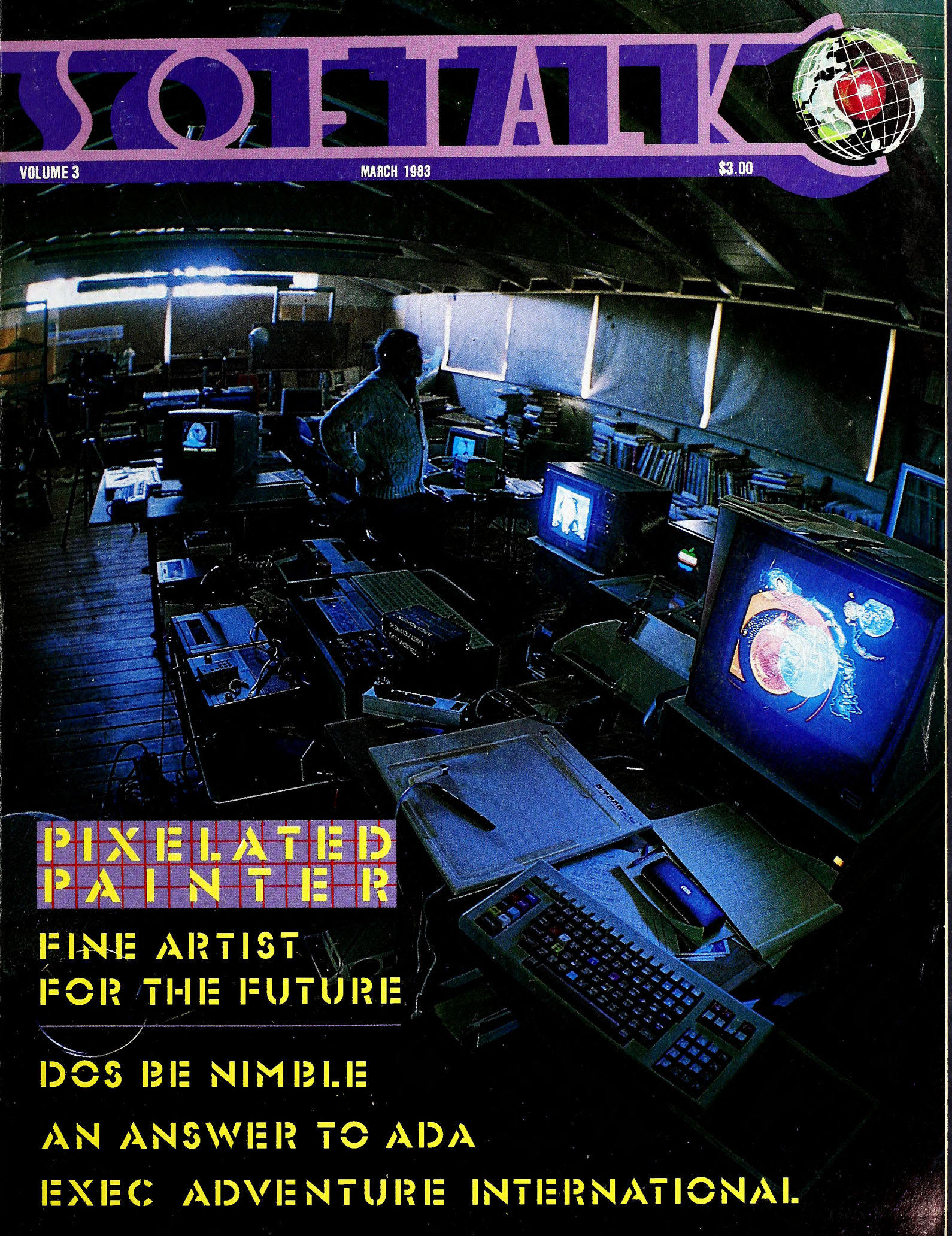
SOFTALK

VOLUME 3 MARCH 1983 $3.00



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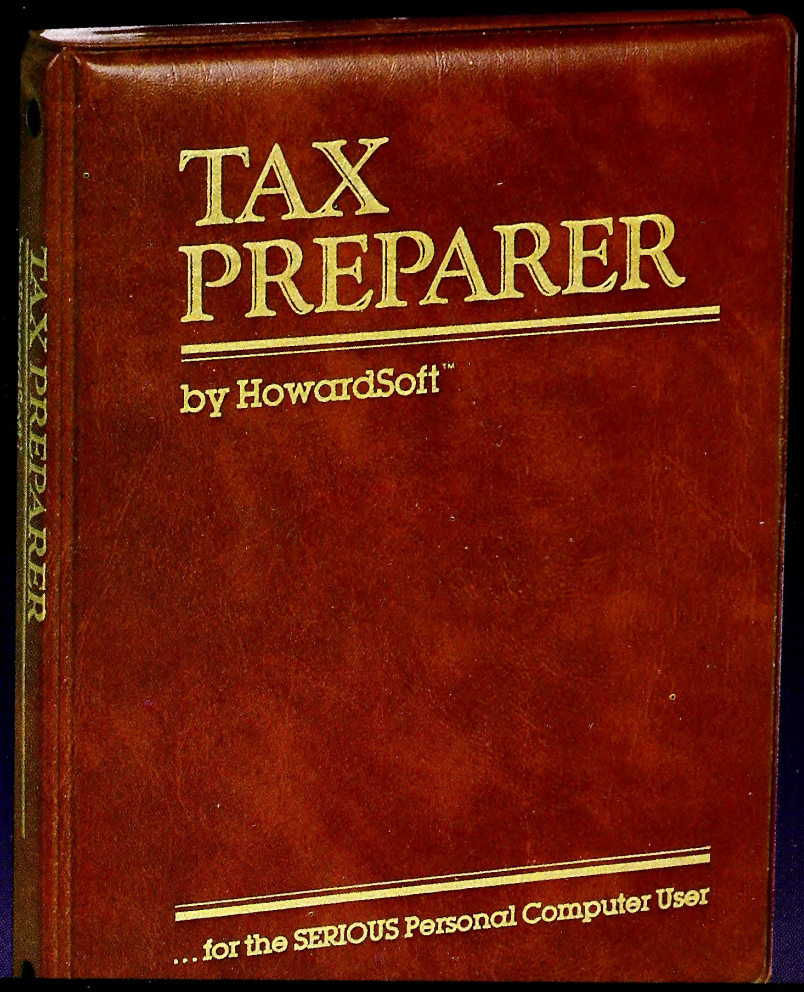

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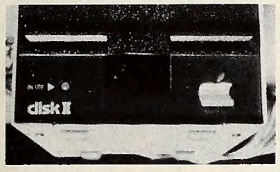

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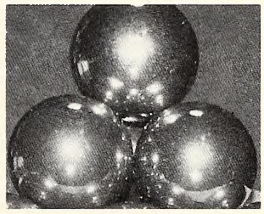

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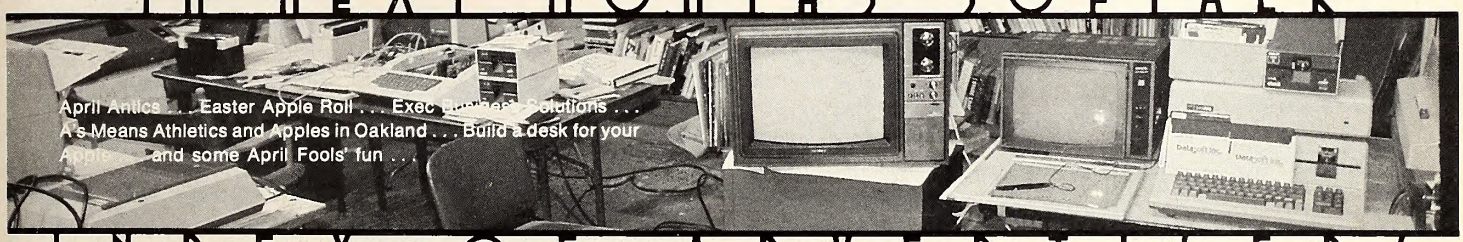

April Antics . . . Easter Apple Roll . . . Exec [illegible] Solutions . . . A's Means Athletics and Apples in Oakland . . . Build a desk for your Apple . . . and some April Fools' fun . . .

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Cover Photo: Saul Bernstein contemplates an Apple screen in his electronic artist's studio. Photo by Kurt Wahlner.

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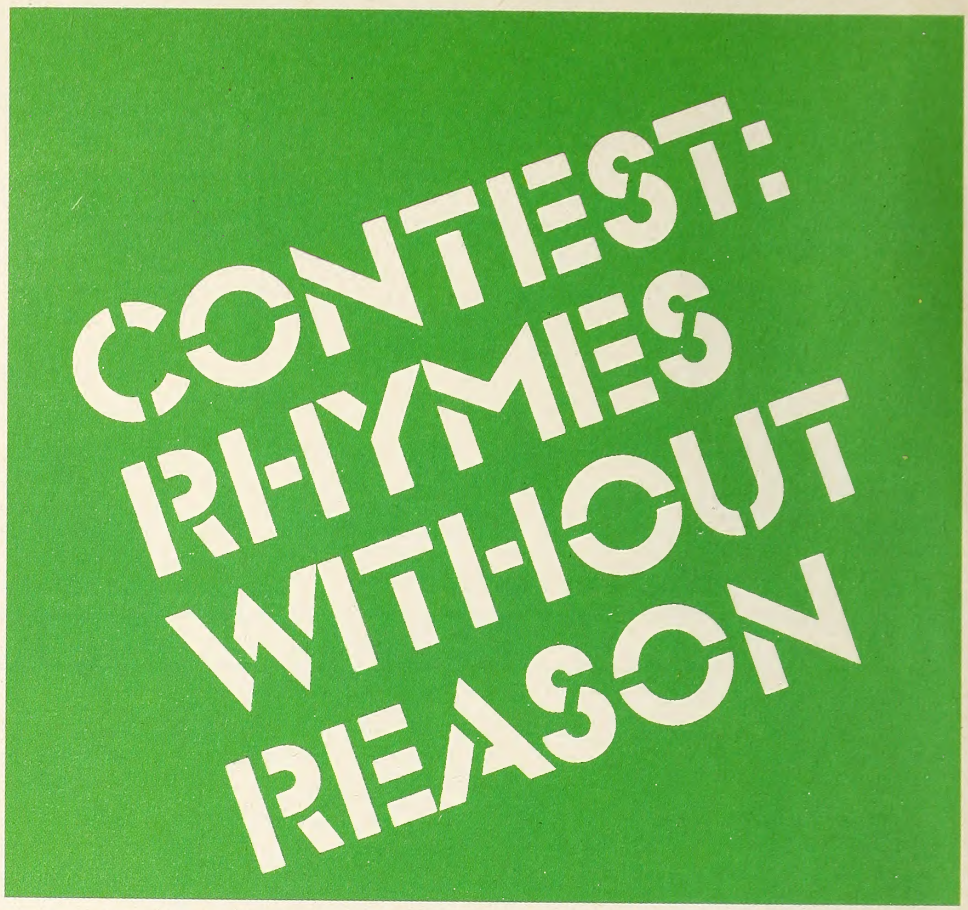
Back Issues: $2 through February 1981; $2.50 through July 1981; $3.50 through September 1982, $4.00 thereafter. November and December 1980, January, February, March, September, October, and November 1981, and December 1982 are sold out. December 1981 and February and May 1982 are in short supply.

Problems? If you haven't received your *Softalk* by the fifteenth of the month, or if you have other problems with your subscription, Hal Schick or Pam Kelley can help out. Call (213) 980-5074.

Moving? Send new address and old to Softalk Circulation, Box 60, North Hollywood, CA 91603; telephone (213) 980-5074.



Saint Patrick's Day is just around the corner, but before you go pouring yourself a Bailey's Irish Cream or sucking down a tall Bushmill's, pull up a stool and have a giggle or two with us.

In honor of ol' Pat the patron saint, we're going to have some fun with limericks. You know what a limerick is, don't you? It's a light five-line verse that serves no other purpose than to be cute or humorous (depending on your sense of humor).

Limericks first appeared in England more than one hundred fifty years ago as a party game. The idea was to make up a nonsense five-line rhyme, after the recitation of which everyone sang a chorus that ended with the line, "Won't you come up to Limerick?"

Well, parties like that tend to have a lot of drinking going on, and the more the spirits flowed, the more the spirits flew. Party animals of the Victorian variety. The drunker they got, the bawdier and sillier the verses became.

Of course, if we were just to have you all send in your favorite limericks, that would be boring. Besides, the unwritten laws of good taste would prohibit our printing most of them. So here's the catch: each limerick must contain at least one reference to a product or its manufacturer that is advertised in this issue. Here's an example from our last limerick contest:

My wife spent last week in the loft.
I know she's alive; she just coughed.
She has found no new suitor;
It's that Apple computer.
I'm afraid that she's gone micro soft.
—Eric Marks (Mount Tabor, NJ)

My brother, named Ed, had a fight
For a woman whose honor was bright.
Asked he, "Was I wrong
To ring that guy's gong?"
"No," I said, "Ed, you were right."
—Mike Leavitt (Reston, VA)

The first example spells it right out in the last two words (Microsoft). Perfectly legal.

The second one virtually requires you to read the last line out loud to get the company's name (Edu-Ware). Also legal, and a bit more subtle.

The subject of your limerick is up to you. It can be funny, witty, punny, or just plain silly. Clue: a good way to win is by making yours stand out in the crowd. Get crazy!

Limericks will be judged on cleverness, jazziness, and general toughness in figuring out what product or company you refer to in the limerick.

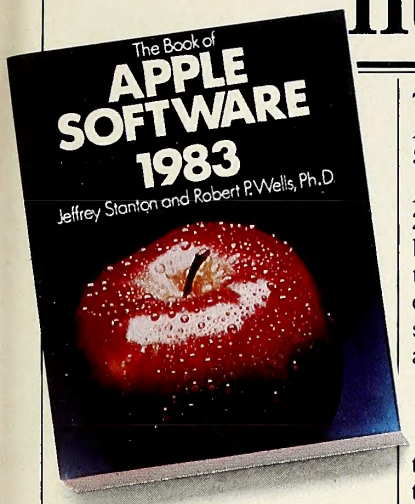
The winner of this contest will win $100 in booty made by advertisers in this issue, and finalists will win a month's supply of Irish Spring.

Also, be sure to include this coupon or a facsimile of it:

I call meself: _____
My house is at: _____
Village, state, zip: _____
Phone: _____
If I win, I'd be so excited to have: _____

Send your entry to Softalk O'Con(nell)test, Box 60, North Hollywood, CA 91603. All entries must be postmarked by April 15, 1983; those in green envelopes will receive priority consideration.

Hundreds of ways to save hundreds of dollars.



GREAT REVIEWS

The Book of Apple Software 1983 $19.95

Software can be a significant investment. But many times it's difficult to compare similar programs to find exactly the program you want.

Enter *The Book of Apple Software 1983*. It's the only source that evaluates (not just lists) hundreds of programs available for Apple microcomputers.

Each evaluation is written by an expert in the type of program being reviewed, be it Accounting, Education, Word Processing or Games. So you get top-notch, impartial information.

Not only does each evaluation tell you all the hard facts (like price, hardware requirements, language, etc), it also gives you a letter grade (A through F) in categories like Ease of Use, Reliability, and Value for Your Money.

The Book of Atari Software 1983 $19.95

Attention Atari 400/800 or 2600 (VCS) owners. Atari has been famous for games, but they also offer a broad selection of software in other areas, such as Business, Education, and Word Processing.

The Book of Atari Software 1983 contains hundreds of incisive reviews. Each evaluation features a concise description of the program, plus a letter grade rating system (A through F), so you'll know at a glance whether or not a particular program is right for you. And it will help to save you money along the way.

Pick up *The Book of Atari Software 1983* soon. It's not just the best consumer guide to Atari software. It's the *only* one.

FUN AND GAMES

Apple Graphics and Arcade Game Design $19.95

It's finally available. Everything you wanted to know about creating arcade games – from Space Invaders to Pacman – but didn't know who to ask.

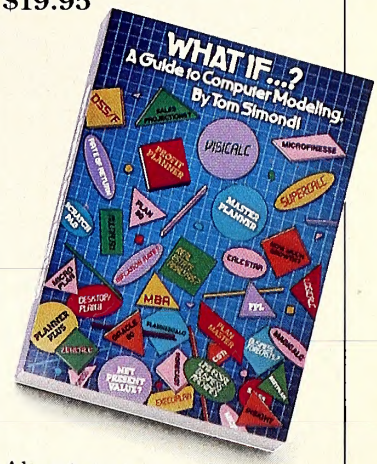
Jeffrey Stanton takes you from game concept through Lo-Res and Hi-Res color graphics at the machine language level. And he gives you a thorough grounding in the Apple's screen architecture and the advantages of bit-mapped design.

Using flow charts and working examples he discusses scoring, laser fire, and bomb drops in both single screen and scrolling games.

This is the "must-have" book for anyone who wants to understand and create a computer game.

PROFITABLE PROJECTIONS

WHAT IF...? A Guide to Computer Modeling $19.95



Almost every practical or business application of computers involves a complex scheme of projections called a model.

WHAT IF...? tells you about these powerful programs in terms that even the new computer-user can understand. You get a general explanation of model building, a comparison of the most popular modeling packages on the market (like VisiCalc and SuperCalc), and all the tools you need to build your own modeling programs. So you'll be able to create models for everything from real estate analyses to cash flow projections for your own company.

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What we have here is Todd "Frosty" Harris (right) grabbing his Oracle'82 Part 2 loot from Tom Kappel of Kappel's Computer Store (Belleville, IL). The loot didn't last long; Harris traded it for *Castle Wolfenstein*, *Bug Attack*, and *Prisoner 2*.

CONTEST WINNERS

Stop right there! Don't you be skipping over to Assembly Lines, or All About Applesoft, or the reviews. Kick off your shoes, open a bottle of pop, and get set for this month's action-packed issue by reading the Contest Winners section first. Some of your fellow readers deserving of recognition are here, and it's only polite to read their names before all those opcodes, mnemonics, and gosubs.

What's in a Name? Back in December, when the Oracle contest was announced, we promised that the winner of the overall contest would win "Apple's next personal computer." At the time, people were guessing: "Super II? Two—And Then Some? Apple IV?" If it's not clear by now, that's an Apple IIe. Sure, we considered awarding the new Lisa computer (ten thousand bucks? Hey, no problem!), but how many games can you play on that thing, anyway? There's no such thing as *Lisardry*, *Lisalifter*, or even *Lisa Wolfenstein. Mouskattack*, maybe.

With a prize such as the coveted IIe at stake, it seemed only appropriate to open the annual contest with something related to Apple's new baby. If you had done any kind of loitering in Apple stores, at Apple fairs; or at an Apple magazine that's based in North Hollywood, you would have known that the new baby was due early in the year.

It was no big secret; the labor pains and short panting emanating from Cupertino could be sensed across the country for months in advance. It's a good thing Apple's not in charge of national security—Ivan would be on us in a flash.

And So It Began. Entries poured in by the hundreds. We were so anxious to see who won that five of our mail deliverers and one post office guard dog are now in intensive care (send get-well cards to Softalk Sick Bay, Box 60, NoHo, CA 91603).

Just a handful of people were able to predict the date of Apple's big day, but Larry Virden (Reynoldsburg, OH) was the one the Random Number Generator liked best. How'd you do it, Larry?

"I just had a feeling it would be somewhere in the middle of January. The nineteenth was the middle day of the middle week, so I picked that day," says Virden, taking his prediction in stride.

Virden wins $100 worth of prizes made by our advertisers, and he plans to blow it on either *ASCII Express: The Professional* or one-seventh of a Hayes Smartmodem 1200.

Though Virden is off to a good start, whether he goes on to win an Apple IIe in the end has yet to be seen; he's predicting that the Oscar for Best Actress will go to Drew Barrymore for her performance in *E.T. The Extra-Terrestrial.*

But then, anything can happen in Oracle '83.

Clueless. For all those who predicted with conviction that "there ain't gonna be no new computer" in 1983, well, what can we say? Under normal circumstances, we would sympathize with you and reconsider our ruthless scoring system (you lose 365 points). But we warned you! And if you don't like it, then tough two-ees.

Then there were those who predicted that

Penguin Graphics Software

Which is for you?

The Complete Graphics System II

by Mark Pelczarski

Complete Graphics System is written for the non-programmer interested in doing a wide variety of graphics and design on the Apple computer. Included are options for two-dimensional drawing, with lines, circles, ellipses, and an automatic 108-color filling routine. Also, you can mix text with graphics, with various colors, sizes, and spacing, and easily create Apple shape tables. Three-dimensional options allow you to draw, edit, and manipulate 3-D objects in perspective—without having to use coordinates. A 2-disk set of additional text fonts is available separately.

Special Effects

by Mark Pelczarski and David Lubar

This is also a non-programmer's package, but oriented more toward computer artistry. It's also an ideal complement to The Complete Graphics System II. It has a brush module that lets you "paint" using a joystick or Apple Graphics Tablet, with the screen as your canvas and a choice of 96 "brushes" and 108 blended colors. You can also magnify any portion of the screen 2 or 4 times for detail editing, perform mirror images, exchange colors, and move parts of pictures to other areas of the screen. Also included is a packing routine that lets you store more pictures on each disk.

Although both Complete Graphics System II and Special Effects are written for non-programmers, they are provided on unprotected disks, and instructions are included for using the graphics and machine language routines in your own programs.

The Graphics Magician

by David Lubar, Mark Pelczarski, and Chris Jochumson

This one is written with the programmer in mind; for anyone who wants to put professional quality graphics in their own software. Fast machine language animation and picture drawing routines are included for use in your own programs, and they're extremely easy to use. Using the editors provided, you simply draw your own multicolored shapes, draw their paths, and combine up to 32 independent shapes with paths and starting locations. The result is a machine language animation file that you just add and control with your own program—it does all the graphics work for you! The adventure-game picture editor works the same way: just draw, save, and add the redraw routine to your program. It increases a disk's storage capacity from 12 pictures to hundreds. A tutorial manual is included with examples of controlling animated objects with joysticks, detecting collisions, and a multitude of other useful hints and examples. For samples of what can be done, see any of our game packages, including PIE MAN, Transylvania, and Spy's Demise, as well as those from several other companies using Graphics Magician for the graphics in their software.

All of our graphics products are on unprotected disks for your convenience.

No fee is required for using our graphics routines in other programs. All our license requires is that it is stated that our graphics routines were used. We are also most interested in publishing good, new products, and beyond our graphics software we can offer further help to authors publishing through Penguin Software.

Instead of offering our own superlatives, we recommend that you read what others have said about our graphics products. Listed here are some of the reviews we've found, along with a few quotable quotes:

Graphics Magician

"recommended to anyone wanting to work with Apple's high resolution graphics for whatever purpose...definitely a program Apple users should have in their software library", Byte, Nov. 82.

"miraculous and marvelous," Creative Computing, Jan. 83.

"makes a graphics magician out of each and every Apple user", Softline, May 82.

Other reviews: Peelings II, Sept-Oct 82. Softalk, May 82.

Complete Graphics System II

"The program earns its name...it brings together at a modest price so many different graphics tools.", Softalk, July 81.

"The three-dimensional utilities verge on the phenomenal", Creative Computing, June 81.

"provides capabilities that go beyond the wishful-thinking stage and painlessly use much of the Apple II graphics potential", Infoworld, March 1, 1982.

Other reviews: Softside, #33. Peelings II, Nov-Dec 81. Cider Press, Sept-Oct 82. Call-A.P.P.L.E., Nov 82

Special Effects

"With Special Effects...the Apple computer comes very close to emulating main-frame computer graphics systems costing as much as $250,000 for only $39.95", Creative Computing, July 82.

"If you can afford only one computer graphics package, this (Complete Graphics System/Special Effects combination) is the one to buy", SoftSide, #33.

Other reviews: Popular Science, Nov 82. Softalk and Peelings II, March 82. Cider Press, Sept-Oct 82.

penguin software

the graphics people

830 4th Avenue, Geneva, IL 60134 (312) 232-1984

BABY PENGUIN NAMED (IT'S A BOY)

Apple would announce a new computer for '83 but were way out in left field (June and later) with their guesses of when it would happen. Get serious, people—can't you see a clue right under your collective nose?

As you may have noticed (after this part of the contest, we have our doubts that you did), the Oracle contest spreads over the course of a year. Each segment of the contest takes place during a different part of the year (National Collegiate Athletic Association Basketball Championships, Academy Awards, Kentucky Derby, and so on). And what do you know? We listed all the events in chronological order.

Since Apple's announcement was the first part of this contest, doesn't it seem likely that it should happen toward the beginning of the year? Sure does. Now, before you go off to a corner mumbling, "I'm such a fenderhead," just remember that you still have a chance in the remaining six parts.

That is, unless you predicted that Ted Kennedy would announce his candidacy, or the Boston Celtics would win the NCAA tournament, or Slipshod Software would make the most Top Thirty appearances, or. . . .

Phantom Contest. Last January, *Softalk* was in a darn generous mood, and we decided to draw four hundred names at random from our subscription list. These four hundred lucky people will each win a 1983 Chrysler Cordoba and a year's supply of Eskimo Pies. And now for the winners.

But wait! What's this? A six-foot, beer-guzzling, M&M-munching penguin has just crashed through *Softalk*'s front doors in a bumper car (how he got past our barbed-wire fences and guard dogs, we'll never know) and handed us the following bulletin:

GENEVA, IL—Deep in the icy confines of their Geneva home, an allegedly innocent (and that *is* "alleged") flock of penguins recently was inundated by what appeared to be thousands of pieces of computer paper, file cards, note paper, and any other surface that could hold a scrap of writing. Some sixteen hundred fifty names rained down upon the flightless ones, who had to call out for pizza and beer to weather the storm.

The paper blizzard consisted of entries to the "Anything But Smokey" contest, in which

ARE YOU STILL LETTING YOUR PRINTER TIE UP YOUR COMPUTER?

While your printer is running, your computer is tied up. You can't use it for processing, computing, data entry. Nothing. All you *can* do is twiddle your thumbs until the program is finished.

Pretty ridiculous.

MICROBUFFER ALLOWS YOU TO PRINT AND PROCESS SIMULTANEOUSLY.

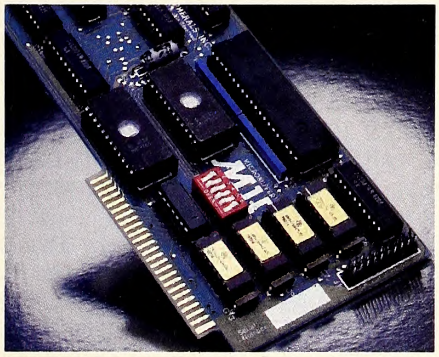
You just dump your printing data directly to Microbuffer, whoosh!, and continue processing. No waiting.

Microbuffer accepts data as fast as your computer can send it. It stores the data in its own memory buffer then takes control of your printer.

It's that easy.

THERE IS A MICROBUFFER ESPECIALLY FOR YOUR APPLE.

Microbuffer II (just one in the full line of Microbuffers) is designed to be specifically compatible with an Apple II



computer. An intelligent interface card with up to 32K of RAM for data buffering, Microbuffer II features on-board firmware for text formatting and advanced graphics dump routines. Both serial and parallel models have energy-efficient low power consumption coupled with a high data transfer rate. Print formatting functions include Basic listing formatter, self-test, buffer zap, text screen dump, fully programmable control characters and transparent and maintain modes — to name only a few.

Microbuffer II is simple to install — being slot-independent, it slips directly inside the Apple II in any slot except zero. The 16K model is priced at $259 and the 32K, at $299.

Other Microbuffer models include Microbuffer/E for Epson printers and a stand-alone, in-line Microbuffer unit to untie virtually any computer/printer combination.

MICROBUFFER FROM PRACTICAL PERIPHERALS.

So what are you waiting for? Write to us for more information or ask your dealer for a demonstration.

When you see how much freedom Microbuffer will allow, you'll understand why it's so silly to be without one.

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WESTLAKE VILLAGE, CA 91362
(213) 991-8200

MICROBUFFER FREES COMPUTERS.

contestants sent in their suggestions for naming the Penguin Software mascot. Entries ranged from minuscule squares of lined notebook paper to practically a whole forest's worth from an entire school district in Pennsylvania. After much squawking and debating, the Penguins reached a consensus.

Ahem! The envelope, please . . . and the winnah is: Preston Penguin, submitted by Thomas F. Bailey (San Diego, CA).

While chosen for its congenial sound, the name Preston arrived with some explanation from Bailey, which bears repeating. ". . . because it evokes the mental image of Sergeant Preston of the Yukon (although not of his faithful sled dog, King), another cold weather fighter of crime and corruption. I suspect that a number of people will have a similar brainstorm, and therefore request that you go by the earliest postmark of entry rather than using the awesome *Softalk* RNG."

Actually, Tom, you were the only one to suggest Preston. Obviously the rest of the world is not as warped as you seem to think.

The runners-up were, in order, Maynard the Penguin, Warren T. Penguin, Phelps Penguin, John Paul Penguin, Waddlesworth, Sir Ice du Berg, and Percival (not Percy). Maynard was submitted by three different people: Richard D. Jeffrey (Sparks, NV), Paul Aoki (Cupertino, CA), and Keith W. Higgins (Schertz, TX). Warren T. was the offering of Ken Hendricks (Grand Rapids, MI).

Phelps was submitted by Stewart E. Smith (Little Rock, AR), along with slogans, explanations, and an address to send "my shirt and directions on selecting my $100 in software." At least the shirt will find its way to your home, Stu. John Paul Penguin came from Charles E. Jones (Brunswick, OH), for obvious reasons. Waddlesworth sprang from the fertile mind of Eric and Sue Huffman (Santa Clara, CA).

Sir Ice du Berg was "Penguin name #17" from B. A. Thale, A.P.O. Miami. Percival was one of the most common (along with Sherlock) of the entries that made it to the final 15—it was sent in by Susan Stamm (Grove City, PA), Lou Briscoe (Saint Charles, MO), Michael Lempert (Haddonfield, NJ), Paige Wait (Eldridge, IA), Steven Peterson, Jr. (Palmdale, CA), Jack English (Piscataway, NJ), Dan Fineman (Los Angeles, CA), John Goldie (Steamboat Springs, CO), and Keith Gonzales (New York, NY).

All of the above-mentioned should wait breathlessly by their mailboxes for the Preston Penguin T-shirt to arrive—as soon as we get them made!

There was a host of other interesting names plus a number of rather boring ones. Among the other finalists were Sherlock, Otis, Elwood, Pinkerton, Drake, Diogenes ("Show me an honest man . . . "), Iona, Agent Pengo, Pat Pending, Max, Sir Fishalot (Penguin name #14 from guess who . . .), Parry, Fred, Payfer, and Paraquat.

To all of those (and God knows there were a lot of you!) who submitted either "Penny" or "Pokey," please go stand in the corner and write "I will try to be more original next time" one thousand times on the nearest blackboard. And remember not to move your feet while you're doing it, regardless of the location of aforesaid blackboard.

To some contest entrants the notion of a solitary penguin on the forefront of the piracy wars seemed too much to bear . . . so they offered sidekicks, including (of all things) a bear! That notable twosome was Zarsky & Dutch, Dutch being the quadrupedal member of the team. And then there was that terrible duo of Captain Penguin and his backup, Mini Diskette.

The award for best sound effects goes to John Schaller (Bridgewater, NY), who suggested the name Protecto the Penguin. His letter ended with, "P.S. Remember, Protecto the Penguin says 'frnk frnk.' . . ." No, John, that's not what the penguins around here say; they say, "I'm going out for M&Ms" or "Where's the coffee?"

One wag, a David Hoover (Toledo, OH), tried Payforit the Penguin. Another, Pete Bermel (Great Falls, VA), tried "Mule Penguin." His primary reason? "Mules do not reproduce!"

A frightening number of people seemed to have missed the point entirely, however, and submitted names such as Pirate, Pilfer, Lafitte, Blackbeak, Jailbird, and (gasp!) Jim Jones. The less said about these deviants, the better.

One other frightening trend in the response to the name-the-penguin contest was the number of double-entendres, intentional or otherwise. Some of the things people seemed to be suggesting sent the Geneva Penguins into a terrified huddle from which they were coaxed only with the greatest of exhortations and several six-packs.

To wit: Paddle the Penguin (ouch), Poach the Penguin (ouch, ouch), Pirate the Penguin (convulse, convulse), Usurp the Penguin, Pilfer the Penguin (hey, lemme go!), Paraquat the Penguin (choke, wheeze, gag), Boot the Penguin (no kicka me 'round, eh?), Snatch the Penguin, Punch the Penguin (says you, fella!), Muffle the Penguin (a popular notion, we're sure . . .), Prosecute the Penguin (for what?!), Chuck the Penguin (from the fourth floor, undoubtedly), Shoplift the Penguin, Jam the Penguin (oooh, our favorite is strawberry), Fire the Penguin (what'd I do, what'd I do?), Pet the Penguin (a wonderful idea), Putty the Penguin (silly), Puff the Penguin, Freeze the Penguin (a ludicrous suggestion at best), and Judge the Penguin (got that one backward, didn't you?).

From the folks here at Penguin, many thanks for your participation. We all enjoyed reading the entries and were suitably overwhelmed by the response. Stay tuned for the further adventures of Preston Penguin. Remember, only you can help prevent software piracy.

We now return you to your local magazine.

Let's see, where were we? We had a list of four hundred subscribers for some reason. Oh, well—it couldn't have been very important. Till next month. . . . ◨

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Fastalk is your quick guide to popular, specialized, or classic software. Programs appearing in Fastalk must meet one or more of the following criteria: (1) equal or surpass in sales the least-selling program to appear on any of the current bestseller lists; (2) relate to a specialized subject area and be in general distribution (more specialized packages and areas will be included as Fastalk matures); (3) be new and of professional quality (such programs will be carried for one month only—after that, they must meet other criteria for inclusion); (4) stand out as extraordinary.

Designation as a classic is noted by a bullet preceding a program's title.

Where opinion is expressed, *Softalk* has seen the software in question; the date of *Softalk*'s review, if any, is given at the end of the item.

Softalk may arbitrarily omit any package from Fastalk, whether or not it meets the foregoing criteria.

Adventure

- **Adventure.** Crowther, Woods. The original text adventure, created on mainframe, contributed to by many over a long time. Very logical within fantasy framework, excellent puzzles, maps; complex, convoluted, and great. Several publishers: Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $28.95. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $35. Frontier Computing, Box 402, 666 N. Main, Logan, UT 84321. $10.
- **Cyborg.** Berlyn. Text adventure with brief action skill game hidden in plot. As a futuristic cyborg, you're lost in a strange forest, desperately needing food and power. In its realism and use of true plot, it represents one of the most significant advances in adventuring since the original *Adventure*. Sentient, Box 4929, Aspen, CO 81612. $32.95. *11/81.*

Deadline. Blank, Lebling. Episode one in a projected series of murder mysteries by the authors of *Zork*. Interrogate, accuse, make transcripts. Includes inspector's casebook, lab report. Text. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95. *8/82.*

Escape from Rungistan. Blauschild. Graphics adventure with some animated real-time puzzles. Espionage theme. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *8/82.*

- **Hi-Res Adventure #1: Mystery House.** Williams. Whodunit in a Victorian mansion. First adventure with pictures. 2-word parser with logical comprehension. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $24.95.

Hi-Res Adventure #2: The Wizard and the Princess. Williams, Williams. Attempt to rescue princess from vengeful wizard. First graphic adventure in full color. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $32.95. *11/80.*

Mask of the Sun. A unique animated graphic quest with full though sometimes frustrating parsing. Moving from room to room involves seeing scenery along the way go by—a graphics breakthrough with nice puzzles. Ultrasoft, 24001 S.E. 103rd St., Issaquah, WA 98027. $39.95. *11/82.*

- **Prisoner 2.** Mullich. Totally relandscaped but loyal version of original game: full-color hi-res graphics added, puzzles reworded, obstacles expanded. Sophisticated and difficult exercise in intimidation with elements of satire. Escape from an island requires player to solve logical puzzles, overcome obstacles, and answer riddles. Excellent computer fare; nothing else like it. Edu-Ware, Box 22222, Agoura, CA 91301. $32.95. *The Prisoner, 3/81*; *Prisoner 2, 10/82.*
- **S.A.G.A. Series.** Adams. Scott Adams's prototypical adventures—12 in all—spruced up with 100-color graphics and Votrax vocals. Fun, not always logical, very story-oriented series. Each adventure has its own theme and often exotic locale. They map small but score big on imagination. Adventure Intl., Box 3435, Longwood, FL 32750. $29.95 each.

Sherwood Forest. Holle, Johnson. Dating game in legendary times. In premiere Softoon adventure featuring neat UltraRes graphics, Robin Hood woos Maid Marian all the way to the honeymoon. Go for it. Phoenix Software, 64 Lake Zurich Dr., Lake Zurich, IL 60047. $34.95.

Starcross. Science fiction prose adventure that comes wrapped in a flying saucer. Set in the year 2186, main puzzle is to discover raison d'etre of miniworld asteroid. Likable, engaging. Infocom, 55 Wheeler St., Cambridge, MA 02138. $39.95. *11/82.*

Swordthrust Series. Set of adventures, seven so far, that integrate fantasy role playing. Create one character, make new friends in each adventure, battle monsters and achieve goals together. Good stories, fun to map. Vocabulary no mystery but puzzles are. Single character goes through all. CE Software, 801 73rd St., Des Moines, IA 50312. Number 1 prerequisite for rest. Each adventure, $29.95. *8/82.*

Time Zone. Williams, Williams. "Microepic" hi-res adventure featuring ten periods from past and future history all over world and universe on six double-sided disks. Good puzzles, many dangers. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $99.95. *1/82.*

Transylvania. Antiochia. Some of best graphics ever in a hi-res adventure. Excellent puzzles and logic—no unfair tricks. Enjoyable. Penguin, 830 4th Ave., Geneva, IL 60134. $34.95. *10/82.*

Zork I. Part one of mainframe adventure; understands complete compound sentences and questions. Simultaneous manipulation of objects. Text, but so what. Infocom, 55 Wheeler St., Cambridge, MA 02138. $39.95. *6/81.*

Zork II. Lebling, Blank. *Zork* comes into its own. Great text adventure technique and communication. Infocom, 55 Wheeler St., Cambridge, MA 02138. $39.95. *3/82.*

Zork III. Lebling, Blank. Text lives! A masterpiece of logic and a grand adventure to revel in. Hard, logical puzzle with unique point system. Benevolence conquers. Infocom, 55 Wheeler St., Cambridge, MA 02138. $39.95. *9/82.*

Business

Accounting Plus II. Integrated package: general ledger, accounts receivable and payable, and inventory-purchasing modules. Basic and machine language. Menu-driven; prompting. Software Dimensions, 6371 Auburn Blvd., Citrus Heights, CA 95610. $1,250.

Accounting Plus IIe. Stripped and rebuilt to take advantage of all IIe functions. General ledger, $450; accounts receivable and payable, $350 each; package, $995. Software Dimensions, 6371 Auburn Blvd., Citrus Heights, CA 95610.

Apple II Business Graphics. Converts numerical data into a variety of charts and graphs. Features mathematical and statistical functions. 64K. Apple, 20525 Mariani Ave., Cupertino, CA 95104. $175.

BPI System. Popular five-module business package; programs also available separately. Includes general ledger (a bestseller), accounts receivable, accounts payable, payroll, inventory control, and job costing. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $395 each; job costing, $595.

Computer Programmed Accountant. Five-module package: general ledger (very popular), accounts receivable, accounts payable, payroll, and property management. All other modules post automatically to general ledger. Continental, 11223 S. Hindry Ave., Los Angeles, CA 90045. $1,495; separate modules: $250 each; property management: $495.

The Data Factory. Passauer. Database management system allows listing files, getting file statistics, transferring records, and adding fields to update forms. Disk swapping required; excellent product overall. Several compatible products available. Micro Lab, 2310 Skokie Valley Rd., Highland Park, IL 60035. $150. *8/81.*

dBase II. Speedy relational database management system. Requires SoftCard. Ashton-Tate, 9929 W. Jefferson Blvd., Culver City, CA 90230. $700.

DB Master. Comprehensive database management system with password protection, extensive report creation options. 1,000 characters per record. Stoneware, 50 Belvedere St., San Rafael, CA 94901. $229. *10/81.*

DB Master Utility Pak I and **Utility Pak II.** Compatible with version III. It translates *DB* files to Apple text, restructures existing files, replicates and merges, and recovers crashed files. II includes accessory disk with label printer, global editor, file merge, reblocker, and forms printer. Stoneware, 50 Belvedere St., San Rafael, CA 94901. $99 each.

Executive Briefing System. Nifty business graphics package for preparing color slides, graphs, and

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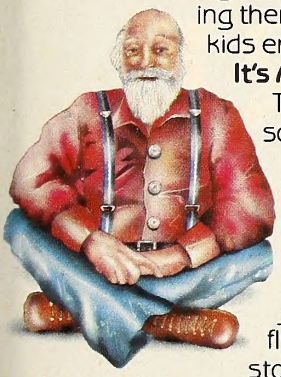

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Your kids will visit the Metallican Auction where they'll trade with the aliens for valuable chips. Your kids will then use these chips to buy things they'll need for their trip. And your kids will learn how to fly over the planet using their jet pack.

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charts. Lotus, 55 Wheeler St., Cambridge, MA 02138. $199.

FCM (1st Class Mail). Schoenburg, Pollack. Fantastically user-friendly program for specialized database applications. 12 fields, sort and filter on any field or combination. Continental, 11223 S. Hindry Ave., Los Angeles, CA 90045. $74.95. *6/82.*

General Manager. User-definable database management system; can use one to four disk drives or hard disk. Change screen and field formats without reentering data. IIe version adds shift key and lower case. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $229.95. Hard disk version, $374.95.

The Incredible Jack. Word processor, database, and spreadsheet in one, plus mailing label print and sort. Gives 80-column dual case display on the IIe. 64K, 80-column card for II Plus. Business Solutions, 60 E. Main St., Kings Park, NY 11754. $79.

List Handler. List-lover's delight. Prints lists, labels, and letters. Handles 3,000 records per disk and eight disk drives. Takes requests. Silicon Valley Systems, 1625 El Camino Real, #4, Belmont, CA 94002. $89.95. *2/83.*

Multiplan. Easy-to-learn electronic work sheet using plain English commands. Powerful modeling and presentation capabilities. For use in analysis, forecasting, technical engineering, and the home. Versions 1.04 and up use 80 columns and extended memory of the IIe. Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $275.

PFS:File (formerly *Personal Filing System*). Page, Roberts. User controls data in totally unstructured database. Up to thirty-two pages (screens) of information in each record. IIe version has 80 columns, u&lc. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125. *10/80.*

PFS:Graph. Chin, Hill. Works alone or interfaces with files created with *PFS:File* and *VisiCalc*. Produces bar, line, and pie charts merging data from several sources. 80 columns and increased graphics support in IIe version. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125. *5/82.*

PFS:Report. Page. Powerful report generator designed for use with *PFS:File.* Sorts, calculates, totals, formats, and prints presentation-quality columnar reports. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125. *6/81.*

Quick File IIe. Easy-to-use personal database filing system. Fifteen fields; files as long as disk allows. IIe, 2 disk drives. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $100.

State of the Art General Ledger and **Budget and Forecasting Module.** The ledger does 12-period accounting, two-digit subaccounts; handles up to 470 accounts; enter 100 transactions before updating to permanent files. Budget module extends the account number to nine digits; custom designs reports; does previous year comparisons. State of the Art, 3183A Airway Ave., Costa Mesa, CA 92626. $495; budget module, $395.

VersaForm. Business forms generator for invoicing, mailing lists, sales analysis, inventory. Hard disk compatible. Applied Software Technology, 14125 Capri Dr., Los Gatos, CA 95030. $389. *6/82.*

Videx Preboot VisiCalc. Prepares *VisiCalc* to run in 80 columns, u&lc. Advanced version uses mixture of existing memory cards. Videx, 897 N.W. Grant St., Corvallis, OR 97330. $49; advanced: $89.

- **VisiCalc.** Bricklin, Frankston. Electronic work sheet for any problem involving numbers, rows, and columns. No programming necessary. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $250. *10/80.*

VisiFile. Creative Computer, Jameson, Herman. Database management system for organization and retrieval of information, allowing sort and modification of records. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $250.

VisiSchedule. Critical path PERT schedule planner. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $300.

VisiTrend/VisiPlot. Kapor. Combines *VisiPlot* graphics with time-series manipulation, trend forecasting, and descriptive statistics. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $259.95. *7/81.*

Communications

ASCII Express: The Professional. Robbins, Blue. Greatly improved version of original modem software package features automatic redial, individual macro files, and conversion of Integer, Applesoft, or binary programs into text files. Works with a plethora of hardware. Southwestern Data, 10761-E Woodside Ave., Santee, CA 92071. $129.95. *12/82.*

Data Capture 4.0. Copyable, modifiable smart terminal program; compatible with Apple III and most lower-case adapters. Southeastern Software, 6414 Derbyshire Dr., New Orleans, LA 70126. $65.

Dow Jones Connector. Guide to the use of the company's news retrieval service and Blue Chip membership, too. Dow Jones Software, Box 300, Princeton, NJ 08540. $95.

Hayes Terminal Program. Standalone disk designed for the Micromodem II lets CP/M, DOS 3.3, and Pascal disks create, list, delete, send, and receive files. Opens access to nonkeyboard ASCII characters and prints incoming data as it is displayed. Hayes Microcomputer Products, 5835 Peachtree Corners East, Norcross, GA 30092. $99.

Micro/Terminal. Access and exchange information with mainframes and minis, databases like the Source, and other remote terminals and personal computers. Allows keyboard mapping, u&lc, 80-column cards. Microcom, 1400A Providence Hwy., Norwood, MA 02062. $84.95.

P-Term: The Professional. Supports all Pascal-compatible interfaces, asynchronous serial cards, Ap-

ple-compatible modems, and baud rates up to 2400. Southwestern Data, 10761-E Woodside Ave., Santee, CA 92071. $129.95.

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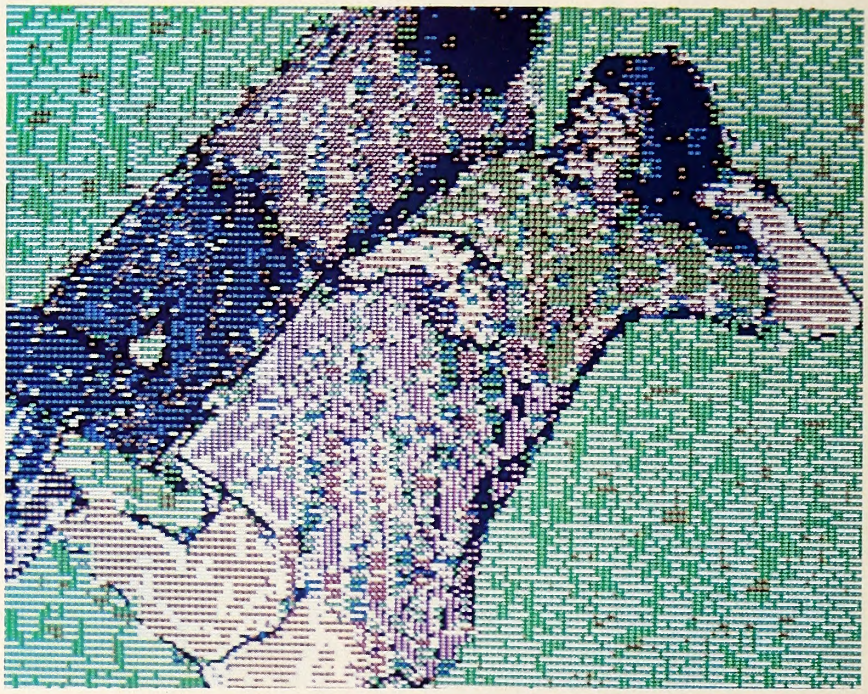
Transend 1, 2, 3. Intelligent terminal software with multiple hardware compatibility. Advanced, easy to use. 1 sends text only; menu driven, limited editor. 2 sends text and files like *VisiCalc*; verifies transmission. 3 does both and handles electronic mail with auto-redial, clock calendar, and password protection. Upgrade, $20. SSM, 2190 Paragon Dr., San Jose, CA 95131. $89, $149, $275. *9/82.*

Z-Term: The Professional. More than an update. Compatible with a great variety of modems, interface cards, and screen modes. Simple file transfer with integrity. Southwestern Data, 10761-E Woodside Ave., Santee, CA 92071. $149.95.



Fantasy

Apventure to Atlantis. Clardy. Sequel to *Odyssey.* Many refinements including recruitable entourage of wizards with individual attributes. Included cheat sheet is invaluable. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $40. *6/82.*

● **Beneath Apple Manor.** Worth. The original dungeon game for the Apple, created in 1978. Newly released version has hi-res, sound effects, a few more magic items, but still the classic game. Quality, 6660 Reseda Blvd., #105, Reseda, CA 91335. $29.95. *2/83.*

Dungeon. Nesmith, Enge. Adaptation of the board game of the same name. Six levels of dungeon—all on one level like board; three levels of difficulty. Limited animation. TSR Hobbies, Box 756, Lake Geneva, WI 53147. $25.

Knight of Diamonds. Second scenario of *Wizardry,* requiring thirteenth-level characters from the original. Individual quests on each of six dungeon levels. Great. Sir-tech, 6 Main St., Ogdensburg, NY 13669. $34.95. *7/82.*

Microbe. Clardy, Zalta. An internal course in medicine, disguised as a fantasy/adventure/arcade/simulation. "Enjoy your next viral infection!" Good game, great educational tool. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $44.95.

● **Odyssey: The Compleat Apventure.** Clardy. Fantasy adventure far beyond one place and one setting. Castles, catacombs, an ocean voyage, and the orb of power. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $30. *10/80.*

● **Temple of Apshai.** Lead title in Dunjonquest series, winner 1981 Academy of Adventure Gaming Arts and Design "Computer Game of the Year" award. Epyx/Automated Simulations, 1043 Kiel Ct., Sunnyvale, CA 94086. $39.95.

Ultima. British. Hi-res color adventure, progressing from Middle Ages to beyond the space age. A masterpiece. California Pacific, 1623 5th St., Davis, CA 95616. $39.95. *6/81.*

Ultima II. British. Faster play in a bigger universe with a time-travel option. Typically British look and feel. Events are much more interdependent; larger realm of fantasy with more transactions available. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $59.95.

● **Wilderness Campaign.** Clardy. First fantasy game to leave the dungeon for the great outdoors; first in hi-res; first to bargain with merchants; and more. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $17.50.

Wizardry. Greenberg, Woodhead. Ultimate role-playing fantasy; ten-level maze in hi-res. Generate twenty characters, six at a time on expeditions. Gripping game; superbly produced. Sir-tech, 6 Main St., Ogdensburg, NY 13669. $49.95. *8/81.*

Graphics

Alpha Plot. Kersey, Cassidy. Hi-res graphics and text utility with optional xdraw cursor and proportional spacing. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $39.50.

The Artist. Schwader. Graphics toolkit for creating shapes, shape tables, character sets. Character animation and byte-move utility routines allow printing text on hi-res screen. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $79.95.

The Complete Graphics System II. Pelczarski. A wealth of graphics tools at a reasonable price. Make 2-D drawings with game paddles, add text in destructive, nondestructive, or reverse modes, create 3-D figures and shape tables. Manual features complete outline of command structure. Penguin, 830 4th Ave., Geneva, IL 60134. $69.95; Apple Graphics Tablet version, $119.95. *7/81.*

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The Graphics Magician. Jochumson, Lubar, Pelczarski. Outstanding animation package consisting of picture editor and shape table extender. Comes with utility program to transfer binary files. Penguin, 830 4th Ave., Geneva, IL 60134. $59.95; Apple Graphics Tablet version, $69.95. *5/82.*

The Graphics Solution. Graphics editor and bit-mapping animation system using film-editing techniques. Saves hi-res screen as a standard DOS file. No programming knowledge necessary. Accent, 3750 Wright Pl., Palo Alto, CA 94306. $149.95.

LPS II. Superb hi-res graphics drawing system with light pen. Draw freehand or use circles and lines to create geometric shapes. Fill routine with colors and patterns; fun animation demo; programmable Pentrak driver. Gibson, 23192-D Verdugo Dr., Laguna Hills, CA 92653. $349. *10/82.*

Zoom Grafix. Holle. Graphics printing utility allows display of picture on screen prior to print; prints out selected portion at any size. Phoenix, 64 Lake Zurich Dr., Lake Zurich, IL 60047. $39.95. *2/82.*

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Career Directions. Take a systematic approach to making career decisions. Professionally designed assessment analysis, planning, and exercises. Systems Design, 723 Kanawha Blvd., #403, Charleston, WV 25301. $59.95.

● **Crossword Magic.** Crossword puzzle maker. Choose subject, words, and clues; program automatically connects words. Play on-screen or make printout. L & S Computerware, 1589 Fraser Dr., Sunnyvale, CA 94087. $49.95.

Dow Jones Market Analyzer (formerly *RTR Market Analyzer*). Automatically collects, stores, and updates historical and daily market quotes. Provides technical analysis and plots eighteen different types of charts. Dow Jones Software, Box 300, Princeton, NJ 08540. $350.

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Home Accountant. Schoenburg. Thorough, powerful home finance program. Monitors live checking accounts against a common budget, plus credit cards and cash; one-step record or transfer of funds. Continental, 11223 S. Hindry Ave., Los Angeles, CA 90045. $74.95. *4/82.*

Know Your Apple. Visually oriented computer tutorial with manual. Covers disks, drives, and peripherals. A model of clarity. Muse, 347 N. Charles St., Baltimore, MD 21201. $29.95.

Know Your Apple IIe. Tutorial program with everything you wanted to know about the soul of your new machine. Muse, 347 N. Charles St., Baltimore, MD 21201. $24.95.

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Nutritionist. Release 4.0 of interactive graphics diet analysis program. Computes nutritive values of meals, menus, or complete diets; creates special requirement diets. N-Squared Computing, 5318 Forest Ridge Rd., Silverton, OR 97381. $145.

Permanent Portfolio Analyzer. Investment tool based on long-term financial strategies of Harry Brown. C.R. Hunter & Associates, 1527 Northwood Dr., Cincinnati, OH 45237. $295.

Personal Finance Manager. Gold, Software Dimensions. Handles 200 entries a month from 14 separate accounts. Search-sort-edit routine. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $75. *11/81.*

Real Estate Analyzer. Make buy-and-sell decisions, compare investments, project future sales for ten years. File, retrieve, and alter information itemized in tabular form. Howard Software, 8008 Girard Ave., #310, La Jolla, CA 92037. $195. *7/81.*

Stock Market Advance Decline Timing Program. Altman. Tells when to buy stocks. Buy/sell recommendations on both short and intermediate term. Defines change in direction of advance/decline line. Dr. R. Altman, Box 1197, Hightstown, NJ 08520. $149.

Tax Manager. Helps prepare federal returns and print schedules. Micro Lab, 2310 Skokie Valley Rd., Highland Park, IL 60035. $150.

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Tax Preparer. Record-keeping program with wide variety of federal tax forms and schedules; creates itemized lists. Yearly updates. Howard Software, 8008 Girard Ave., #310, La Jolla, CA 92037. $99.

Wall Streeter. Collection of stock analysis and management programs that track price, Dow Jones, indices, and advances and declines. Calculates and charts same. Micro Lab, 2310 Skokie Valley Rd., Highland Park, IL 60035. $300.

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A.E. Wada, Horai. Blasting away like mad in 3-D. Time the release and detonation of missiles and repel the next wave. Innovative graphics, new firing technique, and fugues to boot. Broderbund, 1938 4th St., San Rafael, CA 94901. $29.95. *2/83.*

● **Alien Rain (Apple Galaxian).** Suzuki. Monsters in this classic seem to take it personally when you gun down one of their kind. Broderbund, 1938 4th St., San Rafael, CA 94901. $29.95. *9/81.*

Apple Panic. Serki. Rid a five-story building of crawling apples and butterflies by running up and down connecting ladders, digging traps, then covering critters before they devour you. Extremely addictive, excellent hi-res play. Broderbund, 1938 4th St., San Rafael, CA 94901. $29.95. *9/91.*

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Aztec. Stephenson. Graphic fantasy arcade with animation throughout. DataMost, 8943 Fullbright Ave., Chatsworth, CA 91311. $39.95. *1/83.*

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Beagle Bag. Kersey. Twenty games and miscellany, written in Basic and unprotected. Great humor, good two-player games. Manual is worth the price of admission. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50. *1/83.*

Beer Run. Turmell. Catch falling beer cans on your way up one building, hop the blimp, and work your way down another. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *1/82.*

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Bolo. Micro version of sci-fi fantasy. Huge maze where you don't eat anything. Drive around in tank and destroy enemy bases as you're dogged by intelligent assassin tanks. Much depth, many months' fun. Top class. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $34.95. *2/83.*

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Crisis Mountain. Schroeder. Run, crawl, walk, and leap through mountain maze fraught with rolling rocks, geysers, and chasms; defuse nuclear devices. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $34.95. *10/82.*

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David's Midnight Magic. Snider. Pinball challenger to *Raster Blaster*. Excellent hi-res graphics and animation. Broderbund, 1938 4th St., San Rafael, CA 94901. $34.95. *2/82.*

● **Epoch.** Miller. Superbly stylized animation enhances this filmic shoot-'em-up. Tremendous sense of being in space; neat classical music and dramatic time warp sequence. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $34.95. *10/81.*

Evolution. Mattrick, Sember. Player is la prey in six stages from amoeba to human. Surprise ending ain't fun. Sydney, 600-1385 W. 8th Ave., Vancouver, BC, Canada V6H 3V9. $39.95.

Frogger. Lubeck. Not even close. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $34.95. *12/82.*

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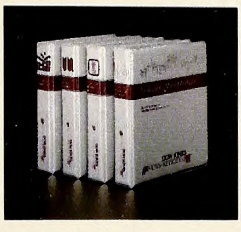

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ing invaders and saving kidnapped inhabitants. Outstanding hi-res graphics, challenging refueling sequence. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95 *8/81.*

Jawbreaker 2. Beuche. No relation or resemblance to *Jawbreaker 1* or Beuche's first. Very playable and addictive. New, fun, and fresh. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $34.95. *1/83.*

Lunar Leeper. Beuche. Silly, enjoyable rescue mission with challenging ship control and unpredictable foes. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $29.95. *1/83.*

● **Meteoroids (Asteroids) in Space.** Wallace. Make little asteroids out of big ones, plus occasional hostile alien ships. Hyperspace, autobrake, autofire. Quality Software, 6660 Reseda Blvd., #105, Reseda, CA 91335. $19.95.

