRINT:POKE211,2:
    PRINT"[SPC]"
450 IFAS="[UP]"THENY=Y-1:IFY
    <0THENY=0
```

```
460 IFAS="[DOWN]"THENY=Y+1:
    IFY>C-1THENY=C-1
470 POKE214,Y:PRINT:POKE211,2:
    PRINT"*":RETURN
```

We want the symbol to appear first in the upper left corner of the screen, so we use this subroutine now. Lines 440 and 470 are the only ones used the first time through.

Memory registers 214 and 211 on the 64 control the vertical and horizontal positions, respectively, of where something is printed on the screen. In the subroutine above, Y is the line number that the pointing symbol \* is on. If Y=0, the \* will be on the first screen line. (Remember, we're counting from 0.) POKE211,2 is the same as PRINTTAB(2). PRINT"[SPC]" erases the asterisk. We'll get to lines 450 and 460 in a minute after we return to the main body of the program.

```
240 Z=50
```

Z is the length of time each pair of tones will sound when dialing and is used later in a simple time-killing FOR-NEXT loop. Remember, the screen has been printed (subroutine 350-380), and the \* is pointing to the first name on the screen (subroutine lines 440-470). We now want to look at the keyboard, specifically the cursor-up and -down and Return keys.

```
250 GETAS:IFAS<>="[UP]"THENIFAS
    <>="[DOWN]"THENIFAS<>
    CHR$(13)THEN250
```

The cursor must move if the up- or down-cursor key has been pressed, so we use the subroutine at 440 again.

```
260 IFAS="[UP]"ORAS="[DOWN]"
    THENGOSUB440:GOTO250
```

Now lines 450 and 460 in that subroutine decrease or increase Y by 1, which effectively moves the \* up or down. Once the \* has been positioned next to the desired name, Y has a particular value corresponding

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to the vertical position of the \*, the screen line number.

If the Return key has been pressed, control falls to line 270.

270 N\$=NU\$(Y)

Remember that in line 350 we filled an NU\$( ) array. Here's where we use Y to index the array. If, say, the \* is on line 7 (the eighth line printed), N\$ will become NU\$(7)—the telephone number on line 7.

The next seven lines contain three nested FOR-NEXT loops. Basically, we want to scan the telephone number and have the computer play two tones for each digit scanned.

280 FORN=1TOLEN(N\$):D\$(N)=MID\$(N\$,N,1)

290 IFD\$(N)="\*"THENNEXT

300 FORT=1TO4:POKEF(T),W(T,(VAL(D\$(N)))):NEXT

310 POKEG,VN:POKEH,VN

320 FORT=1TOZ:NEXT

330 POKEG,VF:POKEH,VF

340 NEXT:GOTO250

In line 280, the outermost FOR-NEXT loop uses its variable N and MID\$ to scan N\$ (the phone number)

one digit at a time. In the number 638-3990, D\$(3) will be 8. Line 290 causes hyphens to be ignored.

Using a nested FOR-NEXT loop and the VAL function, line 300 pokes two pairs of frequencies into the frequency control registers for voices 1 and 2. Line 310 turns on voices 1 and 2 with waveform 64, line 320 causes them to sound briefly, and line 330 turns them off. Line 340 closes the outermost FOR-NEXT loop, which is scanning the digits.

To use the program, carefully enter your DATA lines from 390 to 429. You'll probably want to use more than four people, so number your lines in increments smaller than 10. Run the program. A screen of names and numbers should appear, with an asterisk (\*) to the left of the first one. Select a name with the up/down cursor key. Turn up the volume of your TV or monitor and press Return. You should hear touch-tone dialing tones.

Now pick up the handset of a nearby phone, place the mouthpiece directly over your TV or monitor's speaker, and press Return again. If the volume is adjusted properly, the computer should dial the telephone. If not, adjust the volume and try again. ☐

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# PROGRAMMER'S PAGE

R A N D Y T H O M P S O N

**W**hat happened to the adage bigger is better? Unless you're discussing RAM, the old Texan logic is lost on computer technology. Smaller circuits, smaller disks, and smaller pixels are the mainstay of today's modern computer systems.

Let's have some fun this month and shift the wheels of micro-progress into reverse. The next time some 128 or IBM PC owners boasts of their 80-column display, ask them to show you something really impressive—say, 10-column text.

The BASIC listing shown below creates a machine language routine for the 64 that prints characters four times their normal size. Use *The Automatic Proofreader*, found elsewhere in this section, to help eliminate typing errors.

```

HD 100 REM BIG TEXT
CX 110 GOSUB 10000
FC 120 SYS49152," BIG TEXT ACTIVATED!"
SR 130 END
KJ 10000 FOR I=49152 TO 49484:
      READ D:POKE I,D:NEXT
AR 10010 RETURN
MH 10020 DATA 032,253,174,032,
      158,173,036,013
KA 10030 DATA 048,006,032,221,
      189,032,135,180
KR 10040 DATA 032,166,182,133,
      252,169,255,133
FA 10050 DATA 251,230,251,164,
      251,196,252,208
HM 10060 DATA 024,032,121,000,
      240,011,201,059
BQ 10070 DATA 208,217,032,115,
      000,208,212,240
XH 10080 DATA 007,169,017,032,
      008,193,134,211
JX 10090 DATA 096,177,034,201,
      032,144,031,201
FG 10100 DATA 064,144,042,201,
      096,176,005,041
CE 10110 DATA 191,076,109,192,
      201,128,176,004
EG 10120 DATA 041,223,208,025,
      201,160,144,006
GH 10130 DATA 041,127,009,064,
      208,015,201,029
RK 10140 DATA 208,005,032,017,
      193,240,178,032
JR 10150 DATA 210,255,076,025,
      192,133,253,173
FJ 10160 DATA 024,208,041,002,
      240,002,169,008

```

```

DS 10170 DATA 009,208,133,254,
      169,000,006,253
DS 10180 DATA 042,006,253,042,
      006,253,042,024
XS 10190 DATA 101,254,133,254,
      032,048,193,201
AR 10200 DATA 037,144,003,032,
      021,193,160,000
FK 10210 DATA 173,014,220,041,
      254,141,014,220
JA 10220 DATA 165,001,041,251,
      133,001,177,253
XF 10230 DATA 133,249,200,177,
      253,133,250,200

```

ADD PUNCH TO  
YOUR PROGRAMS:  
**THINK  
BIG**

```

SF 10240 DATA 165,001,009,004,
      133,001,173,014
QQ 10250 DATA 220,009,001,141,
      014,220,162,004
EB 10260 DATA 134,002,165,199,
      072,169,000,006
JR 10270 DATA 249,042,006,249,
      042,006,250,042
JS 10280 DATA 006,250,042,170,
      189,060,193,048
BQ 10290 DATA 012,009,128,162,
      000,228,199,208
QC 10300 DATA 002,162,018,134,
      199,032,210,255
JX 10310 DATA 104,133,199,198,
      002,208,211,169
AF 10320 DATA 157,032,008,193,
      169,017,032,210
QR 10330 DATA 255,192,008,208,
      155,032,021,193
QM 10340 DATA 169,145,032,008,
      193,076,025,192
BH 10350 DATA 162,004,032,210,
      255,202,208,250
KB 10360 DATA 096,162,001,208,
      002,162,004,169
CA 10370 DATA 029,032,210,255,
      032,048,193,208
JM 10380 DATA 011,169,017,032,

```

```

      210,255,032,210
HP 10390 DATA 255,032,210,255,
      202,208,232,096
BA 10400 DATA 165,211,201,040,
      144,003,056,233
SG 10410 DATA 040,201,000,096,
      160,172,187,162
KM 10420 DATA 188,033,063,062,
      190,191,161,060
ER 10430 DATA 034,059,044,032,
      000

```

Using this routine—appropriately titled *Big Text*—is very much like using a PRINT statement. After you've run the BASIC loader above, simply type **SYS 49152**, followed by the item, or items, that you want to print in quotation marks. Note that you must use a comma to separate the SYS command and the item(s) being printed. For example, to print the name of your favorite magazine, enter the following line:

**SYS 49152, "COMPUTE"**

Numbers can be printed just as easily. For example, the following command prints the result of a simple mathematical formula.

**SYS 49152, "2 + 2 =";2 + 2**

As with the PRINT command, you can use a semicolon to combine items being printed or to suppress the carriage return that is usually output at the end of each line. Because this program increases characters' size four times, carriage returns move the cursor down four lines instead of one.

Special control characters, such as Crsr Up or Ctrl-6, can be printed by *Big Text* and often produce impressive results. *Big Text* can't use the TAB() and SPC() functions, however. Using commas outside of a string to advance the cursor doesn't work.

## Killer Birds

To show off *Big Text*'s capabilities, I've written *Flap Attack*, a simple arcade game in which large, hostile birds (inspired by Hitchcock) are attacking earth and must be shot down. Ten points are awarded for each bird hit.



# PROGRAMMER'S PAGE

The score, the cannon, and the flying invaders are all created by using enlarged characters.

The *Flap Attack* program is listed below. You must load and run *Big Text* before running this program.

```

HX 100 REM FLAP ATTACK
RS 110 CR$="{32 RIGHT}":CD$="{
  21 DOWN}"
GG 120 POKE 53280,0:POKE 53281
  ,0:BD$(0)="UI":BD$(1)="
  JK":
FR 130 SYS 49152,"{CLR}{BLU}SC
  ORE:"SC:SYS 49152,LEFT$(
  CD$,16)" {WHT}
  {3 SPACES}{A}{S}{YEL}"
MB 140 PRINT "{BLU}{5 SPACES}P
  RESS THE SPACE BAR TO F
  IRE{YEL}";
XA 150 FR=0:Y=(RND(.)*8)+5:FOR
  X=0 TO 32
RK 160 IF PEEK(197)=60 AND NOT
  FR THEN FR=-1:G=18+X
JC 170 SYS 49152,"{HOME}"LEFT$(
  CD$,Y)LEFT$(CR$,X)BD$(
  XAND1)
RX 180 IF NOT FR THEN FOR P=0
  {SPACE}TO 30:NEXT:GOTO2
  40
XF 190 IF G-X<4 THEN FR=0
GP 200 PRINT "{HOME}"TAB(17)LE
  FT$(CD$,G-X)"<>{DOWN}
  {2 LEFT}{2 SPACES}":IF
  {SPACE}G-X<>INT(Y)+2 TH
  EN240
CG 210 IF X<13 OR X>15 THEN240
QJ 220 FOR I=7 TO 23:POKE 646,
  I:SYS 49152,"{HOME}"LEF
  T$(CD$,Y)LEFT$(CR$,X)**
  *":NEXT
PJ 230 X=32:SC=SC+10
QB 240 NEXT:AT=AT+1:IF SC<>100
  THEN130
EX 250 PRINT "{CLR}{WHT}AFTER"
  AT"ATTACKS..."
DP 260 SYS49152,"{4 DOWN} Y
  {DOWN}O{DOWN}U H{DOWN}A
  {DOWN}V{DOWN}E":SYS4915
  2,"{3 SPACES}W{DOWN}O
  {DOWN}N"

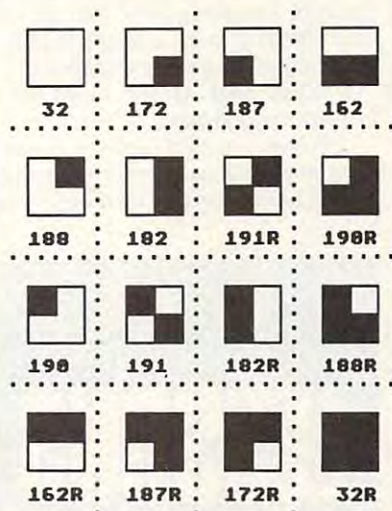
```

## How Big Text Works

Without the 64's extensive number of graphics characters, *Big Text* would not have been possible. To produce enlarged characters, this program uses graphics characters, instead of pixels, to draw a character's shape. The bit pattern of each character is retrieved from character ROM, located in memory at \$D000-\$DFFF. Next, the bit pattern is evaluated, and each 2 x 2 block of pixels is converted into a single Commodore graphics character. Any 2 x 2 block can be represented by one of 16 graphics characters.

To speed up this pixel-to-character conversion, *Big Text* uses a lookup table consisting of the 16 possible

characters. Each 2 x 2 pixel pattern is converted into a number and used as an index to retrieve and print the corresponding graphics character. The accompanying figure shows the 16 graphics characters used and the order in which they appear in the program's conversion table. Not only does this conversion table increase the program's speed, it also decreases the program size by reducing the amount of code required to locate the appropriate graphics character. And as we all know, when it comes to program size, bigger isn't always better.



These 16 graphics characters can represent any 2 x 2 bit pattern. Below each character is the character's Commodore ASCII value. ASCII values followed by the letter R are displayed in reverse video. These characters are shown in the order in which they appear in the pixel-to-character conversion table.

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# D'IVERSIONS

F R E D D ' I G N A Z I O

**R**ecently, I was watching my 11-year-old son, Eric, sitting on the floor operating his Nintendo Game Boy. Suddenly Eric looked up and said, "Dad! I beat it! I finally beat *Super Mario Land!*"

I went over and sat down beside Eric. It took a while for my 40-year-old eyeballs to adjust to the miniature display screen on the Game Boy, but eventually the screen came into focus.

I was stunned. For months Eric had been playing the Game Boy, and I had imagined that its display was only a slightly more sophisticated version of the little hand-held games you see at drugstores and electronics outlets. I was wrong. The action figures on Eric's display screen, though in black-and-white, were incredibly detailed. The game action was complex and nonstop, and the little tune was catchy, if a bit repetitive.

The Game Boy is more than a toy. It's a full-scale computer!

The battle over Nintendo has been raging across the U.S. for years, ever since Nintendo America came along and revived a near-dead electronic-game industry. Educators, almost without exception, are allied against Nintendo and against kids' playing Nintendo. Educators say that Nintendo keeps kids from doing their homework, warps their minds, turns them into couch potatoes, and discourages them from reading.

All this may be true!

On the other hand, educators' epithets have done nothing to stem the Nintendo tide. Almost every kid in America has played Nintendo, and most households now have a Nintendo or a Nintendo look-alike tucked away in some kid's bedroom.

How many adults play Nintendo? Quite a few, judging by Nintendo's recent efforts to create adult-oriented games. However, whenever I speak at a national conference, I ask the crowd of 50-500 adults, "How many of you dare to come out of the closet and admit publicly that you like to play Nintendo and feel confident that you could whip a kid at it?"

The unbelievable thing is that I've *never* had a single adult raise his or her hand when I ask this question. This indicates to me that Nintendo is very much a generational issue. Nintendo game playing, the fascination with Nintendo, and the growth of its market are all related to who our kids are and who we are not. Nintendo offers kids something powerful that we aren't offering them, something powerful they aren't getting elsewhere.

What could that something be? Here are my guesses.

**Power.** The first is power: power to enter a simulated world where they are the top dog, where their decisions

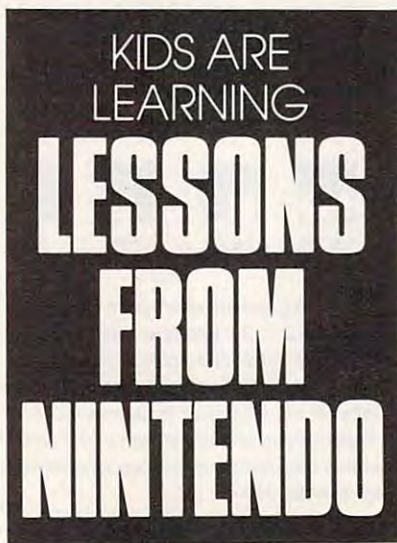
they're going to get there. They follow this character through a simulated three-dimensional landscape full of milestones and markers that tell them how much progress they've made toward their goals. They are on a quest, and this quest has meaning.

**Control.** Adults who think children play Nintendo for fun haven't spent enough time watching their children play Nintendo. Children take their Nintendos very seriously. Often while Eric is playing, I hear cries, grunts, cheers, and groans, depending on how a game is going. Eric measures his overt success by how long he can stay alive and how far toward an ultimate level he can travel. His deeper, more sustained quest in all Nintendo games is toward mastery, competence, and control over the reality of the Nintendo game world.

**Mystery.** Mystery is what makes Nintendo fun. The environment must be unpredictable to be challenging. If it's a good game, no one really knows every step through it. At any point, the next step may be successful—or it may be your last.

It is critical that some adult has not been there before you and now waits (like a teacher in the front of the room) for you to struggle to catch up. The world is a mystery, full of invisible buttons and dangers that leap out from all sides, and you have to master a game world by mapping it out. The only way to map it out is, through an endless series of game voyages into the wilderness, to be struck down again and again. Each time you go back, make it a little farther through the world before the game "you" is sacrificed on the altar of discovery.

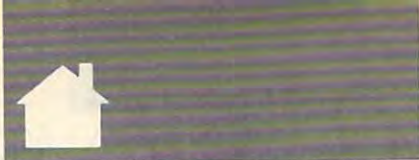
It's my opinion that the Nintendo system is far more important than most of the adult world realizes. I believe computer games could form the basis for a new schooling experience for kids and maybe for us adults as well. It represents a new architecture of knowledge—a new way to map knowledge for the learner and a new way for the learner to navigate through knowledge. □



count, where the world's very existence is dependent on them.

**Complexity.** Simulated experiences that are so complex and so demanding that they challenge today's TV babies to give their undivided attention and to call upon every nook and cranny of their intelligence—or die (at least for a few seconds).

**Context.** Unlike their school days, children's Nintendo experiences are rich in context. Kids sees themselves acting in the role of one of the game characters. They know roughly what the game's goal is and how



# PROGRAMS

M A R K N E R I

**M**ordred, an evil wizard, has stolen the Great Cup of Castalia, plunging all the land into darkness. You have learned that the cup is hidden in a great underground castle. To recover the cup, you must make your way through many caves and caverns leading to the castle. The journey will be difficult; the caves are filled with goblins and traps. Can you return the cup and restore order to the world?

That is the story behind *Castalia*, an excellent arcade/strategy/adventure game. *Castalia* combines fast play, colorful graphics, and many levels to create a great game.

## Getting Started

To enter *Castalia*, you'll need to use *MLX*, our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values given below.

Starting address: 1C01

Ending address: 3478

Be sure to save a copy of the game before you exit *MLX*.

Although *Castalia* is written in machine language, it loads and runs like a BASIC program. After you've loaded and run the game, the first level will appear with your character in the lower left corner of the screen. Move it using a joystick in port 2.

## Goblin Cheese

The caves you must traverse are made of different building materials. It will take some time for you to become familiar with them and to know what you can and cannot do. The purple blocks are cave walls, which you cannot go through. The red bricks are impenetrable unless you have superstrength (see below).

It's possible to move through brown dirt, and gray boulders can be pushed to one side, providing there is space available. White doors are magic. You can pass through one unless you're carrying a boulder. The green

material that looks like dirt is goblin cheese. You cannot go through it, but goblins can eat a passage through.

## Can You Spare a Spell?

Many types of treasure found in the caverns will help you on your journey. Yellow coins are the most abundant. Watch for white coins; each of them is worth ten of the yellow ones. You may also find white healing potions marked with an *L*. These restore one unit of your character's life force. The red superstrength potion allows you to

**CASTALIA**  
EVADE THE GOBLINS  
IN THIS EXCITING,  
FAST-PACED ARCADE  
ADVENTURE FOR THE  
64. JOYSTICK  
REQUIRED.

break any red bricks that get in your way. Collect an orange fireball spell, and you can shoot five deadly fireballs at goblins. Look for a light blue helmet and armor; each will limit the amount of damage goblins and their fireballs can inflict.

Goblins are the blue creatures that patrol the caverns. They are dangerous and will cause you to lose three units of life force unless you have the blue helmet or armor. You can kill goblins by shooting them with fireballs. If you trap a goblin so it can no longer move, it will turn into a white coin.

## Magical Moments

In some caves, you'll find magical statues that shoot fireballs. These fireballs will take three units of your life force unless you have the helmet or

armor. If you stand directly in front of a statue, its fireballs won't be able to hit you.

Other magical items include teleporters. They are cyan, purple, blue, or green and resemble doors. Teleporters will take you to various places throughout the caves. Sometimes, these teleporters will be blocked by locked doors. To open these doors, you must find the key of the same color.

There are two types of toll booths between you and many treasures. The white booths cost 100 yellow coins to pass through; the yellow ones cost 10.

Your status appears across the top of the screen. At the left is the amount of time you have left with superstrength, followed by the number of superstrength potions you're carrying. The number by the fireball potion is the number of fireballs you have. Next, the healing potion shows the amount of life force you have remaining. Any keys or armor you have will be displayed next, followed by the number of coins you have collected.

## Tips on Playing

Pressing the space bar during play pauses the game. While it's paused, you can push the joystick left or right to select a fire-button function. A gray border means you can press the fire button to carry a boulder and release it to drop the boulder, an orange border means you'll shoot a fireball when you press the fire button, and a red border means that if you press the button, you'll drink a superstrength potion. The screen will flash while you have superstrength. Press the fire button to restart the game. Press *Q* while the game is paused to start over.

If your life force drops to 0, your character dies. Press the fire button to restart the game, or press *Run/Stop-Restore* to leave the program. When you restart, you lose all of your coins and potions, but you retain your keys and armor.

## Helpful Hints

*Castalia* is a challenging game, but it

# PROGRAMS

can be solved if you take it bit by bit. Since you don't lose your keys or armor when you die, they are valuable. Once you've found a key, you can teleport past caves blocked by locked doors.

In many caves, goblin cheese will block your way. Move boulders so that the goblins will eat the cheese for you. Be careful if you teleport out of a cave when a goblin is about to get you. It will be waiting for you if you return.

Whenever possible, dispose of the goblins by trapping them with boulders so that you can get the white coins. Use fireballs only when necessary. When dealing with goblins in tight spaces, study their movements and try to find a safe place to stand so you can shoot them.

Use your superstrength potion sparingly. There are many places to use it, but not much potion.

*Castalia* is a fairly long game to type in, but its numerous features will keep dedicated game players busy for hours. It's filled with many little tricks that you'll learn after you've played the game a few times. Good luck.

## CASTALIA

