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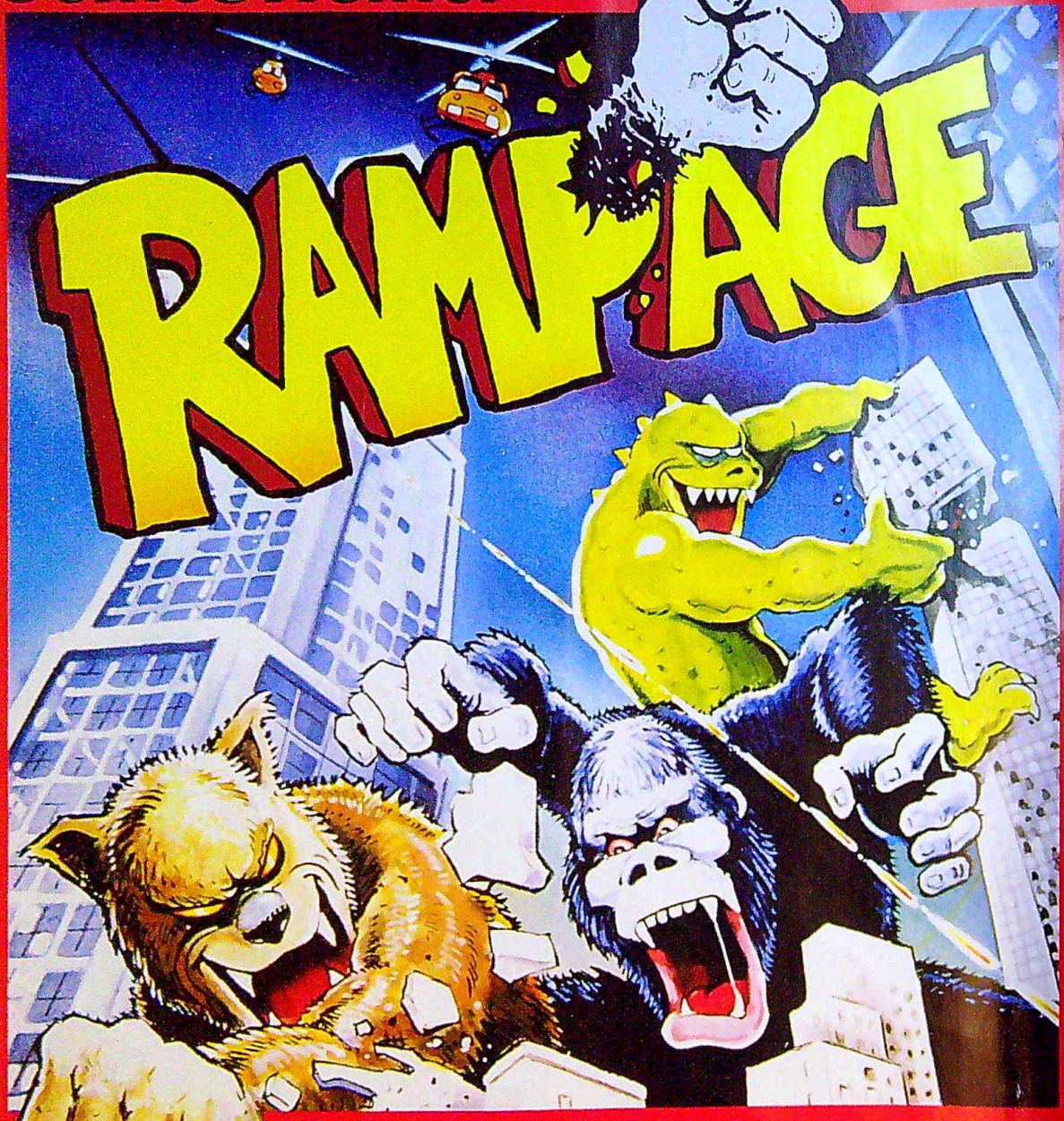

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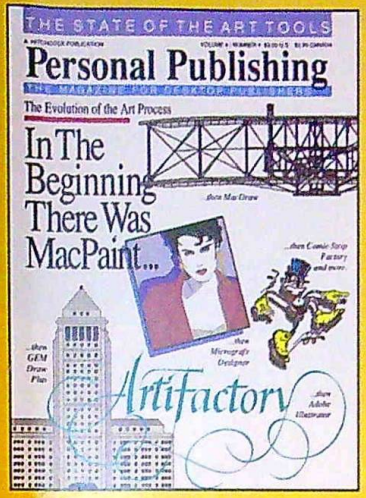

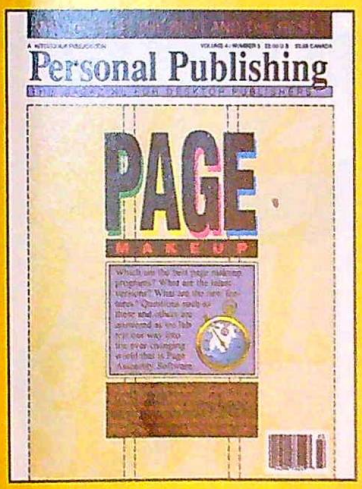

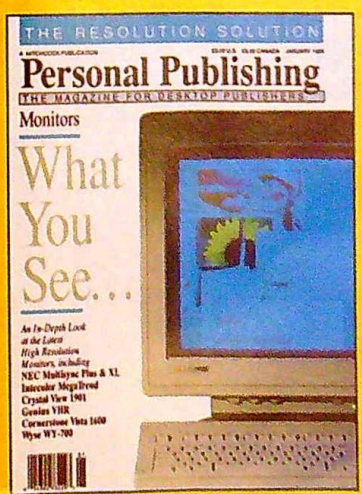

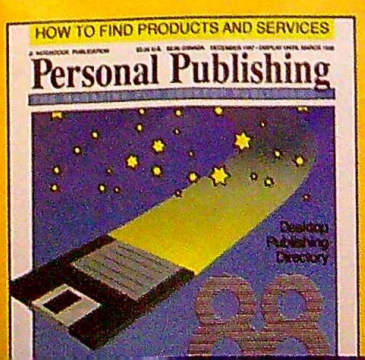

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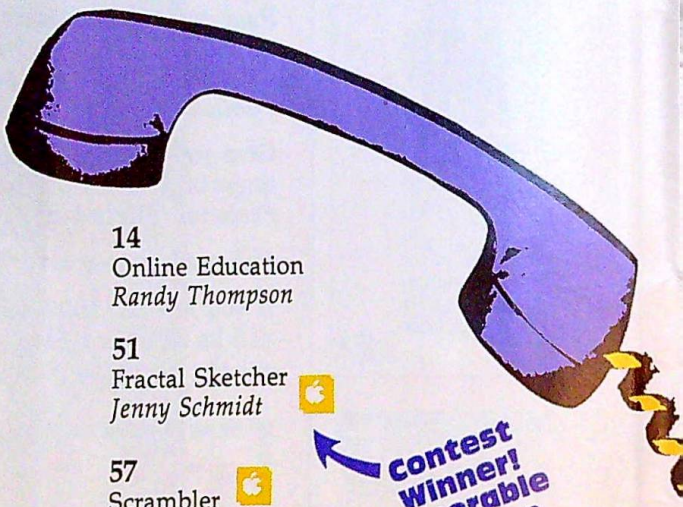

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Indicates Type-In Program

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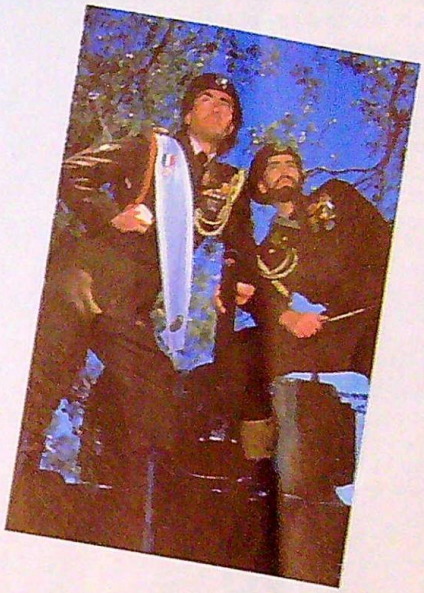

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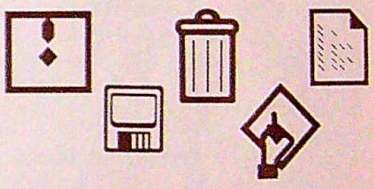

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Editor's Notes

Computer shows present one of the rare occasions where an editor gets to meet his or her readers face-to-face. This May, I had the opportunity to participate in one of the largest computer shows around, the AppleFest show in Boston. As a result, I also had the opportunity to meet and talk to many of you.

Most of you had something to say about one of our magazines (we were giving away issues of *COMPUTE!* and *COMPUTE!'s Apple Applications* at the show), and we received a lot of comments and compliments, and, of course, some complaints. More than anything else, however, we heard a lot of questions.

Questions were welcome, and I enjoyed answering them. The questions ranged from the benign, *Is this a new magazine?*, to my personal favorite, *Didn't you guys go out of business?* Overall, there were five recurring questions. To reach the widest possible audience, I've decided to answer them here.

Is this a new magazine? Yes and no. *COMPUTE!'s Apple Applications* has been around in one form or another for more than three years. Originally, *Apple Applications* started out as a special issue that came out only two times a year. The first issue appeared in the spring of 1985.

As our audience grew, we saw the opportunity to turn the magazine into a bimonthly publication. The first bimonthly issue appeared in December 1987. This was also the issue in which we announced our $10,000 programming contest (see page 16). So, while there have been only 6 regular bimonthly issues, *Apple Applications* has published a total of 11 issues.

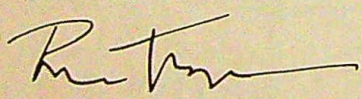
Do you cover the Macintosh? As of the August 1988 issue, we dropped all Macintosh coverage. Our surveys showed that very few of our readers own, or are planning to upgrade to, a Macintosh computer.

Do you cover the Apple IIGS? Starting with the Spring 1987 issue, *Apple Applications* has carried at least one IIGS article/program per issue. (If you check our contents page, you'll find a special Apple IIGS section.) As the IIGS increases in popularity, this coverage is likely to expand.

What's the difference between *COMPUTE!* magazine and *COMPUTE!'s Apple Applications*? Our flagship magazine, *COMPUTE!*, is nine years old this year. It's the leading magazine of home, educational, and recreational computing. *COMPUTE!* covers several brands of computers, including the Apple. Unlike *Apple Applications*, *COMPUTE!* does not publish type-in program listings. Instead, *COMPUTE!* magazine provides news, product reviews, and incisive features that are relevant to all computer owners.

COMPUTE!'s Apple Applications is COMPUTE! Publications' Apple II–specific magazine. It is, of course, the magazine you're reading now. Each issue contains 5–7 of the best Apple II type-in programs available. *Apple Applications* also provides product reviews, industry news, and interesting articles.

Didn't *COMPUTE!* go out of business? No, and as long as there are people interested in computers, I don't think it will.



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Biggest AppleFest Ever

Advertised as the "largest show ever for Apple's home and consumer markets," the AppleFest computer show in Boston drew more than 30,000 people, and more than 150 exhibitors set up booths on the 75,000-square-foot show floor.

Workshops and speakers were featured throughout the three-day event. Every morning, the show began with a speech from an industry leader. Keynote speakers included Charles Boesenberg, senior vice president of Apple Computer's U.S.A. division; Del Yocam, Apple's chief operating officer; and Steve Wozniak, cofounder of Apple Computer.

Several new products were announced at the Boston AppleFest: Apple Computer demonstrated its new telecommunications network, AppleLink–Personal Edition; StyleWare's (hopefully) soon-to-be released *GSWorks* was announced; Uptime introduced a new Apple IIGS–specific version of its monthly magazine-on-a-disk; Mindscape announced its new home/school line of educational programs; and Milliken unveiled its long-awaited *Medley* desktop publishing package.

The entire event took place in Boston's Hynes Convention Center. As AppleFest attendees and exhibitors found out, the recently opened Hynes was not exactly complete. Closed staircases, exposed junction boxes, leaks, unfinished walls, and the distant sound of power tools gave the building a very new look *and* feel. But apart from the building's raw state, AppleFest's exciting new products and interesting speakers made the show a *big* success.

More than 30,000 people attended the AppleFest show in Boston.

Brain Transplant Performed at AppleFest

Berkeley Softworks certainly had one of the most intriguing booths at the AppleFest show in Boston. Dressed in blue scrubs, rubber gloves, and masks, the "surgeons" at Berkeley Softworks performed what they called an Apple II brain transplant. What did they use as a replacement for the Apple II's gray matter? *GEOS (Graphics Environment Operating System)*, Berkeley Softworks' Macintosh-like operating system.

The Berkeley Softworks booth was equipped with an operating table, operating tools, and enough software engineers—or should I say, doctors—to demonstrate *GEOS* and several examples of *GEOS* applications software.

Demonstrated software included geoWrite and geoPaint, along with three new applications: *geoPublish*, a desktop publishing program; *geoCalc*, for production of customized spreadsheets and budgets; and *geoFile*, a user-friendly database.

All Apple computers were under constant supervision by the Berkeley Softworks surgeons, and conference attendees were not allowed to touch the patients—this was not a hands-on operation. It was apparent, however, that the software was near-complete and soon to be released.

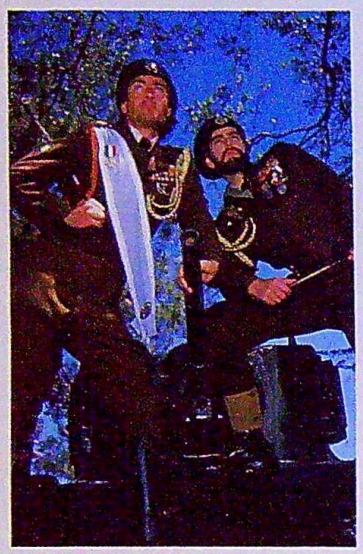
The *geoPublish* program was the most impressive. Combining *GEOS*'s graphics abilities with the features found in such desktop publishing programs as *PageMaker* and *ReadySetGo*, *geoPublish* looks like a serious publishing tool.

You can perform complex trigonometric, exponential, logarithmic, and financial calculations using *geoCalc*. One of *geoCalc*'s most unique features allows you to view two portions of the spreadsheet at once.

With *geoFile*, you design your own page format for entering data. Entry forms can even include graphics. *geoFile* searches, sorts, prints, and, when used in conjunction with geoWrite, creates customized form letters. ▷

Allies in Software

Electronic Arts (EA) has reached an exclusive distribution agreement with Strategic Simulations, Inc. (SSI). Under this agreement, EA will distribute SSI's software products through the Electronic Arts Distribution (EAD) channels in the United States and Canada.



EA's Trip Hawkins and SSI's Joel Billings join forces to reach the largest-ever software-distribution agreement.

SSI is best known for its strategic war-simulation games and fantasy games. Some of the company's better-known titles include *War Game Construction Set*, the Questron series, and the Phantasie series. Its latest title, *Advanced Dungeons and Dragons* (*AD & D*), is a bold new step for SSI. This will be the first role-playing game produced by SSI.

Trip Hawkins, president of EA, states, "This represents the largest affiliated labels deal made to date." Hawkins compared himself and Joel Billings, president of SSI, to two military generals. "Both Joel and I have been in this industry for more than ten years and, in that time, have learned that in some situations it is much more effective to join forces and make your advances as allies." He explained that Electronic Arts, with its mature distribution channels, is in position to ready the troops, and that SSI, with its pending release of the *AD & D* fantasy games, is in position to provide the troops with ammunition.

But the big question still remains: With SSI using EAD channels, will *AD & D*—which is under license from TSR—be as big a hit as EA's *DMCS*? Only time will tell.

RoomMate Wanted

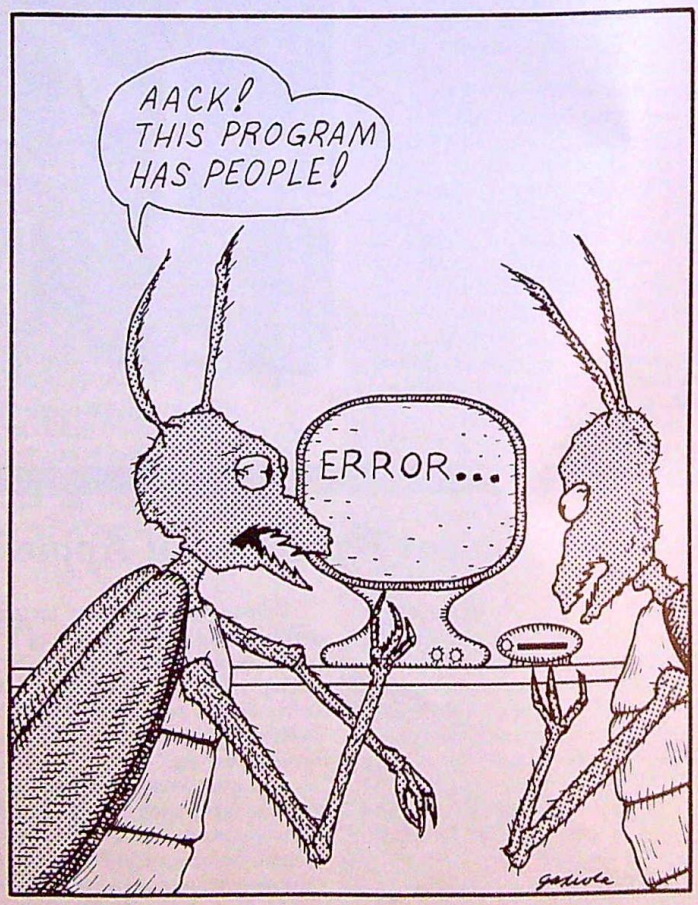
Nonsmoking Apple computer seeks roommate to aid in creation of sound and music. . . .

But, seriously, Bose—the makers of several quality audio products—has announced a special offer for Apple computer owners. When you buy a pair of Bose Pro RoomMate loudspeakers and either a Macintosh computer or Apple's new MIDI interface, you'll receive a free piece of music software. Participants may select from Great Wave's *ConcertWare + Version 4*, Great Wave's *Terpsichore*, Opcode's *MusicMouse*, Coda's *Macdrums*, or Intelligent Music's software package.

If you're interested in this deal but can't justify the purchase of a brand new Macintosh computer, you may consider the new MIDI interface, which works on both the Apple IIGS and Macintosh computers. This is a standard, no-frills interface that provides a MIDI IN and a MIDI OUT port, plus all the cables required for connecting your computer to other MIDI devices. The suggested retail price for Apple's MIDI interface is $99.

Pro RoomMate speakers come with two separate stereo inputs to accommodate two different sound sources. According to Bose, these speakers are perfect for computers, mini recording studios, and small keyboard or guitar amps. And their compact size should make them portable enough to accompany any computer system. The Bose RoomMate loudspeakers retail for $429.

For more information, see your Apple computer dealer or call (800) 526-5313 (in New Jersey, call 201-728-8080). This offer expires October 8, 1988. ▷



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Two New IIGS Games Announced

Among the many new product announcements at the Boston AppleFest were two Apple IIGS–specific games from Accolade: *Bubble Ghost* and *Pinball Wizard*.

In *Bubble Ghost*, players must blow a bubble through 35 different rooms in a castle filled with obstacles and hazards. Each room contains a variety of unfriendly items, including disembodied heads, electric fans, candles, shears, needles, knives, spikes, and scissors.

Pinball Wizard is an action-oriented pinball simulation and construction set for one to four players. You can adjust the level of difficulty by altering parameters such as slope, number of balls, and elasticity. The building set for *Pinball Wizard* features a parts menu with targets, flippers, bumpers, spinners, and discs. A paint menu allows you to illustrate the pinball table.

Also announced at the show was an Apple II version of Accolade's popular *Test Drive* program.

Both *Bubble Ghost* and *Test Drive* carry a suggested retail price of $34.95. *Pinball Wizard*'s retail price is $39.95. For more information, contact Accolade, 550 South Winchester Boulevard, Suite 200, San Jose, California 95128; (408) 985-1700.

Guiding a bubble through this castle is harder than it looks.

You can design your own pinball games with Accolade's Pinball Wizard.

Claris Buys StyleWare

Claris, Apple Computer's software subsidiary, made its first purchase of another company by buying StyleWare, a publisher of Apple IIGS software. This buy out took place just months after StyleWare's announcement of *GSWorks*,an *AppleWorks*-type program for the Apple IIGS.

AppleWorks is Claris's top-selling program for the Apple II. It is, so far, the best-selling Apple II program of all time.

GSWorks was demonstrated to the public for the first time at the AppleFest show in Boston. It is a completely integrated applications program that includes word processing, database, spreadsheet, page layout, graphics, and communications. Taking full advantage of the IIGS's advanced features, *GSWorks* operates in a Macintosh-like environment, with icons, windows, and pull-down menus. Now owned by Claris, *GSWorks* will be renamed *AppleWorks GS* and will be reintroduced this fall.

Claris will also continue to market StyleWare's popular *MultiScribe* word processor. aa

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The Death of the All-Text Adventure

Shay Addams

Expert adventurist Shay Addams looks into the recent demise of the all-text adventure game.

Software reviewers won't have the all-text adventure game to kick around anymore: When Infocom stopped producing such games in the spring of this year, they virtually wrote the final chapter in a saga that began nearly 20 years ago, when William Crowther invented a mainframe game that gave the genre its name—Adventure. This column will serve as a combination post-mortem, obituary, and memorial service, exploring the reasons for the death of the text adventure and what its fans can expect to find—or not find—in future interactive computer games.

Infocom President Joel Berez outlined why they won't do any more all-text games: "We still have a very solid core of loyal interactive fiction [Infocom's marketing term for the all-text adventure] fans, but we're not picking up new people at the rate we used to. And we're even losing some of the old people, who are perhaps growing tired of products that are in many ways very similar." Infocom's solution is to finally add graphics. "We shied away from them previously because early machines weren't capable of producing anything but the most cartoonish of graphics," says Berez, "and the memory and disk limitations required a tradeoff—if you added graphics, you had to take out something else. With today's more powerful machines and our new programming techniques, we feel we add to the games without taking anything away."

Infocom plans to do different versions for the Apple II and IIGS—naturally with superior graphics for the GS. But what *kind* of difference will graphics make in an Infocom adventure? That hinges on the author. Steve Meretzky, best known for *Planetfall*, says things won't change much in his first such creation. "What I'm working on now has everything that used to be in an Infocom game; it just has additional stuff as well.

"You can't really call our new games all-text adventures," Meretzky elaborates, "but you could still call them text adventures, because the interaction, for the most part, is still the same: You type sentences into the parser, and most of the output is still in text. It's really just a case of some graphic and sound enhancements—the heart of the Infocom game is still there. I'm using graphics as part of the puzzles in the game I'm working on, but there are still plenty of text puzzles. When it's out, I think you'll see that maybe 90 percent of the time there won't be any graphics; you wouldn't think it's any different from one of our previous releases. I guess you could say the all-text adventure is dead, but the text adventure has simply been enhanced."

A Zork-Master's Approach

With graphics now at their disposal, other Infocom authors have taken a more radical departure from tradition. Marc Blank, an Infocom founder who coauthored the original *Zork*, left the company a few years ago but is still writing for them and says his first game in the new style "uses graphics extensively to set the mood.

"It was intended to be that way from the beginning, and doesn't take anything away from the story. In Steve's case, the graphics are part of some of the puzzles—what I'm trying to say is that in no sense are they just 'tacked on' to add something else. In all cases, they are integrated into the game to add something to it. In my mind, the story is still the most important aspect. If, on the newer machines, you can put in graphics and sound that enhance the mood of the game or the puzzles—and you don't have to compromise anything in the story or interactivity—then I don't see any harm in it.

"There will always be a few people who will *harrumph* at our new games. But they're at least as much fun as they used to be, and to a large extent more so. In the long run, that's what's really going to matter. There will always be people who are going to posture, who'll say *I'll never buy an American car—they're crummy!*, and then they find one they like. They'll either keep grumbling or eventually back down.

"But someone who says *I won't play it because it has pictures* is not really giving it a fair shake. That's not a real rational attitude. The question is: Is it fun the way the old ones were fun? As long as it is, people will react positively. I think a lot of Infocom people will be skeptical or curious at first. Then they'll take a look at it and say, *Oh, this is fun.* I think they're going to be happy. I really think a lot of people have been expecting Infocom to do something really different, with graphics or a new kind of game, for years. It's not like we rushed into this."

Blank doesn't think anyone else will do all-text adventures now that Infocom has thrown in the towel (the one from *Hitchhiker's Guide to the Galaxy*, perhaps?). "It's really important to put this into context," he emphasizes. "When *Zork* came out, it was for machines that had at most 32K and an 80K disk drive. So we came up with a system to compress the text and code to get the greatest impact. Now that machines have 512K of memory and 800K drives and such great graphics, it makes sense to utilize that in a positive way. So I don't think it's likely anyone will come up with a game that takes less advantage of these new capabilities. Still, I wouldn't say that nobody will do it. I do expect to see fewer and fewer of them. A more interesting question is whether anyone will ever try to illustrate one of the classics, like *Zork*. My sense is that it would be like colorizing movies: They were written for the all-text format and are better games in that format."

Blank shares Meretzky's feeling about the possibility of writing another all-text game: "From the writing point of view, I'm still writing all-text games; I'm writing interactive stories. What I'm doing hasn't impacted the slightest on what I've done. It's not something that weighs on my mind heavily, except that obviously I have to describe to the artist what I have in mind in certain circumstances. But again, I still don't see any difference in what I'm doing. That may change in time. Over the long run, these sorts of things are going to be on CD-I players and what have you, with beautiful pictures and spoken text. In the long, long run, text will be replaced by audio."

A New Company's Perspective

"We took a real chance with *Dumont*," says Dr. Michael Breggar, director of software development for First Row Software, a new software house that released Michael and Muffy Berlyn's all-text *Dr. Dumont's Wild P.A.R.T.I.* at about the same time Infocom stopped doing such games. "I thought it was a chance worth taking because of the Berlyns' talent. They have a way of painting pictures with words and they do it very well, probably as good as anyone else. And people were calling and writing to say *Thank God somebody is picking up the ball from Infocom and the text adventure won't die*. And they've pleaded with us to keep doing them. When word got around that we were doing *Twilight Zone*, those people were hoping it would be a flat-out text adventure. And we're still getting calls like that every day.

"We didn't know Infocom was giving up on text adventures when we signed *Dumont*," Breggar looks back. "I thought there was life left in the genre and figured, *Why should Infocom be the only company doing them?* But the public response has not been great. The people who've purchased it love it—it's a problem of getting people to purchase it. I don't know if there are enough die-hard text adventurers left. So in that format, we won't be doing another text adventure.

"Maybe if I can ever figure out what I mean by a new form of text adventure—because I truly believe that in another two years the all-text adventure will resurface," Breggar predicts. "Not in the same form that we know today; if I could tell you what form it would be in, then I wouldn't be telling you (laughs)—I'd be out doing it and hoping I'm ahead of my time. When Activision did *Portal*, I thought that might be it, but it turned out to be an interesting idea, but it wasn't really a game.

"As an author, I feel saddened that the text adventure will go the way of the folk song and the radio play. But if the technology we have now were in place ten years ago, we would not have seen an all-words text adventure game. It would have been graphics adventures from the beginning. The fact is that the technology is here now that lets us create pictures worth looking at, and there's enough memory to hold them all.

"But I think we lose a lot of the literary qualities of a computer game, almost like taking the string section out of an orchestra, with a graphics adventure. The authors don't have to be as subtle as with a text adventure. I know this from doing *Twilight Zone* [also planned for the II and IIGS]. I wanted *Twilight Zone* to stand on prose alone. I wrote it as a text adventure with pictures, and there are a lot of pictures in it. I wanted someone to be able to turn off the graphics and have the same feel for what the pictures show. The thing that made it difficult was that throughout the game we had to evoke the feeling of 'The Twilight Zone,' which meant that our prose had to be up to par with Rod Serling's stuff—and that's tough to do. I ran into that when I did the *Sherlock* thing [Breggar's first text game was a mystery published by CodeWriter, now out of business] because I wanted people to think of Conan Doyle while they were reading it."

Dead, but Who Cares?

"What we've seen as a line of products called *text adventures* is absolutely, 100-percent-guaranteed dead," Michael Berlyn states flatly. (A science fiction novelist who learned BASIC so he could write his first text adventure in 1981, Berlyn went on to create *Suspended* and other hits at Infocom before becoming an independent developer. He's now a game producer at Electronic Arts.)

"Once in a while, we'll see one from a start-up company, or somebody will go, *Hmm, I wonder if there's a text adventure market out there?* and put one out. If a major company felt there might be a market, it would do a one-shot deal: They'd do a text adventure and decide whether to do another one based on the response. If it didn't sell, they might try again a year later. That's the way all large companies would handle it. Small companies may put themselves out of business dedicating themselves to the text-adventure market. I know I did.

"The all-text adventure died because the public's tastes change from year to year. That's not to say they get better or worse—just that they change. 'The Cosby Show' was really popular last year, but everyone's not rushing home to make sure they see it this year. Of course, there are hard-core fans who enjoy reading the same kind of book every time, science fiction fans who will not read a murder mystery, and mystery fans who read every mystery that comes out. Those are the kinds of people who continue to buy text adventures."

But Berlyn is unconvinced it's just text adventures that people are tired of. "Text-and-graphics adventures represent the kind of puzzle that people aren't really interested in any more. The game-playing public is more interested in a different kind of experience. There are still those who enjoy puzzle-oriented games. But I don't think they are a large enough base for software publishers to support. That's not Electronic Arts talking; that's me talking. I don't want to say that EA feels some people or a customer base isn't worth supporting. But it's evident that if no publisher is making them, then the base isn't large enough to make a profit on. And that's the bottom line.

"Role-playing games, however, are selling even better. I think people are moving on to role-playing games, anything from *Ultima* to *Wizardry* to *Bard's Tale*. It's a more statistically based game that's not as puzzle-oriented. Actually it's more interactive than text-and-graphics adventures. There's more to do, and I think people are activity-starved when they sit down at the computer: What they want—and this is my own theory now—is the largest amount of different types of activities.

"When I was writing text adventures," Berlyn recalls, "the primary thing I disliked was that the players were blocked from experiencing the rest of the game until they overcame some sort of obstacle, whether it was a mental puzzle, needing a key to get through a door, or whatever. Those kinds of obstacles were stopping people from playing the game they had paid money for. Those *game stoppers* are not as evident in role-playing games. There's so much to do around those game stoppers that people don't even mind them. And there's more involvement, more attachment to the characters in a role-playing game, which makes it more interactive. When you read a book, by the time you get to page 200, you are attached to those characters—if it's a good book. Your desire to put the book down and walk away from it and not finish it can be very low, because you don't want to end your relationship with the characters or the situations in that book. That's part of what text-and-graphics adventures never had—real character involvement."

Surprisingly, Berlyn seems ready to dance on the text adventure's grave. "For me as an artist, there are new things evolving that let me tell better stories than I could tell in text adventures. If you asked an Impressionist how he felt about the death of classical art, he'd say, *Thank God, let's move on.* And certainly the Surrealist said, *Time to move on.* And the Expressionist said, *Time to move on.* Well, I'm here to tell you it's time to move on. A lot of people still enjoy text adventures and get a lot of value from them, and they're not bad games. But I think that, for me at least, there are different ways of telling stories that are more interactive, more expressive, and more compelling." aa

Shay Addams coauthored the book The Greatest Games: The 93 Best Computer Games of All Time *(COMPUTE! Books) and is the publisher of* QuestBusters: The Adventurers' Journal.

Tips, Tricks, & Tidbits

Each issue, **"Tips, Tricks, & Tidbits"** *serves up a wealth of information on programming and applications software for the Apple II series of personal computers. If you have an interesting (and unique) solution to a programming problem, or a tip or tidbit on almost any popular application program, send it to Apple Tips,* COMPUTE!'s Apple Applications, *P.O. Box 5406, Greensboro, NC 27403. We'll pay $25–$50 for each tip we publish.*

Program Security

Here are a few protection schemes that can be used to secure your BASIC programs from unauthorized modification.

Permanent By-Line. Before typing in a program, enter a REM statement at line 10 that includes the program name, your name, and any other information that you'd like to include. For example, you might enter line 10 as

```
10 REM  *** "RADIOACTIVE MUTANT
   S" BY LIONEL H. LAYTON ***
```

Before typing in any other program lines, execute the following POKEs from immediate mode:

```
POKE 2051,255:POKE 2052,255
```

Line 10 has now become line 65535. Type LIST and see for yourself. This line cannot be removed by conventional methods; you can't type 65535, press Return, and expect the line to disappear.

Now you can continue to enter program lines and be assured that your REM statement is safe from deletion—by you or anyone else.

Scrambled Listing. At any point in a program where a response from the user is required, include a FLASH statement. If the user presses Control-Reset to exit and list the program, the listing will be scrambled—certain characters, like spaces and numbers, will not be displayed properly.

The program doesn't have to be waiting for input in order for this trick to work. As long as the computer is in FLASH mode when Control-Reset is pressed, the listing appears scrambled. As an example, enter the following program.

```
10 FLASH
20 GOTO 20
```

Run the program, press Control-Reset, and then enter LIST. See what happens?

No Way Out. Here's a way to keep people from breaking out of your BASIC programs. To use it, include the following as the first line in your program:

```
0 POKE 1010,102:POKE 1011,213:P
  OKE 1012,112:ONERR GOTO 0
```

With this line, there's no way to exit your program (except to turn the power off, of course). Both Control-C and Control-Reset automatically rerun the program.

If you use this technique to keep people from listing your program, you should avoid using the END statement. Use NEW instead. This way, the program code is erased before the program ends.

This trick works in DOS 3.3 only. If used in conjunction with ProDOS, Control-Reset not only reruns the program, it enters TRACE mode.

Lionel H. Layton

Rebooting Reset

Here's a slight variation on the "No Way Out" tip shown above. If you don't want people to break out of your programs by pressing Control-Reset, put the following POKEs in your program:

```
POKE 1011,0:POKE 1012,0
```

After executing these two POKEs, if you press Control-Reset, the computer will reboot.

Thomas McQuitty

Cloning Filenames

Copy II Plus's disk utilities program is an excellent alternative to the ProDOS Filer and Systems Utilities Disk. It does, however, have one unfortunate drawback: *Copy II Plus* doesn't check for duplicate filenames when renaming files. This means that you can rename a file so that it has the same name as another file on the same disk. Once you do so, only the first file listed in the directory is accessible via DOS.

Recovering from a "cloned filename" mishap is easy, however. Using *Copy II Plus*'s rename option, simply rename one of the duplicate files to another, unique filename. The best advice, of course, is to exercise a little caution when renaming files. Sometimes, you don't realize what you've done until it's too late.

Vincent D. O'Connor

Calculated GOTO

Here's a powerful one-liner that gives Applesoft BASIC a calculated GOTO command. To use it, simply set the variable *GL* equal to the line number that you wish to go to and execute the following code:

```
1000 POKE 10,76: POKE 11,85: PO
     KE 12,217: POKE GL, PEEK (
     GL):GL = USR (GL)
```

It may not look like it works, but it does.

Randy Thompson

Random ML

BASIC has a built-in, random-number function that returns 0 or 1. Many machine language programs, especially games, require something similar. Here's a short and easy-to-use routine that returns a random byte 0–255.

```
RAND  LDA  RN
      ASL  A
      ASL  A
      SEC
      ADC  RN
      STA  RN
      RTS
RN    DS 1
```

In this subroutine, *RN* contains the seed for the random-number generator. Every time you call this routine, *RN* is updated. The numbers are generated by multiplying *RN* by 5 and adding 1. This generates a good sequence of pseudo-random numbers.

To get a number in a different range, just call the subroutine until you get the desired result. Here's an example for getting a number between 0 and 99.

```
LOOP  JSR  RAND
      CMP  #100
      BCS  LOOP
      ...
```

The random number is returned in the accumulator.

William Chin aa

Sidewalk Surgery

Steve High

Improve your productivity by making a few simple modifications to your* AppleWorks *boot disk. No programming or surgical experience is required.

PRODOS and APLWORKS.SYSTEM are the two most important files on your *AppleWorks* boot disk. All the files are used by *AppleWorks*, but PRODOS and APLWORKS.SYSTEM do most of the work. They're also the files that require the most surgery or patching—two ways to modify a program's code—for top *AppleWorks* performance.

With a little software surgery, you can make *AppleWorks* friendlier, modify the way you switch between application programs, boot *AppleWorks* more quickly, and reserve extra ramdisk space for your own use.

To achieve all this, you need to use the correct version of ProDOS—the Apple II's operating system.

A Friendly DOS?

Many people have trouble understanding what an operating system is. That's because a good program, such as *AppleWorks*, hides the operating system from view. Simply put, an operating system controls your computer, allowing you to store data to and retrieve from disk.

AppleWorks uses the ProDOS operating system. ProDOS loads into memory every time you boot *AppleWorks*—by turning on the computer or by making a three-point landing on Open Apple–Control–Reset. That's why it's important to have the correct version of ProDOS on all your most frequently used boot disks.

Ideally, you should load ProDOS only once per computing session. In other words, you shouldn't have to reboot your computer just to run a different program. Among other things, rebooting your computer reloads ProDOS and destroys the data residing in a ramdisk.

Unfortunately, it isn't always easy to quit one program and start another without rebooting. For example, when you quit *AppleWorks*, you're greeted with the cryptic message ENTER PREFIX/PRESS RETURN TO ACCEPT /APPLEWORKS. This message is not an *AppleWorks* message; it's produced by ProDOS's exit code.

Entering the correct prefix and pathname can be difficult and frustrating.

Cosmetic Surgery

Beagle Brothers' *ProByter* manual proposes a humorous alternative to ProDOS's unfriendly exit message. (*ProByter* lets you change text messages in machine language programs, even if you have no machine language experience.) It suggests that you replace ProDOS's exit message with a blunt *Your computer has died. Turn it off and start over.*

When you turn off your computer and start over, however, the computer reboots and loads another, possibly different ProDOS into memory. There are several versions of ProDOS, and which one you use can be very important.

Fortunately, a far better solution is available, also courtesy of Beagle Brothers Software. It comes in the form of a tiny but crucial patch to the PRODOS system file. This patch, written by Alan Bird, replaces the ENTER PREFIX message with a menu that lists all the system files on your disk. You can choose your next application using the arrow keys and the Return key, or you can toggle through all your disk drives and subdirectories with the Escape key.

I have three ramdisks, two 3½-inch disks, one 5¼-inch drive, and two 20-megabyte hard drives. Alan Bird's version of ProDOS toggles through all of these devices in seconds. I never have to reboot ProDOS.

I use Bird's ProDOS all the time. But the other day, I accidentally booted a standard version of ProDOS. I didn't notice until I quit and found myself disagreeably confronted with the old ENTER PREFIX message, apparently back from the dead.

As demanded, I attempted to enter the prefix and pathname of the next application. Since ProDOS won't catalog disks at this point, I had to type it all in from memory. I must have done something wrong, however, because the computer responded with a beep and brought me back to the beginning of the whole nasty procedure. It's exactly this sort of thing that has led to the popularity of the three-point landing (*Your computer has died. Turn it off and start over*).

I decided to hang tough and continue to type pathnames. After two or three more tries, I managed to enter the correct pathname and escape ProDOS's death grip.

This type of user interface is just awful, and everybody, including Apple Computer, knows it. A new version of ProDOS is in the works, and may be completed by the time you read this. I'm 99-percent sure that our favorite computer company will excise the ProDOS exit-code defect. But even if they don't, you can easily update your *AppleWorks* disks yourself.

All Applied Engineering, Beagle Brothers, and The Software Touch disks published after 1987 contain Bird's modified version of ProDOS. Here's a list of some of the products that contain this improved system file: the desktop expander software that's included with Applied Engineering's memory boards, Beagle Brothers' *TimeOut QuickSpell*, and *Program Writer* from The Software Touch. If you have an older version of any of these programs, you can get an updated disk for only $10.

Using your System Utilities disk, copy PRODOS from any of the previously listed disks to your *AppleWorks* startup disk. Now when you quit *AppleWorks*, you can run a new application simply by pressing a few keys.

A BASIC Solution

If you prefer not to update ProDOS, you can always use BASIC to switch between applications. Once in BASIC, you can use the hyphen (-) command to execute programs without rebooting. For example, entering -/APPLEWORKS/APLWORKS.SYSTEM from BASIC boots the system file APLWORKS.SYSTEM.

It's not enough, however, to simply copy BASIC.SYSTEM onto your *AppleWorks* boot disk. Because APLWORKS.SYSTEM is the first system file on the disk, ProDOS will ignore

BASIC.SYSTEM (and any other startup program you may have). Instead, you should copy the files PRODOS, BASIC.SYSTEM, APLWORKS.SYSTEM, and all SEG files—in that order—from your *AppleWorks* startup disk to a new, freshly formatted disk. This will cause the computer to load BASIC before *AppleWorks*.

When you quit *AppleWorks* and ProDOS tells you to ENTER PREFIX, type **/APPLEWORKS**, press Return, and then enter **BASIC.SYSTEM** to return to BASIC.

Next Patient, Please

Like ProDOS, *AppleWorks* can be modified, as well. There are many commercial patches for *AppleWorks*, but here's one you can do yourself.

Let's say you'd like to turn on your computer in the morning, go get a cup of coffee, and have *AppleWorks* fired up and running when you get back. For this, you need a high-capacity drive, since *AppleWorks* is too large to fit on a standard 136K, 5¼-inch Apple disk drive. Examples of high-capacity drives are 3½-inch drives (like the Unidisk), hard disks, battery-backed ramdisks, and Transdrives (normally used with MS-DOS and a PC Transporter).

To get an automatic-boot disk, we once again rely on the skill and generosity of Beagle Brothers' Alan Bird, who has contributed the following short-but-sweet BASIC programs.

Important: Be sure to keep an unmodified version of AppleWorks *in a safe place. The following patch programs should be run on a copy of your original* AppleWorks *disk only.*

```
10 REM FOR APPLEWORKS 2.0
20 D$ = CHR$ (4)
30 PRINT D$;"BLOAD /APPLEWORKS/
   APLWORKS.SYSTEM,TSYS,A$2000"
40 POKE 14468,44
50 POKE 14148,208
60 POKE 14149,19
70 PRINT D$;"BSAVE /APPLEWORKS/
   APLWORKS.SYSTEM,TSYS,A$2000"
```

```
10 REM  FOR APPLEWORKS 1.1
20 D$ = CHR$ (4)
30 PRINT D$;"BLOAD /APPLEWORKS/
   APLWORKS.SYSTEM,TSYS,A$2000"
40 POKE 13138,44
50 POKE 13522,208
60 POKE 13523,19
70 PRINT D$;"BSAVE /APPLEWORKS/
   APLWORKS.SYSTEM,TSYS,A$2000"
```

```
10 REM  FOR APPLEWORKS 1.2
20 D$ = CHR$ (4)
30 PRINT D$;"BLOAD /APPLEWORKS/
   APLWORKS.SYSTEM,TSYS,A$2000"
40 POKE 13135,44
50 POKE 13518,208
60 POKE 13519,19
70 PRINT D$;"BSAVE /APPLEWORKS/
   APLWORKS.SYSTEM,TSYS,A$2000"
```

```
10 REM FOR APPLEWORKS 1.3
20 D$ = CHR$ (4)
30 PRINT D$;"BLOAD /APPLEWORKS/
   APLWORKS.SYSTEM,TSYS,A$2000"
40 POKE 13193,44
50 POKE 13855,208
60 POKE 13856,19
70 PRINT D$;"BSAVE /APPLEWORKS/
   APLWORKS.SYSTEM,TSYS,A$2000"
```

Using the BASIC editor, enter the program that corresponds to your version of *AppleWorks* and save a copy to disk. These programs remove all pauses from *AppleWorks'* startup sequence.

When run, Bird's patch program loads APLWORKS.SYSTEM into memory, changes three memory locations, and then saves the modified version to disk. You must have your *AppleWorks* disk inserted in a disk drive in order for this program to operate properly.

Reserving RAM

If you let it, *AppleWorks* will consume all of your ramdisk for its desktop. If this happens to you, try the following BASIC program. Type it in and save a copy to disk. You might have to change the prefix RAM4 in line 20 to match the name of your ramdisk.

```
10 D$ = CHR$ (4)
20 F$ = "/RAM4/TEST"
30 PRINT D$"OPEN";F$: PRINT D$"
   WRITE";F$
40 FOR I = 1 TO 10000
50 PRINT I: NEXT : PRINT D$"CLO
   SE";F$
```

Before booting *AppleWorks*, load and run this short BASIC program. It writes a temporary text file to the ramdisk, reserving approximately 48K of disk space. When it's done, run *AppleWorks* by typing **-/APPLEWORKS/APLWORKS.SYSTEM**. Next, choose Delete Files from the Other Activities menu and delete TEST from the ramdisk. You now have an extra 48K of ramdisk to use as you please.

This program is for RAM cards that use slots 1–7. If you have a combination 80-column card/memory card, such as RamWorks or Z-RAM, use the program supplied with your RAM board—not the program above—to partition memory.

Products mentioned in this article may be obtained from the following companies:

Applied Engineering
P.O. Box 798
Carrollton, TX 75006

Beagle Brothers
6215 Ferris Sq., #100
San Diego, CA 92121

The Software Touch
9842 Hilbert St., No. 192
San Diego, CA 92131 aa

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* Back issues of *COMPUTE!*, *COMPUTE!'s Gazette*, and *Apple Applications* are $6.00 each. The following issues are **NOT** available: ***COMPUTE:*** 9/81, 11/81, 2/82–12/82, 2/83, 4/83, 1/85. ***Gazette:*** 10/83, 1/84, 3/84–6/84, 9/84, 12/84, 1/85–7/85, 10/85. ***Apple Applications:*** Spring 1987.

* Single disks for *COMPUTE!*, *Gazette*, or *Apple Applications* are $15.00. NOTE: No disks dated prior to January 1986 are available.

* Back issues of *COMPUTE!'s PC Magazine* and *Atari ST Disk & Magazine* are $16.00 each. (These publications are available only as magazine/disk combinations.) The following issues are **NOT** available: ***PC Magazine:*** 9/87, 11/87. ***Atari ST Disk & Magazine:*** 10/86, 12/86.

* Disk/magazine combinations are $16.00.

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Online Education

Randy Thompson

There's a new form of education taking shape, and it has more to do with telephones than with textbooks.

Education comes in many forms. It can come in the form of a class, a book, a magazine, a filmstrip, a movie, or even a telecommunications network—that's right, a telecommunications network. With a computer, a modem, and some terminal software, you can take a course in business writing, *AppleWorks*, algebra—almost anything you want—all from your computer console.

Although most classes offered via modem are noncredit, they cover a wide range of topics, from BASIC programming to language arts. Courses taken through telecommunications networks are convenient, too. You get to work at home, at a time that's best suited to you. And, unlike correspondence courses, classes taken online offer the interactivity that all telecommunications services provide.

Online courses aren't an Apple-only phenomenon. But as an owner of the most widely recognized computer in the field of education, you might find more available to you in the way of courses and educational information than is available to owners of other computers. For example, the Apple Computer telecommunications service, AppleLink–Personal Edition, offers several of its own online courses.

The Apple University

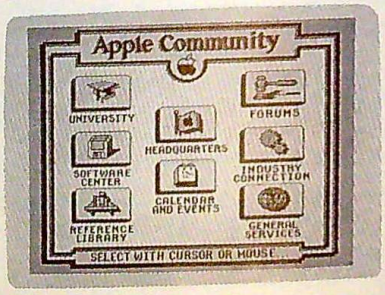
The Apple University is a special section on AppleLink–Personal Edition. It's available to all members and is located in the Apple Community section of the network.

Touted as the "first electromagnetic, hyperspace, unaccredited university for users of Apple computers," Apple University offers a variety of services. At its introduction, the Apple University is offering two classes—BASIC Fun and *AppleWorks*: Making Your Own Home Budget.

The first installment of BASIC Fun focuses on game programming. Students will learn how to incorporate graphics and sound in their own BASIC programs. *AppleWorks*: Making Your Own Home Budget provides instruction on using *AppleWorks* to create a net-worth statement, a cash-flow analysis, and a personalized home-budget system. Additional classes are in the works and may be available by the time you read this.

As an AppleLink–Personal Edition member, you enroll in classes while online. From the Apple University section, simply select Administration, and then enroll from AppleLink's user-friendly menus. It's here that you fill out the class enrollment form. Once the form has been processed, you'll receive confirmation through the network's own electronic-mail system.

Besides classes, the Apple University offers an administration area and chat rooms where students can interact with each other and their instructors.