● **Microsoft Decathlon** (formerly *Olympic Decathlon*). Smith. Ten standard decathlon events. Hi-res animated athletes, muscle-stirring music; you provide the sweat. Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $29.95. *6/81.*

Miner 2049er. Livesay, Hogue. Run, jump, climb, and slide through the mines, reinforcing the groundwork along the way. Elevators, cannons, chutes, and ladders help; mutants don't. Hot stuff, best of the genre. Micro Lab, 2310 Skokie Valley Rd., Highland Park, IL 60035. $39.95. *1/83.*

Pie Man. Berns, Kosaka. Everyone loves Lucy's classic bit with the pies and the conveyor belt, immortalized in hi-res. Penguin, 830 4th Ave., Geneva, IL 60134. $29.95. *10/82.*

Pinball A2-PB1: Night Mission. Artwick. Fantastically realistic and competitive ten-mode pinball simulation, allowing user modification and definition of play. SubLogic, 713 Edgebrook Dr., Champaign, IL 61820. $29.95. *5/82.*

Pinball Construction Set. Budge. Design and play your own computer pinball games, on-screen, with zero programming. A miracle of rare device. Superior. BudgeCo, 428 Pala Ave., Piedmont, CA 94611. $39.95. *2/83.*

● **Pool 1.5.** Hoffman, St. Germain, Morock. Makes most shots you could on a real table, with the advantages of instant replay and slow motion. Four different games. IDSI, Box 1658, Las Cruces, NM 88004. $34.95. *6/81.*

● **Raster Blaster.** Budge. First realistic pinball game. *Softalk* readers' Most Popular Program of 1981. BudgeCo, 428 Pala Ave., Piedmont, CA 94611. $29.95. *5/81.*

Repton. Thompson, Kaluzniacki. The *ne plus ultra* of planet-defending, in the *Defender* style, plus. Top flight all the way. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95. *1/83.*

Ribbit. Small, green, amphibious game for the Apple. Scarce. Piccadilly, 89 Summit Ave., Summit, NJ 07901. $29.95.

Seafox. A good sub-versus-convoy home-arcader. Variety of vessels, bouncing torpedoes, refueling dolphins, and intelligent depth charges. Broderbund, 1938 4th St., San Rafael, CA 94901. $29.95. *11/82.*

Serpentine. Hypnotic snake-chase maze game. Clean action, thrills, hairy escapes. Recommended. Broderbund, 1938 4th St., San Rafael, CA 94901. $34.95. *10/82.*

Snack Attack. Illowsky. Three-maze eat-'em-up; starts at any of five speed levels. Nonfattening. DataMost, 8943 Fullbright Ave., Chatsworth, CA 91311. $29.95. *1/82.*

● **Sneakers.** Turmell. Many-layered shoot-'em-up; one of the best. Stomping sneakers and other creatures require varying techniques. Fun. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *9/81.*

Spy's Demise. Be the first on your block to run a maze of pile-driving elevators. Fast, frustrating fun. Complete puzzle after all nine levels. Penguin, 830 4th Ave., Geneva, IL 60134. $29.95. *11/82.*

Star Blazer. Suzuki. Bomb-run game with five levels, minutely exact animation, and style to burn. A joy. Broderbund, 1938 4th St., San Rafael, CA 94901. $31.95. *4/82.*

Star Maze. Eastman. Hunting for power jewels through 16 zero-gravity mazes filled with unfriendlies. 18 hi-res colors, multidirectional scrolling. A standout. Sir-tech, 6 Main St., Ogdensburg, NY 13699. $34.95. *11/82.*

● **Super Invader.** Hata. Progenitor of home arcades. Still good hi-res, still a challenge. *Softalk* readers' Most Popular Program of 1978-80. Astar Intl., through California Pacific, 1615 5th St., Davis, CA 95616, and Creative Computing, 39 E. Hanover Ave., Morris Plains, NJ 07960. $19.95.

Super Taxman 2. Fitzgerald. Pac up your troubles! Bigger, more complex version of the most perfect extant rendition of a certain arcade game. H.A.L. Labs, 4074 Midland Rd., #23, Riverside, CA 92505. $25. *1/83.*

Swashbuckler. Stephenson. Hi-res swordfighting with animated pirates, snakes, rats, and other scum. DataMost, 8943 Fullbright Ave., Chatsworth, CA 91311. $34.95. *8/82.*

Tubeway. Van Brink. Tempestuous galaxy-saving action with 32 levels. DataMost, 8943 Fullbright Ave., Chatsworth, CA 91311. $34.95.

Wargle. Bernstein. Maneuver through square-grid layout zapping a "wolf pack." Looks innocuous but soon induces *Crossfire*-style hypnosis. Hayden, 50 Essex St., Rochelle Park, NJ 07662. $34.95.

Wavy Navy. McAuley. Galaxy shooting game brought down to sea level in bright, cartoon-style hires. No aliens raining on player's patrol boat; just kamikaze pilots, bombers, and missiles. Shoot them, or it's "P.T. blown home." Good, fun game. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $34.95. *2/83.*

● **Wayout.** Exciting 3-D maze that moves in perspective as you play. Map displayed at all times. Lots of angles and Cleptangles. Separate version for IIe. Exquisite motion animation is breakthrough. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95. *10/82.*

Home Education

Algebra 1-4. Sets of learning units progressing from algebraic rules and definitions to graphing and inequalities. Individualized teaching styles to fit everyone's needs. Good for adults wanting to overcome math anxiety as well as for schoolkids. Edu-Ware, Box 22222, Agoura, CA 91301. $39.95 each.

Alien Addition. Arcade add-'em-up game has kids defend against invading addition problems. Select speed, difficulty level, game length. Developmental Learning Materials, One DLM Park, Allen, TX 75002. $29.95.

Alligator Mix. Alligators get to eat only if addition and subtraction problems match answers on their tummies. Choose speed, difficulty. Developmental Learning Materials, One DLM Park, Allen, TX 75002. $29.95.

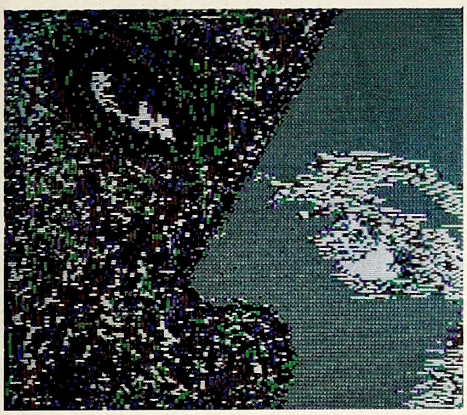
Apple Logo. Papert. Custom version (by its inventor) of turtle graphics language. First-rate educational tool. Great kid-friendly documentation. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $175.

Bop-A-Bet. Alphabetic eat-'em-up, teaching letter recognition and eye-hand coordination. Lets little ones emulate older sibs. Sunnyside Soft, 5815 E. Parkside, Fresno, CA 93727. $29.95. *2/83.*

Bumble Plot. Colorful musical introduction to concepts of graphing and plotting. Teaches positive and negative numbers. The Learning Co., 4370 Alpine Road, Portola Valley, CA 94025. $60. *1/83.*

Compu-Read. Set of programs develops speed and retention in reading. Stresses character and word recognition, comprehension. Edu-Ware, Box 22222, Agoura, CA 91301. $29.95.

CyberLogo. Woodhead. Logo learning package introduces computers, uses imaginary school and



playground settings to teach kids language with fun. Includes off-computer activities for reinforcement. By *Wizardry* author. Only Logo for 48K Apples. Cybertronics Intl., 999 Mount Kemble Ave., Morristown, NJ 07960. $99.95.

Demolition Division. Correct answers destroy tanks carrying dangerous division problems. Choose difficulty, speed. Developmental Learning Materials, One DLM Park, Allen, TX 75002. $29.95.

Dragon Mix. Friendly dragon breathes kids' fiery answers to stop multiplication and division problems on the attack. Choose speed, difficulty. Developmental Learning Materials, One DLM Park, Allen, TX 75002. $29.95.

Dragon's Keep. Graphics adventure in which youngsters find and free imprisoned animals. Written for second-grade-level readers; requires the touch of a key, no typing, to execute actions. Encouraging and rewarding. All upbeat. Sunnyside Soft, 5815 E. Parkside, Fresno, CA 93727. $34.95. *2/83.*

Earl's Word Power. Knudson. Educational software providing homonym training in a Shakespearean mode. Late elementary to early junior high level. Neat. George Earl, 1302 S. General McMullen, San Antonio, TX 78237. $29.95.

Early Games for Young Children. Paulson. Basic training in numbers, letters, Apple keyboard for children ages two to seven. Has a neat little drawing program. Counterpoint Software, Ste. 140, Sherlard Plaza North, Minneapolis, MN 55426. $29.95. *11/82.*

Ernie's Quiz. CTW. Four games, four subjects, one disk. Image recognition, counting skills, creativity, and Muppet expertise are introduced with lots of positive feedback. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $50. *2/83.*

Facemaker. DesignWare. Exercises kids' creativity and introduces programlike command sequencing as kids create faces and link them together in animated pattern. Spinnaker Software, 215 First St., Cambridge, MA 02142. $34.95.

Gertrude's Secrets. Gertrude the Goose teaches four-to-nine-year-olds shape and color relationships. Solve logic puzzles, create shapes. The Learning Co., 4370 Alpine Rd., Portola Valley, CA 94025. $75. *2/83.*

Instant Zoo. CTW. Identify animals, test perception and reaction, match and decode words. Word editor lets you create your own word lists. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $50.

Knowledge Bowl. Home version of that TV college quiz show. Test knowledge of humanities, social sciences, and hard sciences in more than thirty programs. Play alone or compete with companion. Well done. Academic Hallmarks, Box 998, Durango, CO 81301. $27 each.

Krell Logo. Concentrates on underlying principles of Logo; sections on assembly language interfaces and music creation, plus *Alice in Logoland* tutorial. Krell, 1320 Stony Brook Rd., Stony Brook, NY 11790. $149.95. *7/82.*

Letter Man. Teaches typing, *Pac-Man* style. Behavioral Engineering, 230 Mt. Hermon Rd., #207, Scotts Valley, CA 95066. $29.95.

MasterType. Zweig. Learn to type by playing a game; simple and ingenious. Lightning, Box 11725, Palo Alto, CA 94306. $39.95. *4/81.*

Meteor Multiplication. Shoot correct answer at plummeting meteors and save star station. Developmental Learning Materials, One DLM Park, Allen, TX 75002. $29.95.

Micro Mother Groose. Rhyme-related games with progressive levels, music, animation. Simple enough for tots to operate it. Free poster and stickers, too. Software Productions, 2357 Southway Dr., Box 21341, Columbus, OH 43221. $39.95. *2/83.*

Minus Mission. Failing blobs of subtraction problems threaten to overcome robot with green slime. Correct answers stop them. Developmental Learning Materials, One DLM Park, Allen, TX 75002. $29.95.

Mix and Match. CTW. Create mixed-up Muppets and teach the Apple about animals. Logic and word-guessing games. Add your own word lists. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $50. *2/83.*

The New Step by Step. Software and audio tape team up to teach Basic programming painlessly. Graphics, animation, sound effects, and workbook. Superior. Program Design, 11 Idar Ct., Greenwich, CT 06830. $79.95. *7/82.*

Punctuation Skills: Commas. Covers all uses of the comma. **Punctuation Skills: Endmarks.** Covers semicolons, colons, exclamation points, and periods. Milton Bradley, 111 Maple St., Springfield, MA 01105. Each, $49.95.

Rocky's Boots. Rascally raccoon helps children build logical thinking and computer understanding. Construct machines of logical gates in convolutions of thickening complexity. Music and sound effects add to fun. The Learning Co., 4370 Alpine Rd., Portola Valley, CA 94025. $75. *2/83.*

SAT English I. Designed to help high school students prepare for college entrance exam. Covers verbal half of test; learn by mistakes. Micro Lab, 2310

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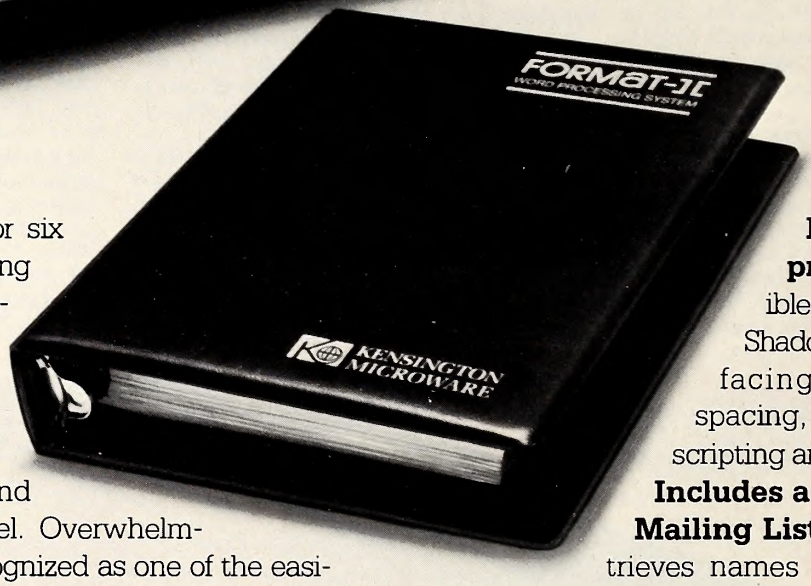

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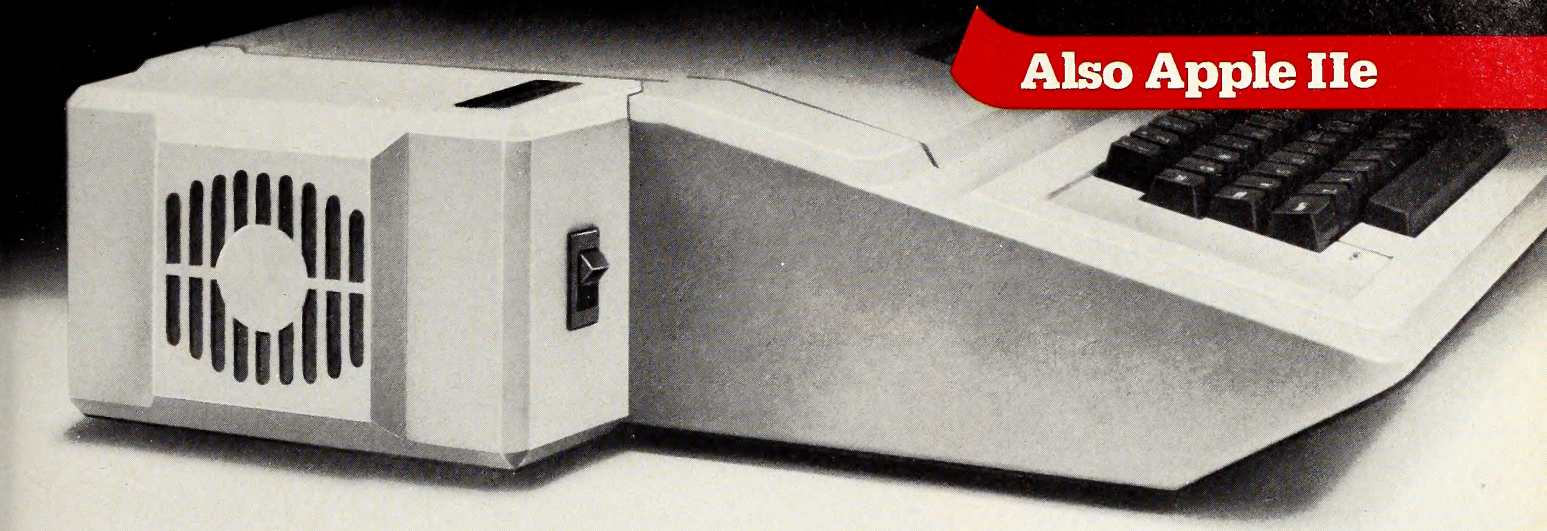

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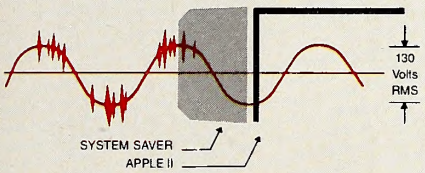
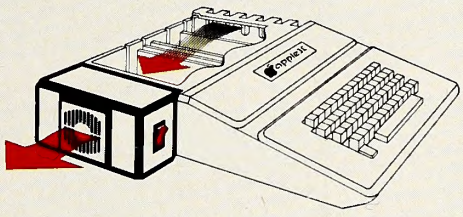


By connecting the Apple II power input through the SYSTEM SAVER, power is controlled in two ways. 1) Dangerous voltage spikes are clipped off at a safe 130 Volts RMS/175 Volts dc level. 2) High frequency noise is smoothed out before reaching the Apple II. A PI type filter attenuates common mode noise signals by a minimum of 30 dB from 600 khz to 20 mhz, with a maximum attenuation of 50 dB.

For Cooling

As soon as you move to 64K RAM or 80 columns on your Apple II you need SYSTEM SAVER.

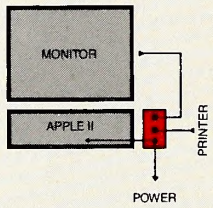
Today's advanced peripheral cards generate more heat. In addition, the cards block any natural air flow through the Apple II creating high temperature conditions that substantially reduce the life of the cards and the computer itself.

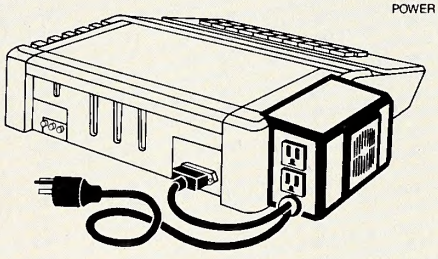


SYSTEM SAVER provides correct cooling. An efficient, quiet fan draws fresh air across the mother board, over the power supply and out the side ventilation slots.

For Operating Efficiency

SYSTEM SAVER contains two switched power outlets. As shown in the diagram, the SYSTEM SAVER efficiently organizes your system so that one convenient, front mounted power switch controls SYSTEM SAVER, Apple II, monitor and printer.





The heavy duty switch has a pilot light to alert when system is on. You'll never use the Apple power switch again!

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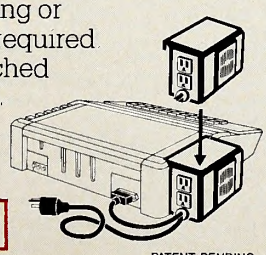
No mounting or hardware required.
Color matched to Apple II.



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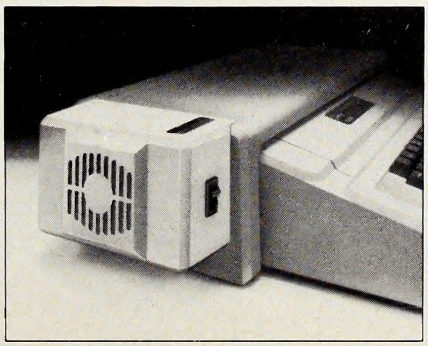

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Written by Greg and Gil; Assembly Language (48K); Requires an Apple II or II+ computer with DOS 3.3; Apple II is a trademark of Apple Computer, Inc.

Skokie Valley Rd., Highland Park, IL 60035. $30. *11/81.*

Snooper Troops. Snyder. Ongoing hi-res mystery series in form of educational games. Highly structured; excellent fourth through eighth-grade educational tool. Fun for adults, too. Spinnaker Software, 215 1st St., Cambridge, MA 02142. $44.95 each. *9/82.*

Spelling Bee Games. Hi-res games strengthen hand-eye coordination, memory, motor skills. Word lists include shapes, animals, more. Edu-Ware, Box 22222, Agoura, CA 91301. $29.95.

Spotlight. CTW. Simple geometry for preteens. Games involve number estimation and angles of reflection. Good and fun. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $50.

Stickybear. Hefter, Worthington. Animated early education programs. In *Stickybear ABC*, moving

pictures with sound represent letters. In *Stickybear Numbers*, groups of moving objects teach numbers and simple arithmetic. Ages three through six. Xerox Education/Weekly Reader, 245 Long Hill Rd., Middletown, CT 06457. $39.95 each.

Story Machine. Helps develop positive attitude toward writing and ability to write correctly. Words come to life when sentence typed is acted out on-screen. Kids five to nine love to type "The tree ran down the street" and see it do so. Spinnaker Software, 215 1st St., Cambridge, MA 02142. $34.95.

Terrapin Logo. MIT. The Logo language, using a Terrapin turtle to teach state, control, and recursion. Terrapin Inc., 380C Green St., Cambridge, MA 02139. $149.95.

Type Attack. Hauser. Learn to type while defending the planet of Lexicon from invaders. IIe version teaches IIe keyboard. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95.

Typing Strategy. Uses animated keyboard image and two typing games to teach a typing strategy. Behavioral Engineering, 230 Mt. Hermon Rd., #207, Scotts Valley, CA 95066. $29.95.

Typing Tutor. Ainsworth, Baker. Four levels of proficiency; individualized drills created with time-response monitoring. Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $24.95.

Vocabulary Skills: Subtext Clues. Develops vocabulary through context, contrast, educated guesses, and examples. **Vocabulary Skills: Prefixes, Suffixes, Roots.** Includes concepts, prefix and suffix tutors, and word building. Milton Bradley, 111 Maple St., Springfield, MA 01105. Each, $49.95.

Word Attack! Davidson, Eckert. Builds vocabulary through multiple-choice quiz, sentence-completion exercises, and arcade game. Nine levels of word difficulty. Davidson, 6069 Groveoak Pl., #2, Rancho Palos Verdes, CA 90274. $49.95.

Strategy

Black Jack Strategy. Wazaney. Strategy tables, simulator, and tutor, plus free fast DOS loader program. Play-mode dealer's tough to beat. Soft Images, 200 Rt. 17, Mahwah, NJ 07430. $69.95.

Casino. Five hi-res games, Vegas-style: blackjack, baccarat, keno, poker, and roulette. DataMost, 8943 Fullbright Ave., Chatsworth, CA 91311. $39.95. *10/82.*

- **Castle Wolfenstein.** Warner. First game to fuse successfully strategy, home-arcade fantasy. Escape from Nazi stronghold with secret plans. Room layout changes with each new game. Enemy speaks, in German. Muse, 347 N. Charles St., Baltimore, MD 21201. $29.95. *10/81.*

Chess 7.0. Atkin. A loving piece of programming; neither too slow nor too easy. Plays a mean end game. Tops yet. Odesta, 930 Pitner, Evanston, IL 60202. $49.95. *1/83.*

- **Computer Baseball.** Merro, Avery. Simulates individual player abilities from the teams of thirteen famous World Series. Enter and play teams of your own creation. Strategic Simulations, 465 Fairchild Dr., #108, Mountain View, CA 94043. $39.95. *9/81.*

Cosmic Balance. Design your own ships and create your own space fleet. Tactical space game that's fast and easy to play. Strategic Simulations, 465 Fairchild Dr., #108, Mountain View, CA 94043. $39.95. *11/82.*

- **Flight Simulator.** Artwick. Uses aerodynamic equations, airfoil characteristics for realistic takeoff, flight, and landing. Two years on Top Thirty. SubLogic, 713 Edgebrook Dr., Champaign, IL 61820. $33.50.

Flip Out. Huskey. Drop marbles through top of maze, activating traps to free your marbles and trap your opponent's. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95.

Frontline. Eagan. New wave strategy/arcade hybrid requiring simultaneous offensive and defensive play. Tests mind, reflexes. SubLogic, 713 Edgebrook Dr., Champaign, IL 61820. $29.95.

Germany 1985. First game in SSI's World War III quartet. NATO forces tangle with Soviet troops in West Germany. Operational-level; two scenarios with solitaire option. Strategic Simulations, 465 Fairchild Dr., #108, Mountain View, CA 94043. $59.95.

Gin Rummy. Carpet. Play against computer. Hi-res hand can be arranged. Knocking allowed. Computer plays pretty well. DataMost, 8943 Fullbright Ave., Chatsworth, CA 91311. $29.95. *6/82.*

Hi-Res Computer Golf. Aronoff. A masterpiece; requires judgment, strategy, and visual acuity. One of the few computer sports simulations that requires dexterity. Avant-Garde, Box 30160, Eugene, OR 97403. $29.95. *2/82.*

- **Microgammon II.** Program for play, practice, improvement of backgammon skills. Pretty good competition. Softape, 5547 Satsuma Ave., North Hollywood, CA 91601. $19.95. *2/81.*

Pandemonium. Wazaney. Solitaire-poker word game with 6,000-word dictionary, scoring display, and player-selectable clock. Soft Images, 200 Rt. 17, Mahwah, NJ 07430. $39.95.

Rendezvous. Huntress. Space shuttle simulation in 3-D, created by senior scientist at JPL. Orbit earth, match orbit, and dock with space station. Authentic, demanding. Edu-Ware, Box 22222, Agoura, CA 91301. $39.95. *7/82.*

- **RobotWar.** Warner. Strategy game with battling robots is teaching device for programming. Muse, 347 N. Charles St., Baltimore, MD 21201. $39.95. *1/81.*
- **Sargon II.** Spracklen, Spracklen. Computer chess game with seven levels of play. Hayden, 50 Essex St., Rochelle Park, NJ 07662. $34.95.

Space Vikings. Robbins. 3-D simulation of space combat. Raid the planets of twenty star systems, gathering loot and establishing bases. SubLogic, 713 Edgebrook Dr., Champaign, IL 61820. $49.95.

Spitfire Simulator. Air flight simulator—Spitfire in combat with German Aces—with 3-D scenery and moving target aircraft. Mind Systems, Box 506, Northampton, MA 01061. $40. *12/82.*

Zendar. Eagan. Manage struggling economies of an 8-nation island. Very long game. SubLogic, 713 Edgebrook Dr., Champaign, IL 61820. $29.95.

Utility

Amper Magic. Nacon. Attaches machine-language routines to Applesoft programs. No knowledge of machine language necessary. Anthro-Digital, 103 Bartlett Ave., Pittsfield, MA 01201. $75.

Apple-Cillin. Hardware diagnostic tests for all RAM and ROM, plug-in cards, cp registers, disks; nine video test patterns. XPS, 323 York Rd., Carlisle, PA 17013. $49.95.

Apple Mechanic. Kersey. Multiple utility disk with shape editor, custom typefonts, byte rewriter, and tricks to facilitate music, text, and hi-res generation. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50. *9/82.*

Apple Spice. Kosak, Fox. Powerful Applesoft expansion utility using *&* and *usr* functions. Easily incorporated programming routines. Adventure Intl., Box 3435, Longwood, FL 32750. $29.95. *5/82.*

Audex. Collection of utilities to create, edit, and play back sounds; in Basic and assembly language. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95.

Bag of Tricks. Worth, Lechner. Four utility programs for dumping and examining raw tracks, sector editing, reformatting tracks, and repairing damaged catalogs. Indispensable. Quality Software, 6660 Reseda Blvd., #105, Reseda, CA 91335. $39.95.

Bug Byter. Screen-oriented mnemonic debugging tool with resident assembler and disassembler. Displays contents of accumulator, X and Y registers. Computer-Advanced Ideas, 1442A Walnut St., #431, Berkeley, CA 94709. $47.50.

DOS Boss. Kersey, Cassidy. Utility to change DOS commands; customize catalog. Good ideas and witty presentation. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $24. *10/81.*

DOS Tool Kit. Excellent utility package; Apple II assembler-editor system and Applesoft toolkit. Edit, assemble machine language programs; write, edit Basic programs. Simplifies graphics, includes character generator. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $75. *10/81.*

Flex Text. Simonsen. Adds graphics to text and vice versa; prints variable-width text with no hardware. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50.

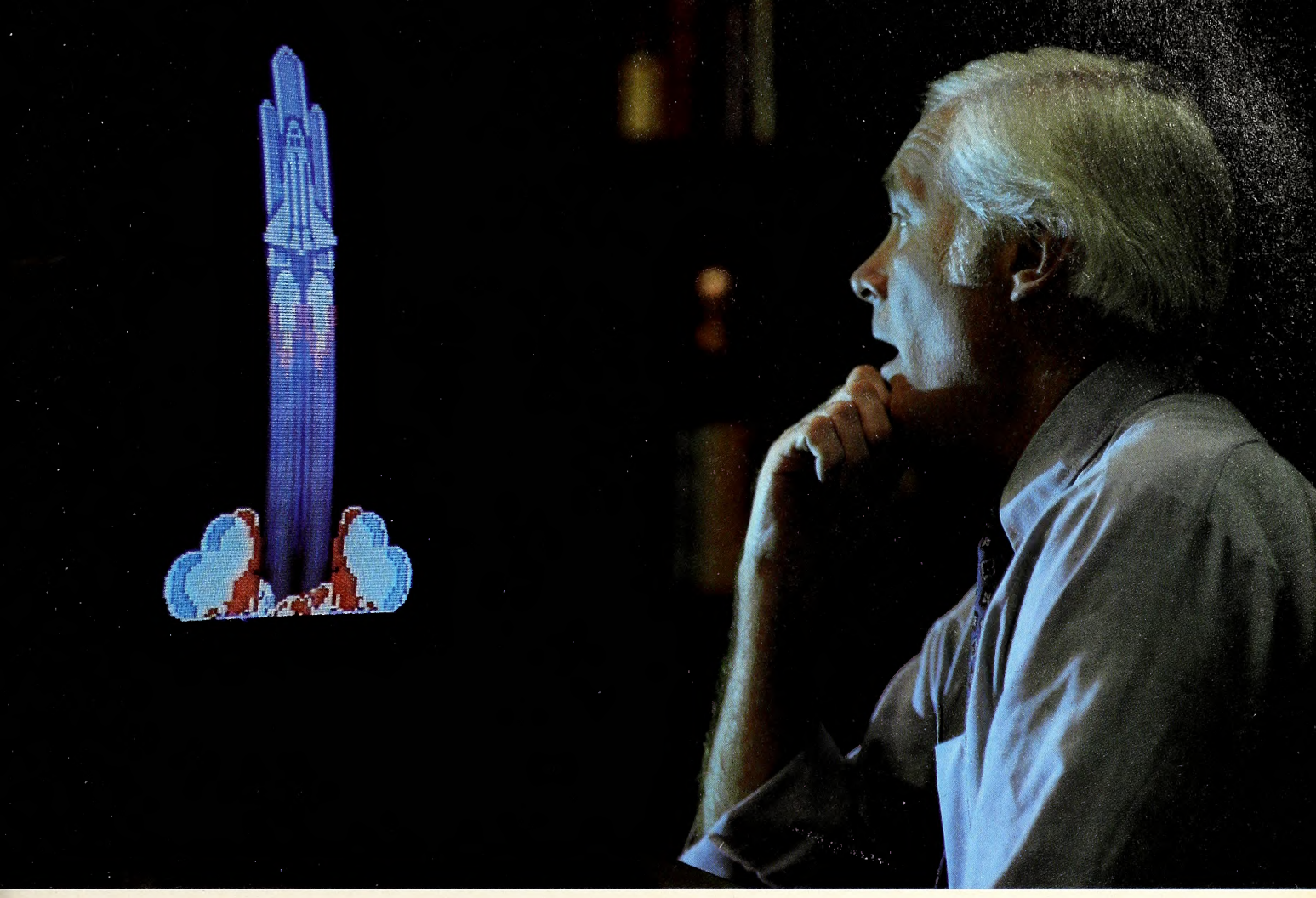
GPLE. Enhanced version of *Program Line Editor.* Edit everything on a line, line by line, or on a range of lines; plus search for strings. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $60.

LISA 2.5. Hyde. Longtime popular assembler with extended mnemonics and more than thirty opcodes. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $79.95.

Master Diagnostics. Twenty-four tests that check Apple II Plus for component malfunctions and suggest replacement. Software Source, 17905 Ventura Blvd., Encino, CA 91316. $69.95. *8/82.*

Merlin. Does assembly language programming with dozen editing commands and 28 pseudo-ops. Southwestern Data, 10761-E Woodside Ave., Santee, CA 92071. $64.95.

- **Program Line Editor.** Program development and modification program with more than eleven editing commands, listing control, lower case, and pro-



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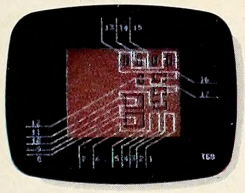

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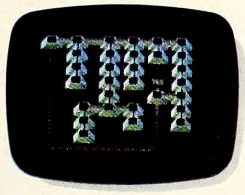

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grammable cursor control. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $40.

Pseudo-Disk. Turns RAM card into additional temporary disk drive. Thermal Scan, 1779 Bradburn Dr., St. Louis, MO 63131. $34.95.

Simple DOS. Text file utility creates files, adds or changes records, without a DBM package. SoftStalker, Box 689, Steamboat Springs, CO 80477. $49.95.

● **Super Disk Copy III.** Hartley. Easy-to-use menu-driven software utility; correct file sizes, undelete, free DOS tracks, more. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48033. $30. *10/81.*

Type Faces. Printing enhancement tool for dot-matrix printers; fifteen hi-res character fonts available. Alpha, 12 New England Executive Park, Burlington, MA 01803. $125.

Utility City. Kersey. Twenty-one utilities on one disk. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50.

Word Processing

Apple Writer II. Lutus, Finstead. Written in word-processing language. Additional editing features and functions menu; continuing features and functions menu; continuous readout of character count and length. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $150.

Apple Writer IIe. Shift, shift-lock, and tab with those keys, four-arrow cursor control, delete key. Data files compatible with II Plus. IIe only. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $195.

Bank Street Writer. Kusmiak, Bank Street College of Education. Designed for use by whole family. Universal search and replace, word wrap are standard. U&lc without hardware. On-disk tutorial. Takes advantage of memory, keyboard on IIe, if you have one. Broderbund, 1938 4th St., San Rafael, CA 94901. $69.95. *2/83.*

Dictionary. Expandable 25,000-word spell-checking program for *Superscribe, Screen Writer, Apple Pie,* and *Apple Writer.* Instant look-ups and corrections. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $99.95.

Executive Secretary. Editing, printing, and form letters, plus mail merge and electronic mail system. SofSys, 4306 Upton Ave. S., Minneapolis, MN 55410. $250.

Format II. Word processor with logic-sorting mailing list. Justifies type, wraps text; has one-key editing, menu prompting. Kensington Microware, 300 E. 54th St., #3L, New York, NY 10022. $250. *2/83.*

Letter Perfect. Format-flexible word processor with ability to send control codes within body of program. Works with database files from *Data Perfect.* LJK, Box 10827, St. Louis, MO 63129. $149.95. *12/82.*

Magic Window II. 40, 70 (in hi-res), or 80 columns in this expanded version. Compatible with Pascal 80-column. With user-tailored, fast menu; underlining; global search and replace. IIe version uses all 64K, more if you have it. Artsci, 5547 Satsuma Ave., North Hollywood, CA 91601. $149.95.

Pie Writer. Business processor allows 9,999 pages. Word deletion, auto indent, spooling, and type-ahead buffer. Hayden, 50 Essex St., Rochelle Park, NJ 07662. $149.95.

PowerText. Does memos, letters, reports, and manuscripts without formatting each time. Good balance of automatic and user-defined functions. Beaman Porter, Pleasant Ridge Rd., Harrison, NY 10528. $199.

ScreenWriter II. Kidwell, Schmoyer. No extra hardware for u&lc, 70-column display, printer spooling. Edits Basic, text, and binary files; complete search and replace. IIe version uses 80 columns, u&lc, shift key, and all available memory. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $129.95. *1/83.*

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Sensible Speller. Spell-checking program sports listable 85,000 words, extensible up to 110,000 words. Recognizes contractions, gives word counts, word incidence, number of unique words. Clear documentation and simplicity of operation. Works with many word processors' files. Best of breed. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48033. $125. *1/82.*

Super-Text Home/Office (40/56/70). Zaron. Get 40, 56, or 70 columns without hardware. Design character sets. Basics of text editing. Character-oriented, floating-cursor edit with add, change, print, and preview modes. Muse, 347 N. Charles St., Baltimore, MD 21201. $125.

Super-Text Professional (40/80). Automatic 80-column, u&lc on equipped IIe; with appropriate equipment on II Plus. On-screen formatting and help reference guides. Muse, 347 N. Charles St., Baltimore, MD 21201. $175.

Videx Preboot Apple Writer. 80-column display for *AppleWriter II* with u&lc input from keyboard. Enhancer II and Videoterm compatibility. Videx, 897 N.W. Grant St., Corvallis, OR 97330. $19.

Word Handler II. Elekman. Simple program with straightforward documentation. Allows folded paper printout for two-sided printing. Silicon Valley Systems, 1625 El Camino Real, #4, Belmont, CA 94002. $199. *11/82.*

WordStar. Screen-oriented, integrated word processing system in CP/M. Z-80. MicroPro, 33 San Pablo Ave., San Rafael, CA 94903. $495.

Zardax. Philips. Highly recommended. Single program includes supersimple use of powerful word processing features. Considerable extras including communication by modem. Good 80-column facility with board, automatic in IIe version. Computer Solutions, Box 397, Mount Gravatt, Queensland, Australia. In the U.S.: Action-Research Northwest, 11442 Marine View Dr. S.W., Seattle, WA 98146. $295. *Zip-Comm* modem program. $80. *11/82.*

Apple III

Access III. Communications program for time sharing and standalone tasks; gives access to remote information services, minis, and mainframes. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $150.

Apple Business Basic. High-level structured programming language. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $125.

Apple III Business Graphics. BPS. General-purpose graphics program draws line graphs, bar graphs in three formats, overlays, and pie charts in 16 colors. Continuous or discrete data; curve-fitting capabilities. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $175.

Apple Writer III. Lutus. Uses WPL (word processing language) to automate text manipulation and document creation. Adjusts print format during printing; translates from typewriter shorthand to English or other language and back again. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $225.

Basic Extension. Extension of Business Basic using disk, array, and utility routines as invokable modules. Machine language; nonmodifiable. Foxware, 165 W. Mead Ave., Salt Lake City, UT 84101. $95.

Catalyst. Allows boot from hard disk; transfers all programs to ProFile. Quark Engineering, 1433 Williams, #1102, Denver, CO 80218. $149.

Data Manager III. Expansion of *Data Factory* allowing 32,000 records per file. Custom screen display and printing. Micro Lab, 2310 Skokie Valley Rd., Highland Park, IL 60035. $750.

Data Reporter. Flexible database management system. Does form letters, patient files, labels, calculations, inventories, and employment records. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $220.

dBase II. Speedy relational database management system. Z-80. Ashton-Tate, 9929 Jefferson Blvd., Culver City, CA 90230. $700.

Hardisk Accounting Series, 2.0. General ledger, accounts receivable, and accounts payable handle 32,776 customers or accounts; inventory features five methods of evaluation. Also payroll, management analysis, and mailing labels. Great Plains Software, 123 N. 15th St., Fargo, ND 58102. $395 to $595 per module.

Lexicheck. Spelling checker that runs from inside *Word Juggler.* 30,000-word dictionary; add your own words. 8,000-word legal dictionary disk also available. Quark Engineering, 1433 Williams, #1102, Denver, CO 80218. $145.

Mail List Manager. Generates, stores, sorts, edits, and prints mailing list files. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $150.

Micro/Terminal. Gives access to any in-house or remote database; set up and log only once. Built-in editor or edit off-line. Microcom, 1400A Providence Hwy., Norwood, MA 02062. $99.95.

PSF:File (formerly *Personal Filing System*). Page. Form-oriented information management system stores and retrieves up to 32,000 entries. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $175.

PFS:Report. Page. Generates reports; sorts, calculates, and manipulates data filed with *PFS:File.* Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125.

Quick File III. Personal index card or filing system. 15 fields; file as long as disk allows; can be put on ProFile. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $100.

State of the Art General Ledger and Business Modules. Standalone interfaceable modules for 12 accounting periods. General ledger: 470 accounts, 100 transactions before updating files. Budget and financial reporting: custom-designs reports, does previous-year comparisons, handles 2, 4, 12, and 13 period accounting. Accounts receivable: prints monthly statements for 25 customers, divisional reporting to six divisions. Accounts payable: 325 vendors, prints monthly check-disbursement register; eight bank accounts. Inventory control: 500 items per disk; 5,000 total. State of the Art, 3183A Airway Ave., Costa Mesa, CA 92626. General ledger, $595; modules, $495.

VersaForm. Landau. State-of-the-art business forms processor. Does invoicing, purchasing orders, mailing lists, client billing. Powerful, complex, worth getting to know. Hard-disk-compatible. Applied Software Technology, 14128 Capri Dr., Los Gatos, CA 95030. $495. *8/82.*

VisiCalc Advanced Version. For corporatewide modeling applications; develop sophisticated templates to be filled in by novice users. On-screen help, IRR and calendar functions, macro facility, variable column widths, locked cell values, and hidden cell contents. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $400.

VisiCalc III. Software Arts, Bricklin, Frankston. Just like it sounds; expanded memory, u&lc, 80 columns. Four-way cursor movement. VisiCorp., 2895 Zanker Rd., San Jose, CA 95134. $250.

VisiSchedule. Critical path PERT scheduler. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $300.

Word Juggler. Gill. Word processor uses expanded memory. Printout can be reviewed on-screen prior to printing; multiple copies printed of selected pages. Quark Engineering, 1433 Williams, #1102, Denver, CO 80218. $295. *12/82.* ❑■

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SOFTLINE

What if they gave out cardboard Oscars for negative achievements along with the real ones?

Here at *Softline*, the same off-the-wall question occurred to us. And we decided to do something about it.

We asked our readers what they thought was the worst game they had encountered in 1982. At the same time we asked our Atari readers what they thought was the best Atari program of 1982.

You can find the results of both of these polls in the next issue of *Softline*, available in the last two weeks of March.

Compare the worst Atari programs and the worst Apple programs. Compare the best Atari programs, as voted by the readers of *Softline*, and the best Apple programs, as voted by the readers of *Softalk* (results to be published in the April issue).

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OPEN DISCUSSION

Open Discussion gives you the chance to air your views and concerns, to seek answers to questions, to offer solutions or helpful suggestions, and to develop a rapport with other readers. It's what you make it, so share your thoughts, typed or printed, and double-spaced (please), in Softalk*'s Open Discussion, Box 60, North Hollywood, CA 91603. To ensure the inclusion of as many contributions as possible, letters may be condensed and edited.*

Buffed and Shining

I have been a reader of your publication since its inception and have always enjoyed your articles, reviews, and guest columns. I have always paid the most attention to the letters in Open Discussion because I feel that the consumer should be heard and listened to. Being in retail myself, I make it my job to listen and take action on any complaint or question. All too often people will jump at a problem but won't say anything when a fine job is done. I enjoy reading both sides of the story in Open Discussion. I've written to praise a company that I feel went "above and beyond" in order to help. That company is Practical Peripherals of Westlake Village, California.

I purchased a Microbuffer II from my dealer a few months ago in order to speed up the interaction between my Apple and my printer. The card did everything it was supposed to but I was having trouble dumping graphics. Since this was not the primary reason for owning the Microbuffer, I figured I was just doing something wrong and promptly forgot about it.

A few weeks ago, a friend of mine inquired as to how I liked my card. I said that it did everything that I wanted and I was very satisfied. He then asked about dumping graphics, since this was to be his reason for buying this card. I thought of the trouble I had had and figured I'd give it one more try. After repeated failures, I assumed that something was wrong with the card. I then started calling dealers to ask how to resolve my problem. I was given answers ranging from "You need another card to dump graphics" to "Your card can't dump graphics to a C. Itoh printer—only to an Epson."

Still upset with the whole ordeal, I called Practical Peripherals. The person on the other end of the phone listened to my story and then told me I had the wrong chip in the card and that the chip I needed does exist. I gave her my name and address and I figured they would send me an order form for the chip. I sat back and waited.

Two days later UPS delivered a package shipped Blue Label from Practical Peripherals. I opened it and my chip was inside. No questions asked, no bill, no hassles, no problem! I was extremely happy. I put the new chip in my card and it dumped the graphics like it should have. I called my friend and told him of my success and he immediately went out and bought a Microbuffer II card, requesting that the proper chip be installed.

My hat is off to Practical Peripherals. All companies should offer such fine and prompt service. I highly recommend this product to readers with the confidence that they will experience the same excellent service and response that I have.
Tracy T. Kornfeld, Katonah, NY

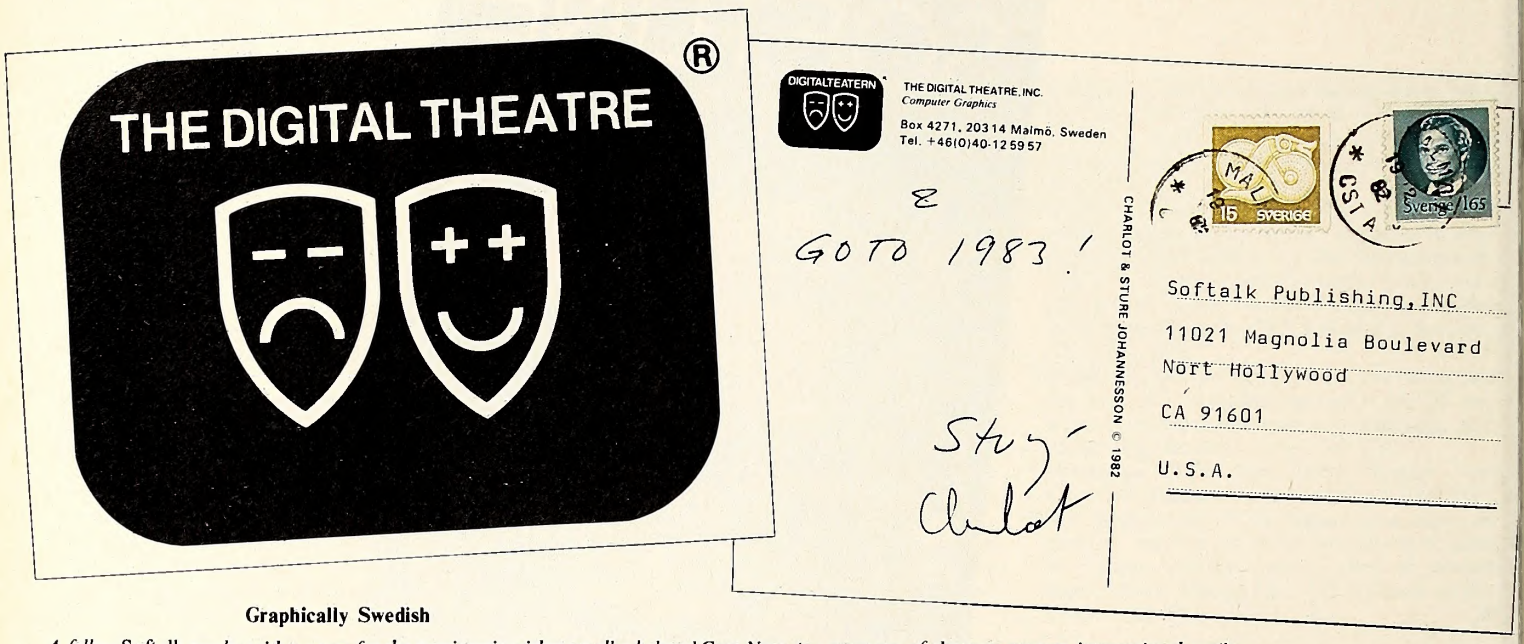
Apple Writers Write

Over the past year I have seen a number of letters and comments lamenting the fact that *Apple Writer 1.1* will not let the user access all the features of a specific printer. Well, there is an inexpensive program out there that will let you do it. This letter was written with *Apple Writer 1.1* on an Apple II Plus and an NEC 8023A-C printer. The key to the system is a routine called the *Universal Text Formater* by Ziggurat Software.

The *Universal Text Formater* generates a replacement printer routine for the one that comes with *Apple Writer.* It will work with virtually any printer, since you load in your specific printer control codes prior to installing it on the *Apple Writer* disk. It allows you to underline, change print styles, access the NEC Greek alphabet, print double width, enhance the print, and more. The first public listing I had seen on the program was in *Softalk*'s Stocking Stuffers. It makes *Apple Writer* one of the simpler and more flexible word processors available.

Ziggurat also produces a proportional text formatter for NEC and Centronics printers. I think it's the best of all, since it allows me to utilize the proportional print on the NEC and still keep the margins straight. It also allows underlining, double width, and enhanced print. These two programs have kept me tied to *Apple Writer* because I have not found another that can match these features.
Eric L. Oshlo, Katy, TX

I am an *Apple Writer II* user but have seen few published programs using the Word Processing Language. If anyone has seen programs, I would like to know sources. I'd like to be able to search several letters for key words and print parts of the letters, and use WPL as a database management system, searching, sorting, and alphabetizing files. I wish to load several files in sequence with a return after each one so that the



Graphically Swedish

A fellow Softalk *reader with a sense for the tragicomic wishes us all a belated Gott Nytt Ar, courtesy of the ever-prompt international mails.*

files load left-justified. Sometimes this works and sometimes it doesn't. Does anyone know why?

If Apple Computer is reading, I would like to make the following suggestions. First, I would never recommend anyone buying an Apple through a store. Even the best stores have one goal—to get your money with minimal effort (translated: service). Rather, I would suggest that Apple heavily support user groups. Any novice buying a computer would be well served by joining such a group and becoming knowledgeable about computing before purchasing—then buying price and only price. An Apple is an Apple.

Second, the Apple keyboard is not well designed for speedy typists like myself. The keys have a peculiar feel—not smooth, not responsive enough. Even so, I can go much faster on the Apple than on my very expensive typewriter (which costs more than the computer). IBM is looking for customers, and in this price range these details count.

The free market allowed Apple to flourish. I think it should continue to do so. What is support to one person is a burden to another. I think most buyers are more sophisticated than Apple wants to admit. In other words, I think you should get your product sold in the most outlets available at the best price possible.
Robert R. Hall, Nantucket, MA

A Marginal Problem

I have recently purchased the new Apple dot matrix impact printer. I am having trouble setting the margins with *Apple Writer 1.1*. Can anyone help me with this problem?
Daniel Wambold, Glen Rock, NJ

Brand X Rated

I'm writing to comment on the *Word Handler* word processor and to supplement the comments by Matthew Machis (October Open Discussion). I have only a little experience with "Brand X" processor; it was nearly a battle every time I tried to write a letter. It had so many necessary requirements that actual writing was not an easy task. It wouldn't even underline, whereas *Word Handler* does it with one easy command. It has other features too, such as headers and footers, print control and retypes, easy centering, right justification, and so on.

I especially want to give a great big pat on the back to Silicon Valley. I had a grave problem arise and called collect, as they advised, and talked to Tony Garcia, their director of customer service. He understood at once what the problem was and graciously solved it for me promptly and at no charge. My advice for anyone who is in the market for a friendly word processor is to have a look at *Word Handler*. For my money, it's a good product, backed up by a good company.
B. W. Muir, Parker, CO

Just the Ticket for Speeding

In recent benchmark comparisons between the Apple II and the IBM pc that I've seen in other magazines, the Apple fared quite well on computationally intensive tests (about 20 percent slower overall). On any disk measures it was significantly slower (about six times slower). I would like to call attention to a remarkable product that helps equalize this difference. It is *Diversi-DOS* by Diversified Software Research.

This product provides an improvement of at least a factor of four on disk operations and also adds a print buffer (uses RAM card), a keyboard buffer for type-ahead, and an optional DOS mover to move *Diversi-DOS* to the RAM card. I purchased the product through my Apple club, and since the original purchase I have received two updates. The product is the most useful Apple utility I have, since it allows the Apple to match IBM pc performance in the DOS area, as well as giving me an additional 12K of addressable RAM. It is an amazing bargain at $30.
Edwin M. Winter, Camarillo, CA

Smatter of Reactions

Softalk is my favorite magazine. I have used an Apple for a year now in my work and I take it home on the weekends too. *VisiCalc, Apple Writer, VisiTrend/VisiPlot*, and other miscellaneous Apple programs are my Apple's best friends. I find *VisiFile* confusing, cumbersome, and disk-intensive, and the hard copy is not presentable to higher management. *Spitfire Simulator* seems slow and boring, while *Horizon V* represents the true potential of the Apple. My highest praise must go to the Beagle Bros for their *Apple Mechanic*. Not only is this fully packed disk useful and efficient—it's fun!
Allan Porter, New Braunfels, TX

Trickster's Cul-de-sac

Before I discuss how *Bag of Tricks* proved its worth to me, let me say that the trouble I had that was destroying not only my original disk but the backup as well was spreading like a malignant disease to a third disk too. It may have been due to my using Wabash disks. I had a good amount of trouble with these disks. A number of them were unbootable and gave the useless and frustrating I/O message when I attempted to load, bload, and catalog.

The original disk failed totally after increasingly erratic behavior as I was doing upgrades on a game that I was hand-compiling. My notes and a fortunate backup copy alone enabled me to rebuild after the disk totally quit on me. The backup had never been bootable, but it had served well when asked to save or load. Then, I/O errors resulted when I attempted to load large files from it for reconstruction work on my games.

After finally transferring data to a third disk and rebuilding my work, I then began writing the new Hello file to a menu driver. To my unpleasant surprise, when I did a save to the disk, the two locked binary files on an adventure game were mangled into R files with gibberish names. Adding to my frustration was the response of the computer when I tried to unlock the first of these monstrosities that had replaced a vital binary file. The response was an I/O error.

Having used *Bag of Tricks* the evening before to locate the trouble in the failing backup disk (all sectors proved readable, at least in one attempt; so I was assured that success would eventually occur), I processed the inexplicably injured catalog through the *Fixcat* utility. It located and reported the damaged, intractable files; so I cleaned up the catalog. It also detected errors in other places, corrected as well, that should only occur on an old disk. I was able to resume work from where the damage occurred. It seems to me that Wabash was responsible for this trouble, or perhaps I got a bad set of disks in the box I bought. In the future I will ask for another brand, as I do not want this trouble again. *Bag of Tricks* saved me two weeks of work.
Paul R. Wilson, New York, NY

Wealth of Notions
Wow! What a rich field for discussion in the January '83 issue! My first comment *has* to be on the Smith/Pelczarski brouhaha (An Interface of Responsibilities). I feel eminently qualified to comment on the whole thing, since I am a consumer, software dealer, and hardware (Franklin) dealer. I'd like to put my twenty cents in (postage, y'know). First, what about the dealer caught in the middle of this? On the one hand I fully support Mark Pelczarski's position that piracy is theft, and no amount of left-handed logic says anything else. But, as a consumer (dealers do *not* get free copies to demonstrate), I understand J. Barry Smith's gripe: Why are we forced to pay twice for programs? By this I mean the practice by some companies of forcing you to pay for backup copies of programs you've already bought. The only solution I can see is to provide reputable, authorized dealers with copyable programs from which to make backups for the people who've paid for the software—but only upon presentation of a bad copy. This would give consumers an alternative to paying twice for software, spending days or weeks waiting for replacement disks, or turning into pirates. (Mr. Smith: If you deal with a good dealer, you will receive the support you desire.)

Secondly, is there some question as to whether or not Franklin Ace owners are fit to talk to? I wasn't aware that owning a Franklin was equivalent to having a social disease! In answer to Mr. Smith's question, of course we should be "allowed" into the "fraternity/sorority." We have all paid good money for our machines and it so happens that they use the same software as yours. Does the question mean that if you own a Dynabyte computer you won't talk to a Cromemco user because they both run CP/M, and Cromemco and Dynabyte are therefore in competition? To address Mr. Smith's other question: Yes, the Franklin Ace will indeed run Apple software. I often boot my system with a copy of DOS 3.3. It works fine. In fact, I've never come across anything that will not run. It is often necessary to put on the alpha lock to get it to run, but this is because an unmodified Apple does not have lower-case capability.

As to Eric Anderson (Smoldering in the Stacks), I think I would be happier with *DB Master* if, when a file's data goes over the capacity of a single disk, I did not have to keep swapping disks as the program makes room on the original for the new data. This is caused by the program's putting all records in first record order. It is a supreme pain, and, according to Stoneware's technical support group, the only solution is to buy its *Utility Pak #1* to merge parts of the file that have been broken up to fit on one disk.

Enough of my gripes; hope to see more on these matters upcoming in Open Discussion.
Jeffery R. Partridge, president, Pear Tree Computer Services, Poughkeepsie, NY

In Search Of
I'm trying to establish personal archives of early Apple software and associated printed material. Specifically, I'm looking for system masters with manuals prior to DOS 3.2, early disks, cassettes, manuals, listings, and blank disks with the small "disk II" logo. I already have disk copies of contributed programs, volumes one through five, both cassette demo packages, and a few Red Book programs. I also have the manuals for the contributed programs and the cassette demos.

If anyone can help me, I'd sure like to hear from them through Open Discussion.
W. Smyth, Monetta, SC

Nibble Quibble
Anyone who has ever invited some friends over to play that new supergame to end all games, only to have it refuse to load, realizes that game program owners have a legitimate right to a backup copy. Software publishers, on the other hand, have a right to protect their investment through copy protection. Another point relevant to the games issue is that it really is not necessary to be able to modify a game program. As I see it, there exist two methods of keeping everybody happy. Either allow the one copy to make one more copy (thank you, Roger Wagner), or supply two copies of the program.

In addition, since disks do wear out, there should be a small, but reasonable, cost to replace blown disks (subject to inflation, the value of the dollar, the price of gold, and the availability of 2 percent yak's milk).

As a result of this action, the need for nibble copiers will have been eliminated, according to the reasoning of their producers, who argue that software publishers have not satisfied the user's legitimate right to back up because of copy protection. Unfortunately, before copy protection, users abused this privilege and brought about copy protection because they violated the rights of the software publishers.

At this point, would it be possible for the software publisher who is providing acceptable backup to cooperate with the nibble copiers and add a code (in addition to any copy protection he might wish to use) that would be recognized by the nibble copier, and would then refuse to make what could only be an illegitimate copy? I realize that there are legal questions involved, but I feel that there is potential here.

Nowadays most Apple owners are users who don't know enough to crack a protection scheme, and most of those who do only do so to provide a legitimate backup. If the backup already existed they wouldn't take the time. I'm sure there are others who are hard-core pirates, but I think most pirates are using nibble copiers, and my suggestion would, therefore, solve most of the problem. Stricter legal penalties for the remainder would also help.

Most of what I say pertaining to games will also apply to business programs, but businesses do differ in that they have a legitimate need for more copies. When several individuals or departments use a program it is very awkward to have only one or two copies. On the other hand, a software publisher can't afford to sell one copy of a program to the United States government that in turn will make 5,000 copies for its employees. I think a satisfactory solution can be arrived at by studying noncopyable hardware.

One computer can be shared by several individuals or departments, but eventually either use or convenience will result in more computers being bought. Why not limit the number of copies (available at a reduced price) to a figure based on the number of computers at a given location? This will require the cooperation of Apple Computer and careful serial number registration, but it will also tend to limit theft, since attempts to buy backup software will turn up stolen computers. As a concession to the existence of nibble copiers, the backups would have to be available at a price greatly reduced from that of backup hardware.

This brings me to one final point, which I'm sure will be disputed. (I had to come up with something to make everybody unhappy.) The current trend in business programs is to include all necessary documentation within the program. I disagree! This wastes RAM (causing unnecessary disk accesses, garbage collections, and so on) and disk space (read extra disks and disk swapping). Since most of this excess baggage is only needed until the user is familiar with the program, why not leave it in the manual? By adopting this procedure, software publishers would raise the pirated price because the documentation would also have to be copied. Now all we have to do is find a way to satisfy users of business programs who want to modify their programs.
Larry Houston, Peru, IN

Gestation Ended
I have been receiving *Softalk* for nine months now and I continue to be amazed by the consistently high quality of this publication. I have read other computer-oriented magazines, but none manage to provide such fascinating and informative insights into the world of the Apple II as *Softalk* does. However, I do have some suggestions that I hope will be of use to you, as well as some comments about what is perhaps the most hotly debated issue in the microcomputer industry.