```

1C01:0B 1C 70 17 9E 32 34 30 9B
1C09:37 00 00 00 20 20 20 BE
1C11:20 20 20 20 20 A0 C4 B9 2E
1C19:3C 08 99 F8 00 B9 FD 08 1F
1C21:99 33 03 88 D0 F1 A0 09 74
1C29:B9 0C 08 99 FF 03 88 D0 C9
1C31:F7 A9 13 85 2D A9 27 85 6E
1C39:2E 4C 00 01 19 A0 02 13 0E
1C41:27 EF 1E B9 6E 09 99 8E 1C
1C49:07 C8 D0 F7 EE 02 01 EE 41
1C51:05 01 C6 F9 D0 ED A2 03 4B
1C59:20 34 03 F0 33 C9 07 D0 BD
1C61:16 A2 01 20 34 03 D0 0A C8
1C69:A2 04 20 34 03 18 69 07 8D
1C71:10 05 A2 0A 20 34 03 85 45
1C79:A8 A5 A7 85 A9 A5 FE 85 24
1C81:F7 A5 FF 85 F8 20 6C 03 9B
1C89:A5 F8 85 FF A5 F7 85 FE 9A
1C91:E8 20 34 03 D0 1E A2 08 49
1C99:20 34 03 A0 02 84 A8 85 52
1CA1:A6 18 A5 FC 65 A6 85 F7 80
1CA9:A5 FD 65 A7 85 F8 20 6C 18
1CB1:03 4C 13 01 E8 20 34 03 24
1CB9:D0 1C A0 03 84 A8 E8 20 5E
1CC1:34 03 F0 08 A2 08 20 34 1D
1CC9:03 4C 5C 01 A2 0B 20 34 E7
1CD1:03 E6 A7 4C 5C 01 E8 20 D7
1CD9:34 03 D0 0A E8 20 34 03 DA
1CE1:18 69 04 A8 D0 D6 E8 20 5F
1CE9:34 03 D0 0A A2 02 20 34 49
1CF1:03 18 69 06 D0 ED A2 08 CA
1CF9:20 34 03 D0 E6 A9 00 85 20
1D01:A7 A4 FB F0 0C 06 FA 2A 5F
1D09:26 A7 C6 FB CA D0 F2 A8 01
1D11:60 48 B1 FE 85 FA A9 08 27
1D19:85 FB 68 A4 FE D0 02 C6 72
1D21:FF C6 FE C0 E7 D0 DE A4 DD
    
```

```

1D29:FF C0 07 D0 D8 A9 37 85 E2
1D31:01 58 4C 0D 08 A4 A8 F0 71
1D39:22 A5 F7 38 E5 A8 B0 03 A6
1D41:C6 F8 38 85 F7 A5 FC E5 B2
1D49:A8 B0 02 C6 FD 85 FC B1 62
1D51:F7 88 91 FC 98 D0 F8 C4 6A
1D59:A9 F0 0A B1 F7 C6 FD C6 9E
1D61:F8 C6 A9 10 EC 60 78 E6 C0
1D69:01 4C 16 08 60 00 0B 08 9B
1D71:0A 00 9E 32 30 36 31 E3 48
1D79:0B 78 A9 02 E7 4A A2 F0 4B
1D81:BD 31 11 54 27 9D FF 2B 29
1D89:BD 21 12 00 B8 28 9D EF BE
1D91:2C 00 2A EB A2 51 BD 7F 3B
1D99:D1 9D 7F 29 10 BF F7 90 A6
1DA1:0B 85 01 1A 9E A9 1A 8D E1
1DA9:1E 1F 2C A2 06 9D 98 CA 0D
1DB1:D0 FA A9 06 8A EA 3C 34 55
1DB9:02 3D 22 00 CE 70 39 62 95
1DC1:A4 44 6A 91 5B 62 52 84 53
1DC9:AA 8D 98 2C 18 2D DC A9 6B
1DD1:0C 43 C5 91 C8 28 9D 64 8D
1DD9:00 0F 20 62 0F 20 46 17 A4
1DE1:B2 45 38 04 7F 02 07 42 62
1DE9:9C A9 3A 71 C3 F8 0D 31 88
1DF1:1D 0C DF C0 4D 93 6A 4C 9F
1DF9:79 7E A1 4C 48 38 18 D0 AD
1E01:15 F0 1D 07 03 CD 4B 8F 8D
1E09:02 D5 08 58 62 5C A5 4F 61
1E11:85 5D 65 65 43 04 E6 4E B0
1E19:E6 4C D0 04 E6 4D 35 FC 0A
1E21:57 44 B1 CA A9 C3 F0 72 AD
1E29:C4 A5 5C C5 AD A5 5D D0 A8
1E31:0A 7C 09 43 30 16 C9 0A 5E
1E39:F0 12 AD 52 83 23 41 03 7B
1E41:A9 50 38 ED B0 8D 4C 00 A0
1E49:71 9D 08 10 3F 89 BD 62 A5
1E51:C7 4C 8C AD 71 F2 43 2C 19
1E59:05 E3 04 46 0C A3 9A 44 5E
1E61:18 00 FE 09 96 0E 24 00 4F
1E69:5E 75 0E 13 D4 84 28 71 9F
1E71:53 09 AB 54 59 03 D0 1A E6
1E79:33 17 A0 8D 43 1A A0 E3 E8
1E81:D0 08 AD 5A CE 40 90 69 85
1E89:89 A3 27 03 10 C4 05 E9 10
1E91:0E 81 F0 0A A1 9A 0C A6 2A
1E99:26 99 AF 07 06 B4 36 BC 43 DF
1EA1:87 16 FC 81 80 8D 69 60 4C
1EA9:C0 AF 8C 11 01 DE AA 29 D6
1EB1:7C 29 10 B1 67 45 02 80 90
1EB9:06 C0 0D 75 4B F4 09 8A C4
1EC1:86 1E C9 15 F0 1A AC 5F FB
1EC9:67 C8 09 10 04 CC 51 A8 9E
1ED1:97 AC 09 A9 14 CC CA C0 EA
1ED9:FB 09 AD 4E D9 80 2D 06 22
1EE1:C5 79 46 64 E4 00 DC 8D DC
1EE9:9B 29 10 AA 4D 40 01 8E E6
1EF1:42 E2 CC 3B 0E 22 1D 43 CB
1EF9:03 49 FF 29 0F 36 AE 10 5B
1F01:0B 79 81 F8 1F 86 01 00 F7
1F09:0D C9 9E 94 4E 8D 50 6B 62
1F11:7F C9 08 B0 65 E2 06 69 B9
1F19:3F B3 08 26 76 B9 57 44 D4
1F21:56 B9 58 0A 80 FA D2 F2 2D
1F29:0B 0C 5C 42 0C 27 0C D3
1F31:1F D1 82 D8 26 A1 68 89 63
1F39:BD 0B AB 1D 0B 30 C4 06 09
1F41:32 02 0B 55 0B 6C 20 23 3D
1F49:E5 0A 9F 0A 07 0B 12 0B 25
1F51:A7 80 F8 40 46 0A F6 0A F8
1F59:80 0D 64 04 C0 59 E1 54 6B
1F61:47 EB 1C 92 90 83 12 AD 4F
1F69:4C 70 F9 89 D0 04 86 64 C9
1F71:4D 03 09 84 9C 0A A5 D2 AB
1F79:07 51 1D 09 91 50 CA 04 2B
1F81:52 91 4E 52 05 06 C4 C6 CC
1F89:99 86 38 80 C9 1C A8 29 7E
1F91:72 55 DB 60 65 A0 6C 28 8E
    
```

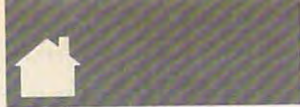
```

1F99:53 34 0A 73 84 83 54 03 E4
1FA1:D2 8D 23 23 0B 27 19 18 82
1FA9:24 17 1E 0C C9 0A B0 05 21
1FB1:E8 F0 16 50 01 66 84 01 14
1FB9:E0 E9 3C 80 1B 85 C5 41 2E
1FC1:40 0E 97 82 0C AD F0 96 4E
1FC9:8D 52 03 0A 0A B4 38 44 3C
1FD1:CC 5A 74 EA 04 85 59 A2 D5
1FD9:00 A0 28 B1 58 45 71 85 A0
1FE1:29 FC C9 04 D0 36 20 4C 59
1FE9:A4 82 21 2B 81 5A E6 58 8D
1FF1:CC BE E3 E6 59 E6 5B A5 F3
1FF9:59 C9 08 D0 D9 AD 4A D1 51
2001:7C 48 18 A8 8C 4B A4 40 3A
2009:03 0E 35 18 6D 40 06 A8 97
2011:B9 F2 10 8D 41 6C 89 08 9C
2019:4F 69 0A F1 A4 A5 78 D0 39
2021:04 63 26 A3 26 1A 19 48 4F
2029:4D C6 85 47 01 64 05 C8 53
2031:7B 90 05 B0 0A 46 C4 BC AE
2039:17 12 71 F4 07 43 23 A3 36
2041:3F 18 70 D1 38 AE 10 6B 5A
2049:F0 5E D2 F8 68 D2 8B ED 17
2051:8D 66 1C D0 69 9B 63 18 1B
2059:D8 A9 02 B7 A6 78 0C A5 01
2061:4E 60 A2 28 85 50 85 54 84
2069:A5 4F E9 00 85 51 22 27 6A
2071:0F 55 0E D6 C4 B1 50 16 61
2079:5B 13 A9 8B 91 50 A9 0C 47
2081:91 54 4E 38 2E 00 28 85 34
2089:44 4C 82 0C A9 20 74 0F D5
2091:A0 21 90 0C A0 28 73 21 EA
2099:8E 90 C8 51 14 84 AC 4C CB
20A1:BC A2 60 C0 83 E6 39 02 2D
20A9:B6 4F A9 C0 C5 4E D0 09 84
20B1:A9 07 C5 4F 60 4E 10 B7 8C
20B9:0C 4C 25 09 A0 FB A2 7F 02
20C1:8A 1B 80 99 FF 03 80 19 DD
20C9:80 99 F9 04 80 19 80 99 33
20D1:F3 05 8A 39 80 0A 99 ED 7F
20D9:06 58 E1 4C DD AA 79 C1 82
20E1:F0 1A AA AD 04 12 49 02 4E
20E9:50 45 8A F8 85 0F D8 A6 45
20F1:22 44 22 08 05 4C 04 7A FA
20F9:00 8D 21 D0 8D 3E 62 21 1A
2101:38 80 39 01 99 8D 59 A6 13
2109:55 12 21 3C 97 03 25 39 AE
2111:C8 3D 39 23 90 83 3F 9C 0E
2119:03 01 39 28 1E A0 08 41 8B
2121:1D 04 E4 20 83 38 A0 0C DB
2129:A8 A2 20 26 0E BB 41 8D 3E
2131:89 53 68 22 21 72 08 20 3F
2139:22 0F 27 22 AD 67 A2 0D B4
2141:A9 22 23 04 A9 20 39 C0 86
2149:CE 90 54 A0 04 B9 54 94 EF
2151:0F 98 0A AA A9 1C 63 03 B4
2159:04 98 7A 04 9D 11 D8 88 BE
2161:D0 E9 4C 87 0E 20 9F FF B0
2169:20 E4 FF 95 BD 00 07 C9 1C
2171:51 D0 69 96 B1 AD 39 D0 AE
2179:61 A7 AC 5A 78 8C A8 9A 73
2181:A8 4B 26 04 D0 0D CE 02 4A
2189:0D 10 1C A2 02 D0 A2 4C E8
2191:D2 0D 98 29 08 D0 0F EE B6
2199:E2 58 03 CD A0 C0 40 0A 60
21A1:B0 41 08 C0 CA 1C 07 AD 1C
21A9:C2 00 53 CD 42 F0 BF 40 2A
21B1:55 20 36 8A 85 C0 C9 0C 12
21B9:F0 B0 4C EB 0D 1C 0E 06 E3
21C1:AC 79 78 B9 0A 0E 8D D0 D7
21C9:4C 1D 09 C0 0A 02 8B A9 7E
21D1:C1 38 ED 49 03 8D 40 0B 2F
21D9:D8 90 05 AD 48 94 05 68 2E
21E1:68 4C 51 0F 60 04 F8 13 9F
21E9:34 10 00 04 B2 9C 40 90 A3
21F1:30 99 01 04 60 2A 47 0A 57
21F9:53 09 37 D0 13 B9 52 48 88
2201:56 B9 53 0E 85 57 6C 56 E2
    
```









# PROGRAMS

30A9:81 66 20 85 22 18 E6 58 58  
 30B1:80 B5 20 39 10 66 45 99 95  
 30B9:46 98 18 78 28 62 C2 65 A3  
 30C1:68 24 63 50 47 24 C0 49 66  
 30C9:84 07 54 24 59 1E 92 04 67  
 30D1:A3 55 40 98 64 94 94 94 1E  
 30D9:24 54 64 F1 16 92 75 50 43  
 30E1:0B 26 C2 A4 A4 A4 25 54 4A  
 30E9:42 E5 07 1C 63 46 80 B2 6F  
 30F1:64 93 21 23 A9 66 48 51 88  
 30F9:F2 3C 2F 52 65 3E CE 21 D0  
 3101:1E AA 09 4E 23 85 1F 92 23  
 3109:F5 26 54 00 F8 54 F1 74 EB  
 3111:08 40 D5 20 F7 2F 72 47 EC  
 3119:40 F2 50 93 81 94 52 66 05  
 3121:2F 55 52 36 40 A0 A6 96 86  
 3129:96 91 F5 23 45 25 47 2E A7  
 3131:49 23 46 EF 18 20 01 21 2D  
 3139:50 55 D5 4A A5 05 8B 69 3A  
 3141:78 48 47 69 69 4A 5E 54 F6  
 3149:91 AA 26 71 78 46 64 56 F6  
 3151:69 64 4A 0E 23 52 F4 44 3C  
 3159:1E 1E 42 36 C2 03 07 56 84  
 3161:94 A4 48 24 58 47 29 89 3E  
 3169:0B 41 E1 E4 64 61 43 75 D0  
 3171:56 4A 29 41 F2 84 24 62 1F  
 3179:44 23 C9 13 E6 C8 2B 64 46  
 3181:23 57 40 66 78 06 47 2B 4F  
 3189:40 44 66 46 6A 66 24 30 B3  
 3191:EE 00 89 4A 22 54 66 42 B2  
 3199:86 42 85 4A 2E 2F 5C 4A 56  
 31A1:A4 24 64 66 47 4B 80 84 3F  
 31A9:A4 BB 76 A4 23 B6 CB 52 44  
 31B1:D4 21 0A 44 59 B8 91 A0 BD  
 31B9:62 06 45 CC 1F 23 50 52 BC  
 31C1:35 67 1F 25 52 3C 1F 05 56  
 31C9:B9 4A 97 E8 BB 4A 90 23 68  
 31D1:8A 30 64 E5 08 0A 40 A4 FD  
 31D9:0A 1F B4 D4 42 3B 44 A4 19  
 31E1:54 04 61 01 42 55 45 26 C3  
 31E9:0A 50 A5 52 34 BB 23 4B 61  
 31F1:D0 F0 18 20 C8 80 28 3A D0  
 31F9:72 55 44 6C 02 22 BB 25 6F  
 3201:00 48 45 45 06 BA 06 23 BE  
 3209:72 45 44 29 B4 B4 49 44 62  
 3211:E2 10 45 52 57 23 54 4B F3  
 3219:26 4B B4 BB 41 F4 55 42 80  
 3221:FB 7C 35 A2 54 1F 27 4B 2C  
 3229:41 E2 6B 74 51 F5 1F 05 41  
 3231:45 5A 54 23 5A A4 26 50 8D  
 3239:72 35 44 B2 84 1F 1A 07 B3  
 3241:9F 34 52 84 54 42 5B E1 59  
 3249:EF 45 24 82 45 04 24 52 78  
 3251:48 1F 57 AA 1E 1E AA 75 6B  
 3259:0C 01 83 CF CE F0 2F 42 4C  
 3261:A4 53 88 F9 67 89 40 72 F1  
 3269:37 12 0A 2D 50 92 64 A0 38  
 3271:85 42 F9 25 F8 2E 20 AC 28  
 3279:70 00 05 20 C8 24 69 44 A6  
 3281:99 24 88 39 CC 80 A0 4B 55  
 3289:B2 44 BB 24 42 4B E0 0F 22  
 3291:21 1E 07 75 44 14 24 2F 30  
 3299:B2 FB 96 40 C5 40 1E 26 BE  
 32A1:8D C2 02 4D 5D 14 23 1E 32  
 32A9:03 45 42 CB 42 39 44 66 CB  
 32B1:94 0D 1F 24 54 2C B4 40 C6  
 32B9:84 69 2E 41 24 B2 E4 DA 25  
 32C1:46 42 04 C0 A1 38 23 62 FC  
 32C9:D9 25 40 03 99 44 3A 24 13  
 32D1:62 F9 23 94 49 92 F6 66 7C  
 32D9:20 3E 49 44 2F 92 F9 28 2B  
 32E1:92 00 1C 12 74 1C 42 2B F7  
 32E9:87 60 83 CC FC CF C0 9E AE  
 32F1:24 C1 68 7C 1E 80 42 33 18  
 32F9:42 52 A4 AA 01 D0 3D 1E 37  
 3301:23 C1 C4 5D D2 4C 15 45 0F  
 3309:C7 03 4E 24 14 8C E2 A8 61  
 3311:01 76 98 D8 00 C9 D8 1E 2D

3319:D4 A0 50 68 C1 12 00 60 59  
 3321:54 C0 62 42 3D 5D 39 D0 F4  
 3329:03 11 75 E0 66 EC C4 D1 54  
 3331:4D D7 D4 66 34 6D 1E 54 1D  
 3339:58 86 39 1A D6 D2 5A E8 D5  
 3341:CC 2A E3 64 21 4C 26 D1 B3  
 3349:55 28 78 40 88 0B E4 CC 7E  
 3351:26 64 77 0B DE 3B 01 20 89  
 3359:0F 79 20 22 1E DD 2A 08 90  
 3361:E8 42 75 44 5C C1 89 94 51  
 3369:52 4D ED 1E 45 27 4C 1D 68  
 3371:DE 4E 44 45 63 23 DE DD FA  
 3379:9D 52 52 76 95 08 3F 45 85  
 3381:45 DD 27 45 24 83 96 C0 58  
 3389:74 94 0D 45 14 10 F0 12 1A  
 3391:6E 45 28 89 0B 10 E6 61 E5  
 3399:40 15 4E 39 06 41 E1 64 20  
 33A1:91 45 23 D1 ED D1 9B E2 74  
 33A9:56 E4 45 4D 4D 23 00 BC A5  
 33B1:A2 10 28 1C 52 84 54 3A BB  
 33B9:96 3B 2A EE E4 59 EE 90 69  
 33C1:2F 36 E2 36 44 54 1E 41 FD  
 33C9:A8 12 A0 22 63 A1 E1 E4 89  
 33D1:54 0B 1E 66 1E B0 1D 48 85  
 33D9:C4 55 C4 E8 06 D4 55 D4 22  
 33E1:D4 C4 45 2A 80 0B 41 41 23  
 33E9:21 75 1F C2 85 2A 40 D2 76  
 33F1:94 0C 28 40 E2 94 0F E0 17  
 33F9:9C B7 0E 53 44 61 28 5C E7  
 3401:45 64 B5 26 39 1C F1 C0 1D  
 3409:BB 43 A2 30 00 89 0E 95 4F  
 3411:88 2D 3F 09 85 91 29 68 AE  
 3419:24 DA 88 28 4C 22 A5 C7 DB  
 3421:03 24 95 44 A2 2A 91 BA A6  
 3429:10 03 90 C8 B5 88 29 A8 C3  
 3431:82 A5 86 2C 58 82 7A 88 22  
 3439:2B A8 1D D5 29 82 C5 32 73  
 3441:1D 2E F5 25 82 E5 3C 1D 16  
 3449:58 2E B6 1C C5 2B 82 B5 97  
 3451:32 1D 54 04 F5 24 54 54 22  
 3459:45 41 19 45 45 44 52 32 3E  
 3461:1F 64 54 42 F5 2F 52 85 B7  
 3469:0A 3E 64 0D 40 02 85 F4 CD  
 3471:2F 42 84 00 80 00 00 00 96

## ONLY ON DISK

In addition to the type-in programs found in each issue of the magazine, *Gazette Disk* offers bonus programs and original 64 and 128 artwork. Here are this month's bonuses.

### Head On

Grant R. Young  
Christchurch, New Zealand

The object of this outstanding two-player arcade game is simple: Try to find your opponent and annihilate him. Two players are placed in a maze that's filled with bullets, missiles, guns, and teleporters. Check out the excellent split-screen technique, and design your own mazes with the editor program that's included.

## ON DISPLAY IN "GAZETTE GALLERY"

### Picture of the Month:

#### CROC

Vincent D. Zahnle  
Martinez, GA

#### NOMAD

Brian Kissinger  
Evansville, IN

#### WINTER PINES

Robert Woodall  
Rural Hall, NC

#### MOUNTAIN

Danny English  
Moreno Valley, CA

Gazette is looking for utilities, games, applications, educational programs, and tutorial articles. If you've created a program that you think other readers might enjoy or find useful, send it on disk to

**Gazette Submissions Reviewer**  
**COMPUTE Publications**  
 324 W. Wendover Ave.  
 Ste. 200  
 Greensboro, NC 27408

Please enclose a SASE if you wish to have the materials returned.



# PROGRAMS

J E S U S M E N D O Z A E S C A L O N A

If you need a useful utility program for reading, renaming, and scratching files, try *Multi-Reader*. It can handle one or more files at a time for extra speed and convenience, and it provides other useful file information as well.

This disk-management program displays the parameters of any file or program on disk. It provides a file's size in blocks, its type (program, sequential, or user), its starting and ending addresses, and whether or not the file is locked.

## Typing It In

*Multi-Reader* is written entirely in machine language, but it loads and runs like a BASIC file. To enter it, use *MLX*, our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values given below.

Starting address: 0801

Ending address: 1720

Be sure to save a copy of the program before you exit *MLX*.

Remove any cartridges you may have plugged into your computer. They may interfere with *Multi-Reader* and cause it not to work.

When the main screen appears, you'll see a menu with all the program options. The first letter in certain words will be flashing. These are hot keys that will activate the *Multi-Reader* commands. The A, B, and Home keys are also active, although they do not appear on the menu screen. Their functions are covered later.

## Using the Program

To use *Multi-Reader*, insert a disk in your drive and call up a directory. Use the appropriate hot keys to make your selections.

**D** Press D after you've inserted a disk, and its directory will appear onscreen. *Multi-Reader* will display all the files, even those that have been deleted (\* del) and would not

normally appear on a directory listing. The current track and sector are displayed on the bottom left of the screen for your convenience.

**S** This option allows you to scratch or delete selected files. Select a file by pressing the space bar. This will highlight its name in the directory. You can delete as many files as you like at one time by simply highlight-

# MULTI-READER

READ, RENAME, OR  
SCRATCH FILES EASILY  
WITH THIS UTILITY  
FOR THE 64

ing each name. Before any files are deleted, you'll be asked if you are sure. Press Y to continue or N to cancel. After a file has been deleted, its file type changes to \* del. If a read or write error occurs, it's displayed at the bottom of the screen, and the program stops until you press the space bar to continue.

**R** Press this key when you want to rename all the files selected. To rename a file, enter the new name on the bottom line of the screen and press Return. Use the Inst/Del key to correct typing errors. Press the Run/Stop key to exit. Any errors are handled as explained above.

**G** Press G to get or read all selected files. The contents will be displayed in ASCII characters. The current track and sector are displayed at the bottom of the screen. Press the

space bar to pause the information; press it again to continue. Press the Run/Stop key to stop and return to the main screen. When you've reached the end of the file, the program stops and waits for you to press the space bar so that you can continue reading the next selected file.

**I** This key provides file parameters: name, type, lock key, size in bytes, size in blocks, starting address, and ending address. The track and sector where the program is saved are displayed at the bottom left of the screen. To stop and return to the main screen, press the Run/Stop key.

**Run/Stop** To stop an operation during its execution, press this key. Press it at the menu screen to exit to BASIC. You'll be prompted to press Y to exit or N to cancel.

**Cursor keys** Use these keys to scroll up and down the filenames in the main screen.

**Space bar** Use the space bar to select a filename. Press it again if you should change your mind about a selected file. In the Get or Read mode, it's used as a toggle key to pause or resume the scrolling text.

**B** Press this key to scroll to the last file in the list.

**Home** Press this key to move to the first filename in the directory.

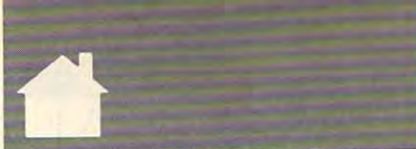
**A** This option toggles all the filenames between highlighted and not highlighted.

## MULTI-READER