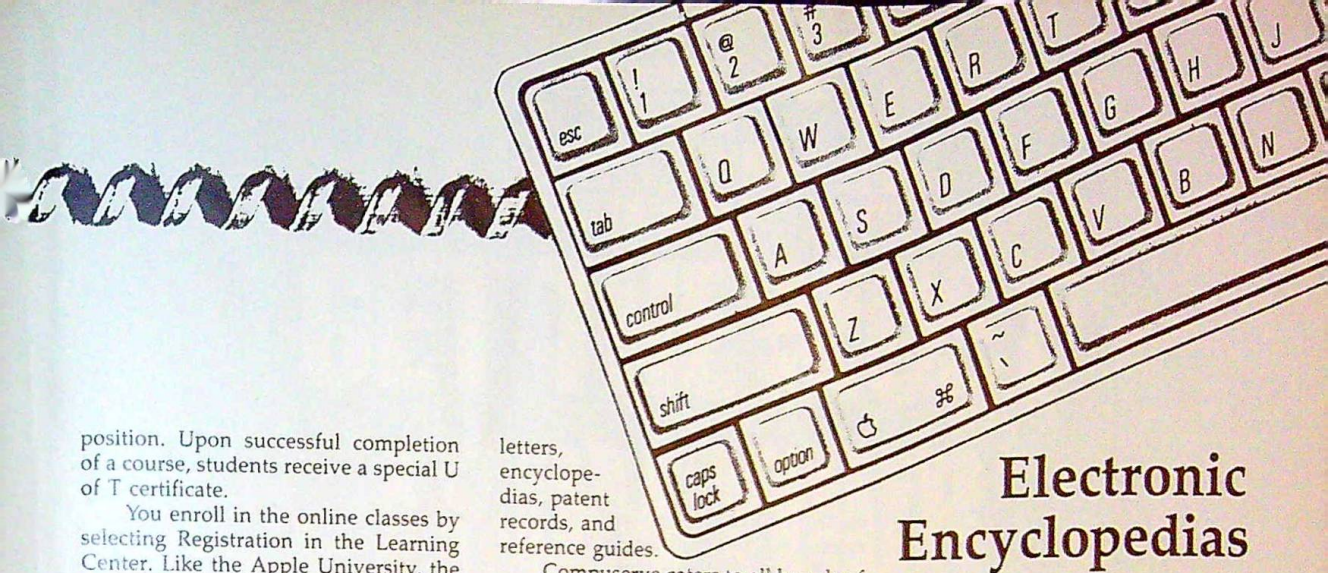


The Apple University option appears in the upper left corner of AppleLink–Personal Edition's online menuing system.

U of T

Also available on AppleLink–Personal Edition is the University of Tomorrow (U of T). U of T's electronic campus is located in the Learning Center section of General Services.

While courses provided by the Apple University are aimed purely at owners of Apple computers, the U of T offers classes of a more general nature. For example, the U of T's summer session offered courses in SAT preparation, computer applications, algebra, business writing, and English com-



position. Upon successful completion of a course, students receive a special U of T certificate.

You enroll in the online classes by selecting Registration in the Learning Center. Like the Apple University, the U of T has no tuition fees—the only requirement is membership in Apple's AppleLink–Personal Edition network.

To connect with AppleLink–Personal Edition, you need an Apple IIGS, a IIc, or an enhanced IIe that has 128K RAM, an 80-column card, and a Super Serial Card. AppleLink–Personal Edition also operates with a Macintosh 512K, Plus, SE, and II.

For more information on AppleLink–Personal Edition and the electronic universities described here, contact Apple Computer, 20525 Mariani Avenue, Cupertino, California 95014, (408) 996-1010.

CompuServe

How do the traditional online services stack up to the specialized educational networks? CompuServe, for one, has a lot to offer.

CompuServe offers a special Student's Forum where students of all ages can share ideas and interests. There's also a special section for teachers. The Student's Forum is accessed by entering GO STUFO.

GO EDUCATION brings you to CompuServe's Education area. Here you can access everything from educational games to valuable reference material such as *Grolier's Online Encyclopedia* (see the accompanying sidebar, "Electronic Encyclopedias").

From within the Education area, you have access to Peterson's College Guide—a database that cross-references more than 3000 colleges in the United States and Canada. Peterson's College Guide is a handy tool when the time comes to choose a college for your high-school-aged son or daughter.

For convenient access to more than 700 information databases, CompuServe offers IQuest. This area provides easy access to thousands of publications for use in research and reference. Source materials include magazines, indexes, conference proceedings, newsletters, encyclopedias, patent records, and reference guides.

Compuserve caters to all brands of computers, including Apple. For more information, contact CompuServe Information Service, 5000 Arlington Centre Boulevard, P.O. Box 20212, Columbus, Ohio 43220, (800) 848-8199 or, in Ohio, (614) 457-0802.

The Source

Like CompuServe, The Source doesn't offer classes per se. What it does offer is a weekly *chat* that can be just as educational as a class. Every Tuesday night at 6:00 Pacific time, the Apple Sig section of The Source hosts an online conference that's open to all members of the network.

Topics for the chats vary with the users' interests, because it's up to them to provide the questions. While conversations are usually limited to computer-related items—problems with *AppleWorks* or in locating software—almost any question is welcome. Occasionally, the chats feature a guest speaker.

To engage in the Tuesday night chat sessions, enter APPLESIG CHAT at the main command level.

The Source may be contacted through The Source, Source Telecomputing, 1616 Anderson Road, McLean, Virginia 22102, (800) 336-3366 or, in Virginia, (703) 821-6666.

Tomorrow's Teacher

As the class of 2000 enters the first grade, it's interesting to speculate as to the types of educational alternatives these students will find available. With today's online courses, online instructors, and online information, it's a safe bet that computer networks will play some role in their life of education.

Computers and computer networks will never replace schoolrooms or textbooks—no one wants that—but telecommunications courses and online reference materials are bound to be major forces in the learning processes of tomorrow.

Electronic Encyclopedias

One of the best sources of educational material is also one of the most available items on a telecommunications network: an encyclopedia.

Online encyclopedias are fast and convenient. The computer does most of the time-consuming searching, and you don't have to wait for the library to open to begin your research.

Almost all consumer networks offer access to an encyclopedia. The most common is *Grolier's Academic American Encyclopedia.* This electronic encyclopedia offers more than 30,000 articles and is updated quarterly so the information is kept up-to-date.

Here's a list of some of the larger telecommunications networks offering online encyclopedias. (Note that the phone numbers given here connect you with a human, not a computer.)

AppleLink–Personal Edition
Apple Computer
20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010

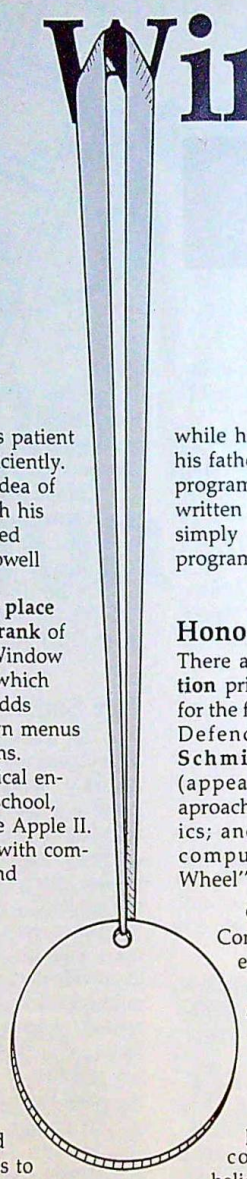
CompuServe Information Service
5000 Arlington Centre Blvd.
P.O. Box 20212
Columbus, OH 43220
(800) 848-8199;
in Ohio, (614) 457-0802

Delphi
General Videotex
3 Blackstone St.
Cambridge, MA 02139
(800) 544-4005;
in Massachusetts, (617) 491-3393

GEnie
General Electric Information Services
401 N. Washington St.
Rockville, MD 20850
(301) 340-4000

The Source
Source Telecomputing
1616 Anderson Rd.
McLean, VA 22102
(800) 336-3366;
in Virginia, (703) 821-6666

And The Winners Are . . .



Here they are: COMPUTE!'s Apple Applications' *$10,000 programming contest winners.*

COMPUTE!'s Apple Applications announced its $10,000 programming contest in the December 1987 issue, the magazine's debut as a bimonthly. The contest drew hundreds of responses from all types of programmers and from all over the country. And, although we received many fine programs, only six could win: a first-, a second-, and a third-place winner, and three honorable mentions.

First, Second, and Third

The **$5,000 first prize** winner is **Bruce E. Howell** of Missouri City, Texas, for his program "DataFlex," a full-featured, general-purpose database that lets you create your own data-input screens with as many as 50 fields per screen. DataFlex was published in our June 1988 issue.

Howell studied zoology in college. Although he has never taken a computer course, he used to read his roommate's PDP-8 computer manuals and write programs for that computer. After college, while waiting for residency status at dental school, he worked as a research associate at the University of Texas doing bioelectrical studies using various computers. In dental school, Howell programmed in assembly language, FORTRAN, and COBOL.

When the company that he worked for needed a data-entry package, Howell developed a method of placing input fields at specific locations on the screen. Years later, while designing an office-management system for his dental practice, he wrote a group of machine language routines for the Apple II. These routines used the computer's auxiliary RAM to access patient records quickly and efficiently.

By combining his idea of flexible-input fields with his high-speed RAM-indexed data routines, Bruce Howell created DataFlex.

The **$2,500 second place** prize went to **Randy Frank** of Iowa City, Iowa, for "Window Pack." Window Pack, which appears in this issue, adds windows and pull-down menus to your BASIC programs.

Frank is a biomedical engineer. While in high school, he wrote games for the Apple II. In college, he worked with computer-aided analysis and graphics.

"Window Pack is nothing more than a game with an idea behind it," says Frank. He says the idea for Window Pack came from working with Microsoft BASIC on the Macintosh. He had written similar routines to dress up his Apple II programs, and friends encouraged him to make these routines usable for the average person. The result is Window Pack.

Thomas Coleman, a tenth grader from Thetford Mines, Quebec, was awarded the **$1,000 third place** prize for "Cribbage," a graphically impressive version of the popular card game. Cribbage appears elsewhere in this issue.

Coleman, who began taking computer courses in grade 9, says that computers are mainly a hobby to him. During the summer, he rents an Apple II computer from his high school.

The idea for his program came while he was playing cribbage against his father. When he saw the ad for the programming contest, he had already written most of the program. The ad simply encouraged him to finish the program and send it in.

Honorable Mentions

There are three **$500 honorable mention** prize winners: **Chris M. Sebrell**, for the fast-action arcade game "Galaxy Defender" (August 1988); **Jenny Schmidt**, for "Fractal Sketcher" (appearing in this issue), a unique aproach to computer-generated graphics; and **Michael Franklin**, for the computerized word game "Word Wheel" (June 1988).

Chris M. Sebrell of Darien, Connecticut, wrote Galaxy Defender because of his love for arcade games. Sebrell is 18 years old and is currently enrolled at Eastern Connecticut University. His hobbies include programming, arcade games, and the martial arts. He says that the hardest part of writing the program was coming up with the idea. He believes that this is the biggest problem that programmers face.

Jenny Schmidt of Oshkosh, Wisconsin, wrote Fractal Sketcher because she wanted an "Etch-a-Sketch for fractals." Although Jenny considers computers her hobby, she has been taking computer classes for the past ten years.

Michael Frank, a 39-year-old research engineer and part-time pastor from Frewsburg, New York, based Word Wheel on a popular television game show. Frank began using an Apple II+ computer in the R & D lab where he worked. He took up programming as a hobby. aa

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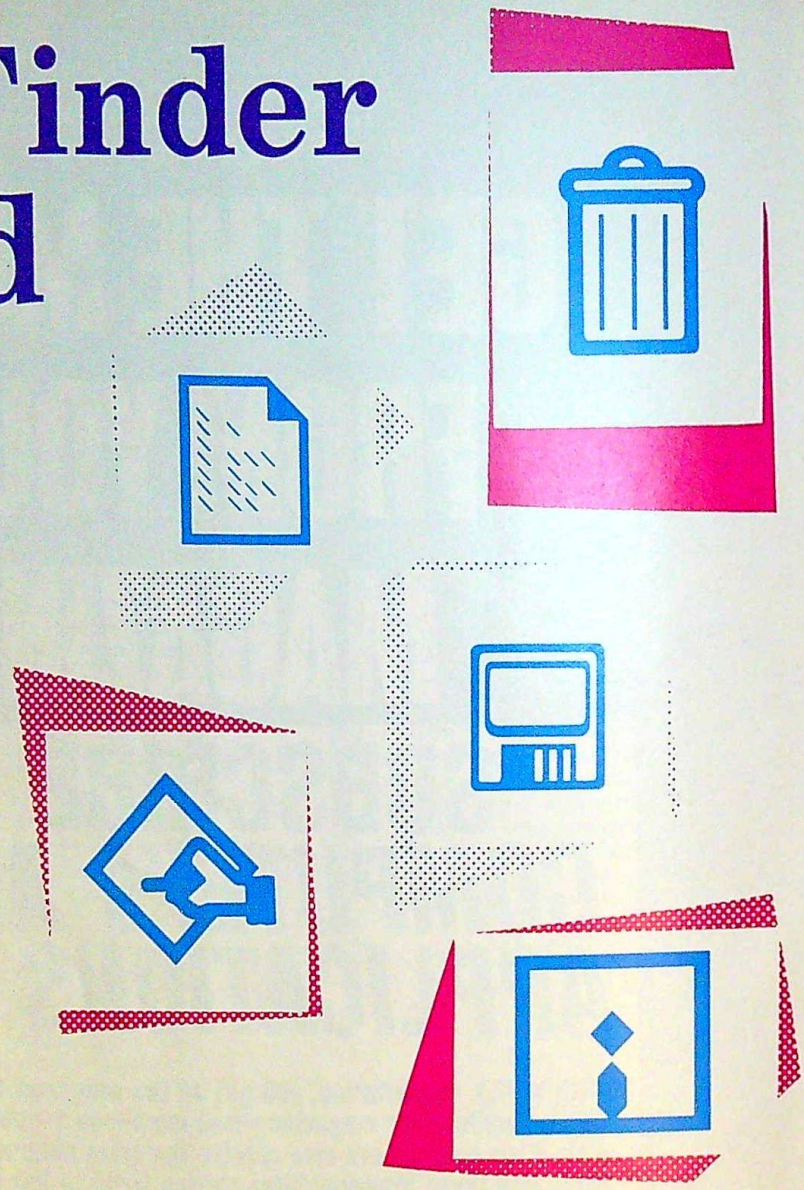
The Finder Found Out

THE IIGS FINDER—not just another pretty face.



Dan McNeill

Compared to other members of the Apple II family, the IIGS wears quite a different face. It's called the Finder, and it's a key part of your experience with the machine. If you're used to an earlier Apple II, you may find the Finder a little alien at first. But, like its Macintosh cousin, the IIGS Finder is easy to learn and pleasing to use, and it offers a grab bag of tricks.

The Finder is your gateway to the IIGS. It's a user-friendly, graphically pleasing interface that's full of useful features. It lets you conduct disk operations, like file copying, with little more than a sideways shift of your wrist.

The key to the Finder is the pointer, which is like a magic wand. You move it freely about the screen with the mouse. When it's above an item, you can click the mouse button and the item will respond. There is instant action. Touched items open up, fold down, or cause changes.

There are three kinds of items that react to the pointer's touch: icons, windows, and menus.

Icons

Icons are small pictures. They can represent disks, folders, applications, and documents. Applications and documents can be contained in folders, any of which can be contained in disks.

Disk icons are readily recognizable, as they resemble the devices they represent. They come in five different types: 3½-inch disk, 5¼-inch disk, 5¼-inch disk drive, hard disk, and ramdisk.

Folders resemble the manila folders in file cabinets. They are rectangles with a raised tab on the left where you would normally stick a name, such as *Taxes* or *Miscellaneous*.

Application icons can look like anything imaginable, but their appearance usually reflects the purpose of the application. A word processor icon, for example, might be a stylized pad and pencil.

Document icons vary widely too, but they are typically somewhat rectangular, like normal paper documents. They also usually drop strong hints as to their parent application. The icon for a word processing document, for example, might resemble a typed page.

Icons act like doorways. Each has a name on it, and each leads you further into the structure beyond. Disk and folder icons open up to reveal other

User Interfaces

A Programmer's View

For a programmer's perspective of icon-based interfaces such as the IIGS Finder, we've pulled an excerpt from the COMPUTE! book Advanced Programming Techniques for the Apple IIGS Toolbox, *by Morgan Davis and Dan Gookin.*

The desktop environment is the latest, supposedly best way for a computer to communicate with a human. It's called *visual communication.* Rather than typing names and commands, you do things visually with the mouse and with graphic icons that appear on the screen.

You might think that this setup would mean anyone could use an Apple computer immediately. You would be wrong. People still have hangups about computers. No matter how easy you make them, some people would have you throw pitchforks at them before they would use a computer.

A Standard Interface

The uniting idea behind the Macintosh and Apple IIGS desktop, windows, menu bars, icons, and dialog boxes is to give all software applications a universal look and feel. Apple wants its computers to be easy to learn and to use. To accomplish this, all software should follow the same conventions and use the same or similar methods of accomplishing many tasks.

Witness the rabble of MS-DOS software, with its many programs and varying uses of graphics, the keyboard, and other conflicting methods of operating a program. The Human Interface Guidelines [a set of rules defined by Apple Computer that describes how a graphics interface should operate] provide sanity and order in an operating system that might otherwise be just as confusing as the rest.

Following the guidelines is not called *user-friendly* programming. Instead, Apple refers to it as *user-centered* programming. Most programs are written by programmers who wish to amaze other programmers. If you're a programmer, you've probably been frustrated with the way things are supposed to be done using the desktop interface. After all, wouldn't it be much easier and faster to type an MS-DOS–like command such as COPY A:*.* C: \ROOT \DEV /B?

Perhaps you have noticed that the user interface of many non-Apple programs is poorly designed. Among the dozens of word processors available for MS-DOS computers, there are radically different procedures to perform the same tasks. Some word processors have their own conventions and, for the convenience of users, allow alternate keypresses to mimic other word processors. Some even have vastly different sequences of commands within a single program to achieve similar results. This is the sort of disarray that naturally occurs when there is no enforced standard.

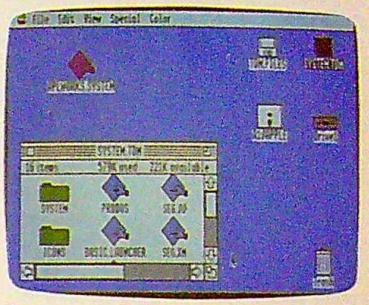
Apple has worked on its Human Interface Guidelines for years. The idea behind the guidelines is to make all programs running on Apple computers behave the same, or enough alike that you only need to learn one technique for accomplishing similar tasks in several programs.

Hopefully, all future IIGS applications will make use of the graphics interface provided by Apple. And, hopefully, they will all follow the standards set forth by Apple—we wouldn't want to have to throw pitchforks at anyone.

icons, while application and document icons call up actual programs.

You open an icon by placing the pointer over it and double-clicking the mouse (pressing the mouse button twice, rapidly). You can double-click a disk icon, revealing a screenful of other icons. If you double-click a folder, you see more icons. Folders can contain other folders, but eventually you reach a point where you find only application or document icons. Double-clicking either of these gets you into the program.

Icons do not exist solely to be opened. You can move them about. First, seize the icon by placing the pointer over it and holding down the mouse button. (This blackens the icon, showing that you've selected it. A selected icon becomes the target of the next operation.) Then move the mouse, and the icon follows—you're dragging it. When you have the icon where you want it, release it by letting up on the mouse button. It stays there, but remains selected. To deselect the icon, click the pointer elsewhere.



Icons can look like anything—disks, folders, and even trash cans.

Why move icons? Their location can affect their status dramatically, as it does when you haul them to the Trash.

The Finder's Trash serves the same function as a real trash can: It allows you to throw things away. To erase a document, first drag it atop the Trash icon. The icon disappears, but not for good. Like a normal wastebasket, the Trash does not destroy the file, but merely stores it for later disposal. You can view the contents of the Trash by double-clicking it. If you have second thoughts and want to rescue the document, open the Trash and drag the icon back onto the desktop—the Finder's screen. To erase it forever, select Empty Trash from the Special menu.

Moving icons also lets you organize and copy your documents.

To bring order to a screen that's full of icons, you can place them in folders; simply drag them on top of the folder icons. This act reduces the number of items cluttering the desktop and streamlines many disk operations.

You can back up a disk by moving its icon on top of the icon of the destination disk or into the window of the destination disk. You can copy a document from one disk to another using the same process: Simply drag the file icon atop the disk icon. It's easy, painless, and, once learned, it's never forgotten.

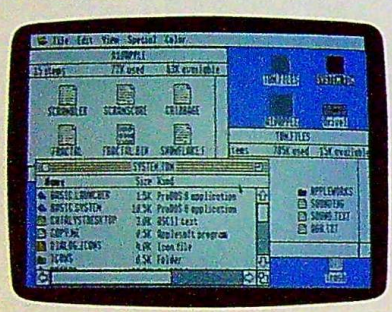
Windows

Windows are opened icons. They're everywhere, and they're so pervasive that you may scarcely notice them. For instance, when you double-click a disk icon, it opens into a window, and when you double-click a folder, yet another window appears.

Windows have their own special properties. You can control their size and placement on the screen, as well as their contents, using symbols attached to the window.

The most important symbol is the close box—a tiny square in the upper left corner of a window. Click it, and the window vanishes back into its icon. This operation is the reverse of double-clicking the icon.

In the lower right corner of the window lies the size box, which shows a small rectangle overlapping a larger one. It's really a before-and-after shot, since the size box lets you turn a small window into a larger one, and vice versa. You place the tip of the pointer over the box and press the mouse button. You have now grabbed the corner of the window, which instantly becomes totally elastic. Move the mouse, and the window grows or shrinks until its new size pleases you and you release the button.



With windows, you can arrange files and view information where and in the manner you like.

The zoom box, in the upper right section of the window, shows a small square nestled in the corner of a larger one. It resembles the size box, and with reason, since it's a special kind of size box. Click on it, and the window quickly fills the entire screen. Click again, and it retreats to its previous size.

Windows can have two different kinds of bar symbols: title bars and scroll bars.

The title bar stretches across the top of the window and displays four parallel lines, broken in the center by the title of the opened icon. The title bar is not just a nameplate. It lets you move the window. You place the pointer on it and drag, and the window tags along. Used with the size box, the title bar lets you position windows anywhere you like.

The title bar also shows which window is active—only one window can be active at a time. The active window is the one the Finder focuses all attention on. Opening an icon automatically generates an active window, but you can activate others at will. To do so, simply click the pointer on the window of choice. The window will leap in front of the others, with its title bar touting the bold parallel lines.

Scroll bars run along the right and bottom of the window. They come into view only when the contents of a window exceed its size. Icons, text, and other types of data can extend in all directions beyond the window, in which case the window acts like a viewfinder over a roll of microfilm. The scroll bars are the knob that shifts new material into view.

Scroll bars are easy to use. You just place the pointer on the proportional scroll box (the blank rectangle within the bar) and pull in the direction you want the window to move. The scroll box is *proportional* because its size changes in proportion to the ratio of window size to window contents. For example, if the scroll box covers the top half of the scroll bar, you're viewing the top half of the window's contents. If it occupies the middle third, you're looking at the middle third.

To move the window's view by specific increments, click on the arrows that appear at the end of each scroll bar. Hold down the mouse button, and the window scrolls its contents until the button is released. When a window contains information such as text, these scroll arrows are very handy.

Pull-down menus are quick, convenient, and always available.

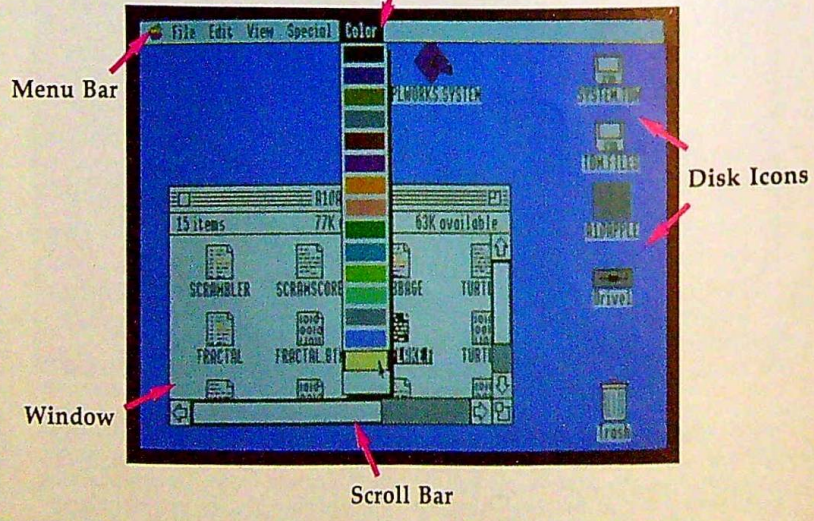
Pull-Down Menus

While much can be accomplished with icons and windows, there's a lot more to the Finder than opening, closing, and deleting files. To access these extra features, you use the menu bar.

The menu bar appears as a string of words stretched across the top of the Finder screen. These words are menu titles. The menus themselves lie hidden from view. To see one, place the pointer over the menu title and hold down the mouse button. A list of menu options drops from the top of the screen. To select an option, drag the pointer down to it and release the mouse button.

Pull-down menus are good for two reasons: flexibility and constant availa-

The Finder Desktop



Here are the various elements that make up the Finder's desktop.

bility. Menus can offer a variety of options, and many program functions, such as closing a window, can be accomplished via a menu option or by manipulating icons—it's your choice.

Since the pull-down menus are always available, you don't have to memorize instructions or commands; you simply pick from those offered to you by the IIGS.

Hints and Tips

The IIGS manual devotes 105 pages to the Finder, and hidden within these pages are several hints, tips, and shortcuts for operating the Finder. Some of my favorites are described below.

- **Multiple selection.** Often you'll want to perform the same operation on several files, such as copying multiple files from one disk to another. The Finder lets you select several icons at once by dragging the pointer across them or by holding down the Shift key and clicking each icon separately. Once they're all selected, you can drag one of the icons, and the rest will follow.
- **Combining disk files.** Normally, when you copy a disk by dragging one disk icon onto another, you replace the contents of the destination disk with the contents of the source disk. There are times, however, when you just want to combine the files from one disk with those of another. Instead of copying each file separately, hold down the Option key as you drag one disk icon atop the other. A dialog box appears, giving you the option to combine the files in the root directory, place the files in a separate folder, or replace the contents of the destination disk with the source disk.
- **Color-coded files.** Using the Finder's Color menu, you can change the color of your icons. You can make files of different types display different colors, color-code files by which disk they come from, or change your icon's colors just for the sake of livening up the screen. To use the Color menu, select the desired icon(s) and pick a color from the Color menu.
- **Keyboard shortcuts.** If you're a fast typist, you may find that menus slow you down. For this reason, the IIGS offers a number of keyboard shortcuts. To use them, hold down the Open Apple key and press D for Duplicate, E for Eject, T for Empty Trash, I for Get Info, N for New Folder, O for Open, Q for Quit, R for Remove, and A for Select All.
- **Activating dimmed commands.** A dimmed command is not available for immediate use, and sometimes you may wonder why. The Finder gives you a quick way to find out: You simply select the option. A dialog box appears, explaining what you need to do in order to activate the option.
- **Closing windows quickly.** Before turning off the computer, many people like to close all the windows on the Finder screen—it's tidier that way. You could click the close box for each and every window, but there's an easier way: Choose Close All from the File menu and each open window will automatically close.
- **Scrolling through windows.** If dragging a window's scroll box scrolls the window's contents too far, and clicking the arrows scrolls it too short a distance, try clicking in the gray area of the scroll bar itself, above, below, left, or right of the scroll box. This will scroll the window in the chosen direction by exactly one windowful. If you hold the mouse button down, you will leap through the window's contents a window at a time.

The IIGS Finder gives your computer a friendly yet powerful interface. It does the dirty work so you can focus on the task at hand. After using the Finder, you may never turn back.

Dan McNeill is a freelance writer who recently purchased an Apple IIGS. He's currently working on a book about Macintosh graphics. aa

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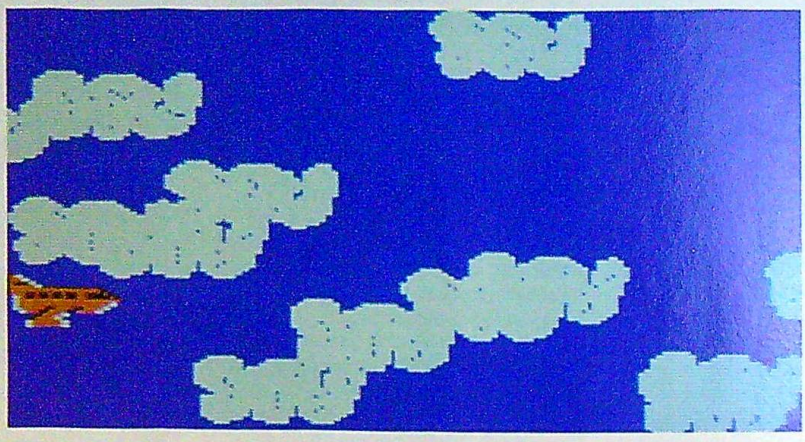

Air Rescue

Stephen A. Cordon

Combining machine language speed with smooth-scrolling color animation, "Air Rescue" is as fun to watch as it is to play. The program runs on any Apple II–series computer in 40-column mode. Requires DOS 3.3.

Before you can join the elite Air Rescue emergency flight team, you need to pass a few tests. The program presented here is just one of them.

You begin your training at 35,000 feet above the Earth, in a cargo plane full of heavy equipment. If this were a normal pilot's test, you could ignore the cloud cover and focus your attention on more important things, like speed, altitude, and heading. But this isn't your average training program, and this isn't a normal test. To achieve a high rating, you have to dodge clouds—not enemy fighters, alien spaceships, or stray comets, but clouds.

Type Before You Fly

"Air Rescue" is written entirely in machine language, so you'll need to use "Apple MLX," the machine language entry program found elsewhere in this issue to enter it. You don't have to know anything about machine language programming to type in the game. All you need is a copy of Apple MLX on disk.

Before loading MLX, type **POKE 104,32:POKE 8192,0**. Run MLX, and when it prompts you, respond with the following values:

```
STARTING ADDRESS? 0900
ENDING ADDRESS?   196F
```

When the options menu appears, choose E to type in the program, and then enter the address where you'd like to start. (If you're just beginning to enter Air Rescue, type **0900**.) After you've finished typing in the data, be sure to save a copy to disk. To run the program, make sure your computer is in 40-column mode; then enter **BRUN** *filename*, where *filename* corresponds to the name used to save the program.

Flight Controls

You can control the plane with either the keyboard, a joystick, or a paddle. At the title screen, press K for keyboard or P for a joystick or paddle. As soon as you press one of these two keys, the game begins.

If you're using the keyboard, the A key moves the plane up, and the Z key moves it down. To stop upward movement, press Z. Likewise, the A key stops all downward movement. By pressing one of these keys more than once, you can increase your vertical speed.

If you selected paddle control, turn the knob clockwise to move up, counter clockwise to move down. If you're using a joystick, move the joystick right to move up and left to move down.

You may pause the game with the Escape key. To resume play, press any key.

While cruising across the screen, the computer makes a *tick* sound for every 10 points that you receive (points are determined by distance). Your score, along with the high score, appears at the top of the screen in large orange letters. If you prefer, you can press S to toggle the sound off and on.

To exit the program while in flight, press D (Done). Pressing D from the title screen exits the program and returns you to BASIC.

Strategy

It may look easy, but avoiding clouds can be quite difficult. They come straight at you, and some move faster than others. The best advice is to look ahead, keep a sharp eye on the clouds, determine the safest possible path through the clouds, and then make your move.

When avoiding clouds, don't worry about the body of the plane or its wings; it's the front of the aircraft that's critical. As long as the very tip of the plane avoids contact with the floating humidity, you're safe.

Page Flipping

Air Rescue uses two techniques to get smooth, flicker-free animation. First, all the shapes are drawn in machine language by writing directly to the high-resolution screen. Second, the program uses a technique called *page flipping*.

Page flipping means a program displays one hi-res screen while the other hi-res screen is being redrawn. When the hidden screen is ready, it's *flipped* with the current one. This way, you never see the shapes being redrawn—they appear onscreen instantaneously.

Program Key

Key	Function
P	Play game using paddles
K	Play game using keyboard
A	Move up or stop downward movement
Z	Move down or stop upward movement
S	Toggle sound off and on
D	Stop play or exit program
Escape	Pause game

Note: Pressing the A and Z keys more than once, or holding them down, causes the plane to move up and down faster.