First of all, with regard to Edward Isenberg's letter that opened January's Open

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Discussion, I do think that *WordStar* deserves some attention for consistently placing in the Top Thirty. In fact, I am certain that such continued sales success demonstrates a product's worthiness far more conclusively than does a sudden, meteoric rise and fall in the Top Thirty. I propose that *Softalk* include another heading in the Top Thirty list: "Weeks on List." This would give the readers an accurate impression of a particular product's continued success in the marketplace, and this is what matters in the long run.

I definitely feel that a new category of software should be implemented to provide a niche for new programs such as *Castle Wolfenstein* and *Aztec*, which clearly do not belong under any of the present categories. These programs, which combine the aesthetic pleasures of fantasy-adventuring with the finger-pounding excitement of arcade-gaming, seem to be the wave of the future. Why not begin a new category called ArcadeVenture (or something like that) to fill the present gap?

Also, I think *Softalk* should be more consistent when classifying programs, both in Fastalk and in the Bestsellers. It is confusing to the reader when he sees, for example, *Prisoner 2* categorized as an adventure in Fastalk but as a fantasy in the Bestsellers.

I am disappointed with Marketalk Reviews. Your software reviews give a good idea of the features in a program; however, these reviews are so rarely negative that one is left uncertain of the reviewer's objectivity. Let's face it, most programs (like most movies, books, and works of art) are of mediocre quality. People shouldn't esteem the critic who praises almost everything that comes his way.

Finally, some words about software piracy. I really cannot sympathize with the major software houses that bemoan the rampant piracy taking place among Apple users. These companies do not seem to realize that the end to piracy lies not in the hands of the consumer but in the hands of the publishers who in vain try to prevent piracy by expensive copy protection. Copy protection is not only futile—for more and more expert software crackers are appearing all the time—but in the final analysis it encourages the very piracy it attempts to prevent, by driving up the price of software beyond the reach of most money-conscious consumers. I therefore applaud Penguin Software and especially Beagle Bros (the latter sells no copy-protected software); after studying the Bestsellers Hobby category, it is obvious to me that these companies are benefiting financially from their unprotected software policies. Only when the other software houses realize the value of this will the vicious circle of software piracy be ended. Until that day the software user should not be expected to listen to the pleas of companies that sell ultraexpensive, copy-protected software.
Andrew Cutler, Washington, DC

Problems with ED

To Greg Tibbetts: I am an owner of an Apple II Plus with the Microsoft Z-80 card and the Videx Videoterm card with softswitch. I also have a 16K RAM card in slot 0. SoftCard Symposium is the column that I look forward to the most among the myriad of computer magazines that I receive to satisfy my computer addiction. I have found no other source of information on this subject as informative and well written.

I'm interested in the idea of a user group for Apple CP/M in which the special case of the Apple in the context of commercial CP/M software could be intensively considered. Among other things, ideas for optimally installing the various packages on the Apple or Apple/Videx terminal would be of great value. Similarly, 6502 assembly language subroutines that could be run from inside a program such as *dBase II* would represent a welcome area of discussion. Perhaps SoftCard Symposium could initiate interest in the formation of such a group, in which I would be happy to take an active role.

I also have one specific question. Is there any way to alter ED.COM so that it defaults to −U instead of U, so that translation from lower to upper case will not take place?
D. Pulver, Riverdale, NY

Greg Tibbetts responds:

Thank you for the kind words about the column. I will certainly mention your ideas concerning the creation of an Apple CP/M user group in an upcoming column. Due to the time lag between their creation and appearance, however, there will be some delay. I wish you luck in the formation of such a group and would suggest that you consider contacting CP/M user group bulletin boards for prospective members, since they often have Apple CP/M subgroups.

Regarding your problems with ED, you will find that ED does not really default to U, upper case lock, as you suspect. If you enter the I(nsert) in upper case, it will default to upper case for that insert session. If you enter the i(nsert) in lower case, it will default to lower case. I neglected to mention this in my column on ED but will make that up to the readers at a future date.
Greg Tibbetts, Santa Barbara, CA

Try and Try Again

I read with great interest Mind Your Business in the October *Softalk*. What caught my attention was the section entitled "Trying Before Buying." At the end of this section Peter Olivieri indicated that he would like to see an operation in which the software could be tried out by the prospective customer.

I opened just this type of store in Bloomington (Minneapolis), Minnesota, at the end of last year. The store is called The Softwaire Centre and, as the name implies, our product will be software. We will sell business (including CP/M), utilities, education, and entertainment programs. In addition, we will carry a very complete selection of books and magazines. We will sell no hardware, but we will have two Apples, one IBM pc, one Xerox 820, one Atari

800, and one TRS-80 III in the store on which our customers can try the software before purchasing. As we do not sell the hardware, we will be able to give customers an unbiased opinion as to the best type of equipment to purchase, based on the type of software they will be running. In other words, you will be able to try three or four word processing programs before purchase. There would be no cost to the customer for this service other than the program, should he decide to purchase one.

We are affiliated on a franchise basis with Softwaire Centres International of Culver City, California. Although we should be one of the first stores to open outside of California, there are successful Softwaire Centre operations in Los Angeles, Orange County, San Diego, and Pasadena. Stores in Torrance and Oakland were scheduled to open approximately the same time as mine.

Robb Jacobs, Woodbury, MN

Creepy Errors That Reach the Core

Jeff Mazur's October '82 Hardtalk on the game I/O connector was greatly appreciated. It prompts me to ask a question I have previously put to *Call −A.P.P.L.E.* as well as the personnel at Cupertino—without any reply.

In the reference manual (mine is a 1979 issue), table 9 on page 24 lists the location addresses of the four annunciators for the autostart ROM. I assume that these are the correct addresses (at least they are the same as in the Red Book!). But on pages 137 and 143 of the reference manual, they are reversed in the monitor listings. And the ROM responds accordingly.

My question is, did I get an autostart ROM that was "burned in" wrong, and, if so, have later editions of the reference book been changed?

It is a bother to put in inverters on any prototype board that uses these annunciator addresses; and I do have a few boards such as the one for the GALFO RTTY interface. Without the inverters the boot brings in the interface already keying my transmitter. Also, if this board is active, any other program called causes the annunciator to key the PTT circuit if my radio transmitter happens to be on. To prevent that, I have had to add a *poke −16293* as the first statement of all programs, or pull the cable from the game I/O socket. Very messy!

I suppose the best thing to do would be to burn a new ROM. But I'd first like to find out if I am alone in this problem. Has Apple done a fix for later issues of both the ROM and the reference manual?

James A. Johnston, Pearl City, HI

Jeff Mazur responds:

To James Johnston: Thanks for the letter. The discrepancies you have discovered are not due to different versions of the autostart ROM. What you have found is simply some of the errors that crept into the reference manual. As you correctly guessed, the addresses shown on pages 137 and 143 are wrong. For a complete (well, almost!) list of the more than forty such inaccuracies, check with your local International Apple Core member club. The Core has a large volume of technical notes that includes errata information on Apple publications. If you don't have a club nearby, you should contact the Core directly at the following address:

International Apple Core
910-A George Street
Santa Clara, CA 95050

Jeffrey Mazur, Canoga Park, CA

Resolute Reaction

In the October '82 Hardtalk, Jeff Mazur mentioned the use of a 100K pot plus capacitor with Apple II game paddle inputs. First, a picky technical point. While the circuit diagram in the column, page 192, shows a 74LS259 addressable latch at board position F-14, most Apple IIs have a 9334 at this location. The 9334 is a twin of the 74259; thus the switch is from LS-TTL to plain vanilla TTL. Some of your readers might be confused by the difference. Incidentally, the switch was made in the other direction on the disk controller card. The schematics distributed with the DOS 3.3 manuals (at least the series mine came from) show a 9334 on the card. The controller card itself, however, has a 74LS259 in that location.

Now for the 100K game controller pots plus capacitor. The problem with this technique is that you're giving up one-third of your potential resolution that way. The root of the problem is, of course, that 150K isn't a stan-

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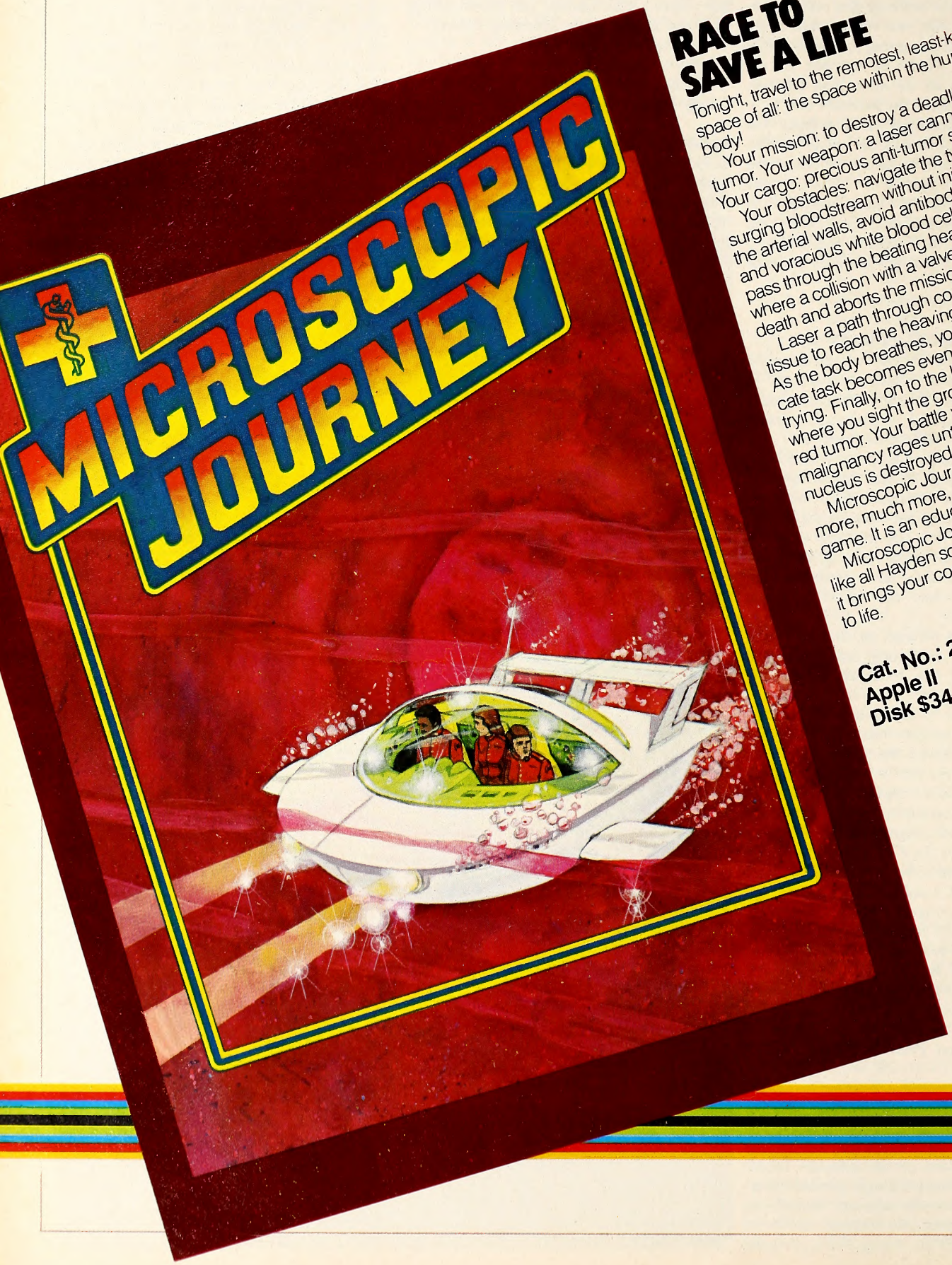

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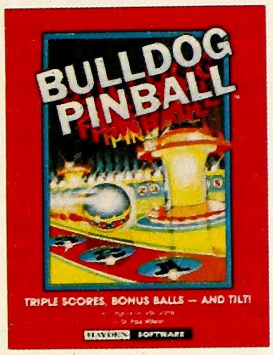

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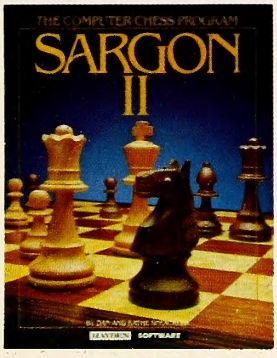

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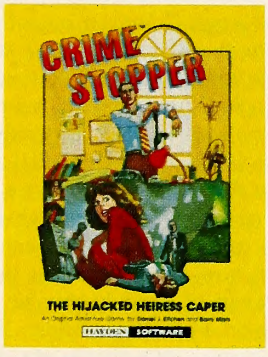

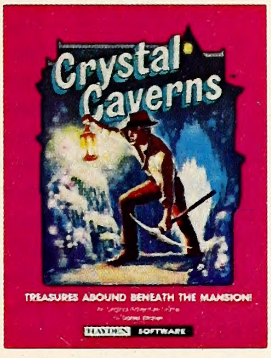

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dard pot value. And the reason the Apple wants 150K has to do with Murphy's laws, Ohm's laws, and, ultimately, quantum mechanics (which, eventually, would tell us why TTL wants 5 volts plus or minus .25 volts and why it goes to sleep or burns up if we deviate).

But there is a better way to compensate than by using a capacitor. Instead, tie one end of a 100K pot to +5. Tie the wiper to the PDL input, and tie the other end to ground through a 360K resistor. In other words, set it up as a voltage divider circuit. This makes the 558 in the Apple think it's looking at a 150K pot. The problem is, most software that uses the analog inputs assumes that a 100K plus capacitor might be used and gives away that much resolution anyway.

Now for something better. You can take a 500K single-turn linear pot and fit it in one of those fancy model airplane joysticks. Tie one end to ground, the other to 5 volts, and the wiper to PDL. Since those fancy sticks move about 60 to 70 degrees, this arrangement is about right. All you have to do is get the pot shaft in the right position before you tighten the clamp that holds it to the joystick gimbal. This way you can make a pair of fancy sticks for half what they cost at the computer store. With the 100K pot arrangement you can use a 330K resistor in series with a 100K trimmer if you want trim control over center. Most of the airplane joysticks have trim levers built in.
F. Kuechmann, Chicago, IL

Jeff Mazur responds:

To F. Kuechmann: Your first point on the change in IC part numbers is well taken. I used the numbers in the schematics to avoid confusion.

As to your comment on 100K pots having less resolution, I disagree. On a percentage basis, a 100K and a 150K pot of the same construction will have the same resolution. This is determined only by the way the pot is built. On a purely resistance scale, the 100K pot actually has more resolution. However, the Apple's game I/O hardware usually limits the resolution to 256 points, and this applies equally well to a 150K pot or a 100K pot plus capacitor. True, many games use their own software routines to read the paddle and limit the resolution even further—but that's a different point. Regarding your scheme of adding the resistor, this will also do the trick. There will be some loss in linearity, however, at the high end, though with most games this will not be noticeable.
Jeffrey Mazur, Canoga Park, CA

Computer Science Major Turns Entomologist

As a computer science major in college, I've programmed on a few microcomputers (and two mainframes), and I consider the Apple II Plus the best of the micros. *Softalk* has really increased my enjoyment of the Apple and my knowledge of programming as well. Now there is a fly in the ointment—Dr. Jeppson has sold me on the Apple III!

With all its features and sophistication I think it is the ultimate Apple. Now comes the dilemma. Apple Computer states that in emulation mode the III can run most Apple II programs. *Softalk*'s Marketalk Reviews states that many Apple II programs will run on the Apple III in emulation mode. Obviously there isn't an Apple II hidden inside the III, and all isn't perfect in Appledom. How can we tell, short of actually running the program, whether or not it will run on the III in emulation mode? An article on how the III emulates the II and the shortcomings of it would certainly help. I vote for more coverage of the Apple III—especially by Dr. Jeppson. His articles are fascinating.
Mark E. Clark, Oak Hill, WV

A Glaring Solution

Reading the January '83 Newspeak, I was somewhat surprised to learn that Rob Cook of Lucasfilm's computer graphics laboratory was having difficulty understanding the "plastic" look of generated images. The news item states that Cook usually found the spectral component to be the color of the material, not the color of the light source. Actually, the spectral glare of a shiny object is the color of the light as modified by the color of the object. This color modification is part of the very basic instruction to theatrical lighting students. I am truly

sorry that there has been such a search for knowledge so easily obtainable from those involved in theatrical lighting.
Frank E. Merrill, Indianapolis, IN

Encounter with Exegesis

I've been involved with newsletter and small-magazine publishing on a free-lance basis for some time. I have also done contract editing and technical writing for Silicon Valley firms, including Apple. I can take a somewhat professional view when I look critically at other publications.

I have a nit to pick, a general complaint, some comments on an earlier letter. The nit: Whoever decided to include a section for personal, short, inexpensive ads made the gross error of comparing "classified" advertising with "display" advertising. To set the record straight, just because the ad is small, cheap, and grouped with other such ads without graphics or designs, it is not necessarily a classified ad. Newspapers and magazines make quite a bit of money with this type of ad, and they are usually set aside in their own section.

However, classified ads are only a subset of this type. By definition, "classified" means that they are grouped into categories, or classifications, such as software, hardware, printers, positions available, and so forth. You will notice that *Call—A.P.P.L.E.* magazine skirts this by heading that page with the banner, "Un-classified." This is precisely what *Softalk* has: unclassified ads.

Softalk could fix this by changing the title, or by actually sorting the ads and classifying them. Who knows, this might even make it look flashier. You may even find more people placing such ads. It might even develop a "personals" category.

My general complaint concerns the monthly drivel that emanates from Jonathan Miller's tripewriter. Apparently I am not alone in my distaste for articles that are ostensibly about the uses of word processing, but turn out to be the type of pap published in the *Western Quasi Review* and *Mountain States Military Journalism Quarterly*. Letter writer Art Cabot (December '82 Open Discussion) writes about the lack of substance in Miller's stories. Jonathan Miller has not replied, nor has there been a change in style since Cabot's letter. I wrote *Softalk* a letter previously addressing this very issue. You choose to continue to let Mrs. Miller's son milk *Softalk* for all he can get. Now I don't mind the new fiction you're publishing; it's labeled as such and is a welcome change. All I ask is that authors state their purpose early in the article and stick to it. Get rid of rambling milkers like Miller.

My last point is to respond to letter writer Bob Wiseman (November '82 Open Discussion). In all my experience both as a reader who compares notes with other readers of a large number of magazines and an intimate of the industry, I have rarely known someone who doesn't first open to the personal ads and then to the letters column. Look at the success of *Forum* magazine. Everybody likes to read other

people's mail. We lend legitimacy to this through letter columns. One solution to Wiseman's complaint would be to divide the letters into groups. The first group would consist of letters that have technical questions or offer technical assistance. The second would be for complaints or praise of advertisers. The third would be comprised of general letters, and the fourth could contain all replies and dialogues between letter writers. Whatever you do, don't stop printing letters. They're the best part of the magazine. Pardon me—they are naturally second to the Top Thirty section!
Tod Wicks, Palo Alto, CA

Pokes 'n' Boots

First, let me congratulate Mark Pelczarski on his approach to piracy. As a software author I am glad to see someone working so avidly against it. Nothing irks me more than to be shown someone's software "collection" containing my own work illegally obtained. Then again, these people never expect that the sixteen-year-old in front of them has written a game and has just insisted on the removal of it from their booty.

My feeling is that only games should be protected, and in the following manner: the program should be on side one of the disk full of serial numbers. After purchase, the disk should be sent immediately to the publisher, who would then record the owner and serial numbers and make a backup on side two of the disk. A pain? Sure, but a reasonable precaution. My work takes valuable time, and I feel a great loss of pride in my work and myself when I see my time stolen.

Now, I'd like to respond to Mike Mahone, whose letter appeared in the January '83 Open Discussion (A Reset That Unsettles). Reset can be very touchy and the reference manual is a little confusing. I've been into machine language for two years and I still have to read pages 36 and 37 twice to understand them.

I love toying with things; so at first I ignored those pages—too nebulous. I started on my own, but found that this often leads to disaster. I discovered that after booting a 48K Apple II Plus the decimal locations 1010, 1011, and 1012 contain 191, 157, and 56 respectively. In machine language that's locations $3F2, 3F3, and 3F4 containing $BF, 9D, and 38. Now I understand the BF and 9D. If you put those together you'll get $9DBF, the DOS rehook location. I didn't quite get the $38 though. Being inquisitive, I changed it—what the hell. I poked 57 into location 1012 and hit reset. It rebooted, whereas poking 56 into location 1012 didn't change anything. This solved the first problem; if the first line in your *Hello* program were *poke 1012,57*, hitting reset would reboot the disk. Now for the second problem: why?

The answer seemed simple; the Apple needs 1012 set to a special value. Well, I didn't stop there. I wanted reset to do something really neat. I decided that rerunning the Basic program would suffice. After research I found that $D566 was the equivalent to "run," so I tried the following program:

```
10  POKE 1010,102: REM 102=$66
20  POKE 1011,213: REM 213=$D5
```

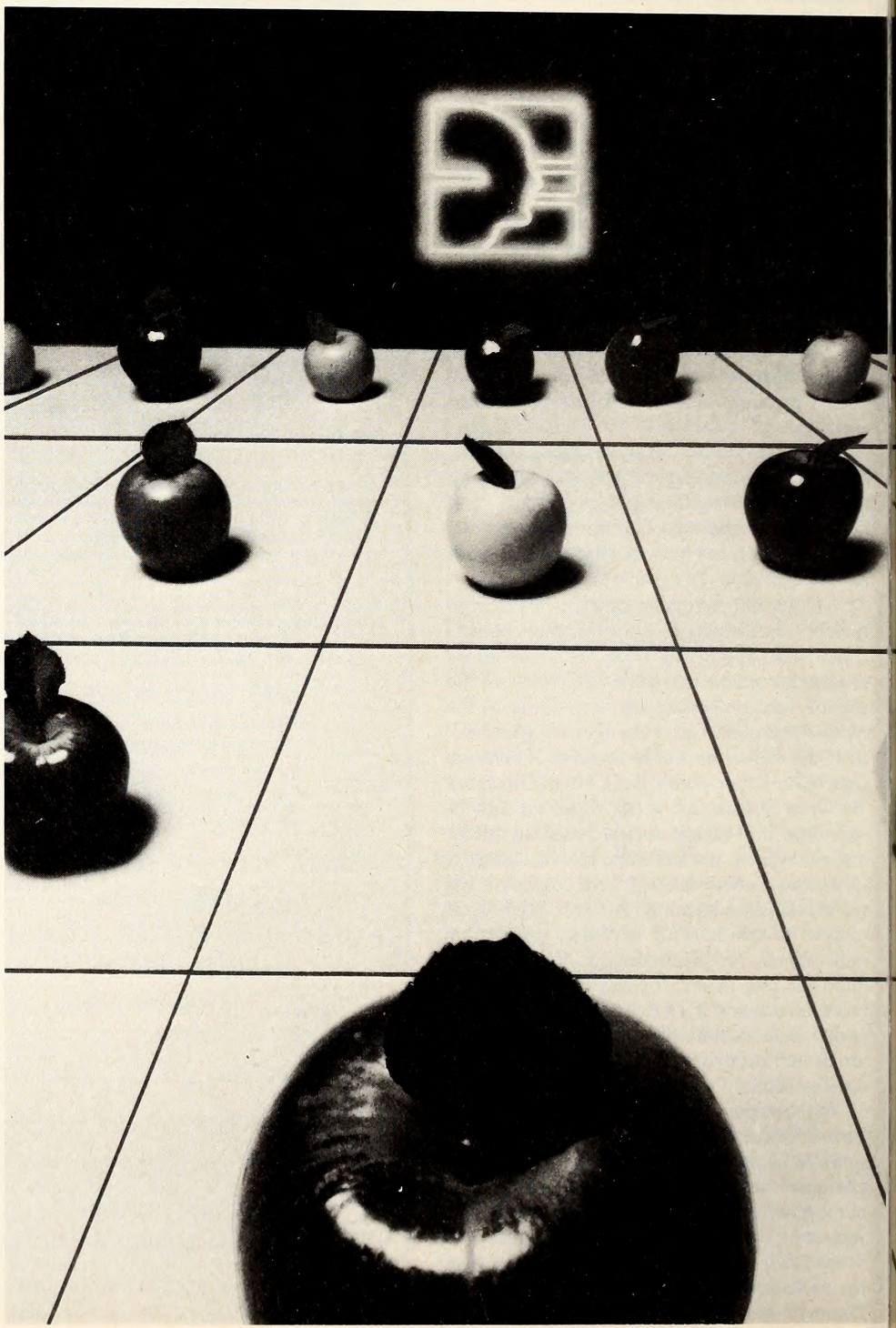
Much to my dismay, the Apple rebooted. I reread pages 36 and 37 of the reference manual carefully and tried adding a third line to the above two:

```
30  CALL 64367
```

Voila! It worked—but wait. I never touched 1012. Actually the Apple did it for me. Line 30 called a routine that scanned 1010 and 1011 and put an appropriate value in 1012. Problem solved.
Steve Hawley, Murray Hill, NJ

I've got an answer to Mike Mahone's unsettling reset question in the January Open Discussion, but first let me say something about the *DOS Tool Kit,* which I recently received as a gift. This is the best piece of software I have yet acquired, but its one fault is the documentation for the assembler-editor. The listings and explanations of the pseudo-operations are vague and hard to understand. I wish Apple would give examples of pseudo-op usage along with a list of 6502 mnemonics it doesn't accept and alternate usages of these mnemonics. The *Tool Kit* is a good piece of software but it doesn't have the kind of manual you would expect from a company as good as Apple.

To reboot upon hitting reset, there are three



memory locations ($3F2 through $3F4) in the system Monitor known as the reset vector, which controls what happens when the reset key is pressed. It jumps to the memory location in $3F2.$3F3 if the "power-up byte" at $3F4 is set correctly. There is a Monitor routine at $FB6F that gives the right value to this byte. Enter the Monitor and type:

```
3F2: 69 FF 51
```

If you make the 51 a 5A, reset will enter the Monitor. This is because $FF69 is the subroutine for entering the Monitor. When the 5A is a 51, the "power-up byte" ($3F4) causes a reboot. You can also use the reset key to call your own machine language programs if you set the reset vector correctly.
James M. Wilson III, Skaneateles, NY

The solution to getting the *Hello* program to reboot when hitting reset is simple. Just add the following line to the start of your *Hello* program:

```
POKE 1011,0
```

The following three pokes make the program rerun after reset is hit:

```
POKE 1010,102
POKE 1011,213
POKE 1012,112
```

After the program ends, this next poke will allow you to type in any command and the program will be rerun:

```
POKE 214,255
```

To display hi-res screen one, use *call −3100.* The following three pokes display hi-res screen two:

```
POKE −16304,0
POKE −16297,0
POKE −16299,0
```

Last of all, to scramble the text output, try:

```
POKE 50, (any number from 0 to 254)
```

Matt Offenbacher, Lake Oswego, OR

Whenever the Apple's reset is used, the Apple peeks into two memory locations to see whether a cold or warm boot will take place. If the computer has just been turned on, it will perform a cold boot that restarts the Apple from the beginning. In order to make the computer think it was just turned on, you can use *poke 1010,105* and *poke 1011,255.* These pokes at the beginning of your *Hello* program will cause the computer to reboot upon hitting reset. At the end of the *Hello* program, use *poke 1010,191* and *poke 1011,157*; then the reset will cause a warm boot.
Jeff Trask, Chesterfield, MO

In answer to Mike Mahone's question on how to reboot upon reset, use *poke 1012,69* in the first line of the *Hello* program.
Jim Crosson, Ripley, CA

To get the Apple to reboot from any Applesoft program, a *poke 1012,0* will do the trick when reset is hit.
Steve Shen, Madison, WI

Entering the following as the first line of the program will solve Mike Mahone's reset problem:

```
POKE 1010,102: POKE 1011,212:
CALL −4116
```

Veliko Lee Bekir, Bellerose Manor, NY

All these responses to Mike Mahone's dilemma seem to work properly, but one thing still remains unsettling. Though the solutions all work, each one is different from the rest. Now let's see who'll be able to settle this seeming contradiction. Anyone game?

Deficient Disks Deduced

In the November '82 Open Discussion there was a letter titled "Mystery of the Meddling Monitor." I had experienced this same problem over a year ago with disks that refused to boot. When I first purchased my Apple the disk drive was located to the right of the computer. Six months later I bought a second disk drive and located the drives on top of the computer with the NEC monitor on top of the drives. Up to that time I paid no attention to the brand of disks purchased. Now I do. I found that one particular brand of disk failed to boot with the

new arrangement of equipment. When the disk drives were removed from under the monitor, the disks would boot normally. It would appear that the normal noise level on certain brands of disks is quite high; when additional noise from the monitor is picked up by the read/write head of the disk drive, the sum of noise versus information is too high, thereby loading garbage. I now stick to well-known, brand-name disks. The no-boot problem has since vanished. As an additional precaution against future problems, my disk drives are stacked to the right of the computer.
Mort Larsen, Winnipeg, Canada

Frequency Factor Fathomed
I believe the cause of the "meddling monitor" problem is a radio frequency field being generated that causes the analog card in the disk drive to be interrupted. This problem can be corrected one of two ways. Set the monitor off to the side of the computer, or set the disk drives on the side of the computer and leave the monitor sitting on the console. This should eliminate the problem in the future. There are two monitors that seem to cause the most problems, the Zenith green screen and the NEC green screen.
George Quade, Waukesha, WI

Of Soft Switches and Disguises
I was prompted to write by Karen Obrock's reaction from abroad in the October '82 Open Discussion. Ms. Obrock laments Apple's arbitrary decision to end mail-order sales, and other readers seem to be equally disturbed by this move, although for different reasons. But I don't see the problem here. Ms. Obrock is bothered because now she can't add on to her existing system with Apple products. It seems to me that Apple has merely given an incentive to use other manufacturers' better and lower-priced products. For example, if one wants to upgrade a system to disk, Apple sells its drive with controller for around $550. A mail-order shopper can find a far better drive/controller package for between $350 and $450. Virtually any piece of hardware Apple sells is available through mail order from other manufacturers at lower prices, and most of them are better! For those who are upset because they don't yet have a system and now can't get those great mail-order prices, one of the largest Apple dealer chains in Houston sells the Apple II Plus for $84 less than I paid for mine a year ago. Be thankful; Apple's decision may have been a blessing in disguise.

In regard to one of lo-reser Ralph Cinque's questions (October '82), the addresses for manipulating graphic modes are listed on page 13 of the *Apple II Reference Manual*, "Table 5: Screen Soft Switches." For example, to switch to the text page without destroying the lo-res page, simply type *poke 49233,0*. Although the screen will appear at this point exactly as it does after typing *text*, you should be able to return to the undamaged lo-res page by typing *poke 49232,0*. These commands also give access to lo-res page 2. As to printing lo-res graphics, Mr. Cinque should refer to the November '82 Hardtalk column, which contains a brief review of the new Pkaso interface card, an absolute necessity to owners of the Prism 80.

I'm startled by Tim Klein's answer to this question in December '82 Open Discussion. I'm not sure about his contention that lo-res page 1 and the text page share the same memory location. To demonstrate what I propose, run *Color Demosoft* from the System Master and select either option 1 or 2. Once the screen is loaded, hit control-C (reset will bomb the lo-res page). Now type *poke 49233,0* (typing *text* will also bomb the image). The text mode appears to have destroyed the lo-res image. Now type *poke 49232,0*. The undamaged graphic page should reappear.

There is a much easier way to move blocks of memory than Tim Klein's byte-by-byte loop move. Moving lo-res page 1 to hi-res page 3 (surprise, it's there) for safekeeping can be accomplished by entering the Monitor (*call−151*), and typing *6000 < 400.800M*. Hi-res page 3 resides in memory range $6000 to $8000. Lo-res page 1 resides in range $400 to $800. The machine-language command shown above moves (M) a block of memory (400.800) to (<) a memory range beginning at $6000. For more information on this technique, and hi-res page 3, see *Nibble* magazine, vol. 3, no. 4. The article entitled "Apple's Hi-Res Page Three" should surprise you as much as it did me.
Hal Scoggins, Lake Jackson, TX

On the Move
In the December '82 Open Discussion, Tim Klein discussed saving page one graphics by moving them to another area of memory. Improved speed can be achieved by using the Monitor Move routine as discussed in the *Apple II Reference Manual,* pages 44 through 46. Using Tim's example, the procedure is first to type *call −151* to enter the Monitor. Then, type:

(destination address) < (start address).(end address)M

For example:

1C00 < 400.7FFM

This will move page one graphics up to $1C00 (decimal 7168). To restore page one, type:

400 < 1C00.1FFFM

Of course, all this assumes that you haven't affected memory at $1C00 in the meantime.
George Osner, Modesto, CA

Picking and Choosing
I am planning on buying a Pascal language system for my Apple II, and I was wondering if any fellow readers could give me a little advice. Which Pascal system could you recommend purchasing: Apple's Apple Pascal, SofTech's UCSD p-System, or another system entirely?

I would like to be able to write commercial software for the Apple II and other personal computers that would not require the Pascal operating system in themselves. I'd appreciate hearing about some readers' experiences in Open Discussion.
Thomas D. Batson, Santa Rosa, CA

Credit Where It's Due
I noticed in the January '83 Open Discussion a letter from Ronald E. Jeffries (Viva Pascal!) crediting Edsger Dijkstra with the design of Pascal. A correction is in order because it was actually Professor Niklaus Wirth of the Federal Institute of Technology of Zurich, Switzerland, who designed the language. Wirth did, however, rely heavily on the structured programming concepts developed by Dijkstra and his colleagues O.J. Dahl and C.A.R. Hoare. (See Wirth's *Algorithms + Data Structures = Programs,* Prentice-Hall, 1976.)

On the other hand, I agree with Mr. Jeffries's evaluation of Pascal as a powerful development language. I prefer it over Basic for problem-solving programs, especially with its recursion capabilities. (Can you imagine the amount of Basic code needed to solve the Knight's Tour problem?)

Carrying this discussion of languages a little further, I recently read somewhere about comparing computer languages to spoken languages. You really can't become fluent in a second spoken language until you can actually think in that language. The same applies to computer languages. To fully utilize the capabilities of a computer language you must be able to approach your programming problems within the framework of that language. A solution in one language may involve an entirely differ-

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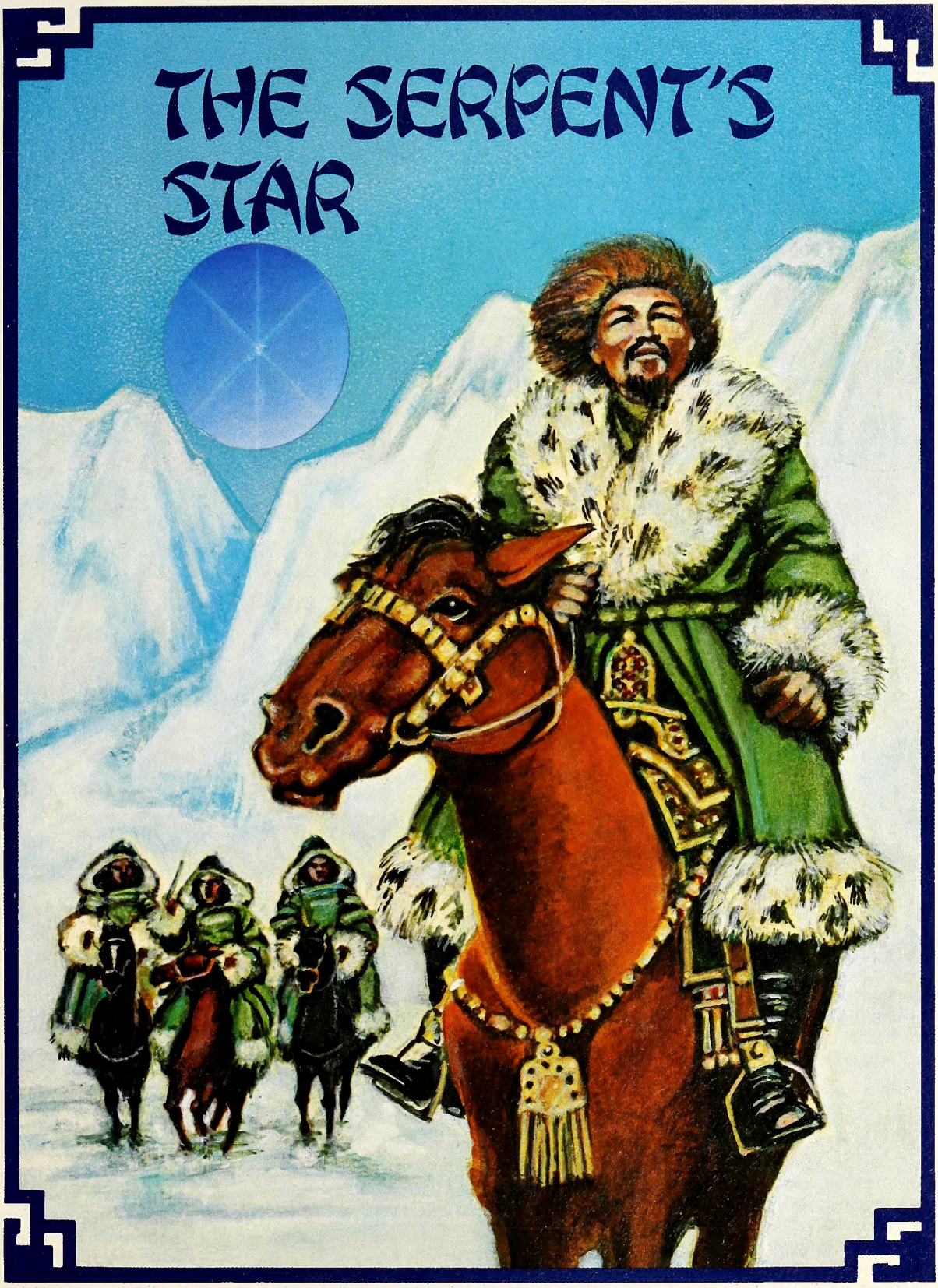

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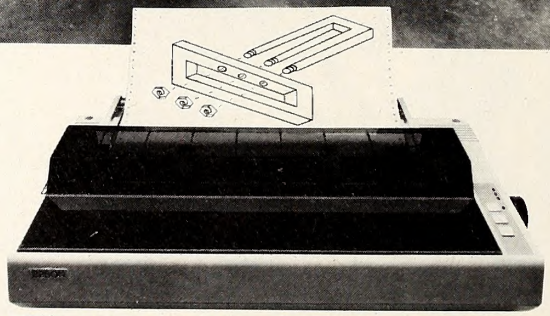

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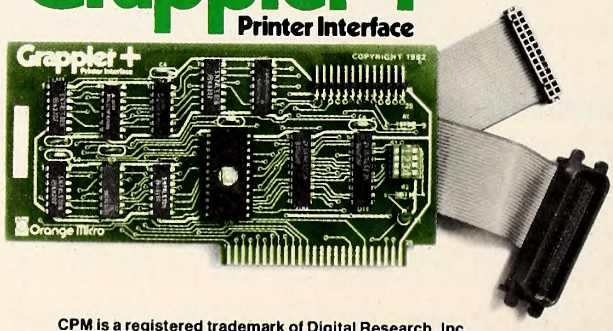

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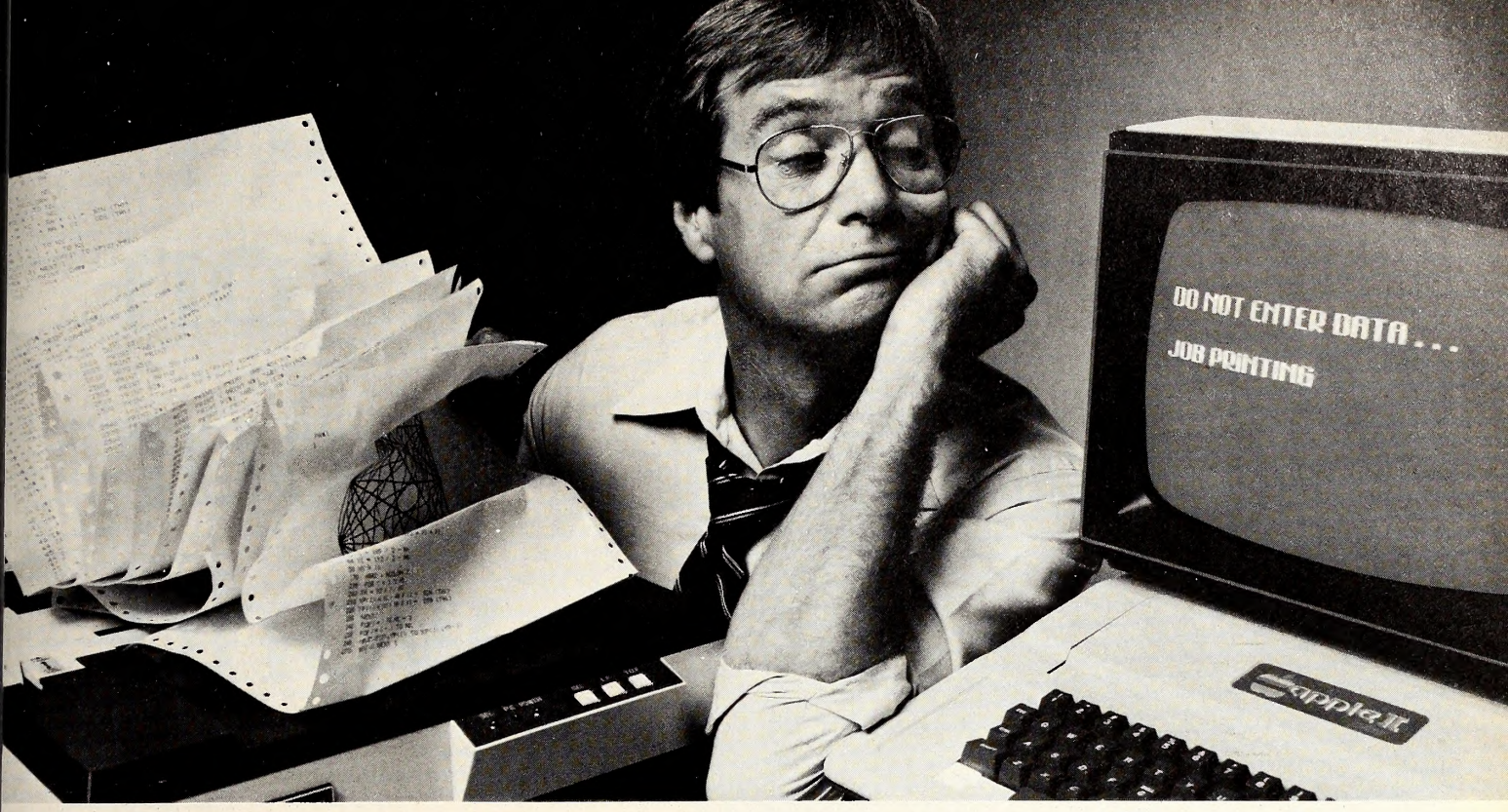

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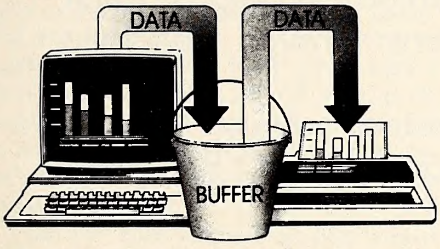

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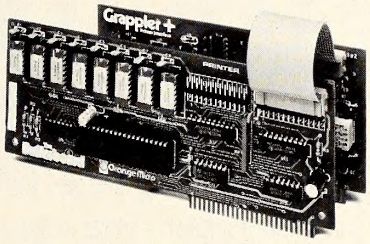

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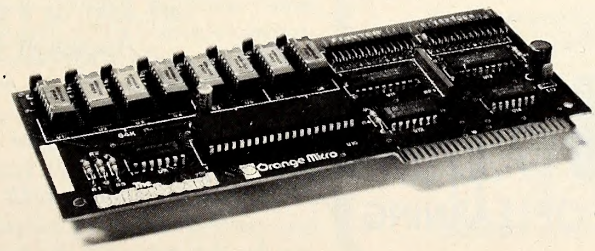

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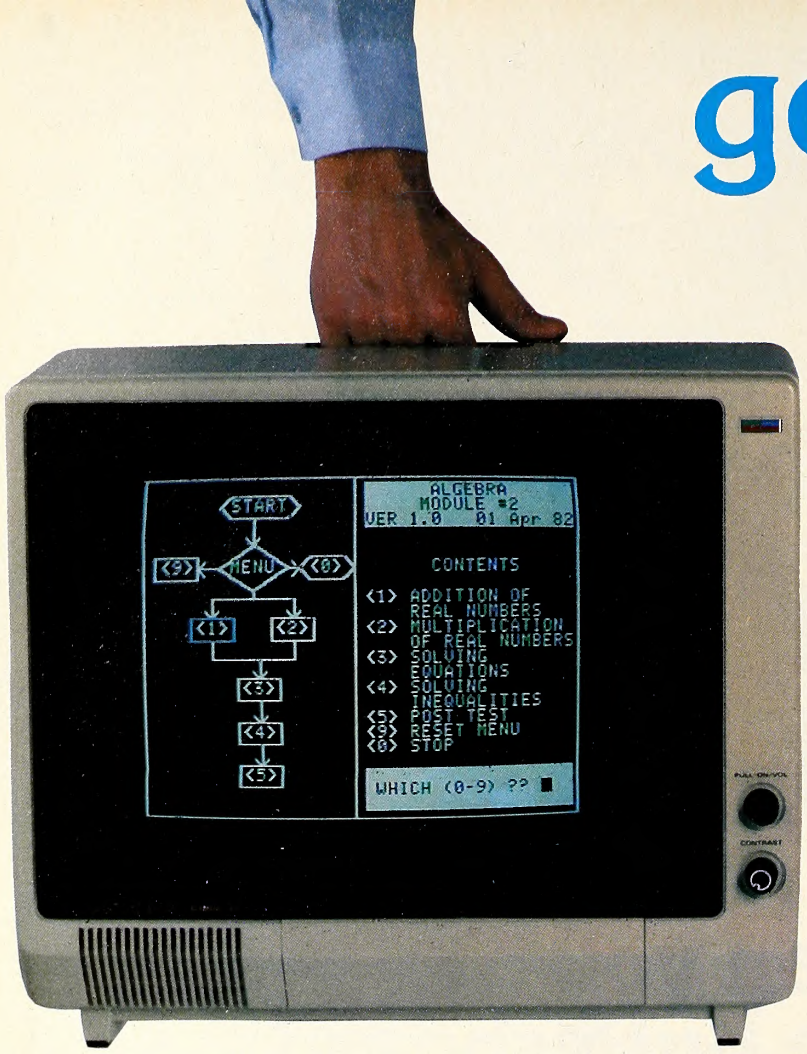

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ent approach than the solution in another. Thus, if you merely translate a Basic program into Pascal, you may not be using the full strength of Pascal, and vice versa. It's not until you can approach the solution from a Pascal perspective that you can utilize the true power of the language.

Incidentally, can anyone provide an address for the UCSD Pascal Users Group?
Hobart S. Cable II, Dayton, OH

Connecting Up
I am interested in buying a modem and I'd like to get some feedback in Open Discussion from fellow readers who are using modems. What do you think of the modem you've been using? Any recommendations would be appreciated.
Fred Berns, Glenview, IL

Last Letter Lop-off Lamented
I take pen to paper to suggest a new column in *Softalk* concerning Epson printers. There must be a fair number of Apple owners with these printers for Epson to rewrite their manual around the Apple. A column would seem to be a logical development.

I have a specific problem I hope someone can help me with. When I am printing a file to my Epson MX-80 that has been transferred by *Transend I* over my Hayes Micromodem, the last letter on each line is omitted. SSM Microcomputer advised me that it is a problem with the printer. Any suggestions?
Roger S. Tallboys, Houston, TX

A Thorn in the Side Dish
I have an Apple II Plus with two disk drives and an Epson MX-80 printer. I also have a thorny programming problem that looks simple but has got me stumped. Here's the problem:

At the next company group meeting, dinner arrangements have to be made for fifteen to thirty-five couples, in settings of three to five couples, at five to ten different restaurants, for three to five evenings. I want to input the number and names of the couples, the number of nights to be arranged, the number of restaurants and name of each, and the number of couples at each setting. From this I want a printed output that shows, for each evening, the grouping of couples at each restaurant. Now for the clincher—I must be sure that no two couples are seated together twice or go to the same restaurant twice.

I certainly hope someone can help unravel this for me.
J. J. Marino, Wilton, CT

Calling Third World Computerists
The International Statistical Programs Center (ISPC) of the Bureau of the Census is conducting a project to study the feasibility of using microcomputers in national statistical offices in developing countries. We are attempting to make contact with overseas microcomputer users, particularly those in developing countries, to gather information for this project. The study is focusing on hardware, software, and the approaches to that processing that will take into account the budgets, levels of experience, types of processing, and computing environments generally found in developing countries.

If any *Softalk* readers have relevant information on this subject, please write or call me at (301) 763-2750. The results of this study will be made available to you if you wish. Thank you for your contribution to our project.
Robert R. Bair, Bureau of the Census, Washington, DC

Pumping for Breaks on the Digibuster
Please hold a contest that has an Apple computer as the prize. I don't have the money to buy one, but I have worked on one at school for a year and I think they are just great.

Also, I haven't seen any references in *Softalk* to the proposed congressional legislation that gives double tax breaks to computer companies that donate computers to schools. Does anyone know if this bill is going into effect?
Steven Saltman, Bethesda, MD

A This-Is-Not-a-Contest-Entry Contest
This is *not* a contest entry—merely a set of anecdotes, an alternative solution to a former contest, and, possibly, the basis of a contest. I thought of claiming that this letter was composed entirely of subheads from former issues of *Softalk* but that is not the case.

I am an assistant dean and coordinator of advisement at the State University of New York at Albany. The university recently decided that if our administrators had at least played with a computer once, then the gap that would shortly exist between them and the students (and some of the faculty) would not be so hopelessly unbridgeable. Therefore, in December 1982 I took home for two weeks an Atari 800 (you'll pardon the expression), disk drive, Hitachi TV, and a book purporting to teach me Basic. I learned enough to know I wanted a computer, though I was unsure which one.

On December 8, Bill Holstein, professor and former dean of our school of business, convinced me over lunch that an Apple II might be best suited to my needs and uses, which include entering (and sometimes winning, I might add) recreational math contests. Bill noted that he and his class had been working on the Significant Figure contest to no avail (October '82). Assuming you are used to puzzler mentality, you no doubt have correctly guessed that I immediately asked for a copy, even though the deadline for entry had long passed.

The next day, I told Bill that $G = 7^4$ not 7^3, since the cats were in sacks, and that C probably is not equal to additive 12, but the sum of additive 12 through 1 = 364. Although I could not go further without knowing the height of an Apple II, it seemed to me the word "call" and other hints suggested ASCII codes might be involved. Rule number five suggested that the answer might be surmised without knowing anything about the mathematical value. Thus, "give us a call" may well be the correct answer. "The U.S. is significant in the microcomputer industry in general," and "Were it not for us, you probably wouldn't be doing this contest."

Well, considering that a whiz like himself, and 500 or so students to boot, had not gotten very far on the problem, Bill thought this was kind of impressive for someone whose degrees are in Latin and ancient Greek, and who had never before touched a computer. He explained that my significance *had* to be correct and was an "in" reference to Steve Wozniak's Us Festival. Since I had not before heard of either phenomenon (Wozniak or Us), I accepted this independent verification.

A trip to a dealer with a pencil marked in quarter inches told me that $x = 4.5$ inches. Using my other variables, my loaned Atari reached 11616125.1; my trusty old Sears twelve-digit calculator, 11616125.259. Bill independently found your .3 answer on his Apple II. But none of these seemed "significant."

On December 13, I proudly showed Bill the "correct" solution: The clue to the whole thing was the title "The Significant Figure" and the many, many references to "significant" and "significance" throughout the column. The magnitude of the solution was solely determined by raising x to the bth power ($b = 12$). As any freshman physics student on our campus can tell you, raising a measurement to the twelfth power produces an answer no more significant than the accuracy of that original measurement. Perhaps the Platonic ideal of an Apple II is precisely 4.5 inches tall, no matter what the atmospheric pressure, distance from sea level, rate of motion, external temperature, internal temperature, and so forth. However fantastic, precise, and minuscule the tolerances of microchips may be, I saw no reason to assume equivalent accuracy to the millimicron during assembly of the plastic cases.

Therefore, assume a range of roughly plus or minus 1/64 inch variance. If x can range from 4.5 + 1/64 inch to 4.5 − 1/64 inch in height, then the value of A in terms of *significant* figures will range from 117×10^6 to 115×10^6. Thus, we simply discard the 10^6 as *in*significant.

```
PRINT CHR$(117);PRINT CHR$(115)
```

yields us Q.E.D. Right? I guess not. Bill lent me the January '83 *Softalk*. I have this strong suspicion that without the benefit of a computer, and without having immersed my mind temporarily into computer-related solutions, I might have quickly translated the simplest substitution code for Apple. As for .3 = II, I find this far-fetched and erroneous. Though "2" is indeed the third Arabic numeral, the third Roman numeral was (and still is) "III." (Had the Romans possessed the zero, we might all be speaking Latin now, in which case I would probably have gotten my degrees in other dead, odd languages—English? Pascal?)

In defense of my solution's superiority to the one given (Apple II), I cite the second tip. The existence of "us" (*Softalk*) has more to do with the probability of one's doing the contest than the existence of "Apple" (II or otherwise). As I have demonstrated, no knowledge or use of computers is necessary to solve the entire problem and arrive at the simplest cryptographic solution, "Apple." All computer-related clues are accompanied by other clues sufficient to determine the values sought. Therefore, if one merely assumed that whatever a "two" was had to be measured in quarter inches, any decent code-breaker would need only attack each of the values of A for $x = 1/4$ inch to, say, 12 1/4 inches.

In sharp contrast, my solution requires that one know about ASCII codes and how to call them up (or at least look them up). Oh, I suppose you could argue that your contest page and the rest of your fine magazine has the Apple as first cause. Arguments with Apples as first cause smack of biased arbitrament and, somehow, I never find them fully convincing.

Therefore, had I known about the contest a month earlier and entered it, I would be writing this letter to express my feelings that I was robbed! Since this was not the case, I can only counter by posing the following problem. Initially forbidding, it really isn't impossibly difficult. Please explain the full significance of the following number:

```
167232878328774277642595318796187 95
```

Tips:

1. Follow your own advice in the last paragraph of "The Significant Figure."
2. Half the significance is more quickly found with a computer than without.
3. The entire significance would be eliminated by a change or deletion of one or more digits.
4. You would not be doing this problem had I not tried to do yours.
5. Each of the preceding tips is probably a good deal more helpful than it appears.

I checked the above number carefully, and those are the right digits in the right order. Good luck!

Dick Collier, Watervliet, NY ◨

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The Saga of Scott and Alexis Adams

BY ROE R. ADAMS III

Scott Adams, president of Adventure International, is a rare gentleman of the microcomputer industry. One never hears him knocking the competition or bemoaning the cleverness of another author.

Adventure International was represented at the 1981 West Coast Computer Faire in San Francisco with a large booth in the center of the hall. A young company called On-Line Systems had a small booth off to the side. On-Line's *Wizard and the Princess* was just starting to make an impression on the market, while Scott Adams's text adventures were at the apex of their popularity.

"Throughout the show, people were coming up and saying, 'Adventures, great!' " recalls Adams. "I would say, 'Well, you came to the right place,' but they would often counter with, 'No, we want graphic adventures.' So I sent them over to Roberta and Ken Williams at On-Line."

Later, after the show, Roberta Williams came over to Adventure International's impressive booth and asked Adams, "Why are you sending all these people over to me? Aren't we supposed to be competitors?" He told her that as far as adventures are concerned, there can never be too many.

"It's like paperback books," explains Adams. "We're all building the same audience. So they buy an On-Line adventure this time. After a while, they'll finish it and want another one." Maybe they'll try one of Adams's for a change. Two years ago that was a refreshing perspective, and, in these days of spreading corporate paranoia and ruthlessness in business, the microcomputer industry could benefit from a return to such values.

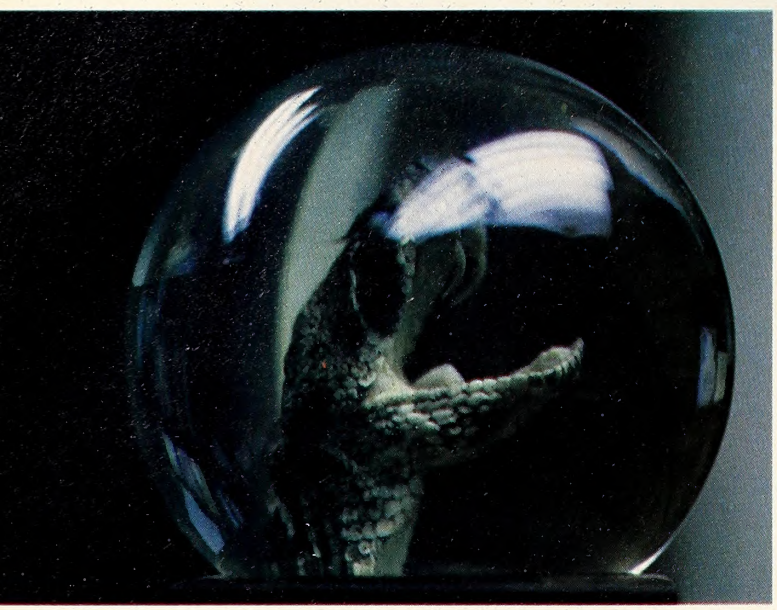
On the Ball. Flying over Orlando, Florida, you're treated to an aerial view of one of the meccas of the computer world. Shaped like a giant golf ball, a geodesic dome rises glistening in the tropic sun. No, it isn't the silver dome of Disney's nearby Epcot Center, but the brown dome that is the headquarters of Adventure International. It's one of the most colorful corporate headquarters in the country.

Adventure International's history is the history of the husband-and-wife team that founded the company, Scott and Alexis Adams. Husband-and-wife teams so deeply involved in the operation of a company are rare in the computer industry; only a few other couples have been so successful. In each case, it was vision, ingenuity, drive, and practicality

that produced the spectacular successes.

Scott Adams attended the Florida Institute of Technology in Melbourne, near Cape Canaveral. The only fully accredited college in the country that still has its founding president, the school is associated with Cape Canaveral and is predictably hi-tech-oriented.

"I went to the college's computer center looking for a job," Adams recalls. "They said, 'Sure, what do you want to do?' I said, 'Well, anything,' and they said, 'Good, we need someone to put shipping labels on the newsletter.' I said, 'Great, I'll take it.' "



New horizons in executive playthings. Adams's collection includes this snake in the glass and an equally appealing bat (not shown, thank God). At bottom right, Adams does battle with *Red Baron*, a coin-operated Hanukkah present from Alexis.

Three years later, Adams was getting free tuition in exchange for writing all the financial software for the school. Once he had a foot in the door, Adams took advantage of the situation to pursue his growing interest in computers.

"My criteria for working for any company was that I would do what they wanted during salaried hours. After hours, I would have free use of the machine to do whatever I wanted. The thing I wanted to do after hours was to play games."