```
0801:0C 08 0A 00 9E 20 32 30 64
0809:36 32 00 00 00 A9 00 85 EC
0811:45 A9 A0 85 46 A0 00 A2 F1
0819:1F B1 45 91 45 C8 D0 F9 CF
0821:E6 46 CA 10 F4 20 06 11 D5
0829:20 28 11 20 49 11 A2 00 4B
0831:86 03 86 05 E8 86 02 86 52
0839:04 78 A9 6C 8D 14 03 A9 D1
0841:0E 8D 15 03 58 20 E4 FF 9B
0849:F0 FB A2 0A DD 1C 16 F0 42
0851:0E CA 10 F8 20 E1 FF D0 06
0859:EC 20 CB 11 B0 E7 00 8A 22
0861:0A AA BD 06 16 8D 70 08 09
0869:BD 07 16 8D 71 08 20 00 A1
0871:00 4C 46 08 A9 30 8D 32 39
0879:16 8D 33 16 A9 31 A0 38 4B
0881:8D 2F 16 8C 30 16 A2 FF CE
```







# PROGRAMS

R O B E R T T R A V A I N I

This is a fast-paced dogfight program for two players flying radon-ium-powered spaceships. Each player tries to destroy the other ship and its cache of fuel containers while avoiding enemy fire.

The ship in the upper left corner of the screen is controlled by a joystick in port 2; the other, by a stick in port 1. So after you've typed the game in, invite your best friend over for a friendly space duel.

*Radonium* consists of two programs. The first is a short BASIC boot program that loads and runs the main machine language program. The boot program is only a few lines long, but to avoid typing errors, you may want to use *The Automatic Proofreader* to enter it; see "Typing Aids" elsewhere in this section.

You'll need *MLX*, our machine language entry program, to enter the main program; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values given below.

Starting address: C000

Ending address: CFFF

Be sure to save a copy of the program as RADONIUM/ML. before exiting *MLX*. This is the name the boot program loads and runs.

## Playing the Game

When the title screen appears, set your game parameters. The levels of play are selected by the function keys. Level 3 is the most difficult. The plus and minus keys select the number of rounds you wish to play. You can set it anywhere between 10 and 90; the default number of rounds is 20. A round continues until a ship has been destroyed.

The main screen also provides scoring information, presenting both scores from the previous game and the game's high score. The high score will be in the color of the ship that scored it.

When you press a function key, the game begins. The object is to de-

stroy your opponent's ship and radon-ium supplies before he or she can destroy yours.

Learning to maneuver your craft may take some practice. Press the joystick to the left to rotate to the left; move it to the right to rotate right. Press the joystick forward to accelerate in the direction your ship is facing; pull it back to stop. Press the fire button to fire a neutron pulse.

# RADONIUM

SPACESHIPS DUEL IN  
THIS TWO-PLAYER,  
ARCADE-STYLE  
GAME FOR THE 64.  
JOYSTICKS REQUIRED.

Do not touch your opponent's radon-ium supply depot until you've destroyed all the canisters stored there. Fifty points are awarded for every radon-ium canister you destroy, but the points go only to the winner of each round. The round ends whenever your ship or your opponent's ship has been destroyed. Your ship is very strong, however; it can bounce off walls and your own fuel area without harm.

Information windows in the center of the screen keep track of the scores for the current round, the overall totals, and the number of the current round. Pressing the up-arrow key during a round will terminate that game and return you to the title screen. Any points accrued in the terminated round will not be added to the total scores.

Since each player has 24 canisters of radonium in his or her supply depot, you can build up your score by destroying as many of them as you

can. Remember, each one is worth 50 points. Getting to the canisters that are stored against the walls can be tricky, however, due to the shape of your vessel and the fact that your guns are located in the ship's nose. You'll have to attack from several angles.

## RADONIUM (PROGRAM 1)

```
KH 0 REM COPYRIGHT 1991 COMPUT
E PUBLICATIONS INTL LTD -
ALL RIGHTS RESERVED
SR 10 IFFL=0THENFL=1:LOAD"RADO
NIUM/ML.",8,1
SQ 20 SYS49152
```

## RADONIUM/ML.

```
C000:A9 0B 8D 11 D0 A9 08 85 9E
C008:FC A0 00 98 84 FB A2 38 4B
C010:91 FB C8 D0 FB E6 FC CA BF
C018:D0 F6 A0 2D B9 9E CC 99 22
C020:0A 08 B9 CC CC 99 4A 08 16
C028:B9 66 CD 99 89 08 B9 FA 4E
C030:CC 99 CA 08 B9 28 CD 99 FB
C038:09 09 B9 94 CD 99 49 09 71
C040:B9 C2 CD 99 88 09 B9 F3 72
C048:CD 99 C9 09 88 10 CD A0 A1
C050:20 B9 55 CF 99 1E 0F B9 15
C058:76 CF 99 5E 0F B9 97 CF 80
C060:99 9E 0F B9 B8 CF 99 DE EA
C068:0F A9 FF 99 80 03 99 A0 59
C070:03 88 10 DD A2 21 BD 71 FB
C078:CE 9D 4D 0C CA 10 F7 A0 5A
C080:18 8C 1F 0C 8C 22 0C A9 84
C088:00 99 A7 02 99 E7 02 B9 AF
C090:AE CE 99 00 D4 88 10 EF 29
C098:A9 19 85 02 A9 00 85 FB 5A
C0A0:A9 20 85 FC A2 28 A5 FB 7C
C0A8:85 FD A5 FC 85 FE A0 00 5A
C0B0:B9 0D CF 91 FD C8 C0 08 02
C0B8:D0 F6 A5 FD 18 69 08 85 F0
C0C0:FD 90 02 B6 FE CA D0 E6 BF
C0C8:E6 FC A5 FB 18 69 40 85 DD
C0D0:FB 90 02 E6 FC C6 02 D0 FA
C0D8:CB A9 68 85 FB A9 2A 85 70
C0E0:FC A9 09 85 FE A0 00 A9 E8
C0E8:0E 85 02 A2 00 BD 56 CD AE
C0F0:91 FB C8 E8 E0 08 D0 F5 A0
C0F8:C6 02 D0 EF 18 A5 FB 69 30
C100:40 85 FB 90 02 E6 FC E6 1A
C108:FC C6 FE D0 D8 A9 0F 8D C1
C110:F6 02 A9 14 8D 13 03 A9 6E
C118:32 8D F4 CE 20 44 E5 A9 2B
C120:00 8D 21 D0 8D 20 D0 A9 70
C128:F8 8D 10 D0 A0 04 B9 A7 CA
C130:02 18 69 B0 99 94 05 B9 D5
C138:AC 02 69 B0 99 AF 05 A9 0A
C140:0F 99 94 D9 99 AF D9 88 A9
C148:10 E4 A0 02 B9 E7 CF 99 E7
C150:4F 05 A9 0F 99 4F D9 88 29
C158:10 F2 C8 B9 A7 02 D9 AC FA
C160:02 D0 07 C8 C0 05 D0 F3 36
C168:F0 15 B9 A7 02 38 F9 AC EC
```









# PROGRAMS

J O E R Y K O W S K I

**T**his handy little routine transfers a block of data from one location in 128 memory to another. It sounds simple, but simple can mean powerful, as in the case of this short machine language routine.

*Xtrax* transfers data between Bank 0 and Bank 1. This can be important if you're writing a program that uses a lot of hi-res graphics screens, sprites, or text. Just set aside enough memory in Bank 1 for your program, and with this routine Bank 1 becomes a buffer for that data. *Xtrax* also provides an overlay option, making it easy to display multiple screens.

## Getting Started

*Xtrax* consists of two parts, the program itself and a demonstration.

*Xtrax* is written entirely in machine language, so use *MLX*, our machine language entry program, to type it in; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values below.

**Starting address: 1B74**

**Ending address: 1C03**

Be sure to save the program before you exit *MLX*.

The demonstration program is written in BASIC. Use *The Automatic Proofreader*, found elsewhere in this section, to type it in.

The demo will call *Xtrax*, so be sure *Xtrax* is on the same disk and has been saved with that name. The demonstration will draw a circle in the center of the screen. *Xtrax* will then copy the circle to Bank 1.

After this, the screen clears and two intersecting lines are drawn. Then the data in Bank 1 is overlaid on the top and bottom portions of the screen that contains the intersecting lines.

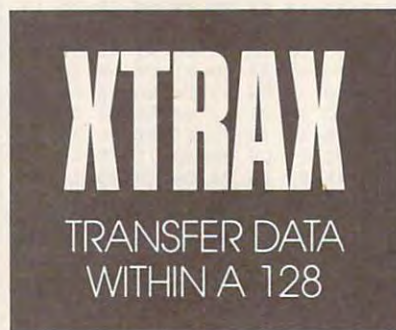
There are now two circles on the hi-res screen with the intersecting lines. The data in Bank 1 was copied to two different screen locations.

## Using the Program

*Xtrax* is a subroutine used from within another program. To load and run

it, type BLOAD "XTRAX",B0,P7028. To transfer data, determine the low- and high-byte values of the source and target addresses.

The demo program does this at line number 160. This is where the data to be transferred is being passed from the address range 28160-32319 to the destination address 8192. In the hexadecimal number system, these addresses are \$6E00-\$7E3F and \$2000, respectively.



The 128 works with addresses as two-byte values, with each byte holding two digits of the hexadecimal address. Thus, for the first address above, the byte values are \$6E and \$00. The former is the high byte; the latter, the low byte. Converting back to decimal, these values become 110 and 0. The decimal pair for the end-of-source require a 1 be added to each, with the result being 126 and 64. For the target address, the byte values are 32 and 0. The part of the demo program that instructs *Xtrax* to make the transfer reads as follows:

```
170 POKE 249,0: POKE 250,110
180 POKE 251,64:POKE 252,126
190 SYS 7028,0,32,6
```

Generally, the format for a transfer is as follows:

```
POKE 249, source starting value (low
byte): POKE 250, source starting val-
ue (high byte): POKE 251, source end-
ing value + 1 (low byte): POKE 252,
source ending value + 1 (high byte)
```

This is followed by SYS 7028, destination value (low byte), destination value (high byte), type of transfer.

The demo type value of 6 refers to an overlay from Bank 1 to Bank 0. Additional transfer and overlay types are listed in the following table.

Type	Action
0	Transfer (Bank 0 only)
1	Transfer from Bank 0 to Bank 1
2	Transfer from Bank 1 to Bank 0
3	Transfer (Bank 1 only)
4	Overlay (Bank 0 only)
5	Overlay Bank 0 on Bank 1
6	Overlay Bank 1 on Bank 0
7	Overlay (Bank 1 only)

## XTRAX

```
1B74:85 FD 86 FE 8C FE 1B A0 E4
1B7C:04 A9 00 99 F9 1B 88 D0 D6
1B84:FA A9 FD 8D B9 02 A0 01 53
1B8C:AD FE 1B 29 01 F0 03 8C AD
1B94:FB 1B AD FE 1B 29 02 F0 A7
1B9C:03 8C FA 1B AD FE 1B 29 51
1BA4:04 F0 03 8C FD 1B A0 00 DF
1BAC:AE FA 1B A9 F9 20 74 FF 30
1BB4:AC FD 1B C0 01 D0 10 8D 29
1BBC:FC 1B A0 00 AE FB 1B A9 91
1BC4:FD 20 74 FF 4D FC 1B AE D3
1BCC:FB 1B A0 00 20 77 FF E6 A1
1BD4:F9 A5 F9 C9 00 D0 02 E6 7B
1BDC:FA A5 FA C5 FC D0 09 A5 98
1BE4:F9 C5 FB D0 03 4C F9 1B 6E
1BEC:E6 FD A5 FD C9 00 D0 02 9C
1BF4:E6 FE 4C AA 1B 60 00 00 EC
1BFC:00 00 00 00 00 00 00 33
```

## DEMO

```
AB 10 BLOAD "XTRAX",B0,P7028
XJ 20 GRAPHIC 1,1
SH 30 REM DRAW CIRCLE
RQ 40 CIRCLE 1,160,100,51
SJ 50 PAINT 1,160,100
JF 55 REM CIRCLE TO BANK 1
BH 60 POKE 249,128:POKE 250,39
RP 70 POKE 251,192:POKE 252,55
EQ 80 SYS 7028,0,110,1
MH 85 REM CLEAR SCREEN
JX 90 GRAPHIC 1,1
HF 95 REM DRAW LINES
FE 100 DRAW 1,0,0 TO 319,199
QJ 110 DRAW 1,319,0 TO 0,199
HS 115 REM OVERLAY CIRCLES
KG 120 POKE249,00:POKE 250,110
DH 130 POKE251,64:POKE 252,126
BD 140 SYS 7028,0,32,6
RA 150 POKE249,00:POKE 250,110
HB 160 POKE251,64:POKE 252,126
SM 170 SYS 7028,0,47,6
```



# PROGRAMS

M A T T H E W S P I N K S

I've always been annoyed by programs that require a SYS command to activate them. For starters, I can never remember all the SYS numbers used by my various programs.

Another problem occurs when I need information to operate a machine language program. It's never available directly from the program itself, so I'm forced to search through all my back issues of magazines for the relevant article.

One way around this problem is to use a separate BASIC loader that activates the program and includes any necessary documentation. This is not always the best solution, however. Loaders are time-consuming to set up, they clutter up disk directories, and they are clumsy to use.

*Loader-Maker* is a short machine language utility designed to rectify these problems. It allows the user to set up a BASIC program containing REM statements (or anything else) to which a SYS command to activate the program is automatically added.

The program can then be saved as a single BASIC file. Gone is the need to remember SYS numbers or provide separate BASIC loaders for each program.

## Getting Started

*Loader-Maker* is written entirely in machine language. To type it in, use *MLX*, our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values given below.

**Starting address: 5000**  
**Ending address: 5137**

After you've finished typing in the program, be sure to save a copy of *Loader-Maker* before exiting *MLX*.

## Using Loader-Maker

After you've produced a working copy of *Loader-Maker*, using it is simple. Simply load *Loader-Maker*, type NEW, and then load the machine language file to be converted. Set up your

basic program with any documentation you might want to include, and then type SYS 20480,sa,ea,ep.

After the SYS command, *sa* and *ea* are the starting and ending addresses of the machine language file, respectively, and *ep* is the program's entry point—that is, the SYS number you would normally use to activate the program.

# LOADER-MAKER

ADD SYS  
COMMANDS TO  
MACHINE  
LANGUAGE  
PROGRAMS TO  
ACTIVATE THEM  
AUTOMATICALLY

After a short pause, the READY prompt should appear. If you list the program, you'll see your BASIC program, plus a new line 63999, containing a SYS command. Don't worry that the SYS number in this line is different from the one you provided. This SYS number calls a small program that moves the actual machine language file into its proper place and activates the program. Now, save the program as you would a normal BASIC file, using the format SAVE "filename",8,1.

For example, to convert *Loader-Maker* itself into a single BASIC file, load *Loader-Maker* and type NEW. Type in some comments, for example,

## 10 REM ACTIVATE WITH SYS 20480,SA,EA,EP

Then in immediate mode, type the command SYS 20480,20480,20787,42100 (this extra number will be explained later).

List the program to verify that line 63999 exists. Then save *Loader-Maker* using the format SAVE "Loader-Maker",8,1. That's all there is to it.

## How It Works

*Loader-Maker* works by searching until it finds the end of your BASIC program. It then calculates the SYS command needed to activate the program and appends it as line 63999. If a line 63999 already exists, it will be overwritten. A small machine language routine then moves the program back to its correct position on reloading. The machine code program is then added to the end of the BASIC program, and CLR is performed to reset any altered pointers.

## Things to Watch For

*Loader-Maker* won't be able to convert machine language files that already exist as a one-line basic SYS statement, such as *SpeedScript's* 10 SYS 2061. These programs already are in their optimal form. Nor will it cope with programs that begin between 2048 (\$0800) and 2061 (\$080E), as these 14 bytes are needed to contain the BASIC SYS command. Plus, *Loader-Maker* will not run programs with entry points beneath BASIC or Kernal ROM (40960-49159 and 57344-65535, respectively). Also, *Loader-Maker* will not work with programs residing between 20480 and 20787 (\$5000-\$5133), as *Loader-Maker* itself resides in this block.

*Loader-Maker* will convert files that lie under BASIC or Kernal ROM, as long as their entry points exist in free memory. It will also convert programs that would overlap the BASIC file, owing to the use of a downward machine language mover. The small restrictions placed on using *Loader-Maker* are not as harsh as they seem,



# PROGRAMS

as most machine language programs reside either in the 4K block beginning at 49152 (\$C000) or at the top of memory. Of the dozens of stand-alone machine language programs I own, not one has been unable to be converted with *Loader-Maker*.

Finally, *Loader-Maker* can be used with utilities that require parameters that need to be supplied with the BASIC SYS command, such as those used with *Loader-Maker* itself.

Simply supply the value 42100 (\$A474) as the entry point when you use *Loader-Maker*, rather than the proper entry point. This will send the computer straight back to BASIC, rather than to the start of the actual program itself, which would generate an error because the required parameters would be missing. The proper syntax can then be given.

Thus, as shown previously, to convert *Loader-Maker* into a BASIC file, type SYS 20480,20480,20787,42100. Once the BASIC loader has been run, simply use *Loader-Maker* as you normally would.

## LOADER-MAKER

```
5000:20 25 51 8D 33 51 8C 34 29
5008:51 20 25 51 8D 35 51 8C 83
5010:36 51 20 25 51 8D 37 51 F6
5018:8C 38 51 A9 FF 85 14 A9 B9
5020:F9 85 15 20 13 A6 A5 5F A1
5028:85 FB A5 60 85 FC 20 59 FE
5030:A6 20 33 A5 18 A5 FB 69 A5
5038:0D 48 A5 FC 69 00 85 62 AE
5040:85 FE 68 85 63 85 FD A2 98
5048:90 38 20 49 BC 20 DF BD BB
5050:A0 0C B9 F0 50 91 FB 88 D3
5058:10 F8 A0 05 A2 00 BD 00 34
5060:01 F0 07 91 FB C8 E8 4C D8
5068:5E 50 A0 27 B9 FD 50 91 CA
5070:FD 88 10 F8 AD 36 51 A0 4D
5078:01 91 FD AD 33 51 A0 05 BD
5080:91 FD AD 36 51 38 ED 34 FD
5088:51 18 69 01 65 FE A0 09 86
5090:91 FD AD 34 51 38 E9 01 B2
5098:A0 22 91 FD AD 37 51 A0 B1
50A0:26 91 FD AD 38 51 A0 27 C2
50A8:91 FD E6 FE A9 00 85 FD B4
50B0:EE 36 51 AD 33 51 85 FB 41
50B8:AD 34 51 85 FC 78 A5 01 D5
50C0:29 FC 85 01 A0 00 B1 FB 5A
50C8:91 FD C8 D0 F9 E6 FC E6 24
50D0:FE A5 FC CD 36 51 D0 EE 5E
50D8:A5 01 09 03 85 01 58 A5 64
50E0:FD 85 2D A4 FE 84 2E 20 58
50E8:59 A6 20 33 A5 4C 74 A4 03
50F0:FF FF FF FF 00 00 00 26
50F8:00 00 00 00 00 A9 00 85 C5
5100:FE A9 00 85 FD A9 00 85 01
5108:FC A9 00 85 FB A0 FF B1 FF
5110:FB 91 FD 88 C0 FF D0 F7 FC
5118:C6 FC C6 FE A5 FE C9 00 E2
5120:D0 ED 4C 00 00 20 FD AE 5B
5128:20 8A AD 20 F7 B7 A5 14 33
5130:A4 15 60 00 00 00 00 76
```

## THE AUTOMATIC PROOFREADER

P H I L I P I . N E L S O N

*The Automatic Proofreader* helps you type in program listings for the 128 and 64 and prevents nearly every kind of typing mistake.

Type in the *Proofreader* exactly as listed. Because the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unusual commands. After you've finished, save a copy before running it.

Next, type RUN and press RETURN. After the program displays the message "Proofreader Active," you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the *Proofreader* displays a two-letter checksum in the upper left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If not, check for your mistake and correct the line.

The *Proofreader* ignores spaces not enclosed in quotation marks, so you can omit or add spaces between keywords and still see a matching checksum. However, spaces inside quotes are almost always significant, so the program pays attention to them.

The *Proofreader* does not accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTING it, moving the cursor back to the line, and pressing RETURN.

Though the *Proofreader* doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program.