Air Rescue

For mistake-proof entry, use "Apple MLX," found elsewhere in this issue, to type in this program.

```
0900: A9 00 85 06 85 00 85 01 30
0908: 20 E2 F3 2C 52 C0 A2 55 54
0910: 8E 97 0C A2 2A 8E 98 0C C3
0918: A0 02 B9 B1 0A 8D 92 0C 05
0920: A9 00 85 24 20 C8 0A FF 32
0928: FF FF FF FF FF FF FF FF 3A
0930: FF FF FF FF FF FF FF FF 42
0938: FF FF FF FF FF FF FF FF 4A
0940: FF FF FF FF FF FF FF FF 52
0948: FF FF FF FF FF FF FF 00 5A
0950: 88 10 C7 A0 00 A9 55 A2 A1
0958: BF 20 B4 0A A0 27 A9 2A A8
0960: A2 BF 20 B4 0A A0 12 A9 A3
0968: 55 A2 30 20 B4 0A A9 20 17
0970: 8D 92 0C A9 2A 8D 97 0C CC
0978: A9 55 8D 98 0C A9 0A 8D 98
0980: 92 0C A9 08 85 24 20 C8 5A
0988: 0A 94 97 FB FC 00 A9 19 CB
0990: 8D 92 0C A9 02 85 24 20 B8
0998: C8 0A FD FE 8E 97 00 A9 BD
09A0: 55 8D 97 0C A9 2A 8D 98 1E
09A8: 0C A0 12 8C 92 0C A9 0C 18
09B0: 85 24 20 C8 0A E9 F2 00 FC
09B8: A9 1D 8D 92 0C A9 06 85 5A
09C0: 24 20 C8 0A E5 F3 E3 F5 63
09C8: E5 8E 94 00 A0 14 84 24 86
09D0: A9 0B 8D 92 0C 20 C8 0A D1
09D8: D3 E3 EF F2 E5 A0 BD 00 28
09E0: A9 1D 8D 92 0C 84 24 20 C4
09E8: C8 0A C8 E9 E7 E8 A0 A0 5E
09F0: BD 8E 00 20 99 0C 20 23 E7
09F8: 0B A9 58 8D 92 0C A9 02 F8
0A00: 85 24 20 C8 0A 8D 95 95 B7
0A08: 95 C3 EF F0 F9 F2 E9 E7 3C
0A10: E8 F4 A0 B1 B9 B8 B8 A0 C7
0A18: C3 CF CD D0 D5 D4 C5 A1 F7
0A20: A0 D0 F5 E2 EC AE AC A0 C1
0A28: C9 EE E3 AE 8D 8D 95 95 A7
0A30: 95 95 95 95 95 95 95 95 44
0A38: 95 C1 EC EC A0 D2 E9 E7 FF
0A40: E8 F4 F3 A0 D2 E5 F3 E5 8A
0A48: F2 F6 E5 E4 00 2C 10 C0 30
0A50: AD 00 C0 10 FB 2C 10 C0 C5
0A58: 85 1A A2 80 A0 30 20 2F 47
0A60: 0F A2 08 A0 80 20 6A 0C 15
0A68: A2 00 A5 1A C9 C4 F0 37 9E
0A70: C9 D0 F0 05 C9 CB D0 D8 04
0A78: E8 86 1E 20 23 0B A9 1F 20
0A80: 85 24 A9 0A 8D 92 0C A9 AE
0A88: 8E 20 41 0B EE 93 0C EE 91
0A90: 94 0C 20 C8 0A A0 A0 A0 37
0A98: A0 8E 00 A9 00 85 00 85 D6
0AA0: 01 20 99 0C 4C D6 0C 2C 33
0AA8: 51 C0 2C 54 C0 20 58 FC 94
0AB0: 60 00 30 B8 85 19 BD 82 15
0AB8: 0F 85 26 BD 42 10 85 27 DA
0AC0: A5 19 91 26 CA D0 EF 60 5C
0AC8: 8D F6 0A 8C F7 0A 68 85 A9
0AD0: 04 68 85 05 A0 00 20 EF 37
0AD8: 0A B1 04 F0 06 20 41 0B 2C
0AE0: 4C D6 0A 20 EF 0A AD F6 0E
0AE8: 0A AC F7 0A 6C 04 00 E6 27
0AF0: 04 D0 02 E6 05 60 00 00 93
0AF8: 00 00 00 86 04 85 05 A2 58
0B00: 04 A0 B0 38 A5 04 FD 65 78
0B08: 16 48 A5 05 FD 6A 16 90 96
0B10: 09 85 05 68 85 04 C8 4C 4D
0B18: 03 0B 68 98 20 41 0B CA EF
0B20: 10 DF 60 A2 B7 BD 82 0F 35
0B28: 85 26 BD 42 10 18 65 06 18
0B30: 85 27 A0 26 A9 00 91 26 DF
0B38: 88 D0 FB CA E0 37 D0 E5 5E
0B40: 60 8D F8 0A 8E F9 0A 8C A6
0B48: FA 0A C9 8E D0 11 A2 00 90
0B50: 8E 93 0C E8 8E 94 0C A2 24
0B58: 7F 8E 97 0C 8E 98 0C C9 3E
0B60: 94 D0 03 EE 94 0C C9 95 42
0B68: D0 02 E6 24 C9 97 D0 03 D7
0B70: EE 93 0C C9 8D D0 0F 48 17
0B78: AD 92 0C 18 69 09 8D 92 2A
0B80: 0C A9 00 85 24 68 29 7F F3
0B88: C9 20 B0 0A AD F8 0A AE 56
0B90: F9 0A AC FA 0A 60 38 E9 97
0B98: 20 85 1A A9 00 85 1B 06 50
0BA0: 1A 06 1A 26 1B 06 1A 26 36
0BA8: 1B 18 A9 6F 65 1A 85 FD 1B
0BB0: A9 16 65 1B 85 FE A9 00 FA
0BB8: 8D 91 0C 85 1B A4 1B B1 27
0BC0: FD 20 23 0C AD 94 0C 85 60
0BC8: 1A AD 92 0C 18 6D 91 0C 10
0BD0: AA BD 82 0F 85 26 BD 42 6F
0BD8: 10 18 65 06 85 27 A5 24 42
0BE0: A8 29 01 AA AD 95 0C 09 45
0BE8: B0 3D 97 0C 91 26 AD 93 56
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ØBFØ: ØC FØ ØF C8 8A 49 Ø1 AA DD
ØBF8: AD 96 ØC Ø9 8Ø 3D 97 ØC D1
ØC00: 91 26 EE 91 ØC C6 1A DØ E1
ØC08: CØ E6 1B A5 1B C9 Ø8 DØ D8
ØC10: AC 38 A5 24 6D 93 ØC 85 DA
ØC18: 24 AD F8 ØA AE F9 ØA AC 8B
ØC20: FA ØA 6Ø AE 93 ØC FØ 29 Ø7
ØC28: 85 1A A2 ØØ 8E 95 ØC 8E 4F
ØC30: 96 ØC A5 1A 3D 55 ØC FØ 35
ØC38: 12 AD 95 ØC 1D 5C ØC 8D 38
ØC40: 95 ØC AD 96 ØC 1D 63 ØC EC
ØC48: 8D 96 ØC E8 E0 Ø7 DØ E2 84
ØC50: 6Ø 8D 95 ØC 6Ø Ø1 Ø2 Ø4 7E
ØC58: Ø8 1Ø 2Ø 4Ø Ø3 ØC 3Ø 4Ø 69
ØC60: ØØ ØØ ØØ ØØ ØØ ØØ Ø1 Ø6 8Ø
ØC68: 18 6Ø 86 19 8C 7E ØC A9 27
ØC70: 2Ø AA 18 65 Ø6 85 27 A0 D1
ØC78: ØØ 84 26 B1 26 49 7F 91 78
ØC80: 26 C8 DØ F7 E6 27 CA DØ B1
ØC88: F2 C6 19 DØ E2 6Ø ØØ ØØ 94
ØC90: ØØ ØØ ØØ ØØ Ø1 ØØ ØØ 7F 3Ø
ØC98: 7F A9 1D 85 24 A9 ØA 8D 4Ø
ØCA0: 92 ØC A9 8E 2Ø 41 ØB EE 2E
ØCA8: 93 ØC EE 94 ØC A9 AA 8D 9E
ØCB0: 97 ØC A9 D5 8D 98 ØC A6 B7
ØCB8: ØØ A5 Ø1 2Ø FB ØA A9 1D D4
ØCC0: 8D 92 ØC A9 1D 85 24 AE 56
ØCC8: 8F ØC AD 9Ø ØC 2Ø FB ØA 4D
ØCD0: A9 8E 2Ø 41 ØB 6Ø A9 ØØ A6
ØCD8: 8D 8E ØC 85 Ø9 85 Ø8 A9 4D
ØCE0: Ø3 85 1D 85 1C 2Ø E4 ØE 11
ØCE8: 2Ø 3E ØE A9 2Ø 85 Ø6 A9 C9
ØCF0: 64 85 Ø7 2Ø B4 ØE 2Ø E4 82
ØCF8: ØE A5 1E DØ 15 A2 ØØ 2Ø A5
ØD00: 1E FB A2 ØØ C0 3Ø B0 Ø2 A6
ØD08: A2 Ø3 C0 B0 9Ø Ø2 A2 FD 27
ØD10: 86 Ø8 AD ØØ C0 1Ø 3E 2C 14
ØD18: 1Ø C0 A2 ØØ C9 C1 DØ Ø8 BD
ØD20: C6 Ø8 24 Ø8 3Ø Ø2 86 Ø8 43
ØD28: C9 DA DØ Ø8 E6 Ø8 24 Ø8 2Ø
ØD30: 1Ø Ø2 86 Ø8 C9 C4 DØ Ø5 2C
ØD38: A2 7F 8E 8E ØC C9 D3 DØ 3E
ØD40: Ø8 AD 34 ØF 49 1Ø 8D 34 1B
ØD48: ØF C9 9B DØ Ø8 AD ØØ C0 94
ØD50: 1Ø FB 2C 1Ø C0 A5 Ø7 18 BA
ØD58: 65 Ø8 A2 ØØ C9 3C B0 Ø4 2Ø
ØD60: A9 3C 86 Ø8 C9 A0 9Ø Ø4 A5
ØD68: A9 A0 86 Ø8 85 Ø7 C6 1C C2
ØD70: DØ Ø9 2Ø B4 ØE E6 1D A5 7Ø
ØD78: 1D 85 1C A5 ØØ 18 69 ØA 9D
ØD80: 85 ØØ A5 Ø1 69 ØØ 85 Ø1 79
ØD88: AD 8F ØC C5 ØØ AD 9Ø ØC 1F
ØD90: E5 Ø1 B0 ØA A5 ØØ 8D 8F 6C
ØD98: ØC A5 Ø1 8D 9Ø ØC A9 Ø2 25
ØDA0: 85 Ø2 A5 Ø7 85 Ø3 A9 Ø4 B2
ØDA8: 85 Ø4 A9 14 85 Ø5 A9 11 A1
ØDB0: A0 Ø2 A2 ØØ 2Ø 3B ØF A2 9E
ØDB8: FF A0 Ø5 2Ø 2F ØF 2Ø 99 2D
ØDC0: ØC 2Ø 64 ØE A2 ØØ A5 Ø6 BC
ØDC8: FØ Ø1 E8 BD 54 C0 2Ø DF 5A
ØDD0: ØD 2C 8E ØC DØ 2F A5 Ø6 A3
ØDD8: 49 2Ø 85 Ø6 4C F6 ØC A9 B0
ØDE0: ØB 2Ø E6 ØD A9 Ø9 18 65 3D
ØDE8: Ø7 AA BD 82 ØF 85 26 BD A9
ØDF0: 42 1Ø 18 65 Ø6 85 27 A0 BE
ØDF8: Ø7 B1 26 29 Ø7 C9 Ø2 FØ AE
ØE00: Ø3 EE 8E ØC 6Ø 2Ø 3E ØE F9
ØE08: A2 Ø3 A0 7F 2Ø 6A ØC 2Ø 25
ØE10: Ø4 ØF A2 Ø1 A0 7F 2Ø 6A Ø4
ØE18: ØC A9 ØØ 85 Ø6 2C 54 C0 47
ØE20: 4C F3 Ø9 A5 FF 6A 6A 45 9E
ØE28: Ø1 45 Ø7 45 FF 45 Ø8 45 B5
ØE30: Ø6 45 Ø9 AC 76 Ø3 C8 2A Ø8
ØE38: 88 DØ FC 85 FF 6Ø A5 Ø6 97
ØE40: 49 2Ø 18 69 2Ø 85 Ø3 A5 65
ØE48: Ø6 69 2Ø 85 27 A2 2Ø A0 C2
ØE50: ØØ 84 Ø2 84 26 B1 26 91 EB
ØE58: Ø2 C8 DØ F9 E6 27 E6 Ø3 Ø6
ØE60: CA DØ F2 6Ø A6 Ø9 CA 86 EF
ØE68: 1B A6 1B BD ØØ Ø3 85 Ø2 14
ØE70: BD 25 Ø3 85 Ø3 A9 Ø8 85 C1
ØE78: Ø4 A9 13 85 Ø5 BD 75 Ø3 C8
ØE80: ØA AA BD 6B 11 A8 BD 6C CD
ØE88: 11 A2 Ø1 2Ø 3B ØF A6 1B 76
ØE90: BD 75 Ø3 38 FD 5Ø Ø3 9D A1
ØE98: 75 Ø3 1Ø 13 18 69 Ø7 9D 75
ØEA0: 75 Ø3 DE ØØ Ø3 BD ØØ Ø3 26
ØEA8: C9 F6 DØ Ø3 2Ø BE ØE C6 9Ø
ØEB0: 1B 1Ø B6 6Ø A5 Ø9 C9 24 44
ØEB8: FØ 29 A6 Ø9 E6 Ø9 2Ø 23 BB
ØEC0: ØE 29 7F 18 69 3A C9 A2 ØA
ØEC8: 9Ø Ø3 38 E9 3Ø 9D 25 Ø3 D8
ØED0: A5 FF 29 Ø7 Ø9 Ø4 9D 5Ø 39
ØED8: Ø3 A9 Ø6 9D 75 Ø3 A9 27 AD
ØEE0: 9D ØØ Ø3 6Ø A2 3B BD 82 26
ØEE8: ØF 85 26 BD 42 1Ø 18 65 76
ØEF0: Ø6 85 27 A0 26 A9 D5 91 75
ØEF8: 26 49 7F 88 DØ F9 E8 E0 14
ØF00: B8 DØ E3 6Ø A9 ØØ 85 19 A2
ØF08: 85 1A A0 Ø8 84 1B AA A0 8A
ØF10: Ø6 2Ø 2F ØF E9 Ø8 C6 1B 28
ØF18: 1Ø F4 C6 1A C6 1A A5 19 F8
ØF20: 49 Ø1 85 19 AA BD 54 C0 1B
ØF28: A5 1A C9 4Ø DØ DC 6Ø 8A 22
ØF30: CA DØ FD 2C 3Ø C0 AA 88 CC
ØF38: DØ F6 6Ø 8C 69 ØF 8D 6A 5E
ØF40: ØF BD 8Ø ØF 8D 6B ØF A5 34
ØF48: Ø5 18 65 Ø3 A8 B9 82 ØF ØC
ØF50: 85 26 B9 42 1Ø 18 65 Ø6 C7
ØF58: 85 27 A5 Ø4 AA 65 Ø2 A8 8F
ØF60: C0 ØØ F0 ØB C0 27 B0 Ø7 B8
ØF68: AD FF FF 91 26 91 26 EE 29
ØF70: 69 ØF DØ Ø3 EE 6A ØF 88 19
ØF78: CA 1Ø E5 C6 Ø5 1Ø C8 6Ø 83
ØF80: 91 11 ØØ ØØ ØØ ØØ ØØ ØØ AB
ØF88: ØØ ØØ 8Ø 8Ø 8Ø 8Ø 8Ø 8Ø 46
ØF90: 8Ø 8Ø ØØ ØØ ØØ ØØ ØØ ØØ ØF
ØF98: ØØ ØØ 8Ø 8Ø 8Ø 8Ø 8Ø 8Ø 56
ØFA0: 8Ø 8Ø ØØ ØØ ØØ ØØ ØØ ØØ 1F
ØFA8: ØØ ØØ 8Ø 8Ø 8Ø 8Ø 8Ø 8Ø 66
ØFB0: 8Ø 8Ø ØØ ØØ ØØ ØØ ØØ ØØ 2F
ØFB8: ØØ ØØ 8Ø 8Ø 8Ø 8Ø 8Ø 8Ø 76
ØFC0: 8Ø 8Ø 28 28 28 28 28 28 21
ØFC8: 28 28 A8 A8 A8 A8 A8 A8 86
ØFD0: A8 A8 28 28 28 28 28 28 4F
ØFD8: 28 28 A8 A8 A8 A8 A8 A8 96
ØFE0: A8 A8 28 28 28 28 28 28 5F
ØFE8: 28 28 A8 A8 A8 A8 A8 A8 A6
ØFF0: A8 A8 28 28 28 28 28 28 6F
ØFF8: 28 28 A8 A8 A8 A8 A8 A8 B6
1000: A8 A8 5Ø 5Ø 5Ø 5Ø 5Ø 5Ø 62
1008: 5Ø 5Ø DØ DØ DØ DØ DØ DØ C7
1010: DØ DØ 5Ø 5Ø 5Ø 5Ø 5Ø 5Ø 9Ø
1018: 5Ø 5Ø DØ DØ DØ DØ DØ DØ D7
1020: DØ DØ 5Ø 5Ø 5Ø 5Ø 5Ø 5Ø A0
1028: 5Ø 5Ø DØ DØ DØ DØ DØ DØ E7
1030: DØ DØ 5Ø 5Ø 5Ø 5Ø 5Ø 5Ø B0
1038: 5Ø 5Ø DØ DØ DØ DØ DØ DØ F7
1040: DØ DØ 2Ø 24 28 2C 3Ø 34 C9
1048: 38 3C 2Ø 24 28 2C 3Ø 34 6Ø
1050: 38 3C 21 25 29 2D 31 35 A7
1058: 39 3D 21 25 29 2D 31 35 7Ø
1060: 39 3D 22 26 2A 2E 32 36 B7
1068: 3A 3E 22 26 2A 2E 32 36 8Ø
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1070: 3A 3E 23 27 2B 2F 33 37 C7
1078: 3B 3F 23 27 2B 2F 33 37 90
1080: 3B 3F 20 24 28 2C 30 34 DA
1088: 38 3C 20 24 28 2C 30 34 A0
1090: 38 3C 21 25 29 2D 31 35 E7
1098: 39 3D 21 25 29 2D 31 35 B0
10A0: 39 3D 22 26 2A 2E 32 36 F7
10A8: 3A 3E 22 26 2A 2E 32 36 C0
10B0: 3A 3E 23 27 2B 2F 33 37 08
10B8: 3B 3F 23 27 2B 2F 33 37 D0
10C0: 3B 3F 20 24 28 2C 30 34 1B
10C8: 38 3C 20 24 28 2C 30 34 E0
10D0: 38 3C 21 25 29 2D 31 35 28
10D8: 39 3D 21 25 29 2D 31 35 F0
10E0: 39 3D 22 26 2A 2E 32 36 38
10E8: 3A 3E 22 26 2A 2E 32 36 01
10F0: 3A 3E 23 27 2B 2F 33 37 48
10F8: 3B 3F 23 27 2B 2F 33 37 11
1100: 3B 3F D5 AA D5 AA D5 D5 CF
1108: AA D5 AA D5 D5 AA D5 AA 57
1110: D5 D5 AA DA D5 D5 D5 AA F1
1118: DA D5 D5 D5 AA D6 D4 D5 65
1120: D5 AA DA D2 D5 D5 D5 8A 9C
1128: C5 B5 D6 D4 AA 95 AD DA A4
1130: D5 AA D5 AD AA D5 AA D5 55
1138: AD C8 85 88 C4 AD D2 85 A4
1140: 88 C4 AA D4 D5 AA D5 AA 2A
1148: D5 AA D5 AD AA D5 AA D5 6D
1150: AB 82 D5 AA D5 AA EA D5 53
1158: AA D5 AA DA D5 AA D5 AA F7
1160: D5 D5 AA D5 AA D5 D5 AA 98
1168: D5 AA D5 79 11 2D 12 E1 B5
1170: 12 95 13 49 14 FD 14 B1 6A
1178: 15 00 00 00 00 00 00 00 25
1180: 00 00 00 00 00 00 7E 00 7E 1B
1188: 00 1F 00 00 00 07 7F 61 EE
1190: 7F 41 7F 60 00 00 1F 7F 76
1198: 73 7F 67 7F 70 00 00 3F FB
11A0: 7B 77 77 6F 7F 70 00 00 02
11A8: 7F 6F 77 6F 7F 7F 78 00 37
11B0: 00 7F 7F 6F 7F 7F 7B 78 03
11B8: 00 00 6B 7F 7F 6F 7F 7F 78
11C0: 78 00 01 7C 7B 7F 7F 7F 5F
11C8: 5F 70 00 01 7F 37 7F 6F 0E
11D0: 7F 7F 00 00 03 7F 57 7F D6
11D8: 77 7F 7F 60 00 03 7F 4F E6
11E0: 7F 7F 7F 5F 78 00 07 77 D1
11E8: 6F 7E 7F 6F 7F 7C 00 07 3E
11F0: 5F 6F 7B 5F 7F 77 7E 00 DA
11F8: 07 7F 4F 77 77 77 7F 7E F6
1200: 00 07 7F 07 7F 7F 7D 7F BA
1208: 7E 00 03 7F 01 7F 7F 7B 44
1210: 7F 7C 00 01 7E 00 3F 7F 15
1218: 43 7F 7C 00 00 70 00 0F 1E
1220: 7E 01 7F 70 00 00 00 00 BA
1228: 00 00 00 3F 40 00 00 03 45
1230: 78 03 78 00 3E 00 00 00 52
1238: 1F 7F 07 7F 03 7F 40 00 3B
1240: 00 7F 7F 4F 7F 4F 7F 60 C1
1248: 00 01 7F 6F 5F 5F 5F 7F 4A
1250: 60 00 03 7F 3F 5F 3F 7F 72
1258: 7F 70 00 03 7F 3F 5F 3F 7F
1260: 7F 7F 70 00 03 7F 7F 3F 86
1268: 7F 7F 77 70 00 03 7F 7F AC
1270: 7F 3F 7F 7F 70 00 07 7F 1D
1278: 6F 7F 7F 7F 3F 60 00 07 9E
1280: 7F 5F 7F 3F 7F 7F 40 00 9A
1288: 0F 7D 5F 7F 5F 7F 7F 60 CF
1290: 00 0F 7E 3F 7F 7F 7F 3F 74
1298: 70 00 1F 5F 3F 7B 7F 5F 15
12A0: 7F 78 00 1E 7F 3F 6E 7F D9
12A8: 7F 6F 7C 00 1F 7E 3F 5F C8
12B0: 5F 6F 7F 7C 00 1F 7C 1F AC
12B8: 7F 7F 7B 7F 7C 00 0F 7C 62
12C0: 07 7F 7F 77 7F 78 00 07 94
12C8: 78 01 7F 7E 07 7F 78 00 68
12D0: 03 40 00 3F 78 03 7F 60 A9
12D8: 00 00 00 00 00 00 00 7F 7C
12E0: 00 00 00 0F 60 07 70 00 F5
12E8: 7C 00 00 00 7F 78 0F 7E C5
12F0: 07 7F 00 00 03 7F 7F 1F AC
12F8: 7F 1F 7F 40 00 07 7F 3F F2
1300: 3F 3F 3F 7F 40 00 0F 7D 13
1308: 7F 3E 7F 7F 7F 60 00 0F F1
1310: 7D 7F 3E 7F 7F 7F 60 00 4F
1318: 0F 7F 7E 7F 7F 7F 6F 60 A6
1320: 00 0F 7F 7F 7E 7F 7F 7F 62
1328: 60 00 1F 7F 3F 7F 7F 7E CF
1330: 7F 60 00 1F 7E 7F 7E 7F 8E
1338: 7F 7F 40 00 3F 7E 7F 7F 78
1340: 3F 7F 7F 40 00 3F 7D 7F 51
1348: 7F 7F 7E 7F 60 00 7E 7D 53
1350: 7F 77 7F 3F 7F 70 00 7B 31
1358: 7D 7F 7D 7F 7F 5F 78 00 2F
1360: 7F 79 7F 3F 3F 5F 7F 78 77
1368: 00 7F 70 7F 7F 7F 77 7F DC
1370: 78 00 3F 70 1F 7F 7F 6F 27
1378: 7F 70 00 1F 60 01 7F 7C EE
1380: 0F 7F 70 00 0E 00 00 7F 0C
1388: 70 07 7F 40 00 00 00 00 9C
1390: 00 00 01 7E 00 00 00 00 BE
1398: 00 00 00 00 00 00 00 00 BE
13A0: 1F 40 0F 60 00 7C 00 00 40
13A8: 01 7F 70 1F 7C 07 7F 00 2E
13B0: 00 07 7F 7E 3F 7E 1F 7F 22
13B8: 40 00 0F 7E 7E 7E 7E 3F F2
13C0: 7F 40 00 1F 7B 7E 7D 7F F8
13C8: 7F 7F 60 00 1F 7F 7D 7F 0C
13D0: 7F 7F 6F 60 00 1F 7F 7F 85
13D8: 7D 7F 7F 5F 60 00 3F 7E 83
13E0: 7F 7F 7F 7F 3F 60 00 3F 49
13E8: 7D 7F 7D 7F 7E 7F 60 00 08
13F0: 7F 7D 7F 7E 7F 7E 7F 60 63
13F8: 00 7F 73 7F 7F 7F 7E 7F DB
1400: 70 01 7D 7B 7F 6F 7F 7F 40
1408: 7F 70 01 77 7B 7F 7B 7F F3
1410: 7F 5F 78 01 7F 73 7E 7E 34
1418: 7F 7F 7F 78 01 7F 61 7F 9F
1420: 7F 7F 3F 7F 78 00 7F 60 EA
1428: 3F 7F 7F 5F 7F 70 00 3F B2
1430: 40 03 7F 78 0F 7F 70 00 08
1438: 1C 00 01 7F 60 07 7F 40 E4
1440: 00 00 00 00 00 00 01 7E E8
1448: 00 00 00 00 00 00 00 00 70
1450: 00 00 00 00 1F 00 1F 40 EF
1458: 03 70 00 00 01 7F 60 3F 24
1460: 78 1F 7C 00 00 07 7F 7C B3
1468: 7F 7C 7F 7E 00 00 0F 7E E3
1470: 7D 7D 7D 7F 7E 00 00 1F 71
1478: 7B 7D 7B 7F 7F 7F 00 00 1F
1480: 1F 7F 7B 7F 7F 7F 3F 00 F7
1488: 00 1F 7F 7F 7B 7F 7F 7F B8
1490: 00 00 3F 7E 7F 7F 7F 7B FC
1498: 7E 00 00 3F 7D 7F 7B 7F 54
14A0: 7F 7E 00 00 7F 75 7F 7D 76
14A8: 7F 7F 7E 00 00 7F 73 7F A4
14B0: 7F 7F 7B 7F 00 01 7D 7B 5A
14B8: 7F 5F 7D 7F 7F 40 01 77 96
14C0: 7B 7F 77 7F 7E 7F 60 01 21
14C8: 7F 73 7D 7D 7E 7F 7F 60 66
14D0: 01 7F 61 7F 7F 7F 5F 7F B5
14D8: 60 00 7F 60 7F 7F 7F 3F 5F
14E0: 7F 40 00 3F 40 07 7F 70 5A
14E8: 3F 7F 40 00 1C 00 03 7F FE
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14F0: 40 1F 7E 00 00 00 00 00 D0
14F8: 00 00 07 7B 00 00 00 00 89
1500: 00 00 00 01 40 00 00 00 3C
1508: 3E 00 3F 00 07 70 00 00 33
1510: 03 7F 40 7F 70 3F 7C 00 15
1518: 00 0F 7F 79 7F 79 7F 7C EA
1520: 00 00 1F 7D 7B 7B 7B 7F 46
1528: 7E 00 00 3F 77 7B 77 7F 9D
1530: 7F 7F 00 00 3F 7F 77 7F 60
1538: 7F 7E 7F 00 00 3F 7F 7F 2D
1540: 77 7F 7F 7E 00 00 7F 7D 5A
1548: 7F 7F 7F 77 7C 00 00 7F DC
1550: 7B 7F 77 7F 7F 70 00 01 BD
1558: 7F 6B 7F 7B 7F 7F 7C 00 B7
1560: 01 7F 67 7F 7F 7F 77 7E 37
1568: 00 03 7B 77 7F 3F 7B 7F A9
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15E8: 7F 7F 6F 7F 7F 7D 7C 00 83
15F0: 00 7F 7F 7F 6F 7F 7F 7C D7
15F8: 00 01 7F 7B 7F 7F 7F 6F 73
1600: 78 00 01 7F 37 7F 6F 7F 96
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1620: 7F 5F 7F 7B 7F 00 07 5F F4
1628: 6F 7F 5F 7F 7B 7F 00 07 B0
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1678: 18 18 18 18 00 18 00 3C D7
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1690: 7C 1E 3C 78 3E 18 00 0E F1
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16D0: 00 00 00 00 18 18 0C 00 36
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18E0: 00 3E 6C 6C 6C 6C 00 00 0A
18E8: 00 3C 66 66 66 3C 00 00 7F
18F0: 00 3E 66 66 3E 06 06 00 F9
18F8: 00 7C 66 66 7C 60 60 00 A1
1900: 00 3E 6E 06 06 06 00 00 38
1908: 00 7C 06 3C 60 3E 00 18 F1
1910: 18 7E 18 18 18 70 00 00 F4
1918: 00 36 36 36 36 7C 00 00 A5
1920: 00 66 66 66 3C 18 00 00 61
1928: 00 66 66 7E 7E 3C 00 00 8D
1930: 00 66 3C 18 3C 66 00 00 80
1938: 00 66 66 3C 18 0C 06 00 91
1940: 00 7E 30 18 0C 7E 00 40 34
1948: 40 60 30 18 7C 0E 1F 01 95
1950: 01 03 06 0C 1F 38 7C 7F 97
1958: 06 06 06 7E 66 46 1F 0F 51
1960: 1C 18 1C 0F 01 03 1F 7F EC
1968: 7F 7F 7F 7F 7F 7F 7F 00 1B aa
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Buyer's Guide to Apple Graphics

From paint programs to t-shirt artwork—
if it has to do with graphics, you'll find it here.

Animate

Broderbund
Apple IIe, IIc, IIgs
128K; extended 80-column card for Apple IIe
$69.95

Drawings and designs can be turned into animated scenes with *Animate*. The program provides predrawn objects and backgrounds; plus, custom characters and backgrounds can be imported from *Dazzle Draw* or created using the "Art of Animation" guide. Each scene can support sound, text, and as many as 16 characters. Other features include pull-down menus, windows, preview, edit, programming guides, and self-running demonstration disks. KoalaPad, joystick, Apple graphics tablet, and mouse input accepted.

Award Maker Plus

Baudville
Apple II
64K; ProDOS
$39.95

Parents, teachers, coaches, and best friends can use this program to create a variety of customized awards, certificates, licenses, coupons, and other documents. Designers can choose the text style, personal message, border style and color, and hi-res pictures to add to hundreds of predesigned awards. The program supports class name files and includes gold-embossed press-on seals. There is a 90-day limited warranty.

AwardWare

Hi Tech Expressions
Apple II
printer
$14.95

Users can print traditional certificates, awards, licenses, signs, and announcements, and create coupons, tickets, checks, stationery, memos, and other awards. There are 20 graphics, 20 borders, five fonts, five seals, and an unlimited number of text borders from which to choose.

Blazing Paddles

Baudville
Apple II series
48K; DOS 3.3
$34.95

Blazing Paddles is a paint program that can be used to draw, paint, and print hi-res pictures. It features color mixing, a selection of brush strokes, and zoom mode. The program contains five text fonts and ten shape tables. There's also a printer dump for most black-and-white and color printers. A user guide and 90-day limited warranty are included.

Business Card Maker

Intracorp
Apple II series
printer
$39.95

Users can design and create their own business cards with this program. The cards can be printed on the custom card stock included with the package.

Button and Badge Maker

Intracorp
Apple II series
printer
$49.95

Buttons and badges can be designed and created with this program. Custom stock is included with the package.

Calendar Maker and Stationery Maker

Sharedata
Apple II series
printer
$7.99

Calendar Maker can be used to track events, engagements, and important dates and to create personalized calendars. *Stationery Maker* contains a range of fonts, graphics, and borders to use in creating personal stationery. Both programs are available in one package.

CardWare

Hi Tech Expressions
Apple II series
printer optional
$9.95

People of all ages can print greeting cards for birthdays and special occasions. The cards can be

Caroline Hanlon

personalized with name and age, and a variety of graphics and musical effects can be added. Cards and greetings can be printed or sent on disk.

Certificate Maker

Springboard
Apple II series
$39.95

Personalized certificates can be created for all kinds of occasions at school, home, or work. There are more than 200 certificates to choose from, and individual names and messages can be added to each. More than three dozen gold seals and stickers are also included to give the certificates extra charm.

ColorMe: The Computer Coloring Kit

Mindscape
Apple II series
128K; joystick or KoalaPad; printer recommended
$29.95

Young children kindergarten- through fifth-grade level can color the predrawn pictures or draw freehand with *ColorMe*. The pictures can be printed out so that children can cut out their drawings. Text can be added to the pictures. A *ColorMe* Picture Disk is included with the program. Additional disks featuring Rainbow Brite, Muppet Babies, Shirt Tales, and others are available for $9.95.

Create a Calendar

Epyx
Apple II series
printer
$29.95

Daily, weekly, monthly, and annual calendars can be designed with this program. More than 100 graphics, borders, and fonts are included, or images from Epyx's *Graphics Scrapbooks* and from *The Print Shop* can be imported. Notes and graphics can be added to any day, and regular events can be scheduled automatically. Users can call up any year from 1753 through 9999.

Create with Garfield!

DLM
Apple II series
64K
$29.95

Students can create cartoons, posters, and labels with Garfield and his friends. The program features 75 pieces of artwork with captions, and can be printed in black-and-white. The package includes an activities sheet that lists ways to use *Create with Garfield!* at home and in school.

Create with Garfield! Deluxe Edition

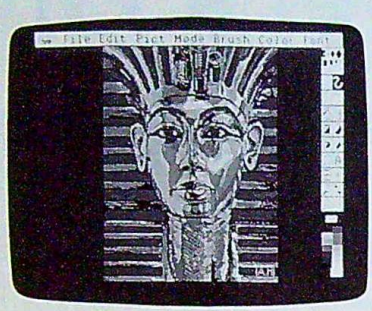
DLM
Apple II series
64K
$39.95

The two disks in this package can help students improve their artistic skills while they create Garfield posters, cartoons, and labels. The students choose a background and characters, create a scene, and add dialogue or captions. More than 200 pieces of art and borders and a variety of typefaces are included. The finished product can be printed on a color printer. An activity sheet lists different ways the program can be used at school or home.

Dazzle Draw

Brøderbund
Apple IIe, IIc, IIgs
128K; extended 80-column card for Apple IIe
$59.95

Dazzle Draw is a paint program for creating graphics, prints, and slides using double-high resolution and a palette of 16 colors. Colors can be mixed to form additional shades and used to flood-fill or spray-paint drawings. Brushes are available in a variety of widths and shapes. Other drawing tools include textures, patterns, circles, ovals, boxes, and lines, and available commands include Cut, Paste, and Edit. KoalaPad, joystick, Apple graphics tablet, and mouse input accepted.



Deluxe Paint II

Deluxe Paint II

Electronic Arts
Apple IIgs
768K
$99.95

Deluxe Paint II incorporates a variety of paint tools, including ten built-in brushes, stenciling, four levels of zoom, dotted freehand, continuous freehand, straight line, curve, circle, polygon, more than 65 fills, and a palette of 16 colors created from 4096 shades. The brush tool can be flipped, stretched, and rotated or used as an airbrush. Spaces can be filled with patterns, solid colors, or gradient colors. The fixed background allows the painter to attach a picture to the background so that it will not be removed when painted over. With the perspective feature, elements can be rotated in three dimensions around a fixed point to create perspective. A range of colors is cycled through a static image to create the illusion of motion in color cycling; as many as four cycles per picture can be stored. Pictures can be sent to selected printers, and the program supports color printing on the Apple ImageWriter II and other color printers. An art disk is included.

Design Your Own Home

Abracadata
Apple II series
64K and input device (II series); 768K and mouse (IIgs); printer optional
$69.95 each

Design Your Own Home modules can help homeowners design structures, interiors, and landscapes for their homes. Outlines, outbuildings, floor plans, and structural details can be drawn using architectural scales in both feet and metric units. Home decorators can experiment with furniture, wall treatments, carpeting, plants, trees, and other furnishings. The programs include 15 files of landscape, interior, or architectural symbols, and additional graphics can be created and saved with the drawing function. Other drawing elements include zoom and line styles. Color and color patterns can be added to the designs with the paintbrush feature. The programs accept mouse, keyboard, joystick, or graphics-pad input, and a color monitor and printer are optional. The mouse is required for the Apple IIgs version. The Architecture, Interior, and Landscape versions are sold as separate modules.

Disney Design Studio

Disney Educational Software
Distributed by Sunburst Communications
Apple II series
64K; printer; color monitor recommended
$75.00

Formerly titled *Walt Disney Card and Party Shop*, the *Disney Design Studio* offers grade-4 through adult-level students the opportunity to create signs, awards, invitations, and wrapping paper using Disney characters. Students can develop their own designs or use the premade ones. They can also practice basic word processing and computer skills. The package includes two program disks, backups, and a teacher's guide.

Draw Plus

Activision
Apple IIgs
512K
$89.95

An object-oriented, color draw program, *Draw Plus* can be used to design floor plans, logos, letterheads, flow charts, forms, posters, graphics, and more. It offers 4096 colors, and the colors and patterns can be edited. Using dual-resolution modes, artists can draw in both 320- and 640-pixel modes with a palette of 16 colors. Text can be added to the graphics and is available in a variety of fonts, type styles, and sizes. Graphics can be reduced or enlarged as many as 16 times the original size to create icons or graphics as large as 6 × 8 feet. With the multiple document windows, a maximum of eight documents can be in progress at the same time. Design functions include Align, Duplicate, Fill, Flip, Group, Lock, Rotate, Zoom, and more. Graphics can be printed in color or black-and-white on the ImageWriter, ImageWriter II, or LaserWriter.

816/Paint

Baudville
Apple II series
128K; 512K for super-hi-res mode
$75.00

816/Paint works in all Apple hi-res graphics modes, including super-hi res with 4096 colors. It contains numerous tools for painting and freehand drawing, including 12 brushes, lines, an airbrush, text capabilities, geometric shapes, a marquee, and lasso functions, and there's a French-curve tool for plotting smooth curves. Color cycling helps the artist modify colors or create pseudoanimation. The program uses an icon menu that appears on the screen only when needed.

Electric Crayon

Polarware
Apple II series
128K; printer optional
$14.95 each

Children can color a variety of pictures with this series of computer coloring books. Pictures can be printed in either color or black-and-white, and children can print any month's calendar with the picture. Titles include *Fun on the Farm*, *ABC's*, and *This Land Is Your Land*. Each title is sold separately.

Electric Crayon—Holidays and Seasons

Polarware
Apple II series
128K; printer optional
$29.95

Children can color pictures representing the four seasons and various holidays and then print the pictures in either color or black-and-white. A description of the holiday's origins can be printed, as can any month's calendar. The program also has banner-making capabilities.

Electric Crayon Deluxe—Dinosaurs Are Forever

Polarware
Apple II
128K; printer optional
$29.95

Designed for young students, this package combines lessons about dinosaurs with a computer coloring book. Users can learn about the weight, size, and eating habits of dinosaurs while they color pictures of the reptiles on the screen. Part of the *Electric Crayon Deluxe* series, this package includes custom banner-, calendar-, and poster-making capabilities, plus 64 four-color stickers to add to printed artwork.

Fantavision

Brøderbund
Apple II series
64K (Apple II); 256K (Apple IIgs)
$49.95 (Apple II); $59.95 (Apple IIgs)

Fantavision employs a technique called *tweening* to help amateurs create cartoons, animated messages, and motion pictures. The program can take two different drawings in separate frames and create as many as 64 in-between frames so that the first drawing gradually turns into the second. High-resolution screens from other programs can be used with *Fantavision*, and the animated projects can be viewed by other computer users even if they don't have a copy of the program. The Apple IIgs version includes a library of digitized sound effects to add to the frames. It is available on 3½-inch disks and accepts mouse input.

Graphic Edge

Pinpoint Publishing
Apple IIgs
$89.99

Graphic Edge is tailored to produce color charts, graphs, drawings, and diagrams for business and other presentations. It can create eight different types of graphs, each containing a maximum of 48 colors or patterns and ten fonts. As many as 16 spreadsheets can be commanded on the desktop at one time, with as many as ten linked graphs in each. Size, color, location, pattern, font, text, tick marks, grids, and brushes in the charts and graphs can be edited. A utility enables the user to display super-hi-res charts, print the images, or save the graphics as ProDOS 16 paint or draw files. The clip-art collection includes a font editor, more than 30 fonts, and the Pinpoint SlideShow Maker to create 16 video effects. With the GraphMerge desk accessory, as many as 16 drawings can be cut and pasted to an *AppleWorks* document. Graphics from *The Print Shop* and other programs can be imported.

Graphics Department

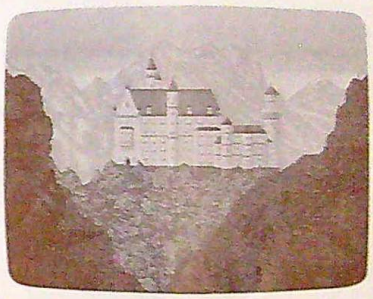
Sensible Software
Apple II series
48K; Applesoft; printer optional
$124.95

Users of *Graphics Department* can prepare drawings, diagrams, charts, and lettering for business and school presentations. The program consists of four main modules—charting kit, lettering kit, graphics tools, and slide projector—plus a set of file utilities. With the charting kit, data can be converted to scatter, line, pie, bar, and area charts. The charts and graphs can be overlaid for comparison, and data files that are written by *VisiCalc* or in DIF format can be imported. Graphics tools include ellipses, points, lines, and rectangles. The pictures can be transferred, merged, filtered, reduced, or painted in six primary colors and more than 100 secondary colors. The lettering kit contains more than 40 font styles—in five sizes and six colors—that can be used in adding text to pictures. With the slide-projector module, as many as 32 pictures can be displayed on the monitor or a TV screen. The frames can be selected manually or automatically with a 1½-second delay separating them. The file-utilities system contains routines to manage the picture libraries and data, and it has routines to rename, delete, lock, or unlock files.

The Graphics Magician Junior

Polarware Software
Apple II series
48K for high resolution; 128K for double-high resolution
$19.95

The computer does the drawing with this graphics program—users just point at an object and click, and it's drawn. *Graphics Magician Junior* offers circles, boxes, triangles, straight lines, fill, brushes, and more than 108 colors and patterns with 48K, or 256 colors and patterns with 128K. Joystick, keyboard, trackball, or Houston Instruments graphics-tablets input is accepted. The program is not copy-protected.



The Graphics Studio

The Graphics Studio

Accolade
Apple IIgs
$69.95

This paint program and graphics editor can be used to create pictures in 8½ × 11 inch format using a palette of 4096 blended colors and an assortment of patterns. Text in a variety of type sizes and styles can be added to any design. The program features a double-screen-size drawing area, full-screen clipboard, a user-programmable color-cycling tool to produce animated pictures, an 8 × 8 pixel pattern capture, mirror symmetry effects, and user-definable erasers. An image or portion of a drawing can be resized, flipped, or rotated; *x* and *y* coordinates can be displayed; and the palette of colors can be changed. Drawing tools include lines, boxes, ellipses, circles, rays, single-color and pattern fills, zoom with four levels of magnification, and copy and move.

Graphics Supermarket

Abracadata
IIgs
512K; color or RGB monitor; mouse; printer optional
$49.95

With *Graphics Supermarket*, images and pictures can be saved as picture files, source code, or binary files to be read by assembly, C, or BASIC programs. Images from other programs can also be converted into source code. Pictures can be drawn and painted using a palette of 4096 colors, resolution as high as 640 × 200, seven-level zoom, a clipboard to save 15 images at one time, and editing tools such as Blend, Replace, Dither, and Exchange. The pictures can be printed on an ImageWriter or LaserWriter printer, and a manual is included. A version containing documented source code is available for $149.95.

GraphicWriter Version 2.0

DataPak Software
Apple IIgs
512K; 3½-inch disk drive; printer
$149.95

Text and graphics capabilities are combined in *GraphicWriter* for word processing, graphics, and desktop publishing applications. There are more than 1100 type styles, with more than 20 fonts in several styles and sizes. Other word processing features include word-wrap, global search and replace, tabs, automatic page numbering, headers, and footers. The color palette contains 48 colors for use in drawings and paintings created with the graphics tools. Complete documents can be viewed on the screen and repositioned before printing. Text and graphics can be imported to *GraphicWriter* and printed on the ImageWriter or LaserWriter printers.

Greeting Card Maker

Sharedata
Apple II series
printer
$7.99

Greeting Card Maker provides eight font styles, 11 border designs, and 70 graphics patterns to use in creating personalized greeting cards.

Headliner

Zephyr Services
Apple II series
printer
$19.95

Headliner enables users to create banners and signs with letters up to 13 inches high. Letters, numbers, punctuation marks, or common symbols can be used. The message is printed sideways and can be any length.

HeartWare

Hi Tech Expressions
Apple II series
printer
$9.95

With this program, users can print greeting cards of friendship, love, and appreciation. Graphics include flowers, a rainbow, a butterfly, and more. The animation can be personalized with friendship greetings.

Image Master: Basic Paint

JADA Graphics
Apple IIgs
512K; RGB monitor
$44.95

A paint program designed for all ages, *Image Master: Basic Paint* offers 64 built-in palettes of color, an unlimited number of user-definable palettes, and a color-editing system to create more than 8 million color mixtures. The screen can display 136 colors at one time, and, with the gradient editor, horizontal, vertical, two-dimensional, angled, and concentric shading can be added. Standard paint features include full-screen painting, ten levels of zoom, text with graphics, cut, paste, copy, custom brushes, color cycling, flipping, inverting colors, and mirrored painting, plus printout capabilities with ImageWriter and ImageWriter II. The program includes a 30-day guarantee.

Mask Parade

Springboard
Apple II series
$39.95

Using this desktop publishing program, children can design their own masks, hats, glasses, jewelry,

badges, and accessories to wear. Children can use the designs in the program or draw their own. After the picture is printed, it can be colored and decorated and then cut out and worn. For ages 4–10.

Mr. Pixel's Cartoon Kit

Thunder Mountain
Distributed by Mindscape
Apple II series
$9.95

Children can create animated cartoons by using the program's collection of cartoons and characters or by drawing their own figures using menu commands. For ages 8 and up.

Mr. Pixel's Programming Paint Set

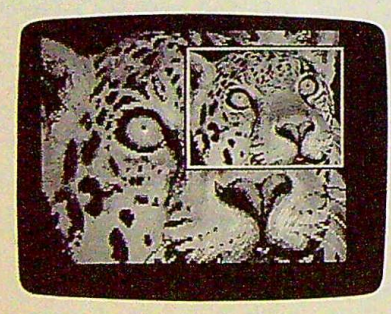
Thunder Mountain
Distributed by Mindscape
Apple II series
$9.95

A drawing program for children, *Mr. Pixel's Programming Paint Set* helps students understand the basic concepts of computer programming logic while they use the computer to draw. The program features onscreen menu commands to show children each step used in the drawings. Pictures can be saved and printed. For ages 8 and up.

The Newsroom

Springboard
Apple II series
64K
$59.95

Desktop publishers can use this program to create newsletters for family, clubs, school, or business. *The Newsroom* contains a word processor and more than 600 pieces of clip art. Text wraps around any photos and graphics added to the composition. Text may be entered in five fonts, and it can be printed out on most printers.



Paintworks Gold

Paintworks Gold

Activision
Apple IIgs
1.25MB RAM; RGB monitor; 3½-inch drive
$99.95

An expansion of the paint program *Paintworks Plus*, *Paintworks Gold* offers the artist 80 additional features that utilize the advanced graphics capabilities of the Apple IIgs. There are two full pages to use in creating art, so one page can be used as a draft or a fixed background. As many as 16 colors can be selected with the gradient-color blending function, and color masking helps prevent painting over colors or objects. Objects can be created and viewed in a 3-D perspective, which can be automatic. Color cycling can be used to simulate animation, or frame-by-frame animation can be constructed. Slippy Colors allows the user to capture and move colors and objects, or colors can be smeared with the Shadow and Contour options. Other tools include Variable-Zoom, FatBits, Shrink, Stretch, Bend, Distort, and a smooth tool to remove jagged edges. Files created with *Paintworks Plus* and other IIgs graphics programs can be used with *Paintworks Gold*.

Paintworks Plus

Activision
Apple IIgs
512K
$69.95

A paint program for the Apple IIgs, *Paintworks Plus* contains a *MacPaint*-style interface and Help screens. It provides more than 4000 colors and 16 built-in, customizable patterns. The Lasso tool can be used to pick up an object without the surrounding area, and mirror commands help draw symmetrical shapes. Full-screen animation is available, and the Page-Preview function displays the whole picture before it's printed. The program is not copy-protected. Clip Art Gallery, a collection of clip art to use with the program, is included in the package.

Paint, Write, Draw

Activision
Apple IIgs
512K required; 1.25MB recommended
$179.95

This three-in-one package includes *Paintworks Plus*, *Draw Plus*, and *Writer's Choice elite*, a color word processor.

PartyWare

Hi Tech Expressions
Apple II series
printer
$14.95

Users can print invitations, thank-you notes, and greeting cards for parties and other special occasions, or they can design their own party decorations. Other creations include banners, hats, place mats, animated cards, invitations, and greetings on computer disks. The program contains a variety of graphics, greetings, and borders.

Postcards

Activision
Apple IIe, IIc, IIgs
$24.95 (Apple II); $29.95 (Apple IIgs)

Postcards is a collection of clip art—warthogs, dogs, rhinos, Mona Lisa, food, aliens, and more—that can be used to create postcards, invitations, memos, and other personal notes. Backdrops such as landscapes and beach scenes on which to place the graphics are also included. Personal messages can be typed in, and phrases and letters from the collection can be added. A paint program is included so users can design their own notes.

Print Magic

Epyx
Apple II series
printer
$59.95

Home artists can design and print cards, flyers, certificates, stationery, and banners with this desktop application. Graphics and text can be placed in the design, and the document appears on the screen as it will print out. The program includes a library of artwork, or images can be imported from Epyx's *Graphics Scrapbooks*, *The Print Shop*, and other paint programs. There are 24 paintbrushes, geometric shapes, zoom, six levels of enlargement, and automatic flip and invert to help in creating pieces. A graphics disk with holiday graphics is included in each package.

PrintMaster Plus

Unison World
Apple II series
128K
$49.95

This graphics program allows users to design and create banners, posters, stationery, cards, and calendars with their computer and a dot-matrix or laser printer. The program offers 11 borders, ten fonts, a drawing pad, a graphics editor, and more than 100 pieces of art. Users can place the border and text, preview it, change it, add graphics, and preview it again before printing. Previously saved designs can also be edited. Additional graphics disks are available from Unison World.

PrintPower

Hi Tech Expressions
IBM/Apple II flippy disks
64K
$14.95

PrintPower allows users to create personalized greeting cards, invitations, multiline banners, tent cards, signs, posters, stationery, and flyers. Users can choose from horizontal or vertical formats, seven variations of six fonts, 40 border designs, and 60 graphics designs with free-form positioning. The program features line-by-line text editing and an onscreen template that enables users to visualize the item while it is being created. Its graphics capabilities can be expanded by using Hi Tech's *AwardWare*.

The Print Shop

Brøderbund
Apple II series
64K
$49.95

Cards, flyers, stationery, and signs can be created and printed using *The Print Shop*. The program contains an assortment of pictures, symbols, borders, backgrounds, and type fonts and sizes to select; plus, the graphics and text editors allow the user to make simple changes. *The Print Shop* accepts keyboard or joystick input, and creations can be printed out. The package includes color paper and envelopes.

The Print Shop IIGS

Brøderbund
Apple IIgs
512K; printer; mouse optional
$59.95

The IIgs-specific version of *The Print Shop* contains the same features offered by the original version, plus new ones such as full-panel designs and two different graphics per page. A trim feature allows extra touches to be added to vertical and horizontal banners. There are more than 120 graphics, plus a graphics editor for creating more. The program includes an assortment of pictures, symbols, borders, backgrounds, and type fonts and sizes. Designs and graphics for the Apple II version of *The Print Shop*, *The Print Shop Companion*, and the *Graphics Library Disks* can be used with *The Print Shop IIgs*. Finished products can be printed in eight colors with a color printer. The program is available on 3½-inch disks only.

Rainbow Painter

Springboard
Apple II, IIgs
$34.95

A graphics program for children ages 4–10, *Rainbow Painter* contains 50 different brushes and 120 colors and patterns. Children can create their own drawings or color in one of the 50 prepared line drawings in ten categories such as Dinosaurs or Outer Space.

Graphics Software Publishers

For more information on the graphics software listed in the "Buyer's Guide to Apple Graphics," contact these publishers.

Abracadata
P.O. Box 2440
Eugene, OR 97402

Accolade
550 S. Winchester Blvd.
San Jose, CA 95128

Baudville
5380 52nd St. SE
Grand Rapids, MI 49508

Beagle Brothers
6215 Ferris Sq., #100
San Diego, CA 92121

Broderbund
17 Paul Dr.
San Rafael, CA 94903

DataPak Software
14011 Ventura Blvd.
Suite 507
Sherman Oaks, CA 91423

Datasoft
19808 Nordhoff Pl.
Chatsworth, CA 91311

Disney Educational Software
P.O. Box 2000
Thornwood, NY 10594

DLM
One DLM Park
200 E. Bethany Rd.
Allen, TX 75002

Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404

Epyx
P.O. Box 8020
600 Galveston Rd.
Redwood City, CA 94063

Hi Tech Expressions
584 Broadway
New York, NY 10012

Intracorp
14160 S. W. 139th Ct.
Miami, FL 33186

JADA Graphics
7615 S. 48th St.
Omaha, NE 68157

Master Software
6 Hillery Ct.
Randallstown, MD 21133

Mediagenic
3885 Bohannon Dr.
Menlo Park, CA 94025

Mindscape
3444 Dundee Rd.
Northbrook, IL 60062

PBI Software
1163 Triton Dr.
Foster City, CA 94404

Pinpoint Publishing
5865 Doyle St., #112
Emeryville, CA 94608

Polarware
1055 Paramount Pkwy.
Suite A
Batavia, IL 60510

Scholastic Software
2931 E. McCarty St.
P.O. Box 7502
Jefferson City, MO 65102

Sensible Software
335 E. Big Beaver
Suite 207
Troy, MI 48083

Sharedata
7400 W. Detroit St.
Suite 170
Chandler, AZ 85226

Spinnaker
One Kendall Sq.
Cambridge, MA 02139

Springboard Software
7808 Creekridge Cir.
Minneapolis, MN 55435

Styleware
5250 Gulfton
Suite 2E
Houston, TX 77081

Thunder Mountain
c/o Mindscape
3444 Dundee Rd.
Northbrook, IL 60062

Unison World
Box 3056
Berkeley, CA 94703

Weekly Reader Software
Optimum Resource
10 Station Pl.
Norfolk, CT 06058

Zephyr Services
1900 Murray Ave.
Pittsburgh, PA 15217

Sesame Street Crayon

Polarware
Apple II series
128K; printer optional
$14.95 each

Sesame Street Crayon is a series of computer coloring books for children. Each issue contains dozens of pictures that can be colored over and over again. The users can point and click to choose the color, point to the area to color, and then click to fill the area with color. The pictures can also be printed out with a printer and then colored by hand. Titles include *Letters for You, Numbers Count,* and *Opposites Attract.* Characters from Sesame Street are featured. Each title is sold separately for $14.95.

Sesame Street Print Kit

Hi Tech Expressions
Apple II series
64K
$14.99

The Muppets are featured in this print program for the entire family. *Sesame Street Print Kit* can be used to design and print signs, posters, banners, cards, invitations, decorations, and books. Sixty Sesame Street Muppet graphics are included, along with 20 borders and seven typefaces. The program is available on a flippy disk for the IBM and Apple II.

Sign and Banner Maker

Sharedata
Apple II series
printer
$7.99

Sign and Banner Maker can be used to design and print banners and signs for special occasions. It contains a choice of fonts, graphics, borders, and backgrounds, and includes a screen-preview option when used with a color graphics card.

Sticker Maker

Epyx
Apple II series
printer
$34.95

Stickers in an assortment of shapes, sizes, and styles can be created with this applications program. The package includes more than 100 stickers on which to print name tags, VCR labels, holiday gift stickers, reminders, and more. There are also more than 100 graphics, fonts, borders, and backgrounds to use in designing the stickers. Graphics can be imported from *Print Magic,* Epyx's *Graphics Scrapbooks, PC Paintbrush, The Print Shop,* or *The Newsroom.*

Stickybear Drawing

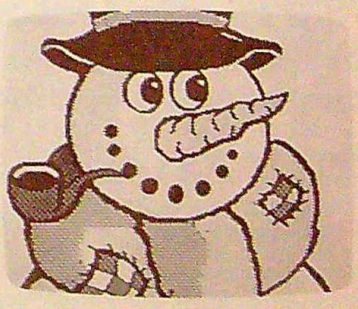
Weekly Reader Family Software
Apple II series
printer optional
$39.95

Children aged 7 or older can use this menu-driven program to draw pictures, create slide shows, and print out artwork. There are a variety of drawing styles, and errors can be erased without deleting the whole picture.

Stickybear Printer

Weekly Reader Family Software
Apple II series
printer optional
$39.95

A graphic-design program, *Stickybear Printer* contains background and border patterns, hundreds of decorations, ten fonts, wrapping paper, stationery, and cards. The program can be used by children of all ages to design and print books, charts, pictures, and 3-D scenes. The printer-dump program supports most popular printers.



SuperPrint!

SuperPrint!

Scholastic
Apple II series
128K
$49.95

SuperPrint! allows users to print banners, graphics, calendars, and decorations up to 55 inches high. The program can print in four sizes, from clip-art icons to a five-foot Santa Claus. There are six font styles in solid, outline, and bold formats. Nearly 200 graphics and ten predesigned borders are included in the program, and more borders can be created. The banners and documents can be scrolled and stamped with different graphics elements and text. The package contains the program disk, two graphics disks, and a handbook. ▷

SwimWare

Hi Tech Expressions
Apple II series
printer
128K
$9.99

Digitized swimsuit models adorn the calendars created with this program. Daily, weekly, monthly, and annual calendars through the year 1999 can be designed and printed. The program can also be used to keep track of appointments and events.

Take 1 Deluxe

Baudville
Apple II series
64K
$59.95

Take 1 Deluxe enables the user to create computer-animated graphics and video effects with backgrounds and special effects. The scenes can be shown on a VCR or made into movies. An animation library, *Actors & Actions*, and a program to automatically boot movie disks are included in the package. For ages 10 and up.

Teddy Bear-Rels of Fun

DLM
Apple II series
64K
$39.95

Teddy Bear-Rels of Fun contains a program disk and a graphics library with more than 200 pieces of art to help the user create stories, pictures, posters, labels, stickers, and other items. The art includes borders, backgrounds, characters, a variety of type styles, and a text writer so that captions and dialogue can be added to the pictures. The two-disk package is designed to enhance learning in art, math, and language. Projects can be printed on black-and-white or color printers.

Timeout Graph

Beagle Brothers
Apple II series
AppleWorks
$89.95

Part of the Timeout series from Beagle Brothers, *Timeout Graph* can be used to create graphs from within the *AppleWorks* spreadsheet. It can produce bar, line, XY, stack bar, pie, and area graphs. The graphs can be printed in several sizes or saved as hi-res pictures. The program does not print in color.

TopDraw

StyleWare
Apple IIgs
$89.95

A draw program designed for the Apple IIgs, *TopDraw* uses Macintosh-like pull-down menus to access the 4096 colors and object-oriented graphics features. The drawing size and shape are user-defined, as is the view scaling. Drawing options include movable palettes, polygon smoothing, and corner radius editing. Colors and patterns can also be edited. This program works with other major IIgs graphics programs such as *Deluxe Paint II* and *PaintWorks Plus*, and it supports the LaserWriter and color ImageWriter II.

T-Shirt Maker

Spinnaker
Apple II series
printer
$9.95

Part of the Easy Working Series, *T-Shirt Maker* helps home artists produce customized t-shirts. The program contains a selection of pictures to use, or new designs can be created. The images can then be printed out and ironed onto purchased t-shirts. The program was previously titled *T-Shirt Shop*.

Video Title Shop

Datasoft
Apple II series
$29.95

Video Title Shop helps design text, borders, and graphics screens to add to videotape recordings for home and business presentations. The program offers fades, wipes, fizzles, scrolling, cycling between screens, and a variety of font styles and sizes. Graphics can be created with Micropainter Plus, a graphics program included in the package that contains four pens and 16 colors. Version 2.0 also includes an optional continuous loop and an abort-from-sequence command.

Visualizer IIGS

PBI Software
Apple IIgs
512K, mouse
$99.95

Visualizer was designed for use with the Apple IIgs to create business-presentation graphics. Numbers can be entered into a worksheet and then transformed into color charts, graphs, columns, and lines by specifying the type, style, and size of graphic required. Data from *AppleWorks* spreadsheet files can be imported, or calculations can be performed by *Visualizer*. Charts can be combined with super-high-resolution graphics, overlaid, and printed out.

aa

COMPUTE!'s Apple Applications Disk is the easy way to enjoy the terrific programs found in _COMPUTE!'s Apple Applications_, your best source for inexpensive, quality Apple II software.

- Save yourself hours of typing time.
- Use the disk with Apple II+, IIe, IIc, and IIgs personal computers.
- Get *all* the programs found in each bimonthly issue of *COMPUTE!'s Apple Applications*, along with additional supporting data files and even source code.

COMPUTE!'s APPLE APPLICATIONS

Here are just some of the programs that you'll find on the October disk:

Window Pack. Give your Apple II programs that professional look with windows and pull-down menus. A full-blown "Window Pack" demo program is included on the disk.

Air Rescue. Imagine a pilot's test where you have to dodge the clouds. Can you pass?

Fractal Sketcher. Explore the beauty of computer-aided art by creating your own fractal designs. Several predesigned fractals are included on the disk.

COMPUTE!'s Apple Applications Disk offers you some of the best and least-expensive Apple II software on the market. The *Disk* costs only $15.00 (plus sales tax where applicable) and is available only through COMPUTE! Publications. COMPUTE! pays the shipping charges.

Complete documentation for the disk is provided in *COMPUTE!'s Apple Applications* (a one-year subscription to the magazine is available separately for only $18.00).

To order your *Disk*, mail your payment to

COMPUTE!'s Apple Applications Disk 10/88
P.O. Box 5188
Greensboro, NC 27403

Sorry, no credit card orders accepted. New York residents add 8¼% sales tax; North Carolina residents add 5% sales tax. All payments must be made in U.S. funds on checks drawn on a U.S. bank.

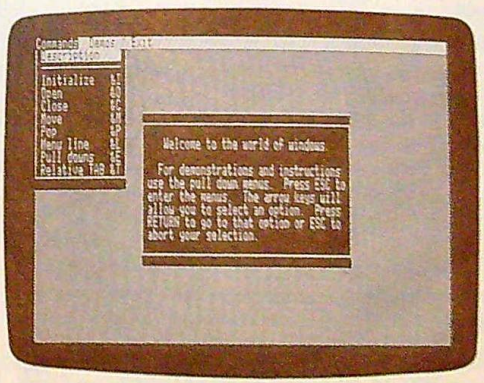
Window Pack

Randy Frank

"Window Pack" adds eight new commands to BASIC, giving Applesoft programmers easy access to windows and pull-down menus. The program runs on an Apple IIc, Apple IIGS, or enhanced Apple IIe with 80-column card. ProDOS required.

By adding windowing commands to Applesoft, "Window Pack" offers desktop operation for all your BASIC programs. With Window Pack's eight new commands, you can open, close, and move text windows, and define and operate pull-down menus, as well.

Window Pack's power is in its simplicity. There are a small number of commands, and each command is straightforward and easy to learn. But before you can use Window Pack, you must type it in.



Window Pack makes your Apple II look like a Macintosh.

Opening the Window

Window Pack consists of three machine language programs and one BASIC program. Programs 1 and 2 contain Window Pack's main routines. Program 3 is required to disable the ProDOS ramdisk so that Window Pack can make use of the 80-column card's extra RAM. The BASIC program, Program 4, helps you design pull-down menus.

To enter Programs 1–3, you'll need to use "Apple MLX," the machine language entry program found elsewhere in this issue. Before loading MLX, you must type **HIMEM:32768**. When you run MLX, answer the first two questions for each program as follows.

For Program 1, answer

STARTING ADDRESS: 3F00
ENDING ADDRESS: 46FF

For Program 2, answer

STARTING ADDRESS: 9900
ENDING ADDRESS: 99EF

For Program 3, answer

STARTING ADDRESS: 0280
ENDING ADDRESS: 02D7

Press E at MLX's Options menu and type the starting address of the program. For example, if this is your first session typing in Program 1, type **3F00**. When you've finished, save Program 1 as WPACK, Program 2 as AMPER, and Program 3 as DISCONNECT.RAM.

Finally, type in Program 4. This is a BASIC listing, so you don't need to use Apple MLX. Instead, use "Apple Automatic Proofreader," found elsewhere in this issue, to ensure accurate typing. Use the filename MENU.EDITOR to save Program 4.

Installing the Program

To use Window Pack's commands, you must begin your programs with the following code:

```
10 REM WINDOW PACK STARTUP CODE
20 PRINT CHR$ (4)"PR#3"
30 PRINT "### WINDOW PACK ###": PRINT "COPYR
   IGHT 1988 COMPUTE! PUBLICATIONS INC.": PR
   INT "ALL RIGHTS RESERVED"
40 PRINT : PRINT CHR$ (4)"BRUN DISCONNECT.RA
   M"
50 PRINT CHR$ (4)"BRUN WPACK"
60 PRINT CHR$ (4)"BRUN AMPER,A$4000"
70 HIMEM: 30720
80 & I
90 & O,1,1,78,22,1
100 REM PROGRAM BEGINS HERE
```

This short routine activates 80-column mode, disconnects the ProDOS ramdisk, loads Window Pack's machine language routines, sets HIMEM to make room for pull-down menu data, and initializes the windowing environment with the command &I. An initial output window is set up in line 90. If you like, you may delete this line and set up your own windows later on.

In order for this routine to work, you must have a disk in the drive that contains Window Pack's machine language routines. For this reason, it's best to copy the machine language files onto all of your Window Pack programming disks. You might consider incorporating the installation routine into your STARTUP program. This way, Window Pack will be activated every time you boot your computer.

The Commands

The following describes each of Window Pack's commands. Command names appear in bold, with the parameters (if any) following in italics.

Where coordinates are required, *x* represents the horizontal position while *y* represents the vertical position. The upper left point on the screen is (0,0) and the lower right point is (79,23). *Note: These coordinates reflect character positions, not pixel positions. Window Pack does not support high-resolution graphics.* ▷

Windowing with Machine Language

Window Pack isn't limited to BASIC. Using machine language, you can bypass Applesoft's ampersand commands and access the windowing commands directly.

To pass command parameters, Window Pack uses memory locations 0–4. The table below explains which memory locations you should use for each parameter:

Parameter	Location
address (low-byte)	0
address (high-byte)	1
x	0
y	1
dx	2
dy	3
id	4

To specify the command you want to execute, you must store a number in memory location 5. The following table gives the numbers required for each command:

Command	Value of Location 5
&I	0
&O	1
&C	2
&P	3
&M	4
&L	5
&E	6
&T	7

After you've stored the appropriate parameters and command number into memory locations 0–5, simply JSR to 768 ($300) to execute the selected command. In the following example, a machine language routine initializes Window Pack and opens a small window.