After three years at school, Adams took a year off. He had been feeling a little burned out in school, and, when he saw a note on a bulletin board—"Math graduate apply for work in the South Atlantic"—he responded. The offer was from RCA. He admitted to not yet having his degree and to not even being a mathematician. He just wanted to go, and RCA immediately agreed. When the company told Adams the job was located on Ascension Island, he said, "Great, never heard of it."

Adams worked for RCA on Ascension Island for eighteen months. Ascension is thirty-five square miles in size, eight hundred miles below the equator, and a thousand miles from nowhere. With the title "space optic identification analyst," Adams analyzed radar signatures of spacecraft that the station was tracking. Done at the bidding of the Space Defense Command branch of the military, Adams's routine was 90 percent boredom and 10 percent frenzy, like flying an out-of-control airplane. Adams spent the down time having fun with the station's huge Xerox computer.

"I could do whatever I wanted on the computer almost all the time. The radar station is probably still playing one of my versions of *Star Trek*—run on the computer, but played on the radar scope.

"I learned more about programming working for the Florida Institute of Technology and working for RCA than I ever did in any course."

Circular Thinking. Scott Adams returned to college after his tour in the South Atlantic, and in 1976 he graduated with honors in computer science with a minor in business. RCA was right there with another alluring opportunity for Adams; this time he went to the Caribbean island of Antigua for nine months.

Cape Canaveral was the best RCA could muster after Antigua, and Adams soon moved on to DVA, a small software company in Melbourne, Florida, that specialized in handling the requirements of top government contracts. But the small-town atmosphere wasn't for him, so Adams found a place in Orlando with Stromberg-Carlson, making telephone digital switches. It was a new experience for Adams.

"There must have been hundreds of programmers in a building the size of a large J.C. Penney's. There were desks as far as you could see. The company was releasing software every three months, and the pace was unbelievable."

Adams's first microcomputer was a Sphere, which he bought in 1977. Sphere was the second company to market a micro, the first being MITS with the lengendary Altair.

"I was their very first customer," Adams reflects. "The kit cost seven hundred and fifty dollars, with a tremendous 4K memory and almost a whole ½K of ROM built around a 6800 processor. It took some time to put the computer together and get it to work; the design was not the best in the world."

Adams designed and built a graphics board, which he sold back to Sphere. He also wrote a tank warfare game for the machine, using hi-res bit-map graphics. Adams even had to design and build the game controllers—"Two levers with a button on top." At the time, Programma International was beginning to write software for the Sphere, and Adams submitted the tank warfare game to that company. But Programma had quit publishing for the Sphere almost as soon as it had begun. Adams sold his own Sphere in the spring of 1978 and, to no one's surprise, the company dissolved shortly thereafter.

Adams replaced the Sphere with Radio Shack's TRS-80 Model I. He could do more programming on this computer and spend less time on maintenance. According to Adams, Tandy expected the Model I to be primarily a business machine; Scott Adams's software contributed to making it a personal computer.

From Red Tape to Red Herrings. While at Stromberg-Carlson, Adams had discovered the original *Adventure* by Crowley and Woods. Like many of the adventure game pioneers, Scott Adams owes his roots to this great classic. In fact, Adams's first game, *Adventureland*, pays direct homage to *Adventure* in many of its sections.

Adventureland had its genesis amid hassles with bureaucratic red tape. Adams had been avidly playing *Adventure* for some time on the company's computer when it occurred to him to share the wonderful new game with friends.

"I couldn't get them to see it at Stromberg-Carlson because they didn't have security badges. Well, I had my 16K Model I; so I thought it would be neat to write my own adventure. My friends laughed when I told them what I wanted to do. I didn't listen and wrote it anyway."

It took Adams a week to solve *Adventure* on the mainframe, coming in every morning at six o'clock and playing intensely. It also took him a week to make an initial design for his "adventure interpreter." It took six months for Adams to refine everything. His friends stopped laughing.

Adventureland almost never saw the light of day. Scott relates how Alexis, his wife and now vice-president of Adventure International, tried literally to bake the game.

"Alexis was pregnant with our first child when I was writing *Adventureland* and she was becoming upset with me. I was spending all kinds of hours on the computer. I would come home from work, jump on the computer until midnight, then get up and work on the program from six to eight in the morning before I left for work.

"One day she had finally had it. I came home to find that she had put all my disks—including my only copy of *Adventureland*—in the oven. I was not going to program anymore, she said, unless I spent some time with her. Luckily, Alexis had been so mad that she'd forgotten to turn the oven on!"

And so it came to pass that Adventure International sold the first adventure game for the microcomputer. It was several months later that Microsoft released *Adventure* for the micro.

The Tale of the Baggie in the Baby Buggy. In 1977, Adams had started what was probably the first American TRS-80 users club. The TRS-80 Beach Users Club still meets, although it's now in Cocoa Beach. It was at the club that Adams first showed the finished *Adventureland.* His friends at the club were duly impressed and suggested that he sell it. But in the summer of 1978 there was no place to sell the program. Computer stores, as such, barely existed. So Adams placed classified ads in several computer magazines. Adventure International was born from those small ads.

As soon as the game started selling, Adams formed his own company. In the beginning Adventure International consisted of Adams and a spare bedroom. He fondly recalls his first dealer order: "It was an order for thirty-five cassette tapes from Manny Garcia, who's still in business in Chicago. Manny was going to a special user group meeting, a sort of computer minishow, and he wanted to sell my game there. It took Alexis and me three nights to make the tapes! This was long before there was any packaging. We sent him tapes, typed labels, and photocopied instruction sheets."

The company's first real packaging required innovation. Adams realized that some form of packaging was necessary for retailers to display his game, and he thought of using simple plastic bags. They turned out to be anything but simple. When he called bag manufacturers to get pricing on bags to fit the cassettes, the companies were helpful until they learned that the quantities Adams was looking for could be counted in tens rather than tens of thousands.

Adams was not daunted. After a long search, he found the perfect package—a baby bottle's plastic liner. It was just the right shape and size and, because the plastic was much thicker than that of general-purpose plastic bags, fewer bags got torn. Adams sealed the package by stapling one of his business cards across the top. For mid-1979, that was state-of-the-art packaging, considering that most games were written in Basic and sold for the price of two for less than fifteen dollars.

Behind Every Good Woman There's a Man. It was time for the new company to expand. In the process of building a new house, they decided to include an office. Ten feet by ten feet, the office sufficed for about a month—then it overflowed into the family room. When it threatened to creep upstairs, Alexis insisted that Scott move Adventure International out of the house.

They took a storefront in a small strip mall because the price was reasonable; as it turned out, that choice led to a second business. Few computer stores existed in the area; so Adams opened a retail store in the storefront and tucked the software operation into a room in the back. In October 1979, the Scott Adams Computers retail chain was born.

Meanwhile, Adams had continued working at Stromberg-Carlson. With a new house and its attendant new mortgage, a new baby, and rent on the new store, Adams quit the company. Linda Novak, Adventure International's first outside employee, then came onboard.

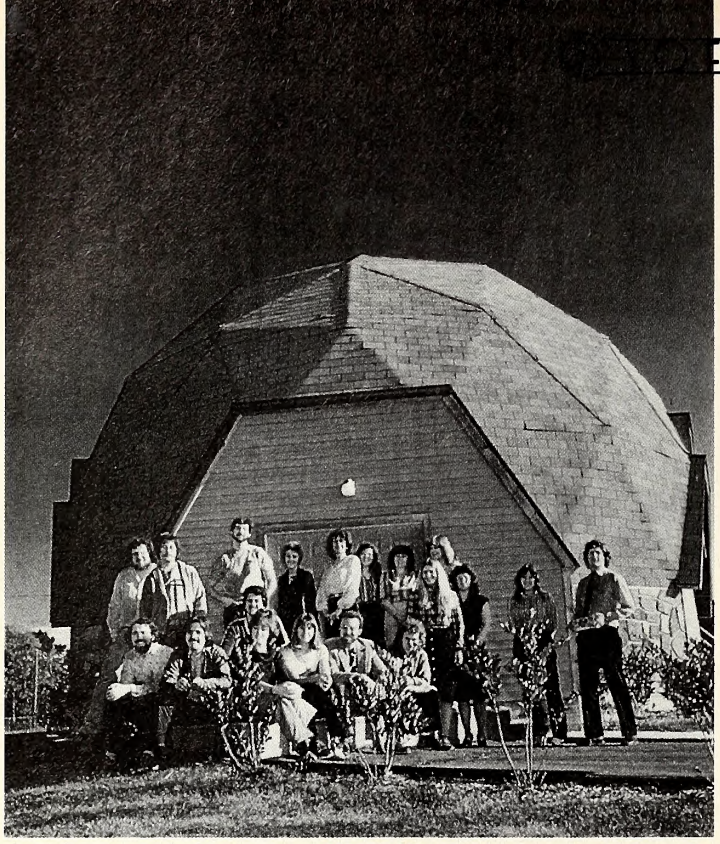
Alexis Adams was the driving force behind a second adventure. "I wrote *Adventureland* as a labor of love," Scott explains. "Once we had sold a few copies at the club meeting, Alexis decided she wanted to do one. We worked together on *Pirate Adventure*, and there was no turning back. Alexis was the main writer of *Mystery Fun House* and *Voodoo Castle*."

Scott describes a typical collaboration: "She would supply the ideas. She'd say, 'There's a cave,' and I'd say, 'What do you see in the cave?' 'A door,' she'd answer. 'Why can't we open the door?' 'There's a pit of crocodiles in front of the door.' 'How can we get past the crocodiles?' 'Well, maybe the crocodiles are hungry.' 'Great, let's put some fish out in the ocean, and make it so that you can't swim, forcing you to find some way to get out in the ocean to catch the fish.' Thus the catching of the fish would lead to getting through the door into the cave."

In the summer of 1979, the Adams adventures were translated to the Apple Computer. Creative Computing wanted to publish Apple versions of the adventures for their new software line. They lent Scott his first Apple, so that he could provide an Apple version for them; until the recent dissolution of Creative's software facility, it continued to market some of Adams's products. Today, most of Adventure International's catalog is available for the Apple.

One of the reasons for the proliferation of Adventure International's text adventures is the approach Adams took in designing the gaming system. The centerpiece of the system is the interpreter.

"There is an interpreter at the base that translates the database for each adventure. So, when I write a new adventure, I only have to write a new database, not the whole system all over again. It isn't a hard-wired adventure. The databases contain the scenario for the adventure, while the interpreter understands the relationships between objects and rooms. I still write all my adventures on a TRS-80 Model I and then transfer



Last days at the old homestead. When Adventure International moves to larger headquarters, their distinctive geodesic dome will stay behind, split seams and all.

them to other machines."

The newest concept being worked on at Adventure International is that of developing a new adventuring program language. Similar in concept to Infocom's Muddle, this language is called Oil. Adams has even designed his own one-of-a-kind computer exclusively to operate it, and he's writing an emulator to translate programs to other computers. The new adventure structure will be called Odyssey.

A Quartet of Successes. Adventure International has been and still is one of the most receptive publishing houses to budding authors. The very first outside program submitted to Adventure International, according to Adams, was from an unknown programmer in Oregon.

"He said that he really liked my adventures and thought it would be really neat if we helped him get his product out into the market. Perhaps you've heard of him: Doug Carlston. The product, of course, was the *Galactic Empire* series. We still sell that series in our catalog today. The royalties he received from us helped Doug found Broderbund."

In the spring of 1980, a man named Ken Williams called Adams and inquired about the West Coast distributor rights to Adventure International's games. This brief venture proved highly profitable for Williams, but he was anxious to do his own programming. So, Williams sold the distributorship and founded what has mushroomed into Sierra On-line. The two fellows who bought the distributorship haven't suffered buyer's remorse; they're Bob Leff and Dave Wagman. They've since built the business into the largest software distributorship in the industry; they call it Softsel.

Pitting Pirate against Piracy. Those two jobs in the tropics heavily influenced Adams's writing. Several of his best adventures are set on tropical isles, involving pirates and buried treasures. Yet there is one kind of piracy that Adams has fought against for years.

Each of Adventure International's programs has begun with the words: "The author has worked over a year on this program, so please don't copy or accept a pirated copy." Last year, when Adams reissued all twelve text adventures as hi-res-graphics adventures, he took the opportunity to update his feelings graphically. Each of the games in the S.A.G.A. series begins with a short hi-res slide show conveying the economic hardship that pirating imposes on a software company. It's Scott Adams's "Open Letter to All Software Users." The first slide is of Adams himself. The second picture is Scott's Adventure International's familiar pirate, who is in all the adventures. The rest of the brief show graphically explains the effect of software piracy. It closes with this plea: "Next time you're asked for a copy of a copyrighted program, please say, 'Sorry, no!' " It's a sincere plea indeed; Adams's great respect for his customers appears on the only screen to precede the letter—the option to skip it altogether.

In the S.A.G.A. series, Scott added more than graphics. He has given adventures a voice. Using the Votrax speech synthesizer, Adventure International's games now talk to the player. The games also recognize a lower-case adapter, include flip screens between text and graphics, and, for die-hard traditionalists, offer a text-only mode. Penguin's *Graphics Magician*, developed by Mark Pelczarski, brings to life the Adamses' rich, hi-res imaginations.

A Call to Arms? Phone It In. Adventure International's *Combat* is the world's first two-player war game playable on microcomputers via modem. Recently released for the Apple, the game has some amazing breakthroughs in war gaming, such as small side screens that show what each troop sees. Each player can see only what his troops see. If the enemy is out of visual range, positions displayed on the master screen cannot be entirely trusted. *Combat* is played on a large grid, only a small part of which is seen at any one time. To increase the challenge, the game is played in a real-time format. If players just sit and carefully ponder their strategies, they'll be surrounded and annihilated.

A brand-new division at Adventure International deals exclusively with business software. A retail-store cash-register program will be the first offering. Called *C.R.I.S.*, for *Cash Register Inventory System*, the system was originally developed for use in the Scott Adams Computers retail stores. That all divisions of Adventure International interact with each other is one of the main strengths of the organization.

Adventure International's Computer Expo Division organizes local computer fairs. Responding to the interests of the rising wave of computer-related companies in the area, Adams has successfully produced a series of computer shows.

It's hard to overlook the presence that Adventure International brings to computer shows; its large theme booths are always show-hall landmarks. Adams and company bring five thousand pieces of software to each major show—every product in the huge catalog. Customers can choose from a veritable wall of software and play or watch the games being played on any of many computers.

Meanwhile, Back at the Dome. Alexis Adams works long hours guiding the path of the business. She oversees all facets, deftly adding her unique touch here and there. The result is a highly fluid and dynamic operation. The complexities of the business have grown considerably since she and Scott first began Adventure International.

The staff has grown from two to forty, and the company now publishes the programs of sixty authors. The whole catalog contains more than one hundred fifty programs, many available for several machines. The company also maintains an extensive mail order business. Every quarter, Adventure International mails out one hundred thousand catalogs. All this Alexis coordinates while raising two daughters. The Adamses' third child is due in August.

The retail division contributes more than monetary profits to the success of Adventure International. Alexis Adams feels that one of the reasons for the company's rapid growth has been "the contact that we continually get from the people in the store. Most companies are totally out of touch with their customers—unless the customer complains.

"I love working in the retail store, even these days. It gives me a chance to learn what people really want, to find out what we can do to help the customers solve their problems. The immediate feedback has proven invaluable to our product development.

"We have a network of several hundred local play-testers. When a new product is about to be released, these people are given copies to check thoroughly. They are one of the reasons our products are so well-known for being bug-free."

From Emerson to Woodhead. . . . Scott Adams is a voracious reader. Despite his heavy schedule, he usually reads a book a day from his extensive library. Science fiction accounts for 80 percent of the library's volumes; the remaining volumes are classics and mysteries. In Adams's office are two large bookcases filled mostly with noncomputer-related books, including the collected works of Ralph Waldo Emerson and Douglas Adams's *The Hitchhiker's Guide to the Galaxy*.

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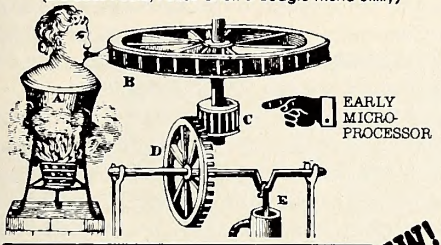

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```
10  FOR A = 1 TO 22: PRINT CHR$(ASC (MID$(
    "IJ—!IPX(TIZPVS!TJTUFS@", A, 1))—A/A);
20  FOR B = 1 TO 4: C = PEEK(49200): NEXT B, A
```

DOS Boss

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BLOAD HI-RES IMAGE	10 sec.	3 sec.
BSAVE HI-RES IMAGE	12 sec.	6 sec.
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SAVE 60-SECTOR PROGRAM	24 sec.	9 sec.
BLOAD LANGUAGE CARD	13 sec.	4 sec.
TEXT FILES	(no change)	

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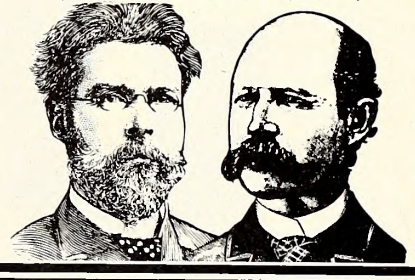

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Adams also keeps an eye on new releases in the microcomputer industry. His favorite game, apart from those of his own company? Adams exclaims, "I love *Wizardry*! I took an Apple home for a week just to play the game."

The Adamses' home reflects its owners' personalities. Completely designed and built by Scott and Alexis, the house resembles a modern medieval castle, complete with running moat and fixed drawbridge leading to the front door. The door is set in a three-story turret, from which the house extends like wings sweeping back in two sections. High on the wall above the front door are two stained-glass windows; one features a large dragon, the other a rose. The sun streaming through those windows projects their images on the main floor of the house. Now, that is the ultimate in fantasy role-playing.

Adventure International soon outgrew the space it shared with the retail operation. A small house sufficed then until corporate headquarters were moved to the geodesic dome. The three floors of the dome circle around a center stairway. With desks located along the curving walls, communications among employees are friendly and face to face.

The top floor is furnished with an unbroken ring of computers. Developmental work, debugging, and play-testing keep dozens of machines running continuously. The noise from the games creates a polytonal symphony of sound.

But the dome can hold no more. By summer, corporate headquarters will move into a new building in a nearby industrial park. The empty dome will welcome the overflow from the company's manufacturing and shipping facilities.

Meanwhile, the retail store division isn't sitting still. Soon, there'll be three stores in the area, with four opening later in the year.

It Was a Dark and Stormy Night. Not everything has gone smoothly at Adventure International. Scott relates the story of how he single-handedly destroyed half the company's computer equipment in an evening he calls "The Massacre at Adventure International Computer Center."

It seems Adams hooked up a new Qume Sprint-5 printer to his TRS-80 Model II, and the printer began churning out garbage. He disconnected the Qume and hooked up an Anadex 9501 instead. The Anadex began printing garbage also. To test the Anadex, Scott hooked it up to an Atari computer; the printer did not work at all. At this point, he connected a Centronics Quick printer to the Model II. You guessed it, nothing printed.

In half an hour, Adams had unwittingly destroyed two computers and three printers. It was discovered, when all the smoke had cleared the next morning, that the Qume had been incorrectly plugged into the Model II's line filter. This burned out the Qume. The Qume retaliated by shorting the printer port on the Model II. When the Anadex was hooked up, it fried. The connecting of the Anadex to the Atari did in the Atari. Naturally, connecting the Centronics printer to the shorted-out Model II printer port was no more successful than trying the Anadex. The only computer left standing after the holocaust was the Apple.

A Novel Future. Scott believes firmly in the future of computer novels. Among the first efforts in this field were Adventure International's *Interactive Fiction Novels*, written by Marin Computer Center. Today, several companies are developing software that brings the user into the program as a participant. "Have you played any good books today?" may become a common phrase in the next ten years. Adams believes Adventure International is in the vanguard of that movement.

"People are no longer scared of these machines," says Adams. "Many children are working with computers in some level of their schooling. I foresee that, in the next ten years, every house will have two cars, five televisions, and two computers. One of the computers will be an old one, bought in the mid-eighties and now relegated to the children's rooms. The other will be some real souped-up computer of the nineties that puts the world at the fingertips of the user. Our software will be running on that machine."

Given the accomplishments of Adventure International over its first five years, it's easy to see the Adamses and their organization remaining a major factor in the microcomputer industry through the nineties.

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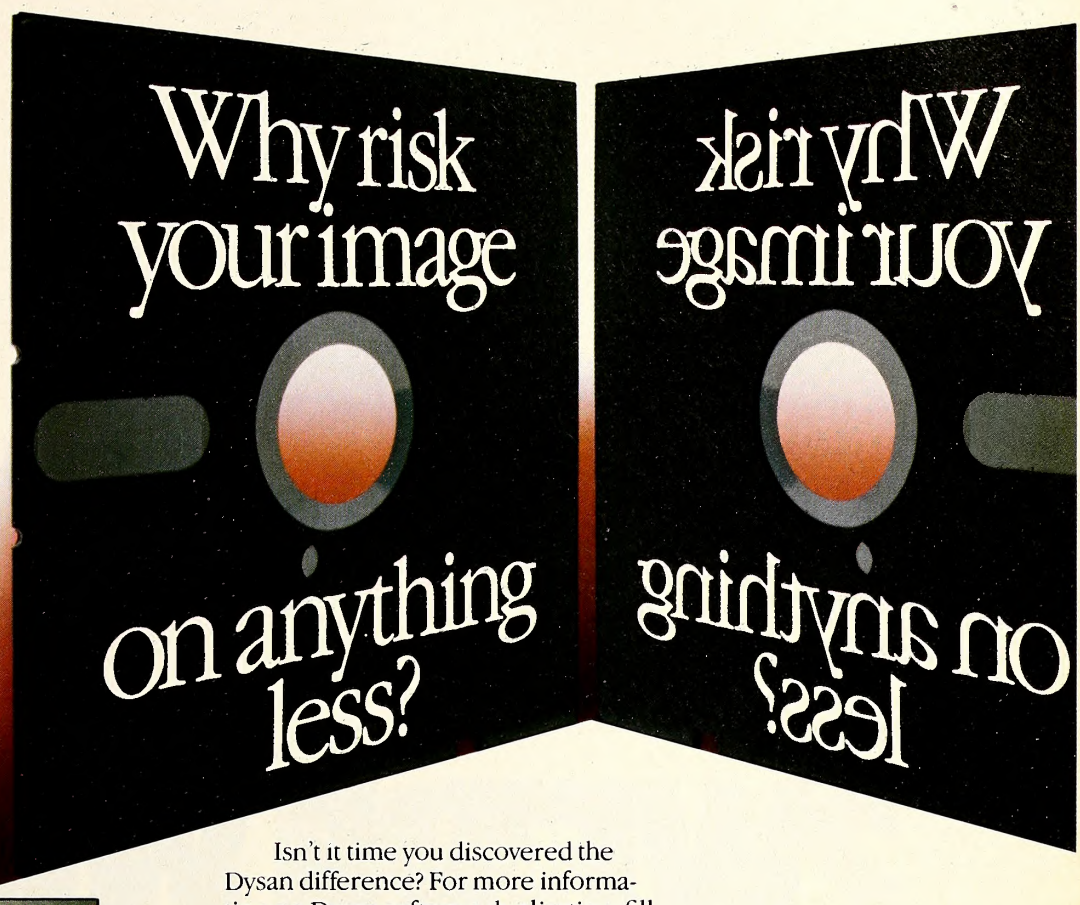

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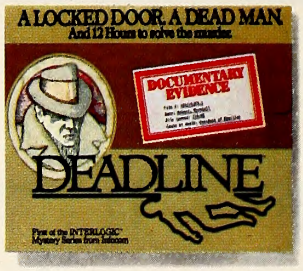

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Judging from the public's reaction, it's worth the wait. For instance, *Creative Computing* welcomed DEADLINE™ as "thoroughly engrossing and realistic," while a *Softalk* readers' poll recently voted ZORK™ I and ZORK II the most popular adventures of 1981.

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THE BASIC Solution

By Wm. V. R. Smith

Database management programs are a major component of today's computerized office. By replacing overflowing desk drawers, bulky filing cabinets, numerous phone lists, and "little black books," they can make information storage and retrieval flexible and quick.

This month, and in the next two Basic Solutions, we'll be designing and creating a simple database program. Though ours will be limited to storing name, address, and phone number files, it will serve as an introduction to the principles of database management. You may find it will come in handy as a small-scale home database as well.

Although we'll be presenting the program in three parts, it is constructed in a modular way, enabling you to use the functions of this month's part as soon as you finish keying them in. This section will allow you to enter and edit one folder containing a single name, address, and phone number. Next month we'll create the disk I/O routines. Then you'll be able to type in many folders, saving them to a text file on disk and getting them back any time you like. The third and final section of the program, coming two months from now, will contain the routines necessary for printing out your list or various folders within it.

There are two ways that data can be handled by a database program. One is RAM-based, meaning that all the data is loaded from disk at the beginning of a work session, manipulated within the computer's RAM memory, and saved back to disk at the end of the session. The other method, by default, is disk-based. This doesn't mean that the data never enters the computer's memory any more than RAM-based means that it is never saved to disk. Rather, the data is saved on disk one folder at a time, as it is entered. To read or edit a particular piece of data, the user calls it up and the computer takes just that data off the disk, manipulates it, and then puts it back.

Both methods have their advantages. The RAM-based system is much faster in searching and sorting operations, or anything involving mass manipulation of data, because it doesn't have to go to the disk to get the data before it can deal with it. The size of the files it can deal with is limited, however, by the amount of memory available in the computer. With a 48K Apple—accounting for the amount of space taken up by DOS, the database program, and other sundry memory usage—this leaves you with maybe 25K for data.

The disk-based system, on the other hand, is limited in memory only by the amount of space on the disk. If you use a whole disk for the data, you can get about 143K of memory in a single database. A more sophisticated program could potentially allow two disks for data storage, but that would require a two-drive system and more overhead for indexing.

For our database we'll use the disk storage method. This will slow down sorting but allow much more data to be manipulated. Like almost any programming decision, this is a trade-off. If you require greater speed and don't need to store as much data, it will be possible to convert the program to the other method.

This month's part of the program is designed to store five fields or pieces of information. Because we'll be using random-access text files for storage, we have to decide right now what the maximum size field will be. It has to be long enough to be able to fit most circumstances but short enough that it doesn't eat disk space unnecessarily. Forty characters is a good middle-ground figure for our purposes. Each field will have a name used as a prompt for input as well as a data identifier. The five field names (or headers) we'll use are *name*, *address*, *city st zip*, *phone number*, and *misc.*

You can change the names or even the number of headers used by changing the data in lines 1210 through 1230. The 5 in 1210 is the number of headers and must equal the number of pieces of data in lines 1220 and 1230, which, of course, are the headers themselves. The only limitation

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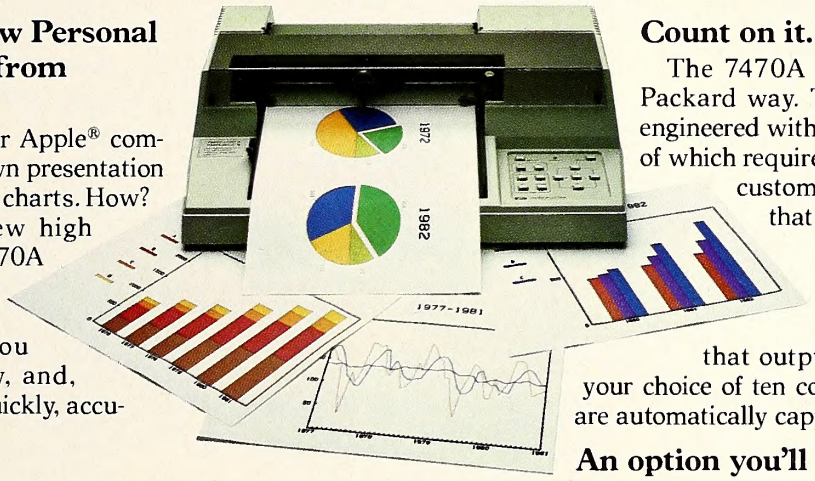

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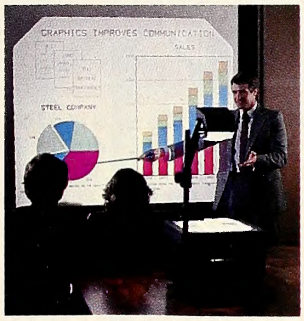

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on changing the parameters of the program is that you have to make the decision before you store the first piece of information to disk. That gives you a month to think about it.

Enter the program as it is listed here. The sections that come in the next two months will fill in the vacant line number regions at the end of the listing. You can run the program to test the sections already provided as soon as you type it in. Lines 2910 through 2930 prevent it from bombing out with an error message if you select an option that isn't implemented yet.

Good luck with the program. Next month you'll be able to use it to save your data to disk, so stay tuned.

```
 10 REM  * ***************************** *
 11 REM  *          DISK-BASED           *
 12 REM  *          DATABASE             *
 13 REM  *          SYSTEM               *
 14 REM  * ***************************** *
 20 REM
100 REM  * ***************************** *
101 REM  *          VARIABLES            *
102 REM  *          USED                 *
103 REM  * ***************************** *
110 REM NH = NUMBER OF HEADERS
115 REM ME = # OF MENU ITEMS
150 REM H$( ) = HEADERS
155 REM A$( ) = RECORD DATA
160 REM M$( ) = MENU DATA
900 GOSUB 1200
905 GOSUB 1100
910 GOTO 2000
1000 REM ***************************** *
1001 REM *          VIEW RECORD          *
1002 REM ***************************** *
1010 HOME
1020 FOR X = 1 TO NH
1030 VTAB X + 5
1040 PRINT H$(X);: HTAB 20: PRINT A$(X)
1050 NEXT
1060 RETURN
1100 REM ***************************** *
1101 REM *          CLEAR RECORD         *
1102 REM ***************************** *
1110 FOR X = 1 TO NH:A$(X) = "N/A":
     NEXT X
1120 RETURN
1200 REM ***************************** *
1201 REM *          SET UP HEADERS       *
1202 REM *            AND MENU           *
1203 REM ***************************** *
1210 DATA 5
1220 DATA NAME,ADDRESS,CITY ST ZIP
1230 DATA PHONE,MISC.
1233 DATA 7
1235 DATA VIEW RECORD,VIEW PAGE
1236 DATA EDIT RECORD,ENTER NEW
     RECORD
1237 DATA DELETE RECORD,PRINT DATA
1238 DATA EXIT
1240 RESTORE
1250 READ NH
1260 FOR X = 1 TO NH: READ H$(X): NEXT
1270 READ ME
1280 FOR X = 1 TO ME: READ M$(X): NEXT
1290 RETURN
1300 REM ***************************** *
1301 REM *          EDIT RECORD          *
1302 REM ***************************** *
1310 GOSUB 1000
1320 FOR E = 1 TO NH
1340 INVERSE
1350 VTAB 5 + E: HTAB 1
1360 PRINT H$(E);
1370 NORMAL : CALL - 868
1375 HTAB 20: PRINT LEFT$ (A$(E),19)
1380 VTAB 20: HTAB 1
1390 CALL - 958
1400 PRINT H$(E)
1420 VTAB 22
1430 PRINT A$(E)
1440 VTAB 22
1450 INPUT "";A$
1460 IF A$ <> "" THEN A$(E) = A$
1470 VTAB E + 5: HTAB 1
1480 PRINT H$(E);: HTAB 20: CALL - 868
1490 PRINT A$(E)
1500 NEXT E
1510 VTAB 20: CALL - 958
1520 INPUT "CORRECT ";A$
1530 IF LEFT$ (A$,1) <> "Y" THEN 1320
1540 RETURN
1600 REM ***************************** *
1601 REM *          INPUT NEW DATA       *
1602 REM ***************************** *
1610 GOSUB 1100
1620 GOSUB 1300
1630 RETURN
2000 REM ***************************** *
2001 REM *          MAIN MENU            *
2002 REM ***************************** *
2010 HOME
2020 MS = 1
2030 HTAB 5: PRINT "DISK DATABASE
     SYSTEM"
2040 FOR X = 1 TO ME
2050 VTAB 3 + X: HTAB 5
2060 PRINT X;" - ";M$(X)
2065 NEXT X
2070 VTAB MS + 3: HTAB 5: INVERSE
2080 PRINT MS;" - ";M$(MS);
2090 NORMAL
2100 VTAB 20: HTAB 1: CALL - 958
2110 PRINT "YOUR CHOICE";
2120 GET A$
2130 IF A$ = CHR$ (13) THEN 2200
2140 X = VAL (A$)
2150 IF X < 1 OR X > ME THEN 2100
2160 VTAB MS + 3: HTAB 5
2170 PRINT MS;" - ";M$(MS)
2180 MS = X: GOTO 2070
2200 REM *******
2210 ON MS GOSUB 2300,2400,2500,
     2600,2700,2800,2900
2220 GOTO 2000
2300 REM
2310 GOSUB 1000
2320 VTAB 20: PRINT "PRESS ANY KEY"
2330 GET A$
2340 RETURN
2400 REM
2410 GOTO 2900
2500 REM
2510 GOSUB 1300
2520 RETURN
2600 REM
2610 GOSUB 1100
2620 GOSUB 1600
2630 RETURN
2700 REM
2800 REM
2900 REM
2905 IF MS = 7 THEN END
2910 HOME : VTAB 10: PRINT " NOT
     FUNCTIONAL"
2920 FOR X = 1 TO 2000: NEXT
2930 RETURN
```

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All About Applesoft

by Doug Carlston

Last month we designed a program that stores and retrieves addresses on disk using text files. This month we'll continue work on that program. In particular, we'll examine the print and editing routines and add a sorting capability. We will also take a close look at what we did last time and make some changes to improve the program.

As you may remember, the general format of the program was like this:

I. Subroutines
  A. Get input line
  B. Pause
  C. Write list to disk
  D. Read list from disk
II. Main Menu
III. Input Data
IV. Print List
V. Look/Edit File
  A. Edit routine
  B. Delete a file
VI. Sort File
VII. Create New File

We looked at sections I through III last time. Before we continue by examining section IV, let's review the first three parts. Look particularly carefully at the lines marked with arrows. These have been changed from the listing in last month's column. The reasons for the changes follow the listing:

```
   10  DIM A$(4,200):D$ = CHR$ (13) + CHR$ (4)
   20  GOTO 500
   40  REM  ************************************
   50  REM  *          SUBROUTINES             *
   60  REM  ************************************
   65  REM
   79  REM *** GET INPUT LINE ***
   80  REM
   81  B$ = "": POKE - 16368,0
   82  GET C$: IF C$ = CHR$ (13) THEN 87
   83  IF C$ = CHR$ (8) AND LEN (B$) > 1 THEN PRINT C$;:B$ =
       LEFT$ (B$, LEN (B$) - 1): GOTO 82
   84  IF C$ = CHR$ (8) THEN PRINT C$;: GOTO 81
   85  PRINT C$;:B$ = B$ + C$: GOTO 82
   87  CALL - 868: PRINT C$;: IF LEN (B$) > 25 THEN B$ = LEFT$
       (B$,25)
   88  RETURN
   90  REM
   91  REM *** PAUSE ***
   92  REM
   93  PRINT : PRINT TAB( 8) "PRESS ANY KEY TO CONTINUE";
   94  WAIT - 16384,128
   95  PRINT : PRINT : POKE - 16368,0: RETURN
   97  REM
   98  REM ** WRITE LIST TO DISK **
   99  REM
  100  PRINT D$"OPEN"FILE$",L100"
-->110  X = 1
  120  PRINT D$"WRITE"FILE$",R"X
-->130  FOR Z = 0 TO 4:A$ = A$(Z,X): FOR Y = 1 TO LEN (A$):A1$ =
       MID$ (A$,Y,1): IF A1$ = "," THEN A$ = LEFT$ (A$,Y - 1) + "%"
       + RIGHT$ (A$, LEN (A$) - Y)
  135  NEXT Y: PRINT A$
-->140  NEXT Z
-->150  IF A$(0,X) < > "END" THEN X = VAL (A$(0,X)): GOTO 120
  160  PRINT D$"CLOSE"FILE$
  170  RETURN
  197  REM
  198  REM ** READ LIST FROM DISK **
  199  REM
  200  FOR X = 1 TO 200:A$(0,X) = "END": NEXT : PRINT
       D$"OPEN"FILE$",L100"
-->210  X = 1
  220  PRINT D$"READ"FILE$",R"X
  230  FOR Z = 0 TO 4: VTAB 22: INPUT A$: PRINT A$: IF LEN (A$)<
       3 THEN 240
-->235  FOR Y = 1 TO LEN (A$): IF MID$ (A$,Y,1) = "%" THEN A$ =
       LEFT$ (A$,Y - 1) + "," + RIGHT$ (A$, LEN (A$) - Y)
  236  NEXT
-->240  A$(Z,X) = A$: NEXT Z
-->245  IF A$(0,X) < > "END" THEN X = VAL (A$(0,X)): GOTO 220
-->250  PRINT D$"CLOSE"FILE$: RETURN
  499  REM
  500  REM ************************************
  510  REM *           MAIN MENU              *
  520  REM ************************************
  525  HOME : PRINT TAB( 15)"MAILING LIST"
  530  VTAB 5: HTAB 8: PRINT "C(HOOSE MAILING LIST": PRINT
  550  HTAB 8: PRINT "A(DD NAMES"
  551  HTAB 8: PRINT "E(DIT EXISTING NAMES"
  552  HTAB 8: PRINT "L(OOK FOR A NAME"
  553  PRINT
  555  HTAB 8: PRINT "S(ORT THE LIST"
  560  HTAB 8: PRINT "P(RINT THE LIST"
  565  PRINT : HTAB 8: PRINT "Q(UIT"
  570  VTAB 19: HTAB 8: GET A$
  580  B$ = "CAELSPQ": FOR X = 1 TO LEN (B$): IF A$ = MID$
       (B$,X,1) THEN S = X:X = LEN (B$): NEXT : ON S GOTO
       7000,1000,4000,4000,6000,2000,8000
  600  NEXT : GOTO 500
 1000  REM ************************************
 1010  REM *           INPUT DATA             *
 1020  REM ************************************
 1030  IF FILE$ = "" THEN 7000
 1050  K = 1
 1060  K$ = A$(0,K): IF K$ <  > "END" THEN K = VAL (K$): GOTO
       1060
 1070  PRINT : PRINT "NAME (<RET> IF DONE): ";
 1080  GOSUB 80: IF B$ = "" THEN 500
 1090  A$(1,K) = B$
 1100  FOR X = 1 TO 3: PRINT "      ADDRESS LINE ";X;": ";:
       GOSUB 80:A$(X + 1,K) = B$
 1110  NEXT
 1120  A$(0,K) = "": FOR X = 1 TO 200: IF A$(0,X) = "END" THEN
       A$(0,K) = STR$ (X):X = 200: NEXT : GOTO 1060
 1130  NEXT X: PRINT : INVERSE : PRINT "FILE IS NOW FULL":
       NORMAL : PRINT : GOSUB 90: GOTO 500
```

We have really made only two changes. In lines 130 and 235 we've replaced the # symbol with the % symbol as a substitute for the comma, since we had found ourselves using the # in addresses to indicate apartment numbers and the like.

The second change is more complicated. Previously, when we wrote

out the file to disk or read it in from disk, we simply dumped the entire array out, starting with the first record and writing the records out one at a time until reaching the last one. However, since our array can hold 200 names and addresses, this system was not particularly efficient. It required that all 200 names and addresses be written out to disk every time we wanted to quit, even if we had added only two names to our mailing list at that point.

Since your author is an impatient, impetuous sort, he decided to speed up the process by testing each record as it was written to see if it was the last one in the file (by looking at the record's pointer to see if the word *end* appeared there). If so, the program immediately concluded that its work was done, closed up the file, and wandered down to Paddy's Pub for its evening pint.

Trouble is, the word *end* sometimes appears at points other than the end of the file. For example, as we shall soon see, if an address is deleted from the list, the pointer for that record is reset to *end* so that the program knows it's okay to write a new address in that space if the occasion arises. The old program, thinking that *end* meant exactly that, would stop reading or writing, and half the mailing list could get lost.

To remedy this problem, we've changed the read and write routines so that they follow the pointers and read or write in the same order in which the list would be printed. Now, when we hit a pointer labeled *end*, we know we are truly at the end.

This is another example of how fuzzy thinking can get one in trouble. Programming is jogging for the brain—and we weekend joggers sometimes overreach ourselves.

Enough philosophizing. Let's move right on to section IV: Print List. For those who didn't memorize last month's column, section IV looked like this:

```
2000  REM ********************************
2010  REM *          PRINT LIST          *
2020  REM ********************************
```

```
2025  HOME : VTAB 5:P = 0:KT = 0: IF FILE$ = "" THEN 7000
2026  PRINT "OUTPUT TO:": PRINT
2030  PRINT TAB( 8)"S(CREEN": PRINT : PRINT TAB( 8)
      "P(RINTER": PRINT : PRINT : PRINT TAB( 8);: GET A$:
      PRINT : IF A$ = "S" THEN 2050
2040  IF A$ < > "P" THEN 2025
2045  PRINT D$"PR#1":P = 1
2050  K = 1
2060  FOR Z = 1 TO 4:A$ = A$(Z,K)
2065  PRINT A$: NEXT : IF A$(0,K) = "END" THEN 2100
2070  K = VAL (A$(0,K)): PRINT : IF NOT P AND KT > 0 AND
      KT / 3 = INT (KT / 3) THEN GOSUB 90
2080  KT = KT + 1: GOTO 2060
2100  PRINT D$"PR#0": PRINT : IF NOT P THEN GOSUB 90
2110  GOTO 500
```

There are a few small changes in lines 2060 through 2080 that improve the format of the output.

Let's examine this section. Line 2025 makes sure we have loaded a file into memory. Assuming that we have, the next three lines ask us whether we want the output to go to the screen or to a printer. If output is to be to a printer, then line 2045 turns the printer on and sets the variable P, used here as a printer flag, equal to one (the reason for this flag will be apparent in a moment).

Lines 2050 through 2080 form a loop that prints the entire list, pulling each address out of the array by following the chain of pointers (K is set to point to the next address each time through the loop).

KT is used as a counter to group the output into groups of three addresses. Line 2070 checks the flag P to see whether or not output is directed to the screen. If it is, the program jumps to the pause subroutine after each group of three addresses. If it doesn't, they scroll by you so quickly that you can't read them at all. (We skip this routine when output is going to the printer in order to prevent the pause message from printing out after each set of three names.) When you're all done, line 2100 turns off the printer and returns you to the main menu.

If you write a lot of letters, you may want to work on this section awhile to create an output format that will fit on labels. Preprinted labels are a wonderful way to give your personal correspondence that depersonalized touch.

The next section is a combined search/edit routine. You can use it to look for a specific name and address and then edit or delete it if you like.

```
4000  REM ********************************
4010  REM *        LOOK/EDIT FILE        *
4020  REM ********************************
4030  HOME : VTAB 5: IF FILE$ = "" THEN 7000
4040  VTAB 5: INPUT "ENTER NAME: ";A$: PRINT
4050  K = 1
4060  B$ = A$(1,K): IF LEN (A$) > LEN (B$) THEN 4100
4070  FOR X = 1 TO LEN (B$) + 1 - LEN (A$): IF A$ < > MID$
      (B$,X, LEN (A$)) THEN 4090
4080  VTAB 7: FOR Z = 0 TO 4: PRINT TAB( 8);A$(Z,K): NEXT :
      PRINT : PRINT "IS THIS IT?";: GET AN$: PRINT :X = 200: IF
      AN$ = "Y" THEN 4200
4090  NEXT X
4100  IF A$(0,K) = "END" THEN PRINT : INVERSE : PRINT "FILE
      NOT FOUND": NORMAL : GOSUB 90: GOTO 500
4110  K = VAL (A$(0,K)): GOTO 4060
```

Line 4070 incorporates one of the oldest tricks in the book, but it is still one of the nicest things you can do with your computer. We have used it in this column several times before (most recently in January's *Softalk*). Using the MID$ statement, we can check each name in our mailing list against the string we input. Entering Fred will give us the address of every Fred we know. Entering Gold will give us Goldberg, Goldstein, Golden, and Goldilocks.

If there is a match, line 4080 prints it out and asks us if this is the one we want. If it isn't, line 4100 looks at the pointer and checks to see if there are still more names in the file. If not, it tells us so and returns to the main menu. If there are, line 4110 sets the new pointer value and once again loops back to the scan routine.

If all we want to do is look at the record, we return to the main menu. On the other hand, if we want to modify the record, it's time to continue to the edit section. Line 4225 sorts this out:

```
4200  REM ********************************
4210  REM *          EDIT ROUTINE         *
4220  REM ********************************
4225  IF S = 4 THEN 500
4230  VTAB 8: FOR X = 1 TO 4: HTAB 4: PRINT "("X")": NEXT :
      PRINT : PRINT "CHANGE WHICH NUMBER?"
4240  PRINT : PRINT "(PRESS < D > WHEN DONE)": PRINT : PRINT
      "(TYPE ";: INVERSE : PRINT "DELETE";: NORMAL : PRINT
      "ON LINE 1 TO DELETE)": PRINT : GET A$: IF A$ = "D" THEN
      500
4260  IF VAL (A$) < 1 OR VAL (A$) > 4 THEN 4230
4270  A = VAL (A$): VTAB 7 + A: HTAB 8: GOSUB 80: IF B$ =
      "DELETE" THEN 4300
4280  A$(A,K) = B$: GOTO 4230
4300  REM ********************************
4310  REM *          DELETE A FILE        *
4320  REM ********************************
4330  FOR X = 1 TO 200: IF VAL (A$(0,X)) = K THEN K1 = X:X = 200
4340  NEXT X:A$(0,K1) = A$(0,K):A$(0,K) = "END": GOTO 500
```

The only complicated part of the edit routine is the delete portion. To understand how a record is deleted, you have to keep in mind how the pointers work:

Record #:	2	3	4
A$(0,n)	:4	A$(0,K) :7	A$(0,K1) :3
A$(1,n)	:Don Jones	:Tom Tom	:David Smith
A$(2,n)	:1 Main St.	:2 Main St.	:3 Main St.
A$(3,n)	:Squ, WY	:Pek, WY	:Koh, WY
A$(4,n)	:77453	:81234	:11111

Initially, the value of A$(0,n) is 4, the record number of the third of these three addresses. The value of A$(0,K1) is 3, the record number of

the middle name. In other words, these three names are linked together through pointers indicating which record is the next one in the sequence. The pointers are stored in exactly the same manner as a line in the address. Names get assigned to a record when they are first entered. However, the pointers are rearranged whenever the list is sorted (in this case alphabetically), which is why they often appear to be out of order.

Now imagine that we want to delete David Smith from our file. To do this, we need to do two things. First, we need to change Don Jones's pointer so that it points to Tom Tom's address. In other words, we need to change the value of A$(0,n) from 4 to 3. We also need to change David Smith's pointer to read *end*, so that the program knows that his space in our file is now vacant and can be used for new addresses (it isn't necessary to zero out the record, since nothing is pointing to it and, therefore, it will be ignored). Once we make these changes, the records should read:

```
Record #:2              :3              :4
A$(0,n) :3      A$(0,K) :7      A$(0,K1) :END
A$(1,n) :Don Jones      :Tom Tom        :David Smith
```

The next section of the program will sort our file either by last name or by zip code. There are many kinds of sorts; the one we are going to use, called a bubble sort, is by no means the fastest, but it has the advantage of being fairly easy to understand.

A bubble sort works like this. Imagine that you have a list of ten numbers you want to put in numerical order:

3 8 2 4 9 0 5 6 1 7

A bubble sorter pairs off the first two numbers and compares them: *is 3 less than 8?* If the answer is yes, they are in the correct order, and the sorter goes on to the next pair: *is 8 less than 2?*

If the answer is no, as in this case, the sorter swaps the two numbers and turns on a flag:

3 2 8 4 9 0 5 6 1 7 flag

It then continues with the next pair (8 and 4) and so on until it reaches the end of the list.

At the end of the list, the routine checks to see if the flag has been turned on. If it has, it is turned off and the routine is repeated until it runs from the beginning of the list to the end without making a single swap (which means the flag stays off). The list is then sorted.

The bubble sort can be used to sort things alphabetically as well as numerically. Your Apple knows that A is less than B and B is less than C. In fact, your Apple even knows that *albatross* comes before *Albuquerque*. So let's take a look at the code for our sort:

```
6000  REM ************************************
6010  REM *          SORT THE FILE           *
6020  REM ************************************
6030  IF FILE$ = "" THEN 7000
6040  HOME : VTAB 7: HTAB 8: PRINT "SORT BY:": PRINT : PRINT
      TAB( 12)"L(AST NAME": PRINT : PRINT TAB( 12)"Z(IP CODE":
      PRINT : PRINT : HTAB 12: GET CH$: IF CH$ < > "L" AND
      CH$ < > "Z" THEN 6030
6050  FLAG = 0:X = VAL (A$(0,1))
6090  X1 = VAL (A$(0,X)): IF A$(0,X1) < > "END" THEN 6120
6100  IF FLAG THEN 6050
6110  VTAB 20: CALL - 868: GOTO 500
6120  IF CH$ = "Z" THEN B$(0) = A$(4,X):B$(1) = A$(4,X1):
      GOTO 6160
6130  FOR Y = LEN (A$(1,X)) TO 1 STEP - 1: IF MID$ (A$(1,X),Y,1)
      = " " THEN B$(0) = RIGHT$ (A$(1,X), LEN (A$(1,X)) - Y):Y
      = 1
6140  VTAB 22: HTAB 1: PRINT Y"  "B$(0)"  ": NEXT : FOR Y
      = LEN (A$(1,X1)) TO 1 STEP - 1: IF MID$ (A$(1,X1),Y,1) =
      " " THEN B$(1) = RIGHT$ (A$(1,X1), LEN (A$(1,X1)) - Y):Y
      = 1
6150  VTAB 23: PRINT Y"  "B$(1)"  ": NEXT
6160  IF B$(1) > = B$(0) THEN 6200
6170  FOR Y = 1 TO 200: IF VAL (A$(0,Y)) < > X THEN 6190
6180  T$ = A$(0,Y):A$(0,Y) = A$(0,X):A$(0,X) = A$(0,X1):A$(0,X1)
      = T$:FLAG = 1:Y = 200: NEXT Y: GOTO 6195
6190  NEXT Y: PRINT "ERROR IN LINE 6190": END
```

```
6195  VTAB 20: CALL - 868: PRINT "SWITCHING "B$(0)" AND "
      B$(1)
6200  X = X1: GOTO 6090
```

Now let's examine this section closely. Line 6030 checks to make sure that we have identified our mailing list. Line 6040 permits us to select a last name or zip code as the appropriate sort field. (Our answer, Z for zip or L for last name, is stored in the string variable CH$, for choice. Line 6050 then sets the flag to zero and loads X with the pointer in the first record.) Line 6090 checks to see if we are at the end of the list. If so, line 6100 checks to see if the flag was tripped, in which case we'd go back and do it again, starting at line 6050. If it wasn't tripped, line 6110 would send us back to the main menu.

If we aren't at the end of the list, we arrive at line 6120, which asks if we want to sort by zip code. If we do, it loads the zips from the fourth address fields of two records into the variables B$(0) and B$(1), and mails them to line 6160 for testing. However, if we want to sort by last name, we have to wade through that whole mess from line 6130 to line 6150 first. These lines may look familiar—we did something similar several months ago. Line 6130 determines what part of A$(1,X) is the last name, and line 6140 figures out what part of A$(1,X1) is the last name. In order to make it more entertaining, we added a couple of instructions at the beginning of 6140 and 6150 to make the whole process visible (not really necessary, and it slows the whole thing down, but it's sort of cute).

Once we've determined what the last names are, we load them into B$(0) and B$(1) and drop down to line 6160 for testing. If the names or zips are in the proper order, they will pass the test at line 6160 and skip down to line 6200. However, if they fail the test, they'll have to be switched. What this really means is that the pointers have to be switched so that X1 comes before X. Line 6170 tries to determine which name has a pointer that points to X. When the line finds that name, control drops to line 6180, where the big switch is made. The name that once pointed to X now points to X1. X, which used to point to X1, now points to whatever X1 pointed to. And X1 now points at X. Like this:

```
Before:  Y  -> X   -> X1  -> ?
After:   Y  -> X1  -> X   -> ?
```

Line 6190 also handles the special situation when one of the items being switched is the first item in the list (in which event your search for the unknown Y will fail).

Line 6195 is included just to keep you informed.

The final section of the program is used for creating new lists. Again, in order to work properly with the delete routine, a number of changes had to be made:

```
7000  REM ********************************
7010  REM *     CREATE NEW LIST FILE     *
7020  REM ********************************
7030  HOME : VTAB 8
7035  HTAB 8: PRINT "NAME OF LIST?": PRINT : HTAB 8: PRINT
      "PRESS < RET > FOR CATALOG"
7040  PRINT : HTAB 7: INPUT "   ";B$: IF LEN (B$) < 3 THEN PRINT
      : PRINT D$"CATALOG": PRINT : PRINT : GOTO 7035
7050  FILE$ = B$: IF S > 2 THEN GOSUB 200: ON S - 2 GOTO
      4000,4000,6000,2000
7060  PRINT : HTAB 8: PRINT "IS THIS A NEW LIST?": PRINT : HTAB
      8: GET A$: IF A$ = CHR$ (13) THEN PRINT : PRINT
      D$"CATALOG": GOTO 7060
7070  IF A$ < > "Y" THEN GOSUB 200: GOTO 500
7080  PRINT D$"OPEN"FILE$",L100"
7090  PRINT D$"DELETE"FILE$
7100  A$(0,1) = "2":A$(0,2) = "START"
7105  FOR Z = 2 TO 200:A$(0,Z) = "END": NEXT
7110  PRINT D$"OPEN"FILE$",L100"
7120  FOR X = 1 TO 2
7130  PRINT D$"WRITE"FILE$",R"X
7140  FOR Z = 0 TO 4: PRINT A$(Z,X): NEXT : NEXT
7150  PRINT D$"CLOSE"FILE$: IF S = 2 THEN 1050
7160  GOTO 500
8000  GOSUB 100: PRINT D$"CATALOG": END
```

Enjoy. Next month we'll do something completely different. ◨

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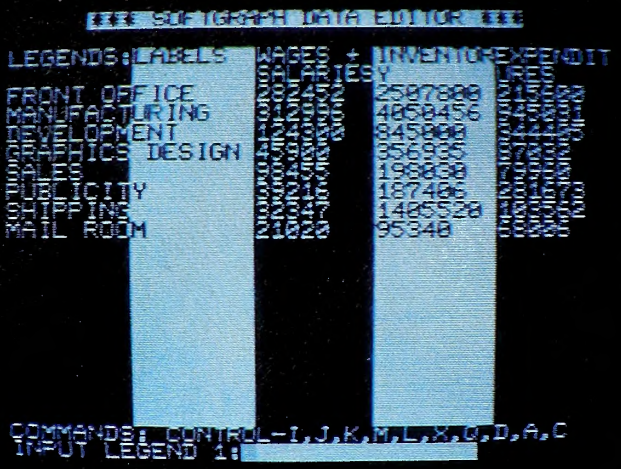

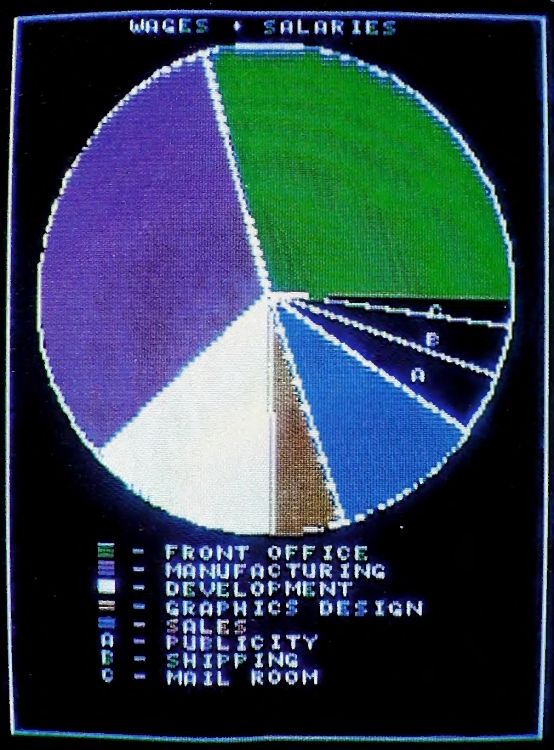

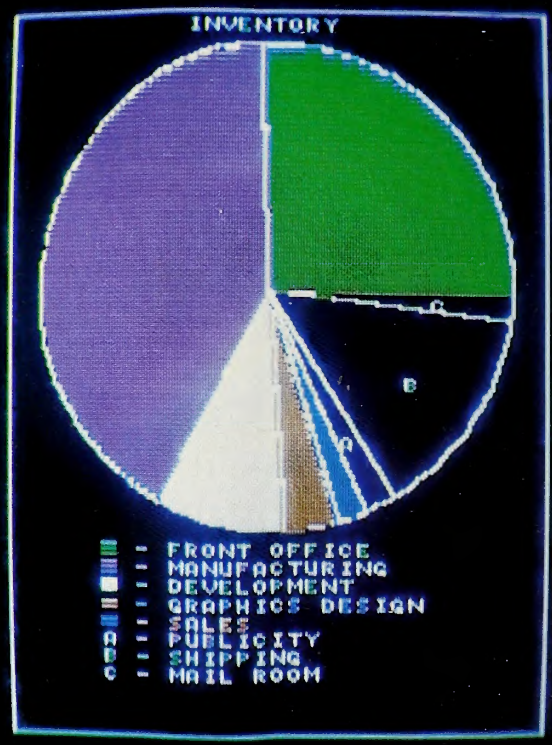

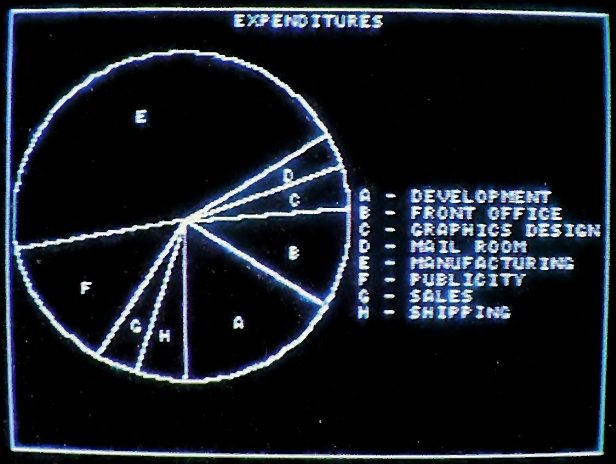

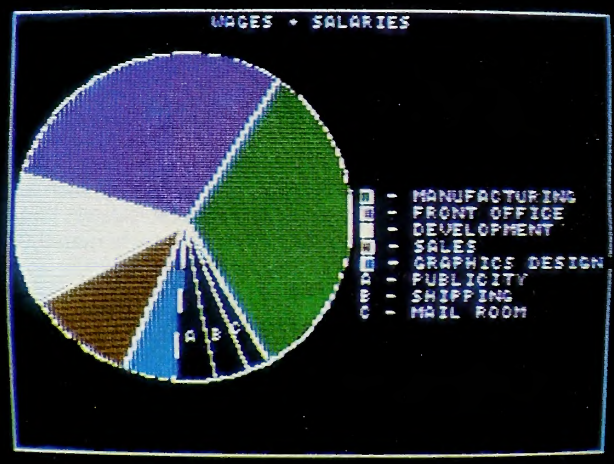

Left to right from the top: the information to be graphed is entered on the *Data Editor*. In order to allow labels of more than eight characters, the labels for this set of pie charts are entered in two columns of the editor.

The *Pie Chart* program's format selection screen allows the user to set six parameters that will determine what data will be graphed and how the chart will finally appear.

The *Pie Chart* program can only graph one column of data from the *Data Editor* at a time. However, you may have more than one column of related data. The three pies in the center of the page show how charts can be formatted and arranged to accentuate the parallels between them. The charts are of the wages, inventory, and expenses of eight departments within a small fictitious corporation. The only difference in the parameter settings for the three charts is the column selected to be graphed.

The first chart on the bottom row shows what *SoftGraph* has to offer the

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DO IT YOURSELF BUSINESS GRAPHICS

Part 3: The Pie Chart Program

BY DAVID DURKEE

The pie chart is, by its nature, a democratic animal. A pie chart can be used to tell the shareholders of a billion-dollar corporation where their profits are coming from. A pie of the same size can tell you where your money is going.

Pie charts have long been a tool reserved for the rich and powerful. With the advent of the personal computer, the balance is changing. Now anyone can create accurate, professional-looking pie charts without even being able to draw a good circle, much less figure out what portion of it represents nontaxable income.

Instant Replay. If you're reading SoftGraph for the first time, go back and read the first two installments. You may find some interesting tidbits in this article, but you won't be able to use this month's pie chart program without having the programs that went before.

Graphs require labels, and January's SoftGraph presented a shape table character set and a subroutine (listing 3 in that article) for putting the shapes in that table onto the hi-res screen.

Last month we developed, among other things, a *Data Editor* for our graphing system. Instead of storing data in a variable array, the *Data Editor* pokes it directly into memory. This enables us to save our data more easily (using the bsave command) and ensures that the data won't go away when we load and run a new program. The *Pie Chart* program requires a special subroutine to read the data, however, and that subroutine is the one in lines 2500 through 2600 of the *Data Editor*. To avoid having to type the routine again, you can get it from the *Data Editor* and merge it with the hi-res print routine.

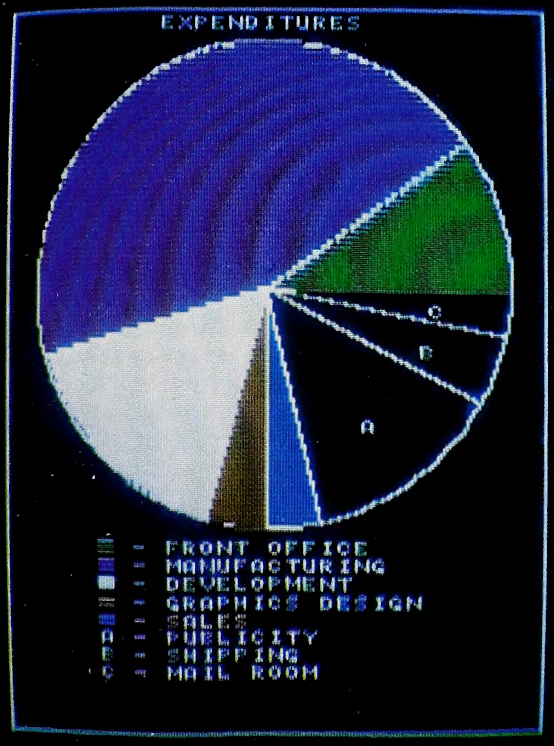
If you're not familiar with the *Renumber* program on your DOS System Master, this is a good time to get acquainted. What we want to do here is merge lines 2500 through 2600 of the *Data Editor* with listing 3 (lines 9000 through 9190) from January. In addition to its enumerating talents, *Renumber* has the ability to merge two Applesoft programs.

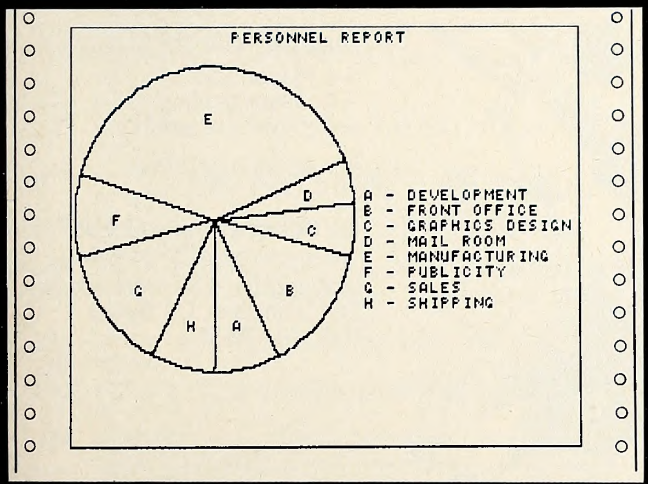
First, load the *Data Editor*. Isolate the read routine by deleting everything else. Type:

```
DEL 10,2400
DEL 2700,2750
SAVE READ ROUTINE
```

Now you're ready to use *Renumber*. Put the System Master in your disk drive and type *run Renumber*. When the fireworks are over, type *&I0* to make sure it's in right. If everything is working properly, the screen should display: "Error– increment = 0." If something else happens, reboot and try again.

With *Renumber* in, load the hi-res print routine. Remember, we want only lines 9000 through 9190, listing 3 from January. List the routine to make sure that only those lines are there, then type *&H*. List again. Don't worry when the routine seems to be missing; &H is *Renumber*'s hold command. The code is still in memory. Now type *load Read Routine* to get the read routine back. Finally, type *&M*, *Renumber*'s merge command, to put the two routines together.





user whose system can't display or print color charts. The slices of the pie are outlined in white and given a letter to tie them in with the labels in the key.

The next chart shows a horizontal chart in color. Because the Apple only has five solid colors (not including black) to plot with, slices after the fifth one are done in black and white. Sorting the data by value beforehand arranges for the five largest slices to be in color.

The last chart shown is a black-and-white chart printed out.

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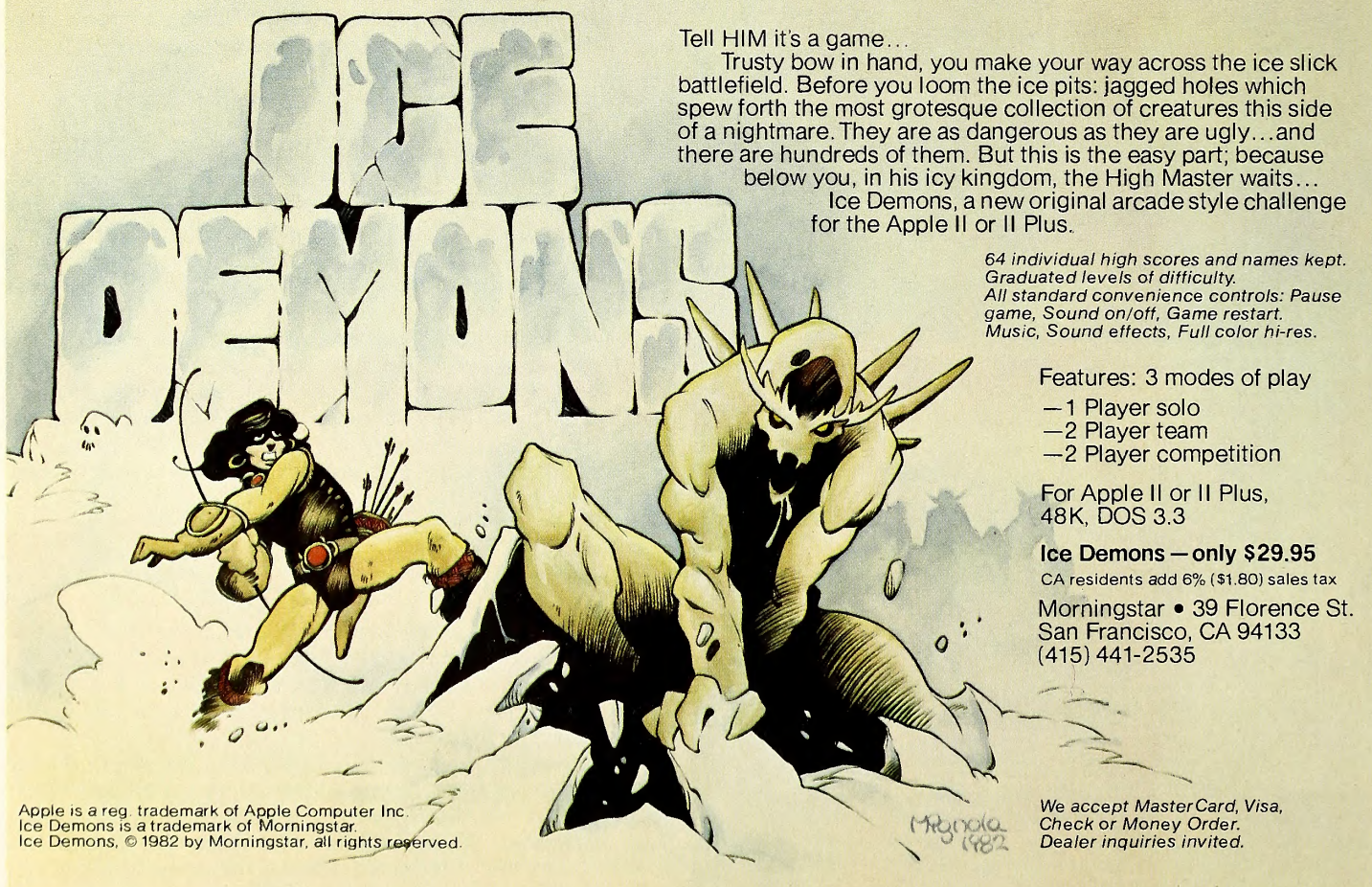

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Renumber can also renumber programs, a very useful function. The curious may want to run *Renumber Instructions* to find out how this works; the indifferent may also want to do this, but with far less urgency.

The Play by Play. The rest of the program can now be added to what we have. Let's type it in, one routine at a time.

Among other things, the first part of the program dimensions some variables, sets some parameters, defines some functions, and reads the legends from the section of memory where the *Data Editor* puts them.

```
10  CLEAR : HOME : DIM L$(18): DIM V(18): DIM L1$(18): DIM
    V1(18): DIM LE$(4)
20  DIM PR(6):PR(1) = 1:PR(2) = 1:PR(3) = 1:PR(4) = 1:PR(5) =
    1:PR(6) = 0: REM PARAMETERS
30  DEF FN X(C) = RA * SIN (C) + XC: DEF FN Y(C) = RA * COS (C)
    + YC
40  PI = 3.1415926:DL = 25056: REM CONSTANTS
50  VTAB 10: HTAB 15: PRINT "PIE CHART"
60  REM LEGEND READER
70  REM LEGENDS IN LE$(HF)
80  FOR HF = 2 TO 5
90  VF = - 1: GOSUB 2500:LE$(HF - 1) = W$
100  IF LEN (LE$(HF - 1)) = 8 THEN 120
110  LE$(HF - 1) = LE$(HF - 1) + " ": GOTO 100: REM ONE
     SPACE
120  VF = 0: GOSUB 2500:LE$(HF - 1) = LE$(HF - 1) + W$
130  NEXT HF
```

Line 30 will be of some interest to the trigonometrically inclined. FN X(C) and FN Y(C) are the functions used to determine points on the edge of a circle that has its center at XC,YC and a radius of RA. The variable C is the value of the point expressed in radians.

The points determined by this function define a mathematically correct circle, but when you run the program the circle displayed on your screen may look somewhat elliptical because every monitor is different. To get properly circular results, you'll have to make a little change in line 30. If your circle is taller than it is wide, multiply the radius of FN Y(C) by .9, making the second statement in line 30 read *def FN Y(C) = RA * .9 * COS(C) + YC*. If the circle is wider than it is tall, however, make the same change to FN X(C) instead. You may have to experiment with the value of the multiplicand to get the best results on your monitor. Printers can also distort your graphics printouts; so if you plan to print out your charts, you may want to adjust the circle functions to suit your printer rather than your monitor.

The next section sets up the input screen for your format options.

```
140  REM OPTIONS I/O
150  TV = 0:LL = 0:NG = 0:CN = 0:NF = 0
160  HOME : HTAB 5: PRINT "SOFTGRAPH PIE CHART
     GENERATOR"
170  POKE 32,7: VTAB 3
180  FOR HF = 1 TO 4: PRINT "LEGEND ";HF;":     ";LE$(HF): NEXT
     HF
190  POKE 32,1: PRINT
200  PRINT "HOW MANY LABEL FIELDS (1 OR 2)?": PRINT : REM
     PR(1)
210  PRINT "CHART WHICH COLUMN (1 THROUGH 4)?": PRINT :
     REM PR(2)
220  PRINT "SORT: 0=DON'T; 1=VALUES; 2=LABELS:": PRINT :
     REM PR(3)
230  PRINT "COLOR: 0=NO; 1=YES:": PRINT : REM PR(4)
240  PRINT "STYLE: 0=SIDEWAYS; 1=UPRIGHT:": PRINT : REM
     PR(5)
250  PRINT "ROTATION: -180 TO 180:": PRINT : REM PR(6)
260  TEXT
270  FOR P = 1 TO 6: VTAB 6 + 2 * P: HTAB 37: PRINT PR(P);: NEXT
     P
280  VTAB 20: HTAB 1: PRINT "ARROWS MOVE CURSOR": PRINT
     "SPACE SELECTS QUESTION": PRINT "CONTROL-P
     PROCESSES PIE CHART": PRINT "CONTROL-Q QUITS TO
     MENU"
290  P = 1
```

This section prints the parameter selection screen. There are six parameters that determine what data is to be graphed and how the final graph will look. Each parameter has an automatic default.

The Personal Pie. The first parameter determines how many columns to read as labels. The *Data Editor* only allows column widths of eight characters. If you want your pie charts to have longer labels, put the labels in the first two columns of the data screen and enter 2 for the value of this parameter. Then you can have labels as long as sixteen characters.

The second parameter determines which column to graph. Pie charts are one-dimensional, so you can only graph one of the four data columns at a time. If you put legends at the tops of the columns, they will appear at the top of the parameter screen to remind you which columns you used for what.

The third option determines whether, and how, you want the data sorted. Sorting it by value produces nice, orderly-looking pie charts. Sorting alphabetically by label may also be appealing. If you choose not to sort, the data will be charted and labeled in the order you entered it.

The fourth choice is whether to create the chart in color or black and white. If you have a color monitor, a color pie chart looks much nicer than a black-and-white one. If you have a black-and-white monitor, a color pie chart doesn't look like much at all. The same holds true for black-and-white or color printers.

Style, for want of a better word, determines whether you want a chart plotted upright or on its side. If you plot it upright, it will appear on-screen with the pie on the left, the labels on the right, and the legend at the top.

If you put a chart on its side, the pie will still be on the left and the labels on the right, but the labels will run from the bottom of the screen to the top and the legend will run up the left-hand side. This looks strange on the monitor and it probably isn't a good idea to put the monitor on its side to make it look right, but if you print the chart you can turn it upright and get a chart with the labels on the bottom.

Finally, rotation determines where on the circle the plotting starts. This option is included mostly for color charts, as some colors don't go well next to each other. Rotating the pie can sometimes alleviate the problem. Most of the time you can ignore this parameter.

This routine allows you to select from among the six parameters and enter new values.

```
300  VTAB 6 + 2 * P: HTAB 1: FLASH : PRINT ">";: NORMAL
310  HTAB 1: GET A$
320  A = ASC (A$)
330  IF A = 8 OR A = 21 THEN VTAB 6 + 2 * P: HTAB 1: PRINT " ";:
     GOTO 380
340  IF A = 32 THEN 430
350  IF A = 17 THEN 2400
360  IF A = 16 THEN 550
370  GOTO 310
380  REM POINTER MOVE
390  P = P + SGN (A - 10)
400  IF P = 0 THEN P = 6
410  IF P = 7 THEN P = 1
420  GOTO 300
```

The vtab in line 300 is designed to place the pointer, a flashing arrow, next to one of the six options printed in lines 200 through 250. The value of P determines which question is indicated.

When you're running the program, you'll use the arrow keys to move the pointer from one question to another. Line 330 then erases the pointer. Lines 380 through 420 determine the new pointer location and go back to line 300, where a new pointer is printed.

Lines 340 through 360 accept three other keys as commands. Control-Q sends the program to the routine at line 2400, where it quits and goes to the *Menu* program. The space bar selects the parameter indicated by the flashing pointer and the program goes to the next routine to input a new value for that parameter. Control-P tells it to go ahead and process the chart.

This is the routine that inputs the new value for the selected parameter.

A flashing pointer, placed in line 300, indicates one of the six parameters. To move the pointer around, use the arrow keys. Press the space bar to select a parameter to change.

When you've selected a parameter, this next routine prompts you to

enter the new value.

```
430  REM GET NEW VALUE
440  VTAB 24: HTAB 1: INVERSE : PRINT "ENTER NEW VALUE: ";:
     NORMAL :W$ = ""
450  VTAB 24: HTAB 18: PRINT W$;
460  GET A$:A = ASC (A$)
470  IF A = 8 THEN 510
480  IF A = 13 THEN PR(P) = VAL (W$): VTAB 6 + 2 * P: HTAB 37:
     PRINT PR(P);: CALL - 868: VTAB 24: HTAB 1: CALL - 868:
     GOTO 300
490  IF A < 45 OR A > 57 OR A = 46 OR A = 47 OR LEN (W$) = 4
     THEN 450
500  W$ = W$ + A$: GOTO 450
510  IF LEN (W$) = 1 THEN W$ = "": PRINT CHR$ (8);" ";
520  IF W$ = "" THEN 450
530  W$ = LEFT$ (W$, LEN (W$) - 1)
540  PRINT CHR$ (8);" ";: GOTO 450
```

The input routine uses the get command. The routine is similar to the one we used in the *Data Editor*, although this one only allows four characters of input and ignores all characters except for the numbers and the minus sign (line 490). When you run the program, the reason for these limitations will become apparent. Pressing control-P will move you from parameter-setting to this next section.

```
550  REM START PROCESSING
560  REM CHECK PARAMETERS
570  VTAB 6 + 2 * P: HTAB 1: PRINT " ";
580  P = 1: IF PR(P) < 1 OR PR(P) > 2 THEN 650
590  P = 2: IF PR(P) < 1 OR PR(P) > 4 THEN 650
600  P = 3: IF PR(P) < 0 OR PR(P) > 2 THEN 650
610  P = 4: IF PR(P) < 0 OR PR(P) > 1 THEN 650
620  P = 5: IF PR(P) < 0 OR PR(P) > 1 THEN 650
630  P = 6: IF ABS (PR(P)) > 180 THEN 650
640  GOTO 660
650  VTAB 6 + 2 * P: HTAB 1: FLASH : PRINT ">"; CHR$ (7);:
     NORMAL : VTAB 24: HTAB 1: PRINT "VALUE ILLEGAL";: GET
     A$: GOTO 310
```

In this routine the program makes sure the values of the parameters are legal. This is accomplished in lines 550 through 650. If the checker encounters an illegal value it indicates that by means of a flashing pointer and returns you to the parameter-setting routine.

The following section of the program reads and organizes the data that will be presented in the chart.

```
660  REM READ LABELS
670  HOME : PRINT "READING LABELS": PRINT
680  FOR VF = 1 TO 18
690  HF = 1: GOSUB 2500:L$(VF) = W$
700  IF LEN (W$) = 0 THEN NF = VF - 1:VF = 18: GOTO 750
710  IF PR(1) = 1 THEN 750
720  IF LEN (L$(VF)) = 8 THEN 740
730  L$(VF) = L$(VF) + " ": GOTO 720: REM ONE SPACE
740  HF = 2: GOSUB 2500:L$(VF) = L$(VF) +W$
750  HTAB 5: PRINT L$(VF): NEXT VF: IF NF = 0 THEN NF = 18
760  REM READ VALUES
770  PRINT "READING VALUES": PRINT
780  HF = PR(2) + 1: FOR VF = 1 TO NF
790  GOSUB 2500
800  V(VF) = VAL (W$)
810  NEXT VF
820  LL = 0:GF = 1:NG = NF
830  FOR VF = 1 TO NF
840  IF V(VF) > 0 THEN L1$(GF) = L$(VF):V1(GF) = V(VF): GOTO
     880
850  PRINT "CANNOT GRAPH ";L$(VF);": ";V(VF)
860  SF = 1
870  NG = NG - 1: GOTO 910
880  IF LEN (L$(VF)) > LL THEN LL = LEN (L$(VF))
890  HTAB 5: PRINT L$(VF);: HTAB 25: PRINT V(VF)
900  GF = GF + 1
910  NEXT VF
920  PRINT : IF NG = 0 THEN PRINT "NO GRAPHABLE FIELDS
     FOUND": PRINT "HIT A KEY";: GET A$: GOTO 140
930  IF SF = 0 THEN 980
940  SF = 0: PRINT "OKAY TO CONTINUE? ";
950  GET A$: IF A$ <> "Y" AND A$ <> "N" THEN 950
960  IF A$ = "N" THEN 140
970  PRINT : PRINT
980  REM SORTING
990  IF PR(3) = 0 THEN 1130
1000  PRINT "SORTING"
1010  FOR VF = 1 TO NG
1020  CF = 1
1030  FOR GF = 2 TO NG
1040  ON PR(3) GOTO 1070,1050
1050  IF L1$(GF) < L1$(CF) THEN CF = GF
1060  GOTO 1080
1070  IF V1(GF) > V1(CF) THEN CF = GF
1080  NEXT GF
1090  L$(VF) = L1$(CF):V(VF) = V1(CF):L1$(CF) = CHR$
      (95):V1(CF) = 0
1100  TV = TV + V(VF)
1110  NEXT VF
1120  GOTO 1180
1130  REM COPY DATA
1140  FOR VF = 1 TO NG
1150  L$(VF) = L1$(VF):V(VF) = V1(VF)
1160  TV = TV + V(VF)
1170  NEXT VF
1180  IF PR(3) = 0 THEN 1230
1190  PRINT : FOR VF = 1 TO NG
1200  HTAB 5
1210  PRINT L$(VF); TAB ( 25);V(VF)
1220  NEXT : PRINT
1230  PRINT "LEGEND: ";LE$(PR(2))
1240  PRINT : PRINT "LONGEST LABEL IS ";LL;" CHARACTERS"
1250  PRINT "TOTAL OF ALL VALUES IS ";TV
1260  PRINT : PRINT "FORMATTING CHART"
```

Lines 660 through 750 read the labels in either the first data column or the first two columns, depending on how you set the first parameter. The read routine only reads up to the last nonspace character in a field. If you are reading two columns for labels, this routine adds spaces to the first field (lines 720 and 730) before concatenating it to the second.

Lines 760 through 970 read the values in the column you have selected to graph. Line 790 calls the read routine, which returns a string variable. Line 800 uses VAL to convert the string to a numeric variable to be evaluated. If the values are found to be ungraphable (try to imagine graphing a negative number in a pie chart), the program warns you and continues. If it finds no graphable fields, it tells you so and sends you back to the parameter screen. If it finds that some fields can be graphed and some can't, it asks whether you want to continue.

Arranging the Data. Line 980 begins the sorting routine. If you tell it not to sort, it moves on. Otherwise it goes into the least efficient sorting routine ever conceived. Don't ever use this routine if you have to sort a lot of material. Given that we only have to sort eighteen fields here, the routine works just fine.

The virtue of this routine is that it is easy to understand, as sort routines go. Line 1020 selects the appropriate comparison statement, either line 1050 or 1070, depending on whether you told it to sort values or labels. The values are stored in a numerical array, V1, and the labels are stored in a string array, L1$.

When the program sorts labels, it wants to put the list in alphabetical order. It looks for the string with the lowest ASCII value and puts this value first. This is how Applesoft interprets "if L1$(GF) < L1$(CF)" in line 1050.

When the program sorts the list by values, it is looking for the field with the highest value—the biggest slice of the pie—to put first.

The search loop (lines 1030 through 1080) finds the data element to put first on the list, whether that is the first label alphabetically or the greatest value numerically. Line 1090 copies the selected data element onto another list (the L$ and V arrays) and then sets the label in the L1$ array to a high ASCII value, CHR$(95), and sets the value in the V1 array to a low numerical value, zero, ensuring that neither of them will be selected again.

The outer loop (lines 1010 through 1110) repeats this process until all the data has been copied from one list to the other in the correct order. At the same time it counts the total value of all the data into the variable TV.

If the list was not sorted, lines 1130 through 1170 copy the list from the L1$ and V1 arrays to the L$ and V arrays in the original order, also

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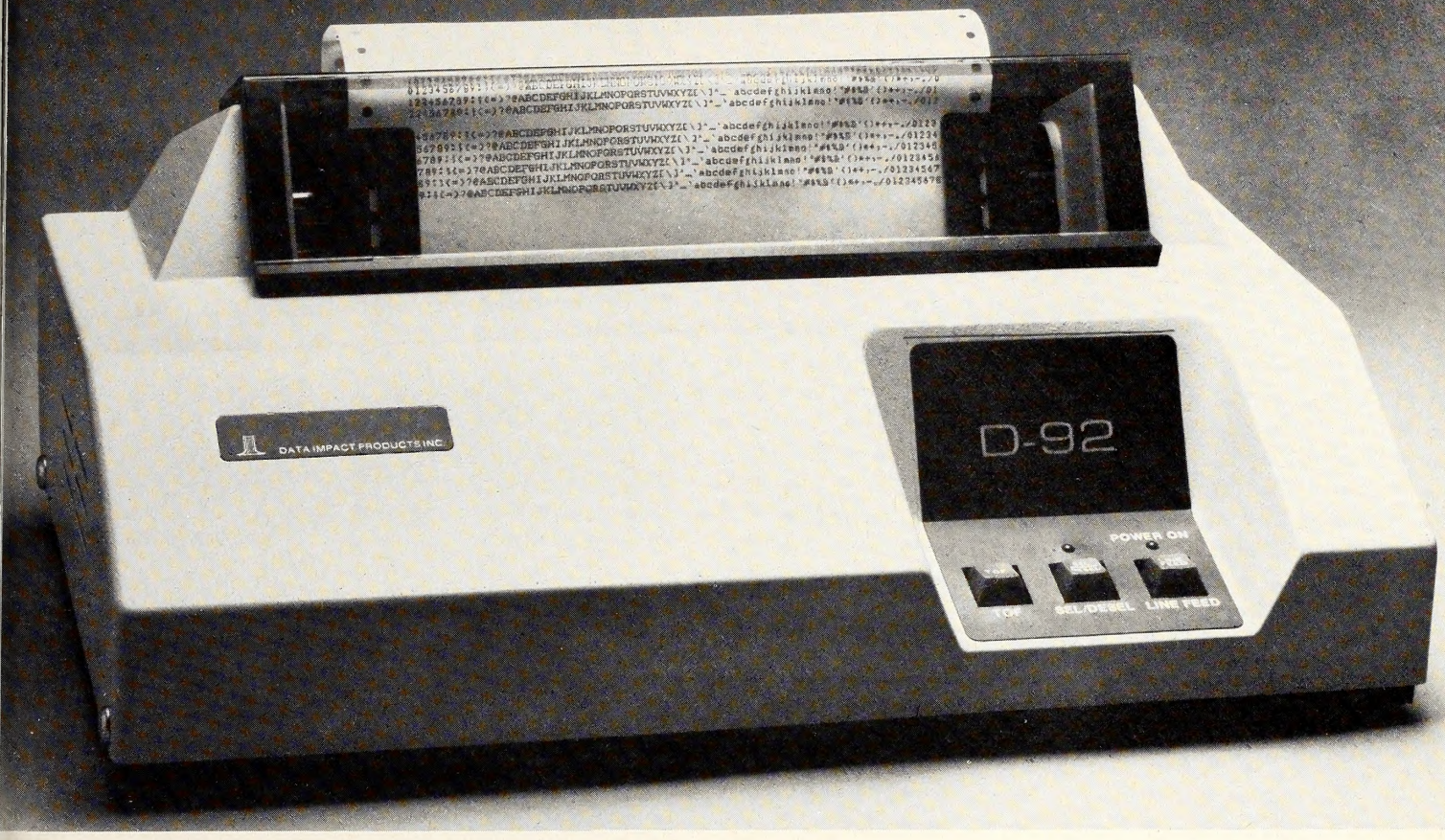

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adding up the total value of the data into TV. This variable is used later to determine which portion of the whole pie each slice represents.

Lines 1230 through 1260 print some pertinent information that you aren't likely to see because the screen switches to graphics soon afterward. These lines are included as a debugging tool. If the computer seems to be scrambling data, add *1255 stop* to the program to find out what's going on.

This next routine does some final number-crunching and then starts the actual plotting.

```
1270  REM FORMAT CHART
1280  D = 1:F = 2: IF PR(5) = 0 THEN D = 4
1290  CO = PR(4)
1300  IF PR(5) = 0 THEN 1360
1310  ROT= 0
1320  RA = (280 - ((LL + 3) * 6 + 20)) / 2: IF RA > 88 THEN RA =
      88: REM RADIUS
1330  XC = RA + 4:YC = RA + 12
1340  XW = 2 * RA + 12:YW = (192 - (NF * 7)) / 2
1350  GOTO 1400
1360  RA = (280 - ((NG + 4) * 7)) / 2: IF RA > 92 THEN RA = 92:
      REM RADIUS
1370  ROT= 48
1380  XC = RA + 13:YC = 96
1390  XW = RA * 2 + 12:YW = (192 + ((LL + 4) * 6)) / 2
1400  HGR2 : HCOLOR= 3: HPLOT 0,0 TO 279,0 TO 279,191 TO
      0,191 TO 0,0: SCALE= 1
1410  RA = RA + 1: HPLOT FN X(0), FN Y(0)
1420  FOR CD = 0 TO 2 * PI STEP .04: HPLOT TO FN X(CD), FN
      Y(CD): NEXT :RA = RA - 1
1430  C1 = PR(6) * 2 * PI / 360
1440  FOR NS = 1 TO NG
1450  C2 = C1 + V(NS) * 2 * PI / TV
1460  ON PR(4) + 1 GOSUB 3000,2900
1470  C1 = C2
1480  NEXT
1490  PR(4) = CO
1500  W$ = LE$(PR(2)): IF PR(5) = 0 THEN X = 3:Y = (192 + ( LEN
      (W$) * 6)) / 2: GOSUB 9000: GOTO 1520
1510  X = (280 - ( LEN (W$) * 6)) / 2:Y = 3: GOSUB 9000
1520  HOME : GET A$
1530  TEXT : VTAB 1: PRINT "PIE CHART COMPLETED"
1540  PRINT : PRINT "    1. RETURN TO MENU"
1550  PRINT "    2. SEE CHART"
1560  PRINT "    3. RESET PARAMETERS"
1570  VTAB 7: HTAB 1: PRINT "WHAT NOW? ";: GET A$:A = VAL
      (A$)
1580  IF A < 1 OR A > 3 THEN 1570
1590  ON A GOTO 2400,1600,140
1600  POKE - 16304,0: POKE - 16299,0: GOTO 1520
2400  REM RETURN TO MENU
2410  HOME : PRINT "INSERT PROGRAM DISK IN DRIVE 1": PRINT
      "AND HIT ANY KEY.";: GET A$
2420  PRINT : PRINT CHR$ (4);"RUN MENU,D1"
```

Once everything is read and sorted, lines 1270 through 2440 do the actual graphing. Line 1280 sets the values of D and F, flags for the hi-res print routine, based on whether you said you wanted the chart sideways or upright. The style parameter also determines which of two formatting routines the program uses.

If the chart is to be upright, the labels will be printed beside it. Line 1320 determines the radius based on the length of the longest label (LL). If the chart is to be on its side, the labels will be below it (that is, on the right on your screen, but at the bottom when you print the chart). The radius is determined in line 1360, based on the number of labels. The idea is to fill the space available by varying the size of the circle.

Other considerations based on the style parameter are the location of the center of the circle (XC,YC), the rotation of the character shapes, and the location of the labels (XW,YW).

After the format of the chart is determined, the program turns on hi-res page two, draws a box around the edges, draws a circle (lines 1410 and 1420), and begins the actual graphing.

The Plot Thickens. Lines 1440 through 1480 loop through the valid data fields, each of which becomes one slice of the pie. Line 1460 calls either the color slice routine or the black-and-white slice routine. Then lines 1500 and 1510 put the label on the top of the chart (whether the "top" happens to be the actual top of the screen or the side). Lines 1520 through 1600 give you your options at this point, which are pretty self-explanatory.

Lines 2400 through 2420 comprise a routine to return you to the *Menu* program covered last month. Running *Menu* replaces *Pie Chart* in memory; so you might want to replace this routine with a simple end statement until you have *Pie Chart* debugged and saved.

This next section is the routine that is called to write labels. It determines where the labels go and in what direction, depending on the style parameter.

```
2700  REM LABEL ROUTINE
2710  W$ = "- " + L$(NS)
2720  IF PR(5) = 1 THEN 2780
2730  REM SIDEWAYS
2740  XW = XW + 7:X = XW:Y = YW - 12: GOSUB 9000
2750  IF PR(4) = 0 THEN 2840
2760  HCOLOR= CN: FOR Y = YW - 2 TO YW + 3: HPLOT XW,Y TO
      XW + 4,Y: NEXT Y
2770  GOTO 2850
2780  REM UPRIGHT
2790  YW = YW + 7:X = XW + 12:Y = YW: GOSUB 9000
2800  IF PR(4) = 0 THEN 2840
2810  HCOLOR= CN: FOR X = XW - 3 TO XW + 2: HPLOT X,YW TO
      X,YW + 5: NEXT X
2820  HCOLOR= INT (CN / 5) * 4 + 3: HPLOT XW - 3,YW TO XW +
      2,YW TO XW + 2,YW + 5 TO XW - 3,YW + 5 TO XW - 3,YW
2830  GOTO 2850
2840  DRAW CN + 22 AT XW,YW
2850  RETURN
```

The next subroutine, called from line 1460, draws one slice of pie in color.

```
2900  REM COLOR SLICE ROUTINE
2910  CN = CN + 1: IF CN = 4 THEN CN = 5
2920  IF CN = 7 THEN PR(4) = 0:CN = 1: GOTO 3020
2930  HCOLOR= CN
2940  FOR CD = C1 TO C2 STEP .01
2950  HPLOT XC,YC TO FN X(CD), FN Y(CD)
2960  NEXT
2970  HCOLOR= INT (CN / 5) * 4 + 3: HPLOT FN X(C1), FN Y(C1)
      TO XC,YC TO FN X(C2), FN Y(C2)
2980  GOSUB 2700
2990  RETURN
```

Color Coordination. The color slice routine draws a slice of the pie in color by drawing lines of that color from the center to closely spaced points on the edge. Line 2970 draws lines around the slice in the white (hcolor is set to 3 or 7) that won't clash with the slice color.

The color slice routine uses only five colors. If there are more than five elements of data, the rest of the slices are drawn by the black-and white slice routine. This is one reason you might want to sort the data by value, so that in a color chart the largest slices will be the ones in color.

Of course, if you selected a black-and-white chart, the program will use this next routine to create all of the slices. The black-and-white slice routine is both simpler and quicker than the color slice routine. It merely draws the leading edge of each slice and puts an identifying letter in the center of the slice.