```
0 CLR
10 VE=PEEK(772)+256*PEEK(77
3):LO=43:HI=44:PRINT
{CLR}{WHT}AUTOMATIC PROO
FREADER FOR ";
20 IF VE=42364 THEN PRINT "
64"
```

```
30 IF VE=17165 THEN LO=45:HI
I=46:WAIT CLR:PRINT"128"
40 SA=(PEEK(LO)+256*PEEK(HI
))+6:FOR J=SA TO SA+166:
READ B:POKE J,B:CH=CH+B:
NEXT
50 IF CH<>20570 THEN PRINT
{SPACE}"*ERROR* CHECK TY
PING IN DATA STATEMENTS"
:END
60 FOR J=1 TO 5:READ RF,LF,
HF:RS=SA+RF:HB=INT(RS/25
6):LB=RS-(256*HB)
70 CH=CH+RF+LF+HF:POKE SA+L
F,LF:POKE SA+HF,HB:NEXT
80 IF CH<>22054 THEN PRINT
{SPACE}"*ERROR* RELOAD P
ROGRAM AND CHECK FINAL L
INE":END
90 IF VE=17165 THEN POKE SA
+14,22:POKE SA+18,23:POK
ESA+29,224:POKESA+139,224
100 POKE SA+149,PEEK(772):P
OKE SA+150,PEEK(773):PR
INT"{CLR}PROOFREADER AC
TIVE"
110 SYS SA:POKE HI,PEEK(HI
)+1:POKE (PEEK(LO)+256*P
EEK(HI))-1,0:NEW
120 DATA120,169,73,141,4,3,
169,3,141,5,3,88,96,165
,20,133,167
130 DATA165,21,133,168,169,
0,141,0,255,162,31,181,
199,157,227
140 DATA3,202,16,248,169,19
,32,210,255,169,18,32,2
10,255,160
150 DATA0,132,180,132,176,1
36,230,180,200,185,0,2,
240,46,201
160 DATA34,208,8,72,165,176
,73,255,133,176,104,72,
201,32,208
170 DATA7,165,176,208,3,104
,208,226,104,166,180,24
,165,167
180 DATA121,0,2,133,167,165
,168,105,0,133,168,202,
208,239,240
190 DATA202,165,167,69,168,
72,41,15,168,185,211,3,
32,210,255
200 DATA104,74,74,74,74,168
,185,211,3,32,210,255,1
62,31,189
210 DATA227,3,149,199,202,1
6,248,169,146,32,210,25
5,76,86,137
220 DATA65,66,67,68,69,70,7
1,72,74,75,77,80,81,82,
83,88
230 DATA 13,2,7,167,31,32,1
51,116,117,151,128,129,
167,136,137
```

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# How to Type In COMPUTE's Gazette Programs

Each month, Gazette publishes programs for the Commodore 128 and 64. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We regularly publish two programs designed to make typing easier: *The Automatic Proofreader*, for BASIC programs, and *MLX*, for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements, as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off and then on, erasing what was in memory. This could cause you to lose valuable data, so be sure to *save a program before you run it*. If your computer crashes, you can always reload the program and look for the error.

## Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from Gazette, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor-down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be shifted (hold down the Shift key while pressing another key), the character is underlined. For example, A means hold down the Shift key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight shifted A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the Ctrl key while typing the letter in braces. For example, {A} means to press Ctrl-A.

## The Quote Mode

You can move the cursor around the screen with the Crsr keys, but you may want to move it under program control, as in examples like {LEFT} and {HOME} in the listings. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote key, you're in quote mode, which can be confusing if you mistype a character and cursor left to change it. You'll see a graphics symbol for cursor left. Use the delete key to back up and edit the line. Type another quotation mark to get out of quote mode. If things get too confusing, exit quote mode by pressing Return; then cursor up to the mistyped line and fix it. If the mistake involves cursor movement, you must press the quote key to reenter quote mode. □

When You Read:	Press:	See:	When You Read:	Press:	See:	When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME		{PUR}	CTRL 5		←	←	
{HOME}	CLR/HOME		{GRN}	CTRL 6		↑	SHIFT ↑	
{UP}	SHIFT ↑ CRSR ↓		{BLU}	CTRL 7		↵		
{DOWN}	↑ CRSR ↓		{YEL}	CTRL 8				
{LEFT}	SHIFT ← CRSR →		{F1}	f1				
{RIGHT}	← CRSR →		{F2}	SHIFT f1				
{RVS}	CTRL 9		{F3}	f3				
{OFF}	CTRL 0		{F4}	SHIFT f3				
{BLK}	CTRL 1		{F5}	f5				
{WHT}	CTRL 2		{F6}	SHIFT f5				
{RED}	CTRL 3		{F7}	f7				
{CYN}	CTRL 4		{F8}	SHIFT f7				

For Commodore 64 Only		
[ 1 ]	COMMODORE 1	
[ 2 ]	COMMODORE 2	
[ 3 ]	COMMODORE 3	
[ 4 ]	COMMODORE 4	
[ 5 ]	COMMODORE 5	
[ 6 ]	COMMODORE 6	
[ 7 ]	COMMODORE 7	
[ 8 ]	COMMODORE 8	



# REVIEWS

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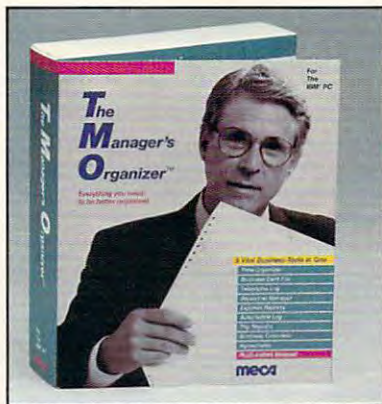
If you manage people, there's finally a Personal Information Manager (PIM) for you. PIMs have been a hot item lately because they help organize people, projects, and ideas in one convenient, free-form program. Because PIMs are so free-form, however, unless you're a computer wizard, you may have trouble harnessing their power.

*The Manager's Organizer* from MECA is different. Managers don't need to be computer jockeys or organizational geniuses to use this \$199.95 program. With *TMO's* five modules, you can organize time, calculations, personnel, travel expenses, and agreements.

The Desk Menu is a comprehensive time organizer that lists daily appointments, reminders, phone calls, and follow-ups in an easy-to-read report format. *TMO* lets you build a business-card file, telephone contacts with its auto-dialer, and write voluminous notes with its Spartan word processor. You can export files to ASCII, from which they can be imported to any word processor. *TMO* can't read or write directly to a *WordPerfect* file, an inconsiderate flaw. The card file allows you to print onto labels and provides sorting. It won't import your current records or export them to a database, however.

The Calculator can do some nifty numerical gymnastics. You can easily figure compound interest, loans and annuities, bond yields, yield versus interest, profits, cash flow, buy/lease/

rent options, and loan amortization. I liked using the days-between-dates calculator to figure out when a project was due. The profit calculator finally ended my frustration of figuring out what to divide by what.



With the Travel menu you can report expenses, trips, and auto mileage. The Agreement menu lists company contracts, such as insurance, rentals, leases, and maintenance, with such information as vendor, price, terms, date, and notes. While you can do this with a word processor, *TMO's* advantage is that it adds the figures for you and provides a total. This helps managers control budgets.

While many PIMs offer the features mentioned so far, *TMO* shines when you explore its special tools for managers.

The personnel menu keeps track of employees' days off, job descriptions, and office policies. For every manager who dreads giving performance reviews, *TMO* gives you the flexibility to become the perfect one-minute manager. You can catch people doing something right and note it in the file. When it is time to do the review, you'll have all the documentation to perform an effective critique. *TMO* provides fields for the employee's goals and accomplishments as well.

The compensation menu helps managers determine raises. You list each employee's salary and bonus. You can change these figures quickly by either percentage or money. The program adds all employees' salaries so you can see how much the department is paid—an effective tool for budget planning.

One wonders why *TMO* lacks a project manager. With the program's hefty \$199.95 list price, this feature should've been included.

*TMO* can be used as a stand-alone program or a TSR. However, it take a deadening 18 seconds to load as a TSR on a 386-class machine.

The documentation is well organized and easy to read, and it even includes hints that can help any manager get more organized.

DANIEL JANAN

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## DESIGNER

Micrografx's *Designer* version 3.0 makes the most of the new *Windows* operating environment and should be a significant contender in the high-end designware market that also includes *Arts & Letters Graphic Editor* and *Corel Draw*. Much has been made of the relative merits of these packages, along with *DrawPerfect*, *GEM Artline*, and a handful of other products. Generally, the argument boils down to what features are more important to the individual.

*Designer's* installation is much more user-directed than most, pausing at each turn to ask whether certain features should be added and giving



# REVIEWS

an estimate of the amount of disk space they will occupy—along with the amount of hard disk space remaining.

Graphic artists who work with scanned art will enjoy *Designer's* autotrace feature. While *Arts & Letters* can only trace a single contour in a monochrome graphic and *Corel Draw* uses an external program to automatically trace an entire graphic, *Designer* combines these features. It will trace an imported file with gray scales or multiple colors, recognizing the contours automatically and coloring the tracings to match the traced areas to which they correspond, right inside the main program.

*Designer* isn't very graceful when it uses all available memory in a too-complex autotrace. First a dialog box repeats several times, complaining that it has run out of memory, and then it continues to try to create the last trace until the user presses Esc. To *Designer's* credit, however, the pro-

gram doesn't crash, and you can back out of most actions with Esc.

Despite the fact that I had 4205K available to me, *Designer* refused to print when the figure onscreen was



***Designer* is a high-end drawing program that makes the most of Windows 3.0.**

highly complex. The solution offered by the technical support personnel was to make the trace less complex. I would suggest that future releases should make use of available memory

for temporary storage of the graphic specifications. I like complex traces, and I'd like to be able to print them out as well.

The people at technical support are patient and knowledgeable (they knew I was a reviewer). Their hours are from 7:00 a.m. to 7:00 p.m. CST, Monday through Friday. As a purchaser, you would be entitled to unlimited free technical support, but the registration card gives you the option of a year's "extended" technical support. This actually means that, for \$150, you will receive *Designer* upgrades for a year.

*Designer* comes with a program called *Telegrafx*, which allows you to download your *Designer* charts and graphics to a slide service, which can create physical manifestations of your graphics for sales presentations and other kinds of shows. This has become a standard feature of design software and is widely available.

Although *Designer* isn't equipped



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to do "tweening" (creating intermediate shapes between two different drawings, as between a bat and a vampire) as *Arts & Letters Graphic Editor* is, it can make multiple copies of a single figure, distorting it and moving it a set amount for each copy. It substitutes gradient fill for blending—a poor bargain, in my opinion.

You can manipulate nodes (move control and set points for curves and lines in a drawing) through combinations of mouse buttons and the Ctrl, Alt, and Shift keys on the keyboard, which is harder to learn than the competing interfaces' styles. (*Corel Draw* uses a pop-up menu when you double-click on a point, and *Arts & Letters* uses selections from an existing toolbox and menu.) However, once you've learned *Designer's* node-manipulation technique, it's faster and less troublesome, representing a slight tradeoff of friendliness for efficiency.

In all, *Designer* is a capable piece

of software representing the state of the art in many areas, but it distinguishes itself in its autotrace capabilities. Its interface is slightly harder to learn but more efficiently laid out than that of the competition.

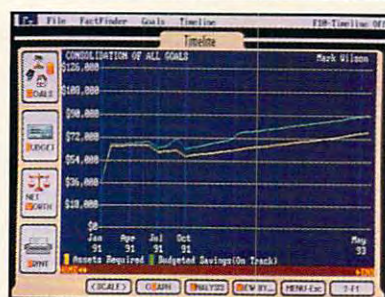
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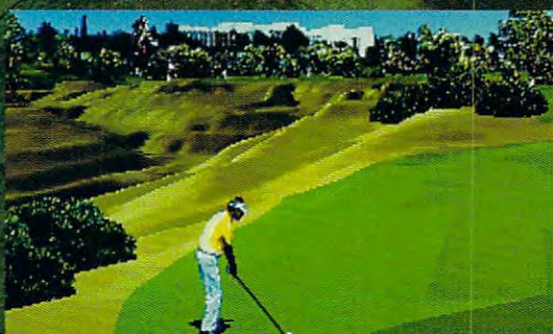
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take to achieve your goals; it even lets you see how you compare to the rest of the country.

*Wealth Starter* bases its financial model on the sound premise that you should have a cash reserve of three to six months' worth of expenses. From that, *Wealth Starter* enables you to set up a budget designed to help you reach your financial goals. After you've defined the parameters for yourself or your family (the program comes with several predefined goals such as debt reduction, retirement, education, and so on), *Wealth Starter* compiles four graphs (goals, monthly budget, projected cumulative budget, and net worth) and gives you such reports as a financial report card, budget tips, projected budget, and net worth.

*Wealth Starter* even lets you easily see if your goals are attainable. To do this, simply change certain parameters to view how these changes could affect your goals or your budget. If you use *Quicken* 3.0 or 4.0, you can import your budget data from *Quicken*, saving yourself double entry every month.

Here's one of the best features of the budget program: *Wealth Starter* will automatically reduce your liability amounts every month when you enter your payments. However, make sure you enter only the principal-and-interest part of the payment. Some monthly payments are loaded with things like taxes and credit life and health insurance. This loan balance information is valuable—use it at the end of the year to compare notes with your lending institution to prevent costly miscalculation.

There are some other nice loan-utility programs in *Wealth Starter* as well. The loan comparer is a good way to find the best loan when you shop for home mortgages. *Wealth Starter* will compare the variables from different institutions to let you know which rate is the most economical. There is also a loan calculator—a must when you're shopping for an item like a new car and are going to finance the purchase. Make sure your numbers compare to the seller's; this is a sure way to find out if any unwanted items like credit life or health insurance are added to your purchase price. There's even a loan-balance program to help you analyze hypothetical loans you may be considering.

*Wealth Starter's* only obvious disadvantage is its cumbersome sub-menus. They can be confusing, but with some practice you'll have no problem navigating through them. And don't forget the user's guide—it's less than 100 pages and should be read before beginning *Wealth Starter*.

To get ahead financially, you should have a picture of where you're going and how you plan to get there. *Wealth Starter* can help provide you with the road map to your financial success. And while you're at it, you can even find out if planning a trip to Europe is in your future.

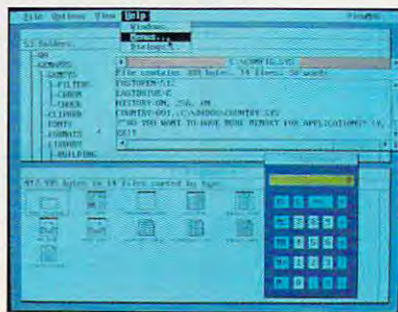
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## DR DOS

This product is a giant step toward what a disk operating system ought to be. On the surface, DR DOS handles like any old DOS you're used to, but if you want more power, or more features, DR DOS provides options galore.



**DR DOS 5.0 features ViewMax, an attractive icon-based graphical user interface.**

The functional equivalent of MS-DOS 3.3, DR DOS lets you use all the normal DOS commands you'd expect without learning anything new. Or you can use command extensions like XDEL, which allows deletion of files in multiple subdirectories and removal of empty subdirectories, or XDIR, which adds a handful of options to the normal DIR command.

DR DOS outshines the current competing DOS versions in its memory-management abilities. It can install itself, device drivers, and certain applications into unused areas of high memory. Imagine having nearly 600K of memory free for programs after DOS loads.

Deciding how to set up your memory is made much easier by installation and setup programs that write and modify your AUTOEXEC.BAT and CONFIG.SYS files. Just answer questions about how you want your system set up, and the proper commands will be saved for you.

This feature is perfect for those who dread tampering with AUTOEXEC.BAT and CONFIG.SYS and is pleasantly palatable for untrusting souls like me who normally won't let any installation program near my system startup files. DR DOS is considerate, making its AUTOEXEC.BAT modifications in a restricted area so that your personal setup is never affected.

DR DOS also improves on MS-DOS by providing online help for all external commands and by keeping a command history, so recently used commands can be repeated or edited and reused without retyping. A full-screen text editor, which replaces the difficult-to-use EDLIN line editor, uses control commands similar to those of *WordStar*.

DR DOS also includes a disk-cache program, a password command that allows you to password-protect files and subdirectories, and a file-link program that can be used in unattended file transfers between computers.

One really exciting feature of DR DOS is its ability to accept user input during execution of the CONFIG.SYS file. Just place a question mark before any normal CONFIG.SYS command, and on boot-up, DR DOS will ask you whether you want that command executed.

For anyone who desperately wants a graphical user interface but has neither the megahertz nor the megabytes to support it, DR DOS provides ViewMAX, which allows you to use mouse clicks to launch applications and handle some rudimentary file-management chores. For more complex operations, however, it requires you to drop out to a DOS command line. Despite these short-

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The program is published with the cooperation of the Tolkien Estate and their publishers, George Allen & Unwin (publishers) Ltd. The plot of The Lord of the Rings, the characters of the hobbits, and the other characters from The Lord of the Rings are © George Allen & Unwin Publishers Ltd. 1966-1974-1975-1981. © 1990 Interplay Productions. All rights reserved. MS-DOS is a trademark of Microsoft Corporation.



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textbooks is that your personal data files are always instantly available. You can use the word processor to copy information from the modules to the letters that you write. This feature is a valuable timesaver if you plan to write letters with boilerplate text. In addition, data files are always instantly available. You can call them up with a few simple keystrokes if you need to complete a job application or access personal information during a phone conversation with a potential employer.

The product is worth its \$99 price tag if you're the kind of person who prefers computers to pens. If you already have a word processor, you might learn as much by visiting the local library. However, the open-ended format may be freeing to some, and may lead to personal insights.

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comings, ViewMAX, which resembles GEM (also a product from Digital Research), may be all the GUI a lot of computers and users need.

The operating system comes packaged with a thorough manual of nearly 500 pages. In addition to the normal sections on DOS commands, there's a range of information for all users including introductory material and glossaries for the uninitiated and chapters on memory-management theory and troubleshooting for old hands.

Microsoft's impending MS-DOS 5.0 is expected to have some of the same memory-management features as DR DOS 5.0. There's no need to wait. Digital Research has a good program here with a lot of extras that can help wring every drop of power out of your machine.

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## CAREER DESIGN

Anyone considering a midlife career change might be interested in a product like *Career Design*. It contains 50 activity modules that encourage you to explore your feelings about work. Almost every module contains an interactive exercise to help you gain a clearer picture of your career interests.

*Career Design* teaches how to write seven types of résumés (including chronological, functional, portfolio, and curriculum vitae), organize research, prepare proposals, and make presentations. And it provides tips on proper conduct during interviews, important interview questions to consider, and how to negotiate a more favorable contract.

*Career Design* is easy to use. It features a tutorial, help screens, and prompts that eliminate the need for memorizing tedious keyboard commands. Its mandatory password protection keeps your personal information confidential.

You can explore the *Career De-*

*sign* modules in any order, but the publisher recommends an exploration sequence in its printed *Flowchart of Modules*.



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If you follow the recommended sequence, *Career Design* begins by focusing on your interests, skills, likes, and dislikes. The objective is to give you a clear idea of what you do well and what you enjoy doing *before* you hunt for a job.

The files you type with the built-in word processor (your interests, goals, letters, and work preferences) are made more accessible through the use of markers in the text that let you return to them instantly.

The manual provides detailed program instructions plus a general-reference resource guide. You'll find information about business organizations and directories, U.S. nonprofit organizations, corporate news, how to locate the best places in the country to live, and much more. *Career Design* also includes a wall-size plan-of-action chart on which you can jot down summaries of your goals, interests, and preferences for work conditions so they'll be visible when you're talking to prospective employers on the phone.

*Career Design* offers practical advice for anyone interested in planning and implementing a successful career strategy. However, many individuals in search of new and exciting employment could probably do just as well by consulting career-planning guide books. The software doesn't use your answers to suggest possible job options. It merely poses questions that help you uncover your interests and abilities. All interpretation is left up to you.

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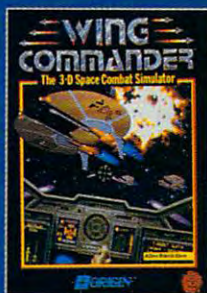
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## TAKIN' CARE OF BUSINESS