```
LDA  #0
STA  5
JSR  768
LDA  #10
STA  1
STA  2
STA  3
LDA  #1
STA  4
STA  5
JSR  768
RTS
```

One note of caution: Always be sure that the 80-column card is active before you call any of Window Pack's commands.

&I

Initialize: This command clears the screen, closes all windows, and removes any pull-down menus. You must execute the initialize command at least once before any other Window Pack command can be used.

&O,x,y,dx,dy,id

Open Window: This command opens a blank window whose upper left corner is at coordinates *(x,y)*. The parameters *dx* and *dy* specify the width and height of the window, respectively. If the coordinates specified are off the screen, no window is opened.

To give your window a unique identity, you must provide an *id* number from the range 0–255. You'll use this number to access the window later on. Only eight windows can be open at once, so it's best to choose a value 1–8. Be careful not to open more than one window using the same *id* number. If you do, you will not be able to choose the window you want to work with.

&C,id

Close Window: Use this command to close (remove from the screen) previously opened windows. The *id* number specifies the window you wish to close. If the window to be closed is obscured by another window, the window will be popped to the surface and then closed.

&P,id

Pop: This command brings the window specified by *id* to the surface (moves it in front of all other windows) and directs all output to this window. As usual, *id* must be a number from the range 0–255 and must specify a previously opened window.

&M,x,y,id

Move: This command moves the window specified by *id* so that the window's upper left corner sits at coordinates *(x,y)*. Move also pops the window to the surface and makes it the current output window.

&T,x,y

Tab: You use this command to position the cursor within the active window. Parameters *x* and *y* specify the desired horizontal and vertical position of the cursor. Tab's coordinates are relative to the window's current location. So the command &T,0,0 always moves the cursor to the upper left corner of the window, no matter where the window is located on the screen.

&L,address

Load pull-down menus: This command displays the pull-down menus stored in memory at *address*, making them accessible to the &E command (below). Before you can use this command, you must BLOAD a menu file that was created using Program 4, the menu editor program (see the "Designing Menus" section, below).

By default, pull-down menus load into memory at 32768. So to activate pull-down menus saved to disk as MYMENUS, you could use the following code:

```
1000 PRINT CHR$(4)"BLOAD MYMENUS"
1010 &L,32768
```

When initialized, Window Pack reserves memory locations above 32768. With almost 8K of available memory, it's possible to load three menu files into this area—each menu file takes up 2K. The first menu can be loaded at 32768, the next at 34816, and the last at 36864. Once the files are loaded, you can use &L to switch between pull-down menus. Here's an example:

```
1000 PRINT CHR$(4)"BLOAD MENU1,A32768"
1010 PRINT CHR$(4)"BLOAD MENU2,A34816"
1020 PRINT CHR$(4)"BLOAD MENU3,A36864"
1030 &L,32768 :&E :REM ACTIVATE MENU1
1040 &L,34816 :&E :REM ACTIVATE MENU2
1050 &L,36864 :&E :REM ACTIVATE MENU3
```

If for any reason the top line on the screen is overwritten, you can redraw the current menu bar with the command &L,0.

&E

Execute Pull-Down Menus: When you use the &E command, the first menu on the menu bar is pulled down. (You must load the pull-down menus with the &L command before using &E.) The up- and down-arrow keys allow you to select the various options. To move from one menu to the next, use the left- and right-arrow keys. As you move from menu to menu, the old menu will close as the new one is pulled down. Any screen information covered by a menu is restored when

the menu is closed. Pressing Return makes the menu selection final. If you decide not to choose any of the options, press Escape.

This command returns two parameters: one in memory location 0 and one in memory location 1. The number PEEKed from these locations specifies which menu and option were selected. PEEK(0) returns a number (0–7) corresponding to the position of the menu on the menu bar (counting left to right). PEEK(1) returns the number of the option (1–15) that was selected. This number corresponds to the position of the option within the menu (counting top to bottom). If the user pressed Escape and did not select an option, both PEEKs return the value 255.

The sample code &E:M=PEEK(0):O=PEEK(1) activates the pull-down menus, gets a selection, returns the menu from which the option was chosen in the variable M, and returns the option selected in the variable O.

Note that if you press Control-Reset while Window Pack is activated, the following commands are automatically executed: &I:&L,0:&O,1,1,78,23,1. *This clears the screen, resets the pull-down menus, and opens a window for output.*

Designing Menus

Program 4 makes designing menus easy. You will use it to create all your pull-down menus. When you tell the program how many menus and options you want, along with the menu and option names, the program creates a pull-down menu file that can be BLOADed into memory and accessed via the &L and &E commands.

The first question asked is how many menus you'd like. Enter a number from the range 1–8 and press Return. Now enter the menu name. Menu names are limited to eight characters in length.

Options come next. Enter the number of options that your menu will offer. You may have as many as 15 options. If you want a thin line to divide any of the option names, count that line as an option. For example, if you want a FILE menu to offer the options LOAD, SAVE, and PRINT, with a thin line separating SAVE and PRINT, enter 4 as your number of menu options.

On the right of the screen, an input window prompts you for the option names. Using our previous example—a FILE menu with four options—you'd enter the following:

1) LOAD
2) SAVE
3) DIVIDER
4) PRINT

pressing Return after each word. Option names may be 15 characters in length. If you make a mistake, use the cursor-left key to delete characters.

Wherever the word DIVIDER appears—as in example option number 3—the menu editor replaces it with a thin line in the menu. This line will not be selectable; it simply serves as a separator, to make your menus more readable.

This cycle of entering menu name, number of options, and option names continues until all the menus have been entered.

After you've entered everything, the program activates your recently entered menu list so you can test it. When you've finished looking at your menus, simply press Return and the menu editor will ask if you'd like to save the menu file. If you answer *yes*, you must enter a filename. Answering *no* exits the program.

Using the instructions given for the &L command, you can load your file and activate the menus using &E.

Besides allowing you to design pull-down menus, the menu editor provides a good example of how to use Window Pack's windowing commands—it uses these commands extensively. Because it's a Window Pack application, you should include Window Pack's machine language commands on the same disk. Otherwise, the program will not run.

Hints and Tips

Although text output is normally restricted to the active window, you can move the cursor above or below the window's normal boundaries using Applesoft's VTAB command. This can be useful for printing window titles. For example, say you opened a window with the program lines

```
100 &I
110 &O,10,5,20,20,1
```

To give this window a title, you'd simply add the following code:

```
120 PRINT:VTAB 5:INVERSE:PRINT " MY WINDOW
    ":NORMAL
```

The PRINT statement moves the cursor to the left-most position of the window, and VTAB moves the cursor into the window's border—something that you normally can't do.

One of the most common things for a program to do is wait for the user to press a key—usually Return—before continuing. Here's a short subroutine that does just that, but with impressive results:

```
500 REM OPEN WAITING WINDOW
510 &O,25,20,30,3,8
520 PRINT:VTAB 21:INVERSE:PRINT "WAITING
    WINDOW...":NORMAL
530 S$="PRESS RETURN TO CONTINUE...
    ":S$=S$+S$
540 I=1
550 &T,0,0:PRINT MID$(S$,I,30);
560 I=I+1:IF I=28 THEN I=1
570 FOR D=1 TO 20:NEXT D
580 IF PEEK(49152)<>141 THEN 550
590 POKE 49168,0:&C,8:RETURN
```

As the program waits for the Return key, the message PRESS RETURN TO CONTINUE scrolls patiently through a convenient waiting window.

If you're a machine language programmer, check out the accompanying sidebar, "Windowing with Machine Language."

On Disk Only

If you purchase this issue's *COMPUTE!'s Apple Applications Disk*, you'll find a "Window Pack" demo program. This program, saved as WPACK.DEMO, demonstrates Window Pack's various capabilities while providing excellent examples of how to use both the menu and windowing commands.

Look for the "On Disk Only" box in all of *Apple Applications'* articles. If a program or article can be enhanced by additional disk files, we'll explain them here and provide them on disk. For more information on ordering *COMPUTE!'s Apple Applications Disk*, see page 32.

Program 1: WPACK

For mistake-proof entry, use "Apple MLX," found elsewhere in this issue, to type in this program.

```
3F00: A0 00 B9 00 40 8D 05 C0 09
3F08: 99 00 10 8D 04 C0 C8 D0 B3
3F10: F1 EE 04 3F EE 0A 3F AD 83
3F18: 0A 3F C9 17 D0 E2 A0 80 E9
3F20: B9 80 3F 99 00 03 8D 05 49
3F28: C0 99 00 03 8D 04 C0 88 24
3F30: 10 EE 60 00 00 00 00 00 7E
3F38: 00 00 00 00 00 00 00 00 B6
3F40: 00 00 00 00 00 00 00 00 BE
3F48: 00 00 00 00 00 00 00 00 C6
```

```
3F50: 00 00 00 00 00 00 00 00 CE
3F58: 00 00 00 00 00 00 00 00 D6
3F60: 00 00 00 00 00 00 00 00 DE
3F68: 00 00 00 00 00 00 00 00 E6
3F70: 00 00 00 00 00 00 00 00 EE
3F78: 00 00 00 00 00 00 00 00 F6
3F80: A5 05 C9 05 F0 13 8D 03 8E
3F88: C0 8D 05 C0 20 00 10 8D 26
3F90: 02 C0 8D 04 C0 8D 54 C0 D7
3F98: 60 A5 00 05 01 F0 E7 A9 46
3FA0: 08 8D 2D 03 A0 00 B1 00 C4
3FA8: 8D 05 C0 99 00 08 8D 04 20
3FB0: C0 C8 D0 F2 E6 01 EE 2D 51
3FB8: 03 AD 2D 03 C9 10 D0 E4 0F
3FC0: F0 C4 00 00 00 00 00 00 E8
3FC8: 00 00 00 00 00 00 00 00 47
3FD0: 00 00 00 00 00 00 00 00 4F
3FD8: 00 00 00 00 00 00 00 00 57
3FE0: 00 00 00 00 00 00 00 00 5F
3FE8: 00 00 00 00 00 00 00 00 67
3FF0: 00 00 00 00 00 00 00 00 6F
3FF8: 00 00 00 00 00 00 00 00 77
4000: A4 05 F0 2D 88 F0 2D 88 EF
4008: F0 2D 88 F0 33 88 F0 33 3D
4010: 88 F0 27 88 F0 27 88 F0 A4
4018: 01 60 A5 00 8D 54 C0 8D B2
4020: 7B 05 A5 01 18 65 22 85 84
4028: 25 20 22 FC 60 00 00 00 5A
4030: 00 4C 93 10 4C EA 10 4C B1
4038: DA 11 4C 0A 14 4C 5E 15 38
4040: 4C 23 13 4C 95 13 B2 06 3B
4048: E6 06 D0 02 E6 07 60 92 9E
4050: 06 E6 06 D0 02 E6 07 60 75
4058: BD 63 10 85 09 BD 7B 10 31
4060: 85 08 60 04 04 05 05 06 36
4068: 06 07 07 04 04 05 05 06 13
4070: 06 07 07 04 04 05 05 06 1B
4078: 06 07 07 00 80 00 80 00 A3
4080: 80 00 80 28 A8 28 A8 28 33
4088: A8 28 A8 50 D0 50 D0 50 3B
4090: D0 50 D0 A2 01 20 58 10 1B
4098: A0 27 8D 54 C0 A9 56 91 15
40A0: 08 8D 55 C0 A9 57 91 08 15
40A8: 88 10 EF E8 E0 18 D0 E5 EC
40B0: A2 00 20 58 10 A9 20 A0 14
40B8: 27 91 08 8D 54 C0 91 08 DB
40C0: 8D 55 C0 88 10 F3 8D 54 BD
40C8: C0 A9 40 85 07 A9 00 85 D8
40D0: 06 A9 00 92 06 A0 01 91 2E
40D8: 06 A5 07 18 69 08 85 07 A5
40E0: C9 90 D0 ED A9 00 8D 30 FB
40E8: 10 60 A5 00 C9 4F B0 F9 25
40F0: A5 01 C9 16 B0 F3 A5 02 C1
40F8: C9 02 90 ED 18 65 00 C9 EF
4100: 51 B0 E6 A5 03 C9 02 90 62
4108: E0 18 65 01 C9 19 B0 D9 AB
4110: AD 30 10 C9 08 D0 01 60 F9
4118: EE 30 10 A9 00 85 06 A9 86
4120: 40 85 07 B2 06 F0 0D A5 E3
4128: 07 18 69 08 85 07 C9 80 3E
4130: F0 E5 80 EF AD 30 10 20 22
4138: 4F 10 A5 04 20 4F 10 A5 5F
4140: 00 20 4F 10 A5 01 20 4F 76
4148: 10 A5 02 20 4F 10 A5 03 87
4150: 20 4F 10 A5 01 18 65 03 49
4158: 8D 2E 10 3A 8D 2D 10 A5 B9
4160: 00 18 65 02 8D 2F 10 A6 A5
4168: 01 20 58 10 A4 00 98 5A 30
4170: 8D 55 C0 4A 90 03 8D 54 CB
4178: C0 A8 B1 08 20 4F 10 A9 44
4180: 5C E4 01 F0 1D A9 4C EC AE
4188: 2D 10 F0 16 68 48 C5 00 15
4190: D0 04 A9 5F 80 0C 1A CD DD
4198: 2F 10 D0 04 A9 5A 80 02 CA
41A0: A9 A0 91 08 7A C8 CC 2F 92
41A8: 10 D0 C3 E8 EC 2E 10 D0 7F
41B0: B8 A5 00 1A 85 20 A5 02 94
41B8: 3A 3A 85 21 A5 01 1A 85 94
41C0: 22 AD 2E 10 3A 85 23 8D 42
41C8: 54 C0 A5 01 1A 85 25 20 BB
41D0: 22 FC A5 00 1A 1A 8D 7B 28
41D8: 05 60 A9 40 85 07 A9 00 CA
41E0: A0 01 85 06 B1 06 C5 04 3A
41E8: F0 0C A5 07 18 69 08 85 08
41F0: 07 C9 80 D0 EF 60 B2 06 F2
41F8: CD 30 10 F0 0D A5 07 48 D4
4200: 20 23 13 68 85 07 A9 00 E1
4208: 85 06 CE 30 10 A9 00 20 F4
4210: 4F 10 20 4F 10 20 46 10 D6
4218: 85 00 20 46 10 85 01 20 80
4220: 46 10 85 02 20 46 10 85 5C
4228: 03 A5 00 18 65 02 8D 2F 96
4230: 10 A5 01 18 65 03 8D 2E 48
4238: 10 A6 01 20 58 10 A4 00 DC
4240: 98 5A 8D 55 C0 4A 90 03 02
4248: 8D 54 C0 A8 20 46 10 91 17
4250: 08 7A C8 CC 2F 10 D0 E8 A1
4258: E8 EC 2E 10 D0 DD A9 40 E4
4260: 85 07 A9 00 85 06 AD 30 6E
4268: 10 F0 38 B2 06 CD 30 10 3B
4270: D0 25 20 46 10 20 46 10 AC
4278: 20 46 10 85 00 20 46 10 16
4280: 85 01 20 46 10 85 02 20 2B
4288: 46 10 85 03 A5 01 18 65 DB
4290: 03 8D 2E 10 4C B1 11 A5 B1
4298: 07 18 69 08 85 07 C9 80 B0
42A0: D0 C9 60 A9 00 85 20 85 82
42A8: 22 A9 50 85 21 A9 18 85 70
42B0: 23 60 20 46 10 20 46 10 E4
42B8: 20 46 10 85 00 20 46 10 56
42C0: 85 01 20 46 10 85 02 20 6B
42C8: 46 10 85 03 A5 00 18 65 18
42D0: 02 8D 2F 10 A5 01 18 65 67
42D8: 03 8D 2E 10 A6 01 20 58 DA
42E0: 10 A4 00 98 5A 8D 55 C0 94
42E8: 4A 90 03 8D 54 C0 A8 B1 98
42F0: 08 48 B2 06 91 08 68 20 DF
42F8: 4F 10 7A C8 CC 2F 10 D0 19
4300: E2 E8 EC 2E 10 D0 D7 60 86
4308: A9 00 85 06 A9 40 85 07 D4
4310: B2 06 CD 90 13 F0 F0 A5 18
4318: 07 18 69 08 85 07 C9 80 32
4320: D0 EE 60 A9 40 85 07 A9 41
4328: 00 85 06 A0 01 B1 06 C5 7B
4330: 04 F0 0C A5 07 18 69 08 44
4338: 85 07 C9 80 D0 ED 60 B2 36
4340: 06 CD 30 10 F0 F8 8D 91 5C
4348: 13 AD 30 10 8D 90 13 20 BF
4350: 08 13 20 B2 12 AD 90 13 4A
4358: CD 91 13 F0 05 CE 90 13 33
4360: 80 ED AD 91 13 8D 90 13 74
4368: 20 08 13 AD 30 10 1A 92 C6
4370: 06 EE 90 13 20 08 13 B2 F2
4378: 06 3A 92 06 20 B2 12 AD E0
4380: 90 13 3A CD 30 10 F0 05 E0
4388: EE 90 13 80 E7 4C B1 11 F9
4390: 00 00 00 00 60 A5 00 8D 3E
4398: 92 13 A5 01 8D 93 13 A9 7C
43A0: 40 85 07 A9 00 85 06 A0 E6
43A8: 01 B1 06 C5 04 F0 0D A5 DC
43B0: 07 18 69 08 85 07 C9 80 CA
43B8: F0 DA 80 EB 20 23 13 AD 9E
43C0: 30 10 8D 90 13 20 08 13 5A
43C8: 20 B2 12 20 08 13 A0 04 22
```

```
43D0: AD 92 13 18 71 06 C9 51 3F
43D8: B0 18 C8 AD 93 13 18 71 3C
43E0: 06 C9 19 B0 0D AD 92 13 62
43E8: A0 02 91 06 C8 AD 93 13 0A
43F0: 91 06 20 B2 12 4C B1 11 27
43F8: 5A 48 8D 55 C0 98 4A 90 53
4400: 03 8D 54 C0 A8 68 91 08 16
4408: 7A 60 A2 00 20 58 10 A9 66
4410: 20 A0 27 91 08 8D 54 C0 AE
4418: 91 08 8D 55 C0 88 10 F3 AE
4420: A0 00 A9 08 8D 2B 14 A2 92
4428: 00 BD 00 08 F0 05 29 7F 0E
4430: 20 F8 13 E8 C8 E0 08 D0 A2
4438: F0 C8 EE 2B 14 AD 2B 14 BD
4440: C9 10 D0 E3 60 00 09 12 31
4448: 1B 24 2D 36 3F 11 1A 23 06
4450: 2C 35 3E 47 50 AA BD 45 66
4458: 14 85 00 BD 4D 14 8D 2F 2D
4460: 10 A9 80 85 07 A9 00 85 28
4468: 06 A2 00 20 58 10 A4 00 EA
4470: 20 46 10 20 F8 13 C8 CC 11
4478: 2F 10 D0 F4 E8 E0 12 D0 C5
4480: EA 60 AA 09 08 8D 20 15 48
4488: BD 45 14 85 00 BD 4D 14 C1
4490: 8D 2F 10 A9 80 85 07 A9 1A
4498: 00 85 06 A2 00 20 58 10 AE
44A0: A4 00 98 5A 8D 55 C0 4A C1
44A8: 90 03 8D 54 C0 A8 B1 08 45
44B0: 20 4F 10 7A C8 CC 2F 10 AE
44B8: D0 E8 E8 E0 12 D0 DE A2 43
44C0: 00 86 01 20 58 10 A4 00 59
44C8: 20 1E 15 C9 00 F0 0A 09 09
44D0: B0 20 F8 13 C8 E8 4C C8 3D
44D8: 14 A2 10 DA E6 01 A6 01 4D
44E0: 20 58 10 FA A4 00 A9 5F 19
44E8: 20 F8 13 C8 20 1E 15 E8 3B
44F0: 20 F8 13 C8 8A F0 10 29 18
44F8: 0F C9 00 D0 EF 20 1E 15 D9
4500: C9 00 F0 03 4C DB 14 A4 5C
4508: 00 E6 01 A6 01 20 58 10 20
4510: A2 00 A9 4C 20 F8 13 C8 B9
4518: E8 E0 11 D0 F5 60 BD 00 2B
4520: 08 60 85 04 AE 5C 15 BD 86
4528: 45 14 A8 C8 AD 5C 15 09 0E
4530: 08 8D 20 15 AE 5D 15 20 AC
4538: 58 10 8A 0A 0A 0A 0A AA 1C
4540: 20 1E 15 C9 5A F0 14 09 69
4548: 80 48 A5 04 F0 05 68 29 AF
4550: 7F 80 01 68 20 F8 13 C8 35
4558: E8 80 E5 60 00 00 A9 00 8D
4560: 8D 5C 15 1A 8D 5D 15 AD C6
4568: 5C 15 20 82 14 AD 5C 15 B7
4570: 09 08 8D 20 15 A9 01 8D 14
4578: 5D 15 A9 01 20 22 15 AD 9D
4580: 00 C0 10 FB 8D 10 C0 C9 F4
4588: 9B F0 20 C9 8D F0 29 C9 0A
4590: 88 D0 03 4C 44 16 C9 95 5C
4598: D0 03 4C 1B 16 C9 88 D0 47
45A0: 03 4C F2 15 C9 8A F0 21 EA
45A8: 4C 7F 15 AD 5C 15 20 55 83
45B0: 14 A9 FF 85 00 85 01 60 80
45B8: AD 5C 15 20 55 14 AD 5C 88
45C0: 15 85 00 AD 5D 15 85 01 5D
45C8: 60 A9 00 20 22 15 EE 5D 90
45D0: 15 AD 5D 15 C9 10 F0 10 CE
45D8: 0A 0A 0A 0A AA 20 1E 15 F3
45E0: C9 53 F0 EA C9 00 D0 07 E8
45E8: A9 00 8D 5D 15 80 DF 4C 86
45F0: 7A 15 A9 00 20 22 15 CE B5
45F8: 5D 15 AD 5D 15 C9 00 F0 C3
4600: 13 0A 0A 0A 0A AA 20 1E D3
4608: 15 C9 53 F0 EA C9 00 F0 7A
4610: E6 4C 7A 15 A9 10 8D 5D C9
4618: 15 80 DC AD 5C 15 20 55 92
4620: 14 EE 5C 15 AD 5C 15 C9 22
4628: 08 F0 11 A2 00 09 08 8D 03
4630: 20 15 20 1E 15 C9 00 F0 B8
4638: E8 4C 67 15 A9 FF 8D 5C 4F
4640: 15 4C 21 16 AD 5C 15 20 19
4648: 55 14 CE 5C 15 AD 5C 15 51
4650: C9 FF F0 11 A2 00 09 08 20
4658: 8D 20 15 20 1E 15 C9 00 31
4660: F0 E8 4C 67 15 A9 08 8D 8C
4668: 5C 15 4C 4A 16 00 00 00 47
4670: 00 00 00 00 00 00 00 00 FC
4678: 00 00 00 00 00 00 00 00 05
4680: 00 00 00 00 00 00 00 00 0D
4688: 00 00 00 00 00 00 00 00 15
4690: 00 00 00 00 00 00 00 00 1D
4698: 00 00 00 00 00 00 00 00 25
46A0: 00 00 00 00 00 00 00 00 2D
46A8: 00 00 00 00 00 00 00 00 35
46B0: 00 00 00 00 00 00 00 00 3D
46B8: 00 00 00 00 00 00 00 00 45
46C0: 00 00 00 00 00 00 00 00 4D
46C8: 00 00 00 00 00 00 00 00 55
46D0: 00 00 00 00 00 00 00 00 5D
46D8: 00 00 00 00 00 00 00 00 65
46E0: 00 00 00 00 00 00 00 00 6D
46E8: 00 00 00 00 00 00 00 00 75
46F0: 00 00 00 00 00 00 00 00 7D
46F8: 00 00 00 00 00 00 00 00 85
```

Program 2: AMPER

For mistake-proof entry, use "Apple MLX," found elsewhere in this issue, to type in this program.

```
9900: A9 01 20 F5 BE 90 01 60 46
9908: C9 99 D0 FB A0 00 B9 00 D8
9910: 40 99 00 99 C8 D0 F7 A9 86
9918: 4C 8D F5 03 A9 42 8D F6 2C
9920: 03 A9 99 8D F7 03 AD F2 65
9928: 03 8D ED 99 AD F3 03 8D 68
9930: EE 99 A9 BB 8D F2 03 A9 1A
9938: 99 8D F3 03 49 A5 8D F4 3B
9940: 03 60 20 B7 00 48 20 B1 9F
9948: 00 68 A0 00 D9 9C 99 F0 0F
9950: 06 C8 D0 F8 4C BE DE 98 16
9958: AA 8E BA 99 A0 00 E0 00 3C
9960: F0 0B B9 A4 99 C8 C9 80 54
9968: D0 F8 CA D0 F5 8C B9 99 97
9970: AC B9 99 B9 A4 99 C9 80 D6
9978: F0 1A 48 20 BE DE 20 67 CE
9980: DD 20 52 E7 68 AA A5 50 FC
9988: 95 00 A5 51 95 01 EE B9 98
9990: 99 4C 70 99 AD BA 99 85 5C
9998: 05 4C 00 03 49 4F 43 50 EF
99A0: 4D 4C 45 54 80 00 01 02 83
99A8: 03 04 80 04 80 04 80 00 C3
99B0: 01 04 80 00 80 80 00 01 7C
99B8: 80 00 00 20 00 C3 A9 00 90
99C0: 85 05 20 00 03 A9 00 85 40
99C8: 00 85 01 A9 05 85 05 20 80
99D0: 00 03 A9 01 85 00 85 01 42
99D8: 85 04 85 05 A9 4E 85 02 64
99E0: A9 16 85 03 20 00 03 A9 FF
99E8: 00 8D 7B 05 4C FF FF 00 A1
```

Program 3: DISCONNECT.RAM

For mistake-proof entry, use "Apple MLX," found elsewhere in this issue, to type in this program.

```
0280: AD 98 BF 29 30 C9 30 D0 E5
0288: 4D AD 26 BF CD 10 BF D0 5E
0290: 08 AD 27 BF CD 11 BF F0 08
```

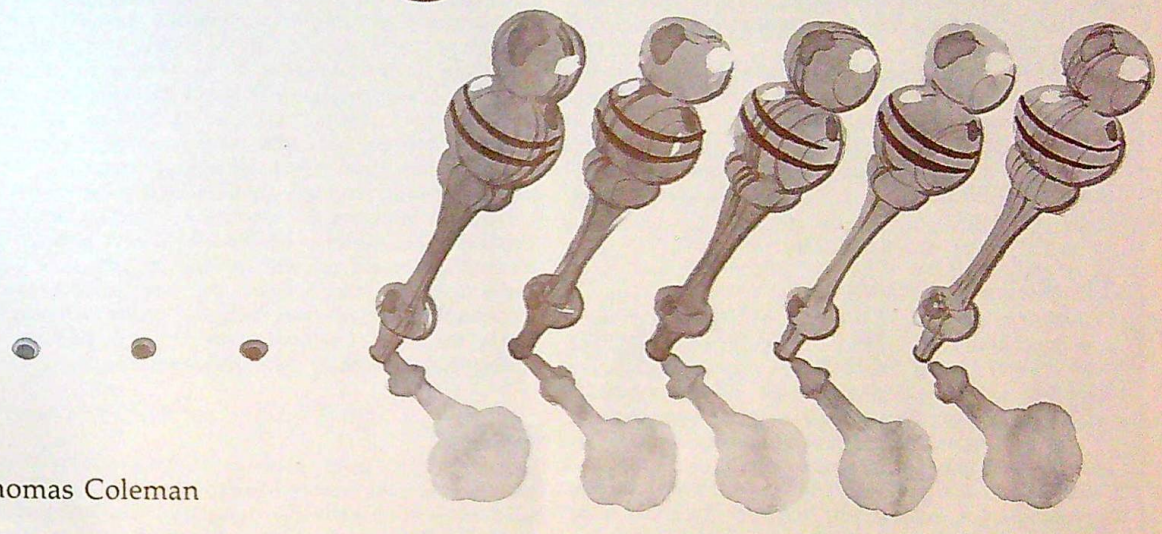
```
0298: 3D AC 31 BF B9 32 BF 29 C7
02A0: F3 C9 B3 F0 05 88 10 F4 F5
02A8: 30 2C B9 32 BF 8D 02 03 65
02B0: B9 33 BF 99 32 BF F0 03 65
02B8: C8 D0 F5 AD 26 BF 8D 00 3A
02C0: 03 AD 27 BF 8D 01 03 AD B6
02C8: 10 BF 8D 26 BF AD 11 BF 6F
02D0: 8D 27 BF CE 31 BF 60 00 93
```

Program 4: MENU.EDITOR

Be sure to use "Apple Automatic Proofreader," found elsewhere in this issue, to enter the following program.

```
E4 10 REM WINDOW PACK STARTUP CODE
51 20 PRINT CHR$ (4)"PR#3"
68 30 PRINT "*** WINDOW PACK ***": PRINT "COP
      YRIGHT 1988 COMPUTE! PUBLICATIONS INC."
      : PRINT "ALL RIGHTS RESERVED"
56 40 PRINT : PRINT CHR$ (4)"BRUN DISCONNECT.
      RAM"
86 50 PRINT CHR$ (4)"BRUN WPACK"
F0 60 PRINT CHR$ (4)"BRUN AMPER,A$4000"
85 70 HIMEM: 30720
03 80 & I
23 90 & 0,1,1,78,22,1
6C 100 LOMEM: 12288
0E 110 GOTO 210
F2 120 REM INPUT ROUTINE
7D 130 A9$ = ""
2B 140 GET A$: IF A$ = CHR$ (13) THEN A$ = A9
      $:B9 = FRE (0): RETURN
94 150 IF A$ = CHR$ (21) THEN 140
E5 160 IF A$ = CHR$ (8) AND LEN (A9$) > 1 THE
      N PRINT A$;" ";A$;:A9$ = LEFT$ (A9$, L
      EN (A9$) - 1 * (( LEN (A9$) > 1))): GO
      TO 140
85 180 IF A$ = CHR$ (8) AND LEN (A9$) = 1 THE
      N PRINT A$;" ";A$;:A9$ = "": GOTO 140
87 190 IF A$ = CHR$ (8) THEN A9$ = "": PRINT
      CHR$ (7);: GOTO 140
BE 195 IF LEN (A9$) = L9 THEN PRINT CHR$ (7);
      : GOTO 140
29 200 A9$ = A9$ + A$: PRINT A$;: GOTO 140
21 210 REM MAIN PROGRAM STARTS HERE
F4 220 DIM F$(10),S$(20)
08 230 & I: & 0,20,7,37,7,1
5F 240 & T,5,2: PRINT "Initializing the progr
      am";
3E 250 ADDR = 32768: REM  ADDRESS OF MENUS
9A 260 FOR I = ADDR TO ADDR + 2048: POKE I,0:
       NEXT
58 270 & C,1
E9 280 & 0,10,4,60,15,1
59 290 HOME : & T,7,3: PRINT "How many menus
      would you like  (1-8)? ";:L9 = 1: GOSU
      B 120
02 300 IF A$ < "1" OR A$ > "8" THEN 290
A6 310 F = ASC (A$) - 48
8B 320 FOR I = 1 TO F
BB 330 & C,1: & 0,5,5,48,10,1
35 340 HOME : & T,0,1
CE 350 PRINT "Menu names are limited to 8 cha
      racters": PRINT "in length.": PRINT
B8 360 PRINT "Please enter the name of menu #
      ";I
95 370 PRINT : PRINT "1) ";:L9 = 8: GOSUB 120
      :F$(I) = A$
38 380 FOR II = LEN (F$(I)) + 1 TO 8:F$(I) =
      F$(I) + " ": NEXT II
3A 390 HOME : & T,0,1: PRINT "When entering o
      ptions, a DIVIDER": PRINT "counts as a
      n option.  To get a DIVIDER": PRINT "i
      n your options list, enter DIVIDER": P
      RINT "as the name of the option.": PRI
      NT
C4 400 PRINT "How many options does "F$(I): P
      RINT "have  (1-15)? ";:L9 = 2: GOSUB 1
      20
78 410 S = VAL (A$): IF S < 1 OR S > 15 THEN
      390
5B 420 & C,1
59 430 & 0,3,7,40,9,1
0E 440 HOME : PRINT
38 450 PRINT "Please enter the names of "F$(I
      )"'s"
46 460 PRINT "options in the window on the":
      PRINT "right.  Enter DIVIDER for a div
      ider."
CC 470 & 0,55,9 - INT (S / 2),22,S + 4,2
8F 480 HOME : FOR J = 1 TO S: & T,0,J: IF J <
       10 THEN PRINT " ";J;") ";
0D 490 IF J > 9 THEN PRINT J;") ";
62 500 NEXT J
25 510 FOR J = 1 TO S: & T,4,J:L9 = 15: GOSUB
       120:S$(J) = A$: NEXT J
E7 520 REM poke in the values for F$(i)
FD 530 & 0,25,8,25,5,3
B5 540 & T,1,1: INVERSE : PRINT "ONE MOMENT,
      PLEASE.";: NORMAL
3C 550 FOR J = 1 TO S
A2 560 IF S$(J) = "DIVIDER" OR S$(J) = "divid
      er" OR S$(J) = "Divider" THEN S$(J) =
      "": FOR K = 1 TO 15:S$(J) = S$(J) + CH
      R$ (0): NEXT K
63 570 FOR K = LEN (S$(J)) + 1 TO 15:S$(J) =
      S$(J) + " ": NEXT K
BD 580 S$(J) = S$(J) + CHR$ (90)
74 590 NEXT J
E6 600 FOR II = 1 TO 8: POKE ADDR + (I - 1) *
       256 + II - 1, ASC ( MID$ (F$(I),II,1)
      ) + 128
74 610 Z$ = MID$ (F$(I),II,1): IF Z$ > = "@"
      AND Z$ < = "_" THEN POKE ADDR + (I - 1
      ) * 256 + II - 1, PEEK (ADDR + (I - 1)
       * 256 + II - 1) - 64
B0 620 NEXT II
79 630 FOR K = 1 TO S
72 640 P = 128: IF LEFT$ (S$(K),1) = CHR$ (0)
       THEN P = 0:S$(K) = "SSSSSSSSSSSSSSS"
      + CHR$ (90)
08 650 FOR L = 1 TO 15
83 660 Z$ = MID$ (S$(K),L,1): IF Z$ = "S" AND
       P = 0 THEN 680
47 670 IF Z$ > = "@" AND Z$ < = "_" THEN Z$ =
       CHR$ ( ASC (Z$) - 64)
D2 680 POKE ADDR + (I - 1) * 256 + K * 16 + L
      - 1, ASC (Z$) + P
76 690 NEXT L
DD 700 POKE ADDR + (I - 1) * 256 + K * 16 + 1
      5,90
E6 710 NEXT K
90 720 & C,3: FOR K = 1 TO 500: NEXT K: & I
E9 730 NEXT I
31 740 & 0,20,5,40,8,1: HOME : PRINT : PRINT
      "  You may try out your menu bar": PRI
      NT "definitions.  Use the arrow keys":
       PRINT "to move the window. Press Retu
      rn": PRINT "when you are finished.";
37 750 & L,ADDR: & E
5B 760 & C,1
75 770 REM SAVE DATA
9E 780 & 0,20,5,40,10,1
9D 790 & T,0,3: PRINT "Would you like to save
       your pull-": PRINT "down menus (Y/N)?
      ";:L9 = 1: GOSUB 120
6B 800 IF A$ = "n" OR A$ = "N" THEN & I: & 0,
      1,1,78,22,1: & L,ADDR: END
CA 810 HOME : PRINT : PRINT "Please enter the
       filename for your": PRINT "pull-down
      menus. ";:L9 = 15: GOSUB 120
D3 820 PRINT " "
2B 830 PRINT CHR$ (4);"BSAVE ";A$;",A"ADDR",L
      $800"
08 840 & I: & 0,1,1,78,22,1: & L,ADDR: END
```

Cribbage



Thomas Coleman

Play against a computer opponent in this Apple II version of the classic card-and-board game cribbage.

"Cribbage" is a computer version of one of the oldest known card games. The computer takes care of the hard part—the scoring. You concentrate on the game to try to beat the computer opponent.

If you're unfamiliar with the rules of cribbage, read the accompanying article, "Cribbage: A Closer Look."

Typing It In

Cribbage is written partly in BASIC and partly in machine language.

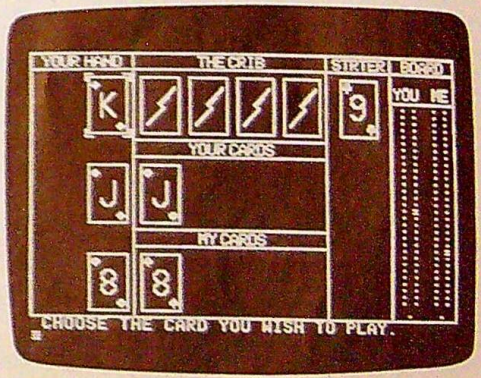
Type in Program 1, the BASIC portion of Cribbage. To ensure accurate typing, we recommend that you use the "Apple Automatic Proofreader" program found elsewhere in this issue. When you've finished typing, save the program to disk as CRIBBAGE.

Use "Apple MLX," the machine language entry program found elsewhere in this issue, to enter Program 2. When Apple MLX prompts you, respond with the values given below.

STARTING ADDRESS? 1388
ENDING ADDRESS? 1677

When the options menu appears, select E to enter the program and then type in the starting address. (If you're just beginning to enter Cribbage, type **1388**, the first address in the listing.) Type in the data for Program 2. When you've finished typing, be sure to save the program to disk with the name CRIBBAGE.BIN.

It's very important that you use the filenames CRIBBAGE and CRIBBAGE.BIN, as these are the filenames the program searches for when run.



Which card would you choose?

Your First Game

When you're ready to play a game of Cribbage, simply type **RUN CRIBBAGE**.

Before the game begins, you must decide whether you want to play Once Around or Twice Around. In Once Around, the first person to reach 61 points wins (once around the cribbage board). In Twice Around, your goal is 121 (twice around the board). Using the space bar, select the option you want and press Return.

Your hand appears in the middle portion of the screen. You must discard two cards at the beginning of each hand. Press the space bar until the square brackets outline the card that you want to discard and press Return. Repeat this process for the second card. ▷

Cribbage: A Closer Look

David Hensley, Jr.

Cribbage is the oldest of all two-handed card games. In fact, it's among the oldest of *all* card games. Historically, its invention dates back to the early 1600s and is most often associated with the English poet Sir John Suckling.

Cribbage is a two-player game. It's played on a table or large open space with a standard 52-card deck and a cribbage board. The board (a wooden board with peg holes) is used to keep score.

The reason that pegs are so useful in scoring is that there are so many different opportunities to score in the game. The pegs are advanced appropriately when a score is made. The first player to reach the end of the board is the winner. The computer version of cribbage conveniently replaces the need for a partner, table, cards, and cribbage board.

The Rules of Cribbage

The object of the game is to be the first player to obtain a total point score of 61 or more in Once Around, or 121 or more in Twice Around. The cards rank from the high card (a king) down to the low card (an ace). All cards are counted at face value. Face cards are valued at 10; aces are worth 1.

At the beginning of a game, the computer cuts the cards to determine who deals first (low card deals). The dealer shuffles and then deals six cards to each player (the opponent receives the first card). In the computer version of the game, your cards are located in the middle of the screen, and your opponent's cards are at the bottom portion of the screen.

After the deal, the remaining cards are put away until needed. Both players then select two of their six cards to discard. These four discards are known as the *crib*. The crib is scored as an extra hand contributing to the dealer's total at the end of a game. It's located at the top of the screen, above your cards.

When both players have discarded two cards, the dealer cuts the remaining cards in the deck. The bottom card from the cut, called the *starter*, is placed face up in the upper right portion of the screen. If the starter is a jack, the dealer pegs (scores) two points. This is referred to as *two for his heels* in cribbage jargon. The starter card counts as the fifth card for both players' hands, and it's also the fifth card of the dealer's crib. Other than being involved in scoring, the starter card is not used in the pegging or play portion of the game.

Gameplay

Once the starter card has been placed, play begins. Both players alternate playing the four cards remaining in their hands. This is called *pegging*. The dealer is never the first to play. Once a card is selected, it's placed in the center row on the screen. The total of the cards is displayed at the bottom of the screen. Play continues until the total of the cards is 31 or as near to 31 as possible.

If, during his or her turn, a player cannot play a card without exceeding 31, the turn is passed to the other player. The opponent must play any or all of his or her cards until 31 has been reached or until no further plays can be made. If neither player can play a card without exceeding 31, then the last player able to play receives one point for closing. This is commonly referred to as the *go*. If you can make the sum of the cards total exactly 31, you'll receive two points for the go. Once a final go or 31 has been reached, the cards that have been played are turned face down, and play continues with any remaining cards.

After both opponents have played the cards in their hands, the remaining cards are revealed. This is referred to as the *meld*. The computer displays the dealer's hand last. This allows the dealer's opponent the chance to total 121 (61 in Once Around) or more and win the game even if the dealer may have scored higher. If the opponent's total is less than the winning score, the dealer's hand is displayed. Finally, the crib (the cards set aside earlier in the game) is displayed along with its point total.

Scoring

In addition to the points scored for the go and 31, there are several other ways to score when playing cribbage. Keep in mind that points are scored in pegging and also in the meld.

Two points may be earned whenever the sum of the face value of the cards played equals 15. For example, if the first player plays a 7 and the second player plays a 5, then the first player could play a 3 and would receive two points for making the tally equal 15.

Every pair (two cards of the same denomination played in succession) scores 2 points. Three of a kind scores 6 points, and four of a kind scores 12 points.

Points are awarded for a *run*, which is similar to a straight in poker. The minimum number of cards in a run is three. The cards in a run do not necessarily have to be played in numerical order. However, they do have to be grouped together. For example, the following are all legitimate runs: 6-7-8, 8-6-7, 7-8-6. Remember, the ace is low in cribbage; therefore, ace-king-queen is not considered a run. One point is scored for each card in a run.

In the meld, it's possible to have double and triple runs. For example, 3-3-4-5 would be a double three-card run (using the 4 and 5 with each 3), and 3-3-4-5-6 would be a double four-card run.

If all four cards in the hand are of the same suit, then four points are counted for a flush. If the cut card is of the same suit, then five points are scored. In the crib, all five cards must be the same suit in order to score points for a flush.

If your hand contains a jack of the same suit as the cut card, you receive one point. This is referred to by cribbage players as *one for his nobs*.

After you discard, pegging begins. When it's your turn, the computer displays the prompt CHOOSE THE CARD YOU WISH TO PLAY. Using the space bar and Return key, select the card that you wish to play. As each card is played, the tally appears at the bottom of the screen.

After pegging is over, the computer shows the hands and their scores. The computer also shows a breakdown of how the points were scored: from the hand, from the crib, or from pegging. The score is reflected in the cribbage board that's displayed on the right-hand section of the screen. ▷

When either you or the computer scores at least 61 points (or 121 in Twice Around), the game ends. The computer then asks if you'd like to play again. Enter **Y** for yes or **N** for no.

You'll find that the computer plays a fairly good game. It isn't terribly cunning, but it's very thorough. Best of all, the game's step-by-step approach and onscreen scoring makes Cribbage an excellent program for teaching beginners how to play this popular card game.

Cribbage Point Scores	Points
Tally combination of 15 (10, 5, 1, 2)	2
Tally total of 31 (during pegging only)	2
Last card pegged (one for the go)	1
Cut card is a jack (two for his heels)	2
Jack same suit as cut card (one for his nobs)	1
One pair (2, 2, 5, 7)	2
Three of a kind (2, 2, 2, 5)	6
Four of a kind (2, 2, 2, 2)	12
Run of three cards or more (5, 6, 7, 8)	1 per card
Double three-card run (3, 4, 5, 3)	8
Double four-card run (4, 4, 5, 6) cut 7	10
Triple run (4, 4, 5, 6) cut 4	15
Quadruple run (8, 8, 9, 9) cut 10	16
Flush (four cards)	4
Flush (five cards)	5

Program 1: CRIBBAGE

Be sure to use "Apple Automatic Proofreader," found elsewhere in this issue, to enter the following program.