**M**anaging a business is tough, and half the battle is keeping records. *Takin' Care of Business* may be the answer. It's an integrated accounting package designed to help small- to medium-sized businesses manage their financial information. The package comes with six modules: General Ledger, Accounts Receivable, Accounts Payable, Account Reconciliation, Payroll, and Financial Utilities. Two additional modules—Inventory and Point of Sale/Invoicing—should be available by the time you read this. The program comes with a separate manual for each of the modules, as well as an introductory manual called *Getting Started*.

Installing the program's eight 5 1/4-inch floppies onto a hard drive is easy with the included Install program. Once up and running, the program can be configured with your preferences for screen colors, printing options, menu types, sound, and so on. You can also specify two levels of passwords for each of the modules. A first-level password allows access to all functions of a module except viewing or printing reports, while a second-level password allows unrestricted access to all functions. The configuration menu also includes a data-file backup utility. For large files, however, you're probably better off using a backup utility that also compresses the files.

Although *Takin' Care of Business* is designed for use by nonaccountants, a knowledge of basic accounting principles will help you to understand how the program works. The General Ledger module, for example, is a double-entry bookkeeping system in which debits must equal credits and assets are the sum of your liabilities and equity. These accounting principles are described briefly in the User's Manual, but it's also recommended that you consult an accounting or bookkeeping text for a more detailed explanation. Fortunately, the program comes with several sample files and sample accounts already created so you can experiment with various types of transactions to see how they

affect both sides of the ledger.

Up to 2000 accounts can be maintained in the General Ledger, and the number of transactions you may enter in any given year is limited only by your disk space. Recurring transactions can be specified as monthly, semimonthly, biweekly and weekly. A wide variety of financial reports can be generated and output to the screen, printer, or disk. Account balances can be compared using pie, bar, or line graphs.

The Accounts Receivable module lets you keep track of up to 2000 customers. Using this module, you can produce invoices and easily generate receivable aging reports that will list those customers with delinquent bills. The program will even print the address labels so you can send reminders to those with accounts past due.

On the other side of the coin, the Accounts Payable module will help you keep track of your vendor payables to ensure that your company's bills get paid on time. Again, this module is feature-packed, allowing an unlimited number of transactions, computer generation of either continuous- or laser-form checks, and several types of reports. *Takin' Care of Business* doesn't allow you to design report formats from scratch, but the existing formats are all thoughtfully designed and quite useful without modification.

The Payroll module can help you keep the paychecks rolling out for up to 1000 employees. The module includes income tax tables from most states and allows automatic tax deductions of both federal and state taxes. It also lets you easily track vacation, sick time, overtime, holidays, and two overtime categories for all of your employees. Again, mailing labels, and several types of reports (including W-2 and 1099 forms) can be generated from within this module.

It should be emphasized here that the Accounts Receivable, Accounts Payable, and Payroll modules are all fully integrated with the General Ledger so that transactions entered in any one module are automatically recorded where appropriate in others. The other modules—Financial Utilities and Account Reconciliation—aren't integrated in this same way, but both are easily accessible from the other modules.

The Financial Utilities module lets you analyze loans, investments such as annuities, and various types of depreciation (straight-line, declining balance, and so on), while the Account Reconciliation module serves to automate the balancing of your checkbook and helps you to monitor the balances of your credit cards. This module seems superfluous in a business package, and other programs such as *MoneyCounts* by Parson's Technology are better at handling personal finances.

Nevertheless, *Takin' Care of Business* is a reasonable accounting solution for any small business with a growing amount of financial data to get under control. Seeing all that *Takin' Care of Business* can do will make you wonder how any small company can get off the ground without such a program.

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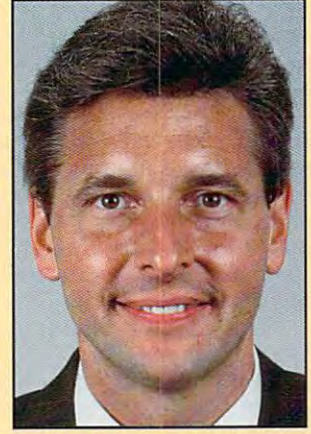


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*BlueMAX* worked with a variety of applications on a PS/2 Model 70, although the manual warns of potential problems with programs using ROM BASIC or undocumented PS/2 features. The program supports LIM 4.0, EMS, XMS 3.0, VDS 1.0, and VCPI- and XMS-compatible protected-mode programs.

The program's documentation is comprehensive, and its operation is simplicity itself. Reconfiguring for new TSRs is easy, too. This is one memory manager you'll actually use.

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## LEGACY

Times have changed. It used to be that if you wanted word processing, page layout, and graphics, you needed three separate programs. Today, however, more and more products are combining all three functions. *Legacy*, a new entry in this everything-you-ever-wanted-in-a-word-processor category, runs under *Windows 3.0* and brims with tools designed to make going from initial idea to finished document easy.

The nicest part of this software combination is having word processing features online during page layout. Search and replace, a spelling checker, and a thesaurus can really help get your document in shape before printing.

*Legacy* also boasts a table generator, which simplifies setting up and formatting tables and grids; mail merge; and Dynamic Data Exchange, which, for example, allows you to link a spreadsheet with a *Legacy* document so changes made in the spreadsheet will be automatically

reflected in the *Legacy* file.

The program's toolbox is jam-packed. Sadly though, some of the tools and the box itself appear to have been bent in order to make everything fit. The result is less than optimum performance.

To run *Legacy*, you need at least a 286 system with 640K RAM and *Windows 3.0*. *Legacy's* main program file is 1.3 megabytes large. With only 640K of RAM available, there's going to be a lot of disk swapping going on. Even with 3 megabytes of RAM on a 386SX, *Legacy's* menus and screen redrawing are sluggish.

*Legacy* is a frame-based system. You build your documents by placing frames on pages and filling the frames with text, graphics, or art. You create various styles for the text elements to define such things as fonts, sizes, positioning, and margins. Similarly, you create properties to manage the attributes of the various frames.

This program may be at its best when it's used to create and fill preset templates and generate fast, sharp output. Setting up templates for commonly used documents—letters, office memos, meeting agendas—assures quick, consistent results. For example, to type a letter, call up the letter template. Select the date style and type in the date. The date style includes positioning information so the date will be properly positioned below your letterhead.

Continue typing the letter, selecting various styles for such things as the recipient's address, salutation, body text, and closing. When you reach the letter's end, formatting is done. All that's left is to check the spelling and print.

*Legacy* provides several templates that can be used as is or modified. These include forms for letters, envelopes, memos, agendas, proposals, reports, press releases, projection overheads, and newsletters.

It's true that *Legacy* has much to offer, but it demands much of the machine and its operator. Even with a fast computer and plenty of memory, the going can be slow. When working with large amounts of text, it may be more expedient to enter the material into another word processing program and import the result into *Legacy*, which includes import filters for most major word processing programs.

Also, *Legacy's* spelling checker, while fine for checking a relatively clean document, leaves something to be desired for massive cleanup projects.

In one of my projects, I misspelled the word *scared* by typing an *x* rather than a *c*. *Legacy's* spelling checker dutifully stopped when it found *sxared*, but the replacement words it suggested left me cold. The top three replacement options were *sexier*, *sudsier*, and *saxifrage*.

Desktop publishers considering *Legacy* will want to note that the program has no apparent provision for distinguishing between opening and closing quotation marks. The documentation does not mention quotation marks, but the manuals exhibit the shortcoming by using inelegant inch marks throughout.

*Legacy's* documentation does a thorough job of guiding you through the program, and it's usually easy to locate needed information. The program's online tutorial is topnotch. The tutorial consists of 29 lessons on various aspects of the program. The lessons, which take from 5 to 15 minutes to complete, can be used in any order at any time.

These tutorials explain the material, then guide you through the menu selections needed to achieve the desired results. If you work through these lessons, you'll have a good basic understanding of *Legacy*.

But be forewarned: This program is complex, and with so many possibilities, it'll take time to master.

TONY ROBERTS

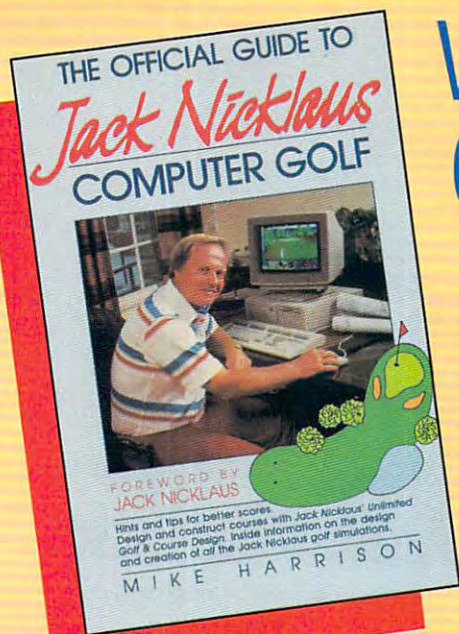
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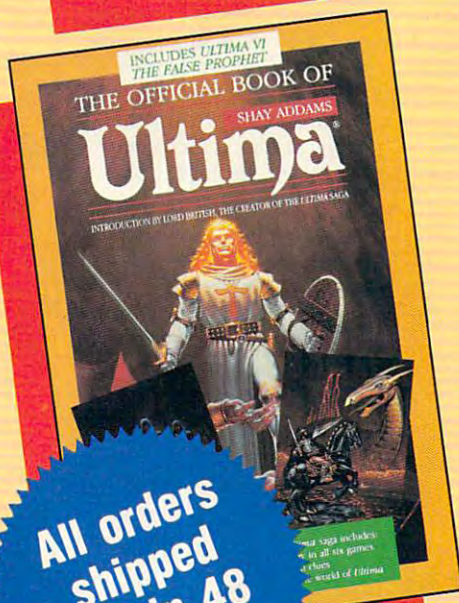
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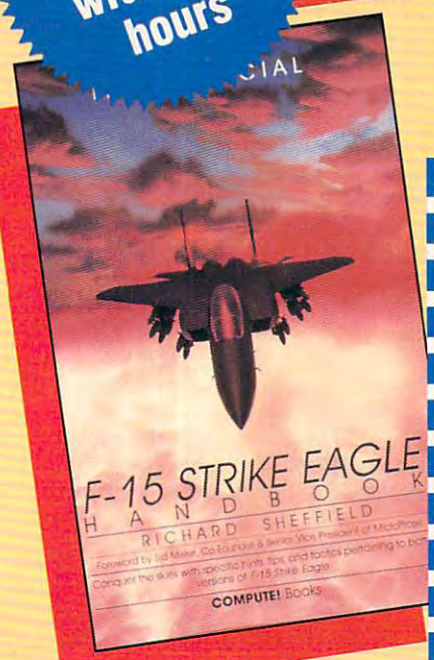




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for each number. Another usage record tracks calls and downloads (including drive, directory, and filename), and it provides a 32-character comment field. The program can up-or download in the background—and uses only 60K to do it. Script files, which store predetermined command sets and play them back on command, simplify repetitive tasks such as logging off commonly used boards. Other features, such as user-programmable wait-to-connect and wait-to-redial, allow easy customization. There's even a built-in text editor. These features, combined with *Eclin Connect's* solid documentation and unlimited technical support, make it one to consider.

STEVE HUDSON

IBM PC and compatibles, 384K RAM, Hayes or compatible modem; Microsoft or compatible mouse recommended—\$49

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## CROSSTALK COMMUNICATOR

**A** modem can be a lifeline. It links your PC to the outside world and lets you send and receive information, scan bulletin boards, and tap into time- and money-saving services where you do everything from researching the latest in panda metabolism to lining up an airline ticket. Standing between you and these exciting services, however, is communications software. Communications software tends to fall into two groups: programs that are easy to use and programs with a lot of features that are hard to use.

*Crosstalk Communicator* tries to be a happy medium. It's packed with enough features to handle a wide variety of telecommunications situations, necessarily making it somewhat complex; yet it's relatively easy to use. Entries are already programmed for popular services like CompuServe and the Official Airline Guide, and a feature dubbed EASYCALL makes

creating new entries for communication with bulletin boards or other computer systems a snap. *Crosstalk Communicator* asks a few simple questions to set up an entry and then dials automatically, if you want it to.

Making adjustments to *Crosstalk Communicator's* standard settings requires a bit more effort. Each entry hides a multilevel maze of options, allowing you to choose between several terminal emulations, XMODEM variants, and specific utilities. After initial setup, however, it's no problem to call a computer or system and interact. I'd like to see a more detailed menu after connection has been established, but once I got used to the system, I was able to work fairly quickly, executing commands and up- and downloading files online.

The program comes with a helpful reference card and a nicely detailed, thoroughly indexed user's guide. Its onscreen help system can be confusing at first, although with repeated use it proved perfectly adequate.

*Crosstalk Communicator* may provide more options and features than a casual telecommunicator needs, but it's basically easy to use, and it's a very powerful tool.

EDDIE HUFFMAN

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## MONOLOGUE

**I** had just mailed a column to my editor when the delivery man brought *Monologue 2.0*, a program that reads aloud any DOS text files including files created with word processors, databases, spreadsheets, as well as electronic mail. Even though I had run the column through *WordPerfect's* spelling checker, I was surprised to discover two missing words I hadn't noticed on paper. The voice sounded realistic and pleasant. You can change its volume, pitch, speed, and gender. The program uses your computer's internal speaker and sup-



Configure *Monologue* to suit you.

ports hardware sound accessories for better tones. People with limited eyesight can obviously benefit from a product like this, but *Monologue* will help any writer identify writing that "reads" poorly, though it looks perfectly acceptable on the page.

SCOTT DANIELS

IBM PC and compatibles; 512K free RAM; supports EMS and XMS memory, Sound Blaster sound card, and the Hearsay 1000, Covox Speech Thing, and Echo PC+ text-to-speech adapters; mouse and hard disk recommended—\$149

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## LABELPRO

**I**f you're running a small business from your home, *LabelPro* will give a sharp look to your mass mailings. In both its dot-matrix and laser versions, this program handles not only mailing labels but also shipping labels, disk and file-folder labels, and a variety of specialty labels. *LabelPro* lets you specify label size and format and gives you control over the type size and typefaces you use on your labels.

*LabelPro* will use address data stored in *dBASE* and *WordPerfect* formats, as well as in Avery's own *List&Mail* and *List&Mail Plus* formats. It can also handle comma-delimited ASCII files. If you're mailing from relatively small lists, you can create a database using *LabelPro* itself. Individual *LabelPro* databases are limited to 300 records per file, but there's no limit to the number of files you can create. Limited search and sort options are available, but there's no

automatic word-wrapping. That means that records can be truncated if they are too long for your specified format. Fortunately, the program can alert you to truncated records.

A home business that wants the look of custom labels for short mail runs will find *LabelPro* a real help.

STEVE HUDSON

IBM PC and compatibles, 512K RAM, hard disk; dot-matrix version requires graphics-capable printer; laser version supports LaserJet- and PostScript-compatible printers—\$99.95

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## GAMES

C H O I C E

### STELLAR 7

The word *stellar* refers to something outstanding. In this sense, *Stellar 7* is aptly named. This futuristic combat game from Dynamix features amazing action punctuated by enemy fire, eye-catching 256-color VGA graphics, and digital sound. *Stellar 7* almost feels like a game from the future.

Although the action is definitely arcade, *Stellar 7* has three-dimensional graphics that closely resemble those of the best flight and tank simulators. Looking out from the cockpit of your vehicle, you steer through fast arcade action that's set in the midst of excellent and realistic-feeling graphics. It's like a *Star Wars* battle on land with high-tech tanks.

The story is a classic plot from the pages of arcade literature (what an oxymoron!). It seems that some Darth Vader-esque character with a bad attitude and a voice like Arnold Schwarzenegger wants to take over the Earth. You are, of course, Earth's only hope and must fight off the invading forces (sound familiar?).

Your weapon is the Raven, which the documentation refers to as

"the ultimate fighting machine." It's a futuristic tank with an antigravity (agrav) generator that lets it hover two feet above any surface. The Raven's weapons include high-tech shields, cannons, radars, a cloaking device, and special thrusters.



*Stellar 7* features eye-catching VGA graphics and fast arcade action.

You pilot your high-tech tank in any direction through a beehive of enemy vehicles and fire. Your tank has fixed turrets, so you must turn your entire vehicle to shoot at the enemy while avoiding its fire.

Unlike incompetent storm troopers who can't hit the side of a cargo ship, your enemy is dangerous, intelligent, and deadly. You have to move fast in order to shoot down the enemy planes, artillery, and tanks before they shoot you. Each time your tank takes a hit, you lose energy. When your power is gone, your shields drop. One more hit at this point, and the game is over.

The graphics exploit the 256-color VGA palette to the hilt. While the VGA graphics are incredible, the EGA graphics are still nice, and the CGA graphics are OK. The game is harder to play in EGA (even harder in CGA) because the objects on the radar are harder to differentiate.

The graphics are so well done that Dynamix features an actual screen shot on the package. How many times have you seen a game that even remotely resembles the picture on the box? *Stellar 7* doesn't let you down. Some of the screens were originally airbrushed and then digitized to produce graphics with a distinctive look.

If you have a sound board, you'll hear first-rate sound effects and a relentless, but rousing, musical score. You'll also hear the characters' voices during the interludes. It's easy to get

caught up in the action when you crank up the stereo sound. My insomnia-ridden neighbors probably heard me playing into the wee hours of the morning. The game is so addictive that I actually lost sleep playing it.

The documentation is brief and clearly written. The game is easy to install and a snap to learn—but with seven levels, it's a definite challenge. Overall, I preferred the joystick, but for certain shots that needed consistent accuracy, I preferred the keyboard.

If you want a break from computer games that bend your mind with puzzles or make you explore and map vast computer-generated worlds, treat yourself to *Stellar 7*. It's an excellent shoot-'em-up arcade game with riveting action and incredible graphics.

WAYNE N. KAWAMOTO

IBM PC and compatibles; CGA, EGA, VGA, or Tandy 16-color graphics adapter; joystick recommended; sound effects and musical support for Roland MT-32, LAPC-1, Ad Lib, and Sound Blaster sound cards; digital voice support for Tandy 1000TL, Tandy SL, and Sound Blaster; mouse optional—\$34.95

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## LINKS: THE CHALLENGE OF GOLF

Golf is a passion. To indulge in their favorite pastime, golfers endure rain, cold, even snow (using colored balls). You just can't keep avid golfers away from their game. When you can't play the real thing, a few rounds on the PC can calm the fever. Computer golf games are wildly popular; nearly every major game developer has one.

Access Software has taken computer golf a giant step forward with *Links*, a VGA-only, three-dimensional visual extravaganza that's the most fun and most realistic golf program I've tried.

Step onto the South Course at California's Torrey Pines, set atop pic-

turesque cliffs along the Pacific Ocean. At the first tee, your digitized golfer stands at the ready as you look over the fairway. The screens are digitized photos of Torrey Pines, showing contours, trees, golf cart paths, cliffs, ocean, background skyline, the clubhouse, and everything else you see on the actual course.



**Links features VGA graphics.**

As you admire the view, you may be surprised to hear birds singing—even through your plain-vanilla internal PC speaker. If you've played Access's earlier golf game (*World Class Leader Board*, also a standout game), you know about RealSound, Access Software's seemingly magical system that produces realistic sound without an add-on sound board. As you play your round, be ready for your companions to pipe up with such comments as "That'll play," "Nice par," or "I seem to have hit the tree, Jim."

You tee off using your mouse (there are keyboard alternatives, but a mouse is best). With fluid motion and true-to-life sound, the golfer hits the ball. The ball's flight is smooth and beautiful (unless you've hooked or sliced it), with its shadow following along the ground. The ball lands on the turf, bounces, and rolls in a way that's appropriate to the terrain.

As the ball rolls dead, a control panel pops up, offering instant replays of the shot, either from the tee or a reverse angle (a TV-like view that shows the ball coming toward you). You can see exactly what happens to your ball, including such interesting possibilities as seeing your ball roll down a long, steep hill to the cliff tops.

The control panel shows the distance of the shot, including the amount of ground roll, and offers two choices: Continue to the next shot or take a Mulligan. If you want to break

par consistently (if unfairly), hit the Mulligan button after every bad shot. It discards the stroke and lets you replay it.

*Links* is unequalled in its visual artistry. But its mouse-based system of control over the swing and aim of each shot makes the play just as pleasant. You can enjoy the game without ever fussing with the finer points of golf. Or, by clicking on the setup button, you can fine-tune the stance, ball placement, angle of the club face, and plane of the swing. Using these controls, you can design and execute an exquisite golf shot, one that quickly rises to clear a close tree and fades to the right to follow the curve of the fairway, for example.

Chip shots are a big part of the game. *Links* handles chip shots realistically by showing you the contours of the green so that you can place your shot just right. Club selection works properly, too. A 5-iron hit softly will run up the green, while a wedge shot landing in the same spot dies almost immediately. Chipping at the practice green with its challenging undulations is particularly addictive. I've hit a hundred consecutive balls from the same spot, trying for just the right combination of loft and strength to sink a 65-foot chip shot, including a curving downhill roll to the cup. I sank five of them.