```
FA 100 REM COPYRIGHT 1988 COMPUTE! PUBLICATIO
      NS, INC. ALL RIGHTS RESERVED
1A 110 IF PEEK (104) < > 64 THEN POKE 104,64:
       POKE 16384,0: PRINT CHR$ (4)"RUN CRIB
      BAGE"
1F 120 DIM S(3,6),R(3,6),US(52),UR(52),P(2,6)
      ,K(2,6),X(3,6),Y(3,6),PC(2),TP$(2),SS(
      2)
5A 130 TEXT : HOME
13 140 VTAB 3: HTAB 16: PRINT CHR$ (21)"CRIBB
      AGE"
20 150 VTAB 8: HTAB 13: PRINT "COPYRIGHT 1988
      ": HTAB 7: PRINT "COMPUTE PUBLICATIONS
      , INC.": HTAB 10: PRINT "ALL RIGHTS RE
      SERVED."
A1 160 PRINT CHR$ (4);"BLOAD CRIBBAGE.BIN"
B1 170 POKE 232,136: POKE 233,19
14 180 VTAB 17: HTAB 7: INVERSE : PRINT "ONCE
       AROUND";: NORMAL : PRINT " OR TWICE A
      ROUND": GET Q$
53 190 IF Q$ = " " THEN 220
25 200 IF Q$ = CHR$ (13) THEN TA = 61: GOTO 2
      60
95 210 GOTO 180
AE 220 VTAB 17: HTAB 7: PRINT "ONCE AROUND OR
       ";: INVERSE : PRINT "TWICE AROUND": N
      ORMAL : GET Q$
0B 230 IF Q$ = " " THEN 180
22 240 IF Q$ = CHR$ (13) THEN TA = 121: GOTO
      260
18 250 GOTO 220
AC 260 R = RND ( - ( PEEK (78) + PEEK (79) *
      256))
AD 270 GOSUB 280: GOSUB 370: GOTO 550
58 280 C = 1: FOR A = 2 TO 5: FOR B = 6 TO 18
F6 290 UR(C) = B:US(C) = A:C = C + 1
BC 300 NEXT B,A
93 310 IF CR = 0 THEN CR = INT ( RND (1) * 2)
       + 1
C3 320 FOR B = 1 TO 104: IF B > 52 THEN A = B
       - 52
77 330 R = INT ( RND (1) * 52) + 1: IF B < 53
       THEN A = B
E3 340 W = UR(A):UR(A) = UR(R):UR(R) = W:W =
      US(A):US(A) = US(R):US(R) = W
05 350 NEXT
1F 360 RETURN
EC 370 HOME : HGR : HCOLOR= 3: SCALE= 1: ROT=
       0
0C 380 HPLOT 0,0 TO 279,0: HPLOT 0,0 TO 0,159
EC 390 HPLOT 65,0 TO 65,159: HPLOT 191,0 TO 1
      91,159: HPLOT 234,0 TO 234,159: HPLOT
      279,0 TO 279,159
87 400 HPLOT 65,53 TO 191,53: HPLOT 65,106 TO
       191,106: HPLOT 234,28 TO 279,28: HPLO
      T 0,159 TO 279,159: HPLOT 0,10 TO 279,
      10: HPLOT 65,63 TO 191,63: HPLOT 65,11
      6 TO 191,116
43 410 FOR Z = 242 TO 250 STEP 8
EF 420 FOR Y = 32 TO 148 STEP 4: HPLOT Z,Y: N
      EXT Y,Z
0C 430 FOR Z = 264 TO 272 STEP 8
F3 440 FOR Y = 32 TO 148 STEP 4: HPLOT Z,Y: N
      EXT Y,Z
CD 450 HPLOT 246,156: HPLOT 268,156
73 460 FOR Z = 1 TO 47: READ E,F,8: DRAW E AT
       F,8: NEXT
22 470 RETURN
90 480 DATA 37,8,8,32,14,8,36,20,8,33,26,8,28
      ,35,8,23,41,8,31,47,8,26,53,8
69 490 DATA 35,107,8,28,113,8,27,119,8,25,127
      ,8,33,133,8,29,139,8,24,145,8
9C 500 DATA  34,196,8,35,202,8,33,208,8,35,21
      4,8,27,220,8,33,226,8
37 510 DATA  24,243,8,32,249,8,23,255,8,33,26
      1,8,26,267,8
A6 520 DATA  37,237,25,32,243,25,36,249,25,30
      ,264,25,27,270,25
7F 530 DATA 37,101,61,32,107,61,36,113,61,33,
      119,61,25,127,61,23,133,61,33,139,61,2
      6,145,61,34,151,61
7C 540 DATA 30,107,114,37,113,114,25,121,114,
      23,127,114,33,133,114,26,139,114,34,14
      5,114
68 550 V(1) = 246:V(2) = 268:W(1) = 156:W(2)
      = 156: FOR C = 1 TO 2:PL = C: GOSUB 28
      00: NEXT
8E 560 REM GAME
94 570 REM
C9 580 FOR D = 1 TO 2: FOR E = 1 TO 6:N = N +
       1
38 590 S(D,E) = US(N):R(D,E) = UR(N)
9F 600 NEXT : NEXT
C1 610 FOR I = 0 TO 2: READ SS(I),TP$(I): NEX
      T
60 620 DATA   2,"A PAIR "
97 630 DATA  6,"A PAIR ROYAL "
AD 640 DATA 12,"A DOUBLE PAIR ROYAL "
5C 650 PL = 1
D1 660 FOR D = 1 TO 6: READ Y(1,D),X(1,D)
75 670 DATA  49,28,49,61,102,28,102,61,155,28
      ,155,61
34 680 GOSUB 2860: NEXT
67 690 CR = 2 - (CR = 2):PL = 2
05 700 IF CR = 1 THEN WH$ = "YOUR"
F1 710 IF CR = 2 THEN WH$ = "MY"
91 720 HOME : VTAB 21: HTAB 3: PRINT "ONE MOM
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      ENT PLEASE, CHOOSING CARDS TO": HTAB 1
      1: PRINT "PUT IN "WH$" CRIB."
58 730 GOSUB 3080:PC(2) = 2: FOR I = 1 TO 6:P
      (2,I) = 0: NEXT
B8 740 HPLOT 0,0 TO 279,0: HPLOT 0,0 TO 0,159
5D 750 PL = 1
D4 760 D9 = 0: VTAB 21: HTAB 1: PRINT "WHICH
      2 CARDS DO YOU WISH TO DISCARD?"
12 770 HTAB 14: INVERSE : PRINT WH$" CRIB": N
      ORMAL
F9 780 Q = 2:Z = 2:U = 49:PC(1) = 2: FOR I =
      1 TO 6:P(1,I) = 0: NEXT :DP = 1
81 790 GOSUB 2960
A6 800 HOME :N = N + 1
79 810 S(3,1) = US(N):R(3,1) = UR(N)
BD 820 D = 1:PL = 3:X(3,1) = 225:Y(3,1) = 49:
       GOSUB 2860
6C 830 NP = 0:AC = 0:PC = CR
54 840 IF PC = 1 THEN PC = 2: GOTO 860
CD 850 PC = 1
58 860 HOME :NP(1) = 0:NP(2) = 0
E2 870 FOR A = 1 TO 2: FOR B = 1 TO 6: FOR C
      = 1 TO 6
2F 880 IF B = K(A,C) THEN 920
F3 890 NEXT C
3B 900 IF R(A,B) > 14 AND AC + 10 < 32 THEN N
      P(A) = NP(A) + 1
60 910 IF R(A,B) < 15 AND AC + R(A,B) - 5 < 3
      2 THEN NP(A) = NP(A) + 1
96 920 NEXT B,A
2F 930 IF NP(1) < > 0 OR NP(2) < > 0 THEN 102
      0
D7 940 IF NP = 8 THEN VTAB 21: INVERSE : GOTO
       960
10 950 D9 = 1: VTAB 21: HTAB 8: PRINT "NEITHE
      R OF US CAN GO.": INVERSE
44 960 IF LP = 1 THEN HTAB 1: PRINT "YOU";:SC
      (1) = SC(1) + 1:PL = 1
65 970 IF LP = 2 THEN HTAB 2: PRINT "I";:SC(2
      ) = SC(2) + 1:PL = 2
DC 980 NORMAL
92 990 PRINT " GET 1 POINT FOR PLAYING THE LA
      ST.": GOSUB 2730:AC = 0: GOSUB 4520: G
      OSUB 4400: GOTO 1040
DD 1000 IF J(1) = 6 AND J(2) < 6 THEN NP(2) =
       1:PC = 1
E0 1010 IF J(2) = 6 AND J(1) < 6 THEN NP(1) =
       1:PC = 2
1A 1020 IF NP(1) = 0 AND PC = 1 THEN VTAB 21:
       HTAB 7: PRINT "YOU CAN'T GO SO I GO
      AGAIN.":PC = 2: GOSUB 4530: HOME : GO
      TO 1040
53 1030 IF NP(2) = 0 AND PC = 2 THEN VTAB 21:
       HTAB 7: PRINT "I CAN'T GO SO YOU GO
      AGAIN.":PC = 1: GOSUB 4530: HOME : GO
      TO 1040
DD 1040 IF NP = 8 THEN 1490
62 1050 IF PC = 2 AND J(2) < 6 THEN GOSUB 374
      0:WH$ = "I": GOTO 1100
A8 1060 IF J(1) = > 6 THEN PC = 2: GOTO 1000
5C 1070 VTAB 21: HTAB 2: PRINT "CHOOSE THE CA
      RD YOU WISH TO PLAY."
CC 1080 Q = J(1) + 1:Z = 1:F = 0:PL = 1: GOSU
      B 2960:PC(1) = PC(1) + 1
8C 1090 WH$ = "YOU"
8E 1100 IF R(PC,K(PC,Q)) > 14 THEN VL = 10: G
      OTO 1120
BD 1110 VL = R(PC,K(PC,Q)) - 5
CD 1120 IF AC + VL = 31 OR AC + VL = 15 THEN
      HOME : VTAB 21: HTAB 9: INVERSE : PRI
      NT WH$" GET 2 POINTS FOR "AC + VL"!";
      SC(PC) = SC(PC) + 2: NORMAL : GOSUB 2
      730: GOSUB 4520: IF AC + VL = 31 THEN
       AC = 0:D9 = 1: GOTO 1140
2B 1130 AC = AC + VL
CA 1140 NP = NP + 1:CP(NP) = R(PC,F):DD = DP
      + D9:NS = 1: IF (NP > 2) AND (DP = (N
      P - 1)) THEN 1250
B6 1150 IF NP = DD THEN 1250
AA 1160 FOR I = NP - 1 TO DD STEP - 1
C8 1170 IF CP(NP) < > CP(I) THEN I = DD: GOTO
       1190
AD 1180 NS = NS + 1
C7 1190 NEXT
40 1200 IF NS = 1 THEN 1250
A5 1210 SS = SS(NS - 2):TP$ = TP$(NS - 2)
AF 1220 HOME : VTAB 21: INVERSE : HTAB 8: PRI
      NT WH$" GET "SS" POINTS FOR A ": HTAB
       (40 - LEN (TP$)) / 2: PRINT TP$".";:
       NORMAL
D4 1230 SC(PC) = SC(PC) + SS:PL = PC: GOSUB 2
      730
69 1240 GOSUB 4520
E2 1250 ZZ = 0:T9 = NP - DD: IF T9 < 2 THEN 1
      470
A4 1260 FOR J = 2 TO T9: GOSUB 1290: NEXT
E3 1270 IF ZZ = 0 THEN 1470
8A 1280 GOTO 1450
30 1290 HI = NP:LO = NP:FF = 0
03 1300 FOR I = NP - J TO NP - 1
64 1310 IF CP(I) = CP(NP) THEN I = NP - 1:FF
      = 1: GOTO 1340
1A 1320 IF CP(I) > CP(HI) THEN HI = I: IF CP(
      I) - CP(LO) > J THEN I = NP - 1:FF =
      1: GOTO 1340
12 1330 IF CP(I) < CP(LO) THEN LO = I: IF CP(
      HI) - CP(I) > J THEN I = NP - 1:FF =
      - 1
81 1340 NEXT I
92 1350 IF FF = 1 OR (CP(HI) - CP(LO) < > J)
      THEN 1440
7B 1360 FOR I = CP(LO) TO CP(HI) - 1
0B 1370 FF = 1
33 1380 FOR I2 = NP - J TO NP
81 1390 IF CP(I2) = I THEN FF = 0:I2 = NP
D8 1400 NEXT I2
98 1410 IF FF = 1 THEN I = CP(HI) - 1
7B 1420 NEXT I
9C 1430 IF FF = 0 THEN ZZ = J + 1
E9 1440 RETURN
DA 1450 HOME : VTAB 21: HTAB 4: INVERSE : PRI
      NT WH$" GET "ZZ" POINTS FOR A RUN OF
      "ZZ".": NORMAL
C7 1460 SC(PC) = SC(PC) + ZZ: GOSUB 2730: FOR
       A = 1 TO 1500: NEXT
E0 1470 HOME : IF AC = 0 THEN GOSUB 4400
C8 1480 LP = PC: VTAB 21: HTAB 19: INVERSE :
      PRINT AC: NORMAL : GOSUB 4520: GOTO 8
      40
40 1490 VTAB 20: PRINT SPC( 79): IF CR = 1 TH
      EN A = 2:B = 3:ZZ = 1
6F 1500 IF CR = 2 THEN A = 1:B = 3:ZZ = 1
1D 1510 D = 1: FOR B = 1 TO 2: FOR C = 1 TO 2
ED 1520 XR(D) = R(B,K(B,C)):XS(D) = S(B,K(B,C
      )):XX(D) = X(B,K(B,C)):XY(D) = Y(B,K(
      B,C)):D = D + 1: NEXT C,B
42 1530 B = 3
D8 1540 TR(B - 2) = R(A,K(A,B)):TS(B - 2) = S
      (A,K(A,B)):TX(B - 2) = X(A,K(A,B)):TY
      (B - 2) = Y(A,K(A,B))
40 1550 B = B + 1: IF B = 7 THEN 1570
86 1560 GOTO 1540
B2 1570 TR(5) = R(3,1):TS(5) = S(3,1):TX(5) =
       X(3,1):TY(5) = (A - 1) * 53 + 102
40 1580 FOR B = 1 TO 4
BA 1590 FOR C = B + 1 TO 5
C8 1600 IF TR(C) < TR(B) THEN W = TR(C):TR(C)
       = TR(B):TR(B) = W:W = TS(C):TS(C) =
      TS(B):TS(B) = W:W = TX(C):TX(C) = TX(
      B):TX(B) = W:W = TY(C):TY(C) = TY(B):
      TY(B) = W
D9 1610 NEXT C,B
3A 1620 FOR B = 1 TO 5
51 1630 R(A,B) = TR(B):S(A,B) = TS(B):X(A,B)
      = TX(B):Y(A,B) = TY(B)
80 1640 NEXT B
30 1650 PL = 3:D = 1: HCOLOR= 0: GOSUB 2860:Y
      (3,1) = (A - 1) * 53 + 102: HCOLOR= 3
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      : GOSUB 2860:PL = A:FLAG = 0: GOSUB 1
      900
32 1660 IF ZZ = 1 THEN A = CR:B = 3:ZZ = 2: G
      OTO 1540
2D 1670 PC = CR
53 1680 PL = CR:A = CR
31 1690 FOR B = 1 TO 4:TR(B) = XR(B):TS(B) =
      XS(B):TX(B) = XX(B):TY(B) = XY(B): NE
      XT
CC 1700 TR(5) = R(3,1):TS(5) = S(3,1):TX(5) =
       X(3,1):TY(5) = 49
28 1710 FOR B = 1 TO 4
A2 1720 FOR C = B + 1 TO 5
D6 1730 IF TR(C) < TR(B) THEN W = TR(C):TR(C)
       = TR(B):TR(B) = W:W = TS(C):TS(C) =
      TS(B):TS(B) = W:W = TX(C):TX(C) = TX(
      B):TX(B) = W:W = TY(C):TY(C) = TY(B):
      TY(B) = W
E7 1740 NEXT C,B
48 1750 FOR B = 1 TO 5
B9 1760 R(PC,B) = TR(B):S(PC,B) = TS(B):X(PC,
      B) = TX(B):Y(PC,B) = TY(B)
E0 1770 NEXT B:PL = 3:D = 1: HCOLOR= 0: GOSUB
       2860:Y(3,1) = 49: HCOLOR= 3: GOSUB 2
      860:PL = PC
AB 1780 FOR D = 1 TO 5: IF R(PC,D) = R(3,1) A
      ND S(PC,D) = S(3,1) GOTO 1800
FF 1790 HCOLOR= 0: GOSUB 2910: HCOLOR= 3: GOS
      UB 2860
B1 1800 NEXT
FE 1810 FLAG = 1: IF CR = 1 THEN WH$ = "YOUR"
9B 1820 IF CR = 2 THEN WH$ = "MY"
42 1830 PL = CR
9C 1840 VTAB 21: HTAB 17: INVERSE : PRINT WH$
      " CRIB": NORMAL : GOSUB 4520: HOME :P
      L = CR:FLAG = 1: GOSUB 1900
0E 1850 HOME : VTAB 21: HTAB 7: INVERSE : PRI
      NT "PRESS A KEY FOR NEXT HAND";: NORM
      AL : GET Q$
55 1860 RESTORE
20 1870 HOME : HGR : GOSUB 370: FOR PL = 1 TO
       2: GOSUB 2800: NEXT : IF N = 52 THEN
       N = 0: GOSUB 280
60 1880 FOR A = 1 TO 2: FOR B = 1 TO 6:K(A,B)
      = 0: NEXT B,A
A1 1890 J(1) = 0:J(2) = 0: GOTO 560
88 1900 IF PL = 1 THEN WH$ = "YOUR":BS = 0
FB 1910 IF PL = 2 THEN WH$ = "MY":BS = 0
BB 1920 GOSUB 2310: GOSUB 2030: GOSUB 2150: G
      OSUB 2610: GOSUB 1940: GOSUB 1990
4C 1930 VTAB 21: HTAB 14: INVERSE : PRINT WH$
      " TOTAL= "BS".": NORMAL : GOSUB 4530:
       HOME :SC(PL) = SC(PL) + BS: GOSUB 27
      30: RETURN
AD 1940 IF FLAG = 1 THEN 1980
06 1950 IF BS > 0 THEN TP$ = "AND"
50 1960 FOR B = 1 TO 5
F4 1970 IF R(PL,B) = 16 AND S(PL,B) = S(3,1)
      THEN F = B: GOSUB 2820: HOME : VTAB 2
      1: INVERSE : HTAB 5: PRINT TP$" 'HIS
      NOBS' IS ";BS + 1".": CHR$ (7): GOSUB
       4530: HOME : HCOLOR= 0: GOSUB 2820:
      NORMAL :BS = BS + 1
0B 1980 TP$ = "": RETURN
16 1990 IF BS > 0 THEN TP$ = "AND"
F8 2000 IF PL = CR AND FLAG = 0 AND R(3,1) =
      16 THEN VTAB 21: HTAB 9: PRINT TP$" '
      HIS HEELS' IS "BS + 2".":BS = BS + 2:
      TP = PL:PL = 3:F = 1: GOSUB 2820: GOS
      UB 4530: HOME : HCOLOR= 0: GOSUB 2820
      : HCOLOR= 3:PL = TP
B7 2010 TP$ = ""
DA 2020 RETURN
26 2030 B = 1:C = 2:CS(1) = B:D = 1
38 2040 IF R(PL,B) = R(PL,C) THEN D = D + 1:C
      S(D) = C:C = C + 1: ON C = 6 GOTO 209
      0: GOTO 2040
20 2050 IF D > 1 THEN 2090
9A 2060 IF C < 5 THEN C = C + 1: GOTO 2040
3F 2070 IF B < 4 THEN B = B + 1:C = B + 1:CS(
      1) = B:D = 1: GOTO 2040
7E 2080 GOTO 2140
06 2090 HCOLOR= 3: FOR B = 1 TO D:F = CS(B):
      GOSUB 2820: NEXT : IF BS > 0 THEN TP$
       = "AND "
2E 2100 SS = SS(D - 2):TP$ = TP$(D - 2)
A5 2110 VTAB 21: HTAB (35 - LEN (TP$)) / 2: I
      NVERSE : PRINT TP$"IS "BS + SS".": GO
      SUB 4530: HOME : HCOLOR= 0: FOR B = 1
       TO D:F = CS(B): GOSUB 2820: NEXT : H
      COLOR= 3
97 2120 BS = BS + SS:TP$ = "":D = 1
5C 2130 IF C < 5 THEN B = C:C = B + 1:CS(1) =
       B:D = 1: HCOLOR= 3: GOTO 2040
EB 2140 TP$ = "": RETURN
F6 2150 IF BS > 0 THEN TP$ = "AND"
2F 2160 IF R(PL,5) - R(PL,4) = 1 AND R(PL,4)
      - R(PL,3) = 1 AND R(PL,3) - R(PL,2) =
       1 AND R(PL,2) - R(PL,1) = 1 THEN FOR
       F = 1 TO 5: GOSUB 2820: NEXT :AA = 5
      : GOSUB 2700: HCOLOR= 0: FOR F = 1 TO
       5: GOSUB 2820: NEXT : HCOLOR= 3: GOT
      O 2300
B5 2170 FG = 0: FOR B = 1 TO 2
2F 2180 FOR C = B + 1 TO 3
F5 2190 FOR D = C + 1 TO 4
96 2200 FOR E = D + 1 TO 5
F1 2210 ZZ(1) = B:ZZ(2) = C:ZZ(3) = D:ZZ(4) =
       E
B8 2220 IF R(PL,E) - R(PL,D) = 1 AND R(PL,D)
      - R(PL,C) = 1 AND R(PL,C) - R(PL,B) =
       1 THEN FOR G = 1 TO 4:F = ZZ(G): GOS
      UB 2820: NEXT :AA = 4: GOSUB 2700: HC
      OLOR= 0: FOR G = 1 TO 4:F = ZZ(G): GO
      SUB 2820: NEXT : HCOLOR= 3:FG = 1
DA 2230 NEXT E,D,C,B: ON FG = 1 GOTO 2300
18 2240 FOR B = 1 TO 3
65 2250 FOR C = B + 1 TO 4
2C 2260 FOR D = C + 1 TO 5
6A 2270 ZZ(1) = B:ZZ(2) = C:ZZ(3) = D
41 2280 IF R(PL,D) - R(PL,C) = 1 AND R(PL,C)
      - R(PL,B) = 1 THEN FOR E = 1 TO 3:F =
       ZZ(E): GOSUB 2820: NEXT :AA = 3: GOS
      UB 2700: HCOLOR= 0: FOR E = 1 TO 3:F
      = ZZ(E): GOSUB 2820: NEXT : HCOLOR= 3
89 2290 NEXT D,C,B
DF 2300 TP$ = "": RETURN
65 2310 FOR B = 1 TO 4: IF R(PL,B) > 15 THEN
      VL(B) = 15: GOTO 2330
8F 2320 VL(B) = R(PL,B)
3A 2330 FOR C = B + 1 TO 5: IF R(PL,C) > 15 T
      HEN VL(C) = 15: GOTO 2350
98 2340 VL(C) = R(PL,C)
08 2350 IF VL(B) + VL(C) = 25 THEN F = B: GOS
      UB 2820:F = C: GOSUB 2820: GOSUB 2710
      : HCOLOR= 0:F = B: GOSUB 2820:F = C:
      GOSUB 2820: HCOLOR= 3
E8 2360 NEXT C,B
2E 2370 FOR B = 1 TO 3: IF R(PL,B) > 15 THEN
      VL(B) = 15: GOTO 2390
A7 2380 VL(B) = R(PL,B)
50 2390 FOR C = B + 1 TO 4: IF R(PL,C) > 15 T
      HEN VL(C) = 15: GOTO 2410
8A 2400 VL(C) = R(PL,C)
7E 2410 FOR D = C + 1 TO 5: IF R(PL,D) > 15 T
      HEN VL(D) = 15: GOTO 2430
93 2420 VL(D) = R(PL,D)
A2 2430 IF VL(B) + VL(C) + VL(D) = 30 THEN F
      = B: GOSUB 2820:F = C: GOSUB 2820:F =
       D: GOSUB 2820: GOSUB 2710: HCOLOR= 0
      :F = B: GOSUB 2820:F = C: GOSUB 2820:
      F = D: GOSUB 2820: HCOLOR= 3
79 2440 NEXT D,C,B
E7 2450 FOR B = 1 TO 2: IF R(PL,B) > 15 THEN
      VL(B) = 15: GOTO 2470
A1 2460 VL(B) = R(PL,B)
0E 2470 FOR C = B + 1 TO 3: IF R(PL,C) > 15 T
      HEN VL(C) = 15: GOTO 2490
```

```
AA 2480 VL(C) = R(PL,C)
9D 2490 FOR D = C + 1 TO 4: IF R(PL,D) > 15 T
      HEN VL(D) = 15: GOTO 2510
8D 2500 VL(D) = R(PL,D)
CB 2510 FOR E = D + 1 TO 5: IF R(PL,E) > 15 T
      HEN VL(E) = 15: GOTO 2530
96 2520 VL(E) = R(PL,E)
7E 2530 IF VL(B) + VL(C) + VL(D) + VL(E) = 35
       THEN F = B: GOSUB 2820:F = C: GOSUB
      2820:F = D: GOSUB 2820:F = E: GOSUB 2
      820: GOSUB 2710: HCOLOR= 0:F = B: GOS
      UB 2820:F = C: GOSUB 2820:F = D: GOSU
      B 2820:F = E: GOSUB 2820: HCOLOR= 0
D6 2540 NEXT E,D,C,B
45 2550 FOR B = 1 TO 5
8A 2560 IF R(PL,B) > 15 THEN VL(B) = 15
47 2570 IF R(PL,B) < 16 THEN VL(B) = R(PL,B)
CC 2580 NEXT
5F 2590 IF VL(1) + VL(2) + VL(3) + VL(4) + VL
      (5) = 40 THEN FOR F = 1 TO 5: GOSUB 2
      820: NEXT : GOSUB 2710: HCOLOR= 0: FO
      R F = 1 TO 5: GOSUB 2820: NEXT : HCOL
      OR= 3
DE 2600 RETURN
F0 2610 IF BS > 0 THEN TP$ = "AND"
F1 2620 IF S(PL,1) = S(PL,2) AND S(PL,2) = S(
      PL,3) AND S(PL,3) = S(PL,4) AND S(PL,
      4) = S(PL,5) THEN FOR F = 1 TO 5: GOS
      UB 2820: NEXT :FP = 5: GOSUB 2720: HC
      OLOR= 0: FOR F = 1 TO 5: GOSUB 2820:
      NEXT : HCOLOR= 3: GOTO 2690
A3 2630 IF FLAG = 1 THEN 2690
C6 2640 FP = 0
69 2650 FOR B = 1 TO 5: IF R(PL,B) < > R(3,1)
       OR S(PL,B) < > S(3,1) THEN FP = FP +
      1:FL(FP) = B
C6 2660 NEXT
7A 2670 IF S(PL,FL(1)) < > S(PL,FL(2)) OR S(P
      L,FL(2)) < > S(PL,FL(3)) OR S(PL,FL(3
      )) < > S(PL,FL(4)) THEN 2690
9D 2680 FOR B = 1 TO 4:F = FL(B): GOSUB 2820:
       NEXT : GOSUB 2720: HCOLOR= 0: FOR B
      = 1 TO 4:F = FL(B): GOSUB 2820: NEXT
      : HCOLOR= 3
8A 2690 TP$ = "": RETURN
D3 2700 VTAB 21: HTAB 9: INVERSE : PRINT TP$"
       A RUN OF "AA" IS "BS + AA".": NORMAL
       : GOSUB 4530: HOME :BS = BS + AA: RE
      TURN
83 2710 HOME : VTAB 21: HTAB 14: INVERSE :BS
      = BS + 2: PRINT "FIFTEEN-"BS".": NORM
      AL : GOSUB 4530: HOME : RETURN
6F 2720 HOME : VTAB 21: HTAB 13: INVERSE : PR
      INT TP$" A "FP"-FLUSH IS "BS + FP".";
       CHR$ (7): NORMAL : GOSUB 4530: HOME
      :BS = BS + FP: GOSUB 2730: RETURN
B9 2730 REM MARK SCORE
55 2740 HCOLOR= 0: GOSUB 2800: HCOLOR= 3
2E 2750 IF SC(PL) > TA - 1 THEN POP : GOTO 43
      20
0F 2760 IF SC(PL) < 31 THEN V(PL) = (PL - 1)
      * 22 + 250:W(PL) = 152 - (SC(PL) * 4)
C6 2770 IF SC(PL) > 30 AND SC(PL) < 61 THEN V
      (PL) = (PL - 1) * 22 + 242:W(PL) = 28
       + ((SC(PL) - 30) * 4)
42 2780 IF SC(PL) > 60 AND SC(PL) < 91 THEN V
      (PL) = (PL - 1) * 22 + 250:W(PL) = 15
      2 - ((SC(PL) - 60) * 4)
66 2790 IF SC(PL) > 90 THEN V(PL) = (PL - 1)
      * 22 + 242:W(PL) = 28 + ((SC(PL) - 90
      ) * 4)
34 2800 HPLOT V(PL) - 1,W(PL) - 1: HPLOT V(PL
      ) + 1,W(PL) + 1: HPLOT V(PL) - 1,W(PL
      ) + 1: HPLOT V(PL) + 1,W(PL) - 1
E6 2810 RETURN
3F 2820 REM DRAW MARKERS AROUND CARD
5F 2830 DRAW 19 AT X(PL,F) + 2,Y(PL,F) - 32:
       DRAW 20 AT X(PL,F) - 22,Y(PL,F) + 2
66 2840 DRAW 21 AT X(PL,F) - 22,Y(PL,F) - 36:
       DRAW 22 AT X(PL,F) + 2,Y(PL,F) - 2
F6 2850 RETURN
FA 2860 ROT= 45: DRAW 1 AT X(PL,D),Y(PL,D)
DA 2870 ROT= 0: DRAW S(PL,D) AT X(PL,D) - 4,Y
      (PL,D) - 2
1A 2880 DRAW S(PL,D) AT X(PL,D) - 20,Y(PL,D)
      - 27
42 2890 DRAW R(PL,D) AT X(PL,D) - 16,Y(PL,D)
      - 10
E4 2900 RETURN
1E 2910 ROT= 45: SCALE= 1: DRAW 1 AT X(PL,D),
      Y(PL,D)
62 2920 ROT= 0
E6 2930 T1 = X(PL,D) - 13:T2 = Y(PL,D) - 18:D
      1 = 10:D2 = 12
2D 2940 HPLOT T1,T2 TO T1 + D1,T2 - D1 TO T1
      + 1,T2 + 1 TO T1 + 3,T2 + 3 TO T1 - D
      1 + 3,T2 + D1 + 3
F8 2950 RETURN
EA 2960 F = F + 1: IF F > 6 THEN F = 1
BB 2970 FOR A = 1 TO 6: ON K(PL,A) = F GOTO 2
      960: NEXT
9B 2980 GOSUB 2820
4E 2990 IF J(1) = Q THEN 3060
55 3000 GET Q$
EF 3010 IF Q$ = " " THEN HCOLOR= 0: GOSUB 282
      0: HCOLOR= 3:F = F + 1: FOR A = 1 TO
      J(1): ON F = K(PL,A) OR F > 6 GOTO 29
      60: NEXT : GOSUB 2820: GOTO 2990
24 3020 IF Q$ < > CHR$ (13) THEN 3000
4D 3030 IF (R(1,F) > 14 AND AC + 10 > 31) OR
      (R(1,F) < 15 AND AC + R(1,F) - 5 > 31
      ) THEN HOME : VTAB 21: HTAB 11: INVER
      SE : PRINT "YOU CAN'T DO THAT!"; CHR$
       (7): GOSUB 4530: NORMAL : HOME : GOT
      O 3000
BE 3040 J(PL) = J(PL) + 1:D = F:K(PL,J(PL)) =
       F: HCOLOR= 0: GOSUB 2820: GOSUB 2860
      : HCOLOR= 3: IF J(PL) < 3 THEN X(PL,F
      ) = J(PL) * 31 + 63:Y(PL,F) = 49: GOS
      UB 2910:Q$ = " ": GOTO 3010
61 3050 X(PL,F) = (Q - 2) * 31 + 63:Y(PL,F) =
       102: GOSUB 2860: GOTO 3070
7B 3060 HCOLOR= 0: GOSUB 2820: HCOLOR= 3
EF 3070 RETURN
9E 3080 REM COMPUTER CHOOSES CARDS TO DISCARD
5D 3090 I(1) = 1:I(2) = 2:I(3) = 3:I(4) = 4
2C 3100 FOR F = 1 TO 5
DE 3110 FOR G = F + 1 TO 6
3E 3120 IF R(2,F) < R(2,G) THEN 3140
7C 3130 W = R(2,F):R(2,F) = R(2,G):R(2,G) = W
      :W = S(2,F):S(2,F) = S(2,G):S(2,G) =
      W
F1 3140 NEXT G,F
1E 3150 FOR B = 1 TO 3
68 3160 FOR C = B + 1 TO 4
2F 3170 FOR D = C + 1 TO 5
F5 3180 FOR E = D + 1 TO 6
41 3190 H(1) = B:H(2) = C:H(3) = D:H(4) = E
8B 3200 FOR A = 1 TO 3
D5 3210 ON A GOSUB 3400,3440,3530
71 3220 NEXT A
61 3230 IF L < > BT THEN 3320
1F 3240 FOR T = 1 TO 4: IF R(2,I(T)) = 16 THE
      N TT(1) = TT(1) + 1
12 3250 IF R(2,I(T)) = 10 THEN TT(1) = TT(1)
      + 2
9C 3260 IF R(2,H(T)) = 16 THEN TT(2) = TT(2)
      + 1
98 3270 IF R(2,H(T)) = 10 THEN TT(2) = TT(2)
      + 2
C7 3280 NEXT
F2 3290 IF TT(1) = TT(2) THEN TT(2) = TT(2) +
       1
44 3300 IF TT(2) > TT(1) THEN I(1) = H(1):I(2
      ) = H(2):I(3) = H(3):I(4) = H(4):BT =
       L
6A 3310 GOTO 3330
FC 3320 IF L > BT THEN BT = L:I(1) = H(1):I(2
```

```
      ) = H(2):I(3) = H(3):I(4) = H(4)
3D 3330 L = 0:TT(1) = 0:TT(2) = 0
D3 3340 NEXT E,D,C,B
86 3350 J(2) = 0: FOR A = 1 TO 6:D = A
20 3360 IF A = I(1) OR A = I(2) OR A = I(3) O
      R A = I(4) GOTO 3380
E8 3370 J(2) = J(2) + 1:K(2,J(2)) = A:X(2,A)
      = 125 + J(2) * 31:Y(2,A) = 49: GOSUB
      2910
C9 3380 NEXT
ED 3390 HOME : RETURN
A1 3400 IF R(2,H(1)) = R(2,H(2)) AND R(2,H(2)
      ) = R(2,H(3)) AND R(2,H(3)) = R(2,H(4
      )) THEN L = L + 12: GOTO 3430
3B 3410 IF (R(2,H(1)) = R(2,H(2)) AND R(2,H(2
      )) = R(2,H(3))) OR (R(2,H(2)) = R(2,H
      (3)) AND R(2,H(3)) = R(2,H(4))) THEN
      L = L + 6: GOTO 3430
79 3420 IF R(2,H(1)) = R(2,H(2)) OR R(2,H(2))
      = R(2,H(3)) OR R(2,H(3)) = R(2,H(4))
      THEN L = L + 2
E7 3430 RETURN
E6 3440 M = 1:P = 1
84 3450 FOR O = M + 1 TO 4
2E 3460 IF R(2,H(O)) - R(2,H(M)) = P THEN P =
      P + 1
97 3470 NEXT O
CA 3480 IF P < 3 AND M < 2 THEN P = 1:M = M +
      1: GOTO 3450
1B 3490 IF P < 3 THEN 3520
C5 3500 L = L + P
73 3510 IF M < 2 THEN P = 1:M = M + 1: GOTO 3
      450
E5 3520 RETURN
0B 3530 GOSUB 3720: GOSUB 3550
ED 3540 RETURN
28 3550 FOR F = 1 TO 3
7A 3560 FOR G = F + 1 TO 4
76 3570 M = R(2,H(F)):Q = R(2,H(G)): IF R(2,H
      (F)) > 15 THEN M = 15
53 3580 IF R(2,H(G)) > 15 THEN Q = 15
53 3590 IF M + Q = 25 THEN L = L + 2
EB 3600 NEXT G,F
7C 3610 M = R(2,H(1)):Q = R(2,H(2)):O = R(2,H
      (3)):P = R(2,H(4))
16 3620 IF M > 15 THEN M = 15
1C 3630 IF Q > 15 THEN Q = 15
1F 3640 IF O > 15 THEN O = 15
A3 3650 IF P > 15 THEN P = 15
85 3660 IF M + Q + O = 25 THEN L = L + 2
8D 3670 IF M + Q + P = 25 THEN L = L + 2
8F 3680 IF M + O + P = 25 THEN L = L + 2
94 3690 IF Q + O + P = 25 THEN L = L + 2
70 3700 IF M + Q + O + P = 25 THEN L = L + 2
E5 3710 RETURN
5B 3720 IF S(2,H(1)) = S(2,H(2)) AND S(2,H(2)
      ) = S(2,H(3)) AND S(2,H(3)) = S(2,H(4
      )) THEN L = L + 4
ED 3730 RETURN
8D 3740 REM COMPUTER PLAYS
40 3750 PL = 2:Q = J(2) + 1:HP = 0:PC(2) = PC
      (2) + 1
DD 3760 FOR A = 1 TO 6
F7 3770 D = 1
14 3780 IF A = K(2,D) THEN A = A + 1: ON A >
      6 GOTO 3910: GOTO 3770
7A 3790 D = D + 1: IF D < = 6 THEN 3780
BF 3800 IF A > 6 THEN 3910
F5 3810 IF R(2,A) > 14 THEN VL = 10: GOTO 383
      0
E1 3820 VL = R(2,A) - 5
C9 3830 B = 1
5F 3840 ON B GOSUB 3970,3990,4020,4110
AA 3850 IF FG = 1 THEN FG = 0: GOTO 3770
B2 3860 FG = 0
D1 3870 B = B + 1: IF B < = 4 THEN 3840
D7 3880 IF PS(A) > HP THEN HP = PS(A):WN = A:
      GOTO 3900
03 3890 IF PS(A) < HP + 1 THEN IN = A
B5 3900 NEXT
03 3910 IF HP > 0 THEN K(2,Q) = WN:F = WN:D =
      WN: GOTO 3930
CC 3920 K(2,Q) = IN:F = IN:D = IN
EA 3930 PL = 2
C7 3940 X(2,F) = (Q - 2) * 31 + 63:Y(2,F) = 1
      55: GOSUB 2860
0F 3950 FOR A = 1 TO 6:PS(A) = 0: NEXT
A0 3960 J(2) = J(2) + 1:PC = 2: RETURN
6F 3970 IF AC + VL > 31 THEN A = A + 1:FG = 1
06 3980 RETURN
F3 3990 IF VL + AC = 15 THEN PS(A) = PS(A) +
      2
5E 4000 IF VL + AC = 31 THEN PS(A) = PS(A) +
      2
D0 4010 RETURN
C5 4020 IF CP(NP) < > VL THEN 4100
EA 4030 FOR C = NP TO 1 STEP - 1
DA 4040 IF CP(C) < > CP(NP) THEN 4070
75 4050 SS = SS + 1
BC 4060 NEXT
FE 4070 IF SS = 2 THEN PS(A) = PS(A) + 2
15 4080 IF SS = 3 THEN PS(A) = PS(A) + 6
9C 4090 IF SS = 4 THEN PS(A) = PS(A) + 12
69 4100 SS = 0: RETURN
C1 4110 IF NP < 2 THEN RETURN
37 4120 NP = NP + 1:CP(NP) = R(2,A):HI = 0:LO
      = 0
7E 4130 DD = 1:ZZ = 1
91 4140 C = NP - 1
08 4150 IF CP(NP) - CP(C) = ZZ THEN ZZ = ZZ +
      1:LO = C: GOTO 4140
50 4160 C = C - 1: IF C > = 1 THEN 4150
B5 4170 IF LO = 0 THEN LO = NP
D1 4180 ZZ = 1
A5 4190 C = NP - 1
AC 4200 IF CP(C) - CP(NP) = ZZ THEN ZZ = ZZ +
      1:HI = C: GOTO 4190
85 4210 C = C - 1: IF C > = DD THEN 4200
98 4220 IF HI = 0 THEN HI = NP
C5 4230 FOR C = DD TO NP - 1: IF A = HI OR A
      = LO THEN 4250
28 4240 IF CP(C) = > CP(HI) OR CP(C) < = CP(L
      O) THEN DD = C + 1:ZZ = 1: ON DD = NP
      GOTO 4280:HI = 0:LO = 0: GOTO 4140
BC 4250 NEXT
4C 4260 C = DD:D = C + 1
60 4270 IF CP(C) = CP(D) THEN DD = C + 1:ZZ =
      1: ON DD = NP GOTO 4280:HI = 0:LO =
      0: GOTO 4140
98 4280 ZZ = NP - DD + 1
2E 4290 IF ZZ < 3 THEN 4310
91 4300 PS(A) = PS(A) + ZZ
85 4310 NP = NP - 1: RETURN
95 4320 TEXT : HOME : IF PL = 1 THEN WH$ = "Y
      OU"
38 4330 HTAB 8: VTAB 5: PRINT "FINAL SCORE: Y
      OU ";SC(1);"  ME ";SC(2)
F4 4340 IF PL = 2 THEN WH$ = "I"
67 4350 INVERSE : VTAB 10: HTAB 16: PRINT WH$
      " WIN!!"
AB 4360 NORMAL : VTAB 13: HTAB 13: INPUT "PLA
      Y AGAIN?(Y/N)";PA$
9F 4370 IF PA$ = "Y" THEN CLEAR : DIM S(3,6),
      R(3,6),US(52),UR(52),K(2,6),X(3,6),Y(
      3,6): GOTO 200
69 4380 IF PA$ = "N" THEN HOME : END
98 4390 GOTO 4360
76 4400 REM  FLIP CARDS
45 4410 HOME :T1 = PL:T2 = D:DP = NP
74 4420 FOR II = 1 TO 2
0F 4430 FOR JJ = 3 TO PC(II)
A7 4440 IF NP < 8 THEN 4480
3C 4450 DP = 1:D = K(II,JJ): IF P(II,D) = 0 T
      HEN 4510
3F 4460 HCOLOR= 0:PL = II:P(II,D) = 0: GOSUB
      2910
D5 4470 HCOLOR= 3: GOSUB 2860:DP = 1: GOTO 45
      10
```

```
F4 4480 D = K(II,JJ): IF P(II,D) = - 1 THEN 4
      510
86 4490 HCOLOR= 0:PL = II:P(II,D) = - 1: GOSU
      B 2860
79 4500 HCOLOR= 3: GOSUB 2910
48 4510 NEXT : NEXT :PL = T1:D = T2: RETURN
DC 4520 FOR TI = 1 TO 999: NEXT : RETURN
6E 4530 FOR TI = 1 TO 2999: NEXT : RETURN
```

Program 2: CRIBBAGE.BIN

For mistake-proof entry, use "Apple MLX," found elsewhere in this issue, to type in this program.

```
1388: 25 00 4C 00 87 00 92 00 2C
1390: 9C 00 A6 00 B0 00 CB 00 F6
1398: E6 00 05 01 1C 01 3D 01 43
13A0: 5C 01 6D 01 91 01 B3 01 EB
13A8: D1 01 E2 01 03 02 1F 02 C4
13B0: 25 02 2B 02 31 02 37 02 71
13B8: 44 02 52 02 5D 02 68 02 B1
13C0: 75 02 83 02 8D 02 9A 02 5E
13C8: A7 02 B2 02 BF 02 CB 02 59
13D0: D4 02 E1 02 24 24 24 24 5C
13D8: 24 24 24 24 24 24 24 24 FE
13E0: 2D 2D 2D 2D 2D 2D 2D 2D 07
13E8: 2D 2D 2D 2D 2D 2D 2D 2D 0F
13F0: 2D 36 36 36 36 36 36 36 92
13F8: 36 36 36 36 36 3F 3F 3F 5E
1400: 3F 3F 3F 3F 3F 3F 3F 3F 28
1408: 3F 3F 3F 3F 3F 27 00 3C 4E
1410: 3C 2C 2C 32 25 2C 32 17 5F
1418: 04 00 3C 3C 0C 25 15 3E EA
1420: 0E 05 20 00 24 3F 2C 24 2F
1428: 2D 3E 2E 35 27 00 24 3F 50
1430: 2C 2C 34 31 37 29 24 00 B9
```


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Sherlock	40	26
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Wizardry-Return of Werdna	60	41

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```
1438: 24 2C 24 2C 24 2C 24 2C 0B
1440: 24 15 32 36 35 36 35 36 BC
1448: 35 36 1F 03 40 18 40 18 A7
1450: 3F 04 00 09 09 09 09 3F 67
1458: 3F 3F 3F 2C 2C 10 2C 2C C0
1460: 2C 2C 2C 2C 24 24 27 27 19
1468: 3F 3F 3E 3E 04 00 40 18 64
1470: 2E 2E 2D 25 25 25 24 27 60
1478: 27 3F 27 09 29 2C 24 3C F7
1480: 3C 3C 3F 37 37 37 12 12 FD
1488: 12 12 12 20 00 09 09 24 DC
1490: 24 24 24 24 24 07 18 18 20
1498: 33 36 36 2E 2D 2D 2D 35 3F
14A0: 1B 1B 20 00 40 18 2E 2E 0E
14A8: 2D 25 25 25 24 3C 3C 3C 6E
14B0: 3F 3F 27 24 24 2C 2D 2D C8
14B8: 2D 35 12 1A 1B 1B 12 12 24
14C0: 12 1B 13 22 00 40 18 2E 9C
14C8: 2E 2D 25 25 25 24 3C 3C B8
14D0: 3C 3F 37 37 37 36 26 40 60
14D8: 18 20 24 24 25 25 2D 2D 21
14E0: 2E 2E 04 00 24 2C 2C 2C 82
14E8: 2C 2C 2C 2C 2C 24 24 3F F3
14F0: 3F 3F 3F 04 00 40 18 24 06
14F8: 25 25 2D 2D 2C 2C 24 3C 0C
1500: 3C 1C 39 3F 37 37 37 36 A5
1508: 35 2D 09 12 29 2E 36 3E 07
1510: 02 30 37 3F 3F 3C 3C 04 89
1518: 00 40 18 2E 2E 2D 25 25 CD
1520: 25 24 24 24 24 3C 3C 3C 73
1528: 3F 37 37 37 36 35 35 2D 38
1530: 2D 2C 34 12 12 1B 1B 1B F1
1538: 13 22 00 24 24 24 24 24 D4
1540: 24 24 0D 12 36 36 36 36 75
1548: 36 35 35 2D 2C 2C 24 24 D2
1550: 24 24 24 27 27 3F 3E 26 65
1558: 00 40 18 30 2E 2E 2E 2D 4C
1560: 25 25 25 24 24 24 24 24 6B
1568: 24 00 40 18 24 24 24 24 4C
1570: 2C 2C 2C 2D 35 35 35 36 33
1578: 36 36 36 3E 3E 3E 3F 27 86
1580: 07 10 3C 0D 09 08 0E 0E 1D
1588: 0A 04 00 10 24 24 24 24 D7
1590: 24 24 24 0D 09 09 09 37 E0
1598: 37 37 37 37 37 37 35 35 BC
15A0: 35 35 35 35 35 04 00 24 8A
15A8: 24 3F 3F 04 00 3F 3F 24 7C
15B0: 24 04 00 3F 3F 36 36 04 25
15B8: 00 36 36 3F 3F 04 00 24 59
15C0: 24 05 28 28 2A 32 3E 3F 9B
15C8: 0E 09 26 00 24 24 24 2D 28
15D0: 2D 32 1E 3F 0E 09 36 3B 12
15D8: 27 00 20 24 2C 28 35 31 7A
15E0: 12 32 3B 27 00 24 24 24 77
15E8: 2D 2D 32 36 3E 3A 27 00 C7
15F0: 24 24 24 2D 2D 16 1A 3F C2
15F8: 16 2A 2D 04 00 24 24 24 9B
1600: 0D 09 36 36 36 07 40 18 85
1608: 3F 04 00 29 24 24 24 2F 90
1610: 31 12 12 22 00 24 24 24 BA
1618: 15 15 26 08 0C 36 36 36 35
1620: 04 00 24 24 24 15 2A 2A 09
1628: 32 0A 24 24 24 04 00 20 08
1630: 24 2C 28 35 31 36 3E 3A EA
1638: 27 00 24 24 24 2D 2D 32 21
1640: 1E 3F 0E 0E 0E 04 00 28 96
1648: 2A 25 21 1C 3F 1C 2C 28 A3
1650: 35 21 00 09 24 24 3C 03 1D
1658: 28 2D 25 00 20 24 24 15 77
1660: 12 12 2A 2D 20 24 24 04 10
1668: 00 09 24 3C 38 20 0D 09 84
1670: 3E 22 00 00 20 20 30 39 5F 88
```

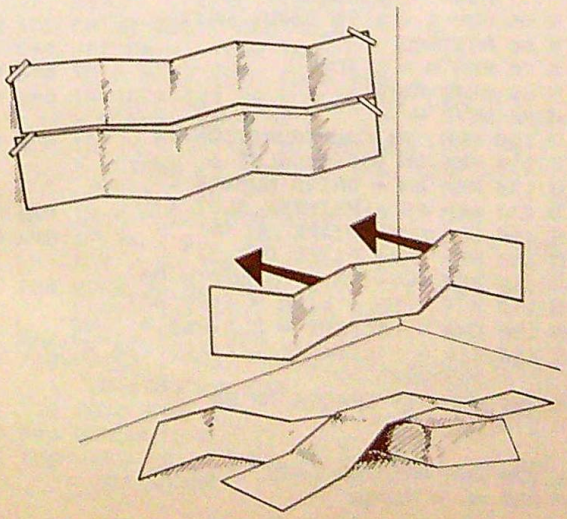
Poster Maker

Gary R. Ellis

Turn your favorite high-resolution pictures into giant, wall-sized posters. Runs on any Apple II–series computer with DOS 3.3 or ProDOS. Printer required.

Did you ever see a high-resolution (hi-res) picture on your Apple II that really impressed you? You liked it so much that you just had to make a printout. So, you got out your copy of *Print Shop* or some other graphics program, and you printed the hi-res screen on your dot-matrix printer. Unfortunately, reduced onto a small, 8½ × 11 inch piece of paper, this once-impressive hi-res screen looked more like a cheap postcard than a dazzling graphics image.

Hanging Your Poster



Well here's a program designed to handle this problem: "Poster Maker" turns hi-res screens into huge, 42 × 55 inch posters. At this size, you could wallpaper your bedroom with Apple II graphics.

Making Posters

Poster Maker is a very simple and very flexible program. It runs on any Apple II–series computer and works with virtually all printers.

The first thing you'll notice about Poster Maker is its *AppleWorks*-style menu. To make a selection, use the up- and down-arrow keys to highlight the desired option and press Return (use the left- and right-arrow keys on the Apple II+). If you select an option by mistake, pressing Escape will return you to the menu. In fact, at anytime within the program, the Escape key will return you to the previous screen.

The menu options available are

```
1) LOAD A HI-RES SCREEN
2) DISPLAY THE DISK CATALOG
3) SEE/PRINT HI-RES SCREEN 1
4) SEE/PRINT HI-RES SCREEN 2
5) CHANGE PRINTER SETUP
6) SELECT A NEW DISK SLOT/DRIVE
7) QUIT
```

Before you can print any posters, you must first load a hi-res picture into memory. To do this, select **LOAD A HI-RES SCREEN**, the first item on the menu. When the computer prompts you, type in the filename of the picture and press Return. If you can't remember the filename, select **DISPLAY THE DISK CATALOG** for a catalog listing of the current disk.

If you have more than one disk drive, you may choose the **SELECT A NEW DISK SLOT/DRIVE** option to change

which slot/drive the program accesses when searching for disk files. The program defaults to slot 6, drive 1.

When first run, Poster Maker assumes that your printer is in slot 1, your page length is 80 characters wide, an on pixel will produce a pound symbol (#), and an off pixel will produce a space. (A pixel is the smallest dot that appears on the Apple's hi-res screen. Any pixel that is lit—not black in color—is considered to be on.) To change any of these settings, select the **CHANGE PRINTER SETUP** option.

The current printer specifications are displayed near the bottom of the screen, along with the disk's slot and drive parameters.

From Screen to Wall

After loading a hi-res picture into memory, you're ready to print it in poster format. Both options 3 and 4, **SEE/PRINT HI-RES SCREEN 1** and **SEE/PRINT HIGH-RES SCREEN 2**, print posters from the Apple II's hi-res screens. There are two separate menu options because the Apple II has two separate hi-res screens. Which option you use depends on which hi-res screen the picture was created on.

To determine which hi-res screen your picture is on, select menu option 3. If your picture isn't displayed on the screen when you select this option, by default, the picture must be on hi-res screen 2. If this is the case, press Escape to return to the menu and select option 4. *Note: Poster Maker will not print double-hi-res screens.*

Once you've found your picture in memory, it's time to print it. To begin printing, turn on your printer and press P, for Print. It takes approximately 40 minutes to print one poster. You can, of course, press Escape at any time to stop the printer and return to the menu (if your printer has a print buffer, you'll have to shut it off and turn it back on; otherwise, it won't stop printing until it finishes the current page).

Be forewarned: With a print width of 80 characters, each poster requires 25 sheets of paper. Be sure you have enough paper before you begin to print.

As each pixel on the hi-res screen is printed, it's also erased. This way, you get to see exactly how close the poster is to completion. By the time the poster is finished, the image is completely erased. Therefore, if you wish to print another copy, you must reload the picture before printing again.

To hang your poster, carefully remove the printed pages from the printer. Next, divide the 25-sheet printout into five sections by separating every fifth sheet along the paper's perforation line. The first five sheets printed make up the top of the poster, the next five sheets make up the next row, and so on.

The illustration "Hanging Your Poster" shows how to get your poster onto a wall. It's best to lay your sheets out on the floor to determine the proper position for each strip of paper. You'll also find that taping each segment separately is much easier than trying to put up the entire poster at one time.

Tips on Printing

Because Poster Maker spits out an average of 25 sheets for every poster, it's best to use tractor-feed, fan-fold printer paper. Single-sheet feeders don't work very well in such situations.

Obviously, if your printer can print 132 characters across, you'll probably want to change the program's printer specifications to take advantage of the increased column width. However, there's another reason for changing the program's print width. If your printer skips every other line (appears to be double-spacing), you can correct this by subtracting 1 from the printer width. That is, if your printer is 80 columns wide and it begins to skip lines, press Escape to stop the printer, choose option 5 to change the print width to 79 columns, and then try again.