There's a host of other features that add to the realism of this outstanding game. If you can't quite make out the slope of a green, for instance, you can overlay grid lines on it, making the contours clear.

One word of caution: All this video wizardry requires a powerful PC and takes up over two megabytes of hard disk.

From the spectacular 3-D course to the excellent play-control system, *Links* is a golfer's dream, a chance to play what feels like real golf without ever having to leave home.

RICHARD O. MANN

IBM PC and compatibles, 640K RAM, MCGA or VGA graphics adapter, hard drive; mouse strongly recommended; supports extended and expanded memory and most sound cards—\$59.95

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## BATTLE CHESS II: CHINESE CHESS

The original *Battle Chess* added a new twist to the game of chess by adding movement, sound, and a sense of humor to the game's medieval characters. Instead of simply sliding from square to square as in other computer chess games, the knights, bishops, rooks, and other pieces on the *Battle Chess* board actually walk to their new squares. Best of all, when one piece captures another, the square isn't surrendered peacefully but is reluctantly vacated after a mini-battle that can include anything from a sword fight to histrionic spell-casting.



**The game pieces come to life in Battle Chess II: Chinese Chess.**

*Battle Chess II* brings this same excitement to Chinese chess—a not-too-distant cousin of conventional chess that developed independently of its Western counterpart. Because Chinese chess features more playing pieces than conventional chess, *Battle Chess II* offers even more battle animations than the original. For instance, a cannon in Chinese chess fires cannonballs in high arcs over the other pieces in order to blow up the piece being captured. A counselor can do away with a pesky pawn by simply drawing an oversized mallet from beneath his robe and flattening the pawn with one bold stroke. Throughout the game, the battles are punctuated with the grunts of the combatants and the realistic clang of weapons and armor.

You can play *Battle Chess II* head to head, via modem, or against the computer on any of nine different skill levels. In addition to the colorful three-dimensional board where the



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The disk is designed to work with Accolade's *Mean 18*. The *Mean 18* program is sold separately.

*Mean 18 Ultimate Golf* is a trademark and copyright of Accolade, Inc. 1986, 1987, 1988, 1989, 1990.

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## THE SAVAGE EMPIRE

When the people at Origin Systems issued their new, much improved gaming engine in *Ultima VI*, they knew in advance that it would be a hit. Understandably, they didn't want to wait another year or *Ultima* episode until series producer Richard Garriott made use of it again, so the Worlds of *Ultima* spin-off line was created.

*The Savage Empire*, the first release, re-creates the steamy Grade B jungle epics of 1930s Hollywood films and pulp magazines. Once again you play the Avatar, good guy *extraordinaire*. Sent to a hidden jungle valley that's been cut off from the world for tens of thousands of years, you'll find a variety of oddly juxtaposed cultures and large, carnivorous reptiles. What begins as your party's attempt to rescue the kidnapped tribal princess Ayesha turns into a broader conflict against a deadly, well-organized foe.

Origin Systems' post-*Ultima V* products mark a radical departure from the standard role-playing interface of icons and stick figures. Conversing with NPCs (NonPlayer Characters) brings up images and short descriptions of each person. Cities are full-size, citizens work, fish gotta swim, and birds gotta fly. The price one pays for this detailed, animated reality is a good computer system; you really should have VGA, a sound card, and (above all) an 80386 microprocessor to sample Origin's universe-in-a-program.

*Ultima's* basic gaming compo-

nents remain unchanged, however. You're in charge of up to seven characters at once, who work, fight, and converse according to your whims. You, in turn, are at the mercy of Garriott's computerized world and a host of fictional people whose vividness tends to lurch at you through the screen.



Be the main course in *Savage Empire*.

Many people will prefer this game to *Ultima VI*. Character images are better drawn, and command response time is slightly faster. Its designers made *Savage Empire* a little more forgiving of errors of judgment and omission than their mainstream product. Should you pass up something important like a jar of sulfur, for instance, you'll find ways to acquire more in your surroundings. The quests are more varied, too, with shorter ones building confidence before you crash into the major efforts. *Savage Empire* is lengthy and involved, but not quite as complex as *Ultima VI*, and some moments of humor (involving a celebrated comedy team of the past) are better integrated with the plot.

In sum, it's an auspicious debut to a gaming series from an old and reliable source. Break out the pretzels, and keep plenty of mosquito repellent handy.

BARRY BRENESAL

### THE SAVAGE EMPIRE

IBM PC and compatibles (10 MHz or faster recommended), 640K RAM (expanded RAM required for music), EGA, MCGA, VGA, or Tandy 16-color; mouse and hard drive recommended; supports Roland, Ad Lib, and Sound Blaster—\$59.95

ORIGIN SYSTEMS  
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## ALTERED DESTINY

At the start of *Altered Destiny*, Accolade's new graphic adventure, P. J. Barrett is sucked bodily through his television into a strange new world. Although not exactly the most subtle of plot devices, the opening sets the story line in motion and establishes the fanciful tone needed for the offbeat events to follow.

P. J. ends up on the bizarre planet of Daltere. Daltere is a dreamscape world that's part fantasy and part nightmare. If the environs are foreign, though, the goal of the game will be all too familiar to veteran adventurers. In yet another variation of the "Universe on the Brink of the Apocalypse" theme, *Altered Destiny* charges P. J. with the task of recovering a stolen jewel that's essential to the planet's stability and survival.

The most puzzling mystery in the game is why its designer has resurrected such a tired, old scenario.

You maneuver P. J. around the screen with the arrow keys or a mouse while giving him specific instructions through typed commands. The program is generally adept at understanding directions, although this seems more related to the kinds of actions P. J. must perform than the intrinsic sophistication of the game's parser. For the most part, you can get away with simple, declarative, Tarzan-like sentences. *Altered Destiny* isn't a very verbal game. Even the text descriptions that accompany the screen graphics tend to be terse. In short, the visual elements predominate.

Visually, the game is a rich collage of arresting, imaginatively drawn landscapes rendered in fluorescent colors. The limited animation (flower petals waft through the air, and odd creatures scurry across the ground) adds to the vividness of the screens. Like the program's varied and entertaining soundtrack (it even sounds good on the PC's internal speaker), the inventive imagery creates a mood and an impression that complement the adventure's far-out setting.

*Altered Destiny* is less linear than many games of its ilk. It allows you a fairly free range of movement on Daltere. Emblematic of the latitude you enjoy is the fact that P. J. starts his ex-

ploration of the planet's surface standing in the middle of a crossroads, with no clue as to which direction he should take. While certain tasks must be performed before others, the game doesn't force you to adhere to a rigid path.



Take a walk on the wild side .

On the other hand, although the puzzles and pitfalls you encounter in the course of P. J.'s quest are challenging, they don't always abide by the rules of logic—or even fairness. In more than one situation, the correct response to a problem must be found through trial and error. The manual warns you to save your position frequently. This is good advice, given the program's tendency to punish missteps with death. Experimentation is also recommended because *Altered Destiny* is a game in which inspiration—as much as calculation and deduction—will carry the day.

JEFF SEIKEN

IBM PC or compatibles (8-MHz or faster AT recommended); 640K RAM; DOS 2.1 or higher; hard drive; CGA, EGA, VGA, MCGA, or Tandy 16-color graphics adapter; supports Ad Lib, CMS, Tandy 3-voice, Roland MT-32 and LAPC-1, and Casio CT460 sound boards; supports MIDI instruments; mouse recommended—\$59.95

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## STUNT DRIVER

After my daily commute on Southern California's congested freeways, a driving game should be the last thing I would want to play on my computer. But that was before I discovered *Stunt Driver*—

Spectrum HoloByte's terrific new car simulator.

This game goes beyond the typical car-racing simulation by offering tracks loaded with radical obstacles. Your car loops, jumps, corkscrews, and banks to the finish line. This roller-coaster race has more twists and turns than a contortionists' convention.

You drive a classic 1966 Shelby Mustang, a heavy-muscle car born to be driven. With *Stunt Driver's* five assorted tracks, three brutal opponents, and an editor to create your own courses, if you haven't driven a Ford lately, you'll have a formidable challenge ahead of you.

The first thing you'll notice about the game is the outstanding graphics. Representing the latest generation of graphics for home-computer games, *Stunt Driver* features a 256-color VGA mode that's stunning. The 16-color VGA and EGA are also well done. The background mountains look like mountains, not like a series of green triangles.

As you drive, you can try to take in the excellent scenery. You can choose backdrops that look like a forest, Tokyo (watch for Godzilla), London, San Francisco, and others. Even when you create your own tracks, the program automatically puts in the backdrops.

As in a flight simulator, you can watch your progress from a front, side, or back view. My favorite view is from an imaginary helicopter that follows the car.

You can replay your driving performance with a clever VCR mode. The best reviewer/camera I've seen in a game, it's literally like using a VCR. You can scan fast-forward through the race to reach the scenes you want to see, play back scenes frame by frame, and amazingly, switch between the views.

When I overshot a jump or fell off the loops, the car flew into the air and realistically tumbled bumper over bumper on the ground. Then I enjoyed reviewing my crashes—frame by frame—from the helicopter view.

Another nice touch is the ability to race another player head to head by modem. The program also supports the Ad Lib sound board for great audio effects.

The driving is very challenging—in fact, this is the toughest driving

simulation I've played. It's easy to overshoot the turns, and it can be hard to get going in the right direction again. Fortunately, the game provides arrows to point you to the right path.

The package says that a joystick is optional. In fact, the game designers specifically recommend that you use the keyboard, and that's what I preferred.

The installation was straightforward, and the game was, overall, easy to learn. It's the driving skills that take some practice to master.

This was the most fun I've had with any driving simulator. The jumps and loops add an exciting twist to the racing-game genre. I'm just glad I didn't have to learn to drive on this challenging race course in real life. I can imagine my frazzled parents yelling at me, "Hey! Look out for that loop!"



Drive your car over incredible obstacles in *Stunt Driver*.

*Stunt Driver* is an exhilarating simulation that lets you forget about real driving issues, such as gas prices and car insurance premiums. Maybe it's the contrast to real driving that makes this game such a fun escape from reality. It's definitely not just another day at the races, and it's certainly not *Driving Miss Daisy*. I recommend *Stunt Driver*. It's is a rip-roaring, drive-by-the-seat-of-your-pants thrill ride.

WAYNE KAWAMOTO

IBM PC and compatibles; 640K RAM; CGA, EGA, VGA, or Tandy 16-color graphics adapter; 8-MHz 80286 and hard drive recommended; supports Ad Lib and Tandy sound boards—\$49.95

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## TREASURE TRAP

In *Treasure Trap*, you control the movements of a diver searching the sunken HMS *Esmeralda* for a horde of lost gold. Local creatures have established squatter's rights since 1856, however, and don't take kindly to your interrupting their daily schedules. You have no map, no weapons, no keys, and a very limited supply of air. Additional air tanks are scattered throughout the ship's 100 rooms, but you don't know where, and the electric eels approaching you aren't about to tell you.

At first glance, *Treasure Trap* resembles a more sophisticated *Mario Brothers* with its jumping hero, points (gold) to collect, moving objects, and deadly creatures. But this game's graphics are far superior, with detailed ship hulls and bulkheads and shadowed highlights that provide good 3-D effects. The graphics suffer on a CGA-equipped machine, but the EGA and VGA versions are stunning.



Try this adventure in the briny deep.

The graphics get support from a plot right out of *Jaws*. Electric eels, stingrays, hammerhead sharks, and piranha all try to make an easy lunch out of you. Beyond the unfriendly marine life, there are also whirlpools that instantly transport you to unknown surroundings. Add to all of this the *Esmeralda's* secret cargo of some unknown substance, carried in leaking barrels and lethal upon contact.

One useful feature to this game is its optional key reconfiguration. Also included are abilities to toggle sound effects, remove shadowing (for speed), and the all-important pause control.

The original version of *Treasure Trap* used a key-disk copy-protection scheme that, in my use, did not operate as designed on one-third of the

computers I tested it on. To the company's credit, it has since released a version without copy protection. If you bought the first version and are having problems, you can exchange it for free by returning your original disks, along with a brief explanation of your problem, to the company's Baltimore offices (see address below).

Arcade addicts will be tempted by *Treasure Trap's* breathtaking visuals and playful brainteasers. And once they give in to that temptation, they can anticipate a lot of undersea fun.

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## JAMES BOND: THE STEALTH AFFAIR

Santa Paragua may look like a sun-soaked South American vacation spot, but you only need to scratch the surface to find trouble in paradise. In *James Bond: The STEALTH Affair*, you step into the secret agent's well-polished shoes. On behalf of the American CIA, your job is to hunt for a stolen stealth fighter.

In this animated adventure game, Bond runs through a series of crises both trivial (getting change to buy a flower) and life-threatening (escaping a watery grave) in pursuit of the jet. Controlled by either keyboard or mouse, the Bond of *The STEALTH Affair* moves and acts in a manner like that of his namesake in latter-day 007 movies—that is, choppy and silly, trading the quiet sophistication of Ian Fleming's hero for a goofy nonchalance. He lapses into confused muttering at the first sign of a confrontation, trudges across open pavement at a sluggish pace, and freezes under smart-alecky insults at every wrong move.

While *The STEALTH Affair* os-

tensibly offers many options for action, each dilemma actually has only one correct resolution. Choosing the right option amounts to outguessing the whims of the game's creators. While some resolutions are challenging but logical—as they should be—others are almost impossibly obscure. If you're lucky, you'll suffer only smug putdowns for your mistakes. If you're not so lucky, you will watch Bond die or be thrown into prison, courtesy of Santa Paragua's system of summary justice.



Save the day with Bond, James Bond.

It's advisable to save your progress with every new scenario, since Bond succumbs so readily to so many different traps. Fortunately, Interplay offers American players a hint line to call if it becomes impossible to maneuver Bond out of a scenario. Unfortunately, it's a 900 number that costs \$1.25 for the first minute and \$0.75 for every additional minute. As a result, mistakes can punish your wallet almost as much as the animated James Bond figure.

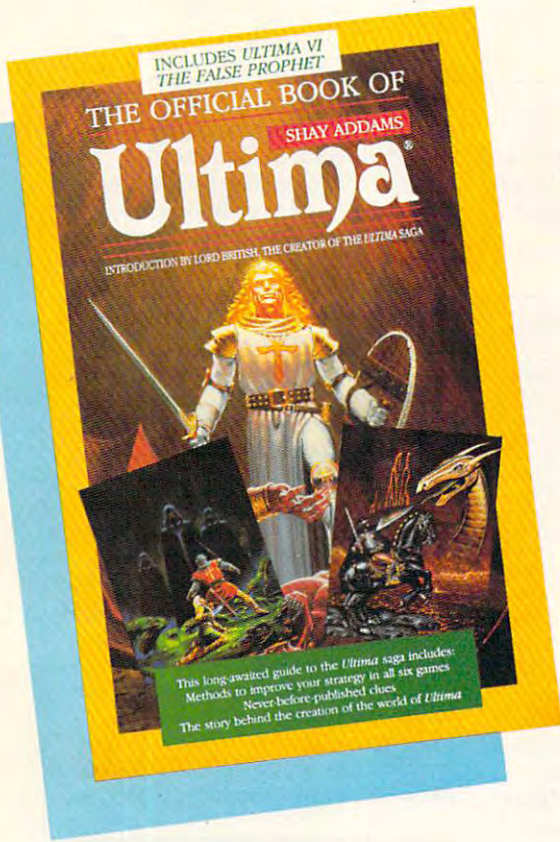
*The STEALTH Affair's* graphics are colorful and varied, placing Bond in imaginatively created settings. There's a lovely park with a city skyline for a backdrop, a plush hotel cast in rich red tones, and an ominous-looking dictator's palace where the walls are peppered with bullet holes. Each scene sports interesting details, some of which are necessary for advancement while others are red herrings. Frenzied electronic music accompanies a handful of crucial scenes; it quickly became irritating, and I toggled it off. A detailed manual offers entertaining background material and crucial guidance.

Bond and the objects around him generally respond well to keyboard commands. The actions necessary to make things work are frustratingly in-



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consistent, however. In one early scene in an airport, where Bond is trying to figure out which luggage to take, the game is maddeningly unresponsive. And a few of the error messages contain annoying typographical errors.

Just as *The STEALTH Affair* obscures thieving military dictators and double-crossing secret agents behind sunny tropical locales, the game obscures some strict limitations on action behind an apparent wealth of options. When every dilemma has only one real solution, resolving predicaments can truly be an exercise in frustration.

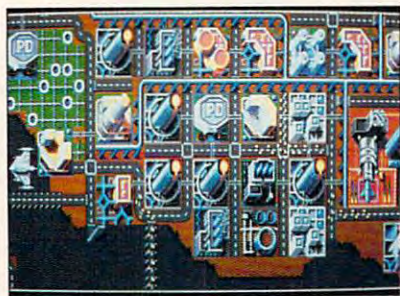
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IBM PC and compatibles; 512K RAM; CGA, EGA, MCGA, VGA, or 16-color Tandy; hard disk recommended; supports Microsoft mouse and Roland MC-32 and Ad Lib sound cards—\$54.95  
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## SIMCITY GRAPHICS

Maxis has released two sets of alternative graphics for its wildly popular *SimCity* game. *Set 1* provides cities from Genghis Khan's Asia, the Wild West, and medieval times. *Set 2* offers futuristic cities in Europe, in the United States, and on the moon. It replaces aircraft with dragons (among other changes),



Build the European city of tomorrow.

and threatens cities of the past and future with different kinds of disasters. Electrical power and railroads are re-

placed with aqueducts and stone paths. Factories become windmills, rice paddies, or smithies, depending on the scenario. The game itself plays exactly the same, which may disappoint some.

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## STUNTS

Driving simulations have accelerated into the fast lane since the original *Test Drive*. This time, Distinctive Software, the developer of the *Test Drive* series, has teamed up with Brøderbund Software to bring us a racecar driver's dream, a game simply called *Stunts*.

As a stunt-car racer, you choose from an arsenal of 11 road rockets ranging from Indy-car racers to elegant sports roadsters to off-road puddle-jumpers. To get the feel of the controls and the inventive stunt tracks, I started with the Lamborghini LM-002, a \$120,000 four-wheel drive with a top speed of only 126 mph. When I switched to the Jaguar XJR9 IMSA, a \$325,000 Indy car with a top speed of 215 mph, it was like going from the cockpit of a twin-engine Cessna to that of an F-19. The feeling of power under the Jaguar's hood was exhilarating.

The stunt tracks include such challenges as steeply banked curves, open drawbridges (you'd better be doing at least 90 mph if you want to make it to the other side), loops, corkscrews, slaloms, and a devious pipe (a simple round tunnel with a nasty cement block in the middle). You have to drive up onto the wall of the pipe in order to miss the block, then be back on the level before you exit the pipe. There are also hills, elevated roadways, and spirals. If that's not enough, you can change the track to dirt or icy roads.

While all this sounds good, you have to see this game to have an in-

king of what it's all about. Driving, of course, you see the cockpit view out the windshield. But after you've crashed (or completed your lap, once you've polished your skills a little), you can run a videotaped replay of the race. A VCR-like control panel lets you run the tape forward and back, watch it frame by frame, and select your point of view. You can see it again from the driver's seat or select the TV-camera view, which shows your car approaching then receding from a series of remote cameras along the track.

The most fun is the helicopter view. You can zoom in and out, move the helicopter camera up and down, and change the angle of view through 360 degrees. As you move the point of view, the scenery, horizon, and race-track all change appropriately. Although the scenery and the cars are mostly polygons that are fairly jaggy-looking, the illusion works. It feels like a race as you drive, and it looks like a race as you watch the videotape.



Race over roads with corkscrew turns in *Stunts*.

*Stunts* has nice touches throughout, such as the choice of six opponents with varying degrees of skill. Helen Wheels and Skid Vicious are the best of the lot. In the evaluation panel that appears after each race, your adversary appears in a digitized animation to either rub your nose in your loss or pout about your superior abilities.

The developers have created painstakingly accurate simulations of the driving characteristics of these 11 cars; you'll come to recognize the feel and sound of each. They accelerate differently, they spin out at different speeds, and they even have individual characteristics when airborne.

In addition to the traditional cursor-key control system, you can

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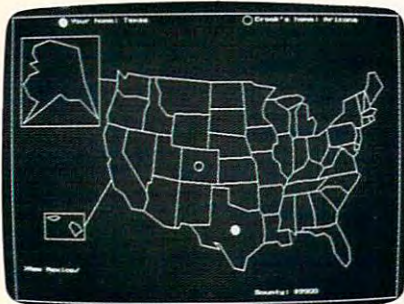
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drive these cars by mouse; left and right mouse movements turn the steering wheel. I found the mouse movements to be too hard to learn, so I soon drove exclusively by keyboard.