By changing which characters are used for on and off pixels, you can create some impressive results. For example, by switching the pixel-on character with the pixel-off character, your poster will be the inverse of the hi-res screen (white on black instead of black on white).

Saving Screens

You can use Poster Maker to print your own hi-res screens. First you must save your screen to disk, in standard Apple format. To save hi-res screen 1 to disk, type

BSAVE "filename",A$2000,L$2000

To save hi-res screen 2, type

BSAVE "filename",A$4000,L$2000

"The Photo Exchange," found in the August 1988 *Apple Applications*, converts *Print Shop* graphics to *Newsroom* graphics, and vice versa. As an added bonus, The Photo Exchange also saves *Print Shop* and *Newsroom* graphics as standard hi-res screens (see instructions in "The Photo Exchange" article). Once saved as a hi-res screen, these graphics can be printed by Poster Maker in larger-than-life proportions.

From Paper to Disk

Now that you have a good idea of what Poster Maker does and how to use it, you'll probably want to type it in and get it running. Poster Maker is written in Applesoft BASIC. The listing appears below.

To ensure accurate typing, we recommend that you use the "Apple Automatic Proofreader" to enter Poster Maker's program listing. Apple Automatic Proofreader is found elsewhere in this issue. After you have entered Poster Maker, save a copy to disk.

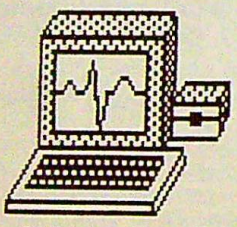
Poster Maker

Be sure to use "Apple Automatic Proofreader," found elsewhere in this issue, to enter the following program.

```
BD 10 REM COPYRIGHT 1988
03 20 REM COMPUTE! PUBLICATIONS, INC.
BE 30 REM ALL RIGHTS RESERVED
47 40 PRINT CHR$ (4)"PR#0"
27 50 TEXT : HOME : VTAB 7: HTAB 13: INVER
      SE : PRINT " POSTER MAKER ": VTAB 9:
       HTAB 13: NORMAL : PRINT "COPYRIGHT
      1988": HTAB 7: PRINT "COMPUTE! PUBLI
      CATIONS, INC.": HTAB 11: PRINT "ALL
      RIGHTS RESERVED."
30 55 FOR I = 1 TO 2000: NEXT
8C 60 RESTORE
55 70 FOR N = 1 TO 7
FA 80 READ M$(N)
60 90 NEXT N
C9 100 REM  ** CONFIGURATION **
41 110 REM DS = DISK SLOT 6
E0 120 REM DN = DRIVE NUMBER 1
70 130 REM PS = PRINTER SLOT 1
AD 140 REM CN$= PIXEL ON "#"
E7 150 REM CF$= PIXEL OFF " "
F3 160 REM PW$= PRINTER WIDTH 80
98 170 M = 1:DS = 6:DN = 1:PS = 1
BB 180 CN$ = "#":CF$ = " ":PW$ = "080"
2F 190 Z1$ = "<<<<<<<<<<<<<<<":Z2$ = ">>>>
      >>>>>>>>>>>"
B5 200 REM  39 SPACES IN S$
73 210 S$ = "
                 "
41 220 REM MACHINE LANG. ADDR.
1E 230 ML = 32768
```

```
A7 240 FOR N = Ø TO 1Ø3
F3 250 READ D: POKE ML + N,D
6D 260 NEXT N
DE 270 POKE ML + 4Ø, ASC (CN$) + 128: POKE
       ML + 44, ASC (CF$) + 128: POKE ML
       + 13, VAL (PW$) / 2
93 28Ø REM
DB 29Ø REM *** MAIN MENU ***
AD 3ØØ HOME : INVERSE
B7 31Ø REM 12 SPACES ON EACH
CC 32Ø REM SIDE OF 'POSTER MAKER'
55 33Ø PRINT "                POSTER MAKER
                ";
CE 34Ø NORMAL
5A 35Ø FOR N = 1 TO 7
C4 36Ø PRINT : PRINT TAB( 5);N;")  ";M$(N)
7Ø 37Ø NEXT N
F2 38Ø PRINT
Ø8 39Ø PRINT "--DISK-------------PRINTER-
       ----------"
83 4ØØ PRINT "SLOT  # ";DS;"  SLOT   # ";P
       S;"  LINE WIDTH: ";PW$
43 41Ø PRINT "DRIVE # ";DN;"  PIXEL ON(";C
       N$;") OFF(";CF$;")"
E7 42Ø PRINT
81 43Ø PRINT "-------------------------
       ----------"
EC 44Ø VTAB (22): POKE 36,Ø
21 45Ø PRINT " HIGHLIGHT DESIRED OPTION US
       ING (1-7) "
Ø2 46Ø PRINT " OR THE ARROW KEYS. THEN PRE
       SS RETURN "
FD 47Ø PRINT S$;
95 48Ø REM
67 49Ø REM *** MENU CONTROL ***
A2 5ØØ POKE 37,(M * 2): POKE 36,8: CALL -
       99Ø
F9 51Ø INVERSE : PRINT M$(M);: NORMAL
6D 52Ø GET K$:K = ASC (K$)
8C 53Ø POKE 36,8: PRINT M$(M)
53 54Ø IF K > 48 AND K < 56 THEN M = K - 4
       8
ØE 55Ø IF (K = 8 OR K = 11) AND M < > 1 TH
       EN M = M - 1
7C 56Ø IF (K = 1Ø OR K = 21) AND M < > 7 T
       HEN M = M + 1
49 57Ø IF K < > 13 THEN GOTO 5ØØ
73 58Ø ON M GOTO 61Ø,79Ø,88Ø,97Ø,12ØØ,1Ø4Ø
       ,19ØØ
98 59Ø REM
ØB 6ØØ REM *** LOAD A SCREEN ***
ØF 61Ø F$ = ""
93 62Ø VTAB (22): PRINT "ENTER THE FILE NA
       ME        <ESC> TO EXIT"
Ø4 63Ø PRINT S$;: POKE 36,Ø
72 64Ø GET K$:K = ASC (K$)
6A 65Ø IF K = 27 THEN GOTO 44Ø
56 66Ø IF (K = 127 OR K = 8) AND LEN (F$)
       = 1 THEN F$ = ""
8B 67Ø IF (K = 127 OR K = 8) AND LEN (F$)
       > 1 THEN F$ = LEFT$ (F$, LEN (F$) -
        1)
E5 68Ø IF K = 13 THEN GOTO 71Ø
5Ø 69Ø IF (K < 127 AND K > 31) AND LEN (F$
       ) < > 32 THEN F$ = F$ + K$
FC 7ØØ POKE 36,Ø: PRINT F$;" ";: POKE 36,
       PEEK (36) - 1: GOTO 64Ø
97 71Ø ONERR GOTO 74Ø
91 72Ø PRINT : PRINT CHR$ (4);"BLOAD ";F$,
       ",S";DS;",D";DN
1C 73Ø GOTO 44Ø
F9 74Ø GOSUB 159Ø
C2 75Ø VTAB (22): POKE 36,Ø: PRINT "PLEASE
        TRY AGAIN     "
3E 76Ø PRINT F$;: GOTO 64Ø
96 77Ø REM
E8 78Ø REM *** SHOW CATALOG ***
F2 79Ø HOME : ONERR GOTO 84Ø
86 8ØØ PRINT : PRINT CHR$ (4); LEFT$ ("CAT
       ALOG",7 - 4 * ( PEEK (48896) = 76))
       ;",S";DS;",D";DN
Ø1 81Ø PRINT : PRINT "END OF DISK CATALOG.
        PRESS RETURN";
ØD 82Ø GET K$: IF K$ < > CHR$ (13) THEN GO
       TO 82Ø
98 83Ø GOTO 3ØØ
FA 84Ø GOSUB 159Ø
2B 85Ø VTAB (2Ø): GOTO 81Ø
95 86Ø REM
5Ø 87Ø REM *** SEE PAGE 1 ***
C6 88Ø N = PEEK (49232):N = PEEK (49235):N
       = PEEK (49239)
2B 89Ø VTAB (22): PRINT "    PRESS <ESC> T
       O RETURN TO THE MENU    ";
E8 9ØØ PRINT "          <P>  TO PRINT THI
       S PAGE       ";
6F 91Ø GET K$:K = ASC (K$)
19 92Ø IF K = 112 OR K = 8Ø THEN POKE 23Ø,
       32: GOTO 2ØØØ
66 93Ø IF K < > 27 THEN GOTO 91Ø
4D 94Ø TEXT : GOTO 3ØØ
94 95Ø REM
5Ø 96Ø REM *** SEE PAGE 2 ***
E5 97Ø N = PEEK (49232):N = PEEK (49234):N
       = PEEK (49237):N = PEEK (49239)
7D 98Ø GET K$:K = ASC (K$)
97 99Ø IF K = 112 OR K = 8Ø THEN POKE 23Ø,
       64: GOTO 2ØØØ
D8 1ØØØ IF K < > 27 THEN GOTO 98Ø
2E 1Ø1Ø TEXT : GOTO 3ØØ
BC 1Ø2Ø REM
ØA 1Ø3Ø REM *** SLOT & DRIVE ***
45 1Ø4Ø VTAB (22): POKE 36,Ø: PRINT "ENTER
       THE NEW SLOT #      <ESC> TO EXIT
       "
9D 1Ø5Ø PRINT S$;
E7 1Ø6Ø POKE 36,8: POKE 37,17: CALL - 99Ø:
       GET K$:K = ASC (K$)
E4 1Ø7Ø IF K = 27 THEN GOTO 117Ø
7F 1Ø8Ø IF K = 13 THEN GOTO 111Ø
1A 1Ø9Ø IF K < 48 OR K > 55 THEN GOTO 1Ø6Ø
89 11ØØ DS = K - 48: PRINT K$
76 111Ø VTAB (22): POKE 36,Ø: PRINT "ENTER
       THE NEW DRIVE #  <ESC> TO GO BACK
       "
F9 112Ø POKE 36,8: POKE 37,18: CALL - 99Ø:
       GET K$:K = ASC (K$)
9E 113Ø IF K = 27 THEN GOTO 1Ø4Ø
D1 114Ø IF K = 13 THEN GOTO 117Ø
8Ø 115Ø IF K < > 49 AND K < > 5Ø THEN GOTO
       112Ø
Ø1 116Ø DN = K - 48: PRINT K$
ED 117Ø GOTO 44Ø
D6 118Ø REM
EF 119Ø REM *** PRINTER SET-UP ***
39 12ØØ VTAB (22): POKE 36,Ø: PRINT "ENTER
       THE NEW SLOT #      <ESC> TO EXIT
       "
91 121Ø PRINT S$;
84 122Ø POKE 36,2Ø: POKE 37,17: CALL - 99Ø
       : GET K$:K = ASC (K$)
DB 123Ø IF K = 27 THEN GOTO 155Ø
DB 124Ø IF K = 13 THEN GOTO 127Ø
Ø2 125Ø IF K < 48 OR K > 55 THEN GOTO 122Ø
64 126Ø PS = K - 48: PRINT K$
6F 127Ø VTAB (22): POKE 36,Ø: PRINT "ENTER
       THE CHARACTER THAT WILL PRINT FOR
       "
```

```
48 1280 PRINT "THE HIGH-RES PIXELS THAT AR
       E ON (LIT) "
11 1290 POKE 36,20: POKE 37,18: CALL - 990
       : GET K$:K = ASC (K$)
66 1300 IF K = 27 THEN GOTO 1200
A9 1310 IF K = 13 THEN GOTO 1340
47 1320 IF K < 32 OR K > 127 THEN GOTO 129
       0
94 1330 CN$ = K$: PRINT K$: POKE ML + 40,K
       + 128
65 1340 VTAB (22): POKE 36,0: PRINT "ENTER
       THE CHARACTER THAT WILL PRINT FOR
       "
51 1350 PRINT "THE OFF HIGH-RES PIXELS (UN
       -LIT)      "
77 1360 POKE 36,27: POKE 37,18: CALL - 990
       : GET K$:K = ASC (K$)
F2 1370 IF K = 27 THEN GOTO 1270
9D 1380 IF K = 13 THEN GOTO 1410
4F 1390 IF K < 32 OR K > 127 THEN GOTO 136
       0
A9 1400 CF$ = K$: PRINT K$: POKE ML + 44,K
       + 128
32 1410 VTAB (22): POKE 36,0: PRINT "ENTER
       THE NUMBER OF CHARACTERS TO PRINT
       "
A6 1420 PRINT "ON ONE LINE              <ESC>
       TO GO BACK "
27 1430 POKE 36,35: POKE 37,17: CALL - 990
       : PRINT PW$;:PX$ = ""
B3 1440 POKE 36,35: PRINT PX$;: GET K$:K =
       ASC (K$)
D3 1450 IF K = 27 THEN POKE 36,35: PRINT P
      W$: GOTO 1340
9F 1460 IF K = 13 THEN GOTO 1510
B7 1470 IF (K = 127 OR K = 8) AND LEN (PX$
       ) = 1 THEN PX$ = ""
61 1480 IF (K = 127 OR K = 8) AND LEN (PX$
       ) > 1 THEN PX$ = LEFT$ (PX$, LEN (
       PX$) - 1)
A7 1490 IF (K < 48 OR K > 57) OR LEN (PX$)
       = 3 THEN GOTO 1440
40 1500 PX$ = PX$ + K$: GOTO 1440
E0 1510 IF LEN (PX$) = 3 THEN GOTO 1530
2A 1520 PX$ = PX$ + RIGHT$ (PW$,3 - LEN (P
       X$))
A9 1530 K = VAL (PX$) / 2: IF K > 255 OR K
       = 0 THEN CALL - 1059: GOTO 1430
69 1540 POKE ML + 13,K:PW$ = PX$
ED 1550 GOTO 440
D6 1560 REM
DA 1570 REM
5C 1580 REM *** ERROR HANDLER ***
9C 1590 E = ( PEEK (222) / 16 - INT ( PEEK
       (222) / 16)) * 16
39 1600 E$ = "UNKNOWN ERROR"
B7 1610 IF E = 6 THEN E$ = "FILE NOT FOUND
       "
75 1620 IF E = 8 THEN E$ = "I/O ERROR"
1E 1630 IF E = 11 THEN E$ = "SYNTAX ERROR"
91 1640 IF E = 13 THEN E$ = "FILE TYPE MIS
       MATCH"
13 1650 VTAB (24): POKE 36,0: PRINT LEFT$
       (Z1$,(25 - LEN (E$)) / 2);"DISK ER
       ROR : ";E$; LEFT$ (Z2$,(26 - LEN (
       E$)) / 2);
DB 1660 CALL - 1059: RETURN
3C 1670 DATA LOAD A HI-RES SCREEN
FA 1680 DATA DISPLAY THE DISK CATALOG
EC 1690 DATA SEE/PRINT HI-RES SCREEN 1
EA 1700 DATA SEE/PRINT HI-RES SCREEN 2
91 1710 DATA CHANGE PRINTER SETUP
C1 1720 DATA SELECT A NEW DISK SLOT/DRIVE
5B 1730 DATA QUIT
92 1740 DATA 169,0,133,8,169,39,133,7
FB 1750 DATA 169,0,133,255,169,40,133,9
14 1760 DATA 165,8,133,6,160,0,162,0
21 1770 DATA 32,17,244,164,7,177,38,166
CD 1780 DATA 255,208,1,10,10,144,4,162
A7 1790 DATA 163,208,2,162,160,145,38,138
AC 1800 DATA 32,237,253,138,32,237,253,173
2E 1810 DATA 0,192,201,155,208,1,96,230
A2 1820 DATA 6,198,9,240,6,165,6,201
2B 1830 DATA 192,208,201,32,142,253,230,25
       5
07 1840 DATA 165,255,201,7,208,182,198,7
A0 1850 DATA 16,174,169,12,32,237,253,165
17 1860 DATA 6,133,8,201,192,208,157,96
E0 1870 REM
E4 1880 REM
16 1890 REM *** QUIT ***
85 1900 VTAB (22): POKE 36,0
E5 1910 PRINT "ARE YOU SURE ? (Y/N)
                "
A3 1920 PRINT S$;
AF 1930 VTAB (22): POKE 36,22: GET K$:K =
       ASC (K$)
6F 1940 IF K = 121 OR K = 89 THEN GOTO 197
       0
9A 1950 IF K = 110 OR K = 78 THEN GOTO 440
92 1960 GOTO 1930
0E 1970 HOME : END
E6 1980 REM
A9 1990 REM *** PRINT POSTER ***
9B 2000 N = PEEK (49234): PRINT
85 2010 PRINT CHR$ (4)"PR#";PS
E6 2020 REM  ** CONTROL CHARS HERE
DD 2030 CALL ML
29 2040 PRINT : PRINT CHR$ (4)"PR#0"
17 2050 TEXT
DF 2060 GOTO 300
```

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Fractal Sketcher

Jenny Schmidt

Explore fractal graphics with this user-friendly program and see just how easy computer-generated art can be. The program runs on the Apple II+, IIe, IIc, and IIGS.

What do you think of when you think of computer art? Do you visualize geometric shapes rotating slowly on a computer screen, or do you think of paint programs such as *Blazing Paddles*? Well, "Fractal Sketcher" doesn't animate three-dimensional objects or allow you to cut and paste bitmapped images, but it does generate some fairly impressive shapes—shapes called *fractals*.

Unlike conventional art programs, Fractal Sketcher does the drawing for you. You give it some rudimentary rules to follow and it does the rest. Based on complex mathematical equations, Fractal Sketcher produces shapes and patterns that range from the mildly interesting to the out-and-out dazzling.

Fractal Sketcher allows you to control the drawing in several ways: You can select the number of segments, the path, and even the color. Not only does the program generate intriguing computer art, but for those who are interested, it serves as an introduction to how fractals work.

Typing In the Program

Fractal Sketcher comes in two parts, one BASIC listing and one machine language routine. Both are necessary to run the program.

Type in Program 1. Since it's a BASIC program, you can use the "Apple Automatic Proofreader" (included in this issue) to help you enter it without errors. Save Program 1 to disk with the filename FRACTAL.

Next, type in Program 2. It's a machine language listing that you'll have to enter with "Apple MLX," the machine language entry utility found elsewhere in this issue. Before you load and run MLX, type **POKE 104,32:POKE 8192,0**. If you don't already have a copy of Apple MLX, you'll need to type it in and save a copy. Run MLX and answer the two prompts as indicated below:

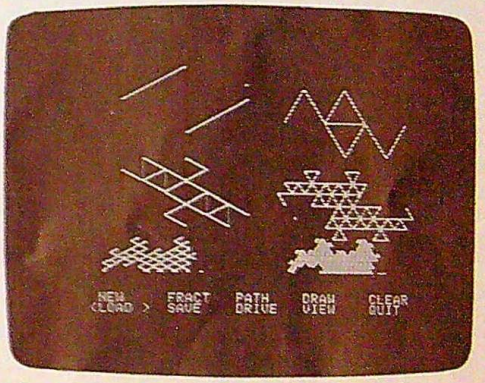
```
STARTING ADDRESS? 0800
ENDING ADDRESS?   0B4F
```

Program Key

Key	Function
I	Move cursor up
M	Move cursor down
J	Move cursor left
K	Move cursor right
Space bar	Move to next point
Escape	Make segment invisible
Left arrow	Select menu option
Right arrow	Select menu option
Return	Activate menu option

When MLX displays its Options menu, choose E to enter the program; then type the address for the area where you'd like to start. If you're just beginning to enter Program 2, type **0800**, the first address in the listing. Type in the data and save this file as FRACTAL.BIN. Save it to the disk that contains Program 1.

It's vital that you save Program 1 as FRACTAL and Program 2 as FRACTAL.BIN, since these are the filenames that Fractal Sketcher looks for when it's run.



Turtle Trail

The Fractal Turtle

Imagine a turtle walking on a wet beach, dragging his tail behind him. Although the turtle wants to move from one point to another, he doesn't travel in a straight line. Instead, he travels in a zigzag course, similar to the first pattern in the Turtle Trail screen shot.

On the first leg of the journey, he travels up at a 30-degree angle until he reaches about the halfway point. Then he goes straight down for the same distance. Finally, he travels up again at a 30-degree angle to reach his destination. This is the rule that the turtle uses to go from one point to another.

This turtle doesn't like traveling in straight lines. In fact, whenever he moves from one place to another, he applies his special rule. So on the first leg of his journey he won't travel in a straight line. Instead, he follows his rule: up 30 degrees, straight down, and up 30 degrees. Each subjourney is, of course, a straight line. So the turtle divides these subjourneys into sub-subjourneys, and so on into infinity.

It's impractical for computers to subdivide line segments forever, so the fractals designed by Fractal Sketcher are only approximations of fractals. The Turtle Trail screen shot shows the same fractal, but with six different levels of subjourneys. The trail left in the sand by the turtle's tail is called a *fractal curve*.

With Fractal Sketcher, you design your own rules for moving (which angle and direction to take), you specify the starting and ending points of the fractal's path, and you give the level of approximation to use when tracing the fractal curve (how many subjourneys the path is broken into). ▷

What's a Fractal?

What is a fractal? One answer is that it's a shape that exists in a fractional dimension. A line is a one-dimensional shape. Circles and squares are two-dimensional shapes. Cubes, spheres, and pyramids are among the infinite number of three-dimensional shapes. By constructing shapes that fit into fractional dimensions, mathematicians have created fractals.

Fractals were created by Benoit B. Mandelbrot, an IBM fellow, in order to study and recreate such natural objects as clouds and mountains.

Major film studios were quick to incorporate fractals into computer-generated graphics. Perhaps the best known sequence is the "Genesis effect" from *Star Trek II—The Wrath of Khan.*

An important feature of fractals is that they are self-similar. This means that a fractal shape looks the same at any scale. Take a shoreline, for instance. On a globe, the shoreline is a crinkly, intricate shape. From a satellite, the view is much the same. Now imagine a seaplane over the shoreline. No matter how closely you look, the view is similar—the shoreline twists and turns. There are many different kinds of fractals. Among the best known are the Mandelbrot and Julia sets.

The fractals generated by the accompanying program are another type—they are fractal sweeps. Fractal sweeps can be used to create another well-known fractal: the fractal dragon. The first step in generating fractal sweeps is to take a shape made up of two or more line segments. Now use that shape to replace each line segment in the original shape. You have just created a fractal of order 1. Next, repeat the process, replacing each line segment with the original shape. Now you have a fractal of order 2. In a real fractal, this process goes on forever, but on a computer screen we soon surpass the resolution of the monitor.

— Rhett Anderson

The Menu

To run the program, type **RUN FRACTAL**. If you saved the program as something other than FRACTAL, use the name with which you saved it instead. When Fractal Sketcher is run, its menu appears at the bottom of the screen. Options include

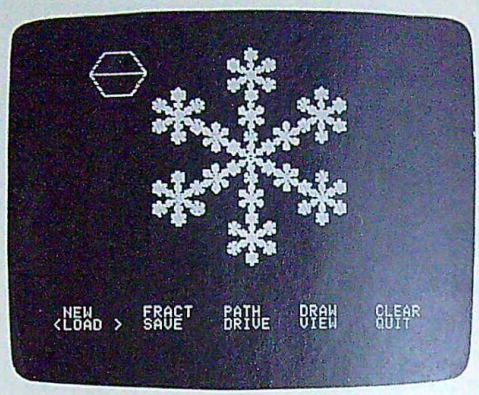
```
NEW     FRACT   PATH    DRAW    CLEAR
LOAD    SAVE    DRIVE   VIEW    QUIT
```

You select options by pressing the left- and right-arrow keys. Brackets outline the current option. Press Return to activate the selected menu option.

To see what each option does, let's create a simple fractal. To begin, select **NEW** to create a new rule. The program asks how many line segments (legs of a journey) you want. Enter 3.

A straight line appears across the screen, with a square cursor on the left end. This line is made up of three segments. Press the space bar to move the cursor from segment to segment. You move the segments up, down, left, and right by pressing the I, M, J, and K keys, respectively. The ends of the segments are connected to the cursor, so you can push and pull the segments into any shape you like.

The cursor's point position and coordinates are displayed in the lower left corner of the screen. In a three-segment pattern there are four points (points 0–3). Horizontal coordinates are in the range 0–279 and vertical coordinates are in the range 0–221. If the cursor is on a point other than point 0, the length of the previous segment is listed as well.



Snowflake

Normally, you move segments a distance of one pixel at a time. To speed things up, press a number key (2–9) to move by two, three, four, or all the way up to nine pixels in one keypress. Pressing the number key 1 returns things to normal.

Using what we know, let's create a path that simulates the path of our fractal turtle. With the space bar and keys J, K, I, and M, position each point to match the coordinates given below. (Try using the number keys to speed things up.)

Point	Coordinates
0	0,159
1	92,0
2	185,159
3	277,0

You've just created a fractal rule.

Before drawing the fractal, you must first determine the starting and ending points of the fractal curve. Select **PATH**. A line with a square cursor appears. The left end of the line is the starting point and the right end is the ending point.

You move this line using the same keys that you used to define the fractal rule. The space bar moves you from one end of the line to the other. You can make this line as large or as small as you like. You can even place it diagonally across the screen.

Note: If the message PATH ON SCREEN ever appears, this means that you've already defined a path and do not need to select the PATH option again. You can still modify the path using the J, K, I, and M keys, or move the menu brackets to select another option.

When you're happy with the path you've made, select **DRAW**. The program asks for two pieces of information: color value and approximation level. The color values are as follows:

Color	Color Value
Black1	0
Green	1
Violet	2
White1	3
Black2	4
Orange	5
Blue	6
White2	7

White1 and White2 (3 and 7) give the clearest-looking fractals.

As for the approximation level, try using a relatively low number, such as 5. The higher the number, the more complex the drawing and the longer it takes to complete the fractal. Once both values have been entered, the fractal is drawn.

The menu returns to the bottom of the screen when the fractal is complete. To stop the fractal drawing before it's fin-

ished, press a key. You must always define a path before you can draw another fractal.

Don't worry if your fractal is missing some lines. If either of the segment's endpoints goes off the screen, then the entire line segment is not drawn. In this case, you need to make the path smaller or move the path farther away from the screen's borders.

Fine-Tuning Fractals

Making changes in the fractal rule is the best way to fine-tune a fractal. Choosing NEW won't help because it erases the current rule, forcing you to start from scratch. For minor rule changes, use FRACT. This option displays the current fractal rule on the screen, allowing you to make changes with the J, K, I, and M keys.

Try making the angles between segments more or less acute. See what happens when you make one of the line segments longer than the rest? Changes in the PATH and DRAW parameters can affect the fractal as well. And because previously drawn fractals remain on the screen, it's possible to create some impressive graphics simply by laying different fractal shapes on top of each other.

After a while, the screen is likely to get cluttered with fractals. To clear the screen of all graphics, select CLEAR.

When you're tired of a fractal rule, it's time to select NEW and define a new rule. Fractal rules can have 2–20 segments. The more segments, the longer it takes to draw the fractal.

A word of advice for designing rules: Make sure that no one line segment is longer than the distance between the starting point of the rule and the ending point. Otherwise, the long segment will subdivide into an even longer segment than itself. After several subdivisions, this line segment will produce an incredibly huge segment that won't fit on the screen. To judge segment lengths, use the length value given at the lower left section of the screen.

Invisible Lines

Go back to the turtle analogy for a moment. What if the turtle kept his tail out of the sand for one segment of the rule? The curve would have gaps in it. Look at the Snowflake screen shot. This snowflake fractal was designed with two invisible segments. The fractal rule used to create the Maze screen shot has four invisible segments—each invisible segment actually reverses the direction of the previous segment.

Invisible segments are easy to define. Assuming you have a rule displayed on the screen—from choosing either the NEW or the FRACT option—move the cursor to the point just right of a segment and press Escape. That segment becomes invisible. Pressing Escape again makes it visible. The Escape key acts as a toggle switch.

You can move invisible line segments with the cursor the same way you move visible ones, although it can be confusing when you can't see them. It's easiest to position the segments first and then make them invisible.

Invisible segments produce many interesting curves.

Additional Options

There are five menu options that have not been discussed yet: LOAD, SAVE, DRIVE, VIEW, and QUIT. The following is a description of what each of these options does.

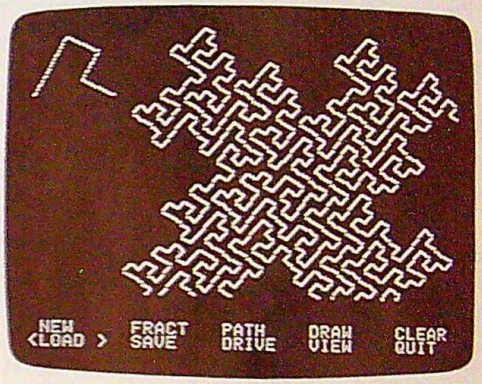
LOAD. This option allows you to load previously created fractals. You're given two options: Load a Fractal or a Load a Picture. The fractal option loads fractal rules, but not the picture. The picture option loads the fractal image, but not the fractal rule that created the picture. When you've chosen which file type you want, simply enter the filename of the fractal/picture and press Return.

SAVE. To save a fractal/picture to disk, select this option. SAVE works the same way load does.

DRIVE. When the program first runs, it defaults to using drive 1, slot 6. Using this option, you can switch between drive 1 and drive 2.

VIEW. Often, parts of the fractal shape are drawn below the menu line. To remove the menu and view the entire high-resolution screen, select this option. Press Return to display the menu again.

QUIT. Choose this to exit the program.



Maze

Some Examples

To get you started, we've compiled three predefined fractal rules for you to experiment with. To use them, select NEW, enter the appropriate number of segments, and adjust the point coordinates to match those shown below. If it says *invisible* after a set of coordinates, that means to press Escape while the cursor is positioned on the corresponding point. When that key is pressed, the word *INVISIBLE* appears on the screen, and the specified segment disappears.

Example 1—Snowflake

Segments: 9

Point	Coordinates	
0	0,92	
1	65,92	(invisible)
2	98,37	
3	163,37	
4	195,92	
5	163,148	
6	98,148	
7	65,92	
8	195,92	
9	260,92	(invisible)

Example 2—Dragon

Segments: 4

Point	Coordinates	
0	0,221	
1	0,0	
2	221,0	(invisible)
3	0,0	
4	221,0	(invisible)

Example 3—Maze

Segments: 9

Point	Coordinates	
0	30,184	
1	30,92	(invisible)
2	30,184	
3	30,92	(invisible)

4	30,0	
5	122,0	
6	122,92	(invisible)
7	122,0	
8	122,92	(invisible)
9	214,92	

As you can see, fractals are capable of creating some marvelous curves. Even the ones that look like scribbles can be interesting.

On Disk Only

If you purchase this issue's *COMPUTE!'s Apple Applications Disk*, you'll find four fractal files and four picture files ready to load and enjoy. These files are saved with the prefixes TURTLE, SNOWFLAKE, DRAGON, and MAZE. The fractal files have a .F extension and the picture files have a .P extension. So the complete filename for the dragon picture is DRAGON.P.

To use any one of these files, simply load it in with Fractal Sketcher's LOAD option. To load the maze fractal, for example, select LOAD, press F for Fractal, and enter the filename MAZE.F.

Look for the "On Disk Only" box in all *Apple Applications* articles. If a program or article can be enhanced by additional disk files, we'll explain them here and provide them on disk. For more information on ordering *COMPUTE!'s Apple Applications Disk*, see page 32.

Program 1: FRACTAL

Be sure to use "Apple Automatic Proofreader," found elsewhere in this issue, to enter the following program.

```
7F 100 REM COPYRIGHT 1988 COMPUTE! PUBLICATIO
       NS, INC. - ALL RIGHTS RESERVED
B0 110 HOME : TEXT : VTAB 10: HTAB 11: INVERS
       E : PRINT CHR$ (21)" FRACTAL SKETCHER
       ": NORMAL
D5 120 VTAB 12: HTAB 13: PRINT "COPYRIGHT 198
       8": HTAB 7: PRINT "COMPUTE! PUBLICATIO
       NS, INC.": HTAB 10: PRINT "ALL RIGHTS
       RESERVED"
65 130 IF PEEK (104) < > 64 THEN POKE 104,64:
        POKE 103,1: POKE 16384,0: PRINT CHR$
       (4)"RUN FRACTAL"
CF 140 ONERR GOTO 1410
81 150 IF PEEK (48896) = 76 THEN POKE 48985,0
       : POKE 48986,0: POKE 48987,0
8E 160 PRINT CHR$ (4)"BLOAD FRACTAL.BIN"
9D 170 IF PEEK (48896) = 76 THEN POKE 48985,2
       55: POKE 48986,255: POKE 48987,255: RE
       M IF PRODOS PROTECT FRACT
85 180 BL = 1:DD = 1:FD = 2048:EL = 2707:SZ =
        5:SC = .8625954
8D 190 DIM TX(20),TY(20),BA(20),R(20),A(20),A
       X(20),AY(20),VI(20)
8A 200 FOR I = 0 TO 2:AX(I) = INT (279 * I /
       2):AY(I) = 111: NEXT :NS = 2:NA = NS
27 210 REM POKE SHAPE TABLE AND ERROR ROUTINE
8E 220 DATA 1,0,4,0,33,63,54,45,4,0,104,168,1
       04,166,223,154,72,152,72,96
7B 230 FOR W = 0 TO 19: READ I: POKE 768 + W,
       I: NEXT W: POKE 232,0: POKE 233,3: ROT
       = 0: SCALE= 2
FB 240 HGR
56 250 REM MAIN MENU
46 260 BX = 1:BY = 23
2E 270 HOME : VTAB 23: HTAB 2: PRINT "NEW";:
       HTAB 10: PRINT "FRACT";: HTAB 18: PRIN
       T "PATH";: HTAB 26: PRINT "DRAW";: HTA
       B 34: PRINT "CLEAR"
9E 280 HTAB 2: PRINT "LOAD";: HTAB 10: PRINT
       "SAVE";: HTAB 18: PRINT "DRIVE";: HTAB
        26: PRINT "VIEW";: HTAB 34: PRINT "QU
       IT";
1F 290 POKE - 16368,0
87 300 HTAB BX: VTAB BY: PRINT "<";: HTAB BX
       + 6: PRINT ">";
0C 310 IF PEEK ( - 16384) < 128 THEN 310
57 320 KY = PEEK ( - 16384)
14 330 POKE - 16368,0
D2 340 IF KY < > 149 THEN 380
26 350 IF VW THEN 300
4A 360 HTAB BX: VTAB BY: PRINT " ";: HTAB BX
       + 6: VTAB BY: PRINT " ";:BX = BX + 8:
       IF BX > 33 THEN BX = 1:BY = BY + 1: IF
        BY > 24 THEN BY = 23
9B 370 GOTO 300
B5 380 IF KY < > 136 THEN 430
2E 390 IF VW THEN 300
8F 400 HTAB BX: VTAB BY: PRINT " ";: HTAB BX
       + 6: VTAB BY: PRINT " ";:BX = BX - 8:
       IF BX < 1 THEN :BY = BY - 1:BX = 33: I
       F BY < 23 THEN BY = 24
90 410 GOTO 300
6A 420 REM CHOOSE OPTION
EF 430 IF KY = 141 THEN ON (BY - 23) * 5 + (B
       X - 1) / 8 + 1 GOTO 870,820,780,940,10
       80,1130,1230,1350,1380,1300
91 440 IF ( NOT FT) AND ( NOT PN) THEN 300
91 450 IF KY < > 160 THEN 550
97 460 XDRAW 1 AT TX(IN),TY(IN):IN = IN + 1:
       IF (IN > NA) THEN IN = 0
93 470 XDRAW 1 AT TX(IN),TY(IN): VTAB 21: HTA
       B 1: PRINT SPC( 15);: HTAB 1: PRINT "P
       OINT ";IN;":";TX(IN);",";  INT (TY(IN)
       / SC);
52 480 VTAB 22: HTAB 1: PRINT SPC( 17);: HTAB
        1: IF (IN) THEN PRINT "LENGTH: "; INT
        (.5 + SQR (((TY(IN) - TY(IN - 1)) / S
       C) ^ 2 + (TX(IN) - TX(IN - 1)) ^ 2))
2C 490 IF PN THEN 300
0A 500 VTAB 21: HTAB 20
B5 510 IF NOT (IN) THEN PRINT SPC( 15);: GOTO
        300
24 520 IF NOT VI(IN - 1) THEN PRINT "   <--VI
       SIBLE";
36 530 IF VI(IN - 1) THEN PRINT " <--INVISIBL
       E";
97 540 GOTO 300
BE 550 IF KY < > 155 THEN 590
03 560 IF IN AND NOT PN THEN CALL EL,TX(IN -
       1),TY(IN - 1),TX(IN),TY(IN):VI(IN - 1)
        = ABS (VI(IN - 1) - 1)
9E 570 GOTO 500
27 580 REM  CHOOSE CURSOR INCREMENT
DE 590 IF KY > 176 AND KY < 186 THEN SZ = KY
       - 176: GOTO 300
9E 600 REM PROCESS I,J,K,M
BC 610 IF KY = 202 OR KY = 234 THEN 630
1B 620 GOTO 650
BB 630 XDRAW 1 AT TX(IN),TY(IN): GOSUB 1500:
       IF TX(IN) - SZ > - 1 THEN TX(IN) = TX(
       IN) - SZ
75 640 GOSUB 1500: GOTO 470
D0 650 IF KY = 203 OR KY = 235 THEN 670
27 660 GOTO 690
B3 670 XDRAW 1 AT TX(IN),TY(IN): GOSUB 1500:
       IF TX(IN) + SZ < 280 THEN TX(IN) = TX(
       IN) + SZ
7D 680 GOSUB 1500: GOTO 470
63 690 IF KY = 205 OR KY = 237 THEN 710
96 700 GOTO 730
2E 710 XDRAW 1 AT TX(IN),TY(IN): GOSUB 1500:
       IF TY(IN) + SZ < 192 THEN TY(IN) = TY(
       IN) + SZ
72 720 GOSUB 1500: GOTO 470
3C 730 IF KY = 201 OR KY = 233 THEN 750
99 740 GOTO 300
61 750 XDRAW 1 AT TX(IN),TY(IN): GOSUB 1500:
       IF TY(IN) - SZ > - 1 THEN TY(IN) = TY(
       IN) - SZ
7A 760 GOSUB 1500: GOTO 470
B9 770 REM PATH OPTION
```

```
A9 780 IF PN THEN HOME : VTAB 23: INPUT "PATH
       ON SCREEN. PRESS RETURN";A$: GOTO 270
74 790 IF FT THEN FOR I = 0 TO NS:AX(I) = TX(
       I):AY(I) = 191 - TY(I): NEXT I: GOSUB
       1700: XDRAW 1 AT TX(IN),TY(IN)
85 800 NA = 1:TX(0) = 70:TY(0) = 80:TX(1) = 2
       10:TY(1) = 80: CALL EL,TX(0),TY(0),TX(
       1),TY(1):IN = 0:PN = 1:FT = 0: XDRAW 1
       AT TX(0),TY(0): GOTO 270
92 810 REM FRACT OPTION
CA 820 IF FT THEN 270
A9 830 IF PN THEN CALL EL,TX(0),TY(0),TX(1),T
       Y(1): XDRAW 1 AT TX(IN),TY(IN)
52 840 FOR I = 0 TO NS:TX(I) = AX(I):TY(I) =
       191 - AY(I): NEXT I
C5 850 NA = NS:FT = 1:PN = 0:IN = 0: GOSUB 17
       00: XDRAW 1 AT TX(0),TY(0):FF = 1: GOT
       O 270
D7 860 REM  NEW OPTION
9C 870 HOME : VTAB 22: INPUT "ENTER NUMBER OF
        SEGMENTS:";A$: IF A$ = "" THEN 270
D0 880 IF VAL (A$) < 2 OR VAL (A$) > 20 THEN
       870
B0 890 IF (FT) OR PN THEN GOSUB 1700: XDRAW 1
        AT TX(IN),TY(IN)
5B 900 NS = VAL (A$):NA = NS
39 910 FOR I = 0 TO NA:TX(I) = INT (278 / NA
       * I):TY(I) = 80:VI(I) = 0: NEXT I: GOS
       UB 1700
A6 920 XDRAW 1 AT TX(0),TY(0):FT = 1:PN = 0:I
       N = 0:FF = 1: GOTO 270
44 930 REM DRAW OPTION
25 940 HOME : VTAB 23: IF NOT PN THEN INPUT "
       NO PATH SHOWN. PRESS RETURN";A$: GOTO
       270
0B 950 IF NS < 2 THEN INPUT "NO FRACTAL TO PL
       OT. PRESS RETURN";A$: GOTO 270
14 960 INPUT "ENTER COLOR VALUE (0-7):";A$: I
       F A$ = "" THEN 270
CD 970 IF VAL (A$) < 0 OR VAL (A$) > 7 THEN 9
       60
74 980 CL = INT ( VAL (A$)): IF NOT FF THEN 1
       000
EB 990 GOSUB 1620
74 1000 LP = SQR ((TX(1) - TX(0)) ^ 2 + ((TY(
        1) - TY(0)) / SC) ^ 2): IF TX(1) - TX
        (0) = 0 THEN BP = 1.570796 * SGN (TY(
        0) - TY(1)): GOTO 1020
9E 1010 BP = ATN ((TY(0) - TY(1)) / SC / (TX(
        1) - TX(0))) + ( SGN (TX(1) - TX(0))
        = - 1) * 3.141593
B8 1020 INPUT "ENTER LEVEL (1-15):";A$: IF A$
        = "" THEN 270
AE 1030 LV = INT ( VAL (A$)): IF LV < 1 OR LV
        > 15 THEN 1020
B5 1040 CALL EL,TX(0),TY(0),TX(1),TY(1): XDRA
        W 1 AT TX(IN),TY(IN): HCOLOR= CL
B4 1050 CALL FD,NS - 1,LV,TX(0),191 - TY(0),L
        P,BP,R(0),A(0),VI(0),SC
EB 1060 PN = 0: GOTO 270
47 1070 REM CLEAR OPTION
17 1080 HOME : VTAB 22: INPUT "ARE YOU SURE?
        ";A$: IF LEFT$ (A$,1) < > "Y" THEN 27
        0
C1 1090 HGR : IF PN OR FT THEN XDRAW 1 AT TX(
        IN),TY(IN): IF PN THEN CALL EL,TX(0),
        TY(0),TX(1),TY(1)
CE 1100 IF FT THEN GOSUB 1700
D9 1110 GOTO 270
DA 1120 REM LOAD OPTION
31 1130 HOME : VTAB 22: INPUT "LOAD FRACTAL O
        R PICTURE (F/P)? ";B$: IF LEFT$ (B$,1
        ) < > "F" AND LEFT$ (B$,1) < > "P" TH
        EN 270
5E 1140 GOSUB 1550: ONERR GOTO 1210
17 1150 PRINT CHR$ (4)"VERIFY"A$",D";DD
59 1160 ONERR GOTO 1410
BF 1170 IF LEFT$ (B$,1) = "P" THEN PRINT CHR$
        (4)"BLOAD"A$",A$2000,D";DD:FT = 0:PN
        = 0: POKE - 16304,0: GOTO 270
B5 1180 IF PN THEN CALL EL,TX(0),TY(0),TX(1),
        TY(1):PN = 0: XDRAW 1 AT TX(IN),TY(IN
        )
57 1190 IF FT THEN GOSUB 1700:FT = 0: XDRAW 1
        AT TX(IN),TY(IN)
AA 1200 PRINT CHR$ (4)"OPEN"A$",D"DD: PRINT C
        HR$ (4)"READ"A$: INPUT NS: FOR I = 0
        TO NS: INPUT AX(I): INPUT AY(I): INPU
        T VI(I): NEXT I: PRINT CHR$ (4)"CLOSE
        ": GOSUB 1620: POKE - 16304,0: GOTO 8
        20
51 1210 PRINT "FILE NOT FOUND": PRINT "ANY KE
        Y TO TRY AGAIN": GET A$: GOTO 1140
0F 1220 REM SAVE OPTION
06 1230 HOME : VTAB 22: INPUT "SAVE FRACTAL O
        R PICTURE (F OR P)";B$: IF LEFT$ (B$,
        1) < > "F" AND LEFT$ (B$,1) < > "P" T
        HEN 270
F2 1240 IF (FT) OR PN THEN GOSUB 1700: XDRAW
        1 AT TX(IN),TY(IN)
76 1250 IF FT THEN FOR I = 0 TO NS:AX(I) = TX
        (I):AY(I) = 191 - TY(I): NEXT I
27 1260 FT = 0:PN = 0:IN = 0
41 1270 GOSUB 1550: IF LEFT$ (B$,1) = "P" THE
        N PRINT CHR$ (4)"BSAVE"A$",A$2000,L$1
        FFF,D"DD: POKE - 16304,0: GOTO 270
0C 1280 PRINT CHR$ (4)"OPEN"A$",D"DD: PRINT C
        HR$ (4)"WRITE"A$: PRINT NS: FOR I = 0
         TO NS: PRINT AX(I): PRINT AY(I): PRI
        NT VI(I): NEXT I: PRINT CHR$ (4)"CLOS
        E": POKE - 16304,0: GOTO 270
D1 1290 REM QUIT OPTION
ED 1300 HOME : VTAB 22: INPUT "EXIT PROGRAM (
        Y/N)? ";A$: IF A$ = "" OR LEFT$ (A$,1
        ) = "N" OR LEFT$ (A$,1) = CHR$ (110)
        THEN 270
62 1310 TEXT : HOME
75 1320 IF PEEK (48896) = 76 THEN POKE 48985,
        0: POKE 48986,0: POKE 48987,0: REM IF
         PRODOS FREE FRACT MEMORY
D4 1330 END
BB 1340 REM DRIVE OPTION
E0 1350 TEXT : HOME : VTAB 12: INPUT "ENTER D
        RIVE NUMBER (1 OR 2) : ";A$:DD = VAL
        (A$): IF DD < > 1 AND DD < > 2 THEN 1
        350
CE 1360 POKE - 16304,0: GOTO 270
46 1370 REM  VIEW OPTION
E2 1380 IF NOT VW THEN VW = 1: POKE - 16302,0
        : GOTO 300
E5 1390 IF VW THEN VW = 0: POKE - 16301,0: GO
        TO 300
6C 1400 REM ERROR HANDLER

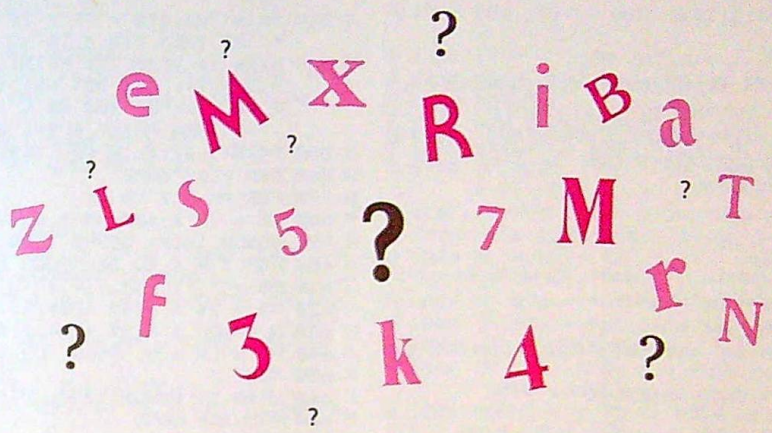
A6 1410 CALL - 3288
24 1420 IF BL THEN 1480
1A 1430 PRINT CHR$ (7): PRINT "PLEASE INSERT
        DISK WITH FRACTAL.BIN FILE";: PRINT "
        AND PRESS <RET>, OR PRESS <ESC> TO EX
        IT.": POKE - 16368,0
6A 1440 KY = PEEK ( - 16384)
E6 1450 IF KY = 141 THEN POKE - 16368,0: GOTO
         150
F6 1460 IF KY = 155 THEN POKE - 16368,0: END
86 1470 GOTO 1440
82 1480 CALL 778: PRINT : PRINT CHR$ (4);"CLO
        SE": PRINT "ERROR #"; PEEK (222);" IN
         LINE "; PEEK (218) + PEEK (219) * 25
        6: INPUT "PRESS RETURN TO CONTINUE";A
        $: POKE - 16304,0: GOTO 270
1A 1490 REM DRAW SEGMENT PAIR ROUTINE
77 1500 IF ( NOT IN) THEN 1520
15 1510 IF NOT VI(IN - 1) OR PN THEN CALL EL,
        TX(IN - 1),TY(IN - 1),TX(IN),TY(IN)
44 1520 IF (IN < NA) AND ( NOT VI(IN) OR PN)
        THEN CALL EL,TX(IN),TY(IN),TX(IN + 1)
        ,TY(IN + 1)
E7 1530 RETURN
95 1540 REM CATALOG ROUTINE
08 1550 TEXT : HOME : VTAB 12: INPUT "ENTER F
```

```
      ILE NAME (?=CATALOG, <RET> TO    CANC
      EL) : ";A$: PRINT
35 1560 IF A$ = "" THEN POKE - 16304,0: POP :
      GOTO 270
E6 1570 IF A$ < > "?" AND A$ < > "/" THEN RET
      URN
68 1580 IF PEEK (48896) = 76 THEN PRINT CHR$
      (4)"CAT": GET A$: GOTO 1550
E9 1590 PRINT CHR$ (4)"CATALOG": GET A$: GOTO
       1550
DD 1600 RETURN
DA 1610 REM CALCULATE RELATIVE POLAR COORDINA
      TES
32 1620 LN = SQR ((AX(NS) - AX(Ø)) ^ 2 + ((AY
      (NS) - AY(Ø)) / SC) ^ 2)
23 1630 IF AX(NS) - AX(Ø) = Ø THEN BN = 1.570
      796 * SGN (AY(NS) - AY(Ø)): GOTO 1650
3B 1640 BN = ATN ((AY(NS) - AY(Ø)) / SC / (AX
      (NS) - AX(Ø))) + ( SGN (AX(NS) - AX(Ø
      )) = - 1) * 3.141593
46 1650 FOR I = 1 TO NS:R(I - 1) = SQR ((AX(I
       - 1) - AX(I)) ^ 2 + ((AY(I - 1) - AY
      (I)) / SC) ^ 2) / LN
CF 1660 IF AX(I) - AX(I - 1) = Ø THEN A(I - 1
      ) = 1.570796 * SGN (AY(I) - AY(I - 1)
      ) - BN: GOTO 1680
4A 1670 A(I - 1) = ATN ((AY(I) - AY(I - 1)) /
       SC / (AX(I) - AX(I - 1))) + ( SGN (A
      X(I) - AX(I - 1)) = - 1) * 3.141593 -
       BN
B2 1680 NEXT I:FF = Ø: RETURN
#4 1690 REM DRAW FRACTAL OR PATH
CB 1700 FOR I = 1 TO NA: IF ( NOT VI(I - 1))
      OR PN THEN CALL EL,TX(I - 1),TY(I - 1
      ),TX(I),TY(I)
9# 1710 NEXT I: RETURN
```

Program 2: FRACTAL.BIN

For mistake-proof entry, use "Apple MLX," found elsewhere in this issue, to type in this program.

```
0800: 20 4C E7 86 EB 20 4C E7 F8
0808: 86 EC 20 BE DE 20 7B DD D2
0810: 20 69 0A 20 BE DE 20 7B FA
0818: DD 20 70 0A 20 BE DE 20 A7
0820: 7B DD 20 85 0A 20 BE DE EE
0828: 20 7B DD 20 7E 0A 20 BE FF
0830: DE 20 E3 DF 85 06 84 07 86
0838: 20 BE DE 20 E3 DF 85 08 97
0840: 84 09 20 BE DE 20 E3 DF E3
0848: 85 CE 84 CF 20 BE DE 20 36
0850: 7B DD A2 44 A0 0B 20 2B CA
0858: EB A9 00 85 EE 85 ED 85 10
0860: FA 85 FB A5 EE C5 EC F0 82
0868: 03 4C 44 09 AD 00 C0 10 25
0870: 06 2C 10 C0 4C B7 00 A9 87
0878: 01 85 FC 20 62 0A 20 A0 28
0880: E7 20 52 E7 A5 51 D0 29 92
0888: A9 BF 38 E5 50 90 22 85 51
0890: EF 20 5B 0A 20 A0 E7 20 20
0898: 52 E7 A6 50 A4 51 C0 01 92
08A0: 90 06 D0 0D E0 18 B0 09 37
08A8: A5 EF 20 11 F4 A9 00 85 70
08B0: FC 20 25 0A A5 FC D0 30 7F
08B8: 20 A0 E7 20 52 E7 A5 51 CE
08C0: D0 26 A9 BF 38 E5 50 90 7E
08C8: 1F 85 EF 20 5B 0A 20 A0 AD
08D0: E7 20 52 E7 A5 EF A8 A5 89
08D8: 50 A6 51 E0 01 90 06 D0 1A
08E0: 07 C9 18 B0 03 20 3A F5 F7
08E8: A0 04 A5 FB D0 07 A5 FA A7
08F0: D0 03 4C B7 00 20 8D 09 D3
08F8: 20 7E 0A 20 AA 09 86 EE 71
0900: 20 AA 09 86 ED 20 8D 09 6A
0908: 20 85 0A E6 ED A5 ED 0A 27
0910: 0A 18 65 ED 65 CE 48 A5 55
0918: CF 69 00 A8 68 20 F9 EA 99
0920: F0 14 A5 ED C5 EB F0 05 08
0928: B0 BE 20 06 0A 20 56 09 2D
0930: 20 25 0A 4C E8 08 A5 ED 42
0938: C5 EB 90 11 D0 03 20 56 74
0940: 09 4C 63 08 E6 EE A9 00 1D
0948: 85 ED 4C 0D 09 20 06 0A D1
0950: 20 56 09 4C 63 08 A5 ED 62
0958: 0A 0A 18 65 ED 48 65 08 AE
0960: 48 A5 09 69 00 A8 68 20 4B
0968: F9 EA A9 30 A0 0B 20 BE 9A
0970: E7 20 7E 0A 68 18 65 06 63
0978: 48 A5 07 69 00 A8 68 20 23
0980: F9 EA A9 35 A0 0B 20 7F C3
0988: E9 20 85 0A 60 A5 FA 38 B0
0990: E9 05 85 FA A5 FB E9 00 2A
0998: 85 FB A9 49 18 65 FA 48 CA
09A0: A9 0B 65 FB A8 68 20 F9 D7
09A8: EA 60 A5 FA 38 E9 01 85 9D
09B0: FA A5 FB E9 00 85 FB A9 7F
09B8: 49 18 65 FA 85 FC A9 0B 50
09C0: 65 FB 85 FD A0 00 B1 FC 7A
09C8: AA 60 A5 FA 18 69 49 85 2B
09D0: FC A5 FB 69 0B 85 FD A0 EB
09D8: 00 8A 91 FC A5 FA 18 69 42
09E0: 01 85 FA A5 FB 69 00 85 99
09E8: FB 60 A5 FA 18 69 49 AA 19
09F0: A5 FB 69 0B A8 20 2B EB BA
09F8: A5 FA 18 69 05 85 FA A5 10
0A00: FB 69 00 85 FB 60 A9 35 AE
0A08: A0 0B 20 F9 EA 20 EA 09 89
0A10: A6 ED 20 CA 09 A6 EE 20 84
0A18: CA 09 A9 30 A0 0B 20 F9 77
0A20: EA 20 EA 09 60 20 77 0A 1C
0A28: 20 EA EF A9 35 A0 0B 20 02
0A30: 7F E9 A9 3A A0 0B 20 BE 87
0A38: E7 20 69 0A 20 77 0A 20 29
0A40: F1 EF A9 35 A0 0B 20 7F C2
0A48: E9 A9 44 A0 0B 20 7F E9 10
0A50: A9 3F A0 0B 20 BE E7 20 B9
0A58: 70 0A 60 A9 3A A0 0B 4C 84
0A60: F9 EA A9 3F A0 0B 4C F9 19
0A68: EA A2 3A A0 0B 4C 2B EB B7
0A70: A2 3F A0 0B 4C 2B EB A9 FA
0A78: 30 A0 0B 4C F9 EA A2 30 E3
0A80: A0 0B 4C 2B EB A2 35 A0 DB
0A88: 0B 4C 2B EB A9 35 A0 0B C7
0A90: 4C F9 EA 20 BE DE 20 B9 14
0A98: F6 85 EF 86 EB 84 EC 20 5B
0AA0: 11 F4 20 BE DE 20 B9 F6 4C
0AA8: 85 FA 86 ED 84 EE A4 E5 FC
0AB0: A5 ED 38 E5 EB 48 A5 EE 33
0AB8: E5 EC 85 D3 B0 0A 68 49 B0
0AC0: FF 69 01 48 A9 00 E5 D3 C0
0AC8: 85 D1 85 D5 68 85 D0 85 A2
0AD0: D4 A5 FA 38 E5 EF B0 04 EF
0AD8: 49 FF 69 01 85 D2 66 D3 E6
0AE0: A5 D2 18 65 D0 AA A9 00 5A
0AE8: 65 D1 85 1D A5 D4 38 E5 7D
0AF0: D2 85 D4 A5 D5 E9 00 85 A0
0AF8: D5 B1 26 45 30 49 80 91 B6
0B00: 26 CA 8A 49 FF D0 06 C6 D7
0B08: 1D A5 1D 30 20 90 09 A5 B7
0B10: D3 0A 20 65 F4 4C EC 0A A9
0B18: A5 D3 20 D3 F4 A5 D4 18 37
0B20: 65 D0 85 D4 A5 D5 65 D1 3C
0B28: 85 D5 4C F9 0A 4C B7 00 90
0B30: 4C B7 00 03 FF 4C B7 00 2B
0B38: 03 FF 4C B7 00 03 FF 4C 2D
0B40: B7 00 03 FF 4C B7 00 03 D6
0B48: FF 24 E6 24 A9 00 85 41 20 aa
```



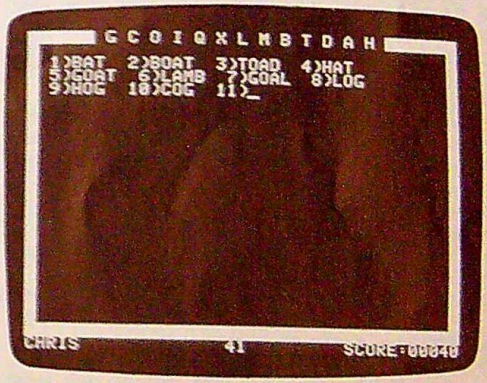
Scrambler

Rhett Anderson and David Hensley, Jr.
Apple version by Randy Thompson

Grab a dictionary. You'll need it to settle the disputes that arise when you play "Scrambler," a challenging word game for one to four players.

How many words can you make from the letters in the word *Thanksgiving? Tank, shin, knit, gnat, gin, thin* . . . that's a few. If you can find more, you'll enjoy "Scrambler," a word game that will keep you on the edge of your seat. Play head-to-head against up to three opponents or play for a high score on your own.

Scrambler has many features that will sharpen your skills: a countdown timer, an intelligent keyboard routine that doesn't let you use unavailable letters, and a duplication checker that makes sure you don't type the same word twice. To keep track of your best games, high scores are automatically saved to disk.



Dog, clog, flog, glitch . . .

Getting Started

Scrambler is written entirely in BASIC. Using the "Apple Automatic Proofreader" program found elsewhere in this issue, carefully type in Scrambler and save it to disk before attempting to run it.

When you're ready to play a game of Scrambler, load the program and type RUN. Make sure your clock speed is set to normal if you're using a IIGS. After an interestingly scrambled title screen, Scrambler looks for a high-score file called SCRAMSCORE. If it can't find a file with this name, it will create one.

Scrambler first asks you how many people will be playing. Enter a number from 1 to 4. Next, when Scrambler asks for the names of the players, type them in one at a time. Scrambler asks whether you want to play for words or for points. Press W if you want Scrambler to score each word as one point. Press P if you'd rather have the game reward more points to long words than to short ones. Finally, choose how long you want the game to last. Scrambler is a timed game. You may choose to play a one-, three-, five-, or seven-minute game.

In the Hot Seat

Before you start the game, decide on the rules. Will you allow proper nouns? Are slang words acceptable? What about single-letter words like *I* and *A*? You might want to use a dictionary to resolve disputes.

The first player should be seated at the computer's keyboard. Press a key to begin the game. Thirteen letters appear at the top of the screen. The player uses these letters to create words. The letters are different every time a round is played. This keeps players from memorizing a list of words.

The letters can each be used once. You can't use the word *mess* if you have only one s, but you can use it if you have two.

Scrambler won't let you type the same word twice. If you try it, you'll hear a beep and the word will disappear.

Keep an eye on the timer; it shows the number of seconds remaining on the clock. The screen flashes and the computer beeps when you have only 20 seconds left. When time runs out, you'll be asked if you would like to delete any of the words you typed. If you answer Y, you can step through each word you typed and check it in the dictionary. Press Y to keep

the word and N to delete it. After the score has been reported, the next player gets a chance to play with a new set of letters.

High Scoring

At the end of the game, the winner will be announced. If the high score beats the previous high score stored on disk, the SCRAMSCORE file will be updated. There are eight combinations of scoring and time options; note that a high score is kept for each type of game.

Scrambler

Be sure to use "Apple Automatic Proofreader," found elsewhere in this issue, to enter the following program.

```
37 100 REM SCRAMBLER
E3 110 REM COPYRIGHT COMPUTE! PUBLICATIONS IN
       C.
2D 120 REM ALL RIGHTS RESERVED
88 130 REM
79 140 REM INITIALIZE PROGRAM
D5 150 DIM W$(200),DC$(13),AL(26)
DA 160 T$ = "SCRAMBLER":HS$ = "SCRAMSCORE":D$
       = CHR$ (4):DL$ = CHR$ (8):BP$ = CHR$
       (7):VO$ = CHR$ (0):SP$ = "
                                          "
21 170 LA = 768:X = RND ( - PEEK (78))
18 180 FOR I = 1 TO 4: FOR J = 1 TO 2:HS$(I,J
       ) = " ": NEXT J,I
F8 190 FOR I = 1 TO 13: READ DC$(I): NEXT I
B7 200 DATA BOWYOL
DF 210 DATA TIKRBH
D3 220 DATA AEAEAE
1E 230 DATA FPLHBN
82 240 DATA FINUTP
B4 250 DATA OCOMPW
2B 260 DATA VQYWAI
24 270 DATA PQVWAI
DF 280 DATA SIHRUF
46 290 DATA KDGJMC
A6 300 DATA EAEAEA
92 310 DATA ZQXEVJ
AA 320 DATA SUMRGI
F0 330 REM DISPLAY TITLE SCREEN
55 340 PRINT D$"PR#0": TEXT : HOME :L = LEN (
       T$)
C4 350 S$ = "": FOR I = 1 TO L:S$ = S$ + MID$
        (T$,I,1) + " ": NEXT I
46 360 FOR I = 1 TO 72
65 370 S$ = RIGHT$ (S$,2) + LEFT$ (S$,L * 2 -
        2): HTAB 11: VTAB 13: PRINT S$: POKE
       - 16336,0
29 380 FOR J = 1 TO 63 - I: NEXT J
F1 390 NEXT I
8B 400 FOR I = 1 TO 1000: NEXT I
BA 410 HTAB 10: VTAB 13: INVERSE : PRINT " "S
       $;BP$: NORMAL
F0 420 HTAB 2: VTAB 20: PRINT "COPYRIGHT 1988
        COMPUTE! PUBL., INC.": HTAB 10: VTAB
       22: PRINT "ALL RIGHTS RESERVED"
F7 430 FOR I = 1 TO 300: NEXT
F0 440 GOSUB 1480
76 450 REM GET GAME OPTIONS
7F 460 HOME :S$ = "=== GAME OPTIONS ===": GOS
       UB 2230
13 470 HTAB 1: VTAB 5: PRINT "NUMBER OF PLAYE
       RS (1-4): ";:L = 1:B = 49:T = 52:S$ =
       "1":OK = 0: GOSUB 2150:NP = VAL (S$)
58 480 HTAB 1: VTAB 7: PRINT "ENTER THE NAME
       OF EACH PLAYER:":OK = 1
E7 490 FOR I = 1 TO NP
ED 500 HTAB 3: VTAB 8 + I * 2: PRINT "PLAYER
       "I": ";:L = 8:B = 65:T = 90:S$ = "": G
       OSUB 2150:P$(I) = S$: IF S$ = "" THEN
       P$(I) = "PLAYER " + STR$ (I)
E3 510 NEXT I
0F 520 HTAB 1: VTAB 19: PRINT "GAME TYPE - WO
       RDS OR POINTS (W,P): ";: GET K$: IF K$
        < > "P" AND K$ < > "p" AND K$ < > "W"
        AND K$ < > "w" THEN PRINT BP$;: GOTO
       520
AF 530 PRINT K$:GT$ = "P": IF K$ = "w" OR K$
       = "W" THEN GT$ = "W"
E9 540 HTAB 1: VTAB 21: PRINT "TIMER LENGTH (
       1,3,5,7): ";: GET K$: IF K$ < > "1" AN
       D K$ < > "3" AND K$ < > "5" AND K$ < >
        "7" THEN PRINT BP$;: GOTO 540
66 550 PRINT K$;:TL = VAL (K$)
65 560 REM PLAY GAME
0A 570 FOR PL = 1 TO NP
9D 580 TM = TL * 600:NM = 0:SC = 0:BP = 0
CD 590 GOSUB 1910: GOSUB 1950
95 600 FOR I = 1 TO 26: POKE LA + I,0: NEXT I
C2 610 S$ = " ": FOR I = 1 TO 13
92 620 S$ = S$ + MID$ (PS$,I,1) + " "
0D 630 N = ASC ( MID$ (PS$,I,1)) - 64
1B 640 POKE LA + N, PEEK (LA + N) + 1
EC 650 NEXT I
53 660 VTAB 1: GOSUB 2230: HTAB 3: VTAB 3
D5 670 REM NEW WORD
0D 680 NM = NM + 1:WD$ = ""
DB 690 PRINT NM")";
3E 700 FOR I = LA + 1 TO LA + 26: POKE 100 +
       I, PEEK (I): NEXT I
06 710 REM GET WORD
89 720 PRINT "_"DL$;: NORMAL
1F 730 A = PEEK ( - 16384):TM = TM - .56: IF
       SS < > INT (TM / 10) THEN SS = INT (TM
        / 10): GOSUB 2100
32 740 IF SS < = 0 THEN 1000
FA 750 IF INT (SS) = 20 AND BP = 0 THEN BP =
       1: POKE - 16304,0: PRINT BP$BP$;: POKE
        - 16303,0
4F 760 IF A < 128 THEN 730
35 770 A = A - 128:A$ = CHR$ (A): POKE - 1636
       8,0
D8 780 IF A = 8 OR A = 127 THEN IF WD$ < > ""
        THEN GOSUB 870: GOTO 720
7E 790 IF A = 13 AND WD$ < > "" THEN 920
61 800 IF A < 65 OR A > 90 THEN 730
49 810 TM = TM - 2
0C 820 X = A + LA + 36: IF PEEK (X) = 0 THEN
       730
E7 830 PRINT A$;
F4 840 WD$ = WD$ + A$
43 850 POKE X, PEEK (X) - 1
A2 860 GOTO 720
AC 870 REM DELETE CHARACTER
13 880 X = ASC ( RIGHT$ (WD$,1)) + LA + 36: P
       OKE X, PEEK (X) + 1
43 890 WD$ = MID$ (WD$,1, LEN (WD$) - 1)
D5 900 PRINT " "DL$DL$" "DL$;
1B 910 RETURN
56 920 REM CHECK IF WORD IS OK
20 930 FL = 1: IF NM = 1 THEN 960
4A 940 FOR I = 1 TO NM - 1: IF WD$ = W$(I) TH
       EN FL = 0
EF 950 NEXT I
E3 960 IF FL = 1 THEN GOSUB 1750: GOTO 670
BE 970 PRINT " ";: FOR I = 1 TO LEN (WD$) + L
       EN ( STR$ (NM)) + 2: PRINT DL$" "DL$;:
        NEXT I:NM = NM - 1
CD 980 PRINT BP$;
2E 990 GOTO 670
05 1000 REM TIME'S UP
4D 1010 SC(PL) = SC: PRINT BP$;: VTAB PEEK (3
       7) + 2:S$ = "ANY DELETIONS (Y/N)? ":
       GOSUB 2230
4F 1020 GOSUB 1700
36 1030 IF K$ = "N" THEN 1190
49 1040 REM DELETE CONTESTED WORDS
97 1050 GOSUB 1870
DB 1060 SC = SC(PL)
55 1070 FOR I = 1 TO NM - 1
59 1080 VTAB 3: HTAB 3: PRINT W$(I)"
           ";
3B 1090 HTAB 3: VTAB 4: PRINT "IS THIS WORD C
       ORRECT (Y/N)? ";: GOSUB 1700
```

```
C7 1100 IF K$ = "N" THEN WD$ = W$(I): GOSUB 1
       130
75 1110 NEXT I:SC(PL) = SC
7A 1120 GOTO 1190
EF 1130 REM READJUST SCORES
24 1140 NL = LEN (WD$): IF NL > 5 THEN NL = 6
D3 1150 NL = NL + (NL > 3) + (NL > 4) + (NL >
       5)
1B 1160 IF GT$ = "P" THEN SC = SC - NL
FB 1170 IF GT$ = "W" THEN SC = SC - 1
F3 1180 RETURN
32 1190 NEXT PL
74 1200 REM END OF GAME
4A 1210 HOME : VTAB 3: IF NP = 1 THEN 1330
69 1220 PRINT "THE SCORES:": PRINT
0A 1230 HS = 0: FOR I = 1 TO NP: PRINT P$(I),
       SC(I)
81 1240 IF SC(I) > HS THEN WN = I:HS = SC(I)
7E 1250 NEXT I: PRINT
BF 1260 TI = 0: FOR I = 1 TO NP
79 1270 IF I < > WN THEN IF HS = SC(I) THEN T
       I = 1
FA 1280 NEXT I: IF TI = 0 THEN 1310
21 1290 PRINT "IT'S A TIE BETWEEN ";: FOR I =
        1 TO NP: IF SC(I) = HS THEN PRINT P$
       (I)" & ";
53 1300 NEXT I: PRINT DL$DL$"  ": GOTO 1340
CE 1310 PRINT "THE WINNER IS ";P$(WN)
6E 1320 GOTO 1340
C6 1330 WN = 1: PRINT "YOUR SCORE IS ";SC(WN)
       :HS = SC(WN): PRINT : PRINT
5C 1340 GOSUB 1480: HTAB 1: VTAB 13
91 1350 I = INT (TL / 2) + 1:J = (0 + (GT$ =
       "W")) + 1
27 1360 IF HS > HS(I,J) THEN HS$(I,J) = P$(WN
       ):HS(I,J) = HS: GOSUB 1590
A1 1370 HTAB 1: VTAB 13: PRINT "HIGH SCORES:"
34 1380 PRINT : PRINT "MIN","POINTS","WORDS":
       PRINT "---","------","-----"
C2 1390 FOR I = 1 TO 4: PRINT I * 2 - 1;
C8 1400 FOR J = 1 TO 2: HTAB J * 16 - LEN (HS
       $(I,J)): PRINT HS$(I,J)" "HS(I,J),
F8 1410 NEXT J,I
DF 1420 PRINT : PRINT : PRINT "PLAY AGAIN? (S
       )AME, (N)EW, OR (Q)UIT? ";SP$;: HTAB
       39: VTAB 23
80 1430 GET K$:K = ASC (K$): IF K > 96 THEN K
        = K - 32
E0 1440 K$ = CHR$ (K): IF K$ < > "S" AND K$ <
       > "N" AND K$ < > "Q" THEN 1430
BE 1450 IF K$ = "S" THEN 560
AB 1460 IF K$ = "N" THEN 450
04 1470 HOME : END
5E 1480 REM READ/CREATE HIGH-SCORE FILE
2F 1490 ONERR GOTO 1580
89 1500 PRINT D$"VERIFY "HS$
A7 1510 POKE 216,0
D8 1520 HTAB 1: VTAB 24: PRINT "READING HIGH
       SCORES. . .";: VTAB 1
F4 1530 PRINT : PRINT D$"OPEN "HS$
1E 1540 PRINT D$"READ "HS$
02 1550 FOR I = 1 TO 4: FOR J = 1 TO 2: INPUT
       HS$(I,J): INPUT HS(I,J): NEXT J,I
8F 1560 PRINT D$"CLOSE "HS$
F7 1570 RETURN
15 1580 CALL - 3288: POKE 216,0
51 1590 HTAB 1: VTAB 24: PRINT "SAVING HIGH-S
       CORE FILE. . .";: VTAB 1
4E 1600 ONERR GOTO 1660
EE 1610 PRINT : PRINT D$"OPEN "HS$
82 1620 PRINT D$"WRITE "HS$
65 1630 FOR I = 1 TO 4: FOR J = 1 TO 2: PRINT
       HS$(I,J): PRINT HS(I,J): NEXT J,I
89 1640 PRINT D$"CLOSE "HS$
EA 1650 POKE 216,0: RETURN
0F 1660 CALL - 3288: POKE 216,0
35 1670 HTAB 1: VTAB 24: PRINT "UNABLE TO CRE
       ATE HIGH-SCORE FILE"BP$;
0D 1680 FOR I = 1 TO 3000: NEXT I
02 1690 RETURN
44 1700 REM GET Y/N RESPONSE
7E 1710 GET K$:K = ASC (K$): IF K > 96 THEN K
        = K - 32
98 1720 IF K < > 89 AND K < > 78 THEN 1710
EF 1730 K$ = CHR$ (K): PRINT K$;
EF 1740 RETURN
0B 1750 REM ACCEPT WORD
A9 1760 W$(NM) = WD$: PRINT "  ";
7D 1770 IF PEEK (36) > 28 THEN VTAB PEEK (37)
       + 2: HTAB 3
57 1780 IF PEEK (37) > 21 THEN GOSUB 1870
44 1790 NL = LEN (WD$): IF NL > 5 THEN NL = 6
CD 1800 NL = NL + (NL > 3) + (NL > 4) + (NL >
       5)
94 1810 IF GT$ = "P" THEN SC = SC + NL
75 1820 IF GT$ = "W" THEN SC = SC + 1
ED 1830 SC$ = STR$ (SC)
68 1840 IF LEN (SC$) < 4 THEN SC$ = "0" + SC$
       : GOTO 1840
64 1850 FOR I = 1 TO 4: POKE 2035 + I, ASC (
       MID$ (SC$,I,1)) + 128: NEXT I
F9 1860 RETURN
E6 1870 REM CLEAR MIDDLE SCREEN
F1 1880 FOR I = 1 TO 21: VTAB I + 1: HTAB 2:
       PRINT LEFT$ (SP$,38);: NEXT
15 1890 HTAB 3: VTAB 3
E3 1900 RETURN
C9 1910 REM SCRAMBLE LETTERS
EC 1920 PS$ = ""
6D 1930 FOR I = 1 TO 13:PS$ = PS$ + MID$ (DC$
       (I), INT ( RND (1) * 6 + 1),1): NEXT
       I
F3 1940 RETURN
7A 1950 REM DRAW PLAY SCREEN
31 1960 HOME : INVERSE
6B 1970 PRINT SP$;
77 1980 FOR I = 1 TO 21: HTAB 1: PRINT " ";:
       HTAB 40: PRINT " ";: NEXT I
73 1990 PRINT SP$;
3A 2000 NORMAL
CF 2010 HTAB 1: VTAB 24: PRINT P$(PL);: HTAB
       30: PRINT "SCORE:0000";: VTAB 3
85 2020 FOR X = 1 TO PL
3D 2030 VTAB X + 2
D7 2040 IF X > 1 THEN S$ = P$(X - 1) + "'S SC
       ORE WAS " + STR$ (SC(X - 1)): GOSUB 2
       230
8F 2050 NEXT X
3E 2060 VTAB 12: INVERSE :S$ = " PRESS ANY KE
       Y TO START ": GOSUB 2230: NORMAL
6D 2070 GET K$
A4 2080 GOSUB 1870
F6 2090 RETURN
FF 2100 REM DISPLAY TIME
DE 2110 SS$ = STR$ (SS)
C1 2120 IF LEN (SS$) < 3 THEN SS$ = " " + SS$
       : GOTO 2120
8F 2130 FOR I = 1 TO 3: POKE 2016 + I, ASC (
       MID$ (SS$,I,1)) + 128: NEXT I
E4 2140 RETURN
A4 2150 REM INPUT ROUTINE
65 2160 PRINT S$;:X = LEN (S$)
88 2170 GET K$:K = ASC (K$): IF K > 96 THEN K
        = K - 32
8D 2180 IF (K = 13) AND (X > 0 OR OK) THEN 22
       20
EE 2190 IF (K = 8 OR K = 95) AND X > 0 THEN P
       RINT DL$" "DL$;:X = X - 1:S$ = MID$ (
       S$,1,X): GOTO 2170
3C 2200 IF (K < 8) OR (K > T) OR (X = L) THEN
        2170
C0 2210 PRINT K$;:X = X + 1:S$ = S$ + K$: GOT
       O 2170
DE 2220 RETURN
07 2230 REM CENTER TEXT
DF 2240 HTAB (40 - LEN (S$)) / 2 + 1: PRINT S
       $;
EA 2250 RETURN
```

aa

Collector's Guide for Topps Baseball Cards and Vacation Orlando

David Hensley, Jr.

Baseball cards are hot. Real hot. Pick up practically any city newspaper, and you'll see a classified ad with an offer to buy or sell baseball cards. Many of the hobbyists are true collectors while others are investors. That's right, I said *investors.* As reported in such notable sources as the *Wall Street Journal* and *USA Today,* some people are shying away from the volatile stock market and are investing money in collectibles. Pop-Fly Software has seized the opportunity and developed a database for both collectors and investors.

The *Collector's Guide* for Topps baseball cards is a database file for *AppleWorks* users. It lists each Topps card from 1985 through 1988 by number, player name, team, current value, and trivial tidbits for selected players. Each year is divided into a separate file on a 5¼-inch disk. You must have the *AppleWorks* program to use these files.

There isn't a manual or documentation for this product. However, if you know how to use the *AppleWorks* database, you can use this package.

The card prices listed in the database were obtained from a popular price guide and are strictly for reference; the prices are *not* an offer to buy or sell the cards. Quarterly price updates are available for $6. Pop-Fly has plans for including databases for older sets of cards, as well.

Appleworks' many powerful features gives you the ability to sort or search almost every way imaginable. This makes it easy to locate your favorite player or view the most valuable cards in the set.

Collector's Guide saves you many hours of tedious data entry and price referencing. However, one feature omitted from the database is check listing—a field where you can check off the cards that you own. Collectors would find this option valuable when compiling sets card by card; hopefully, it will be added to the older-card issues Pop-Fly is planning.

One of the biggest concerns of people involved in the hobby is the condition of a card. Mint or perfect cards bring premium prices over lesser-grade cards. Nearly every price guide or hobby magazine lists two values for each card according to their condition. This database provides only one value, and there isn't a field for denoting condition.

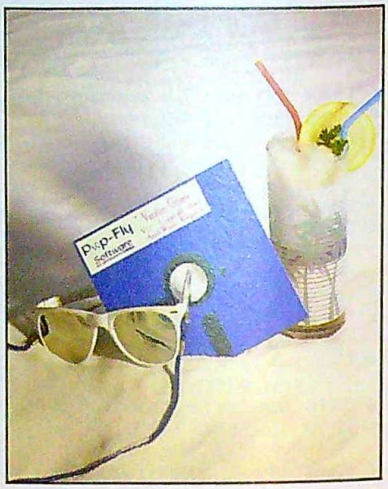
If you compare the cost of the software to the amount of time you would spend typing in information, the database is definitely a bargain. However, the overall value of this package is questionable. With the absence of check listing, the main focus of the database is the card prices. Baseball card prices change rapidly. This is especially true of the cards of hot, new rookies and older stars. Therefore, prices in the database quickly become out-of-date and $6 updates become costly.

Collectors Guide saves you many hours of tedious typing.

If you were going to computerize your baseball card collection anyway, save yourself the drudgery and buy *Collector's Guide.* But if you're more concerned with card prices, a weekly hobby magazine subscription would be more affordable.

Vacation Orlando

A separate, but related, database file also offered by Pop-Fly Software is *Vacation Orlando,* the shopping and dining guide to the Disney World/Orlando area. Hotel and resort listings include room rate, description, location, and a phone number for reservations. Hours and prices are given for area attractions. This database helps you plan your Orlando vacation with special tips from an insider. Most of this information is available from your friendly travel agent, but having it in computer format allows you to locate specific information easily.



Orlando on a disk.

The Up & Coming file keeps track of the opening dates of new Disney rides and attractions. This is the first release in Pop-Fly's new series of travel-information software. Soon to be released are Chicago and New York editions that will appear on a single disk. Los Angeles and San Francisco guides are also planned.

Vacation Orlando seems to be more useful than the *Collector's Guide.* Having all this information in one place is an advantage. However, a good guidebook may be just as good or even better because photos and maps can complement the text.

Both products appeal to a limited audience. *Collector's Guide* and *Vacation Orlando* seem best suited to professionals such as baseball card dealers and travel planners/agents. Many baseball card collectors enjoy their hobby by doing things the old-fashioned way—without the aid of a computer—while vacationers rarely consider using computer software to plan their vacations.

Collector's Guide *and* Vacation Orlando
Apple IIe, IIc, or IIGS; AppleWorks *required*
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$19.95 (Collector's Guide *or* Vacation Orlando)*; $6.00 updates for* Collector's Guide

RamKeeper

William Chin

Can RamKeeper turn your IIGS memory card into an "electronic hard disk"? That's what the ads claim, and after weeks of testing, I'd say the answer is *yes*. Applied Engineering's new RamKeeper card delivers the speed of a ramdisk with the permanent-storage capabilities of a hard drive.

RamKeeper is a hardware expansion card for the Apple IIGS. It's what you call a *piggyback* card—other cards plug into it. It doesn't add RAM to your system; *you* supply the RAM card(s). But by piggybacking your memory cards onto the RamKeeper, this once-volatile RAM is transformed into a battery-backed ramdisk—something Applied Engineering calls a *romdisk*. The romdisk survives reboots, turning the computer off, and even power failures.

Applied Engineering lists the following cards as RamKeeper-compatible: GS-RAM, GS-RAM Plus, GS-RAM 2-Meg Expander, Apple IIGS Memory Expansion Card, OctoRam, and RamPak 4GS. You can plug a maximum of two cards into RamKeeper (one on either side). RamKeeper can support a total of 16 megabytes of RAM. A 1-megabyte GS-RAM board was used in this review.

With RamKeeper, my IIGS boots ProDOS 8 in less than two seconds. Add a custom STARTUP program, and *AppleWorks* is ready for work instantly, System Utilities is just a keypress away, and the Finder is up and running in ten seconds.

Pop Open the Hood

Inside RamKeeper's box is the RamKeeper card, a 54-page manual, a transformer, a Gel/Cell rechargeable battery, a sheet of insulating material, and some cables and connectors.

The battery is a gray, three-pound block that appears awkward when placed next to the IIGS's sleek computer case. The transformer plugs into a standard wall outlet and keeps the memory refreshed (keeps it from forgetting anything), even while your computer is turned off. In case of a power failure, the battery provides as many as six hours of emergency electricity.

To the novice, installation can be intimidating. Basically, you must install a grounding plate at the back of the computer; connect the battery and transformer to the card; using a special adapter, attach your RAM expansion card(s) to the RamKeeper; and, finally, plug the RamKeeper card into the computer. The insulation sheet is placed between the computer case and the RamKeeper card.

When installed, memory cards mesh with the RamKeeper to form a single unit. This intensifies the heat put off by each card. With RamKeeper sandwiched between two RAM cards, you'll probably need a fan to keep the cards from overheating in a warm environment.

Overall, the installation instructions are clear, with pictures and diagrams for each step. And despite my fears of making a wrong connection that would send sparks flying, installation went fairly smoothly for me. It took two hours from box-opening to power-up.

What's a Romdisk?

RamKeeper comes with its own firmware (software that's built into the card). An AE RamKeeper program lets you partition your memory into permanent storage (romdisk) and temporary workspace (ramdisk). The programs and files saved onto the romdisk are there even after the computer has been turned off. Any information on the ramdisk disappears as soon as you've hit the switch.

Applied Engineering's new RamKeeper card delivers the speed of a ramdisk with the permanent-storage capabilities of a hard drive.

The AE RamKeeper program, which contains several diagnostic routines, is simple and straightforward. Accessing it is just like accessing the Control Panel. I set up a 768K romdisk, leaving 512K of free RAM. ProDOS 8, *AppleWorks*, ProDos 16, the Finder, and System Utilities are all nestled into my romdisk.

Even with 768K of storage, I had to leave many programs and utilities off the romdisk. To take full advantage of RamKeeper, I recommend at least two megabytes of expansion memory.

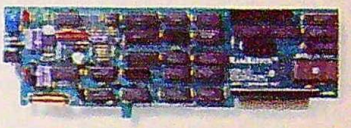
The term *romdisk* is misleading. It isn't a Read Only disk, because you can write to it. It simply doesn't lose its memory when the power is shut off, unlike a ramdisk.

Booting from the romdisk changes the slot assignment for 3½-inch drives: The romdisk is slot 5, drive 1; the ramdisk is slot 5, drive 2; and the 3½-inch floppies change to slot 2. These new slot assignments are confusing and take some getting used to.

Flying Floppies

RamKeeper comes with two utility programs on a 3½-inch disk: AECache and AW 2 Expander.

With the AECache program, you can triple the speed of 3½-inch drives. This program is installed as a desk accessory. It allows ProDOS to read an entire track at a time instead of a block at a time. (A track is 6144 bytes; a block, 512 bytes.) This technique is called *track caching*, and it makes the initial read from disk much faster.



In the manual, Applied Engineering claims that the program gives you twice the normal drive speed, but my experience was even better. Loading a 100K *AppleWorks* word processing file normally takes 35 seconds. With AECache installed, it took only 12 seconds—almost *three* times as fast. For smaller files, the speed improvement was not as noticeable.

The real power of a disk cache appears when you repeatedly access the same file. While the first load is fast, subsequent loads are a blazing *six* times their normal speed. This is particularly useful for programs that swap data in and out of memory. By storing the most recently accessed data in a RAM cache, the computer doesn't have to reread the data from disk.

AECache defaults to a 32K RAM cache, but you can allocate more memory if you like. Unfortunately, AECache doesn't work with 5¼-inch drives or hard disks. Some copy-protected programs do not take advantage of the disk cache.

Apple Workspace

The AW 2 Expander program modifies *AppleWorks* to take full advantage of expansion memory. When upgraded, *AppleWorks* can handle 22,600 database records, 22,600 lines of text in the word processor, and 2042 entries in the clipboard.

Other features include multiple disk saves and a print buffer. Multiple disk saves let you split a single file into segments so that one file can span several floppy disks. The print buffer speeds up print operations, allowing you to return to work on the computer sooner.

With AECache installed and a modified version of *AppleWorks* copied onto the romdisk, the IIGS becomes a tremendously productive machine. *AppleWorks* boots in only five seconds, and data files load quickly with the disk

cache. Saving files isn't any faster, but you can always save to the ramdisk or romdisk for extra speed.

Conclusions

To me, RamKeeper is a must. After using it for this review, I won't operate the IIGS without it. It's a fantastic product for the *AppleWorks* user or heavy-duty programmer, and a marvelous invention for anyone tired of waiting for the Finder to boot.

If you use your IIGS strictly for playing commercial games, however, RamKeeper may not be worth its $189 price. And remember: RamKeeper requires a memory-expansion board; by itself, it does *not* add memory to your system.

RamKeeper does have a few quirks. Occasionally, the computer goes through a memory test when you turn it on, and you must press Control-Reset to get it to boot properly. You also have to remember to leave enough free memory in the ramdisk if you're going to run the Finder. The temptation is to make the romdisk as large as possible, thus reducing the size of the ramdisk. All in all, however, these are minor complaints about a superior product.

RamKeeper
Apple IIGS with one or more RAM cards
Applied Engineering
P.O. Box 798
Carrollton, TX 75006
$189.00

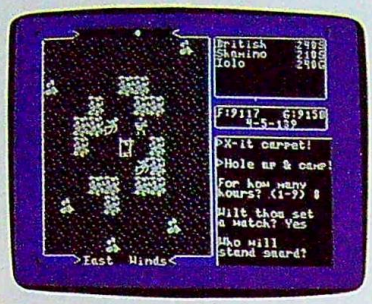
Ultima V: Warriors of Destiny

Bob Guerra

If you're a long-time fan of the Ultima series, you know that Origin Systems likes to package their role-playing games with plenty of "goodies." For example, with *Ultima V*, you receive a Book of Lore (player's manual), a player reference card, a combination quick-reference card/spell chart, a colorful cloth map similar to the one shipped with *Ultima IV*, and a shiny amulet about the size of a silver dollar. What's even more impressive than what's packaged with Origin's new role-playing masterpiece, however, is what's packed onto the game's four—that's right, *four*—double-sided disks.

The World of Britannia

The setting for this latest Ultima extravaganza is Britannia—a realistic world made up of more than 30 multi-level towns, villages, castles, and dungeons, as well as a vast outdoor landscape of swamps, mountains, forests, deserts, and grasslands. These areas may be traveled by foot or on horseback. In addition, much of the world of Britannia is covered by oceans, rivers, streams, and lakes that may be traversed in frigates or smaller skiffs.



Ultima V *combines graphics with a text-based command parser.*

Besides these conventional modes of travel, adventurers who are well studied in the astronomical sciences can take advantage of eight *moongates* that serve as transporters during the night between the apexes of the twin moons, Trammel and Felucca. The phases of these moons determine your destination. This method of travel is almost always safe, but when both moons are "equidistant in the midheaven," the results are unpredictable.

As you'll quickly learn, you and your small party of adventurers are not alone in Britannia. The land is inhabited by three main classes of adventurers—mages, bards, and fighters—as well as several local villagers, merchants, minstrels, jesters, farmers, beggars, and guards. To complete your quest, it's important to talk to as many people as possible because, by doing so, you'll receive several useful clues.

Britannia is also home to several types of monsters and demons, including giant spiders, gremlins, two-headed ettins, orcs, slimes, gazers, and ghosts.

Unfortunately, Britannia is also home to several types of monsters and demons, including giant spiders, gremlins, two-headed ettins, orcs, slimes, gazers, and ghosts. Even at sea, you'll have to be on guard against sharks, sea horses, squids, and sea serpents.

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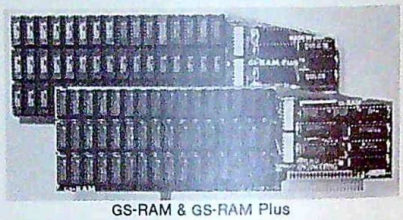

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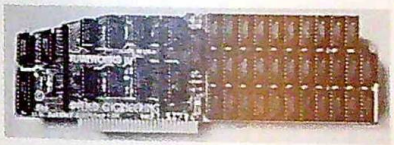

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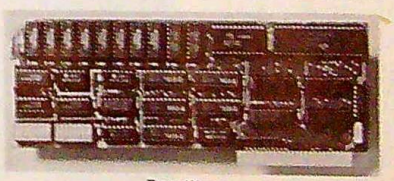

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Weapons and Spells

To defend yourself against the creatures of the land, sea, and sky, there are seven types of armor, including leather, plate, chain-mail helms, and shields, as well as a veritable arsenal of weapons ranging from simple daggers and swords to deadly polearms and halberds. There are even a few missile weapons, like crossbows and slings, that can be used at greater distances. One of the advantages that *Ultima V* has over previous *Ultimas* is that now, when missile or throwing weapons are used, the flight of your weapon is shown in high-resolution, animated graphics.

Of course, not all of your enemies can be disposed of by using brute force. In some cases, you'll have to call upon the skills of the magic users in your party. Here again, the designers have gone to great lengths to create a system of magic that is intricate, even complex, but at the same time logical and well documented.

For starters, the game's magic system has its own language with 26 words (one for each letter of the alphabet) that are used in various combinations to cast 50 different spells. These are divided into eight circles, with the easiest spells in the first circle and the hardest in the eighth.

First-circle spells provide even relatively inexperienced characters with a few handy powers, such as the ability to create light or to cure sickness caused by poison. By the time you advance to the eighth circle, the right combination of reagents allow you to cast somewhat flashier spells that stop time, create cones of energy, or summon flame-throwing demons to battle your foes.

While most of the reagents needed to begin creating spells can be bought from the local apothecary, a few are rare and can be found only by experienced adventurers. The eight magical reagents range from common materials such as sulphurous ash and garlic to exotic black pearls and mandrake root.

. . . the designers have gone to great lengths to create a system of magic that is intricate, even complex, but at the same time logical and well documented.

Each of the 50 available spells is described in detail in the Book of Lore. A separate spell chart lists each spell by name, its effect, the times at which it may be cast, and the reagents needed to create it. As with past *Ultimas*, trial and error is the only way to determine much of this information.

A Musical Adventure

For those who like a little music to slay dragons by, *Ultima V* includes over a dozen tunes that can be played through five different sound boards, including Sweet Micro Systems, Applied Engineering's Phasor board, and even through your favorite MIDI-equipped synthesizer (provided you have the appropriate Apple MIDI interface).

Ultima V will keep even hard-core role-playing fans busy through many sessions. And *Ultima IV* players can transfer their existing characters directly to the program.

Ultima V is the crowning touch to a fantastic series of role-playing adventures and another reason why the Ultima series should continue to grow.

Ultima V: Warriors of Destiny
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Under Fire!

Jim Fuchs

In the early morning hours of the Russian winter, the wind howls fiercely and the world turns gray in subzero weather. Shivering, you inch your way forward across the endless Russian steppes, the clanking of Panzer treads a constant accompaniment to the grating sound the frozen snow and ice make beneath your boots. Suddenly, your world explodes in flames as a Soviet artillery battalion unleashes a devastating barrage on you and your men.

This is a scene from World War II, recreated by Avalon Hill in *Under Fire!*. *Under Fire!* is a squad-level game in which players give orders to individual squads of men, tanks, guns, and so on. Comparing *Under Fire!* to other war games is almost a waste of time—there's really no comparison.

Traditionally, computer war games have emphasized one of two things: playability or historical accuracy. War games that are historically accurate are extremely detailed but can be somewhat tedious to play. War games written for playability are easy to learn and play but don't always give realistic results. Avalon Hill's *Under Fire!* is unique in that it's extremely playable yet very realistic.

Customizing the Battlefield

One of the most enjoyable features of *Under Fire!* is that you can customize it. For instance, you can choose how large a map position is; whether or not to use supply depletion; the number of combat phases per turn; the season; whether combat will be controlled by the computer, a leader unit, or a player; whether your opponent is another human or the computer; and so on. The computer opponent can even play at four different skill levels—choose 1 for a relatively easy opponent or 4 to pit yourself against Erwin Rommel.

Once the game conditions have been selected, you choose the nationalities of the armies—American, German, or Soviet. There are three predefined scenario maps to choose from. Each scenario map has different terrain, from crowded house-to-house combat to broad Russian plains. There are three different scenarios per map, for a total of nine predefined scenarios. If none of these suit your tastes, *Under Fire!* comes with a separate map-maker utility that allows you to create custom-designed maps.

Next, you select the units you'll command. For every scenario, the computer generates a maximum point total and picks out a number of units for you, each unit costing a certain number of points. You can add and delete units as you like; your only restriction is that you can't exceed your maximum point total. Each unit has three different skill levels—green (new soldiers who've never seen combat), seasoned, and crack (battle-hardened veterans). The more skilled a unit is, the more it costs.

Commanding Your Army

The game is played in turns, with each turn divided into 24 phases. There are either 2, 3, 4, or 6 combat phases per turn, depending on how many you selected at the beginning of the game. Noncombat turns are used for movement, digging in, unloading men and equipment, and so on. Players have complete control over their units—what direction a unit moves in, what direction it's facing, and whether it will assume an assault or defensive position during combat.

One big difference between *Under Fire!* and board games is that unsighted enemy units are hidden. If an enemy unit isn't in the line of sight (LOS) of one of your units, it won't be shown on the map. Time and time again, you'll find yourself wondering when an enemy unit might suddenly appear out of the woods or attack your flanks.

Avalon Hill's Under Fire! *is unique. It's playable yet realistic.*

The Extended Capability Disk

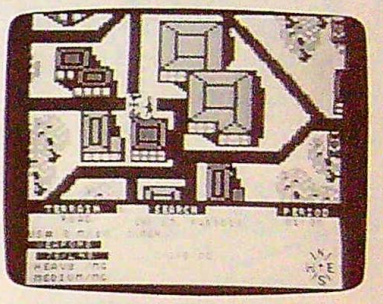
Avalon Hill has a companion extended capability disk for *Under Fire!* (additional extended capability disks will be released in the future). This disk adds more scenarios and scenario maps, additional countries—Italy, Great Britain, and Japan—as well as more tanks, artillery, and vehicles.

The extended capability disk is a welcome addition to the *Under Fire!* game. After all, a disk can hold only so much information. With an extended capability disk, Avalon Hill adds flexibility to *Under Fire!*.

A Few Annoyances

Like any product, *Under Fire!* has a few points that could be improved. First of all, the game's copy-protection scheme prevents you from storing the game on a ramdisk or on a hard drive. I ran *Under Fire!* on an Apple IIGS with one megabyte of memory. It would have been nice if I could have copied the game into RAM for faster file access.

The control a player has over his or her units isn't without its price: The program seems to crawl along at times. On an unmodified IIc or IIe, *Under Fire!* operates very slowly when there are several pieces on the board. Playing the game on an Apple IIGS in fast mode, however, results in a very playable game.



A German infantry unit has spotted a US M-10 tank in the open.

Speaking of the IIGS, I should mention that the game is written for the *entire* Apple II family—it doesn't take advantage of the IIGS's spectacular graphics. No matter which Apple I used, I had difficulty finding pieces that occupied the same territory as a previously destroyed piece. The only way I could locate such a piece was to move the cursor around the screen and look for a telltale flicker. Hopefully, Avalon Hill will release a version written specifically for the IIGS that will overcome this problem.

Another problem with the game deals with selecting targets for indirect fire. Sometimes the cursor seems to fit over a piece in two different places, when only one is correct. It's very frustrating to have an enemy piece out in the open and accidentally direct your artillery to fire on a position next to it.

The last quirk I found in *Under Fire!* deals with checking LOS. To check whether a unit can see a position, you must select the LOS option, move the cursor to that position, and then press Escape. It would be much nicer if all visible positions were automatically highlighted whenever LOS was selected.

In Conclusion

Under Fire! is a very well-designed program that should satisfy even the most demanding war gamer. Although it contains a few minor problems, I feel comfortable recommending it to anyone who enjoys war games.