Once you've mastered the half-dozen increasingly complex tracks that come with the game, you can design your own tracks using the basic building blocks. You'll be able to create tracks formidable enough to keep you challenged, no matter how well honed your driving reflexes become.

*Stunts'* extensive graphics and complex simulation algorithms require a powerful computer; a 286 machine running at 8 MHz or better is recommended. The game also requires a tremendous amount of memory. If you have any TSRs running, you'll have to unload them in order to run *Stunts*. For me, this meant creating a separate boot disk just to run the game, which rankles a little.

If you have an unfulfilled desire to drive the hottest racing cars on the planet or if you fantasize about driving in an exciting TV-style car chase with jumps and other stunts, you can work off a lot of that energy with *Stunts*. The cars are satisfyingly realistic, the stunts are dramatically exciting, and you can create (and save) computerized videotapes of your exploits. In addition, the highway patrol will thank you for confining your stunt driving to your computer room.

RICHARD O. MANN

IBM PC and compatibles; 512K for CGA and Hercules, 640K for EGA, MCGA, VGA, or Tandy 16-color; 8-MHz 286 or faster processor recommended; mouse or joystick optional—\$49.95

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## HOYLE'S OFFICIAL BOOK OF GAMES

Although Sierra is best known for its 3-D graphic adventures such as the Space Quest and Leisure Suit Larry series, *Hoyle's Official Book of Games, Volume 2* proves that the company also knows a thing or two about strategy games. *Hoyle's 2* is a feature-packed program that boasts

28 card games for the solitaire connoisseur. The collection includes everything from old standbys like *Pyramid* and *Klondike* to several lesser-known solitaire games such as *Scorpion*, *Fortress*, and *Penguin*. The program's designer, Warren Schwader, has even tossed in a couple of his own creations—*Bowling* and *Slide*.

No matter which game you select, the cards are neatly arranged on-screen and can be easily manipulated with your choice of control device—keyboard, joystick, or mouse. Mouse control is the easiest, but when no mouse is available, either of the other methods works just fine.

All of these solitaire games can be played at an easy or hard level of difficulty. But even with two difficulty levels, some games are much easier to win than others. Once you've selected a game and difficulty level, you may also choose the game's background color and the design of the deck you'll be using. While an unusual design won't improve your chances of winning, the option of choosing your own deck makes playing *Hoyle's 2* that much more enjoyable.

Other options let you toggle the sound on and off, adjust the cursor speed, and set the animation speed. This last option determines how fast cards are spun into place at the start of the game and how quickly they're flipped from the deck to the stockpile.

All in all, *Hoyle's 2* is a terrific way to pass some free time. Once you've installed it on your laptop, you'll never again be bored waiting at an airport terminal. If I had to find one fault with the program, it's that it doesn't allow you to save games in progress. Nevertheless, *Hoyle's Official Book of Games, Volume 2* will provide hours of solid entertainment for anyone who enjoys a good game of skill and chance.

BOB GUERRA

IBM PC and compatibles (8 MHz or faster recommended); joystick or mouse optional—\$34.95

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## STAR CONTROL

This is not just another space game. While *Star Control* revives several classic game themes, it improves on them all and gives you plenty of options. Whether you decide to fight for the Alliance (good guys) or the Hierarchy (bad guys), you can choose one of 14 different craft to pilot, each with a truly distinct personality.



Choose among 14 ships, each with a distinct personality, in *Star Control*.

To help you out, stunning digitized graphics provide vital information about each ship. Pay attention here because knowing your ship helps you develop tactics to exploit enemy weaknesses.

Once battle has begun, you see your ship represented in deep space, with stars and planets floating by in different directions. The fine detail and multiple animations give the action a 3-D feel. As your ship and the enemy ship approach or dart away from each other, the screen zooms in and out. This ensures that both spacecraft appear on the screen at all times while providing the greatest possible detail.

The real virtues of *Star Control* emerge when you graduate to playing a full game. There are nine war game scenarios to choose from and an option to design your own. Generally, each places you in command of a handful of specific ships, pitted against an enemy who, one way or another, is as strong as you are. Taking turns, you and your opponent set out to explore planets. Ideally, you discover worlds where you can establish strategically important mines or colonies.

Don't think the strategy involved is an afterthought. In a full game, it's vital. Accolade wisely incorporated a

save-game feature into *Star Control*, as a well-fought scenario can last several hours.

Player options are extensive. A human or the computer can exercise exclusive control over each side. If you'd like, the computer can control either the strategic moves or the tactical fighting of a camp. Either player can navigate by keyboard or joystick. The keyboard seems to offer the best control, but ditch the key defaults. *Star Control* allows you to define your keys, and that really helps the playability.

CGA screens are adequate, EGA good, and VGA gorgeous. The supported game boards primarily provide different weapon sounds. While everything sounded perfect on my CMS board, you don't have to own a sound card to fully enjoy the program.

*Star Control* works just fine on a floppy-only system, but to run it on anything less than an AT-class machine requires stripping off a lot of the visual and audio features that you wouldn't want to miss. Documentation is very good. The off-disk copy protection is probably the least burdensome yet most effective I've seen.

Accolade deserves credit for taking the time to integrate the many diverse facets of *Star Control* into a cohesive package, paying obvious attention to minute detail in every aspect of this game. It may be another space game, but it's a space game with everything done right.

WARREN QUINLAN

IBM PC and compatibles; 512K RAM for CGA or EGA, 640K RAM for MCGA, VGA, or Tandy; 8-MHz or faster AT class recommended; supports Ad Lib, Tandy, CMS, and Roland MT-32—\$49.95

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## WEIRD DREAMS

**W**atch the roses—they bite. Careful of the little girl—she's lethal. Flying fish are key to your survival. Is this a nightmare or another David Lynch movie? *Weird Dreams* is a little of both, a

game that traps you in a surreal environment from which you must escape, checkered pajamas and all. The only way out is to wake yourself up, but you won't be able to do that until you experience some of the strangest adventures ever seen on a computer screen.



Well hello, Dali, it's so good to have you back in dreams where you belong.

Like most action games of this kind, *Weird Dreams* deposits you in a series of potentially deadly situations that you must survive by using your wits and joystick skill. Make your way through all the screens, and you achieve the ultimate goal of the game (in this case, to reassemble your badly addled brain and make it through the surgery you seem to be undergoing). What's refreshing and different in this adventure is the game's unpredictable sense of humor and use of graphics that would give Salvador Dali pause.

The gameplay will be very familiar to sword-and-sorcery gamers, even if it does require a fish or soccer ball instead of a sword. Instead of dragons and trolls, there are more unusual adversaries. Watch out for seemingly innocent objects; unwary encounters with these are likely to result in sudden, gruesome (sometimes gruesomely funny) death. To survive, you've got to kill just about everything you meet and grab anything that you can pick up.

The package includes a useful hint book and a long-winded novella that sets the scene for the game itself but which won't help you much in playing it. (You'll need the novella to pass the game's copy protection.) A joystick is also highly recommended, although you can play from the keyboard. One irritating flaw is the lack of a save-game feature; after five deaths, you're back at the beginning.

While *Weird Dreams* is certainly something different in the all too predictable world of computer gaming, I found myself wishing it were even more different. A lot of the game depends on joystick reflexes. The game would've broken new ground if it had required players to figure out the kind of intensely personal symbolisms and puzzles that dreams really present. You get some of the flavor of a generic dream, without the emotional urgency that all real dreams have. Sometimes I wanted to talk with some of the characters I met, but to progress required more violence than voice. The nastier opponents tend to be female (the little girl, the ballerina, the queen bee); game programmers ought to be more sensitive to these issues.

Perhaps my wish is really a call for a radically different kind of computer game, one that *Weird Dreams* only hints at. All in all, the game was fun, an odd diversion from the usual without being a complete reverse of the familiar. All that's required to have a good time with *Weird Dreams* is a quirky sense of humor—and it helps if you aren't too squeamish.

STEVEN ANZOVIN

IBM PC and compatibles, 640K RAM, CGA, EGA, or VGA graphics; joystick recommended—\$39.95  
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## SPELLCASTING 101

**W**ith *Spellcasting 101*, game designer Steve Meretzky (*Zork Zero*) has taken a text-and-graphics interface and revamped it for gamers new to text adventures. The strong plot and Meretzky's irreverence give the game a unique flavor. You play the role of Ernie Eaglebeak, a nerd who lusts after the hand of Lola Tigerbelly and who aspires to be a famous sorcerer.

The game is separated into chapters, the first of which involves Ernie's escape from home in Port Gekko.

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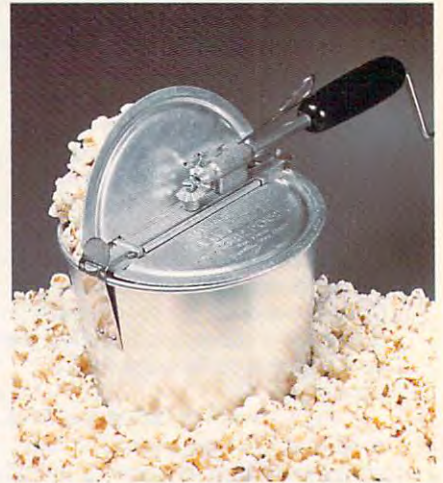
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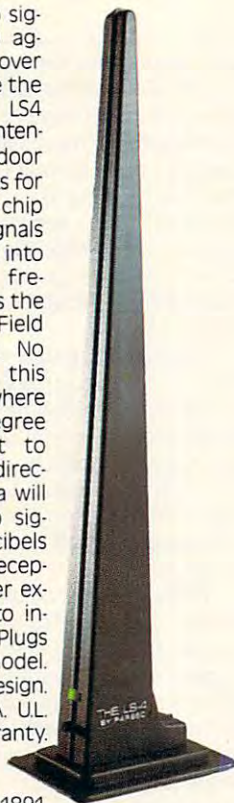
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Chapter 2 begins at Sorcerer University, where *Spellcasting 101* really gets started. An evil bunch of hooded ruffians ransack the school, and everybody disappears. Solving this mystery is the goal of the game, and it involves putting together the pieces of the Sorcerer's Appliance.



That ol' black magic will have you in its spell with its many surprises.

The interface for *Spellcasting 101* is one of the easiest I've ever seen for such a game. A window at the top of the screen can show a picture of your location, an overhead map, your inventory, your status, or a verbal description of your current location. You can toggle these options with the function keys. For those who have no desire or talent for typing, don't fear. Gameplay isn't hampered by the point-and-click interface.

*Spellcasting 101* features outstanding graphics. Some of the pictures are a little risqué, but you can play the game in naughty or nice mode. (Frankly, I didn't see much difference.)

All of this ribaldry is easily installed on a hard drive. It supports most graphics modes and the Ad Lib and Roland sound boards. The game's puzzles are challenging but not so hard that they make you want to quit. As sophomoreic fun without a trace of redeeming social value, *Spellcasting 101* appeals to the *Animal House* in all of us.

RUSS CECOLA

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## FULL METAL PLANET

This science-fiction strategy game is better than most but not quite as good as it could be. It takes its scenario from 1940s–50s industrial science fiction; you're in charge of an armed expedition to mine ore on an unstable planet. At your disposal are barges, tanks, cargo haulers, and attack boats. There's also a clever vehicle called the *Weather Hen*, which can not only manufacture replacement equipment but also forecast the planet's extraordinary tides. Yours isn't the only crew working the world. Your opponents possess the same tools and arms.

The planet itself has plenty of valuable ore, but the world's terrain makes extracting minerals difficult. Before each turn, a substantial tide alters the landscape. Dry ground can become swamp or even waterway, stranding your equipment or providing your enemies with access to your resources.



Be careful—this planet is all mine.

*Full Metal Planet* is a timed game with 25 turns. You have the option of setting the length of each turn on the opening menu. Up to four players, human or computer, can compete for the mineral resources. Several computer opponents are included, each offering a different strategic challenge.

The game all but requires a mouse, and its interface takes some getting used to. Use the cursor to guide your vehicles and to access various menus and commands. The game's manual doesn't explain these commands as clearly as it should, so I recommend watching a couple of completely computer-controlled turns

before trying your hand at the controls. It's also worthwhile to play against a single computer opponent before taking on more than one. When you place several rival mining groups on the map, things become hectic and violent very quickly. To win, you must escape the planet's surface with the most points, which are rewarded for ore and recovered equipment.

One annoying flaw interfered with my fun. The game insists that you complete its copy-protection scheme every time you start a new game. Copy protection upon executing a program is one thing; requiring it when you start a new game from within the program itself is altogether unnecessary.

Within its own context, *Full Metal Planet* is a solid strategy game. It would be interesting to see what its designers could do with the game's engine by way of offering different planetary surfaces and types. It certainly has potential for creating the basis for a much larger game.

KEITH FERRELL

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## BILL ELLIOTT'S NASCAR CHALLENGE

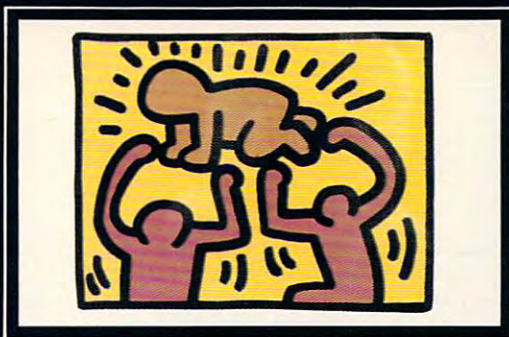
Stock car racing has always been the romantic favorite on the pro racing circuit, the poor cousin to Grand Prix glamour and Indy 500 high-tech. With its roots in Prohibition-era moonshine running and its heroes self-effacing good old boys from down the pike, the NASCAR road-running track meets have all you need for spending a perfectly good Sunday afternoon engulfed in noise, steel, and the checkered flag.

*Bill Elliott's NASCAR Challenge* brings those Sunday afternoons home, with a simulation that puts PC sports players in the driver's seat of one of

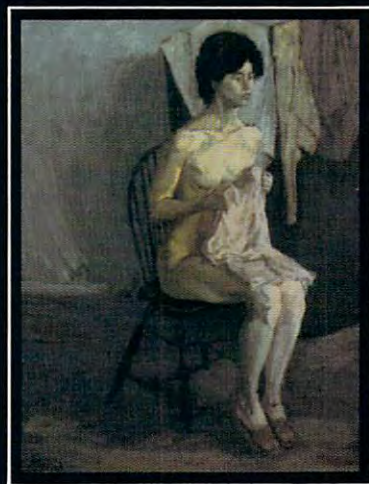




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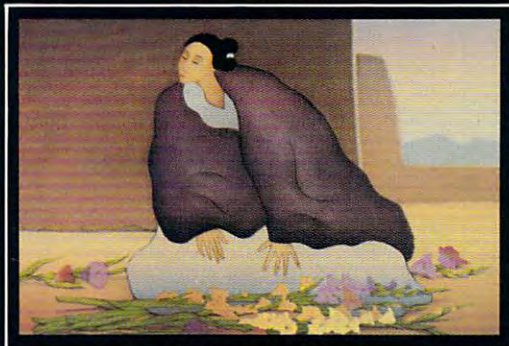
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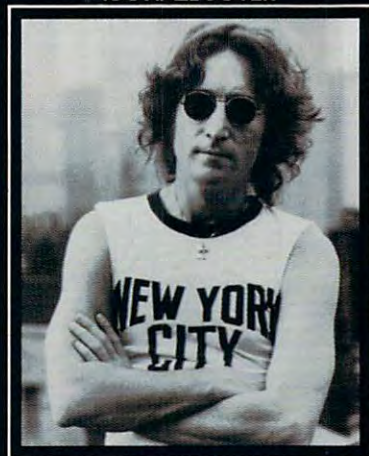
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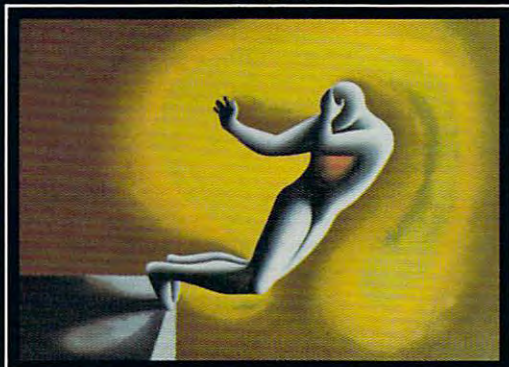
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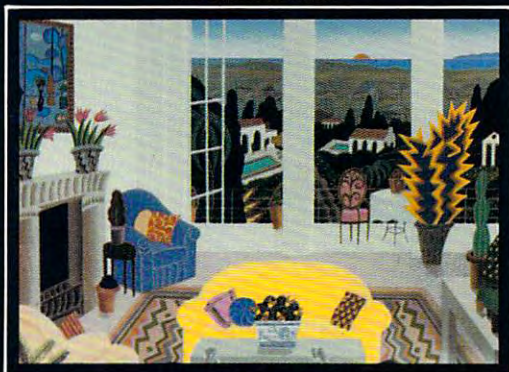
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three hot stock cars: a Ford Thunderbird, a Pontiac Grand Prix, or a Chevrolet Lumina. And even though the NASCAR rules are straightforward on what modifications you can make to your car, it's plain to see that these aren't your everyday showroom models. They may look like the cars you see on your dealer's lot, but when you get inside and put your sneakers through the floorboard, you'll have a whole new appreciation for the American automobile.



**Gear it down and hit the straightaways with *Bill Elliott's NASCAR Challenge*.**

Racing is more than cars, however. It's also the driver and the skills he or she can bring to bear when barreling down the asphalt. You'll need all the practice you can get before you take to the blacktop in this game, because the cars are tricky to control, even with manual shifting.

Races take place on any of eight topflight NASCAR speedways: Atlanta, Bristol (Tennessee, home of the first Winston Cup series race), Darlington, Daytona (a trioval course that begs for speed), Michigan, Sears Point, Talladega (claiming the fastest 500-mile stock car race), and Watkins Glen. If you're starting out, you can practice on any of these courses. If you're ready for racing, you can race a single race on any of the courses or go right to the championship season. A season of racing takes you through all eight tracks and awards points on your finishes. The top finisher walks away with the coveted championship trophy.

As with any racing game, realism boils down to how well the simulation controls the cars as they make their way around the track or down the street. With *Bill Elliott's NASCAR Challenge*, gear shifting is extremely accurate and realistic, while steering is a little less accurate and more diffi-

cult. And although you can't escape the feeling that you're in a race when you are surrounded by other cars, once you're alone on the track, it's difficult to see that you're on a racetrack.

This simulation blends bit-mapped graphics (for animated detail) and filled polygons (for fast graphic processing and a 3-D effect) in an attempt to capture the look and feel of NASCAR racing. The detail inside the cars is terrific, with finely drawn gauges and an animated gearshift that tracks your shift patterns. Outside your car, however, the filled polygons fail to deliver the same level of realism, though they enhance the feeling of speed.

Sound support is superb, with an upbeat theme song giving way to extremely realistic engine sounds. The noise of shifting and the squeal of tires in the curves add excitement to the simulation and promote the game's realistic sense.

While you have only three cars from which to choose, the game allows for several adjustments to your car's equipment so that you can modify it to suit your driving style and the track you're racing on. Everything from the engine (qualifying or racing) to tire stagger is adjustable. If, for example, you choose to qualify before every race (Auto-Qualify is also an option; you will start at the back of the pack), you can put a qualifying engine in your car which you will discard after you secure your starting position. If you like to gas it hard out of curves, you'll want to set the gear ratio higher. If the racetrack is an oval with banked curves, you'll want to adjust the tire stagger on your car. You can also adjust the angle of your spoiler, to help the car stabilize at high speeds. Modification is the soul of stock-car racing.

If what you want out of life is speed, thrills, crackups, and a kiss at the winner's circle, belt yourself into this racer. It's a rubber-burning treat for any racing fan.

PETER SCISCO

IBM PC and compatibles (AT-class), 640K RAM, EGA or VGA—\$49.95  
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KAREN LEE SIEPAK

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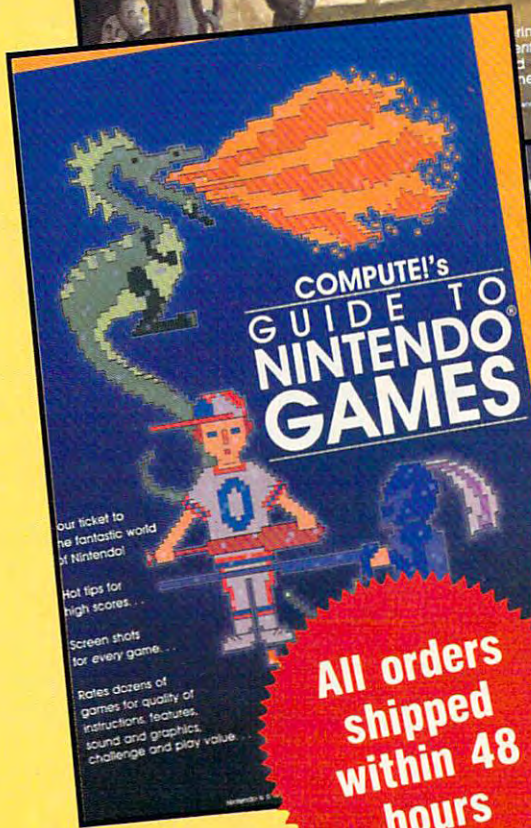
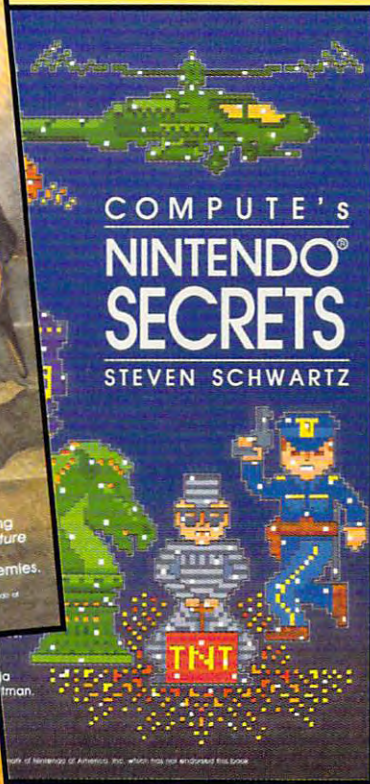
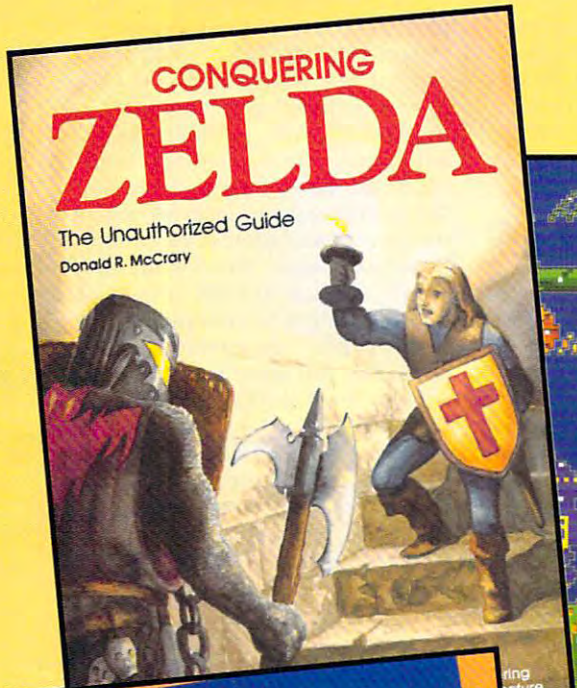
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and Louie climb mountains, explore caves, and make their way through the jungle. Watch your step—a multitude of dangers await you in your quest for gold and adventure. Disney Software deserves credit for its great sound and graphics. This game offers one of the best implementations of Tandy's 16-color graphics I've ever seen.

MIKE HUDNALL

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## BLADES OF STEEL

No doubt about it—this is the straight stuff for any arcade junkie with the hockey jones. As a straight port from its Nintendo videogame cousin, *Blades of Steel* is long on stick reflexes and short on strategy. It's skate, skate, slap shot, skate, skate.

That's not all bad, if that's as far as you want to take computer hockey or if you want to experiment first before jumping into a full-blown simulation. There's plenty of five-on-five action here, and since you also control the goalie, you must think quickly and act faster to get points on the board and to keep your opponent from scoring.

Play against either the computer or a friend. The game will work with keyboard commands, but you're a sucker if you use anything but a joystick. Your control of the player follows whatever direction you move your joystick. Passing and shooting are fine arts; shooting is the most difficult because you must aim at a red mark that moves back and forth on the goal, awaiting the time that it gets into a clear position and you have a chance to get the puck past the goalie.

On defense, you can try to steal the puck by taking it away from the offensive player or by intercepting a pass. When the ball gets close to the goal, you must defend the net by moving the goalie back and forth. Blocking

one shot isn't usually too tough, but if your opponent gets two or three tries, you can just about mark it down.

*Blades of Steel* offers two modes of play, Exhibition and Tournament, and three skill levels. These options enhance the playability of the game but do not make it a true simulation. All players are equal in ability, and you have no coaching options. Still, if your idea of fun is a 100-mph slap shot across thirty feet of ice, this game has all you need.



Hockey action is yours in *Blades of Steel*.

Because of its arcade orientation, *Blades of Steel* sacrifices realism for action. However, fights and penalties do play a role, as they do in real hockey. If two players do get into a brawl, the game switches to a fight screen. You can actually control the fighting, throwing punches at your opponent. If the ref thinks things have gotten out of hand, he will award one of the teams a penalty shot—a one-on-one match-up between you and the goalie or, if you're on the short end of the stick, between you and the shooter.

*Blades of Steel* supports Hercules, CGA, EGA, and Tandy 16-color graphics but is unspectacular in any of these modes. The graphics are enough for you to enjoy the action but not so splendid as to interfere with your shooting.