Under Fire!
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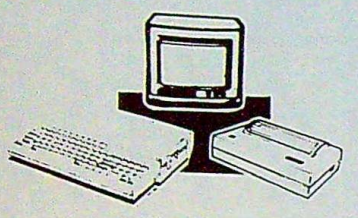

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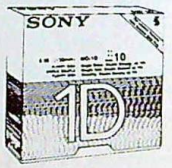

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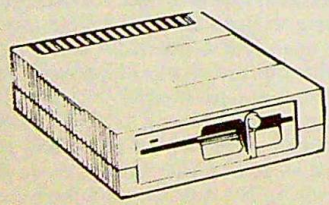

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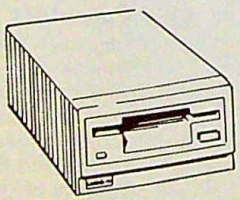

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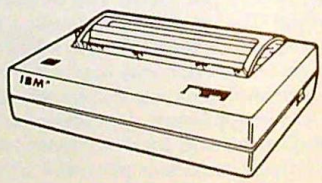

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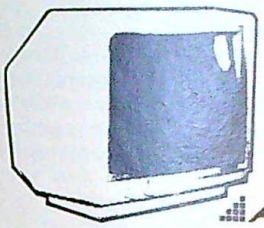

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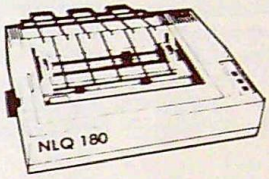

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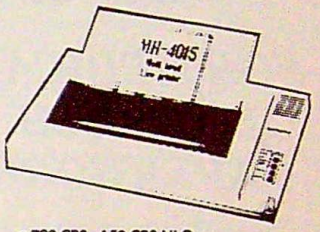

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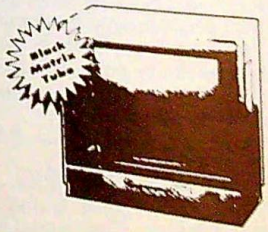

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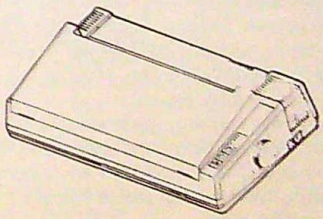

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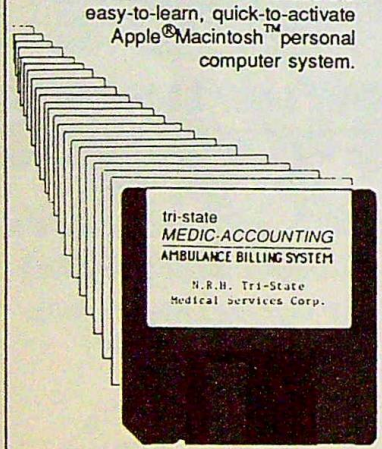

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Print Magic

Nancy Rentschler

Merlin used potions and spells to create his magic. All you need is a computer, a printer, and *Print Magic* by Epyx to create yours. This program has many avenues of choice in designing pages and cards.

Print Magic is flexible and versatile. The program's page design can be a sign, a letterhead, or even a newsletter. Card design gives you creative license, not only on the front and right inside of the card, but also on the left inside and back. The banner design allows for a variety of fonts. These and other extras make the program worth looking into.

Graphics Everywhere

Print Magic offers many options for graphics. The program provides around 140 selections, ranging from teddy bears to leprechauns. Holidays are represented, as are religious symbols. The best thing about the program is the ability to use graphics from other sources. *Print Shop, Graphics Scrapbook,* and *Newsroom* graphics are readily accepted by *Print Magic.*

Although graphics can be used from many different places, none are as clear and true-to-life as those from *Print Magic.* The resolution is wonderful. The teddy bear really looks like a teddy bear. The people graphics show detailed facial features. The animals are clearly recognizable.

Are you clever with a paintbrush or a pencil? Even if you aren't, the Paint option can turn you into a computer artist. This part of the program gives you an opportunity to design your own special graphics. Several brush sizes, brush shapes, and angled lines are available. If you make a mistake, you can use the eraser and try again.

While you're in a creative mind set, try making your own typeface. The fonts in *Print Magic* can be tampered with, and you can create one yourself, pixel by pixel.

Perfect Pages

Once you get used to the Page Design feature, your imagination will go wild. Choose a graphic; then change the size. Move it to any place on the page you wish. Put a border around the graphic or the whole page. The border can be adjusted to any of nine different widths. You can make it plain black, or you can choose from any of the patterns offered. Add text by choosing one of 15 fonts from *Print Magic* or select one from the program *Fontrix.*

A newsletter can be put together easily using Page Design. Graphics can be placed anywhere, and articles can be of any length. Putting a border around each feature adds an attractive touch. The text appears at the bottom of the screen, and a blinking box shows you where the print will appear on the page.

When the actual letters appear on the page, they are very small and difficult to read, so be sure of your spelling before you set your text. To edit, you must go to the Modify option, clear the area, and start over. It would be nice if the program offered an easier way to edit placed text.

It's in the Cards

Do you remember to buy cards in time for special occasions? Most people rush out to the card shop at the last minute, searching for a card with the perfect saying. Why not make your own cards? With *Print Magic,* you can coin your own phrases to fit any occasion.

To begin, select Card Design. As far as the graphics and text are concerned, this option follows the same procedures as Page Design. *Print Magic* lets you design all four sides of a card—front, back, and both sides on the inside.

Banners and More

Making a banner is easy with *Print Magic*—just choose a font and type. There's no graphics option, however. If you're using a mouse, you can insert text anywhere. With keyboard commands, you're restricted to straight text with no fancy additions.

For future additions to *Print Magic,* the program has an Accessories selection available under the Apple menu. Epyx promises to come out with other options that can be accessed from here, making the program even more versatile.

An additional Art Disk is already available and can be purchased through the mail using the order form found in the back of the manual.

The Last Word in Magic

Print Magic is a fun way to approach desktop publishing. The manual is well written and easy to follow. Creating your own graphics and fonts adds a personal touch to everything you make. A color version of *Print Magic* would make it very, very appealing, especially to children. But even without color, *Print Magic* would have made Merlin jealous.

Print Magic
Apple II series with a minimum of 128K; mouse recommended
Epyx Software
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Readers' Feedback

Do you have a question or problem about hardware or software? Or have you discovered something that could help other Apple II owners? If so, we want to hear from you. Write to Apple Feedback, P.O. Box 5406, Greensboro, North Carolina 27403. We regret that we cannot provide personal replies to technical questions.

Stuck in 80 Columns

After running an 80-column program on my Apple IIc, I'm unable to return to the 40-column screen—PR#0 doesn't work. Can you please explain why this happens and what I can do about it?

Bill Pinkerton
Orlando, FL

Because of differences in the firmware, there is a difference in the way PR#0 operates on the Apple IIc and on the Apple IIe. (You might also note that while the IIe has physical slots, the IIc has ports *that simulate slots.) When you're using the IIc in ProDOS, PR#0 simply reinitializes the most recent screen, be it 40 or 80 columns. In DOS 3.3, however, PR#0 always returns you to the 40-column screen.*

The easiest way to change display modes on the Apple IIc is to press Escape-4 or Escape-8 for the 40- or 80-column screen. Another way to change the screen width is with PRINT CHR$(21) for 40 columns and PR#3 (PRINT CHR$(4)"PR#3" from within a program) for 80 columns. Of course, you can always press Control-Reset to return to the computer's default screen width.

ML Musings

I am 16 years old and live in Mexico. I've been working with an Apple IIe since 1986. I have two questions. First, I want to know how to run a machine language program that's already in memory. I need to know the memory address where the program begins so I can call it. Is there an easy way to calculate the starting address of a BLOADed file?

Second, I want to know whether the monitor Move command can be used from a program (example: 1200 < 2000.2500 M). Can I call this routine directly from a machine language program?

Lee Kim
Roma Sur, Mexico

*After you've BLOADed a program file, you can easily calculate the length and starting address from DOS 3.3. For the length, type PRINT PEEK(43616) + PEEK(43617) * 256 − 1. For the starting address, type PRINT PEEK(43634) + PEEK(43635) * 256. The CALL address of a binary file is usually the same as the starting address. If it's different, BRUNing the program will generate an error.*

To find the length and starting address of a ProDOS file, simply use CATALOG—not just CAT—to list the files on disk. File lengths appear under the ENDFILE heading, while starting addresses appear in hexadecimal under SUBTYPE.

In response to your second question: Yes, you can execute a monitor command from within a BASIC program. You POKE the command string into the keyboard buffer and then CALL the monitor's keyboard-scanning routine. The following short subroutine does just that:

```
10 A$ = "1200<2000.2500M"
20 GOSUB 1000
30 END
1000 C$ = A$ + "300:68 68 60 30
     0G"
1010 FOR I = 1 TO LEN (C$)
1020 T = ASC ( MID$ (C$,I,1)) +
     128
1030 POKE 511 + I,T
1040 NEXT I
1050 CALL - 144
1060 RETURN
```

In our example, A$ can contain any valid monitor command. A machine language routine is tagged onto the end of your command to return program control to your BASIC program (instead of letting it break out into the monitor). For the curious machine language programmers out there, the opcodes that correspond to 68 68 60 are PLA, PLA, and RTS. These commands pull the program's return address off the stack and jump back to BASIC.

The subroutine above stores the return code at location $300. If your program uses memory at $300, you can move these three bytes to another location. To do this, simply substitute another address for the $300. For programs that use high-resolution graphics, $3FFD is a good alternative. The following line makes this change:

```
1000 C$ = A$ + "3FFD:68 68 60 3
     FFD6"
```

You need only make this change if your program is using locations 768–770.

Up and Down AppleWorks

I have a problem with *AppleWorks*. I use the spreadsheet to calculate a series of tables to three decimal places. When I reformat them to two decimal places, any amount ending in .005 rounds down rather than up. Any ideas on how to alter this?

John Thornley
North Parramatta, Australia

AppleWorks does have a slight problem with rounding numbers, as do most Apple programs. When you perform @round(15.005,2), AppleWorks *properly returns 15.01, but if you use the result of another calculation, it may fail. For example, when you average 15.00 and 15.01—which results in 15.005—and then round,* AppleWorks *incorrectly returns 15.00.*

This inconsistently occurs in many computer programs. Most computers convert decimal numbers to binary before doing math. This results in very small inaccuracies from time to time. The AppleWorks *problem is just one of many complaints about computer calculation. Try PRINT 9^2 in Applesoft BASIC. This gives you 81.00001, although 9 squared is exactly 81.*

To compensate for this irritating "rounding down" bug, try adding a small adjustment factor. For a better dollars-and-cents average, use @round(value + .00001,2). Make sure your adjustment factor is smaller than any anticipated differences in values.

This isn't really a fix, but it may cut down on the number of rounding errors. Unfortunately, the only way to make sure is to do the rounding yourself.

Dealing with Disk Files

I have a Laser 128 personal computer. I started writing a program to keep a database of addresses and phone numbers, but I'm having trouble storing data to a file. Can you give a brief explanation of how to save and load data to and from disk?

Jason V. Colacchia
Address Unknown

ProDOS has a number of commands for writing to and reading from disk files—OPEN, CLOSE, READ, WRITE, and so on. As you might expect, OPEN opens a file, CLOSE closes a file, READ prepares a file for reading, and WRITE prepares a file for writing. However, there are two peculiarities about these commands: They must be contained in a string or in quotation marks, and they must be printed with a preceding CHR$(4). For example,

```
10 PRINT CHR$ (4);"OPEN TEST.DA
   T"
```

opens the file TEST.DAT.

With this in mind, let's develop part of your database program line by line. Since CHR$(4) precedes all these commands, it's common practice to set a variable—usually D$—equal to CHR$(4). So, our first line becomes

```
10 D$ = CHR$ (4):MAX = 20: REM
   INITIALIZE KEY VARIABLES
```

MAX is simply a constant defining the maximum number of names and numbers that the database will hold. Next, we need a place to store the names and phone numbers. Let's use NAME$() to store names and NUMBER$() to store phone numbers. The next line becomes

```
20 DIM NAMES$(MAX),NUMBER$(MAX)
   : REM RESERVE SPACE FOR THE
   VARIABLES
```

Now we're ready to let the user enter data. We need a loop to read in the names and numbers, and we need some way to leave the loop. We also need to keep track of the number of names entered so that we don't exceed the maximum. In the program below, pressing Return without entering a name exits the loop, and the variable PLACE counts the number of records (names and numbers) that are entered.

```
30 PLACE = 0
40 PRINT "PLEASE ENTER A NAME (
   RETURN TO EXIT) ";
50 INPUT NAME$(PLACE)
60 IF NAME$(PLACE) = "" THEN 10
   0: REM EXIT LOOP
70 PRINT "PLEASE ENTER THE PHON
   E NUMBER ";
80 INPUT NUMBER$(PLACE): IF NUM
   BER$(PLACE) = "" THEN 70
90 PRINT :PLACE = PLACE + 1: IF
    PLACE < MAX THEN 40: REM GE
   T ANOTHER
```

Line 60 checks whether the user has entered a name. If a name is not entered, the program jumps out of the loop, branching to line 100 (see below). If the user enters a name, then the corresponding phone number is read in by lines 70–80. Finally, line 90 increments the variable PLACE and, if it is less than the maximum allowed, branches back to line 40, the top of the input loop.

Once the programs leaves the input loop, all the data has been entered and is waiting to be saved. All we need to do is open the file, use a simple loop to write the data, and then close the file.

```
100 PRINT D$;"OPEN DATABASE.DAT
    "
110 PRINT D$;"WRITE DATABASE.DA
    T"
120 PRINT PLACE
130 FOR COUNTER = 0 TO PLACE -
    1
140 PRINT NAME$(COUNTER)
150 PRINT NUMBER$(COUNTER)
160 NEXT
170 PRINT D$;"CLOSE DATABASE.DA
    T"
180 END
```

That's all there is to it. Once the file is open for writing, all PRINT statements are sent to the disk file instead of to the screen. Notice that we write the number of names to disk first. This makes reading the data from disk easy—just open the file, read this number, and then set up a loop to read in that many names and numbers. While this program is by no means a complete database, you should have no trouble adding the features you need.

There are a few basic rules to using disk commands: The READ and WRITE commands must be preceded by a corresponding OPEN command; you must CLOSE your file when you've finished; and in DOS 3.3, you should always execute a single PRINT statement prior to opening a disk file—otherwise, strange things may happen (this has to do with a bug in DOS 3.3 and is not required in ProDOS).

There are several more DOS commands not explained here. To learn more about these commands, we suggest that you read Apple's BASIC Programming with ProDOS, *a manual available from your Apple dealer.*

SpeedScript File Converter

I began using Apple *SpeedScript* when it first came out, and I like it a lot. I now use it and *AppleWorks* and would like to know how to convert my *SpeedScript* text files to *AppleWorks* format.

Philip Bauter
Newman, IL

Apple SpeedScript *files are stored as screen codes. This was done to make screen updates faster. Unfortunately, no other major word processors use this format. To convert your files to normal ASCII, use the conversion utilities listed below.*

ProDOS version:

```
10 HOME
20 D$ = CHR$ (4)
40 PRINT "DO YOU WANT TO:"
50 PRINT " (1) MAKE A SPEEDSCRI
   PT FILE INTO A TEXT      FILE
   "
60 PRINT " (2) MAKE A TEXT FILE
    INTO A SPEEDSCRIPT      FILE
   "
70 GET A$:A = VAL (A$)
80 IF A < > 1 AND A < > 2 THEN
   70
90 ON A GOTO 100,200
100 PRINT "ENTER SPEEDSCRIPT FI
    LE NAME": INPUT ":";A$
110 PRINT "ENTER TEXT FILE NAME
     TO CREATE": INPUT ":";B$
120 PRINT D$;"BLOAD ";A$;",A$20
    00"
125 L = PEEK (48859) + PEEK (48
    860) * 256 + 8192
150 FOR I = 8192 TO L - 1
160 IF PEEK (I) = 60 THEN POKE
    I,141
180 NEXT
190 PRINT D$;"CREATE ";B$;",TTX
    T"
195 PRINT D$;"BSAVE ";B$;",A$20
    00,E";L - 1;",TTXT"
196 END
200 PRINT "ENTER TEXT FILE NAME
    ": INPUT ":";B$
210 INPUT "ENTER SPEEDSCRIPT FI
    LE NAME TO CREATE   :";A$
220 PRINT CHR$ (4);"BLOAD ";B$;
    ",A$2000,TTXT"
230 L = PEEK (48859) + PEEK (48
    860) * 256 + 8192
240 FOR I = 8192 TO L - 1
245 IF PEEK (I) = 141 THEN POKE
    I,60
260 NEXT
295 PRINT D$;"BSAVE ";A$;",A819
    2,E";L - 1
296 END
```

DOS 3.3 version:

```
5 HIMEM: 8191
10 HOME
20 D$ = CHR$ (4)
30 PRINT D$;"MAXFILES1"
40 PRINT "DO YOU WANT TO:"
50 PRINT " (1) MAKE A SPEEDSCRI
   PT FILE INTO A TEXT      FILE
   "
60 PRINT " (2) MAKE A TEXT FILE
    INTO A SPEEDSCRIPT      FILE
   "
70 GET A$:A = VAL (A$)
80 IF A < > 1 AND A < > 2 THEN
   70
90 ON A GOTO 100,200
100 PRINT "ENTER SPEEDSCRIPT FI
    LE NAME": INPUT ":";A$
110 PRINT "ENTER TEXT FILE NAME
     TO CREATE": INPUT ":";B$
120 PRINT D$;"BLOAD ";A$;",A$20
    00"
125 L = PEEK (43616) + PEEK (43
    617) * 256 + 8192
130 PRINT D$;"OPEN ";B$
131 PRINT D$;"DELETE ";B$
132 PRINT D$;"OPEN ";B$
140 PRINT D$;"WRITE ";B$
150 FOR I = 8192 TO L - 1
155 B = PEEK (I)
160 IF B = 60 THEN B = 141
170 PRINT CHR$ (B);
180 NEXT
190 PRINT
195 PRINT D$;"CLOSE ";B$
196 END
200 PRINT "ENTER TEXT FILE NAME
    ": INPUT ":";B$
210 INPUT "ENTER SPEEDSCRIPT FI
    LE NAME TO CREATE   :";A$
220 PRINT D$;"OPEN ";B$
230 PRINT D$;"READ ";B$
235 L = 0
240 ONERR GOTO 270
250 GET C$:A = ASC (C$ + CHR$ (
    0)) + 128: IF A = 141 THEN
    A = 60
260 POKE 8192 + L,A:L = L + 1:
    GOTO 250
270 POKE 216,0
280 PRINT
290 PRINT D$;"CLOSE ";B$
295 PRINT D$;"BSAVE ";A$;",A819
    2,L";L - 1
296 END
```

AppleWorks *easily imports ASCII text files from other word processors. When you add a file to the desktop, choose to create it from an existing ASCII file.* aa

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New Products

Young Authors

Muppet Slate is a new word processing program from Sunburst, designed for writers in grades K–2.

The program features large letters and numbers, pictures for illustrating stories or for rebus writing, and a choice of ten borders to frame the finished project. A teacher feature allows the creation of fill-in-the-blank papers for students to complete. The teacher's guide includes word processing instructions and 24 lesson plans.

Animated Muppet characters appear onscreen to help students choose from the main menu, make border selections, and print the finished product.

The lesson plans are designed to introduce word processing and language arts concepts. Two charts allow teachers to see the language arts and word processing skills covered in each lesson.

Teacher options include choosing the students' cursor modes and customizing student disks to preselect the pictures and borders. Printing options can also be limited by the teacher.

Muppet Slate is available for the Apple II series of computers and can be used with a regular keyboard or with the Muppet Learning Keys. The program comes with a Teacher's Disk, Master Student Disk, backup disks, and a 153-page Teacher's Guide. The suggested retail price is $75.

Sunburst Communications, 39 Washington Ave., Pleasantville, NY 10570

Circle Reader Service Number 170.

Accolade Hall of Fame

Accolade has introduced a new product line that includes several of the company's most popular software titles at a reduced price. Accolade's *All Time Favorites* are available at a suggested retail price of $14.95.

The titles available for the Apple II series include *HardBall!*, a 3-D baseball game; *Fight Night*, a boxing game; *Dam Busters*, a World War II bombing mission simulation; and *Law of the West*, an Old West adventure.

Accolade, 550 S. Winchester Blvd., Suite 200, San Jose, CA 95128

Circle Reader Service Number 171.

Mousestick

CH Products has announced the release of the Mach IV Plus, a mouse replacement and joystick device for Apple II and Macintosh computers.

The unit has been engineered for use with all mouse-intensive applications software including CAD, desktop publishing, and games. The Mach IV Plus features an absolute mode and three rate modes of movement. The absolute mode tracks like a mouse, with the cursor following the stick position. In the rate modes, the cursor moves in the same direction as the stick handle from its center position. The rate mode offers a choice of slow, medium, and fast speeds.

The Mach IV Plus operates as a joystick and a mouse.

By flipping a switch, the unit becomes a multibutton joystick for game applications. The joystick features electrical trims and variable action controls.

The Mach IV Plus works with all Apple II computers, although the Apple II and IIe require a mouse card for mouse operation. The unit works only as a mouse replacement on the Macintosh. The suggested retail price is $89.95.

CH Products, 1225 Stone Dr., San Marcos, CA 92069

Circle Reader Service Number 173.

Hi Tech Extends Sesame Street

Hi Tech Expressions has released several new titles in its Sesame Street line of educational software for preschoolers.

The *Sesame Street Print Kit* is a print program featuring the Sesame Street characters. Users can design and print cards, signs, storybooks, invitations, and banners. Features include a line-by-line text editor and seven typefaces in three sizes with boldface, italics, shadow, and outline effects. Graphics from Hi Tech's *PrintPower* are compatible with the *Sesame Street Print Kit* and provide more printing options.

The program is available on an IBM/Apple flippy disk and has a suggested retail price of $14.95.

Hi Tech has recently released the *Sesame Street Learning Library*, Volume 1, which contains Sesame Street educational software titles currently published by Hi Tech. Volume 1 features *Astro Grover*, *Ernie's Magic Shapes*, and *Big Bird's Special Delivery*. Included with the package is a 12-page learning guide for parents and teachers that contains follow-up activities. The suggested retail price is $24.95.

Hi Tech has also released *Ernie's Magic Shapes* and *Big Bird's Special Delivery* for the Apple II series. The two programs require at least 128K and have a suggested retail price of $9.95 each.

Hi Tech Expressions, 584 Broadway, New York, NY 10012

Circle Reader Service Number 172.

Improve Writing Skills

Optimum Resource has released the *Writing Skills Improvement Program*. Designed for adults, the program concentrates on grammar, usage, and style and can be used by teachers, students, and people in business. A copy of *The Little, Brown Handbook* is packaged with the program.

Writing Skills can detect areas that need improvement, and it can create practice exercises to assist the user in those problem areas. Following a 60-question diagnostic test, users must complete workbook problems that were determined by the test. Three different diagnostic tests are available, with exercises that follow each one. Users have the option to review or retake the diagnostic tests.

The program is available for the Apple II and has a suggested retail price of $59.95.

Optimum Resource, 10 Station Pl., Norfolk, CT 06058

Circle Reader Service Number 174. ▷

Advice from Mindscape

Mindscape has made available a pamphlet that outlines the basics of software evaluation and selection. *A Guide to Selecting Educational Software* includes information on how to look for a computer user group, how parents can help their children learn about computers, and how to buy programs for a child with learning disabilities.

The guide is available free of charge and can be obtained by sending a self-addressed, stamped, business-size envelope to Educational Software Guide in care of Mindscape.

Institutions and organizations can purchase the guides in quantities at a special rate. Interested organizations should contact Mindscape's educational customer service representative to place orders.

Mindscape, 3444 Dundee Rd., Northbrook, IL 60062

Circle Reader Service Number 175.

Turn It Down!

Archelion Innovations has introduced a computer accessory that controls the volume output from system speakers. The VOLCOM volume-control accessory allows users to adjust the volume from barely audible to maximum output.

To install the unit, users must plug it in and mount the control knob. The unit draws no power from the system and can be transferred to another computer.

VOLCOM can be used with an Apple II, II+, and IIe. The suggested retail price is $14.95.

Archelion Innovations, P.O. Box 8055, Blaine, WA 98230

Circle Reader Service Number 176.

Computer Crayons

Polarware has announced the release of *Holidays and Seasons*, the latest in the Electric Crayon Computer Coloring Book Deluxe series.

The program includes 30 line drawings of all major holidays and the four seasons. Users can point and click on the color palette, move the crayon to the area to be filled, and then click to color it in. Users have access to 256 colors.

Each program in the Deluxe series has custom banner-, calendar-, and poster-making capabilities. Banners can be designed with a colored picture printed at each end and a personal message in the middle. Posters can be made with a custom message printed below the artwork. Users can also add their art to wall calendars and can use the 64 four-color stickers included with the package to mark special occasions.

Holidays and Seasons has a suggested retail price of $29.95.

Polarware, 1055 Paramount Pkwy., Suite A, Batavia, IL 60510

Circle Reader Service Number 177.

Save the World's Intelligence

Aliens are trying to reduce everyone's IQ to single digits in *Zak McKracken and the Alien Mindbenders*, the latest release from Lucasfilm Games. Zak is the ace reporter for the *National Inquisitor*. He and his friends, two Yale coeds and an occultist, must travel around the world and beyond to save the world from the aliens.

Players control the four characters as they collect clues and objects from locations such as San Francisco, Stonehenge, Mexico, Atlantis, Mars, and the Bermuda Triangle. Problems and puzzles can be solved by one character or by coordinating several characters at once. The characters, objects, and actions are controlled by joystick or mouse. There are no type-in commands. The game features 3-D graphics, music, and sound effects. Players can also utilize "cut scenes" that reveal action and clues in several places at once. Puzzle solutions are changed from game to game.

Zak McKracken and the Alien Mindbenders is available for the Apple IIc and IIe and requires 128K. The suggested retail price is $34.95. The game is distributed exclusively by Mediagenic (formerly Activision).

Mediagenic, 3885 Bohannon Dr., Menlo Park, CA 94025

Circle Reader Service Number 178.

Slide Show

Thunderware has recently released *ThunderView*, a program designed to create personalized slide shows. The software is available for the Apple IIe and IIc in the 5¼-inch format and for the Apple IIGS in 3½-inch disks.

The program runs under Apple's ProDOS operating system and includes Volume 1 of Thunderware's Image Library, which is a collection of clip-art graphics that can be used with most paint and desktop publishing programs.

Users can create slide-show images with most paint programs or scanned images created with ThunderScan for the Apple II. ThunderScan replaces the ribbon cartridge of any Imagewriter printer except the LQ. *ThunderView* users can advance through images manually or through one of two automatic speeds.

The IIGS version supports super-hi-res mode. The program can use files created with ThunderScan for the Apple II, *Paintworks Plus*, *Deluxe Paint II*, and *8/16 Paint*. *ThunderView* also contains controls that allow the user to both alter the contrast and brightness of an image and save these images to disk. Files must first be in the C1 format.

The suggested retail price is $39.95.

Thunderware, 21 Orinda Way, Orinda, CA 94563

Circle Reader Service Number 179.

Model Rocket Tracker

Estes Industries has released *AEROTREK: Model Rocket Altitude Prediction Toolkit*, a software product that features seven programs that calculate the flight performance of model rockets. The seven programs include Single Stage, Two Stage, Three Stage, Single-Stage Cluster, Single-Stage Incremented Weight, Designer's Scratchpad, and Lunar Launch.

The programs operate by selecting the appropriate entry from a menu for each characteristic of a user's rocket. The rocket's flight performance is then calculated and displayed on the screen and can be printed out with an Imagewriter printer.

The first four programs calculate the performance of usual types of model rockets. The Single-Stage Incremented Weight program allows users to achieve maximum performance from their rocket through weight optimization. The Lunar Launch program calculates a rocket's actions from the surface of the moon.

The suggested retail price is $19.95.

Estes Industries, 1295 H St., Penrose, CO 81240

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A machine language program is usually listed as a long series of numbers. It's hard to keep your place and even harder to avoid making mistakes as you type in the listing, since an incorrect line looks almost the same as a correct one. To reduce the problems associated with typing in machine language programs, we've presented them as MLX listings which can be entered using the "Apple MLX" editor.

MLX checks your typing on a line-by-line basis. It won't let you enter inappropriate characters, and it won't let you continue if there's a mistake in a line or even if you're trying to enter a line or digit out of sequence. You don't have to know anything about machine language to use it. In other words, MLX makes machine language program entry almost foolproof.

Using MLX

Type in and save MLX to disk (you'll want to use it to enter programs in this and future issues of *COMPUTE!'s Apple Applications*, as well as programs in *COMPUTE!* magazine and Apple-specific books from COMPUTE! Publications). It doesn't matter whether you type it in on a disk formatted for DOS 3.3 or ProDOS. Programs entered with MLX, however, must be saved to a disk formatted with the same operating system as MLX itself.

If you have an Apple IIe, IIc, or IIGS, make sure that the key marked Caps Lock is in the down position. Type RUN. You'll be asked for the starting and ending addresses of the machine language program. These values are given at the beginning of the machine language program listing and in the program's accompanying article. Find them and type them in.

The next thing you'll see is a menu asking you to select a function. The first is (E)nter Data. If you're just starting to

e E key, and
nt to begin
line of the
ne number
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data.
the address
nine num-
git number
ytes and a
Return, MLX re-

calculates the checksum from the eight bytes and the address. If you enter more than or fewer than nine numbers, or if the checksum doesn't exactly match, MLX erases the line you just entered and prompts you again for the same line.

Invalid Characters Banned

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MLX also checks to make sure you're typing in the right line. The address (the number to the left of the colon) is part of the checksum recalculation. If you accidentally skip a line and try to enter incorrect values, MLX won't let you continue. Just make sure you enter the correct starting address; if you don't, you won't be able to enter any of the following lines. MLX will stop you.

Editing Features

MLX also includes some editing features. The left- and right-arrow keys allow you to back up and go forward on the line you're entering so that you can retype data. Pressing the Ctrl (*Control*) key and the D (*Delete*) key at the same time removes the character under the cursor, shortening the line by one

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Each program in the Deluxe series has custom banner-, calendar-, and poster-making capabilities. Banners can be designed with a colored picture printed at each end and a personal message in ... be made with a custom message printed be- ... air art to wall calendars and ... to mark

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in 3½-inch disks.

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The suggested retail price is $39.95.

Thunderware, 21 Orinda Way, Orinda, CA 94563

Circle Reader Service Number 179.

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Apple MLX

Machine Language Entry Program

Tim Victor

"Apple MLX" is a labor-saving utility that allows almost fail-safe entry of machine language programs on the Apple computer. It runs on the II, II+, IIe, and IIc, and IIGS, with either DOS 3.3 or ProDOS.

Note: This is a new version of Apple MLX, with some slight changes. Be sure to use this version to type in all machine language programs in this and future issues of COMPUTE!'s Apple Applications.

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The next thing you'll see is a menu asking you to select a function. The first is (E)nter Data. If you're just starting to type in a program, choose this function. Press the E key, and the program asks for the address where you want to begin entering data. Type the first number in the first line of the program listing if you're just starting, or the line number where you left off if you've already typed in part of a program. Hit the Return key and begin entering the data.

Once you're in enter mode, MLX will print the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight bytes and a checksum. When you enter a line and hit Return, MLX recalculates the checksum from the eight bytes and the address. If you enter more than or fewer than nine numbers, or if the checksum doesn't exactly match, MLX erases the line you just entered and prompts you again for the same line.

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MLX is fairly flexible about how you type in the numbers. You can put extra spaces between numbers or leave the spaces out entirely, compressing a line into 18 keypresses. Be careful not to put a space between two digits in the middle of a number. MLX will read two single-digit numbers instead of one two-digit number (F 6 means F *and* 6, not F6).

You can't enter an inappropriate character with MLX. Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), nothing happens. This safeguards against entering extraneous characters. Even better, MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake.

MLX also checks to make sure you're typing in the right line. The address (the number to the left of the colon) is part of the checksum recalculation. If you accidentally skip a line and try to enter incorrect values, MLX won't let you continue. Just make sure you enter the correct starting address; if you don't, you won't be able to enter any of the following lines. MLX will stop you.

Editing Features

MLX also includes some editing features. The left- and right-arrow keys allow you to back up and go forward on the line you're entering so that you can retype data. Pressing the Ctrl (*Control*) key and the D (*Delete*) key at the same time removes the character under the cursor, shortening the line by one

character. Pressing the Ctrl key and the I (*Insert*) key simultaneously puts a space under the cursor and shifts the rest of the line to the right, making the line one character longer. If the cursor is at the right end of the line, neither Ctrl-D nor Ctrl-I has any effect.

When you've entered the entire listing (up to the ending address that you specified earlier), MLX automatically leaves Enter mode and redisplays the functions menu. If you want to leave Enter mode before then, press the Return key when MLX prompts you with the address of a new line.

Display Data

The second menu choice, (D)isplay Data, examines memory and shows the contents in the same format as the program listing. You can use it to check your work or to see how far you've gotten. When you press the D key, MLX asks you for a starting address. Type in the address of the first line that you want to see and hit Return. MLX displays program lines until you press any key or until it reaches the end of the program.

Save and Load

Other menu selections are provided to let you save programs to disk and load them back into the computer. These are (S)ave File and (L)oad File. MLX asks you for the name of the file which contains the program. The first time you save a machine language program, there won't be a file on the disk containing the program. Whatever name you type in will be the name of a new file that's created.

The message DISK ERROR appears during a SAVE or LOAD if a problem is detected. If you're not sure why a disk error has occurred, check the disk drive. Make sure there's a formatted disk in the drive and that it was formatted by the same operating system that you're using for MLX (ProDOS or DOS 3.3). If you're trying to save a file and see an error message, the disk might be full. Either save the file on another disk or quit MLX (by pressing Q), delete an old file or two, and then run MLX again. Your typing should still be safe in memory. If the error message appears during a load, you may have specified a filename that doesn't exist on the disk.

Quit

The (Q)uit menu option has the obvious effect—it stops MLX and enters BASIC. (Of course, you can also press Ctrl-Reset to get out of MLX.)

The Finished Product

When you've finished typing all the data for a machine language program and have saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. You'll almost always load and run an MLX-generated program by typing BRUN *filename* (or sometimes just BLOAD).

An Ounce Of Prevention

By the time you finish typing in the data for a long program, you may have several hours invested in the project. Don't take chances—use the "Apple Automatic Proofreader" to enter MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses; then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to insure that you can recall your work from disk. Don't let a simple typing error in MLX cost you several nights of hard work.

Line 100 of MLX traps all errors to line 610. If MLX is typed in correctly, only disk errors should be encountered. A disk-error message when you're not trying to access the drive—for example, when you first start entering data—indicates a typing error in the MLX program itself. If this occurs, hit Ctrl-Reset to break out of MLX and carefully compare your entry against the printed listing.

Apple MLX: Version 1.1

Be sure to use "Apple Automatic Proofreader," found elsewhere in this issue, to enter the following program.

```
35 100 N = 9: HOME : NORMAL : PRINT CHR$ (17)
       ;"APPLE MLX V1.1": POKE 34,2: ONERR GO
       TO 610
CC 110 VTAB 1: HTAB 20: PRINT "START ADDRESS"
       ;: GOSUB 530: IF A = 0 THEN PRINT CHR$
        (7): GOTO 110
8C 120 S = A
E3 130 VTAB 2: HTAB 20: PRINT "END ADDRESS  "
       ;: GOSUB 530: IF S > = A OR A = 0 THEN
        PRINT CHR$ (7): GOTO 130
20 140 E = A
B5 150 PRINT : PRINT "CHOOSE: (E)NTER DATA";:
       HTAB 22: PRINT "(D)ISPLAY DATA": HTAB
       8: PRINT "(L)OAD FILE  (S)AVE FILE  (Q
       )UIT": PRINT
AE 160 GET A$: FOR I = 1 TO 5: IF A$ < > MID$
        ("EDLSQ",I,1) THEN NEXT : GOTO 160
93 170 ON I GOTO 270,220,180,200: POKE 34,0:
       END
AF 180 INPUT "FILENAME: ";A$: IF A$ < > "" TH
       EN PRINT CHR$ (4);"BLOAD";A$;",A";S
A1 190 GOTO 150
6D 200 INPUT "FILENAME: ";A$: IF A$ < > "" TH
       EN PRINT CHR$ (4);"BSAVE";A$;",A";S;",
       L";E - S
92 210 GOTO 150
C2 220 GOSUB 590: IF B = 0 THEN 150
9E 230 FOR B = B TO E STEP 8:L = 4:A = B: GOS
       UB 580: PRINT A$;": ";:L = 2
B5 240 FOR F = 0 TO 7:V(F + 1) = PEEK (B + F)
       : NEXT : GOSUB 560:V(9) = C
F2 250 FOR F = 1 TO N:A = V(F): GOSUB 580: PR
       INT A$" ";: NEXT : PRINT : IF PEEK (49
       152) < 128 THEN NEXT
94 260 POKE 49168,0: GOTO 150
CC 270 GOSUB 590: IF B = 0 THEN 150
48 280 FOR B = B TO E STEP 8
A6 290 HTAB 1:A = B:L = 4: GOSUB 580: PRINT A
       $;": ";: CALL 64668:A$ = "":P = 0: GOS
       UB 330: IF L = 0 THEN 150
F9 300 GOSUB 470: IF F < > N THEN PRINT CHR$
       (7);: GOTO 290
27 310 IF N = 9 THEN GOSUB 560: IF C < > V(9)
        THEN PRINT CHR$ (7);: GOTO 290
72 320 FOR F = 1 TO 8: POKE B + F - 1,V(F): N
       EXT : PRINT : NEXT : GOTO 150
8E 330 IF LEN (A$) = 33 THEN A$ = O$:P = O: P
       RINT CHR$ (7);
22 340 L = LEN (A$):O$ = A$:O = P:L$ = "": IF
        P > 0 THEN L$ = LEFT$ (A$,P)
E0 350 R$ = "": IF P < L - 1 THEN R$ = RIGHT$
        (A$,L - P - 1)
55 360 HTAB 7: PRINT L$;: FLASH : IF P < L TH
       EN PRINT MID$ (A$,P + 1,1);: NORMAL :
       PRINT R$;
7B 370 PRINT " ";: NORMAL
E6 380 K = PEEK (49152): IF K < 128 THEN 380
C1 390 POKE 49168,0:K = K - 128
5B 400 IF K = 13 THEN HTAB 7: PRINT A$;" ";:
       RETURN
A7 410 IF K = 32 OR K > 47 AND K < 58 OR K >
       64 AND K < 71 THEN A$ = L$ + CHR$ (K)
       + R$:P = P + 1: GOTO 330
```

```
C7 420 I = FRE (Ø): IF K = 4 THEN A$ = L$ + R
      $
5F 430 IF K = 9 THEN A$ = L$ + " " + MID$ (A$
      ,P + 1,1) + R$
ØA 440 IF K = 8 THEN P = P - (P > Ø)
93 450 IF K = 21 THEN P = P + (P < L)
9D 460 GOTO 330
37 470 F = 1:D = Ø: FOR P = 1 TO LEN (A$):C$
      = MID$ (A$,P,1): IF F > N AND C$ < > "
       " THEN RETURN
BB 480 IF C$ < > " " THEN GOSUB 520:V(F) = J
      + 16 * (D = 1) * V(F):D = D + 1
5F 490 IF D > Ø AND C$ = " " OR D = 2 THEN D
      = Ø:F = F + 1
Ø8 500 NEXT : IF D = Ø THEN F = F - 1
17 510 RETURN
B5 520 J = ASC (C$):J = J - 48 - 7 * (J > 64)
      : RETURN
AB 530 A = Ø: INPUT A$:A$ = LEFT$ (A$,4): IF
      LEN (A$) = Ø THEN RETURN
6F 540 FOR P = 1 TO LEN (A$):C$ = MID$ (A$,P,
      1): IF C$ < "Ø" OR C$ > "9" AND C$ < "
      A" OR C$ > "Z" THEN A = Ø: RETURN
2D 550 GOSUB 520:A = A * 16 + J: NEXT : RETUR
      N
28 560 C = INT (B / 256):C = B - 254 * C - 25
      5 * (C > 127):C = C - 255 * (C > 255)
2Ø 570 FOR F = 1 TO 8:C = C * 2 - 255 * (C >
      127) + V(F):C = C - 255 * (C > 255): N
      EXT : RETURN
DA 580 I = FRE (Ø):A$ = "": FOR I = 1 TO L:T
      = INT (A / 16):A$ = MID$ ("Ø123456789A
      BCDEF",A - 16 * T + 1,1) + A$:A = T: N
      EXT : RETURN
1F 590 PRINT "FROM ADDRESS ";: GOSUB 530: IF
      S > A OR E < A OR A = Ø THEN B = Ø: RE
      TURN
ØD 600 B = S + 8 * INT ((A - S) / 8): RETURN
B6 610 PRINT "DISK ERROR": GOTO 150
```


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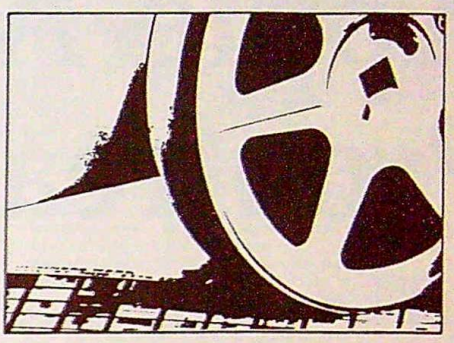

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Apple Automatic Proofreader

Tim Victor

It's easier than ever to enjoy programs for Apple II–series computers. "Apple Automatic Proofreader," an error-checking program for the Apple II, II+, IIe, and IIc, with either DOS 3.3 or ProDOS, alerts you to almost every typing mistake you might make.

"Apple Automatic Proofreader" will help you type in program listings without typing mistakes. It's a short error-checking program that hides itself in memory and attaches to your Apple's operating system. Each time you press Return to enter a program line, this routine displays a two-digit checksum at the top of your screen. If you've typed the line correctly, the checksum on your screen matches the one in the printed listing—it's that simple. You don't have to use the Proofreader to enter listings, but doing so greatly reduces your chance of making a typo.

Getting Started

First, type in the Apple Automatic Proofreader program following this article. The Proofreader can't check itself before it's done, so you'll have to be extra careful to avoid mistakes.

The Proofreader checks which operating system you're running before it hooks up the checksum routine, so you can type it in with either DOS 3.3 or ProDOS. If you want to use the Proofreader with both operating systems, you won't have to retype it. All you need is a utility to copy a file between disks with different formats, such as the one provided on the ProDOS *User's* or *System Utilities* disk.

As soon as you finish typing the Proofreader, save at least two copies. This is very important, because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Now, type RUN and hit Return. The Proofreader clears the screen, loads the machine language routine, displays the message PROOFREADER ACTIVATED, erases the BASIC portion of itself, and ends. If you type LIST and press Return, you'll see that no BASIC program is in memory. The computer is ready for you to type in a new BASIC program.

Entering Programs

Once the Proofreader is activated, you can begin typing in a BASIC program as usual. Every time you finish typing a line and press Return, the Proofreader displays a two-digit checksum number in the upper-left corner of the screen. Compare this checksum with the two-digit checksum printed next to the corresponding line in the program listing. If the numbers match, you can be pretty certain the line was typed correctly. Otherwise, check for your mistake and type the line again.

A common mistake when entering BASIC programs on the Apple occurs when you accidentally press a key while holding down the Control key. This adds an invisible control character to the line you are typing. If you don't find it before you run the program, this stray character may cause a SYNTAX ERROR or other mysterious behavior. Fortunately, the Proofreader detects the presence of these invisible control characters and displays a checksum that doesn't match the one in the listing. So it's always a good idea to retype a line if the checksums don't match, even though you might not see any difference in the lines themselves.

The Proofreader ignores space characters, so you can omit spaces between keywords and still see a matching checksum. Spaces are important only between the quotation marks of PRINT statements or string assignments. The only mistake the Proofreader won't catch is if you accidentally type too many spaces or leave some out. For this reason, be extra careful when you're entering text within quotes.

Before running another BASIC program, it's a good idea to turn off the Proofreader by holding down the Control key while pressing the Reset button. The machine language part of the Proofreader is kept in memory starting at address 768 ($300 hexadecimal). This location is out of BASIC's way, but a lot of other programs use this same place for their machine language subroutines. Disable the Proofreader to avoid conflicts.

How It Works

When the Applesoft BASIC interpreter needs to get a line of input from the keyboard, it calls a machine language routine in the Apple's read-only memory (ROM) called GETLN. GETLN, in turn, calls the operating system to get a single keypress, which it stores in an input buffer. If the Return key was pressed, GETLN ends, leaving one new line for the BASIC interpreter in the input buffer. Otherwise, it repeats the process, asking for another keypress.

The operating system normally gets individual keystrokes from a ROM routine called KEYIN, but the Proofreader changes this. When the Proofreader is installed, the operating system calls the checksum routine instead, and the checksum routine asks KEYIN for a character. If any key other than Return was pressed, the checksum routine just passes it on to the operating system, which gives it to GETLN. But if Return *was* pressed, the checksum routine examines the contents of GETLN's input buffer, which now contains an entire line of input, to calculate the checksum that it displays at the top of the screen. ▷

A common typing mistake is transposition—typing two successive characters in the wrong order, like *PIRNT* instead of *PRINT*. A checksum program that merely adds the codes of the characters in a line can detect only the presence or absence of a character, not transposition errors. Because the Apple Proofreader uses a sophisticated formula to compute checksums, it alerts you to transposed keystrokes.

The Apple Automatic Proofreader detects almost every possible typing mistake, including transpositions, missing or extra characters, accidental control characters, and incorrect line numbers. Typing *COMPUTE!'s Apple Applications Special* programs into your Apple computer has never been easier.

Apple Automatic Proofreader

```
52 10 C = 0: FOR I = 768 TO 768 + 68: READ A:
    C = C + A: POKE I,A: NEXT
8C 20 IF C < > 7258 THEN PRINT "ERROR IN PROO
    FREADER DATA STATEMENTS": END
D0 30 IF PEEK (190 * 256) < > 76 THEN POKE 56
    ,0: POKE 57,3: CALL 1002: GOTO 50
70 40 PRINT CHR$ (4);"IN#A$300"
24 50 POKE 34,0: HOME : POKE 34,1: VTAB 2: PR
    INT "PROOFREADER INSTALLED"
FE 60 NEW
52 100 DATA 216,32,27,253,201,141
10 110 DATA 208,60,138,72,169,0
75 120 DATA 72,189,255,1,201,160
FA 130 DATA 240,8,104,10,125,255
47 140 DATA 1,105,0,72,202,208
1B 150 DATA 238,104,170,41,15,9
AF 160 DATA 48,201,58,144,2,233
D8 170 DATA 57,141,1,4,138,74
9E 180 DATA 74,74,74,41,15,9
B5 190 DATA 48,201,58,144,2,233
E3 200 DATA 57,141,0,4,104,170
A9 210 DATA 169,141,96
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aa

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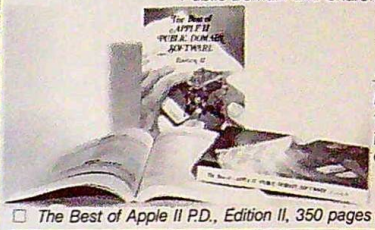

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   In the classroom ☐ 217
   Other _____ 218

3. Do you plan to purchase a personal computer in the next 12 months?
   Yes ☐ 219
   No ☐ 220
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5. Which of the following peripherals do you own or use? (check all that apply)
   Disk Drive ☐ 225
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   Modem ☐ 227
   Monitor ☐ 228
   Printer ☐ 229
   Other (please specify) _____ 230

6. Which of the following peripherals do you plan to purchase in the next 12 months? (check all that apply)
   Disk Drive ☐ 231
   Joystick (or game peripheral) ☐ 232
   Modem ☐ 233
   Monitor ☐ 234
   Printer ☐ 235
   Other (please specify) _____ 236

7. Approximately how much do you plan to spend on your computer or computer-related items in the next 12 months?
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   100–499 ☐ 238
   500–999 ☐ 239
   1000–1999 ☐ 240
   2000 or over ☐ 241
   Don't know ☐ 242

8. Please put an X in the box which indicates your age group.
   Under 18 ☐ 243
   18–29 ☐ 244
   30–44 ☐ 245
   45–65 ☐ 246
   Over 65 ☐ 247

9. What is the highest level you completed in school?
   Some high school or less ☐ 248
   High school graduate ☐ 249
   Attended college 1–3 years ☐ 250
   College graduate ☐ 251
   Post-graduate study without degree ☐ 252
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10. Would you describe your present occupation as
    Student ☐ 255
    Manufacturing/service ☐ 256
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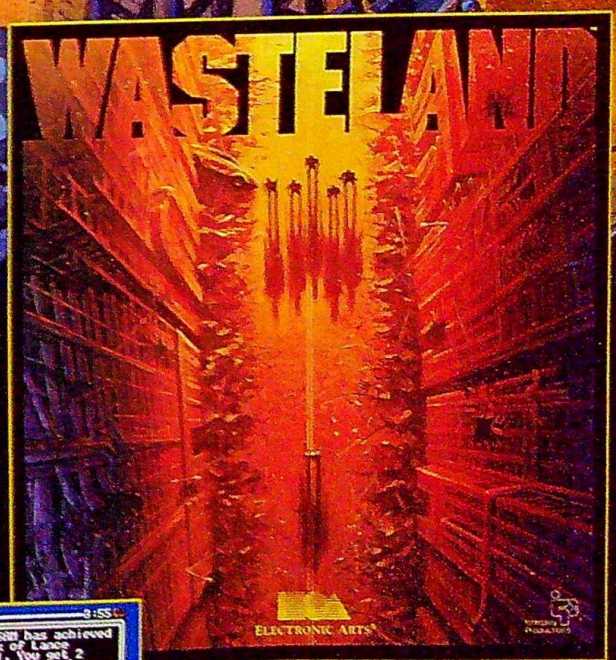

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More Sniperdroids! All tracking me with them death glares. And them Uzis. They're weird trigger-twitchin' folks. I suspect it's them poisoning the water.

Or maybe it's those Leather Thugs. Heck, I don't know anymore. I heard they have a bunch of civilians cut off east of Ranger Center, which is where I'm headed. Hope not. They want me dead. Like every other mutant this side of Vegas.

The worst part is, I'm getting to be as bad as they are. You wouldn't believe some of the ways I've learned to kill. I hang out in sewers, and my best friend is a MAC 17 submachine gun.

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