Sound is limited to the internal PC speaker and includes a few digitized voiceovers that sound quite realistic.

Although you can't edit teams or compile stats on individual players, *Blades of Steel* does have one interesting feature not found in some of its competitors. If the referee awards one of the teams a penalty shot, you move to the penalty-shot screen. If you're on the receiving end, you must defend against a free shot by one of your opponent's best slap-shot artists. If the

penalty is against the other team, it's your turn to burn one into the net. The free shot does play a role in hockey, so it's good to see it incorporated here.

Keep these tips in mind as you play. In defensive pro mode, you should watch for a computer player camped near your goal. He will knock in your deflected save if you don't keep him covered. To initiate a fight sequence, bump the opponent head-on, wiggle the joystick, and press both fire buttons quickly. Fight sequences will be activated more often by the boards than in the center of the ice. During the face-off, click the passing button rapidly while pointing the joystick left before the ref throws out the puck. This will better your chances of winning the face-off and controlling the puck early.

*Blades of Steel* for the home computer was programmed as a conversion of the highly successful Nintendo version of the same name. The game is designed for the novice sports gamer.

PETER SCISCO

IBM PC and compatibles; 384K RAM for CGA or Hercules, 512K RAM for EGA, 640K RAM for Tandy 16-color; joystick recommended—\$19.95

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## JOE MONTANA FOOTBALL

The 49ers might not have made it to the Super Bowl this year, but there's no stopping this game from scoring big at any PC sports gamer's house. This is without a doubt the best version of football to come to the PC, with superb graphics and animation, a well-designed and easily learned interface, a wealth of editing functions (including individual player stats as well as league functions), and an endorsement by one of the greatest quarterbacks ever to play the game.

*Joe Montana Football* is comprised of 28 teams, all from cities that boast an NFL franchise (no team names, just the cities). You can play

an exhibition match or an entire season while coaching a team, or you can let the computer call the plays while you watch. Taking a professional football team through a season on a march toward Super Sunday is captured here in all of its essence, with the setbacks, the celebrations, and the drama that make up the game of football.

Before you jump right into a game, however, you'd better familiarize yourself with the game's controls. You can do that with two practice modes, one for passing/running, the other for kicking field goals. The kicking game is the easiest to grasp. After the snap of the ball, you must press the fire button at the proper place along an accuracy meter that is displayed at the bottom of the screen. You can direct your kick against the wind, or you can angle it toward the sideline by moving your joystick handle forward or back (the keyboard works, too).

Running is also simple. All you have to do is take the snap from the quarterback and then direct your player toward the gaps in the defense.

You may find some running plays work well and then be frustrated when the defense seems to "get smart" to your plans. That's all a part of the game—and an engaging piece of realism.

Passing is the toughest part of the game to master. After you take the snap, you can cycle through the eligible receivers, then press a button to release the ball. You must learn to do this in a matter of seconds, or the defensive linemen will have you chewing turf.

Only by practicing can you gain the skills you need. And even then you'll want to play a few exhibition games to try out your new-found talents before engaging in a full-blown season.

Everything about this game, from its presentation to its sound effects,

puts a premium on bringing the realism of football to the PC. The plays are professionally drawn (you can design your own) and realistically executed. The playing perspective during most of the game resembles what you would see on television; during field goals and extra points you have a view of the defensive line and the up-rights from behind the kicker—a view not many PC game players have experienced in real life.

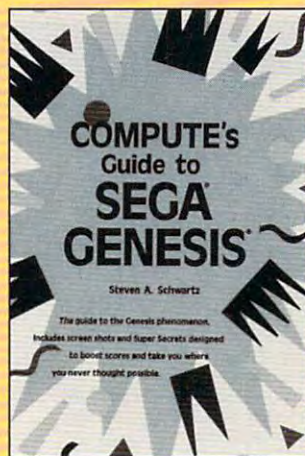
Realistic animation, coupled with the grunts, pops, cracks, and thunder of 300-pound linemen crashing into one another, create an illusion of an interactive sporting event happening right on your small PC screen.

Also contributing to the effect are injuries, substitutions, and full player rosters. The weather doesn't really play a role, and penalties are limited to two: Pass Interference and Delay of Game. (The documentation lists three but includes Safety, which is, of course, a score, not a penalty). Fum-

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bles, interceptions, and lost opportunities round out the many pieces that go into creating an extremely realistic simulation.

With full color graphics support (from CGA to VGA), *Joe Montana Football* looks as good as it plays. The scrolling screen always keeps you in the middle of the action, whether you're covering a punt or throwing long on a post pattern. The onscreen characters are fun to watch even after the whistle is blown, when they continue to push and shove each other until called to the huddle. My only small quibble is that the team uniforms aren't a match for their real-life counterparts. (Chicago wearing Miami blue? Cincinnati in gold and black?)

The sound support for this game is also excellent, with full attention paid to the Sound Blaster, Game Blaster, and MT-32 sound cards. The music is a kind of never-ending trumpet fanfare that eventually grows tiresome, but the sound effects add a dimension to the game that shouldn't be missed.

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Aside from team editing and league play, *Joe Montana Football* brings its own method of instant replay to PC football. Each play is recorded as it happens; you have the option of seeing an instant replay from the field or of saving the replay on an option screen.

If you save from the option screen, you have the capability of splicing together several replays to create your own "game highlights" film.

Another special feature is what Sega calls its *Receiver Cam*. This feature allows you to check off your receivers during pass plays. Football games that incorporate action as part of their design have always had trouble dealing with the multiple receivers that pro quarterbacks routinely use; the Receiver Cam feature is a unique way of solving that problem, by presenting a small window in the corner of the screen that highlights each receiver as you toggle through the possibilities. You still have to keep an eye on the pass rush, but this method is less intrusive than those employed by most PC football games.

Don't drop the ball on this one. With its superb blending of action and strategy and its use of stats and reflexes, it's bound to go down as one of the best sports simulations ever to hit the field. And even if you never play as well as Joe Montana, this game will just about make you think you could.

PETER SCISCO

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## GALLEONS OF GLORY

Magellan never completed his quest for glory, honor, and gold; he was killed by Philippine tribesmen while still thousands of miles from home. *Galleons of Glory* re-creates his sixteenth-century voyage from Spain to the coast of

South America and shows you what it was like to be an admiral setting sail for the unknown during the Age of Discovery.

*Galleons* also teaches managerial skills. To acquire gold and glory, you must equip and maintain your ship, keep your crew in line, weigh the opinions of your officers, deal with adverse weather and sea conditions, and explore unmapped coastline. As you gather information and issue orders to your captain, navigator, and other officers, you must keep track of provisions, maintain morale, and watch for signs of discontent. Lose touch with your crew, and a traitorous officer will organize a mutiny. Unless you can discover who is leading the rebellion, you'll be marooned on shore, falling to your knees in despair as your ship sails on without you. Mutinies are less likely if you locate treasure and extract it with minimum casualties from the natives you meet.

This game is more challenging than Brøderbund's *Carmen Sandiego* series, but it should appeal to much the same audience. The interface is very easy to master, and the graphics are well done, especially in VGA. A few things are slightly off about *Galleons of Glory*, though. Play can be repetitive. With such a small cast of characters, players will find themselves hopping frequently between cabin and galley, longing for a change of scene (much like real sailors, I suppose). Younger players will probably find it impossible to guess the leader of the mutineers, so their games will never progress very far.

Some of the less palatable aspects of Magellan's voyages are glossed over in *Galleons*. Mention is made of wormy biscuits, but you don't experience the extreme hardships that the crew suffered (at one point Magellan's men were reduced to eating boiled leather). The natives with whom you trade or fight are offensive stereotypical caricatures bearing little resemblance to the South American coastal peoples that Magellan and other explorers actually met—and often enslaved or killed.

Interestingly, conversion of the natives to Christianity is not one of the onshore menu options, although that was one of the main goals of Magellan's expedition and ultimately proved to be his undoing. Nor do you

get a sense of what drove Magellan personally—his religious zeal, the Spanish desire for world domination, the rivalry between the Portuguese Magellan and his Spanish captains.

Still, if you are intrigued by the exploits of "so noble a captain," as Magellan's chronicler Antonio Pigafetta called him, take the helm. *Galleons of Glory* proves to be quite a seaworthy simulation.

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# REVIEWS

## COUNTDOWN

Anyone familiar with the PC adventure-game scene knows that every new entry is the most exciting, most appealing, most realistic game ever. Now, from Access Software, there's an adventure that may send you in search of new superlatives. It's called *Countdown*, and it's great!

*Countdown* starts with a mystery. You're Mason Powers, American agent, held in a Turkish prison hospital. There's something about a murder . . . somebody named Frank McBain . . . the CIA . . . the phrase *96 hours to save the world*. You really have no idea what's going on, thanks to a bad case of amnesia, but that's part of the fun. Mysteries are best unraveled alone.

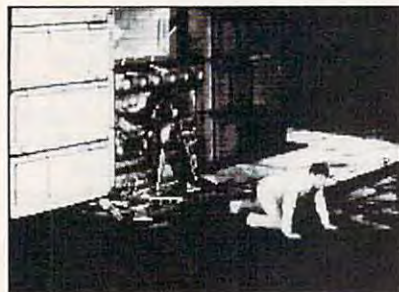
*Countdown* is billed as an interactive movie, and it definitely has impressive moves. Some you make yourself; some debut in automatic animated sequences. All of the plot develops on the game's fantastic 256-color VGA graphics screens, which are undeniably first-rate.

But there's more here than a lot of pretty pictures. *Countdown* has a strong interactive element, too. A key game component is searching—easy to do thanks to a straightforward interface. To check out an object, simply peg it with the crosshairs and click on the desired action (LOOK, OPEN, and so on). Now and then you'll pick up something that triggers an animated onscreen flashback. Pay careful attention. There may be valuable information in those tattered shreds of memory.

Next to careful searching, careful conversation is key. *Countdown's* characters are a chatty lot, but you've got to get them talking first. Some can be bluffed or hassled into helping you; others respond better if you're pleasant or sincere. You set the tone with the push of a button, choosing from an onscreen list of options. Choosing the right tone can determine whether you get much-needed information or a nasty insult and a door in your face. Oh, yes—an offer of cold, hard cash may help out, too.

If you keep at it, you'll eventually escape from your cell. After exploring lots of rooms and conducting lots of

conversations, you may even find your way out of the asylum. That's when you'll recover your handy-dandy CAD (spy talk for Computer Access Device). It slices, dices, and puts you in direct contact with the CIA computer at Langley, Virginia. This gives you vital access to background information and lets you do detective-style analysis, too. It even accepts E-mail, which other characters will send you from time to time.



Save the world from destruction and regain your memory in *Countdown*.

Make it this far, and soon you're on the road. New destinations (ranging from McBain's apartment to Cairo and Jerusalem) will become available as you discover them, and the travel screen lets you visit them by train or by air. Train trips are cheaper, but air is faster. Your choice will depend on your resources and on how much time is left.

Throughout *Countdown*, you'll appreciate the program's broad-based approach to sound. It features digitized sound effects, music, and speech and even offers synchronized voice and sound. It supports Ad Lib, CO-VOX, and PS/2 Sound Adapter cards, as well as the Sound Blaster. But even if you have no sound card, better-than-average sound is available (on machines running at a 6 MHz or more) thanks to *Countdown's* use of the RealSound system. This patented technology allows your MS-DOS machine to reproduce high-quality digitized sounds without any additional hardware. It works, too, although actual sound quality will be affected by the quality of your PC's speaker and to some extent by your clock speed. The results, while far from sound-card quality, are nonetheless a big improvement over what you'd get otherwise. *Countdown* also offers a no-

sound option, handy should you decide to go adventuring during those slack times at the office.

*Countdown* is a massive program, but hard disk installation is almost automatic. Be sure, though, that when you shop for a copy, you pick up the package with disks in your machine's format.

Challenging without being obscure, entertaining without being trite, and realistic without being tedious, *Countdown* is what every adventure game should be. There's even a number to call for help in case you reach what seems like a dead end. And with world-class graphics, *Countdown* may be the best reason yet to buy yourself a VGA board!

STEVE HUDSON

IBM PC and compatibles, 640K RAM, VGA; hard disk and 8 MHz or faster CPU recommended, supports major sound cards and mouse or joystick—\$59.95

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Featuring over 30 onscreen tutorials, *Professor DOS* covers a wide range of material. The first of seven sections includes lessons on the function and history of DOS and on how to use the *Professor DOS* program. Sections 2 through 7 cover commonly used commands, hard disks, the DOS 4.0 shell, batch files, advanced commands, and special tools.

Use your keyboard to access all tutorials, and take advantage of the

excellent onscreen index.

Each lesson begins with a statement of objectives and ends with a summary. The program presents information in a straightforward fashion, with prompts that provide continual assistance. Graphics enhance and clarify what you're being taught, and sound effects draw attention to specific concepts.

Constant interaction between you and *Professor DOS* assures that you'll understand what you need to understand. The program helps you assess your knowledge and understanding of the material in a variety of ways. Quizzes come in many forms, including true/false, fill in the blank, and matching columns.

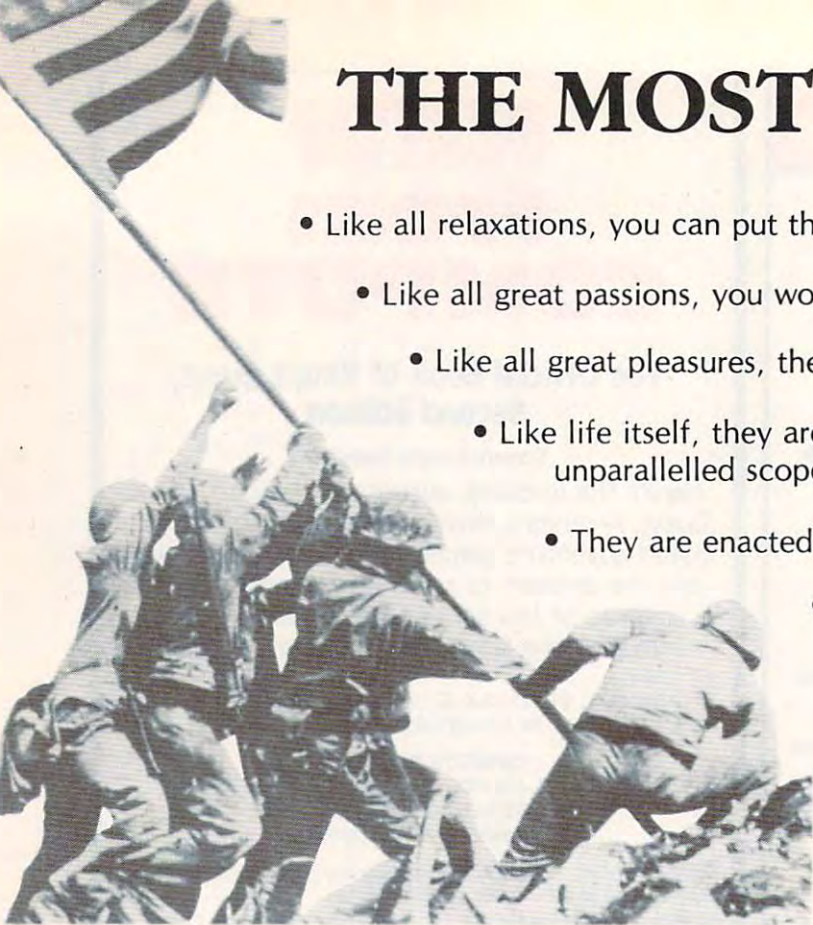
As valuable as this program is, it does present a few very minor difficulties. If you take too long to reply to questions or give incorrect responses, the program displays the correct answer. Unfortunately, the answers pop up so quickly that some users may not get a chance to reply before the system gives the answer.

Also, some information is phrased unclearly. Instead of indicating that a period precedes the extension of a DOS filename, the program suggests that the period is part of the

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The tapestry of these struggles was dark to its creators, its final outcome obscure and inevitably the result of a panoply of individual efforts. For example, the French were undone in Spain by *Napoleon's* inability to personally supervise the campaign.

### MUSKETS & MULES

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extension: "The extension can be up to 3 characters long and includes the period."). It would've been better to refer to the period as a separator between the filename and the DOS extension, which can be associated with applications in later versions of the operating system.



Learn advanced DOS commands by taking the professor's class.

The *Professor's* worthy companion—*SmartGuide for DOS*—may operate solo or work inside another program. With the stroke of a key, *SmartGuide* provides useful information about numerous DOS commands. Facts pertaining to other DOS topics, tips for users, and special tables (ASCII codes, for example) are available as well.

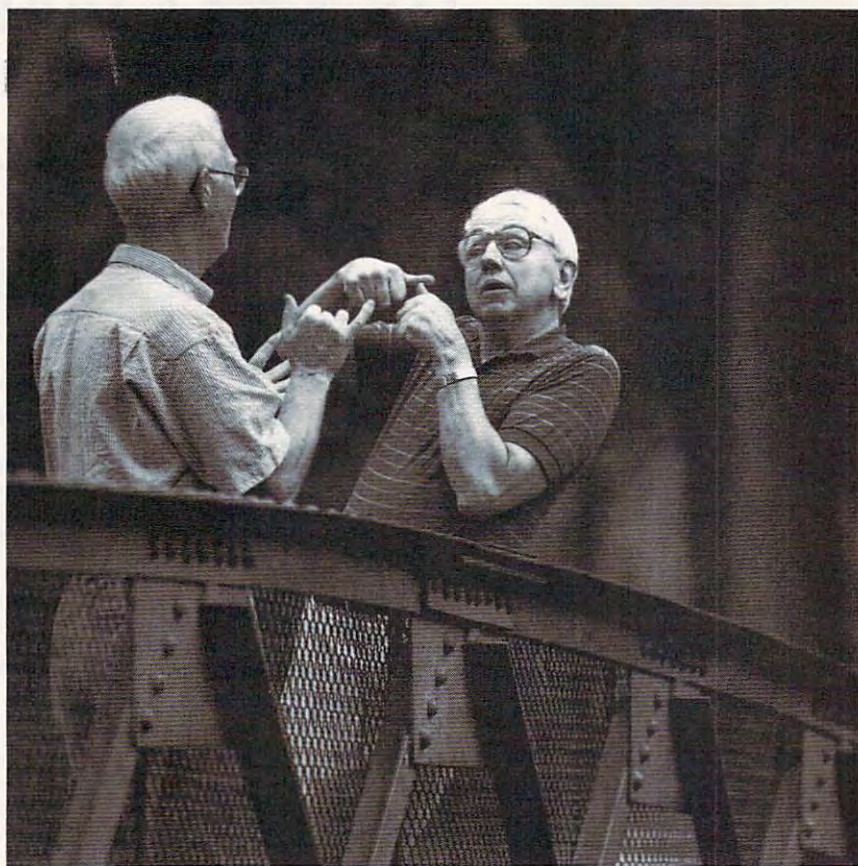
*SmartGuide* functions not only as a memory-resident reference tool but also as a timesaver. From the Utilities option, you may create a menu of your 15 most-used DOS commands. One keystroke will transport them to *SmartGuide's* line editor, and pressing Enter will send them to DOS to be executed.

Both programs are very easy to use, thanks to the expert design of the menus, the excellent tutorials, and the concise 31-page manual. Ease of use combined with solid educational and practical value make *Professor DOS* and *SmartGuide for DOS* musts for the perplexed beginner, the curious intermediate, and the would-be expert.

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to overcome.



## PICTIONARY

The transition from the tabletop to the desktop isn't always a smooth one, but the PC version of *Pictionary* does a remarkable job of capturing the frenzied drawing, wild guessing, and leap-from-your-chair gymnastics that the board game inspires. Not only that, but it serves as an excellent introduction to computer draw and paint programs.

*Pictionary* for the PC can be played by two to four teams or by one to four individual players. The picturer (the person who does the drawing) is determined by the play format



Draw on your parlor game skills.

you select. If you have two or more people on a team, a member of each team draws the picture on the screen. A word card reference number appears on the screen, and the picturer uses it to look up the word to be drawn.

Drawings are created onscreen using your mouse or joystick and an array of drawing tools. If necessary, you can use the cursor keys, but I don't recommend it. An option for practicing your drawing skills will help before the serious competition begins.

Teams have one, two, or three minutes to guess the word that the picture represents. Dual onscreen clocks (one digital, one analog) keep track of remaining time. If you or your team guesses correctly, then a small die is rolled toward the center of the screen. The computer moves your piece forward the indicated number of spaces, and then it's time for the next turn.

*Pictionary's* biggest limits are the size of the teams and the size of the screen. There's a practical limit to the

number of people you can crowd around a computer monitor. For smaller gatherings, it might work; but for large groups, it will prove frustrating.

You can play the game with the computer drawing the pictures and with you and a friend trying to guess what the picture is. Unfortunately, you only get one guess, which eliminates a lot of the excitement found in the board version. A better design would have allowed you to type in answers as the picture drawing progresses, rather than halting the action and making a single guess.

Despite this limitation, the computer is a remarkably human artist. It's fun to watch it draw pictures of varying skill and sophistication. And while the game lacks some of the board version's sizzle, it's nonetheless an engaging diversion. Board game purists will find it an interesting addition to their game shelf.

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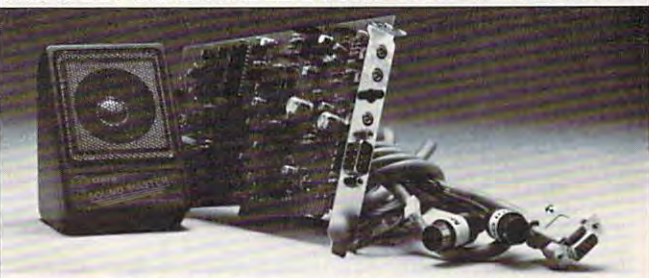
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# REVIEWS

speech capability, an optional underline mode lets your youngster follow along with the reader. Turn off the speech capabilities, and you still have three excellent stories beginning readers will love to recite to any parent willing to sit and listen. If you like, you can instruct the program to ask questions every few screens, just to make sure your child is really paying attention. Speech and music can be enhanced using a Covox Speech Thing, Creative Lab's SoundBlaster card, or the Ad Lib music card.

For all of its drama, sound, and graphics, however, *Storyteller* also has some omissions. For example, there's no printer support. Also, despite the generally excellent quality of the digitized voice, the speech routine is much too fast for preschoolers, even when slowed down by 20 percent. Skipped words or slurred speech, designed to provide dramatic highlights, often confuse beginning readers who must read every word. On a more aca-

demic level, the program's linear design doesn't take full advantage of the PC's ability to create an interactive environment.



**Little Red Riding Hood and the big bad wolf meet the electronics age.**

Whether you and your child enjoy the *Storyteller* depends a lot on your child's natural inclinations. Kids who enjoy the security of knowing what will happen in a story won't mind the program's linearity. It's fun to read the stories out loud, and the

clever animations are fun to watch. The reward sequences that come when children answer the questions correctly are positively enchanting. Children who are knowledgeable computer users may become bored after the initial thrill of hearing the computer talk. Parents will have to consider these factors when weighing the difference between this entertaining program and the hardcopy books that it brings to the PC.

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