```
3000  REM B&W SLICE ROUTINE
3010  CN = CN + 1
3020  HCOLOR= 3
3030  HPLOT XC,YC TO FN X(C2), FN Y(C2)
3040  RA = RA * .7: DRAW CN + 22 AT FN X((C1 + C2) / 2), FN
      Y((C1 + C2) / 2):RA = RA / .7
3050  GOSUB 2700
3060  RETURN
```

Now you have all the necessary components of the SoftGraph system for creating pie charts. Use the *Data Editor* to enter the information you want to graph, the *Pie Chart* program to graph it, and the disk menu in the *Menu* program to save the data or the graph to disk. Next month we'll wrap things up with a bar and line chart program. We'll also talk about printing the charts. ■

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Remember the bridge players in college? The ones who dropped their classes unofficially and spent their days in the student union scrutinizing pasteboards and calling out incomprehensible bids? Now think of your neighborhood hacker, the prodigy who is more turned on by control codes than by the opposite sex. See how much he has in common with bridge addicts—relatively high intelligence, for instance, a fascination with abstract things, a love of problem-solving for its own sake, and a willingness to live mostly in his head? That kid will spend hours reading symbols his parents can't decipher, occasionally cackling or emitting other nutty noises.

By the way, those bridge addicts pored over pages of peculiar symbols, too—the only books they read in college (after conversion from Protestantism to bridge) were manuals on abstruse bidding methods, or exotic styles of trump coup.

A Funny Thing Happened on the Way to the Goren. . . . So these two sorts of people have lots in common (except that bridge players are generally social creatures, hackers usually not). Then what could be more logical than computer bridge games, or computer bridge tutors? And why don't we have more bridge programs, and better ones than sit beside my disk drive at the moment? All that a bridge book can do, a computer teacher can do better and faster.

Just make sure the computer teacher knows how to defend against a darn clever finesse after school.

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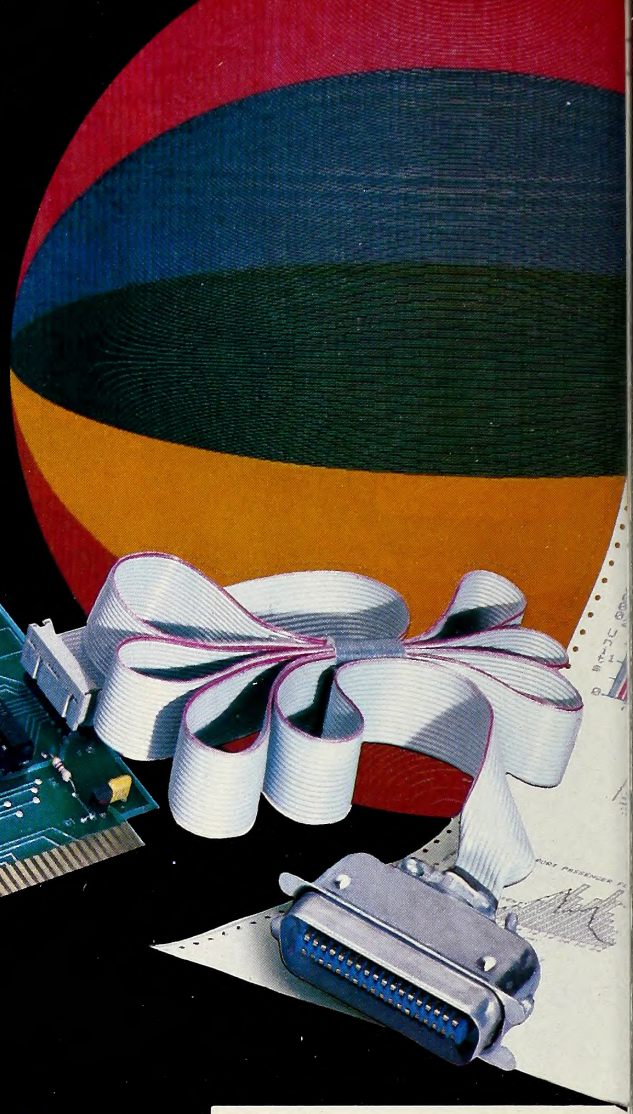

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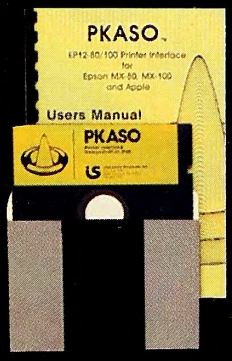

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Your Apple circumvents lots of little nuisances of bridge playing. It deals hands much faster than you can deal them manually—and its hands are truly random. You can save hands for later study or for comparison with how your friends do in the same circumstances. In addition, you never get stuck being short a fourth player. Nor a third, nor a second.

The Apple's main advantage, though, is that it provides you the opportunity to practice. Suppose you want to learn tactics for any of the dozens of bridge situations that crop up continually. For instance, when you have eight spades, including the ace, king, and jack, and your opponents have five, including the queen and ten, how do you keep them to a minimum of tricks? A bridge book can only give you rules of thumb and a couple of printed illustrations. Your Apple can give you dozens or hundreds of real-life situations to try yourself against, situations that would take years to duplicate with manual dealing. Where a book can basically just tell you what happens when you try a particular approach, a computer can let you actually see repeatedly what happens.

Suppose you're a relative novice who just needs practice trying to make bids in gamelike situations. You can't practice alone effectively because you have to see your opponents' cards to play for them. But your computer can make a good opponent, as good at playing bridge as the person who writes the program.

A Blackwood Bid to Programmers. Consider how inconvenient the books on bridge are, with their diagrams of hands, their pat examples, and their dense paragraphs of exposition. Then consider how splendidly they have sold over the years, even with their handicaps. It ought to inspire someone to move into that limited but dependable market, starting with computer versions of classic books like Watson's *The Play of the Hand* and a popular bridge practice game like *Auto Bridge*.

Unfortunately, three of the four bridge programs written for the Apple don't take advantage of the possibilities of the computer. The publisher of the fourth declined to have it reviewed for this article—or at all.

The best of the three is probably the least ambitious: *Bridge Partner*. Boot the program and it immediately gives you several options—getting

random hands to bid and play, getting random hands within point-value ranges that you choose, setting up your own deal, or loading deals from disk.

After you choose, the screen displays your hand and your partner's and asks you to name a contract. When you've done that, it plays against you as you try to make good. The big problem is that it doesn't play good defense—at a nickel a point, you should be so lucky as to get its opening leads.

Still, you get to practice making your contracts—slams, games, or partials. You can replay them if you like; better yet, you can shuffle only the defensive hands and play again.

Setting up your own deal can be intriguing if, say, you want to try again on a hand that got the best of you the night before. But the best strategy seems to be to try to make contracts with hands selected for the high-card points you choose—an hour, say, of trying to make partials, or half an afternoon practicing slams.

A useful and entertaining program, but not a tough enough opponent.

Down Three, Vulnerable. The more ambitious programs, *Bridge Tutor* and *Bridge Tutor with Precision and Scientific Bidding*, promise more than they deliver. They're sound enough in bridge theory and technique, but woeful as teaching devices.

Instead of integrating dictum and example, theory and experience, the designer separated them on two disks. Volume one is essentially a long lecture divided into subjects. Volume two offers randomly generated hands for practicing opening bids, responses, elemental plays, and others. Unfortunately, the precepts offered in volume one come too thick and fast for absorption and mostly without examples or any opportunity to participate. Volume two lets you practice and lets you know whether you're right or wrong—but provides no reason as to why you're mistaken, nor any explanation of the correct play. This reticence can be annoying, especially when the program seems to be violating the guidelines it set down.

The version with precision and scientific bidding is identical to the basic version, except that it offers two extra files in each volume. But because theory is so removed from experience and because the teaching seems so rule-oriented and unwilling to explain, most players will find this exposition of precision and scientific bidding too forbidding.

The final disappointment: neither *Bridge Tutor* nor *Bridge Tutor with*

Precision and Scientific Bidding includes an opportunity to play a complete hand.

Looking for a Grand Slam. None of these three programs is easy to find. No one picked up *Bridge Partner*'s contract when it fell victim to VisiCorp's layoff of all its game software a year or so ago; and the *Bridge Tutors* seem to have faded from sight along with Apple's Special Delivery line of software, although theoretically they're still available through Apple.

But even when they were new and eminently buyable, these programs made few inroads into a market that seems ideal: bridge attracts people capable of monomaniacal passions, just as computers do; buffs are generally brighter and more affluent than average—the sort of people who buy personal computers; and the computer is spectacularly capable of speaking to their needs.

We'll be waiting, programmers. ◨

If you're interested in these programs—and each does have value—the following information should provide enough clues to begin a search; try dealers too, because even if they don't stock the programs they may know how to get them. *Bridge Tutor*, by Alex Hanuse in conjunction with Apple Computer, two disks, requires Integer Basic; $40. *Bridge Tutor with Precision and Scientific Bidding*, same author, same stats; $60. *Bridge Partner*, by George Duisman, VisiCorp, ROM Applesoft, 32K; $19.99.

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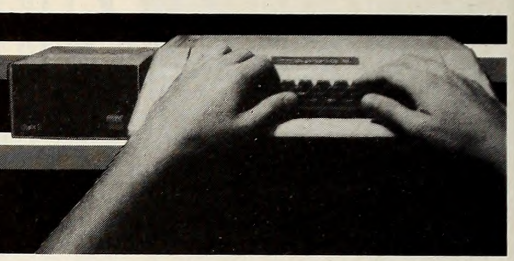


☐ When *Fortune* publishes its next index to the five hundred largest companies in the nation, **Apple Computer** (Cupertino, CA) will be one of them. The upstart company with the unbusinesslike name took on the many times larger Tandy Corporation and barely flinched when mammoth International Business Machines decided to vie for its territory; it has now become the youngest company ever to join *Fortune*'s elite. No one else has progressed so far in five years.

Just wondering . . . if the company had been called Jobs/Wozniak Computers, Inc., and the product we all know and love had come out as the JW-6500I, would we be writing this now? Of course, if the Steves had been the kind of people who'd choose such names, it's questionable whether the Apple would have been the computer it is.

It's no news that Apple revealed the IIe and Lisa at its annual shareholders' meeting January 19; what was less ballyhooed is that a real meeting took place, too. Therein it was revealed that Apple IIs in users' hands now number somewhere around seven hundred fifty thousand, that there are now nearly sixty million shares of Apple stock spread among nearly forty-four thousand people, and that December's Apple sales of more than eighty-eight million dollars made Apple the first billion-dollar company in the field of personal computer products. That's extrapolating, of course; no calendar year's sales have reached the Big Billion yet.

Apple's shareholders confirmed the current board of directors for another term; 99 percent of the 79.7 percent of shareholders voting ratified board members **Steve Jobs, Mike Markkula, Peter Crisp, Philip Schlein, Henry Singleton,** and **Arthur Rock**. That's one heck of a vote of confidence. Even greater confidence fell to **Arthur Young and Company**, which received only a handful less than 100 percent of the vote in favor of its continuing as Apple's accountants.

Shareholders also agreed to a three and a half million share increase in the stock available to Apple's employees as stock options.

Steve Jobs attributed the failure of the bill to allow tax breaks for computer donations to schools to Kansas's **Senator Robert Dole**, a member of the Senate Finance Committee—which is where the bill broke down after passing handily in the House of Representatives. Former California governor **Jerry Brown** came to the rescue as best he could, however, with a state bill giving just such a break for donations to California schools. As a result, every elementary and secondary school in the state of California will have an Apple IIe, compliments of Apple. That's ten thousand schools.

Apple's willing to do it for the rest of the country; naysayers prevent it often with the argument, "So what? They'll only do it to get the tax break." So what again. No company could give out so much product free of charge and survive without some break, and even if the company profited from the gifts—wouldn't the kids too? If you're for the bill, get behind it. Write to Dole, your congresspersons, the president, the dogcatcher—whoever you think might help in this cause. And if you're not for it, voice your opinion too—but for goodness sake find a better reason than holier-than-thou altruism.

Perhaps the lightest note of the meeting was struck when an attendee wanted to know whether you could use directly all of Lisa's thirty-two bits instead of only sixteen, and, if not, when you'd be able to? Steve Jobs answered three times with increasing detail, but the questioner wouldn't be satisfied. Finally, Jobs set the issue at rest, quipping, "You can use the thirty-two-bit architecture right now, once you get inside the chip—as long as you're an electron."

☐ Tourists beware: it is against the law to bring an Apple look-alike computer into the country. The **U.S. Customs Service** is cracking down on the importation of the cheap Apple copies—coming primarily from Taiwan—seizing fake Apples and software at points of entry all along the West Coast and in Honolulu.

☐ **3Com** (Mountain View, CA) has signed a multimillion-dollar contract with Apple to provide Ethernet local networking products for Apples. "When you add high-speed local communication between personal computers, you add an entirely new dimension to their capabilities," says 3Com president **Bill Krause.** The Apple user can share peripherals and a database of common information, as well as take advantage of personal electronic communications facilities. Under the terms of the current agreement, Apple will immediately integrate Ethernet hardware and software products into its product offerings, including Lisa. Shipments from 3Com to Apple will continue through June 1986.

☐ **E. Floyd Kvamme,** formerly president of National Semiconductor's computer manufacturing subsidiary, has been hired by Apple to fill the new post of vice president in charge of marketing and sales. The position was temporarily filled last year by Apple chief executive **A. C. Markkula, Jr.**

☐ **Penguin Software** (Geneva, IL) continues to blaze trails in redefining the term "user friendly." Having last year removed the copy protection from its graphics utilities, the plucky company is now cutting its game software prices. Effective March 1, all Penguin games will cost $19.95.

"A lot of people are going to question our sanity again," says Penguin prexy **Mark Pelczarski**. "We're going to try it for six months as an experiment, and if we're right we'll continue." Penguin wants it known that this is a marketing decision and will not affect software development policies—they will still sell no game before its time.

The company will not be able to make retroactive adjustments for dealers, distributors, or consumers who bought a Penguin game for $30 or $35 at, say, midnight on February 28. Any purchasers who should find themselves in such a position are encouraged to look on the price change as a savings on future purchases. Dealers and distributors should contact Penguin at (312) 232-1984 about current inventory.

☐ **CompuVision,** creator of a computerized software demonstration system for retailers, has relocated to a new facility, doubling its office space. Formerly of San Jose, the company's West Coast sales and customer service departments are now at 3140 De La Cruz Boulevard, Suite 101, Santa Clara, CA 95050. Two regional customer service representatives serving the northern California and New York areas have been added, and two more are planned for Dallas and Chicago. The CompuVision system works like a jukebox of videotaped presentations on selected software programs, and consists of a nineteen-inch color monitor, video player, and custom-designed interface system housed in a floor-standing system.

☐ **Epyx/Automated Simulations** (Sunnyvale, CA) has elected its board of directors. **Sam Bernstein** is an independent marketing consultant in Cupertino, California; **Joseph Horowitz** is a venture capital investor and associate at U.S. Ventures in Menlo Park, California; and **William P. Lanphear IV** is a venture capital investor and partner in the Early Stages partnership of San Francisco. In his address to shareholders, president **James Connelley** announced that the sales rate of Epyx strategy games for fiscal 1982 was "three times that of the previous year, and is forecast to grow by a factor of five by the end of fiscal 1983."

☐ The latest companies to enter into distribution agreements with **Softsel** (Inglewood, CA) are **PromptDoc** (Colorado Springs, CO) and **Innovative Computer Products** (Tarzana, CA). The Inglewood distributor will carry the *PromptDoc Manual Maker,* an aid to documentation writing, and Innovative's line of PerfectData computer care products.

☐ **Spinnaker Software** (Cambridge, MA), a publisher of educational game programs, has completed second-round financing of $1.5 mil-

Sia Lux, involved with Silicon Valley Systems's seminar and training programs, and Rainbow the mime help Scott in his first encounter with an Apple at a group home in Palo Alto.

lion with four investment firms: New Enterprise Associates of San Francisco, Harvard Management of Boston, Alex Brown and Sons of Baltimore, and L.F. Rothschild, Unterberg, Towbin of New York. Chairman **William Bowman** reported that the company took orders for forty-five thousand copies of its first four educational games between September 1 and December 10 of last year, exceeding its forecast figures by 400 percent.

☐ **Software Dimensions** (Citrus Heights, CA) has expanded its distribution network. Software Distributors and Micro D will act as national distributors; CompuServe will cover the Western Canada region; and Zainax Systems will serve the mid-Atlantic. Internationally, Arabian Computer serves Saudi Arabia and the Middle East, and Mediatech distributes to the United Kingdom. The company has introduced new packaging for its line of accounting software and has rewritten all documentation to improve ease of use. It has also developed a training program for retailers, consisting of a videotape, a training manual, a quarterly newsletter, and a toll-free support line: (800) 824-1212; in California, (800) 822-3303.

☐ You've heard, no doubt, about the computer revolution. If you're like most people in the world, you ask: How much of this "revolution" is genuine, positive social change and how much is pure hype? What are the goals of this revolution—the Fortune 500 or the betterment of humankind?

What would Orwell say if he were alive today? You'll hear that question a lot in the next two years. Are personal computers spreading totalitarianism? Or are they the key to ending tyranny forever?

It all comes down to who is using a computer for what purpose.

On January 15, the overwhelmingly positive aspects of the computer revolution were demonstrated in a group home for the educationally retarded in Palo Alto, California. More than half a dozen employees of **Silicon Valley Systems** donated their time, software, and computers to the admirable task of introducing the technology to some of those less fortunate than most of us.

Silicon Valley's president, **Nathan Schulhof**, personally took charge of making the arrangements with **Joe Eller**, director of the Palo Alto group home. Six young people live in the home learning basic survival skills that, Eller says, "most of us have assimilated in the course of growing up and take for granted."

While the Silicon Valley folks set up several Apples and an Atari, a mime known as Rainbow (the one in Silicon Valley's *Word Handler* advertisements) entertained the residents of the home. He was a big hit and almost upstaged the true stars of the day. But when the computers were up and running the enthusiastic young adults took to them with vigor.

Silicon Valley employees demonstrated a variety of software that included educational programs, games, and word processing. The games got the best reponse; the bright smiles and laughter in the house were evidence that the affair was a success.

The presentation was short, but its legacy will live on. Silicon Valley donated a computer to the group home, as well as a number of software packages. They believed the group home residents could benefit from the incorporation of microcomputers into the learning process. Although it's not an academic situation, the group home emphasizes independent living skills and self-sufficiency. Personal computers, on a one-to-one basis with an educationally handicapped person, are well-suited to these kinds of goals.

Silicon Valley Systems plans to make these presentations once a month to similar groups that wouldn't normally have the opportunity, usually for economic reasons, for contact with computer technology. In February, the company visited the Children's Hospital at Stanford University.

So, amid all those integrated circuits and industrial parks that are evident throughout Silicon Valley, there is a heart. Rather than spreading tyranny and enslaving the masses, the computer revolution is opening doors. What's on the other side is what we all want it to be. The future that is ours is that of the residents of Joe Eller's group home as well.

We are all equal in the eyes of the computer.

☐ **Jim Harris**, former marketing manager of Intel's software distribution and support operations, has been appointed general manager of the OEM group at **Microsoft** (Bellevue, WA). He will be responsible for the management and direction of the domestic OEM organization, its language offerings, operating systems, and productivity software.

☐ Fourteen distributors have been signed to carry the educational game programs produced by the **Learning Company** (Portola Valley, CA). Micro D and Softsel are their major commercial American distributors, with Bell & Howell largely serving the educational market. Others are Software Distribution Services, Eastern Software Distributors, Micro Distributors, First Software, Mobilsoft, Soft Center Distributors, and Hayloft Distributing.

☐ **WIDL Video** (Chicago, IL) has filed suit against **Advanced Software Technology** (Kansas City, MO), publishers of *Vanloves Apple Software Directory*, and its president, **Rolland Love**. Filed in the United States District Court for the Northern District of Illinois, the suit alleges that the 1983 *Vanloves Apple II/III Software Directory* contains hundreds of software listings copied directly from WIDL's *Blue Book*

for the Apple Computer, this in violation of Copyright Act 17 U.S.C. 501. Additional counts against Advanced Technology include common-law unfair competition, deceptive trade practices, and deceptive business practices. WIDL is seeking a preliminary federal injunction against Advanced Technology and a court order to ban further sales of the directories.

☐ **Mind Games** (Beverly Hills, CA) is the latest game software house to appear on the scene. Founded by **Greg Segall** and **Gil Beyda**, the company has debuted with *The Desecration*, the first of a planned line of "Adventurecade" games, in which several arcade game sequences are integrated into the plot of a graphic adventure.

☐ **Don Williams,** former sales support manager for Apple Computer and author of *Desktop Plan,* has cofounded **Desktop Computer Software** (Santa Cruz, CA) with his son, **Michael.** In announcing the new company, Williams stated that his intent was to "establish a publishing house geared toward the independent author and low-cost 'commodity' software programs in the decision-support area. As the author of the first financial modeling program for microcomputers, I've seen the micro software industry come out of nowhere and become a several-hundred-million-dollar business. In the race to secure early market share and control of distribution, many of the original software publishers have turned away from the independent author. Instead, these publishers have turned to in-house development. Yet, without those early software development entrepreneurs and their innovative products like *VisiCalc,* none of these publishers would likely exist today."

Williams, after managing IBM's senior executive computer education program, wrote *Desktop Plan* as director of dealer development at PolyMorphic Systems in September 1978, turning it over to VisiCorp when he joined Apple. His goal is to produce a new generation of executive software products that emulate user thought processes and can be learned by the novice user in a few minutes.

☐ **Ultra Magnetics** (Watsonville, CA), manufacturer of flexible disks, has appointed **Jim Brashers** director of quality assurance. He was formerly with Pragma Data Systems as manager of quality activities and was previously involved in quality control for Amdahl, Verbatim, and Memorex.

☐ Speaking of which: **Verbatim** (Sunnyvale, CA) has announced the promotion of three executives to the level of senior vice president. **Hal Acuff** is senior vice president, software, and president of **Dakin 5,** Verbatim's software subsidiary in Denver. **Dr. Geoffrey Bate** has been named senior vice president of research and development, and **Marshall Hart** is now senior vice president, quality.

☐ **CompuShop** (Richardson, TX), a national computer retail chain, has gained three corporate officers. Company controller **Nancy Ross** is now also vice president, as are manager of operations **Charles Huff** and director of merchandising **Joe Harmon.** President **Jim Shuster** expressed confidence in the management team in implementing CompuShop's expansion plans, which call for thirty-six stores open by October 1983.

☐ **VisiCorp** (San Jose, CA) has added three people to its marketing division. (No one does anything by twos anymore.) **David Spencer,** late of Clorox, is director of marketing communications. **A. W. Pirtle,** director of marketing for large accounts such as IBM, Apple, Tandy, and DEC, brings data processing sales management experience from ITT Courier, where he was vice president of marketing for international product support. **Peter Schireson,** sales education manager, is in charge of VisiCorp's education and training programs. He holds a Ph.D. from Harvard University Graduate School of Education.

☐ Formerly a regional software distributor in the northern California area, **SKU** (Berkeley, CA) has gone national, opening a warehouse in Edison, New Jersey, in December with two more to open in the South this month. Offering personalized inventory planning, computerized stock control, technical evaluation of new software packages, a technical hot line during store hours, and buyback of dealer inventories, the company signed an additional thirty retailers to its software supply program in December, bringing its total number of retail customers to twelve hundred.

☐ **Ferox Microsystems** (Arlington, VA) has added three new offices to its Arlington headquarters, accommodating its marketing staff and new director of communications, **Colonel Michael A. Vargosko** (U.S. Army, ret.), previously the Army's chief of media relations.

☐ **Peachtree Software** (Atlanta, GA) has signed five distributors to its authorized warehouse distributor plan whereby computer dealers can obtain product quickly through local authorized distributors according to terms set by the individual distributor. The program is cost effective, according to director of sales **Mark Pierce,** in that Peachtree can "distribute the cost of selling software to both the sales and support functions, thereby allowing each to gain from their particular expertise." The distributors involved are **Byte Industries** (Haywood, CA), **Micro D** (Fountain Valley, CA), **Softsel** (Inglewood, CA), **Software Distributors** (Culver City, CA), and **Citation Software** (Winnipeg, Canada).

☐ **Gessler Educational Software** (New York, NY) has been formed by Gessler Publishing, the oldest and largest American publisher of foreign-language supplementary teaching materials. The company will release its first Apple software aids for the teaching of French, Spanish, German, Italian, and English as a second language this April. Anyone wishing information on programs or standards of submission should contact **Seth C. Levin**, president, Gessler Publishing, 900 Broadway, New York, NY 10003; (212) 673-3113.

☐ Wizware, the new line of educational software from **Scholastic** (New York, NY), will be supported by a ten-person national sales force and a national accounts manager, a distributor program, and an advertising campaign scheduled to begin with Scholastic's own publications, which reach 75 percent of all children in the United States. The software will be sold through bookstores, toy and computer stores, and mass merchandisers. "By the end of 1983 we hope to have five thousand outlets," says vice president **Bruce Butterfield.** "We are seeking retail outlets looking to sell a quality line over the long term, an interactive relationship that will benefit their business as well as ours."

☐ **Axlon**, makers of Ramdisk memory systems and the Datalink hand-held communications terminal, has relocated from its former Sunnyvale headquarters. The new twenty-two-thousand-square-foot facility is located at 70

Daggett Drive, San Jose, CA 95131.

☐ **Jim Sadlier**, president of **Continental Software** (Los Angeles, CA), has announced the promotion of four employees. **Kathryn Farmer**, former director of administration, is now vice president, administration; **Mary L. Watt**, previously manager of accounting, is vice president, operations; **George Rodgers**, former manager of production, is vice president, production and purchasing; and **Jim Densmore** has been promoted from Continental's support staff to manager of special projects.

☐ **PDI** (Program Design Inc.), a developer of educational software, has moved to 95 East Putnam Avenue, Greenwich, CT 06830. "The move was necessitated by our dramatic growth in the past year," says **John Victor**, president. "Both our staff and revenues have doubled since last January, thereby severely overloading our previous facilities."

☐ **Systems Plus** (Palo Alto, CA) is merchandising its *Landlord* property management software through a portable counter-top seven-minute presentation for on-site sales and training applications. "With the slide presentation presenting the information to the customer, it becomes more cost-effective than videotapes and can be taken to the customer's location," says president **Rick Mehrlich**. "The initial cost outlay is in the viewer, which can then be used for presenting other products via the carousel that fits into the viewing unit." A slide presentation is under development for the company's *Medical Manager*.

Davong president Tom Hong takes a breather after moving his company to its new headquarters.

☐ **Davong Systems**, manufacturer of Winchester disk and memory expansion products, has moved to 610 Palomar Avenue, Sunnyvale, CA 94086. Their new telephone number is (408) 773-8370. The move to the new twenty thousand-square-foot facility is the result of the 250 percent growth rate the company has experienced since June 1981.

☐ **Hayes Microcomputer Products** has a new address: 5923 Peachtree Industrial Boulevard, Norcross, GA 30092. **Daniel McCutcheon**, formerly manager of software, is now manager of planning. He will serve as a focus for all planning activities, according to president **Dennis Hayes**.

☐ **Don't Ask Computer Software** is now located at 1700 Pontius Avenue, Suite 201, Los Angeles, CA 90025; telephone (213) 477-4514.

☐ **Douglas McCormick** and **Christopher Varley** have been named computer-science-acquisitions editors for the **Hayden Book Company** (Rochelle Park, NJ). McCormick, a former CAD/CAM editor with Design Engineering, is "looking for manuscripts dealing with programming, machine-specific hardware, and related technology." Varley, former software and computer science book acquisitions editor for Brady Publishing, is looking for machine-specific applications and prefers manuscripts accompanied by disk.

☐ When **Tracy Valleau** spoke of having been on "Apple's recommended programmer list" ("Programmer for Hire," January 1983), he was speaking of the past. Back in the wild, unsettled early days of Silicon Gulch, when a certain young computer company was looking for that occasional, exotic rare bird outside the firm who was actually working with and was knowledgeable about these new machines, Apple engineers kept in their heads the names of local programming types who could be tapped as new program product testers.

It was printed as a bit of history, not as a possible job opportunity. Apple would appreciate it if customers would stop calling and asking how they can get on "the list." There's no such animal. ◨

HARD TALK

BY JEFFREY MAZUR

In the beginning, the Apple II was considered primarily a game computer. In fact, that's what Steve Wozniak intended it to be.

But Wozniak chewed more than he bit off, and the result was a machine that suited the needs of business, education, science—just about everyone found a good use for the Apple.

Given its purpose in the beginning and given the fact that that beginning took place nearly six years ago, the Apple was way above everything else available at the time. Even its keyboard was the best available—far superior to the Pet with its calculatorlike keys and the TRS-80 with its barely debounced console.

Now that the Apple II, mostly in its Plus configuration, has proven itself a popular and capable business machine, its keyboard is a major shortcoming. After all, built-in lower-case capability is almost a must for word processing, and financial work cries out for the convenience of a numeric keypad. No Apple II prior to the IIe—meaning almost all the Apples already in circulation—has had either, and even the IIe lacks the keypad, although it does have a port for an outside one. But, in the same spirit that has produced more than 90 percent of all Apple-related products, third-party manufacturers have come to the rescue.

Before we look at the new hardware that has become available, a brief history of the Apple keyboard is in order. In the beginning, there was that "really nice keyboard"—the one with the power light that looked like one of the keys. (Can anyone honestly deny thinking that it was also the power switch at first?) This keyboard went through several phases, but, generally speaking, it was a single board unit that attached directly to the motherboard via a short ribbon cable.

One annoying problem with the old keyboard in its various incarnations was its lack of a true N-key rollover. *Rollover* is the ability of a keyboard to recognize a keypress even if one or more keys hit previously are still being held down. Rollover is especially important if you're a fast typist, since you may strike the next key before fully releasing the previous one. Thus, with a true N-key (or infinite) rollover keyboard, pressing and holding down the keys A, B, and C in order produces the same results as if each key had been struck and released individually.

The old keyboard had such rollover but it was often limited to two keys, depending on the specific characters pressed. Thus, pressing more than two keys in too close a succession had the potential of giving false results. This same kind of thing may occur when you type *run*. If you haven't released the R key by the time you press the N key, you may get *runb*. The extra B is a result of the R, U, and N keys being pressed simultaneously. Since run is a common command, even hunt-and-peck typists can find themselves typing this too quickly (those who use more than two fingers, that is).

Although the older keyboards have not been used on Apples for several years, the keyboard description and schematic contained on pages 100 through 102 of the *Apple II Reference Manual* refer to the old boards. Even the latest revision of the addendum to the reference manual makes no mention of the changes made to the keyboard.

In 1980, however, during the Revision 6 motherboards, Apple Computer introduced the new-style keyboard with a separate piggyback keyboard encoder board. The major reason for the change was that the special keyboard encoder IC used by the old keyboards was no longer being manufactured. By now, the power light had become a square piece of plastic flush with the case, and a spring had been added to the reset key so it would be a little harder to press it accidentally.

The new encoder board now had provisions for requiring a control-reset operation. And, with a simple modification, the shift keys could be made to function (more on this later). Although missing the connector, this board was also designed to accept an external numeric keypad.

The current Apple II Plus keyboards still use this same encoder. The styling of the keys has changed a little. They now have a "sculptured" shape that not everyone considers an improvement. One advantage is that the keys are not as shiny as the old ones, which means that there is less glare in a harshly lit room. The new keyboard still has only two-key rollover, but the switch matrix is different. As a result, quick typing of often-used commands such as run and list (and most other common combinations of keystrokes) doesn't generate any extraneous characters.

To rival the state-of-the-art keyboards, several enhancements need to be made to the Apple keyboard. For starters, the keyboard must allow the entry of lower-case letters by means of functioning shift keys. Some form of a shift-lock should also be provided. It would also be nice to regain the missing ASCII characters such as the curly brackets and the square brackets. Since there aren't any extra keys on the Apple, this will probably have to be accomplished using various combinations of the shift and control keys. A ten-key or full financial keypad to facilitate fast numeric entry would also be a nice improvement. Of course, it would have to be external.

With all these enhancements, we might also want a FIFO (First-In-First-Out) keyboard buffer to allow keyboard input even when the computer is busy (for example, when it is accessing a disk). Finally, there are times when it might be desirable to redefine certain keys or allow one keystroke to represent an entire string of characters (that is, to create a keyboard macro). All of these things are possible with the products we're going to talk about now.

Shift Key Modification. The simplest way to gain lower-case *entry* capability for the newer keyboards is through the encoder board itself. Just to the right of the reset control switch are several holes. If a switch is mounted here, the shift keys can be made to function normally. (Shift key modification gives you lower-case *entry* capability only. If you want to *display* lower case on the screen, some form of lower-case adapter or eighty-column board will, of course, be needed.)

To add the switch, start by removing the encoder board from the keyboard. This is accomplished with the aid of a small pair of pliers to free the plastic spacers holding the boards together. By squeezing the tips of each spacer, you can gently rock the encoder board back and forth until it is free.

After removing the encoder, examine the area where the switch will be mounted. There will probably be an outline of the switch and the designation S2. Note that there are two shorting pads (those bow-tie-shaped traces) in this area. These must be cut with a razor or sharp knife. Then add a DPDT (double pole, double throw) switch (C & K type 7201 is perfect), soldering to the existing holes. Check your work and then replace the encoder board back under the keyboard.

The added switch now selects one of two modes. When the switch is toward the left, the Apple keyboard operates as before; this is also the shift-lock mode. Moving the switch to the right puts the keyboard in the lower-case mode and enables the shift keys. This mode can be used for word processing, for telecommunications, or for when you're working in Pascal or CP/M. Since Apple's Basic and DOS don't recognize lower-case commands, however, the lack of an external shift-lock key be-

comes rather cumbersome.

Repeaterrrr. The Repeaterrrr is an auto-repeat adapter from High Order Micro Electronics. It's easy to install this device on any Revision 6 or above Apple that has the separate encoder board under the keyboard. The Repeaterrrr has an adjustable delay and also uses the Apple's repeat key to double the repeat rate. Furthermore, this board offers a convenient place to attach the common "one-wire" shift key modification without the need for soldering.

Installation of the Repeaterrrr requires removal of the encoder board. A small tool that simplifies this operation is included. After you've separated the twenty-five-pin connector from the keyboard proper, position the Repeaterrrr over the encoder board. If you give it a gentle push, it will slide over all twenty-five pins. In addition to making the necessary electrical connections, these pins also serve to hold the Repeaterrrr firmly in place. Next you must connect a small jumper wire to one of the components on the encoder board via a simple push-on connector. Finally, the entire assembly must be mated back with the keyboard; this completes the installation procedure.

Initially, the delay before repeating is set at 0.6 seconds. This can be adjusted, however, to be between 0.3 and 1.3 seconds, or it can be disabled completely. This is sometimes necessary for playing games that use keyboard control. If you have to turn off the unit, it's a good idea to mark the control setting before moving it. Then you can return to your previous delay setting after the game.

The Repeaterrrr works with the newer Apple keyboard and provides auto-repeat capability.

Vista Model 150 Type-Ahead Buffer. For a very modest price, the Model 150 from Vista Computer Company adds forty characters of type-ahead buffering to any Apple II keyboard, including the older-style keyboard. Installation of the tiny board is quite simple but will probably require removing the case from your computer. There's no provision for clearing the buffer, so the control-C interrupt function and many games may not always work.

The Vista Model 150 type-ahead buffer is compatible with all Apple II keyboards.

ABT Keypad. Advanced Business Technology makes two versions of its numeric keypad—one for use with the older one-piece keyboards and one for the newer type of keyboard. The Type A keypad for older keyboards connects through the keyboard socket on the motherboard. We tested the Type B unit, which connects directly into the encoder board. This connection is made through a nine-pin D-connector that the encoder board is designed to accept. Since the mating connector is not supplied by Apple, you'll have to remove the encoder board and install a connector that comes with the keypad. This is quite simple but does require some soldering.

After you've put the modified encoder board back in place, you can plug in the keypad and place it on either side of the computer. You can also remove the keypad any time you need to.

A wooden stand for the keypad is also available. Called PadLegs, this stand raises the keypad to the same height and slope as the Apple keyboard.

Apple Numeric Keypad. Apple Computer's numeric keypad contains twenty-four keys for expanded calculator functions and easy *VisiCalc* operation. In addition to the numeric keys, there are six math keys (plus sign, minus sign, times sign, division sign, and open and closed parentheses). These keys can be used with the duplicate print (actually "?") and return keys to enter complex calculations from the immediate mode of Applesoft. This makes the Apple easier to use as a desk calculator.

Simplifying data entry even further, there are the decimal point and "double zero" keys. The double zero key enters two zeros each time you press it—very useful when you're working with financial data. For faster cursor moves and data entry using *VisiCalc*, there are also keys that duplicate the escape, space, and left and right arrows of the Apple's keyboard. The arrow keys feature auto-repeat.

To install the Apple keypad, you add a small interface board in series with the keyboard cable. After removing the Apple's case, disconnect the keyboard from the motherboard. Then plug the interface board into the empty socket and the keyboard cable to the interface board. This board is attached to the keypad by means of another cable. In order for the computer to operate, this keypad must remain connected. If it must be disconnected for some reason, the interface board must also be removed.

The Apple keypad (formerly available from the Keyboard Company) is a numeric keypad that works with all Apple II keyboards. It offers auto-repeat on the arrow keys only.

Lazer Keyboard +Plus. The Keyboard +Plus works with old and new keyboards. It adds lower-case entry with shift-lock, generates the complete ASCII character set, and has a 128 character type-ahead buffer. Installation involves mounting the small circuit board on the inside wall of the computer and connecting three cables. One of these cables connects to the Apple motherboard after the keyboard cable has been moved to a socket on the Keyboard +Plus. Another cable connects to a small socket adapter, requiring the removal of one IC from the motherboard. The final cable goes to the keyboard itself to pick up the control and shift key connections. This requires a brief session with the soldering iron.

After you've successfully installed the Keyboard +Plus, the Apple should power up in a normal fashion. The only noticeable change is that hitting reset by itself will no longer reset the computer (assuming that it used to). A hardware reset can be achieved by holding down the control key and pressing reset. Hitting the reset key by itself toggles the shift-lock mode off and on. All of the extra ASCII characters are made available through pressing the control key in conjunction with various numeric or punctuation keys.

A type-ahead buffer stores up to 128 keystrokes while the computer is busy. A special *clear buffer* command is provided to wipe out pending keyboard input. This is accomplished by pressing shift-reset. There are also instructions for adding a switch to disable the buffer for game playing and other pursuits.

The Keyboard +Plus from Lazer MicroSystems is compatible with all Apple II keyboards. It provides lower-case entry capability by means

of the shift keys, shift-lock, all ninety-six ASCII characters and a type-ahead buffer.

Videx Enhancer II. The Enhancer II is probably one of the most sophisticated attachments available for the Apple keyboard. It consists of a completely new encoder board that replaces the existing one (and therefore only works with newer keyboards). It also includes a character generator ROM for lower-case display (also known as a lower-case adapter).

The Enhancer II contains its own microprocessor, complete with EPROM and RAM; this accounts for the simplicity and extreme versatility of the unit. Among the functions provided are lower-case keyboard entry (actually, the full 128 character ASCII set), auto and fast repeat, keyboard redefinition and macros, and type-ahead buffer.

Installation of the Enhancer II is comprised of three phases and requires some disassembly of the computer. First, the lower-case character generator ROM must be installed. If you already have one, or if your Apple motherboard is a Revision 6 or earlier, this step is not required. The next step is to remove the keyboard encoder board and replace it with the Enhancer II. The final step is optional but necessary if you want to realize all of the new features. It involves adding two wires to the motherboard. The instructions provided with the Enhancer II explain in detail how to do this. The process consists of removing a couple of ICs, inserting the jumper wires into the appropriate holes of the IC sockets, and then replacing the ICs. The procedure just outlined is not at all hard; if you're adept at soldering and not too squeamish about taking an iron to your computer, a neater looking job can be accomplished by adding the wires to the underside of the motherboard.

Since there are no spare keys on the Apple keyboard to control such functions as shift-lock, the Enhancer II calls upon the control, shift, and reset keys to perform double duty as command keys. For example, hitting reset places the keyboard into the caps-lock mode. This mode is similar to the standard Apple keyboard operation.

Pressing shift-reset turns off the caps-lock mode and allows normal lower-case entry. In this mode, the keyboard acts like a standard typewriter in that all letter keys produce lower case unless the shift key is pressed simultaneously. Those keys that used to have a shifted function (the at sign as a shift-P, for example) will produce the correct upper-case letters as appropriate. To regain those lost characters, as well as the rest of the ASCII set normally unavailable from the Apple keyboard, various combinations of control and control-shift of the number keys are used. For example, pressing control-2 yields the ~(tilde) character while control-shift-8 acts as the left curly bracket key. Pressing the control key by itself engages a shift-lock mode whereby all subsequent keystrokes act as if the shift key were being held down. Unlike in the caps-lock mode, which only shifts alphabetic keys, pressing the 4 key in the shift-lock mode gives the dollar sign character (shift-4) as expected. The shift-lock mode is easily cancelled by pressing either shift key.

Since the Enhancer II has assigned additional functions to the reset key, it would be awkward if the computer executed a hardware reset each time this button was pressed. Therefore, with the Enhancer II installed, you're required to press control-reset to perform this function (many Apples are configured this way to prevent accidental resets). A small jumper is provided, however, to restore reset-only operation or to disable the hardware reset function completely from the keyboard.

Another feature of the Enhancer II is auto-repeat on all keys and fast-repeat using the repeat key. Holding a key down for more than three-fourths of a second causes it to repeat at about fourteen times per second. Pressing the repeat key allows instant repetition at twice that rate. There's also a 128 character type-ahead buffer.

In the event that you make a mistake or change your mind about some characters in the buffer, there are two ways to empty or *flush* the contents of the buffer—hitting reset or hitting control-C. The latter command is included to avoid a possible problem with running Basic programs. While a program is running, it is usually scanning the keyboard at regular intervals to see if a control-C has been pressed. If so, the program halts and returns to the immediate, or command, mode.

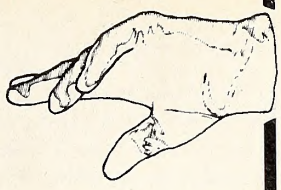
With the type-ahead buffer, however, it's possible to enter characters while a program is running. But until they're specifically asked for by the program (via an input statement, for example), these keystrokes will remain within the buffer. If you were to try typing control-C in an attempt to stop the program, this character would just sit at the end of the buffer and the computer would never see it. Thus the program would continue running until it reached an end statement or until enough characters were read from the buffer to allow the control-C to be passed on to the system. By allowing the control-C keystroke to flush the buffer, the Enhancer ensures that the control-C will be sent to the program immediately. Like most of the other features of the Enhancer II, both the control-C flush and the entire type-ahead buffer can be defeated if you wish.

The Enhancer II has the ability to define up to 170 single-character macros or one 510 character macro. Assigning macros from the keyboard is quite simple. First, the macro definition mode is enabled by typing control-shift-repeat. Next, the keyboard character to which the macro is to be assigned is typed. Any and all keys typed after this become part of the macro (including escape and return). The end of the macro definition is signaled by pressing the repeat key. Individual macro definitions can later be cleared or the entire macro list can be erased by typing repeat-reset.

The best part about the Enhancer's macro facility is the speed and ease with which you can use it to create macros. This makes it much more likely that you will make frequent use of this capability. Another nice thing about these macros is that the definitions are stored in the Enhancer's private RAM. Thus they cannot be wiped out by changing programs, booting disks, and so on. You can even use them with protected software such as games and business programs.

Macro definitions can also be loaded from disk by means of a special *Download* program. The download operation can be used to disable the shift-lock and to select and lock the keyboard mode. It can also be used to disable any of the following: the auto-repeat capability, the type-ahead buffer, the ability to enter and clear keyboard macros, and the download functions.

The Enhancer II comes with a utility disk and a hefty user manual. The disk contains programs that modify Basic, the Monitor, Pascal, and *Apple Writer* to allow lower-case entry and display. Two other pro-



VOLUME TWO!

&Amper~Magic T.M.

by Bob Nacon

The success of the original Amper-Magic™ program package and the introduction of its technique for attaching new commands to Applesoft programs has stimulated the production of Command Library™ packages designed around a 'theme' such as information display or output, input, memory management, etc., which will enhance your Applesoft programs. They will give your program a professional operation and appearance by increasing speed, reducing size, and giving you features you never could have before, while still allowing you to program with the ease of BASIC.

Amper-Magic Command Library No. 2 is dedicated to information display and output capabilities. Read on and enjoy the new programming power Amper-Magic Command Library No. 2 will give you.

This disk contains 27 machine language routines ready to be inserted quickly and painlessly into your own Applesoft programs. Included among them is the most powerful PRINT USING routine yet created for Applesoft, as well as some small but very handy routines for controlling the appearance and activity on the display screen.

In order to use these commands, you will need the Amper-Magic program itself which is contained on Volume One. SOME commands on this disk are:

** Access the most powerful PRINT USING command EVER for the Apple. It sure does more than just line up decimal points! It works with strings of characters as well as numbers, and lets the program decide whether to make them Flash or Inverse or Normal depending on conditions you specify. With numbers, you can have fixed or floating dollar sign and/or optional commas and a variety of fill characters. You can embed standard phrases within your format design. You can even print to the screen WHILE outputting to the printer! And generate NO GARBAGE to collect! All in all, the most powerful PRINT USING yet!

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** Save and restore instantly any text screen, no matter how complex with flashing, inverse, and any window settings...

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** Print anywhere on the screen under program control, either with absolute movements or with relative movements...

** Print string arrays to any device, with or without an appended special character, and WITHOUT A LOOP...

** Set, clear, or toggle ANY bit or bits anywhere in RAM memory...

** Check the keyboard when called, pause if SPACEBAR is pressed, then continue if SPACE is pressed again or GOTO a location if RETURN is pressed...

** Print the current text screen on command or from the program...

** Send ASCII characters to peripheral devices and POKE peripheral card memory to set or clear bits for control purposes...

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grams, *Macro Editor* and *Download,* take care of creating macro definition and operating mode files and loading them into the Enhancer II.

The Enhancer II documentation deserves considerable praise. It's very thorough (offering everything from detailed installation instructions with photos to complete schematics and program listings), and it's easy to read. Many examples are given to aid the novice. And for the advanced programmer, a wealth of technical data and information on related topics is contained in the appendixes.

An optional Function Strip to work with the Enhancer is also available. This is a thin membrane keyboard consisting of sixteen "touch" switches. The keyboard strip attaches to the lower lip on the Apple's cover, just above the keyboard. It connects via a flat cable to the external keypad input of the Enhancer (after the mating connector has been mounted there). Each of the sixteen keys can be defined in the usual manner to represent often-used commands.

The Enhancer II works with the newer-style Apple II keyboard. It provides lower-case entry by means of the shift keys, shift-lock, auto-repeat, and type-ahead buffer. Keyboard macros can be used.

EPS Detachable Keyboard. The ultimate keyboard "enhancement" would have to be something like the detachable keyboard from Executive Peripheral Systems. This is a completely separate, self-contained keyboard that can be connected to the Apple. This unit was unavailable for evaluation. Here's a brief description of its features based on information derived from the sales brochure supplied by the manufacturer.

The EPS keyboard starts with the full upper-case and lower-case alphabet and includes a separate shift-lock key. All of the common ASCII punctuation characters can be found among the 102 keys on this unit. There are six cursor movement keys, including the four direction keys (which are laid out in an "inverted T" configuration). Another six editing keys enable you to perform such functions as inserting a line, deleting a line, inserting a character, and so on.

On the right side of the keyboard is a numeric data entry pad; it contains double and triple zero keys, keys for the decimal point and the comma, and double-size enter keys. Along the top of the keyboard are twelve special function keys that can be assigned according to the program being used.

Each key, including the cursor control and editing keys, can be defined through the use of Promware modules. These modules tailor the keyboard to work with such programs as *VisiCalc, Apple Writer II, PFS,* and *WordStar*. Each module comes with a plastic overlay strip that delineates the operation of the special function keys (each of which can represent a single character operation or a multiple character macro). All keys offer auto-repeat when held down.

The EPS keyboard is a lightweight unit that you can place on your lap if you wish. It connects to the Apple motherboard (it doesn't take up a peripheral slot) via a six-foot coiled cable. The keyboard also has a storage compartment for extra Promware modules and overlay labels.

The EPS keyboard provides lower-case entry capability by means of the shift keys, shift-lock, all ninety-six ASCII characters, auto-repeat, and a numeric keypad. Keyboard macros and function key capability are also available.

Other Data Entry Devices. Not all data and control functions need be entered via keyboard devices. Cursor motions, for example, are much simpler to direct via mechanical transducers such as the joystick, trackball, or mouse.

Most people are familiar with the joystick as a gaming device. It transforms two-dimensional motion into signals that the computer can interpret. From these signals the computer is able to determine the exact location of the stick at any time and can cause a program to react accordingly.

QuikVis. Kraft Systems has just released QuikVis, a joystick cursor control for *VisiCalc*. After you've prebooted using the QuikVis disk, you can load *VisiCalc* and connect a joystick to the Apple's game I/O port to control the cursor. Moving the stick away from its center position (spring-return centering of the joystick is recommended) causes the cursor to move up, down, sideways, or diagonally. Pressing one of the buttons on the joystick increases the speed of the cursor motion. Pressing the other button causes the cursor to "home" to the A1 position.

The Trackball. This device is somewhat similar to a joystick. It uses a rotating sphere mounted in a housing so that only the top surface of the ball is exposed. By guiding the ball with your fingers in any direction, you can produce results similar to those you'd get using the joystick. Due to its construction, however, the trackball can offer more precise control, especially when moving an object such as a cursor.

The Mouse. There are basically two kinds of mice (mouses?)—optical and mechanical. An optical mouse uses an optical sensor to detect two-dimensional motion over a grid-lined tablet. Mechanical mice are more common. If you were to shrink a trackball a little and turn it upside down, the result would resemble a mechanical mouse.

Operating a mechanical mouse is somewhat different from using the trackball—now the housing is moved around with the ball rolling on the table underneath to indicate movement. If you need to move farther in one direction than the cord will allow, you simply pick up the mouse, move it back in the opposite direction, set it down, and continue the motion. Of course, while the mouse is off the table, it does not register any movement.

At present, the mouse seems to be generating the most interest as an auxiliary input device. Manufacturers of many of the latest computers and software are considering it to be standard equipment. VisiCorp's *VisiOn* is an example of this trend. Making these kinds of devices standard items instead of add-on options and incorporating software to utilize their potential will greatly increase the acceptance of such devices. Other input devices that may see wider use in the future are light pens, bar wands, touch screens, and voice recognition units. ◨

Advanced Business Technology, 12333 Saratoga-Sunnyvale Road, Saratoga, CA 95070; (408) 446-2013. Apple Computer Accessory Products Division, 7101 Patterson Drive, Garden Grove, CA 92641; (714) 891-5831. Executive Peripheral Systems, 800 San Antonio Road, Palo Alto, CA 94303; (415) 856-2822. High Order Micro Electronics, 17 River Street, Chagrin Falls, OH 44022; (216) 247-3110. Kraft Systems, Box 1268, Vista, CA 92083; (619) 724-7146. Lazer MicroSystems, 1791 Capital, Suite G, Corona, CA 91720; (714) 735-1041. Videx, 897 N.W. Grant Avenue, Corvallis, OR 97330; (503) 758-0521. Vista Computer Company, 1317 East Edinger, Santa Ana, CA 92705; (714) 953-0523.

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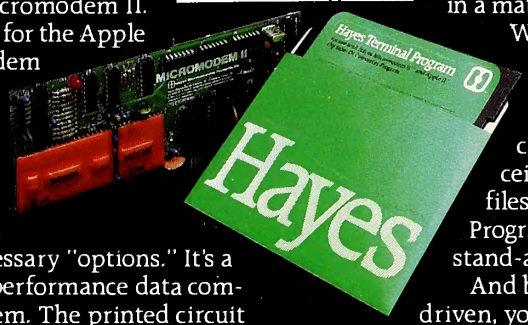
Microcoupler



A complete data communication system. Micromodem II is not "base priced" plus necessary "options." It's a complete, high-performance data communication system. The printed circuit board fits — quickly and easily — into your Apple II, eliminating the need for a serial interface card. And the Microcoupler™ (included) connects the Apple II directly to a standard modular telephone jack. Auto-dial and -answer features are built in. Operation can be full or half duplex, with a transmission rate of 300 bps. And it's Bell 103 compatible and FCC approved.

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And because it's menu driven, you can choose from a wide variety of options to set your communication parameters — as well as change hardware configuration — directly from the keyboard. It even allows you to generate ASCII characters that are normally not available from Apple keyboards, further extending your capabilities. Incoming data can be printed (on serial or parallel printers) as it's displayed on your screen.

Micromodem II is available with or without the Terminal Program. Buy your modem by itself, or optionally packaged with the Terminal Program disk and user manual at extra cost. The software is also sold separately, for those who already own a Micromodem II.

If you're ready to communicate with other computers, to access information utilities, time-sharing systems, or use bulletin boards, then you're ready for Micromodem II. Come on. Compare. Consider. Then buy.

Micromodem II is already the best-selling modem for the Apple II. And Hayes' new Terminal Program makes it better than ever. Available at computer stores nationwide.

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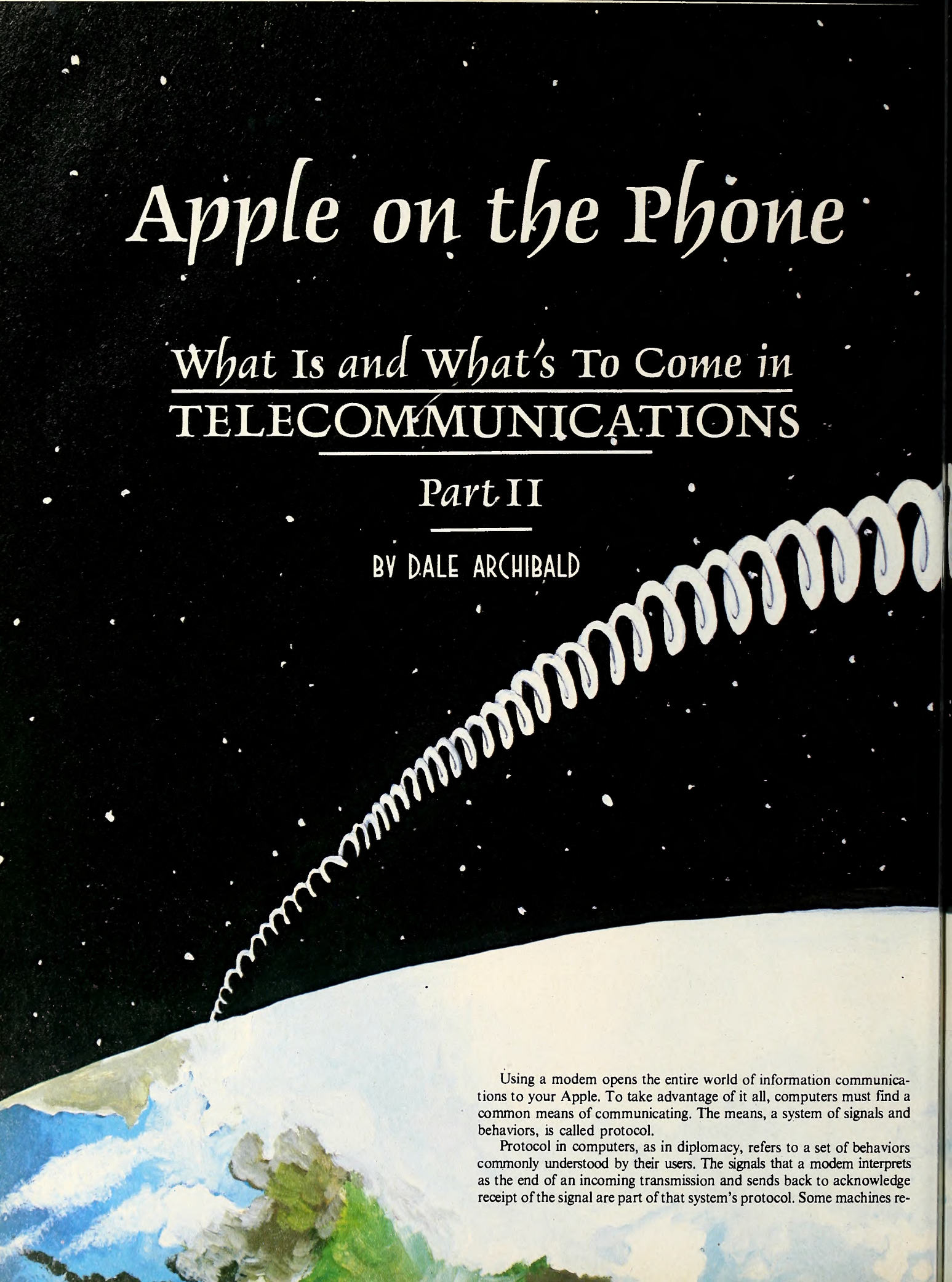
Apple on the Phone

What Is and What's To Come in TELECOMMUNICATIONS

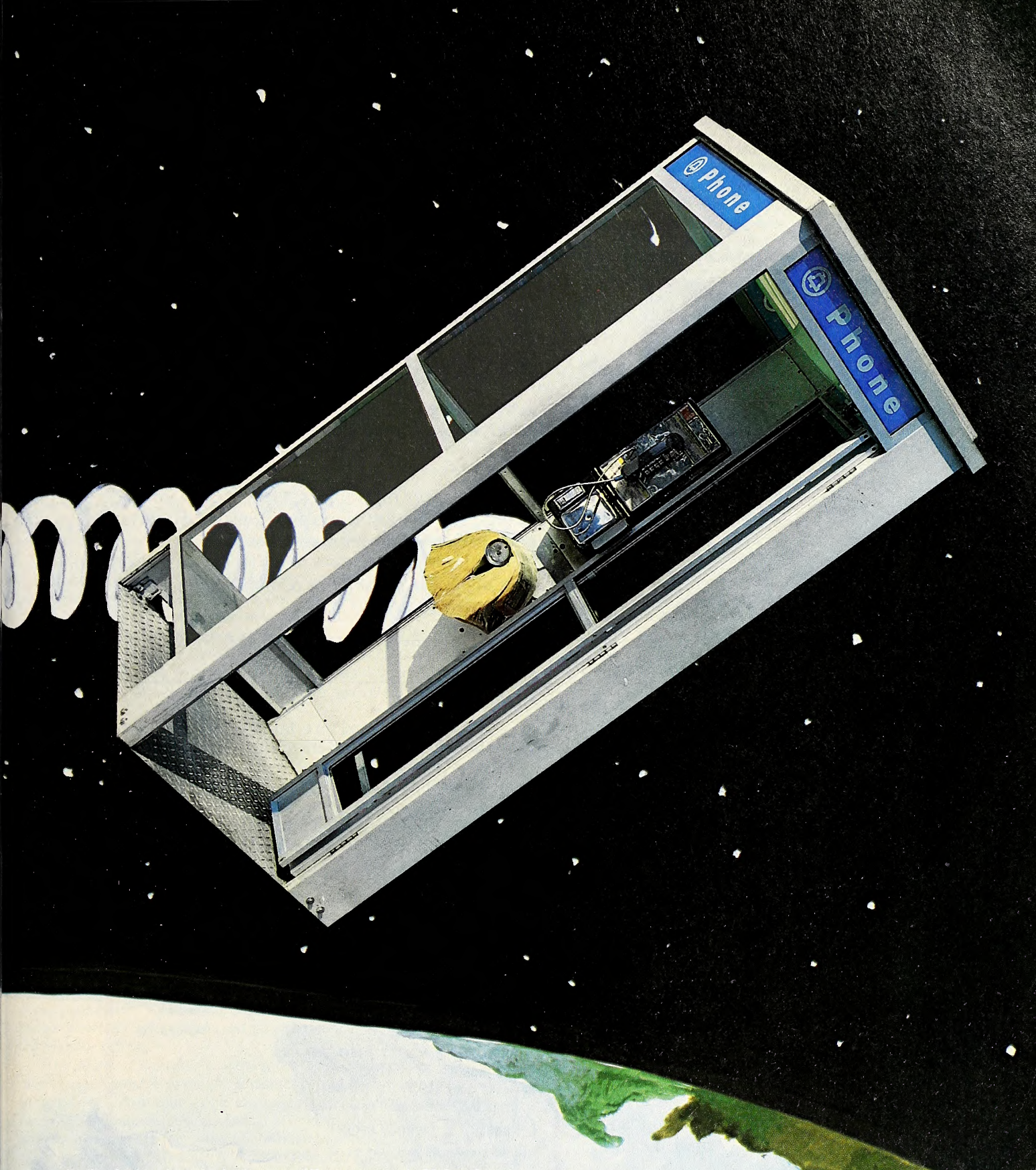
Part II

BY DALE ARCHIBALD



Using a modem opens the entire world of information communications to your Apple. To take advantage of it all, computers must find a common means of communicating. The means, a system of signals and behaviors, is called protocol.

Protocol in computers, as in diplomacy, refers to a set of behaviors commonly understood by their users. The signals that a modem interprets as the end of an incoming transmission and sends back to acknowledge receipt of the signal are part of that system's protocol. Some machines re-



quire line feeds, others don't; they use different protocols. Unless the protocols they understand match, computers can't talk to each other.

Some terminal programs for the Apple include routines that understand and translate some protocols that aren't native to the Apple into signals the Apple can understand.

With data communications networks, however, you don't have to think about protocol at all.

Data communications networks, vast telephone-oriented octopuses,

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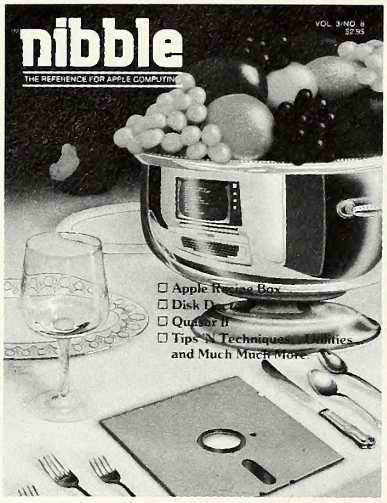

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adjust protocols at their central computer to match those of the computer calling in.

Networks are truly shrinking the world and enlarging the universe. With the availability of networks now spreading to home computerists in addition to businesses, task and information services and huge general and specialized databases are available to all our homes.

Four major networks lead the field today. Telenet, from General Telephone Electronics, and Tymnet, from Tymshare, share 38 percent of the market. Fast ascending are American Telephone & Telegraph's brand-new American Bell sprout, Advanced Information System/Net 1, and ADP's AutoNet.

How They Work. Generally, data transmission networks attempt to have nodes in every metropolitan area. A node is often a minicomputer. When you call in through a modem on the Apple, the minicomputer supplies the correct protocol. In effect, your signal is massaged into the proper form to be sent long distance to the host computer of the service you're using.

In some cases, the networks offer reduced-rate telephone service, such as incoming WATS lines, to lessen the strain on users' pocketbooks.

Businesses and interested groups buy minimum blocks of this time at a set per-hour cost. Zenith, for example, buys blocks of time for its network for internal ordering from distributors.

But the network clients that have the most significance for computer-loving homes are the information and task services. The Source, CompuServe, Dow Jones News/Retrieval Service, and many smaller information services operate through the big networks. They buy blocks of time from the networks; subscribers to the services then pay fees to the services to cover their network costs and the costs of their features.

Business-oriented features are most used during the workday, particularly late afternoon, when many companies enter electronic mail—and thus they provide the slowest service. Hobbyist features suffer in the evenings, on weekends, and on holidays. Responses that take a fraction of a second during less busy times can take several seconds during rush hours.

Part of the delay comes from overload at the host computer; part of it is from the heavy workload at the local node.

The most economical means for using data transmission networks or information services are terminal programs. They make it easy to sign on to the network, download into memory material you want (such as electronic mail or stock quotes), and sign off. Then you can save the items in memory onto disk or print them out—without paying for time on the service while you're doing it.

Similarly, when you're ready to reply, you may write messages, compile information, or select a program before you sign on to the network, then sign on and upload it in the appropriate place in the least possible time.

Thus, terminal programs keep your time on the network, and your subsequent charges, to a minimum.

So, the data transmission networks are the means by which all varieties of computers talk to each other. Now, what will they talk about? Here's where the information and task services enter the picture—and the monitor screen.

The Source, CompuServe, Dow Jones News/Retrieval Service, and an increasing number of on-line databases provide information in detail (or not—remember your Apple can select if given the opportunity) on many general-interest subjects and in several specialized fields. Besides straight information, they offer opportunities for distant individuals to exchange letters electronically and for strangers to find other like-minded strangers for sharing any number of interests.

Among the services becoming more and more prevalent are those that enable users to investigate travel possibilities and make air, car rental, and lodging reservations directly. Within a few years—which may be an underestimation—it will be possible to use such services to purchase groceries.

Specialized databases are springing up in many fields. An opthalmological service, being set up now, will offer any eye doctor with a computer the opportunity to call in symptoms for diagnostic information, to keep up with the most recently discovered treatments, and generally to follow up-to-the-minute research and progress being made in the field. There is even a database for horse breeders, expected to go on-line this spring; racehorse trainer Darrell Vienna and other forward-looking horse people will be able to learn the complete bloodlines of any registered Thoroughbred merely by typing its name into the computer.

The most widely used data communications services at present are the general-interest Source and CompuServe and the investment-oriented Dow Jones News/Retrieval.

The Source. Perhaps the best known of the database services, the Source started small and independent; now it's large and owned by Reader's Digest Association, a company that puts out a mildly popular magazine of which you may have heard.

Offering service at speeds of 300 or 1200 baud, the Source provides menus, but experienced users can bypass the menus to save time and money. Members in any of the 360 cities served by Tymnet or Telenet can use those networks for their Source calls; outside those areas, the Source provides a WATS line at less cost than long-distance phone rates.

Mike Rawl, director of public relations and advertising for the Source, describes the services the Source offers by category:

"One category consists of travel services. You can use the Source to look at all the airline schedules and figure out connecting flights. Through an on-line travel club, you can reserve a car and hotel room. You can check the weather at your destination, review the restaurants and hotels, even check out movies you might catch while you're there.

"News, reference, and research comprise another category. The Source gives you access to the United Press International news service, which you can read just as it comes over the wire or which you can search for special interests, using as many as three keywords at a time. It has management news, summaries of all articles in the twenty-seven leading business publications, and a special service called Information on Demand, which is the gateway to more than one hundred fifty research-oriented databases. Source staff members search any of the databases for you, transferring the information you request back to you by computer."

The third category, according to Rawl, is communication, including electronic mail, on-line bulletin boards, a Mailgram message service in

which messages sent by late afternoon are guaranteed next day delivery, and a computer conferencing service.

Electronic mail involves more than just leaving messages in other individuals' Source "boxes." Indeed, you can create a distribution list for regular mailings. For example, a business with a list of two hundred salespeople with access to terminals of any kind could send a single message to all of them.

Sending such a message express would place it in front of all other messages in the receiving mailboxes, and the sender could place a request that would keep the message recipients from moving on to other messages until they replied.

Access to mainframe computers is another category of service the Source provides. Through your Apple and the Source, you can program, compute, or make financial models, storing your work on mainframes in languages such as Fortran, Pascal, and Info-X.

Also from mainframes come professional investment services including continually updated market quotations, news and price data from all commodity markets, detailed analytical data about all common stocks, advice from investment columnists, and the UPI business wire.

A library of consumer services comprises yet another category of service: read United Media Features columns; keep hale with the help of a health care database; shop electronically by browsing among more than fifty thousand items at discounts of up to 40 percent; post your resume or nose through those of others.

Finally, it's time for fun, and, appropriately, the last category is games. More than sixty games are open for play on the Source; they are strategic games or logical or mental puzzles rather than fast-action arcade games.

But games are the frosting not on cake, but on good solid meat and potatoes. Says Rawl, "What we're really trying to provide for is use, practical use. That's what's going to make the difference between the Source being something people try and something they use every day."

Still, there's a fine line between the practical and the not quite so practical. A recent addition to the Source's service is an electronic newspaper staffed by eight journalists who contribute information daily.

"When the National Basketball Association draft was going on, we put it up round by round," says Rawl. "It was information you couldn't find anywhere else."

CompuServe. Also offering 300 baud and 1200 baud service in more than three hundred cities via local telephone calls, CompuServe features EMAIL (an electronic mailbox), a national bulletin board, a citizens' band radio simulator, access to the Associated Press wire service, financial and portfolio management programs under an umbrella called MicroQuote, use of various programming languages, and memory storage space. The company provides a special commercial branch for large business users.

There's no way to avoid CompuServe's menus, and some users consider that its biggest drawback. Every time you turn a CompuServe page, which is the equivalent of going to a different feature, the entire menu prints on-screen. To experienced users, this procedure seems a costly filler. It's possible to jump directly to various pages if you know their code names; but you still must tolerate their menus when you get there.

Rich Baker of CompuServe describes a unique feature of the system: the closed user group. A wholesaler, for example, formed such a group, limited to his customers, and gave each his CompuServe user number and a password. When the wholesaler's customers sign on, they're shunted to a certain workspace inside the host computer. There they find messages, product lists with up-to-the-minute prices and inventory conditions, and electronic order forms. The system is set up so that, when the forms are filled in, all the calculations, including prices, taxes, and discounts, are done automatically.

Through the use of the closed group service, which costs more than the basic service, companies can form their own common databases. As they update information on the common database, all reports, surveys, or projections stored on the database reflect the changes instantly.

Dow Jones News/Retrieval Service. For years, high finance has been synonymous in the United States with Wall Street; and, for many of those years, the image of Wall Street has been the image of a stockbroker anxiously reading the tape of latest prices as it comes off the ticker machine.

Ticker tape so represented the American spirit of enterprise and courage that we came to honor our heroes by raining the long white strips

Apple II

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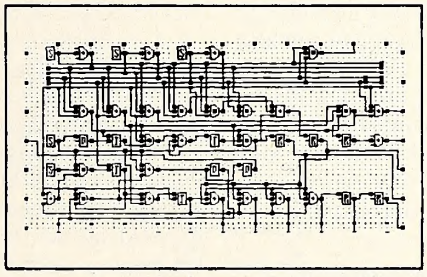

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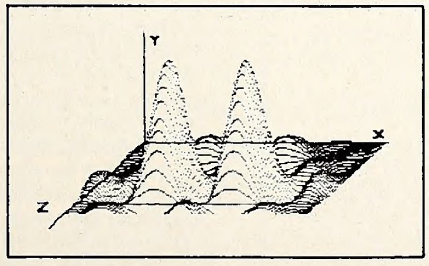

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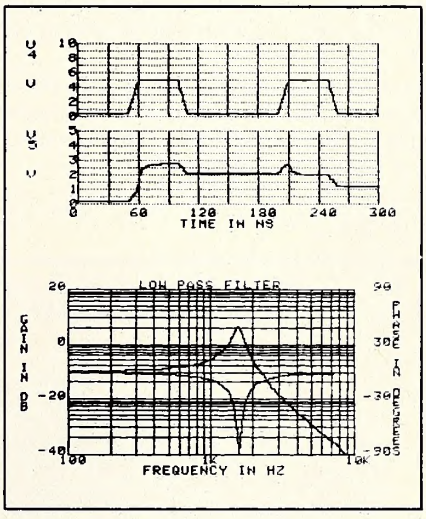

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The personal computer is so efficient for investors that numerous programs have been published to enhance use of the Dow Jones News/Retrieval Service. One of the oldest, recently updated, is Apple's *Dow Jones News & Quotes Reporter*. Giving instant access to the Dow Jones News/Retrieval Service, the program enables users to select only the reports and articles they want to print out.

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Note that the *News & Quotes Reporter* seems to believe that all the news that's fit to print isn't necessarily fit to save on disk. You can't save anything on disk; which means you must stay expensively logged on to the service throughout the printing process to keep a record of anything you see.

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Dow Jones News & Quotes Reporter is a quick and simple way to keep an eye on Wall Street.

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Independent On-Line Databases. There are nearly as many specialized databases as there are fields of interest; in the future, the popularity of a subject will be a determining factor not in whether it has a database devoted to it, but in how many such sources there are. Everything will be represented.

Most of these spring from publications and organizations that have developed specialized pockets of interest into electronic information banks. From databases like this you can learn how many tons of steel were shipped in July 1982, what damage the Medfly did, and what chemicals constituted the bug spray used against it. Lots more too, but surely that much knowledge will impress your friends.

A recent issue of the *Directory of On-Line Databases* illustrates the range of information your Apple can get you. It shows three accounting databases; two on aeronautics; eight serving agriculture; four on aquatic sciences; and, skipping to the other end of the alphabet, three databases covering technology transfer; ten on transportation; five on urban planning; and one on urban studies.

On-Line databases come in two flavors: reference databases and source databases. Reference databases are gigantic, glorified indexes of the *Reader's Guide* variety. Their function is to send their users to other sources; their arguments are bibliographic citations and abstracts.

Source databases are the ones that reference databases send you to. They contain the complete data on particular subjects and often offer original unabridged text.

Specialized databases are not always distributed by their creators. For example, Lockheed Information Systems and two other database services distribute Oceanic Abstracts from the Cambridge Scientific Abstracts. Lockheed's system provides the offerings of more than a hundred database developers.

Some of the specialized on-line databases are expensive; but, should your work or your interest compel you to seek one, you already have more than six hundred to choose from.

As the popularity of computers increases and as people's awareness of the wealth of information and fun available through modem use spreads, costs will drop and breadth of subjects will increase. ◨

Dow Jones Market Analyzer, Dow Jones Software, Box 300, Princeton, NJ 08540; (609) 452-2000. $250.

News and Quotes Reporter, $95, and *Dow Jones Series Portfolio Evaluator*, Apple Computer, 20525 Mariani Avenue, Cupertino, CA 95104; (408) 996-1010. $50.

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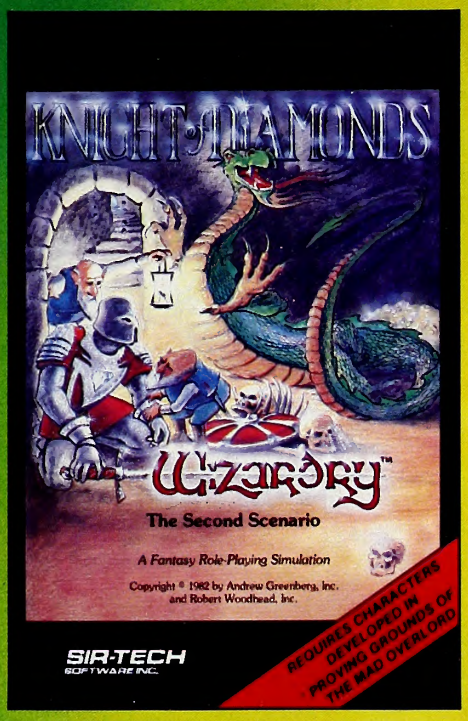
Independent specialized database services require a monthly minimum charge. Some may have a $100 minimum per month; others are much more expensive.

Wizardry



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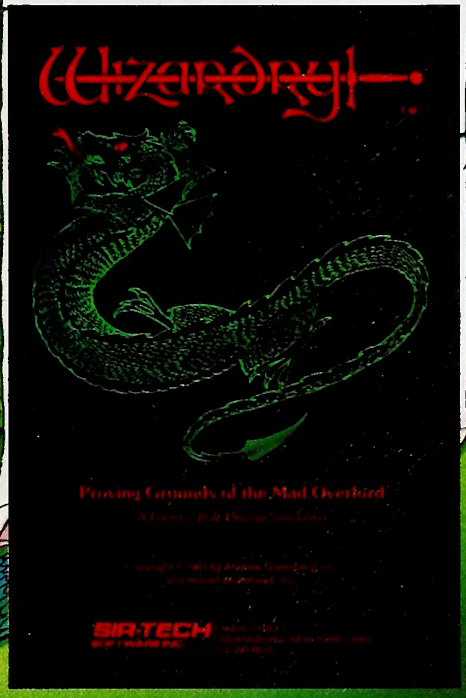

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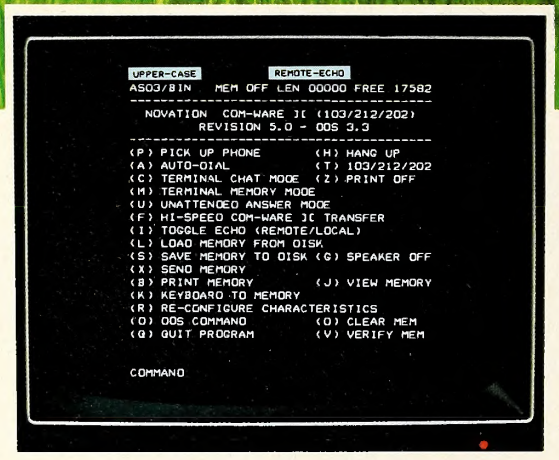

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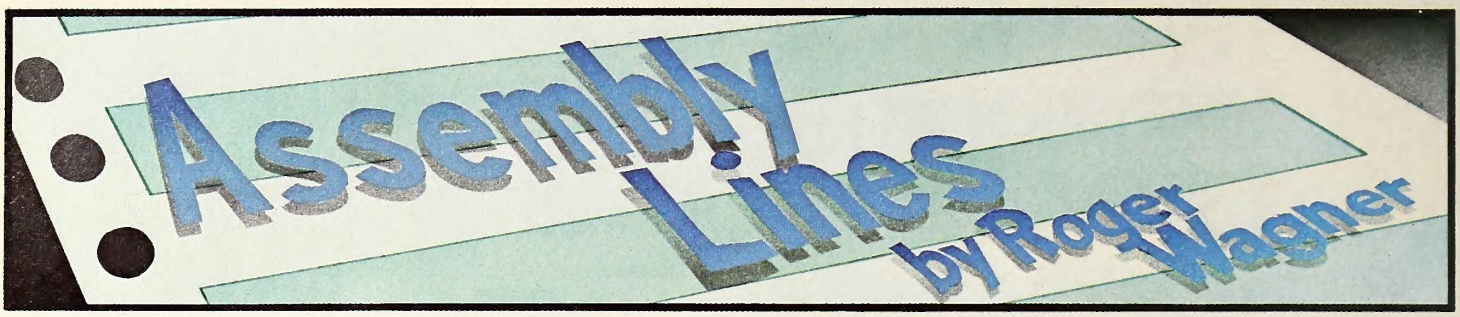

Everyone's Guide to Assembly Language, Part 30

It's time now to examine the input system of the Apple. Many parallels can be drawn between it and the output system, discussed last time. Though not required, some familiarity with last month's major points will help you understand our current topic.

The main demo routines in this installment involve lower-case text; therefore, it's strongly recommended that you acquire lower-case display hardware, if you don't have it already. Lower-case chips for Apples with revision numbers greater than 7 can be set up for $20 to $30. Earlier Apples require more than a single chip. Apple IIe doesn't require any additional software or hardware; the lower-case display capability is built in. For serious study and exploration of text input/output methods, lower-case capability is essentially required.

The Input Vector—KSW. The byte pair $38,39 constitutes the main input vector and is generally labeled KSW for keyboard input switch. Like CSW (the character output switch), KSW is used to switch input to Basic and the Monitor from different sources. As is evident from the fact that an input statement will read a DOS text file and the action of the exec command on text files, the keyboard isn't the only place from which the Apple can obtain ASCII data

When you're writing a machine language program that needs a single-character input from the outside world, the usual procedure is to do a JSR RDKEY ($FD0C) and then to use the value that is returned in the accumulator.

As we did with COUT ($FDED), let's see what RDKEY does to get that character. To examine the routine, enter the Monitor with the usual *call −151* and list the code at $FD0C by typing:

```
FD0CL
```

Here, shown with labels and comments, is the code at that location:

```
FD0C:  A4 24     RDKEY  LDY  CH        ; GET HORIZ CURSOR
FD0E:  B1 28            LDA  (BASL),Y ; GET CHAR FROM
                                        SCREEN
FD10:  48               PHA            ; STORE IT
FD11:  29 3F            AND  #$3F      ; CLEAR BITS 6,7
FD13:  09 40            ORA  #$40      ; SET BIT 6 (FLASH)
FD15:  91 28            STA  (BASL),Y ; PUT ON SCREEN
FD17:  68               PLA            ; GET THE ORIG. CHAR
FD18:  6C 38 00         JMP  (KSW)     ; TO 'REAL' INPUT
FD1B:  E6 4E     KEYIN  INC  RND       ; RND = RND + 1
FD1D:  D0 02            BNE  KEYIN2
FD1F:  36 4F            INC  RND+1
FD21:  2C 00 C0  KEYIN2 BIT  KBD       ; CHECK FOR KEY
FD24:  10 F5            BPL  KEYIN     ; NO, AGAIN
FD26:  91 28            STA  (BASL),Y ; RESTORE OLD CHAR
FD28:  AD 00 C0         LDA  KBD       ; GET INPUT CHAR
FD2B:  2C 10 C0         BIT  KBDSTRB; CLEAR STROBE
FD2E:  60               RTS            ; RETURN WITH CHAR
```

On entry to RDKEY the first three instructions read the character on the Apple screen and put it onto the stack. Remember that what you see on-screen is the representation of a byte stored in the memory range of $400−$7FF. To determine what byte corresponds to a screen position, you need only load the Y register with the horizontal cursor position (CH = $24) and add this offset to the base address for the current line. This base address is always stored in $28,29 (BASL,BASH).

Once the existing character on-screen has been read and stored (so we can put it back on-screen after the input), the next three instructions have the net effect of putting a flashing character on the screen equivalent to the character that was on-screen in the current cursor position.

The action of the ANDs and ORAs may not be intuitively obvious. Let's consider this example:

	Hex	Binary	Character	
Original Character	$C1	%1100 0001	A (normal)	
AND:	#$3F	%0011 1111		clear bits 6,7
First Result:	$01	%0000 0001	A (inverse)	
ORA:	#$40	%0100 0000		set bit 6
Final Result:	$41	%0111 0001	A (flashing)	

Remember that the action of the AND is to clear any bits in the accumulator that are matched by a 0 in the mask value. Bits in the accumulator matched by 1s in the mask are left unchanged, whether they are 0s or 1s.

An ORA, on the other hand, sets to 1 any bits in the accumulator that are matched by a 1 in the mask value. Bits in the accumulator matched by 0s in the mask are left unchanged.

You might wonder at first why two instructions—the AND followed by the ORA—were needed. After all, in last month's column didn't we change control characters to inverse in just one step? Why not just use a different mask value to get flashing characters? The answer lies in the differences between the bit patterns for inverse and flashing characters. All inverse characters have the top two bits clear (bits 6 and 7). Flashing characters, on the other hand, have one bit clear (bit 7 = 0) and the other set (bit 6 = 1).

When the cursor is on a character and the character is to be converted to flashing temporarily, we must not only clear the high bit (at least for all "normal" text), but must also on occasion set bit 6. This combination of a set and a clear requires two operations.

Once RDKEY has thus put a flashing character on-screen to show the cursor's location, the character originally on the screen is retrieved from the stack in preparation for the jump to KEYIN (or any other input routine that will want to restore the original character if no new character is entered). Finally, the actual indirect jump via KSW is done.

In COUT ($FDED), the jump via CSW was made immediately. This extra portion in RDKEY preceding the actual jump explains the presence of the cursor on-screen during a text file read. Although DOS is handling the input at that point, the call is still done via RDKEY, and thus the presence of the cursor is still somewhat unavoidable.

If DOS is not active, KSW ordinarily points to KEYIN ($FD1B). KEYIN is the routine responsible for getting characters from the keyboard; it thus involves the keyboard memory hardware ($C000 and $C010) directly. If input was from a modem or some other external device installed in a peripheral slot, KSW would point to *Cnxx*, where *n* is the slot number and *xx* is the input routine entry point. Before considering the unusual situations, let's see what happens most of the time, when KSW points to KEYIN.

KEYIN first increments the random number byte pair, $4E,4F. This is a part of the loop that will be repeated until a key is pressed. The theory is that the passage of time between keypresses is random. This byte pair is used primarily by Integer Basic. Applesoft has its own random number registers and routines.

After incrementing the random byte pair, KEYIN2 then does the actual keyboard check, repeating the process by going back to KEYIN if no key is pressed. Remember that the BIT instruction makes the test possible by setting the sign flag of the status register equal to bit 7 of the character value detected at the keyboard ($C000). BPL can thus be used to detect (by failing) when bit 7 goes high (bit 7 = 1), indicating a keypress.

Once a key has been pressed, the value in the accumulator is put back

into screen memory. Remember that this is the value of the old character presumably there, *not* the new character input. If the character entered is a right arrow, this signifies that we want to move the cursor over the displayed character without changing that character. The LDA KBD is what puts the input character into the accumulator, at which point the strobe is cleared by accessing $C010 and the final return is done. The calling program then has the option of printing the input character to the screen.

Other Input Sources. KSW does not always point to RDKEY. In fact, it doesn't point there when DOS is installed. With DOS booted and active, enter the Monitor and type in:

```
38.39 AA55.AA56
```

You should get:

```
0036- 81 9E
AA55- 1B FD
```

You'll see that KSW actually points to DOS at $9E81, which then eventually points to RDKEY ($FD1B) at $AA55,AA56. Like the output system, DOS is rather permanently made part of the input path. Any attempts to disconnect DOS by modifying KSW directly will be undone by DOS if any output is done. DOS has its own internal input vector at $AA55,AA56. It alters this vector, not KSW, as needed to gain access to various slots (or to disk files, as is appropriate).

You can install your own routine into the input path by means of a procedure similar to the one used last month to intercept the output path. Put the low and high order bytes of the destination address into KSW ($38,39 = 56,57 decimal) and do a call to $3EA (1002 decimal). This causes DOS to change its own vectors at $AA55,AA56 to the address specified, and then to restore KSW so that it points to DOS again, usually $9E81.

In Applesoft this would take the form:

```
10  POKE 56,LB: POKE 57,HB: CALL 1002
```

In this example, LB and HB are the low and high order bytes of the destination address. In machine language, it would look like this:

```
LDA   #LB
STA   $38
LDA   #HB
STA   $39
JSR   $3EA
```

Just as output has two basic classes of routines, there are two main types of input routines—those that intercept incoming characters and do some sort of processing, and those that entirely replace the input routines already being used. If you are doing the latter, things are fairly simple. Once installed, your routine is entirely in charge of getting the input character; and when that character is "got," your routine ends with an RTS to pass control back to the calling program. This approach is similar to our custom output routines from last month.

The first class of input routines, in which incoming characters are to be intercepted, must be handled slightly differently than output experiments were.

Interception Routines. When we were dealing with the output process, the point at which we intercepted the data flow really didn't matter. Because the calling program loads the accumulator with the character to be output, the character can be examined at any point along the way. With input, the character input is not available until the very end of the procedure, when the RTS returns control to the calling program. Fortunately, there is a relatively easy way around this limitation.

In both the input and output systems, the links in the process are done by means of a series of jumps (as opposed to JSRs). You'll recall that in our output interception last month the final exit from the routine was a jump to $FDF0 (or wherever) *after* the processing was done.

With input, the secret is to do a JSR to KEYIN (or wherever) *first* and then do your processing, followed by an eventual RTS to the calling program.

For our first experiment, we'll try writing a routine to convert all incoming characters to lower case:

```
                        1  ********************************************
                        2  *      SIMPLE CASE CONVERT ROUTINE         *
                        3  ********************************************
                        4  *
                        5          ORG  $300
                        6          OBJ  $300
                        7  *
                        8  KEYIN   EQU  $FD1B
                        9  *
0300: 20 1B FD 10 ENTRY JSR  KEYIN
0303: C9 C1    11       CMP  #$C1     ; ASCII A
0305: 90 02    12       BCC  DONE
0307: 09 20    13 MASK  ORA  #$20     ; %0010 0000
0309: 60       14 DONE  RTS
```

In theory, anything you type in now should be displayed in lower case. Numeric and control characters should be unaffected. The routine works by first calling KEYIN, which gets a character from the keyboard and puts it in the accumulator. At that point our routine ensures that we've got a capital letter, rather than a numeric or control character. If we don't have an alphabetic character value less than $C1, then the routine skips to DONE.

If what we have is an alphabetic character, the conversion to lower case is done by forcing bit 5 of the ASCII value to 1. The values of all lower-case characters are equal to the values of the corresponding upper-case letters plus 32. This means, as an ASCII chart showing bit values reveals, that capital letters have bit 5 clear and lower-case letters have bit 5 set. Line 13 of our routine sets bit 5, thus converting the character to lower case. Finally, line 14 returns us to the calling program.

Our routine should work from within Applesoft. Try this:

```
10  POKE 56,0: POKE 57,3: CALL 1002
20  INPUT "ENTER A STRING:";I$
30  PRINT I$
40  PRINT CHR$(4);"IN#0":REM DISCONNECT ROUTINE
```

Don't be surprised if this program doesn't work. Try changing line 20 to look like this:


```
20  GET A$:IF A$ < > CHR$(13) THEN PRINT A$;:I$=I$+A$:GOTO
    20
```

Now run the program. The results this time should be more like you expected. Line 30 is used to confirm the fact that the lower-case data we typed in on line 20 actually made it to Applesoft.

The question now is, why didn't the first program work? In a sense it did. If you like, go back and run the first program without line 40. When the program ends, go into the Monitor and check the DOS input vector at $AA55,AA56. It should indicate that our routine at $300 is being used.

The problem lies in Applesoft's use of the GETLN (get line) routine for the input statement. This routine is used to input entire lines at a time. Although GETLN does use the RDKEY routine to get individual characters, it unfortunately tampers with the characters entered before it returns the data to Applesoft, DOS, or the Monitor.

Specifically, GETLN converts any lower-case characters coming in to upper case. Thus, even though our routine converts the upper-case characters coming in through the keyboard to lower case, GETLN undoes everything by converting them back before they're even echoed to the screen.

Another annoyance of GETLN is that it converts characters that you copy from the screen using the right arrow.

The reason the program works with the new version of line 20 is that the Applesoft get statement uses a direct call RDKEY and does not use GETLN.

One way to solve the problem of the input statement not working is by writing your own input routine instead of using the get sequence. The easiest thing to do here would probably be to copy the GETLN routine and eliminate the conversion portion starting at $FD7E.

Instead, let's see if we can improve on the simple input routine just shown, making it a little more flexible, without rewriting the GETLN routine.

Something More Useful. Although the routine just given illustrates the concept of intercepting input, it's not really that useful, since it provides no way of switching between upper and lower-case letters at will. Why not create an input routine that allows us to shift between upper and lower-case letters as we input them? As we did for the output routine last month, we'll first make a list of what we want the routine to do:

1. The routine should allow numeric and control characters to pass through unaltered.

2. The routine should be set up such that pressing escape once when in the lower-case mode will shift only the next letter to a capital letter.

3. Pressing escape twice when in lower-case mode should shift all successive input to the upper-case mode (this is sometimes called "caps lock").

4. Pressing escape once when in the upper-case mode should return the system to the lower-case mode.

The system of using escape as a shift key is somewhat standard. Before going on to the listing, though, let's think a little more about what is needed to implement this system. First off, we'll need some way to remember which mode (lower-case or upper-case) we're in. The most direct way of doing this is to use a flag, which we'll call CSFLG (for case flag). To avoid zero page conflict, we'll reserve a place for the flag at the end of the routine.

In order to fulfill the requirement stated in item three on our list, we need to store the value of the last character input, that is, the character just *before* the one currently being input, in another storage location. This will allow us to tell when escape has been hit twice in a row. We'll call this location LSTCHR (for last character).

The general pattern will be to do some brief tests each time a character is input, and, if no conversion is necessary, to pass the upper-case letter through unaltered. Only when an escape sequence is coming through or when we're in the lower-case mode will we ever alter the input character.

Here, then, is the improved listing:

```
1  ********************************************
2  *      LOWER-CASE INPUT ROUTINE            *
3  ********************************************
```

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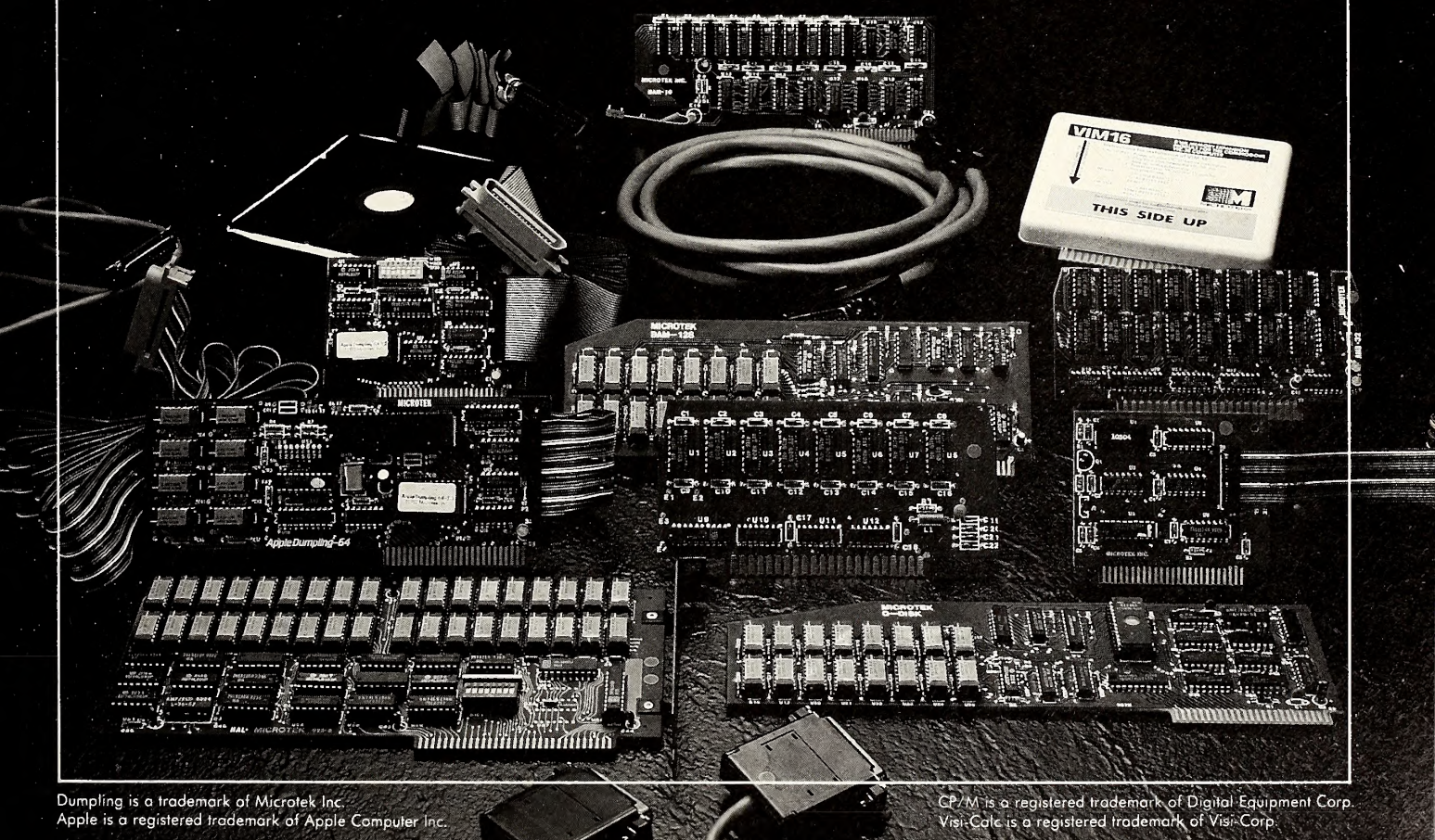

```
                        4  *
                        5          OBJ  $300
                        6          ORG  $300
                        7  *
                        8  KEYIN   EQU  $FD1B
                        9  ESC     EQU  $9B
                       10  *
0300: 20 1B FD          11  ENTRY   JSR  KEYIN    ; GET KEY
0303: 48                12          PHA          ; SAVE CHAR
0304: C9 9B             13          CMP  #ESC
0306: F0 19             14          BEQ  ESC1
                       15  *
0308: AD 3F 03          16  CHAR    LDA  LSTCHR
030B: C9 9B             17          CMP  #ESC
030D: F0 0D             18          BEQ  XFER     ; CAP THIS CHAR
                       19  *
030F: 2C 40 03          20  CASE    BIT  CSFLG
0312: 30 08             21          BMI  XFER     ; CAPS
                       22  *
0314: 68                23  CVERT   PLA          ; RETRIEVE CHAR
0315: C9 C1             24          CMP  #$C1     ; ASCII A
0317: 90 02             25          BCC  X2       ; DON'T CHANGE
0319: 09 20             26          ORA  #$20     ; SET BIT 5
031B: 48                27  X2      PHA          ; PUT CHAR BACK
                       28  *
031C: 68                29  XFER    PLA          ; RETRIEVE CHAR
031D: 8D 3F 03          30          STA  LSTCHR   ; LSTCHR=CHR
                       31  *
0320: 60                32  DONE    RTS
                       33  *
0321: AD 3F 03          34  ESC1    LDA  LSTCHR
0324: C9 9B             35          CMP  #ESC
0326: D0 10             36          BNE  CASE2
                       37  *
0328: A9 80             38  LOCK    LDA  #$80     ; BIT 7=1
032A: 8D 40 03          39          STA  CSFLG    ; UC
032D: D0 ED             40          BNE  XFER     ; ALWAYS
                       41  *
032F: 68                42  UNLOCK  PLA          ; PULL CHAR
0330: A9 00             43          LDA  #$00
0332: 48                44          PHA          ; CHR=NULL
0333: 8D 40 03          45          STA  CSFLG    ; 0=LC
0336: F0 E4             46          BEQ  XFER     ; ALWAYS
                       47  *
0338: 2C 40 03          48  CASE2   BIT  CSFLG
033B: 10 DF             49          BPL  XFER     ; LC NEEDS NO
                                                    ACTION
033D: 30 F0             50          BMI  UNLOCK   ; UNLOCK UC
                       51  *
033F: 00                52  LSTCHR  DFB  $00
0340: 00                53  CSFLG   DFB  $00      ; DEF=LC; #$80
                                                    =UC
                       54  *
```

After assembling and installing this routine at $300, try the Applesoft program with the altered line 20 again. This time you should be able to enter a string containing both upper-case and lower-case letters, with the escape key functioning as described in the requirements list.

Note the use of EQU to define ESC in line 9. The label ESC is used as a value rather than a location. This way you can change the key used for shift by changing the value equated in line 9.

A look at the source listing reveals what's going on. First, a JSR KEYIN is done to get a character from the keyboard. KEYIN handles the flashing cursor and keyboard hardware for us. Next, the input character is pushed on the stack so we'll be free to use the accumulator if necessary without losing the input character.

Next, a test is done to see if the current character is an escape character. If so, a branch is done to the escape-handling routine, ESC1 (line 34). The first thing done at ESC1 is to see if the last character was an escape as well, in which case LOCK (line 38) sets caps lock mode by putting a $80 in CSFLG. If not, then CASE2 (line 48) checks CSFLG to see if we're presently in lower or upper case.

To simplify this test, we've used a value of $00 for CSFLG to signify the lower-case mode. A value of $80 signifies the upper-case mode in our example. These values were chosen to allow the use of the BIT command. Because the BIT instruction conditions the sign flag (bit 7) of the status register according to bit 7 of the memory location referenced, we can test the status of CSFLG without actually having to load the accumulator with anything to do the test.

CASE2 uses the bit instruction to test bit 7 of CSFLG. If bit 7 is clear, we're in lower-case mode and all that needs to be done is to pass this first escape character through to XFER, where it will be stored in LSTCHR. That way the escape can be used to signify a shift to upper case if the next character is a letter.

If bit 7 is set, then we're in upper case, and we need to "unlock" the upper-case mode. UNLOCK does this by putting a 0 value in CSFLG. You'll also notice that the current character is changed from an escape to a null. This is done so that after down-shifting, we can still press escape once more to capitalize the next letter. If we hadn't changed that escape to a null when we down-shifted, we'd be back in upper-case locked mode.

For the next pass through, let's see what happens with a nonescape character. We'll resume tracing the routine right after ENTRY has decided that the current character is not an escape character.

The next section is CHAR, which checks to see whether the *last* character through was an escape character. If so, we need to make sure the current letter is capitalized, even though we're presumably in the lower-case mode. This is easily done, though; program flow proceeds directly to XFER. Remember, XFER simply stores the current input character in LSTCHR and then returns to the calling program. In this case, because all characters generated by KEYIN are always upper case (except on the Apple IIe), we'll just leave the capital letter input "as is," and pass it through.

If the last character was not an escape, program flow continues to the CASE section, which decides whether to convert the character coming through by checking to see whether we're in upper or lower-case mode.

CASE uses the BIT instruction to do this test. If we're in the upper-case mode (bit 7 = 1, therefore BMI works), no conversion of the incoming upper-case letter is needed and the program branches directly to the XFER routine. XFER retrieves the original input character stored on the stack, updates LSTCHR (since this will now be the "last character" on the next pass through), and then returns to the main calling program via the RTS.

If the CSFLG was set to zero, line 21 would not branch, and the CVERT (for convert) routine would be entered. CVERT first retrieves the input character from the stack and then checks to see if the character has an ASCII value less than that of the letter A. If so, the character coming through is a number or a control character, and as such should not be converted to lower case. If such a character is detected, the routine jumps over the conversion routine to line 27, which puts the character back on the stack (where XFER expects to find it) and goes through to the XFER section.

If the character has an ASCII value equal to or greater than that of the letter A, then the ORA #$20 sets bit 5, thus converting the letter to lower case. At that point the new character is put on the stack for the XFER routine.

Conclusions. This is definitely one of those programs that take a flow chart to design, so don't feel discouraged if everything's not immediately clear. Considering all the possible situations of escape sequences and current case, it may take a little time before you feel comfortable with it.

Even if the program never makes complete sense, remember that the important thing here is to understand the workings of the input system in general, rather than this particular little routine.

Of course, the best way to understand what's going on is to experiment with your own routines. Doing this always helps bring out the right and wrong assumptions about the way we think things work. You might want to try writing the generalized input routine suggested earlier, or perhaps you're one of those people who've hooked up a wire from the shift key to push button 2. If so, see if you can improve the input routine to allow yourself to use the shift key as well. Another interesting project would be to write your own KEYIN routine to be used by the input routine, and see if you can generate a different kind of cursor—or solve the problem of the cursor not looking quite right when it's on a lower-case letter.

In any event, enjoy whatever it is you do with your Apple; see you here next month! ∎

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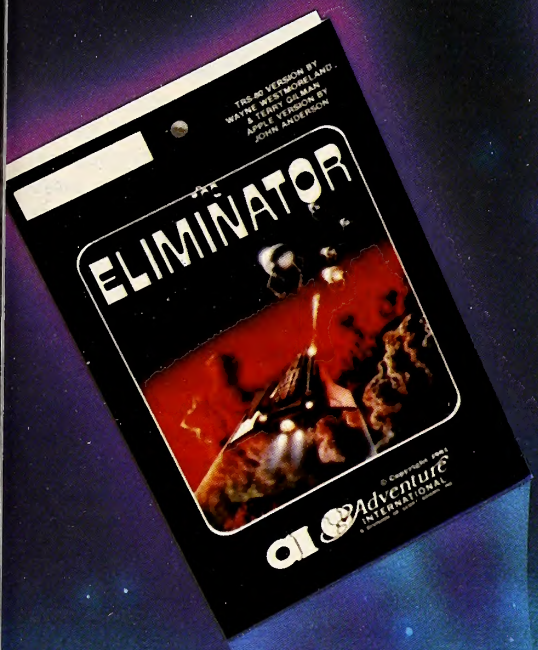

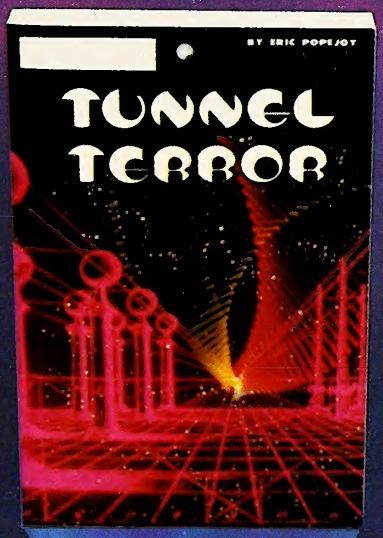

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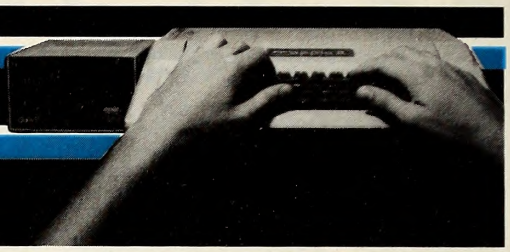

Unless otherwise noted, all products can be assumed to run on either Apple II, with 48K, ROM Applesoft, and one disk drive. The requirement for ROM Applesoft can be met by RAM Applesoft in a language card. Many Apple II programs will run on the Apple III in the emulator mode.

☐ Prices on all games from **Penguin Software** (830 Fourth Avenue, Geneva, IL 60134; 312-232-1984)—*Spy's Demise*, *Transylvania*, and *Pie Man*—are now $19.95 as part of an experimental price cut reflecting the size of the market and potential volume of sales. Upcoming Penguin games will also carry the new price tags. (See story in Tradetalk.)

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☐ The College of Education at **Northern Illinois University** (DeKalb, IL 60115; 815-753-1949) is sponsoring a Software Fair on April 27 from 9:00 a.m. to 4:00 p.m. in the ballroom of the Holmes Student Center. The purpose is to introduce teachers and administrators to software available for instructional purposes.

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☐ Protecting your ideas is what *Trade Secrets* from **Osborne/McGraw-Hill** (630 Bancroft Way, Berkeley, CA 94710; 415-548-2805) is all about. The book tells you how to protect ideas by using patent, copyright, and trade secret methods, as well as how to tighten company security systems. Steps in a typical lawsuit are also covered. 145 pages. $11.95.

☐ For dentists, **OR-D System** (1200B Haddonfield Road, Cherry Hill, NJ 08002; 609-665-2255) presents the *OR-D* dental management system. With a capacity of 5,000 active accounts, 10,000 patients, and 500 insurance companies, the system handles per-visit billing, receipt and reminder notices, and form generation for laboratories, patients, and insurance companies. Installation, hard disk system, one-day training, and thirty hours of consultation are included. $9,995.

☐ It's a microcomputer show; it's an electronics show; it's a flea market. It's the 1983 Greater Baltimore Hamboree and Computerfest (GBH&C), and it takes place March 27 at the Maryland State Fairgrounds Exhibition Complex in Timonium, Maryland. Lots of computers and software for sale. There will be guest speakers throughout the day. Hours are 8:00 a.m. to 4:00 p.m. For information, contact the GBH&C (Box 95, Timonium, MD 21093; 301-561-1282). Admission, $3.

☐ *Game Power for Phonics* from **Spin-a-Test** (404 Old Orchard Court, Danville, CA 94526; 415-837-4532) offers help to students with reading problems. The student can practice phonetics in a game format. Emphasis is on word recognition, nonverbal and verbal responses, comprehension, sentence improvisation, articulation, and spelling. Accompanying the program is a manual with 1,280 language games. Cassette. $28.50.

☐ **Tar Heel Career Camps** (Box 2328, Chapel Hill, NC 27514; 919-967-6996) offers a computer camp for high school juniors and seniors. The six-day session at the University of North Carolina covers computers and their history, hands-on instruction with Apples, Basic programming, and alternatives in computer careers. $335 per session.

☐ A series of four books has been released by **Howard W. Sams** (4300 West 62nd Street, Box 7092, Indianapolis, IN 46206; 317-298-5400). *Foundations of Computer Technology* examines software maintenance, assembly language, printers, and integrated circuit manufacturing. 272 pages. *Modern Computer Concepts* explores different types of mass storage, CPUs, data communications, networks, teletex, and videotex. 304 pages. *Basic: Fundamental Concepts* introduces Basic and compares Microsoft Basic with that of Digital Equipment Corporation. Dialect conversion is taught. 208 pages. *Basic: Advanced Concepts* uses Basic to help you understand program storage within the computer, explore floating-point arithmetic, and examine commonly used number systems. 192 pages. $22.95 each.

☐ *Spide Attack* is an educational game from **Ahead Designs** (699 North Vulcan, Suite 88, Encinitas, CA 92024; 619-436-4071) designed for the teacher, who can create multiple choice, true/false, and fill-in questions for students to solve. Create your own sentence and word lists from any subject area. For grades one through eight. $24.95.

The reason you bought a computer in the first place.

The General Manager

The Agony... You expected your new computer to perform miracles — to bring order out of chaos. You looked for it to organize and manage your business information. You looked forward to the end of errors, the end of frustration . . . and the saving of time, effort and money. Afterall, that's the reason you invested in a computer in the first place. Yet, there it sits. Nothing.

...and the ecstasy.

Well, your computer *can* perform all the miracles you hoped for. It needs just one professional addition. **The General Manager.**

The General Manager is what the computer industry calls a data base management program (DBM). In everyday words — it allows you to organize, store, file, find, save, retreive, interrelate, control and print out all or selected parts of your information. The result: your information, or data, is managed totally, completely, automatically.

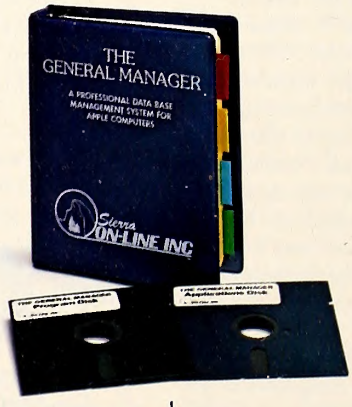
Ordinary

The ordinary DBM system expects your business to conform to its program design. So you must change your records, your forms, your way of having information cross-referenced, saved and . . . well, you almost end up with a different business! Certainly a more frustrating one.

Extraordinary

The General Manager on the other hand is extraordinary in the DBM field, because it makes no such demands on you. Instead, it lets you make demands on it! The General Manager was designed so that your business routines can be kept as individualized as you want . . . so your data is managed and delivered in the ways which are most useful, efficient and effective for you.

It works so easily and so well because of its "hierarchial" structure. This sensible "family tree" type of design starts with the main subject, then branches out to related information. You enter data on "Blank Forms" which you may construct to your exact needs. The data may be updated, deleted or modified to your heart's content. To know The General Manager will be to love it!



Power & Price

Nothing near the price of the General Manager (by hundreds of dollars) gives you all the power, features and benefits it does! At $229.95, The General Manager is the absolute value in its field.

Consider this: it supports 1 to 4 floppy disk drives (even hard-disk systems). It includes utility programs which others charge hundreds extra for. Upper and lower case characters in the data base are provided without need for additional costly hardware. If someone goofs, the "error message" is displayed in understandable English. There is an on-screen "Help" function available any time. It creates Applesoft usable files for your program needs. And many especially useful printing commands are built-in for greater flexibility. When you consider all these advantages, and more, we think your business sense will agree, there's no contest at any price.

The fantasy... Almost everyone claims user friendly documentation. The fact remains much of it is convoluted, complicated and defies understanding. You can't afford that! — for a program without excellent documentation is frustrating and basically useless.

...and reality!

At Sierra On-Line we've spent the time and the effort to create superb documentation. It is so good that you can have The General Manager up and running after the first two chapters! And after you're thoroughly at home with it, you can move on to the other chapters as you have need for the many additional functions and capabilities.

The reason you bought...

. . . a computer in the first place was, we know, twofold: for word processing (our Screen Writer program is the leader) . . . but mainly for information management. The General Manager is your powerful answer . . . the truly outstanding value in DBM's, bar none, at only $229.95.

For further information and ordering, see your computer dealer or contact us:

(209) 683-6858

Sierra ON-LINE INC

SIERRA ON-LINE, INC.
Business products division
Sierra On-Line Building
Coarsegold, CA 93614

*The General Manager, version 2.0 requires 48K Apple II or II+, 1 or more drives, DOS 3.3. Direct orders add $3.00 shipping/handling.

☐ **MCE** (157 Kalamazoo Mall, Kalamazoo, MI 49007; 616-345-8681) is introducing five new programs in its basic living skills line for junior high school to adult level learners. *Managing Your Time* helps the learner organize time. The program identifies time-wasting habits and provides methods for changing such habits. A utility allows you to develop a daily schedule with hard copy printout. $44.95. *First Day on the Job* discusses the importance of making a good impression on the job. It covers clothing, grooming, arriving on time, and the importance of understanding instructions. A simulation allows the learner to select a specific job situation and then make various decisions regarding conditions likely to occur during early periods of employment. $44.95. *Following Written Directions* explains the importance of following directions and what can happen if they are not precisely followed. A challenging game is included based on your following directions. $44.95. *Strategies for Test Taking* examines major types of tests and provides techniques for taking them and experience in applying those techniques to sample questions. $44.95. *Analyzing an Ad* helps learners become informed customers by exploring the reasons for advertising and how advertisements are designed to be successful. $44.95.

☐ Diskus is a disk storage drawer with a capacity for 125 disks and is available from **Diskus** (7851 Hanna Avenue, Canoga Park, CA 91304). Five disk compartments are separated by removable, clear inserts. Index tab dividers are also included. Its dimensions make the unit compatible with most disk drives and computer desk setups. Made of dark, see-through acrylic. $75.95.

☐ *Roadsearch* is a computer road atlas that helps you plan trips. It provides you with driving routes, mileage, travel times, and fuel usage. The atlas, from **Columbia Software** (Box 2235, Columbia, MD 21045; 301-997-3100), contains a database of 406 cities and road junctions in the United States and Canada. Also included are 69,000 miles of interstate and major highways. The program computes the shortest route between cities and avoids toll or other roads in its planning if you desire. For air travelers, a subroutine computes flying time between cities. $34.95.

☐ If you have the Legend RAM card from **Legend Industries** (2220 Scott Lake Road, Pontiac, MI 48056; 313-674-0953), you might be interested in the *Legend Mailer*. With the Disk Emulator, it stores and retrieves database records, using the RAM card as a second disk drive. *Legend Mailer* comes free on the Legend utilities disk. Current RAM card owners may update for $8 by contacting Legend Industries. Also from Legend is the 18SRC Static RAM card. It's an 18K RAM card for the Apple II and IIe computers, containing a battery backup system that allows you to retain what's in memory in the case of a power loss. Store programs, monitor routines, or DOS if you desire. A write-protect switch allows you to protect the information in the card or alter data at will. $149.95.

☐ Examine countless mortgage types quickly with the *MBA Creative Financing/Mortgage Analyzer* from **MBA Software Group** (1122 Colorado, Suite 103, Austin, TX 78701; 512-476-9243). You can tailor loan types, examine a variety of financing options, and customize messages on printed reports. Requires two disk drives and a printer. $295.

☐ The Heat Snatcher is a passive cooling device that mounts on the power supply inside the Apple. Without noise or power consumption, it reduces the temperature of the power supply and the temperature inside the Apple by dissipating the heat. From the **Juli Company** (1415 South Harlem Avenue, Berwyn, IL 60402). $9.95.

☐ **SSM Microcomputer Products** (2190 Paragon Drive, San Jose, CA 95131; 408-946-7400) introduces its Transpak products. SSM's five Transpaks include their Apple ModemCard (110 or 300 baud), TransModem 1200 (110, 300, or 1200 baud), and *Transend 1, 2,* or *3*. The Transpaks include all necessary interfaces and cables as well as preconfigured and pretested, fully compatible software. Prices range from $388 for Transpak 1 to $1,100 for Transpak 3+.

☐ **Expanding Space** (5739 S.E. 34th Avenue, Portland, OR 97202; 503-771-7521) offers *III Edit,* a tool for developing Basic programs. This utility provides a framework for the program you're writing and has built-in tools for editing, testing, and debugging that will delete themselves from the final perfected program. Single-keystroke commands make it simple. $29.95. Also from Expanding Space is *Scat III,* a disk file management tool that doubles as a Hello program on boot disks. It reduces the number of keystrokes in normal disk file operations and provides more information with less time and effort. Now you can catalog, run, load, exec, lock or unlock, rename, and delete files with single keystrokes. $29.95.

☐ The *Prime Plotter* offers flexibility and versatility in business graphics. From **PrimeSoft** (Box 40, Cabin John, MD 20817; 301-229-4229), this program handles plotting, statistics, and plotter interfacing modules, as well as replaceable character sets, typeset designs, and figure files. Included is a replay feature, making *Prime Plotter* suitable for preparing slide shows for presentations. Data can be generated in the program or converted from other formats. $239.95.

☐ **Lifeboat Associates** (1651 Third Avenue, New York, NY 10028; 212-860-0300) announces *UniCalc,* a spreadsheet that handles financial projections, budgeting and planning, numerical analysis, and other spreadsheet capabilities. Designed especially for the computer novice, *UniCalc* lets you use a full range of relational or mathematic operators to specify field formats. Handles 255 rows by sixty-four columns. CP/M required. $195.

☐ **Peripheral Visions** (5285 N.E. Elam Young Parkway, Suite B500, Hillsboro, OR 97123; 503-640-1317) includes a light pen with each of the following products. *Compuquote* is a cost estimation and price-quoting system allowing you to make consistent, accurate quotes for customers by displaying your price list on the video screen and then letting you select specific items and quantities. $275. *Bibliophile* is a filing and cross-referencing system for magazine articles. The article is filed by descriptive categories that apply to it. You can define a set of up to sixty descriptors and sixty different names of periodicals to customize the system. $275. Peripheral Visions's *Shutter Test* is a comprehensive quality-control system that tests camera shutter speeds and maintains performance files. When speeds are tested, the actual speed, percent error, average speed, high and low speeds, and average deviation are all displayed. Store results on disk for reference. $99. *Photophile* is a system for filing and cross-referencing of slides and negatives. You can file them by as many as sixty descriptors, sixty film types, and sixty locations. $275.

☐ **Sterling Swift Publishing** (1600 Fortview Road, Austin, TX 78704; 512-444-7570) gives you information at your fingertips. *Will Someone Please Tell Me What an Apple Can Do?* is a book about state-of-the-art software. It's aimed at the person who wants to use a microcomputer but isn't interested in programming or technical aspects of the computer. The chapters cover accounting, agriculture, investing, education, music, word processing, and more. 136 pages. $12.95.

☐ From **Starsoft** (4984 El Camino Real, Suite 125, Los Altos, CA 94022; 415-965-8000, 800-882-8000) comes *CPApartner,* a client write-up and billing system for small to medium sized accounting firms. One module handles time management and billing, while another does the client write-up. Both allow you to modify them to your peripheral setup. *CPApartner* manages and schedules up to 500 clients and is capable of handling up to 4,500 monthly journal entries per client. Hard disk drive isn't required but is recommended. Client write-up module, $695; both time management/billing and write-up modules, $1,295.

☐ Let it be known that **Persimmon Software** (502 C. Savannah Street, Greensboro, NC 27406) is providing a bulletin board service for potential customers to try programs before ordering. The BBS accepts COD and charge orders. Modem: 919-275-5824.

☐ The popular game of *Dominoes* (the real kind, not the knocking-down kind) and its variations are available from **JPR Software** (Box 4155, Winter Park, FL 32793) in which the object is to score points by sending your opponent to the bone yard as often as possible and getting rid of your dominoes first. For solitary play against the computer. Cassette. $9.95.

☐ **Piccadilly Software** (89 Summit Avenue, Summit, NJ 07901; 201-277-1020) has added two games to its game catalog. *Martian Soil* has nothing to do with gardening. Stop pesky avenging invaders from attacking your colony and carrying off your fellow inhabitants. Multiple screens with different avengers. $29.95. No holds barred in *Invasion of Everything* as you try to repel hordes of nasties. The things they send out to destroy you are unbelievable. Includes an intermission. $29.95.

☐ You can find almost any software or hardware for virtually any use in *The Blue Book for the Apple Computer.* Hobbyists, educators, businessmen, and even professionals can find what they're looking for in this reference book. The book contains 2,350 product listings in fifty-seven subject categories. More than 450 companies listed. Available from **WIDL Video** (5245 West Diversey, Chicago, IL 60639; 312-622-9606). 464 pages. $24.95.

☐ If you've been using *DB Master* and feel reasonably comfortable with it, **Missing Link Publications** (3020 Bridgeway, Sausalito, CA 94965; 415-332-3424) suggests you try its *Management Master,* a program management workbook for *DB Master* masters. *Management Master* works with the *DB Master* training guide, steering the concepts toward specific applications. *Management Master* includes a quick reference section of *DB Master* and both *Utility Pak 1* and *2.* Comes in a three-ring binder. $29.95.

☐ No longer do Atarians have the upper grip when it comes to joysticks. Game controls from **Wico** (6400 West Gross Point Road, Niles, IL 60648; 312-647-7500) can also be used on the Apple with Wico's special adapters. First, there's the conventional joystick, eight-position movement, two firing buttons. A comfortable bat-handle grip and conveniently placed buttons make blasting aliens and eating dots a breeze. $29.95. The Famous Redball joystick offers eight-position movement, two firing buttons, and a ball-handle like those found in arcades. $34.95. The Joystick Deluxe is similar to the regular joystick, and it has a weighted base for a true arcade feel. $39.95. All joysticks have a five-foot-long cord. You'll need a Wico Adapter to use these joysticks with the Apple. $21.95.

☐ Another contest! **The Alien Group** (27 West 23rd Street, New York, NY 10010; 212-741-1770) is sponsoring the Voice Box-ing Match Contest for the best talking or singing game program. A panel of thirteen- to eighteen-year-old computer game players will judge entries on the basis of originality, playability, and quality of Voice Box use. $6,800 in prizes plus royalties will be awarded, with a first prize of $5,000. Contact the Alien Group for rules and further information.

☐ Now there's a word processor that's oriented to the family. **Broderbund Software** (1938 Fourth Street, San Rafael, CA 94901; 415-456-6424) introduces the *Bank Street Writer.* Just a few minutes with the on-disk tutorial and you'll be working with this word processor like a pro. Powerful features include universal search and replace, block move and "unmove," automatic centering and indent, inverse highlighting of text, word wrap, disk functions with password protection, and many more. You get lower case without hardware. For kids ninety-seven and younger. $69.95.

☐ **Computer Scholar** (145 Park Street, Susanville, CA 96130; 916-257-7929) has some programs to assist the classroom teacher. *Create a Quiz* allows the teacher to design quizzes from lesson plans in any subject area. Simply enter the questions with the corresponding answers. Quizzes are stored on disk and called up by the student when he types the quiz title. Immediate evaluation is given, and class reports are generated. $49.95. *Computerized Gradebook* will average up to thirty grades per quarter for any number of students. Assignments can be weighted according to their importance on the final grade. Individual and class reports can be viewed at any time from the screen or on hard copy. $49.95.

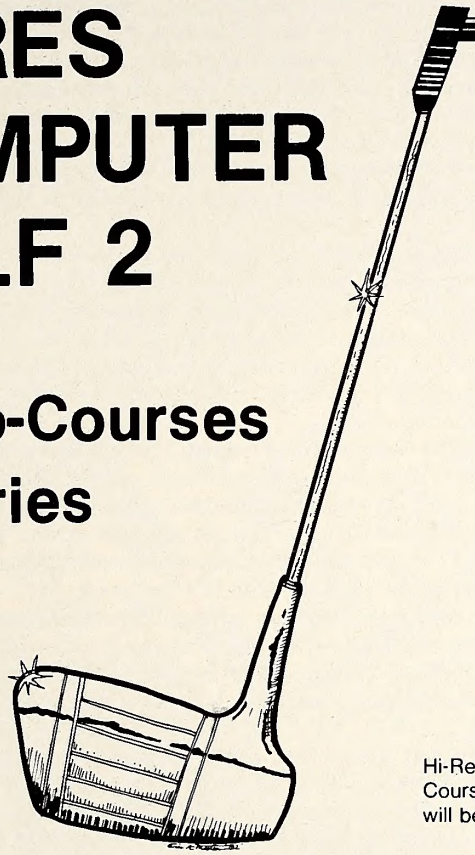
☐ *Rhymes and Riddles* is a letter guessing game presented in three formats to help children spell as well as learn words to nursery rhymes and popular sayings. The child learns by filling in the missing parts of jokes, riddles, and rhymes. A color illustration and music are the reward for succeeding. It's from **Spinnaker Software** (215 First Street, Cambridge, MA 02142; 617-868-4700). $29.95. *KinderComp* is for youngsters three to eight years old. Three games here: *Draw* lets the child use the joystick to create colorful art on the screen. *Scribble* sends an enlarged character into motion with sound, all at the touch of a key. In *Letters,* the child matches a series of lower and upper case characters to those on-screen. $29.95.

☐ **Sorrento Valley Associates** (11722 Sorrento Valley Road, San Diego, CA 92121; 619-452-0101) is introducing the Megaflex, a universal disk controller for the Apple II and III. The Megaflex offers tri-mode operation, allowing users to connect it with standard 8-inch maxi drives, 5 ¼-inch mini drives, or the new 3-inch micro drives. The controller is compatible with DOS 3.3, SOS, Pascal, and CP/M. As many as four

NEW RELEASES

HI-RES COMPUTER GOLF 2

Pro-Courses Series

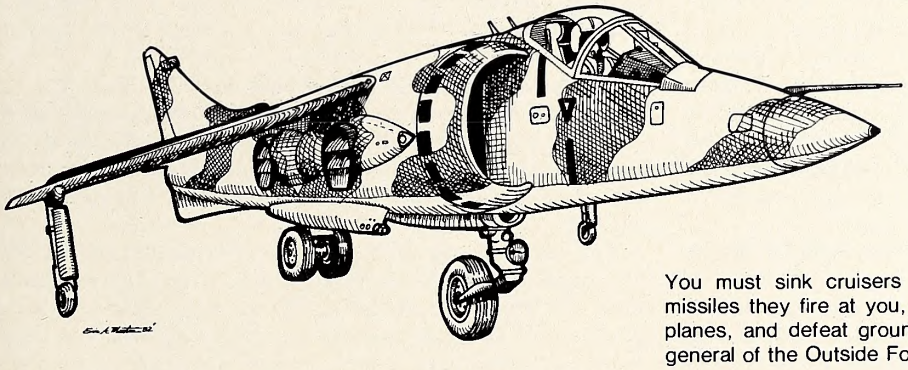


Spring is on its way, but why wait? You can be playing golf indoors now with Hi-Res Computer Golf 2, Pro Courses Series. This computerized version of one of America's most popular sports can be more of a challenge than the real thing! Introduced last year as Hi-Res Computer Golf, this improved version for 1983 requires even more skill and strategic planning than the original. Plus, you get all these great *new* features:

- Real professional golf courses presented in a multi-diskette system. The "Master" package and multiple "Pro-Courses" packages contain three professional courses each.
- Improved graphics for accurate reproduction of actual courses.
- Improved sounds.
- Auto-swing Option will take your swings for you but will allow you to overrlde and take your own swing.
- Improved golf rules.
- Scorecard Archives Processor stores up to 20 complete or incomplete scores on each disk.
- Tournament-Security Option: Playing of nationwide tournaments is now possible thanks to a special feature which guarantees that the scores on a printed or handwritten scorecard have not been altered. Also prevents the golfer from re-playing a designated round.
- Plus many more improved features.

Hi-Res Computer Golf 2, Pro-Courses Series Master Disk Package with three Pro-Courses retails for $34.95. Additional Pro-Courses diskettes with three courses each will be available for $24.95.

JUMP JET



A Loyal island territory has been captured by a powerful army of outsiders. You must fly your Loyal Air Force JUMPJET on missions to regain the island. Your JUMPJET can outfly any aircraft in the sky, but you must deal with its limited fuel and weapons carrying capabilities.

You must sink cruisers and submarines while dodging bullets and missiles they fire at you, defend your carrier against kamikaze fighter planes, and defeat ground forces on the island. If you succeed, the general of the Outside Force will surrender.

JUMPJET is a fast-paced arcade-style game with state-of-the-art action and animation. It is bound to become one of your all time favorites. And it's available now for only $29.95!

These and many more exciting Avant-Garde Creations games are available now at your local dealer. Or you can order direct from us by mail or phone. Visa, MasterCard or American Express accepted. Order today!!

AVANT-GARDE CREATIONS **P.O. Box 30160** **Eugene, OR 97403** **(503) 345-3043**

AVANT-GARDE CREATIONS

drives can be installed per controller. $299.

☐ Want to know when the next satellite will fall from space? **Computer Applications** (3628 A Court, Oxnard, CA 93033; 805-644-9327) has released *Pathfinder II*, a satellite tracking package that tracks any circular orbit satellite from anywhere in the world in real time on world and United States maps. Both maps can be printed on an Epson printer (with Graftrax), as can all data tables. $34.95.

☐ Are we not amoebas? You can find out by playing *Evolution* from **Sydney Development** (600-1385 West 8th Avenue, Vancouver, BC, Canada V6H 3V9; 604-734-8822). Evolve from a one-cell being all the way to a human one and beyond by fighting off animals for whom you'd make a delicious meal. Experience life as a tadpole, rat, beaver, and gorilla along the way to your human form. A more difficult evolution awaits you once you're human in this ninety-nine-level game. $39.95.

☐ If you don't want to evolve that far, then you can play *Pollywog*, from **Top-Notch Productions** (1201 Montana Avenue, Suite 5, Santa Monica, CA 90403; 213-395-9591). In this game, you begin as a pollywog, eat algae, fight off killer fish, and grow up to be a frog. One of the eggs you lay could even turn into a prince. More than fifty levels of difficulty. $29.95.

☐ **Bifrost Technical Effects** (6406 Farmdale Avenue, North Hollywood, CA 91606; 213-760-7882) has released *Apple Lasersoft*, a collection of laser programs. *Laser Draw* lets you draw pictures, logos, and words on a graphics tablet and view it on the monitor and in laser light. Saves pictures to disk. $500. *Laser Displayer* has the same display modes as *Laser Draw* and will load ten pictures from disk, then save them as a single file for automatic reloading. *Laser Draw* and *Laser Displayer* package, $1,000. *Lasersoft* includes *Draw*, *Display*, and several utilities that let you animate your pictures, scroll sentences, and solve for variables in geometric equations that involve finding unknown angles of deflection, distance to screen, and image size. $2,000. Each package includes an Apple/laser control interface box. Requires 64K and Mountain Hardware digital-to-analog converter.

☐ The popular *MasterType* from **Lightning Software** (Box 11725, Palo Alto, CA 94036; 415-327-3280) is now available in Apple IIe format. Arcade games combine with seventeen progressive lessons to help you master the IIe keyboard. New features include upper and lower case, allowing you to practice using the shift key, and separate lessons that teach special IIe characters. $39.95.

☐ Also for the Apple IIe is a new version of *Accounting Plus* from **Software Dimensions** (6371 Auburn Avenue, Citrus Heights, CA 95610; 916-722-8000). This one's *Accounting Plus Super/e*, an enhanced version of the popular program. The package consists of several interactive modules that maintain data and generate reports on the general ledger, accounts payable and receivable, inventory control, and payroll. It also generates mailing labels and keeps sales and purchasing journals. $995.

☐ **CompuCover** (Box 324, Mary Esther, FL 32569; 904-243-5793) offers static-free dust covers to help keep things clean around your terminal. In tan, black, or clear cloth-backed vinyl. $3.95.

☐ For software developers, **Ashton-Tate** (9929 West Jefferson Boulevard, Culver City, CA 90230; 213-204-5570) is introducing *dBase II RunTime*, an application development module that lets *dBase II* programmers market specialized applications written and developed with *dBase II*. With this module, programmers can distribute their applications without selling customers a full *dBase II* system. $100.

☐ Jane Fonda and Richard Simmons have nothing on **Verbatim** (323 Soquel Way, Sunnyvale, CA 94086; 408-245-4400). A free exercise guide, *Tone Up at the Terminals*, for workers in computerized offices, is available from Verbatim. Twenty exercises intended to alleviate muscle strain are demonstrated.

☐ **Advanced Logic Systems** (1195 East Arques Avenue, Sunnyvale, CA 94086; 408-730-0306) has introduced a plug-in CP/M card for the Apple IIe. Called CP/M Card, it contains CP/M Plus, the latest version of CP/M. $399. ALS has also introduced supportive products for the CP/M Card, including the Smarterm II eighty-column video board that's compatible with the IIe. $179.

☐ *Basic Workbook for Microcomputers* comes from **Camelot Publishing** (Box 1357, Ormond Beach, FL 32074; 904-672-5672). Intended for the beginner, it introduces the reader to microcomputers, Basic, and problem solving. Lots of problems and exercises are given with space for solving each one. 128 pages. $7.95.

☐ It's almost tax time, and **Professional Software Technology** (Whistlestop Mall, Box 269, Rockport, MA 01966; 617-546-2073) will help prepare you with the introduction of its new program, *Tax Templates*. Features include income-averaging, tax tables and rate schedules, automatic tax calculation, and direct printout on the 1040 form. The templates come in two versions. The personal version includes all the filing methods of the 1040 form. $100. The professional version includes corporate 1120 and partnership 1065 returns as well as the individual 1040 package. $150. Also available is a disk that includes the 1040 schedules. $75.

☐ If you need database management for the home or classroom (sorry, you office people), you might try *Notebook*, a file management program from **Window** (469 Pleasant Street, Watertown, MA 02172; 617-923-9147). You can use it as a notebook, address book, student file, or a gift list. *Notebook* is the latest addition to *Window*, a magazine on a disk. The current issue of *Window* that includes *Notebook* is $24.95. One-year subscription, $95.

☐ **Sensible Software** (6619 Perham Drive, West Bloomfield, MI 48033; 313-399-8877) is entering the education market with the release of *The Report Card*, a program for teachers that tracks the progress of up to three hundred students per disk. It calculates student and class averages and ranks students within their classes. Exercises, quizzes, and tests can be weighted for their effect on the final grade. $60. Sensible's *Sensible Speller* is now available in a formatable version. Now you can use the same *Sensible Speller* with files generated by different word processors. *Sensible Speller* contains more than eighty thousand words and adds *Word Handler* and *Super Text* to its list of compatible word processors. $125.

☐ The latest release from **Applied Microsystems** (Box 832, Roswell, GA 30077; 404-475-0832) is *Introduction to OS/JCL*. This interactive tutorial is for people who work in IBM OS batch environments. Ten lessons teach OS concepts, JCL syntax and usage, and introduce the student to IBM utilities. Individual version, $25; institutional version, $50.

☐ The *Apple Stacker* from **Universal Industries** (Box 63188, Los Angeles, CA 90063; 213-269-2117) is a rack designed to stack and hold securely your Apple system. It holds two disk drives and a large monitor. It even has space to store disk boxes. $35.

☐ *What's So Funny about Computers?* is a book from **William Kaufmann** (95 First Street, Los Altos, CA 94022; 415-948-5810) that captures the pains, joys, and ironies of the computer age. This collection of 121 cartoons humorously reflects life with the computer as we know it. 128 pages. $6.95.

☐ **Notable Software** (Box 1556, Philadelphia, PA 19105) has released *Musical Match-up*, an instructional game in which you try to match pairs of chords played through the Apple speaker. The game lets you choose the skill level of your computer opponent, root position or inversions, types of chords, and whether to display the chord by name or on the staff. $25.

☐ Two templates are available for use with *VersaForm*, the database from **Applied Software Technology** (14125 Capri Drive, Suite 4, Los Gatos, CA 95030; 415-370-2662). The *Purchase Order* template is designed for purchasing departments in small to very large companies. The system contains suggested screen formats, sample paper forms, and a library of common report definitions. *VersaForm* allows you to customize your own reports. $49.95. The *Legal Office Manager* has error-trapping to prevent mistakes in data entry and a reporting capability that lets you define reports. Contains preconfigured input screens that track billable and nonbillable hours by attorney, case, and service. $249.95.

☐ **Mountain Computer** (300 El Pueblo Road, Scotts Valley, CA 95066; 408-438-6650) has reduced the price of its Winchester hard disk systems. The new price of its five-megabyte hard disk is $1,995.

☐ The wolf pack is loose, and it's just you and your wargle against the lot of them. In *Wargle*, you can evade these nasties or knock them off. Six levels of play. From **Hayden Software** (600 Suffolk Street, Lowell, MA 01853; 617-937-0200). $34.95.

☐ **Compupeg Software** (1202 West Ridgeway, Waterloo, IA 50701; 319-233-2816) has introduced its new system for health care professionals. *Compupeg* is a computerized pegboard accounting system, serving a one to four doctor practice handling such tasks as receivables,

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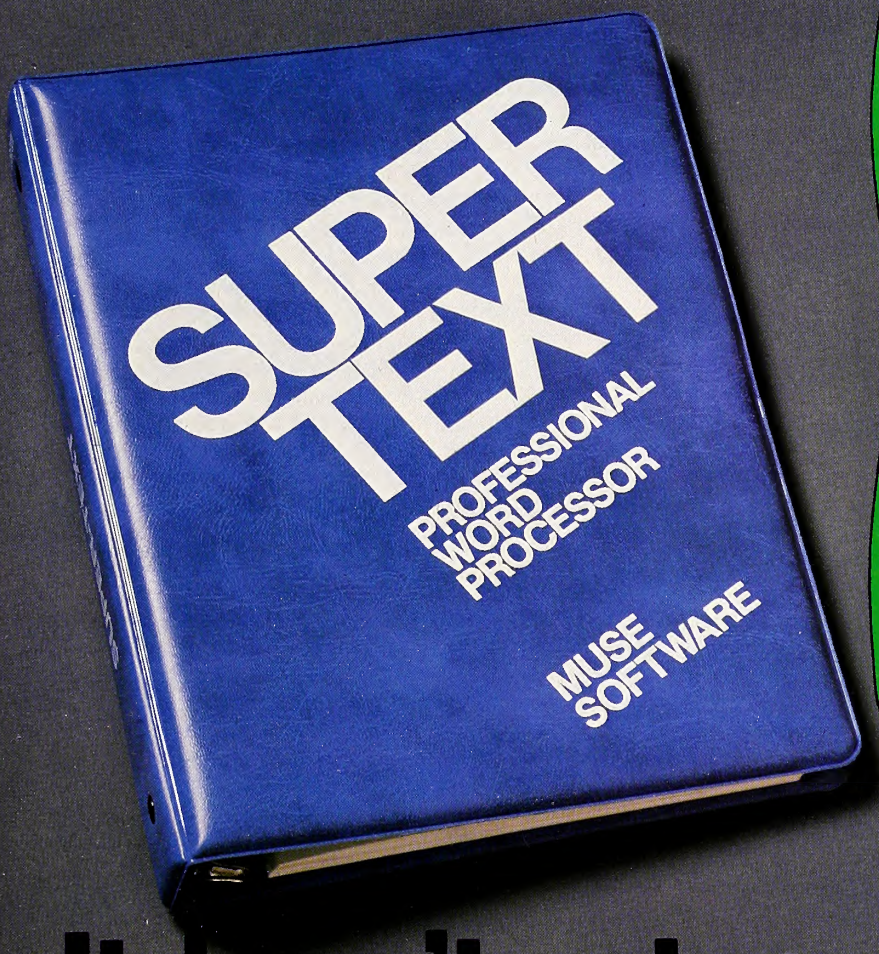

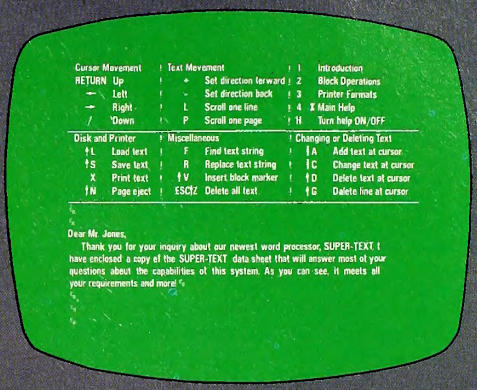

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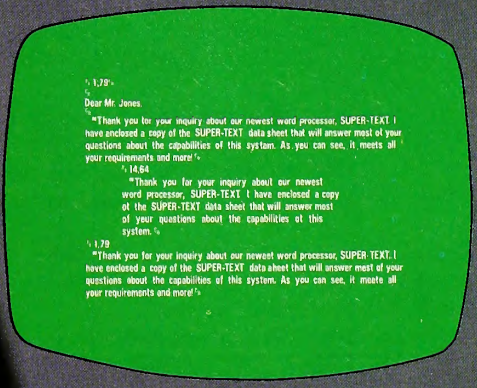

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account aging, service charges, insurance forms, patient recall, and ledger accounting for up to thirty thousand accounts. You need CP/M and 64K for this one. $700.

☐ The *Einstein Compiler* from **Einstein Corporation** (11340 West Olympic Boulevard, Los Angeles, CA 90064; 213-477-4530) offers code compression, fast string handling, memory control, and program debugging. $79.95.

☐ *Tabulyzer* analyzes and cross-tabulates survey data and prints analysis tables in report format. It handles up to 999 interviews on one disk. Multiple disks may be used for more interviews by splitting questions into groups. The alpha/formatter combines, deletes, and rearranges table rows, titles, and calculation setups. From **Business Research and Surveys** (50 Greenwood Avenue, West Orange, NJ 07052; 201-731-7800). $395.

☐ **Beaman Porter** (Pleasant Ridge Road, Harrison, NY 10528; 914-967-3504) has released an enhanced version of its *PowerText* word processor. New features include automatic indenting, automatic drama script formatting, a disk-based editor, definable function keys, and automatic backing up of the text you're editing. A separate mode lets you type vertically for diagrams. $299. If you have Pascal, it's $199.

☐ **Apollo Software** (6338 Wisteria Lane, Apollo Beach, FL 33570; 813-645-3153) has released its *Font Generator III* for the Apple III. You can design your own fonts and test them out before you save them away. You can also check out how they look in different text modes and with different foreground and background colors. Ten character fonts may be loaded at one time, and you can copy characters from one font to another. $40.

☐ The Genius offers full-page display in a fifty-seven-lines-by-eighty-characters format. From **Micro Display Systems** (Box 455, Hastings, MN 55033; 612-437-2233), the monitor is available in white, green, or amber phosphors and provides reverse video and flashing capabilities. $1,795.

☐ The real price of the Bufferboard (Marketalk News, January) from **Orange Micro** (3150 East La Palma, Suite G, Anaheim, CA 92806; 714-630-3620) is $175 for the 16K version.

☐ The Bubdisk from **MPC Peripherals** (9424 Chesapeake Drive, San Diego, CA 92123; 619-278-0630) plugs 128K of nonvolatile data storage into your Apple. With it, you can load DOS without having to go to the disk drive. It executes DOS commands three times faster than the standard disk drive and holds programs in memory after the machine is shut off. Patches are available for CP/M and Pascal. $875.

☐ **Vagabondo Enterprises** (1300 East Algonquin, Suite 3G, Schaumburg, IL 60195; 312-397-8705) has announced *Maestro,* a product for the Ceemac visual composition system. The program supports users of the language by assembling collections of their own creations with documentation and necessary run-time modules. $35.

☐ A new manual for users of *Modula-2* is available from **Volition Systems** (Box 1236, Del Mar, CA 92014; 619-481-2286). It's designed to be used with Niklaus Wirth's monograph on the language. The manual contains a tutorial for Pascal programmers that can help them become comfortable with the language in a short time. $35.

☐ For developers of 8080 assembler programs for the Apple, **Allen Systems** (2151 Fairfax Road, Columbus, OH 43221; 614-488-7122) is offering the XASM-80 assembler. $45.

☐ A new printer interface card is available from **Wesper Microsystems** (3188 Pullman Street, Costa Mesa, CA 92680; 714-850-1666, 800-850-8737). The Wizard Intelligent Printer Interface allows you to format such parameters as line length, left and right margins, page length, perforation skip, and Epson block graphics. Single-key commands let you print double-size pictures, inverse graphics, and rotated pictures. Graphics firmware is all contained on the board. $84. Also available from Wesper Microsystems is a buffer for Epson printers. The Wizard Epson Buffered Interface mounts inside the printer and allows the computer to dump all the data into it for printing, freeing the computer for other tasks. The buffer is available in 8K, 16K, 32K, and 64K versions. From $139.

☐ **Digital Marketing** (2670 Cherry Lane, Walnut Creek, CA 94596; 415-938-2880) has unveiled *LPMaster*, a decision-making tool that creates a mathematical model of your company within minutes. It helps in maximizing profits, optimizing operations, exploring alternatives, allocating scarce resources, presenting reports, and minimizing expenses. Requires CP/M or MS-DOS, 64K, and two disk drives. $495.

☐ The RAMdisk 320 from **Axlon** (70 Daggett Drive, San Jose, CA 95131; 408-945-0500) now includes CP/M capability. The RAMdisk works with any Z-80 card, as well as with any other memory cards for RAMdisk. Under CP/M, the system can be configured one of three ways: to look like two thirty-five-track drives, two forty-track drives, or one eighty-track drive. $1,395.

☐ **Multi-Tech Systems** (82 Second Avenue, S.E., New Brighton, MN 55112; 612-631-3550) has made available a 1200 baud modem. The Multi-Modem II provides full duplex communication over standard dial-up telephone lines at 1200, 300, or 110 baud. Prompts at all levels of command entry make auto-dial, auto-answer, and keyboard dialing simple. Also provided is the ability to answer manually or originate transmissions using the software voice/data switch. A built-in speaker monitors calls in progress. $750.

☐ **Continental Software** (11223 South Hindry Avenue, Los Angeles, CA 90045; 213-410-3977) now has a form letter enhancement for its *FCM* (formerly *1st Class Mail)* database program. The module can print envelopes with return addresses and messages. It can also be customized to handle functions such as inventories of household goods, family medical records, books, collectibles, and other personal records. The form letter enhancement will support most popular word processors. Form letter enhancement with *FCM*, $99.95. Updates for current *FCM* owners, $25.

☐ Two bank security programs have been released by **Quest Designs** (371 22nd Avenue, Oakland, CA 94612; 415-839-1579). *Loss Control* lets security personnel track and analyze bank losses and recoveries by operating unit and category. You can look up loss history under thirteen search criteria and compare selected categories of current operating losses with prior months and years to spot problem trends. $750. *Audit Control* smooths the production of audit reports. The package combines separate audit functions of data entry, reporting, and follow-up into one procedure. Descriptions of standard findings can be saved and then called up when desired. $750. ■

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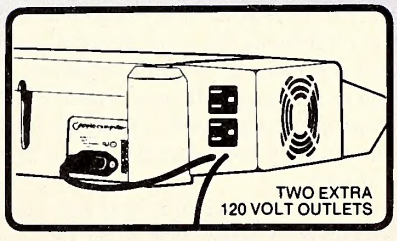

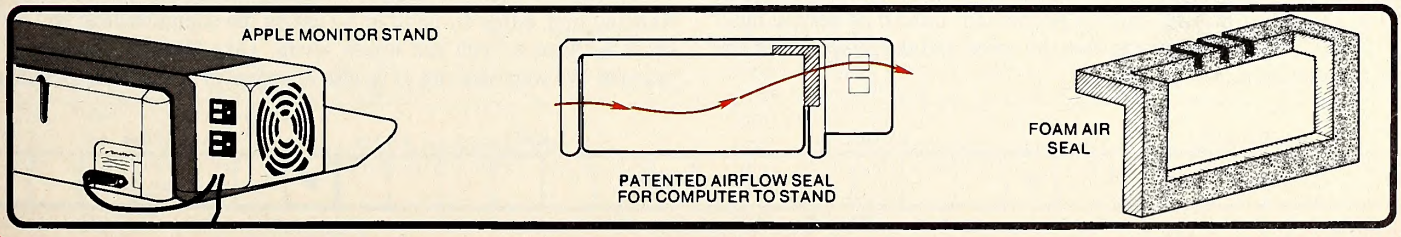

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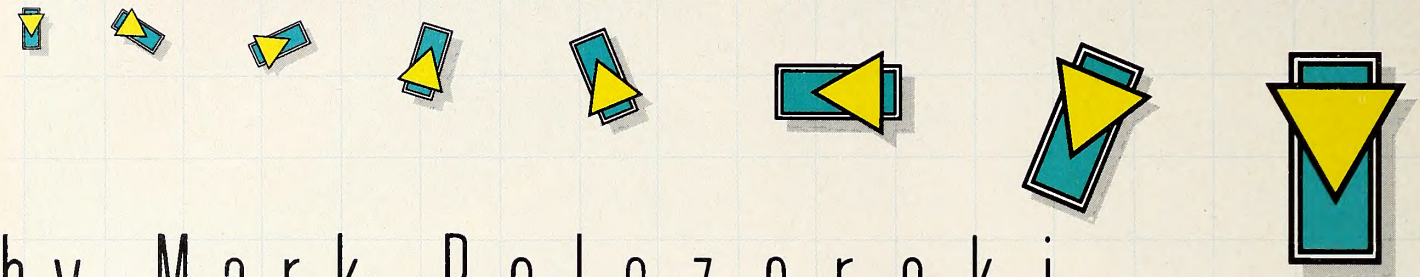


by Mark Pelczarski

Now we get down to some of the nitty-gritty techniques used for creating fast animation in arcade games. We covered basic animation ideas using shape tables, but they are much too slow and cause too much flickering for really professional-looking results. Today we start creating some real animation.

One of the techniques for fast, smooth movement is an invention called a *preshifted shape*. It should be noted from the outset that the term preshifted shape has a few different definitions, depending on who's talking about it. It seems that a couple of years ago, when everyone's little inventions for fast-animation techniques started filtering around, preshifted shapes was the magic phrase, although definitions didn't always accompany the phrase. So when people happened on techniques that caused fast animation, many assumed they had discovered the secrets of preshifted shapes, even if it wasn't the original technique. It's just as well, for now we have that many more approaches to work with.

Page-flipping was, and is, another magic phrase for smooth animation. It's simple to understand: use both hi-res graphics screens, show one, erase and redraw on the other, and flip pages. That way you don't see the flicker caused by the erase and redraw cycle. Page-flipping, to be fast, has to be used along with some form of preshifted shapes, or a similarly fast animation method. There are, however, ways to achieve the smooth results of page-flipping within the structure of preshifted shapes without actually flipping pages.

The first way to think of a preshifted shape is in terms of character graphics. Recalling from a few months ago when we did a hi-res text generator, a character on-screen is nothing more than a set of bytes with bits on or off defining the shape of the character. By putting those bytes into screen memory, the shape is displayed. Try typing in and running the program in listing 1. It uses characters on the text screen for doing animation as we did earlier with shape tables. The same results could be achieved on the hi-res screen using the hi-res character generator of a few issues back.

Examine the animation; it is fast, but it's also very jumpy. The character moves by large steps rather than small ones, creating the impression of something moving under a strobe light instead of normal lighting. A very simple example explains the speed and the jumpiness of this type of animation.

Suppose our shape is one dot. Throwing away the high bit in each byte, since it is only a color flag, we have seven bits with which to work, and our one-dot shape might be stored as the byte in figure 1. To move across the screen, however, it will have to occupy each of the positions shown in figure 2. (Figure 2 shows the bit that's set as a dot and those that aren't set as blank, which is what happens when they are displayed on the screen.)

BIT	0	1	2	3	4	5	6	
	1	0	0	0	0	0	0	BYTE VALUE 1
VALUE	1	2	4	8	16	32	64	

Figure 1.

Note that, when the byte is moved horizontally, our dot shape moves seven pixels at a time, rather than a smoother one or two. (Pixel is short for picture element, which is a fancy way of saying dot.) Vertical movement doesn't give us the same problem, since the bytes are only one dot tall when stacked on the screen. In other words, you could take figure 2 and duplicate it immediately below itself and find the dot shapes immediately above and below each other. Our hi-res text generator would work better than the text screen animation in listing 1 for vertical movement.

How do you get smooth horizontal movement? Two ways. First, you could use the assembly language ROL and ROR commands (rotate left and rotate right) to put the shape in the correct column before putting the byte on-screen. But that isn't very workable, since any shape wider than one pixel can overflow across two bytes, depending on exact screen position. You also have to worry about keeping the high bit where it is when you're ROLing and RORing things around. And worse yet, all that takes time, which you don't want to waste when animating. That's why the character animation was fast: there was minimal computation involved—you simply found the byte and put it on the screen.

Solution? Preshifted shapes. In other words, do the ROLing and RORing first, either by hand or by letting the computer help you. We'll do it by hand so you can follow along. Take that one-dot shape, for example. We want that dot to be able to appear in any of seven positions in

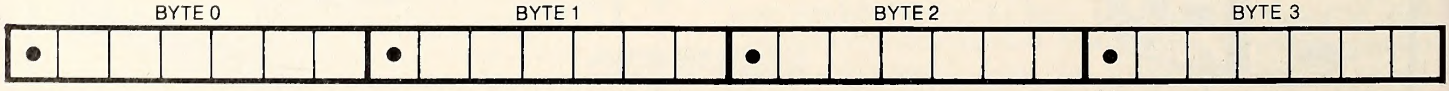


Figure 2.

any byte. Hence, we store seven shapes: preshifted shapes. Take a look at figure 3 to see how to get them. Notice that for any dot you want set in figure 2, you can find one of the preshifted shapes and store that byte's value in screen memory to set that dot.

Before leaving off, we'll do a crude preshifted shape plotter in Basic. Note that the program in listing 2 has a byte counter (X) and a bit counter (XB) for the X value. That's because we are interested not only in putting a byte on the screen, but also in finding the byte value with the proper bit set. We'll store our table of seven preshifted, one-dot shapes in the array S%, so that S%(XB) will have the proper value with the correct bit set for any of seven dot positions. Note that we didn't put an erase routine into the program, so our dot shape leaves a trail—most of the time.

The program in listing 2, and the one in listing 5 as well, uses two files we generated in November's Graphically Speaking, named Plot and Lookup. For those of you who've joined us since then, we'll reprint them just this once. Listing 3 generates the lookup table in memory. Run the program and save the table to disk using the command:

```
BSAVE LOOKUP, A16384, L384
```

Listing 4 is a quick way that anybody can type in the machine language plot routine. Save it to disk with the command:

```
BSAVE PLOT,A24576,L23
```

Next time we'll do larger animated shapes and a machine language routine to put them on-screen and we'll look at a tricky technique for eliminating the erase cycle. The really clever ones among you might find the secret to that trick in the way the program in listing 2 works. Or perhaps listing 5, a variation on listing 2, will give you a clue.

```
1   REM Clear screen
2   HOME
4   REM XC is X-change, YC is Y-change
5   XC = 1:YC = 1
9   REM XO is old X, YO is old Y
10  X = 1:Y = 1:OX = 1:OY = 1
19  REM Erase
20  HTAB OX: VTAB OY: PRINT " ";
24  REM Plot
25  HTAB X: VTAB Y: PRINT "O";
29  REM Save old coordinates
30  OX = X:OY = Y
34  REM Find new coordinates
35  X = X + XC:Y = Y + YC
40  IF X > 39 THEN X = 39:XC = - 1
50  IF X < 1 THEN X = 1:XC = 1
60  IF Y > 24 THEN Y = 24:YC = - 1
70  IF Y < 1 THEN Y = 1:YC = 1
80  GOTO 20
```

Listing 1.

```
1   GOSUB 1000
4   REM XC is X-change, YC is Y-change
5   XC = 1:YC = 1
10  X = 0:XB = 0:Y = 0
19  REM Plot
20  POKE 24576,X: POKE 24577,Y: POKE 24592,S%(XB): CALL
    24578
34  REM Find new coordinates
35  XB = XB + XC:Y = Y + YC
40  IF XB > 6 THEN XB = 0:X = X + XC
45  IF XB < 0 THEN XB = 6:X = X + XC
55  IF X > 39 THEN X = 39:XB = 6:XC = - 1
60  IF X < 0 THEN X = 0:XB = 0:XC = 1
65  IF Y > 191 THEN Y = 191:YC = - 1
70  IF Y < 0 THEN Y = 0:YC = 1
80  GOTO 20
999 REM Initialize
1000  PRINT CHR$ (4);"BLOAD PLOT"
1010  PRINT CHR$ (4);"BLOAD LOOKUP"
1020  HGR : POKE - 16302,0
1029  REM Read preshifted shape definitions, as in figure 3
1030  DIM S%(6): FOR I = 0 TO 6: READ S%(I): NEXT : DATA 1,2,4,
      8,16,32,64
1040  RETURN
```

Listing 2.

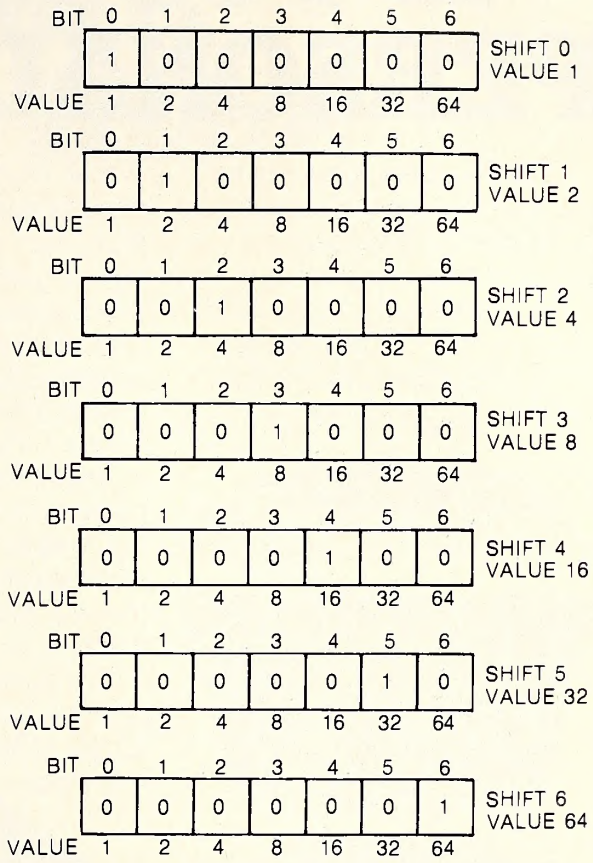


Figure 3.

```
160   FOR Y = 0 TO 191
200   Y1 = INT (Y / 8):YR = Y - Y1 * 8
210   Y2 = INT (Y1 / 8):YS = Y1 - Y2 * 8
220   YL = 8192 + Y2 * 40 + YS * 128 + YR * 1024
230   POKE 16384 + Y, INT (YL / 256)
235   POKE 16576 + Y,YL - INT (YL / 256) * 256
236   REM The right half of line 235 has the formula for finding the
      remainder of the division YL/256
240   NEXT Y
```

Listing 3.

The bracket (]) and asterisk (*) characters at the beginning of each line are prompts. You type the rest. After each line, press return.

```
]CALL -151
*6000:00   00   AC   01   60   B9   C0   40
*6008:85   06   B9   00   40   85   07   A9
*6010:FF   AC   00   60   91   06   60
*3D0G
```

Listing 4.

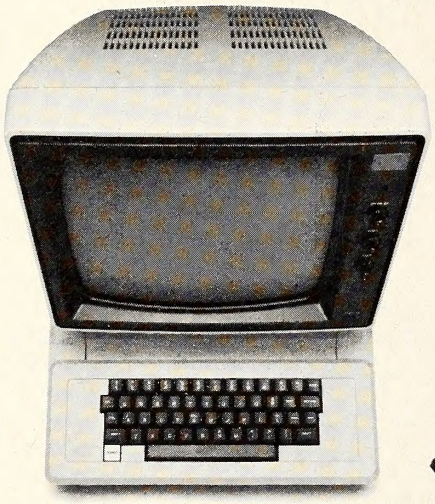
```
1   GOSUB 1000
5   XC = 1
10  X = 19:XB = 0:Y = 95
19  REM Plot
20  POKE 24576,X: POKE 24577,Y: POKE 24592,S%(XB): CALL
    24578
34  REM Find new coordinates
35  XB = XB + XC
40  IF XB > 6 THEN XB = 5:XC = - 1
45  IF XB < 0 THEN XB = 1:XC = 1
80  GOTO 20
999 REM Initialize
1000  PRINT CHR$ (4);"BLOAD PLOT"
1010  PRINT CHR$ (4);"BLOAD LOOKUP"
1020  HGR : POKE - 16302,0
1029  REM Read preshifted shape definitions, as in figure 3
1030  DIM S%(6): FOR I = 0 TO 6: READ S%(I): NEXT : DATA 1,2,4,
      8,16,32,64
1040  RETURN
```

Listing 5.

IF YOU'RE CONFUSED PERSONAL COMPUTER,

At this moment, there are no less than 50 personal computers on the market. And more are being introduced every day.

On one hand, having all those options is a good thing. On the other, it can make picking the right one pretty difficult.



Computers come in two parts. You have to buy both.

We'd like to help. So here are a few suggestions about how to buy the computer that's right for you.

Computers come in two parts.

One part is the "hardware," which is the machinery itself. The other is the "software," or a program, as it's sometimes called.

Software is the part that tells the computer what to do, the way a driver tells a car what to do.

Without software, a computer can't do anything.

And vice versa.

You have to buy both.

Buy the software first.

Since the reason you're buying a computer is to get the capability the software gives you (remember, it's the software that knows how to get things done), it makes good sense to pick the software first.

Start by making a list of the things you want to use the computer for. It can include almost anything—any kind of inventory, filing, accounting, graphics, reporting, record-keeping, analysis—you name it and there's probably a software program that does it.

Next, take the list into a computer store and ask the salesperson to give you a demonstration of the program, or programs, that will do the things you want.

Even though you'll need a computer for the software demonstration, keep in mind the computer is just a vehicle. The software is the driver. And once you've decided on the software, picking out the rest of the computer system will be much easier.

The simpler the better.

Look for software that's easy to learn, easy to use, and that does the job in the simplest way possible.

Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you have to do without getting in the way.

Meaning there are no complicated routines to follow to perform a simple task. And no programming language to learn.

Some people, however, will tell you that software has to be complicated to be powerful.

Nothing could be farther from the truth.

Because in order for a program to appear simple to you on the outside, it has to be extremely complex on the inside.

ABOUT BUYING A HERE'S SOME HELP.

Good software keeps the complications in the computer, where they belong. And keeps the capability at your fingertips. It's that simple.

You simply have to see for yourself.

You can read any number of interesting books and magazines about personal computers. You can ask friends who have them. You can look at all the sales literature you can get your hands on. And you should do all those things before you decide to buy.

But as helpful as all that can be, there really is no substitute for a real, live demonstration.

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With REPORT, you get presentation-quality reports—sorted, calculated, formatted and printed—automatically, in seconds.

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GRAPH gives you presentation quality bar charts, line graphs, and pie charts, in black and white or color, on paper or the computer screen. To get a clearer picture of things and spot trends instantly, you simply enter your information and specify the kind of graph or chart you want. GRAPH does the rest.

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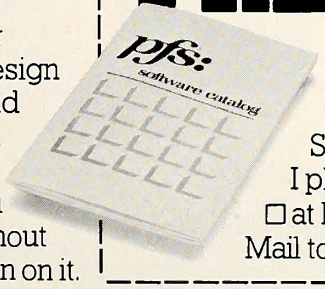

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IN USE
disk II

DOS Be Nimble, DOS Be Quick

BY TOM WEISHAAR

Load a language card with Applesoft in four seconds. Load a hi-res graphic in three seconds. Save a sixty-six-sector Basic program in five seconds—a task that usually takes your Apple more than four times that long.

Do it without RAM cards or hard disks. All you need is the standard Apple DOS and some special subroutines (available in several versions for less than $30) that get DOS to jump over candlesticks.

In the April 1982 *Softalk*, Don Worth and Pieter Lechner suggested a way to make DOS work faster. Their method involves changing the way your disks are skewed.

What's that mean? When you initialize a disk, magnetic patterns divide it into thirty-five circles lying inside each other (tracks). Each track is further broken into sixteen sectors.

If the sectors were numbered sequentially (1, 2, 3, 4, and so on), there would be no skew. But if you look very closely through the oblong hole on one of your disks, you will see the actual pattern is 1, 9, 2, 10. . . .

Think of it this way. In front of you is a merry-go-round with sixteen horses. Walk up to it and tape a 1 to your favorite. Then start walking around the merry-go-round, taping the numbers 2 through 8 on every other horse. When you're ready to mark horse 9, you will find yourself in front of horse 1. So skip him, and make the *next* horse 9. Continue on around until you have them all numbered.

You now have a reasonable facsimile of a track on an Apple DOS disk. It is not exact, since your Apple's sectors are actually numbered 0 through 15, in binary, backwards, with two sectors between 0 and 1 and between 14 and 15, but it will do for us carbon-based creatures.

In their article, Worth and Lechner pointed out that Apple DOS wastes a lot of time waiting for the next sector it needs to come by. Start your merry-go-round spinning. We are going to load a file called Peanuts. When the kid on horse 1 comes by, he's going to hand you a bag of peanuts. Grab it. While the horse next to 1 (horse 9) goes by, put the bag in a cardboard box on the ground. Then reach up and grab the bag from the kid on horse 2. You will quickly appreciate why disks are skewed—it gives you time to put the peanuts in the box.

The problem with poor Uncle DOS is that he can't move as fast as we can imagine. By the time he gets our peanuts into memory, the kid on horse 2 has already gone by. In fact, Worth and Lechner say, the kids on horses 3, 4, and 5 have gone by, too. Uncle DOS then has to stand and wait for a relatively long time (for a silicon-based creature), until the kid on horse 2 comes around the bend again.

No less than eighteen kids pass Uncle DOS for each bag of peanuts he gets. If your disk drive is well adjusted, it spins at 300 revolutions per minute (about eighty sectors per second—much too fast for a merry-go-round, incidentally). So Uncle DOS spends 3.6 seconds just getting sixteen bags of peanuts off the merry-go-round. Since our good uncle is not really quick on his feet, either, the total time for loading or saving Peanuts is somewhat longer.

Worth and Lechner suggest that we can get a better response time from our disks if we reskew them. In other words, since Uncle DOS spends so much time standing around waiting for the next kid he needs to come by, why not rearrange the way the kids sit on the merry-go-round? Doing this intelligently, we could fix it so that when Uncle DOS was ready for another bag of peanuts the very next horse to show up would be the one he was looking for.

Worth and Lechner wrote a program that does this. It lifts that which is on each track of your disk—horses, numbers, kids, peanuts, and so on—rearranges it, and puts it back down. In the process, it actually reinitializes each track with the new sector skew. In the new arrangement, only nine sectors go by for each one loaded. Uncle DOS works much more efficiently and, in some cases, almost twice as fast.

But the solution is not perfect. As Worth later pointed out in the August *Softalk* (Open Discussion), a problem arises when Uncle DOS is resaving an old file. In this case, the new skew actually lengthens the time it takes to save the file. If the file is a brand-new one, however, the problem doesn't occur.

So we want more speed from Uncle DOS and we have a lot of respect for Worth and Lechner (they are the Matthew, Mark, Luke, and John of this branch of human knowledge—they wrote *Beneath Apple DOS*). But we are left with having to redo all our disks (shades of Muffin); longer saves on preexisting files; and nagging questions about what old Uncle DOS is doing while all those sectors pass by. It's quite a long time for a silicon-based creature, after all.

Rub-a-Dub-Dub—Three Men in a Tub. When you get old Uncle DOS up on the examining table and take a good look at him, you find

out (holy chips!) that he's really three separate people.

The first of these three is the one who talks to us. We send him messages like *catalof*, and he responds with messages like *syntax error.* He doesn't have a common name in the Apple literature, but in data-processing circles he is known as a "command interpreter." Since many of us are allergic to data-processing circles, let's just call him "captain."

Our new friend the captain is part spy. This guy actually reroutes all your incoming and outgoing keystrokes and messages; so he gets to see them first. If he detects something that looks like it's for him, he tries to act on it. There are a few things he can handle on his own, such as *mon, maxfiles, pr#*, and *in#*. But, in general, the captain doesn't do dirty work. In particular, he stays as far away from your disk drive as possible. Whenever he sees a command requiring the accessing of the disk, he fills out a form known as the file manager parameter list and gives the file manager a call.

The file manager is the second person of the DOS trinity. He's a sweet old guy, kind of slow but ultraorganized. There's a good picture of him on page 6-9 of *Beneath Apple DOS*. It's the file manager who keeps track of what's on your disks and where. He reserves space on each disk that he uses to write himself messages. These remind him what he stored where. But not even the file manager can actually turn on your disk drive. What he can do is write some numbers on the input/output blackboard (IOB) and give a call to Mr. RWTS.

Mr. RWTS, the third part of DOS, is not really a "person." He may be a robot. His features are very chiplike. We humans don't even know how to pronounce his name correctly. What we do know is that if we fill out the input/output blackboard with the right numbers and call him, he then, through a miracle of timing loops, nibblizers, and stepper motor phases, can actually turn a disk drive on; move the arm inside it to the track we want; and read, write, or initialize sectors. Amazing.

The input/output blackboard has spaces for several interesting and several rather ordinary numbers. The interesting ones are the track and sector that Mr. RWTS will read from or write to, and a memory address. This address tells Mr. RWTS where to put the bag of peanuts if he is reading a disk, or where to get it if he is writing. An important limitation of Mr. RWTS is that he doesn't deal with single peanuts. He only deals with bags of peanuts, and each bag has to have exactly 256 bytes, er, peanuts, in it. These robots are so demanding.

If you leave the Uncle DOS trio up on the examining table and watch them do their stuff, you will be amazed by how many numbers they move around just, for instance, to load a file called Lollipops. And if you watch them very closely you'll see that the file manager needs to take a seminar in time management and delegation. In the interests of order and organization, the old fool moves so many irrelevant numbers around that it makes your head spin.

So what is the file manager doing while the next sector he needs (as well as several more) pass by? Lots of things. One of the most time-consuming is moving the bags of peanuts he gets to where they belong in memory. The file manager always tells Mr. RWTS to put the bags in a box called the data buffer. Then he moves them, peanut by peanut, to where they belong. By the time he's finished and has filled in the input/output blackboard for the next sector he needs, Mr. RWTS finds it long gone.

There are certain times when using the data buffer is absolutely necessary, such as when you're dealing with a text file, or when you want only part of a bag of peanuts.

If Lollipops was only 56 bytes long, for example, and Mr. RWTS put its data sector directly into memory, not only would you get the 56 bytes you wanted, but you would also get 200 extra bytes that would overwrite your program or data and thus destroy them.

On the other hand, there are times when sifting everything through the data buffer is foolish. If you're loading a hi-res graphic, for example, thirty of its thirty-two sectors can be placed in their final positions in memory by Mr. RWTS.

If we teach the file manager to let Mr. RWTS put the peanuts directly into memory, astounding things happen. We catch the next sector when it passes! Suddenly, only two sectors are passing by for each one we read—not eighteen, not nine. We can read or write the sixteen sectors on an entire track in 0.4 seconds, not 3.6 seconds. This is nine times faster!

Since a lot more goes on when you read or write a file than the actual transfer of data between the disk and memory, the total speed increase is less than 900 percent. But 300 to 400 percent faster is easy. Thumb-twiddling, carbon-based creatures find the difference significant and very pleasurable.

One of the advantages we mortals have over silcon-based creatures such as the file manager is that we can change their DNA easier than they can change ours (as of this time). Several people have figured out new sequences of DNA that can be spliced into the file manager. These fix the little man's reluctance to delegate things to Mr. RWTS. They're available in programs from at least five different publishers. If you like the excitement of typing in your own DNA sequences, look at the program called *Oiler* in *Nibble*, volume 3, number 5.

These programs are similar but do have different features you will want to consider if you think this kind of speed is for you. Some will load files at high speed, but not save. Some don't work on extremely long files. Some copy-protect the DOS on your disks, thus making special copy programs necessary for backup. Some delete an automatic verify that the captain normally orders after each save, slightly increasing the risk of file tragedy. Each program scrambles the inner workings of DOS to various degrees; if you use programs that peek and poke standard DOS locations, you may find things have been moved. Each needs extra memory space; some get it by deleting the init command and using its territory, some by turning your error messages into numbers, some by using the empty spaces within DOS. The best program for you will depend on your needs.

A final point to consider. The speed increases will apply to binary, Applesoft, and Integer Basic files. Text files are a breed that has to be handled one byte at a time. Text file bytes are passed to an input routine (or come from a print routine) rather than being associated with a fixed place in memory. This makes text files naturally slow and not applicable to speed-up by this technique. ■

Tom Weishaar is an independent software author in Kansas City. His latest programs, Frame-Up *and* ProntoDOS, *are published by Beagle Bros.*

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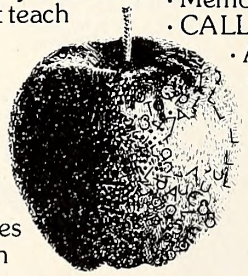

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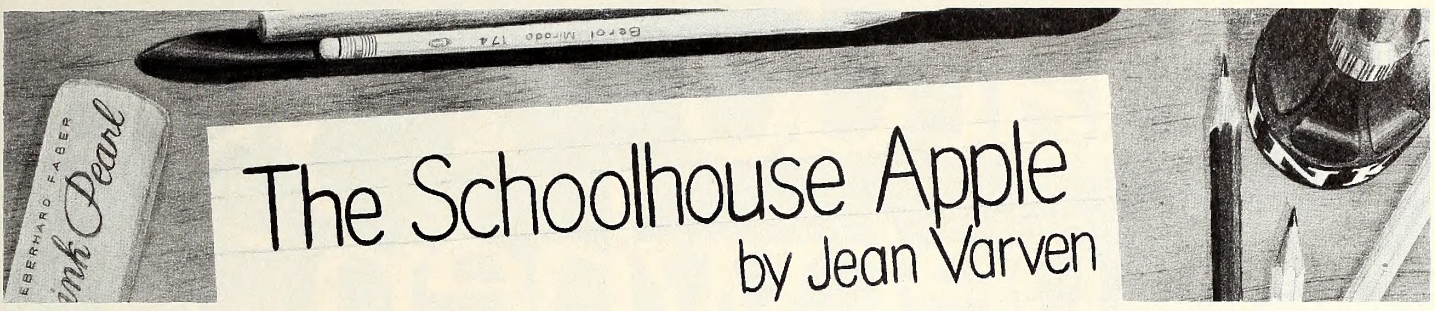

The Schoolhouse Apple

by Jean Varven

What's a computer center like and what do you learn there? Young people who've spent some time at the Farrell Area School District's Microcomputer Center in Farrell, Pennsylvania, can give you some idea. Their descriptions and comments follow.

As Brian Clarke puts it, when you visit the computer center, you discover "how much fun working with a computer really is." Farrell's Microcomputer Center is managed by Donna DeBonis, computer instructor/coordinator for the Farrell school district. Quoting from an article that appeared in a parent's night program, Becky Harkless explains that "computer awareness and programming are being taught in grades K through 12. The students are learning how to operate the computers and to use the software."

The students seem to agree with Eric Savage's opinion of their teacher: "One more thing I have to tell you—Miss DeBonis is great!" "She is always there when we need her," adds Hattie McLean.

Regina Caputo and others highlight the role David Joseph, the former academic administrative coordinator, played in the origination of Farrell's center. It was he who was responsible for writing the proposal resulting in the purchase of Farrell's first computers. The computers are maintained by George Pedas, the audio-visual coordinator.

Pam McKethan describes the room that houses Farrell Middle School's Apples. "When you walk in the room, you see four tables that have three or four computers on them. On the walls are nice pictures that give you a little advice." Lance Messett quotes the motto displayed on a bulletin board: "The secret of success is to look upon each problem as a challenge."

Paul Samuels and others tell more about the particulars of Farrell's Microcomputer Center. "We have thirteen computers in the center; we have one in each elementary school and one in industrial arts. We also have four in the high school and one in each administrative office." Farrell Middle School also has six printers.

As Nicholas Scarmack explains, "The setup includes a teacher who is here from 7:45 to 4:30 to help anybody who wants to learn about data processing. The resources we use are books on how to use the computers, magazines about different computers, and the many different software programs computers use."

To begin with, you learn "how to put the disk in, how to turn on the machine, and how to type on the machine," explains Mary Lou Jackson. And you're taught early on that you must "handle the disk with gentleness."

Rosiland Brown likes the various experiences she's had at the center—"Especially when we opened the computer. Inside the computer were the integrated circuits, the small speaker, and the RAM and ROM memory." Cecilia Chapman also enjoyed the lesson: "In the center I have learned things about the computer I never knew. I've learned about the parts inside the machine—chips that run the computer, the integrated circuits known as ICs or chips. ICs store the information."

Lenora Grande explains some of the computer's internals: "There are two types of computer memory, RAM and ROM. RAM stores the data that I enter into the computer, while ROM stores the computer's language."

According to Leonae J. Evans, different groups of students "come to learn different subjects on the computers. The high school students come to the computer center mainly to write different reports and learn the ways of computer input." In addition, students from the high school come to the center to help the middle schoolers learn to operate the machines, according to Vicki Davis and Terry Kromka.

"The seventh-graders come to learn math on computers," continues Evans. "Different groups of eighth-graders come to the computer center for computer-awareness sessions." Michele Lee is one such eighth-grader. She enjoys doing word processing using a text editor and learning how to edit.

Dave Chec tells about students who come to the center in their free time to write their own programs, and about those who work on the school newspaper (*The Inkspot*), using *Apple Writer* and the printer. Dave and Ron Dorogy both mention a disk from MECC, which contains learning games such as *Nomad*, *Sumeria*, and *Oregon Trail*, as an example of the commercial programs students can enjoy when they come to the center after school.

Buddy Mackin points out that "the computer center also has classes for older people wanting to learn about computers." As Lenora White explains, "Grown people learn just about the same parts of computer awareness as we students do."

"Students and parents at the center work together to help each other become computer-literate," says Lena Mayes. In fact, reports Damon Avery, there's a special class for parents, Introduction to the Apple Computer; it was recently added to the Farrell Adult Continuing Education Program.

"Teachers also learn to work with the computers," says Mary Anne Heckathorn, using them to write programs for their classes. Margo Ray explains how some students became teachers. "Some of the students were so good that they were able to teach administrators, secretaries, and teachers, and they weren't all from our school district. So, you can see that the Farrell Microcomputer Center is helpful to many different people in many different ways," concludes Ray.

Alicia Hilton is enthusiastic about Farrell's center. "I like it because I learn something every day, mostly about things I've never seen before. Once you keep on going, you get the hang of it." Says Nikki Jaggers: "When you leave the computer center, I guarantee that you will know something."

Diane Kagle expresses a common sentiment when she says, "It's just a shame that we don't have more computers to work with." Amy Linonis agrees, adding, "I think everyone should have a chance to work on a computer, no matter what their age. If all the schools would get a computer, the students would enjoy and benefit from coming to work on them—computers are the way of the future."

Many thanks to all the Farrell Microcomputer Center correspondents who shared their experiences and perspectives. More on computer centers in a future column.

There's a Contest Under Way. It's the Computer EdGame Challenge, sponsored by Verbatim Corporation (the folks who make floppy disks) and administered by Conduit and MicroSIFT. Contest organizers are looking for "imaginative instructional software" that's nonviolent and fun. You'll have to work fast—the contest opened in January and closes on the thirty-first of March.

The contest has three divisions—elementary, secondary, and postsecondary—and can be entered by students, teachers, and professionals. The authors of the best educational games in each of twenty subject areas will be awarded $500 Computerland gift certificates. Three additional gift certificates will be awarded for the best student entry overall in the elementary, secondary, and postsecondary categories. The two best entries in the elementary/secondary and postsecondary divisions will receive IBM Personal Computers.

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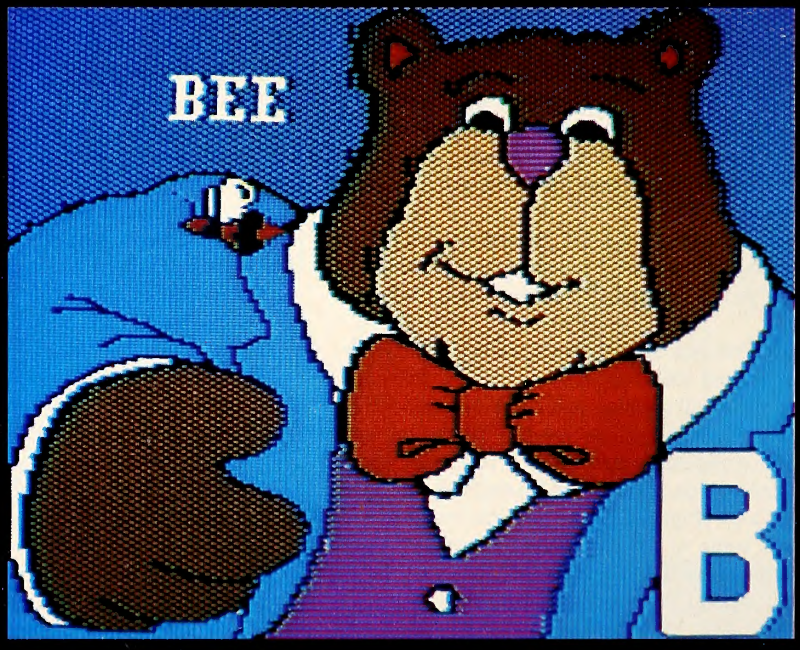

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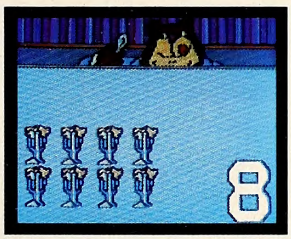

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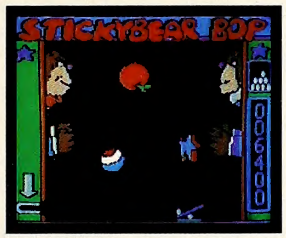

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edge and that, in order for this to happen, the game's scoring must be carefully linked to the game's "educational intent." Otherwise, it's very possible that players will become really good at the game without having mastered anything but a game strategy that enables them to rack up high scores. It's also recommended that entrants concern themselves with clarity of visual presentation and instructions, effective error-trapping, and helpful help options. Commercial software producers would do well to keep these guidelines in mind.

Contest entry forms can be obtained at participating Computerlands or by calling 800-221-4052 (in Oregon 248-6800). You'll receive information about contest rules, categories, and judging criteria, as well as some helpful guidelines for writing game software. A special packet is available to teachers who'd like to make a class project out of this event.

The games submitted become the property of the contest organizers. The best of them will be put on disk and distributed to educators on a nonprofit basis. Game authors will receive royalties.

A Word about Software. Let's look now at a program intended to help young people become more knowledgeable about words.

Word Attack! By Janice G. Davidson, Ph.D., and Richard K. Eckert, Jr. At a time when too much of the drill and practice software available is of questionable value, Davidson and Associates's *Word Attack!* comes as a welcome surprise. This well-conceived, well-executed drill and practice program for building vocabulary serves as a much-needed reminder that the phrase drill and practice need not be synonymous with dull and deadly.

The purpose of the program is to help people in grades four through twelve increase their vocabularies. As the authors explain at the beginning of the documentation, *Word Attack!* is not meant to be students' only vocabulary-building tool, particularly since it does not teach pronunciation or the multiple meanings of words. What the program is meant to do is help students learn to recognize, define, and become comfortable with new words.

The main learning process consists of three activities (each of which builds on the last) supplemented by a final—and fun—reinforcement activity. The program has nine levels of difficulty, each containing seventy-five words, divided into twenty-five-word groups of adjectives, nouns, and verbs.

First, each word in a given list is displayed on-screen, along with a synonym or brief definition and a sentence in which it is used correctly. Users are encouraged to run through this exercise until they have the words and their meanings firmly in mind.

Next comes a multiple-choice quiz that can be set up two ways. In normal mode, the word is given and the correct meaning must be selected; in reverse mode, a meaning is given and the correct word must be chosen to go with it.

In the sentence-completion section, learners are asked to supply the missing word in the sentence. It will be one of the twenty-five words under study.

When learners are convinced they know all twenty-five words in a list, they can test that assumption by playing *Word Attack!*, the entertaining arcade-like game for which the package is named. Four words and one definition appear on the screen and the player must find and shoot down the correct one before time runs out. The game has three different speeds and is an effective and painless way of using and reinforcing new knowledge. Some kids will want to start out here, rather than progress through the first three learning exercises; that's fine. It will soon become clear that doing really well at the game hinges on knowing the meanings of the words.

The program is still useful after the words on the disk or on a given level have been mastered. Supplementary data disks, containing 500 words apiece and designed for learners at various grade levels, are available from Davidson and Associates for $19.95. In addition, teachers, parents, and older kids can create learning materials of their own by using the editor function of the program and storing the results on an initialized data disk.

The inclusion of the editor program does much to ensure that *Word Attack!* will continue to be used by various members of a family or students in a class. A clearly written chapter in the documentation provides a step-by-step explanation of how to use this useful tool. It also identifies the editor's limits—words can have a maximum of thirteen letters, meanings a maximum of thirty-six letters and spaces, and sentences a maximum of 120 letters and spaces.

The program documentation is suitably brief, easy to read, and attractively presented. Alphabetized word lists and definitions for each of the nine levels are provided at the back of the book.

Word Attack!, by Janice G. Davidson, Ph.D. and Richard K. Eckert, Jr., Davidson and Associates (6069 Groveoak Place, Suite 12, Rancho Palos Verdes, CA 90274; 213-378-3995). $49.95.

Pertinent Publication. *The Digest of Software Reviews: Education* is a new quarterly publication edited by San Mateo classroom teacher and librarian Ann Lathrop. A member of the Executive Board of Computer Using Educators, Lathrop is the organizer of Softswap—a service through which public domain educational software edited and evaluated by teachers is made available for classroom use.

Published by School & Home CourseWare, the *Digest* is designed to be a quick, comprehensive reference for teachers, administrators, librarians, publishers, and others trying to find quality educational software. Each issue will feature profiles of fifty programs and a guest editorial written by someone in the educational software field. The profiles will include digests of published reviews, publishers' descriptions, system, price, and educational content information, and library cataloguing data.

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The Voice of THE TURTLE

A Schoolhouse Apple Tutorial

LOGO

JIM MULLER

Logo is often thought of as a graphics language for children, but it can be a lot more than that. It's not terribly fast, but it has a beautiful logic that suggests all sorts of application possibilities. Indeed, Logo's list processing commands can open up a whole new realm of interactive language arts programs.

When Irish Eyes Are Smiling. Since it's the time of shamrocks, leprechauns, the wearing of the green, and all other things Irish, let's create a greeting in honor of Saint Patrick. Enter the Q&A procedure given here. The screen display that results will resemble the sample that follows the procedure.

```
TO Q&A
PRINT [WHAT IS YOUR FAVORITE IRISH FOOD?]
MAKE "A READLIST
PRINT [ ]
PRINT [WHAT IS YOUR FAVORITE IRISH SONG?]
MAKE "B READLIST
PRINT [ ]
PRINT [WHAT IS YOUR BEST FRIEND'S NAME?]
MAKE "C READLIST
PRINT [ ]
PRINT [WHAT IS YOUR NAME?]
MAKE "D READLIST
PRINT [ ]
( TYPE :D [, MY SAINT PATRICK'S DAY WISH FOR YOU IS THAT YOU AND]
"\  :C "\  CHAR 13 )
( TYPE [WILL SHARE SOME] "\  :A "\  [WHILE]" \  CHAR 13 )
( TYPE :B "\  [IS PLAYING IN THE BACKGROUND.] )
PRINT [ ]
END
```

Q&A procedure.

```
WHAT IS YOUR FAVORITE IRISH FOOD?
MULLIGAN STEW

WHAT IS YOUR FAVORITE IRISH SONG?
"WHEN IRISH EYES ARE SMILING"

WHAT IS YOUR BEST FRIEND'S NAME?
JIMMY O'REILLY

WHAT IS YOUR NAME?
CASEY

CASEY, MY SAINT PATRICK'S DAY WISH FOR YOU
IS THAT YOU AND JIMMY O'REILLY
WILL SHARE SOME MULLIGAN STEW WHILE
"WHEN IRISH EYES ARE SMILING" IS PLAYING
IN THE BACKGROUND.
```

Screen display.

This question and answer program is a simplistic first step toward the use of Apple Logo's list processing capabilities. An exercise of this type can be thought of as a first step toward word processing in Logo.

In the Q&A procedure, the response to each question is taken as an input, A, B, C, or D. These responses are then placed within the text using the TYPE command. TYPE differs from PRINT in that it does not automatically trigger a carriage return. The carriage return, CHAR 13, has to be inserted in the procedure.

Another thing to note in this Q&A procedure is the fact that the quotation marks, followed by backslashes, don't appear to be performing any function. This combination of characters represents a space. A space is entered by hitting the quotation mark, followed by control-Q and two spaces. Without these space characters, the words would run together. (You'll notice, however, that if you print out this procedure the backslashes won't show up.)

Let's Argue. It's time now to explore a little further the list processing capabilities of Apple Logo. Why not follow along with the ARGUE procedure?

The actual sequence of procedures is:

```
ARGUE
ARGUE1
RESPOND:S
LEARN :WORD
OPPOSIT.PHRASE :IT
OPPOSIT.IT
```

Once you've entered the procedure ARGUE, you'll be instructed to enter a sequence beginning with, "I like " or "I hate ." The next line is TYPE, followed by two spaces—in essence, a two-space tab. For example, if you say that you like Logo, the computer will respond, "I hate Logo." If you enter a word to which the computer has no response, it will ask for the opposite, as was the case with peaches.

Now here's the procedure, followed by a sample screen display:

```
?POPS
TO ARGUE.1
( TYPE "  "  )
RESPOND READLIST
ARGUE.1
END

TO OPPOSIT.PHRASE :L
OUTPUT SENTENCE OPPOSIT FIRST :L BUTFIRST :L
END

TO RESPOND :S
IF EMPTYP :S [STOP]
MAKE "IT BUTFIRST BUTFIRST :S
IF "LIKE = FIRST BUTFIRST :S [PRINT SENTENCE [I HATE] :IT]
IF "HATE = FIRST BUTFIRST :S [PRINT SENTENCE [I LIKE] :IT]
LEARN FIRST :IT
IF "LIKE = FIRST BUTFIRST :S [PRINT SENTENCE [I LIKE]
 OPPOSIT.PHRASE :IT]
IF "HATE = FIRST BUTFIRST :S [PRINT SENTENCE [I HATE]
 OPPOSIT.PHRASE :IT]
END

TO OPPOSIT :IT
OUTPUT THING :IT
END
```

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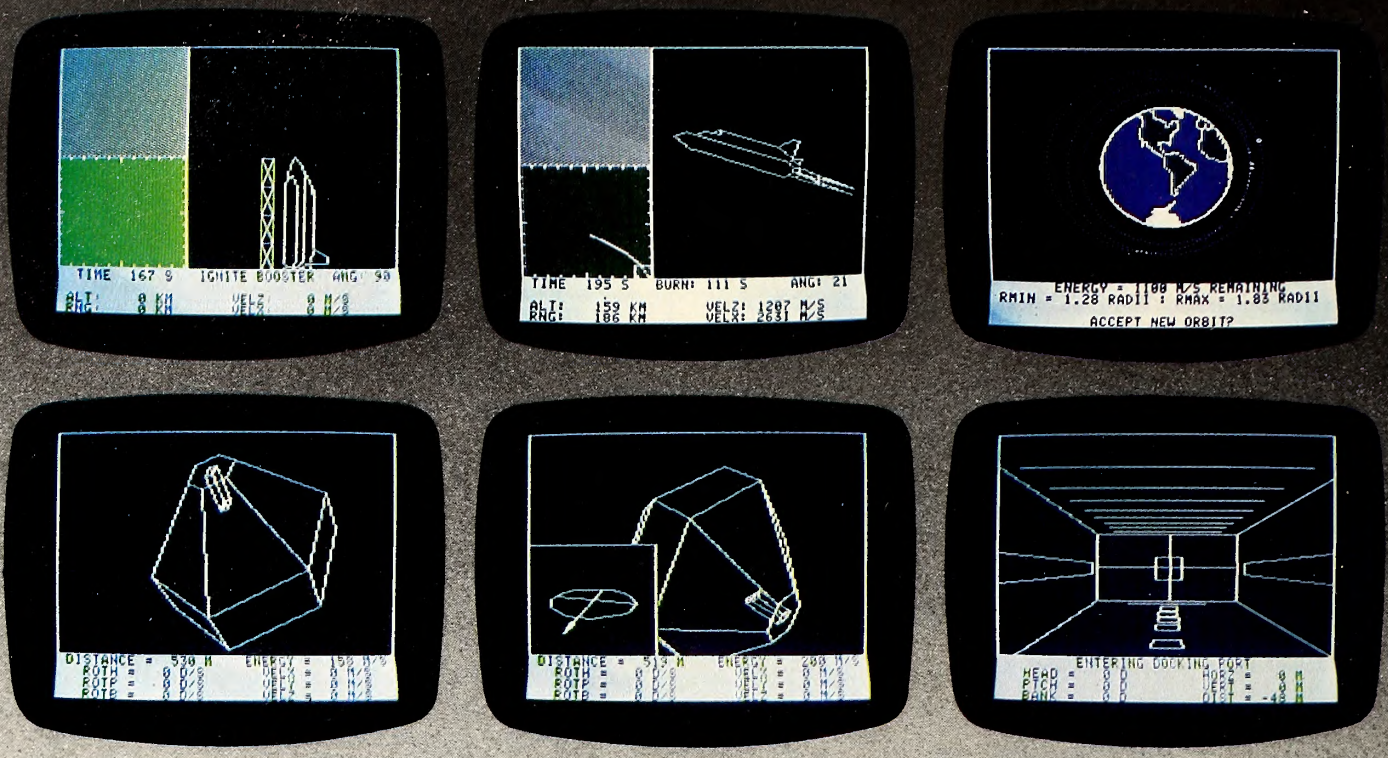

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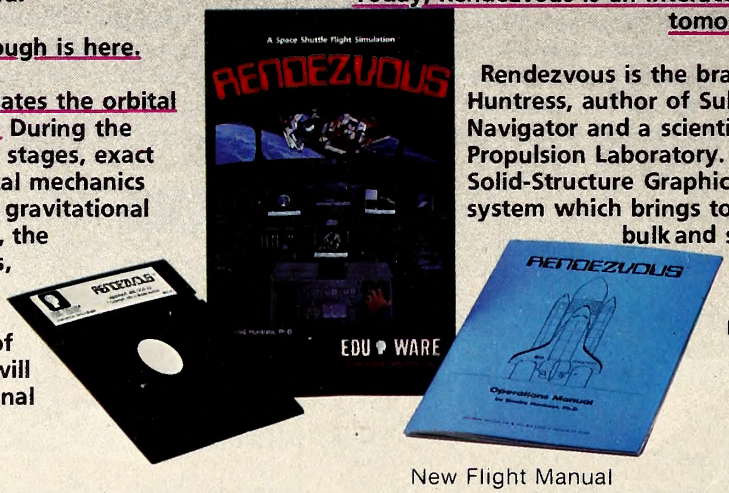

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```
TO LEARN :WORD
IF NAMEP :WORD [STOP]
PRINT (SENTENCE [WHAT IS THE OPPOSITE OF] :WORD "?)
MAKE :WORD FIRST READLIST
MAKE THING :WORD :WORD
END

TO ARGUE
PRINT [ENTER A SENTENCE BEGINNING WITH]
PRINT ["I LIKE " OR "I HATE " SOMETHING.]
PRINT [ ]
( TYPE "  "  )
RESPOND READLIST
ARGUE.1
END
```

ARGUE procedure.

```
ARGUE
ENTER A SENTENCE BEGINNING WITH
"I LIKE " OR "I HATE " SOMETHING.

   I LIKE LOGO
I HATE LOGO
I LIKE FORTRAN
   I LIKE VANILLA
I HATE VANILLA
I LIKE CHOCOLATE
   I LIKE PEACHES
I HATE PEACHES
WHAT IS THE OPPOSITE OF PEACHES ?
APPLES
I LIKE APPLES
   I LIKE CARROTS
I HATE CARROTS
WHAT IS THE OPPOSITE OF CARROTS ?
BEANS
I LIKE BEANS
   I HATE BEANS
I LIKE BEANS
WHAT IS THE OPPOSITE OF BEANS ?
CARROTS
I HATE CARROTS
```

Screen display.

Let's take a tour of the procedure itself. When you enter ARGUE, the instructions are listed, a line is skipped, and the cursor indents two spaces. When you enter a response, the computer reads the response and calls the RESPOND procedure—RESPOND RL (ReadList).

The first line of the RESPOND procedure inquires as to whether or not the predicate "S" is empty. If it's not, the next line instructs you to ignore the first two words and make the third one "S."

There's no designation for second, third, fourth, or other elements of a list. You can, however, get the procedure to skip over objects by specifying BUTFIRST. In this case, when you enter, "I like Logo," the second line of the procedure goes to work. First the procedure reads the entire line except for (BUT) the FIRST word, *I*. It then reads the sentence again, all BUT what is now the FIRST word, *like*.

The conditional statements in the next two lines set up the response. If *like* is the FIRST word after all BUT the FIRST word is printed, or if *like* is the second word in the sentence, then the sentence is printed. IT has already been established as the variable "S."

The next line calls up the LEARN procedure. If the name of the word is already stored away, then LEARN stops and reverts back to RESPOND. If not, it proceeds on. The next three lines ask for the opposite of the word input in RESPOND. This is then filed away.

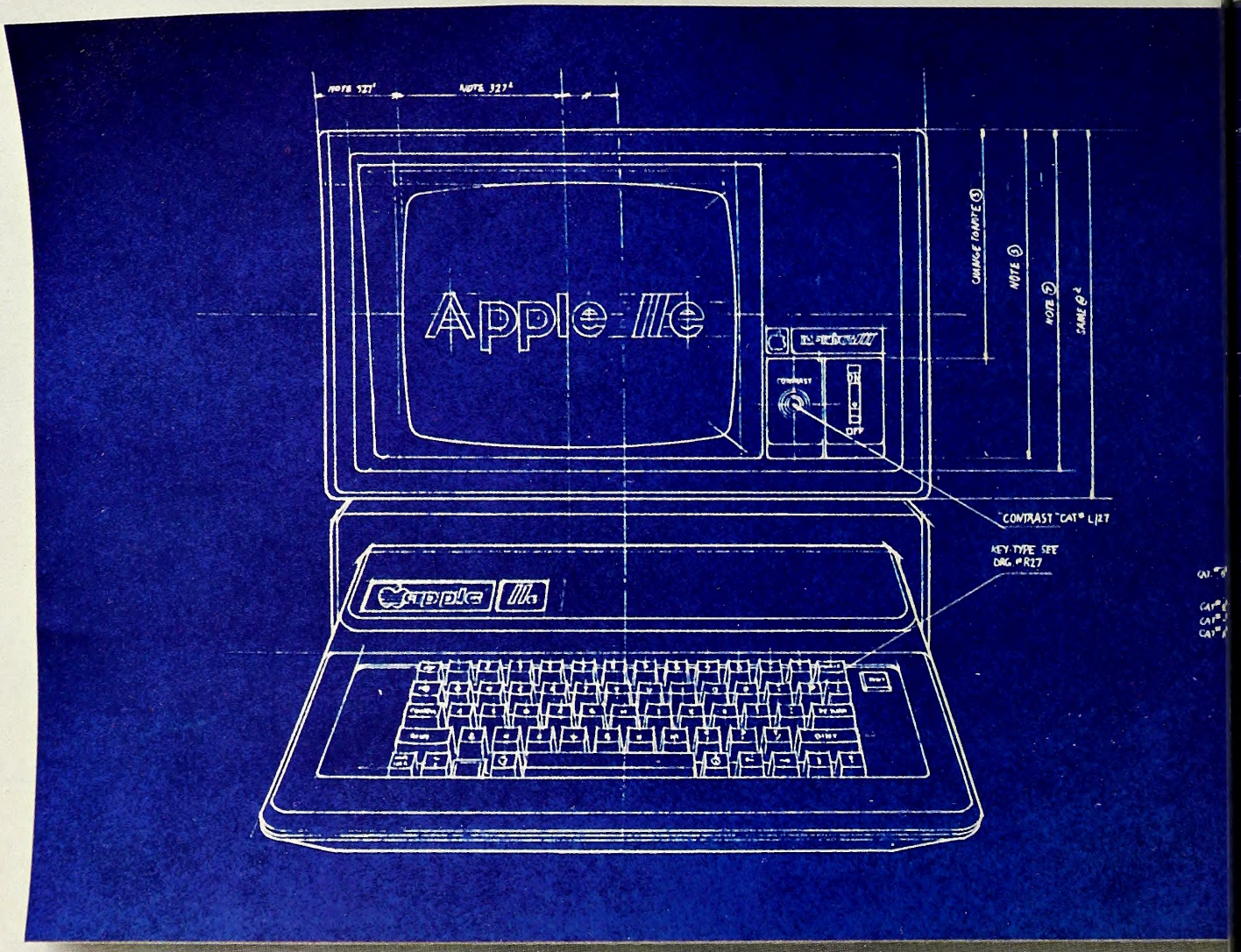
Now comes the challenging part.

You've had a taste of list processing; now can you follow the rest of the procedure? What happens in OPPOSIT.PHRASE :L and OPPOSIT :IT?

Put this article in front of you and enter the complete ARGUE procedure into the Apple. Try working through it one procedure at a time, reading the error messages and attempting to interpret their impact on the final procedure. You'll probably also want to try variations of the procedure; that's one way of discovering for yourself the power of list processing with Logo. ◨■

ARGUE procedure contributed by Logo Computer Systems.

It's the same old Apple II.



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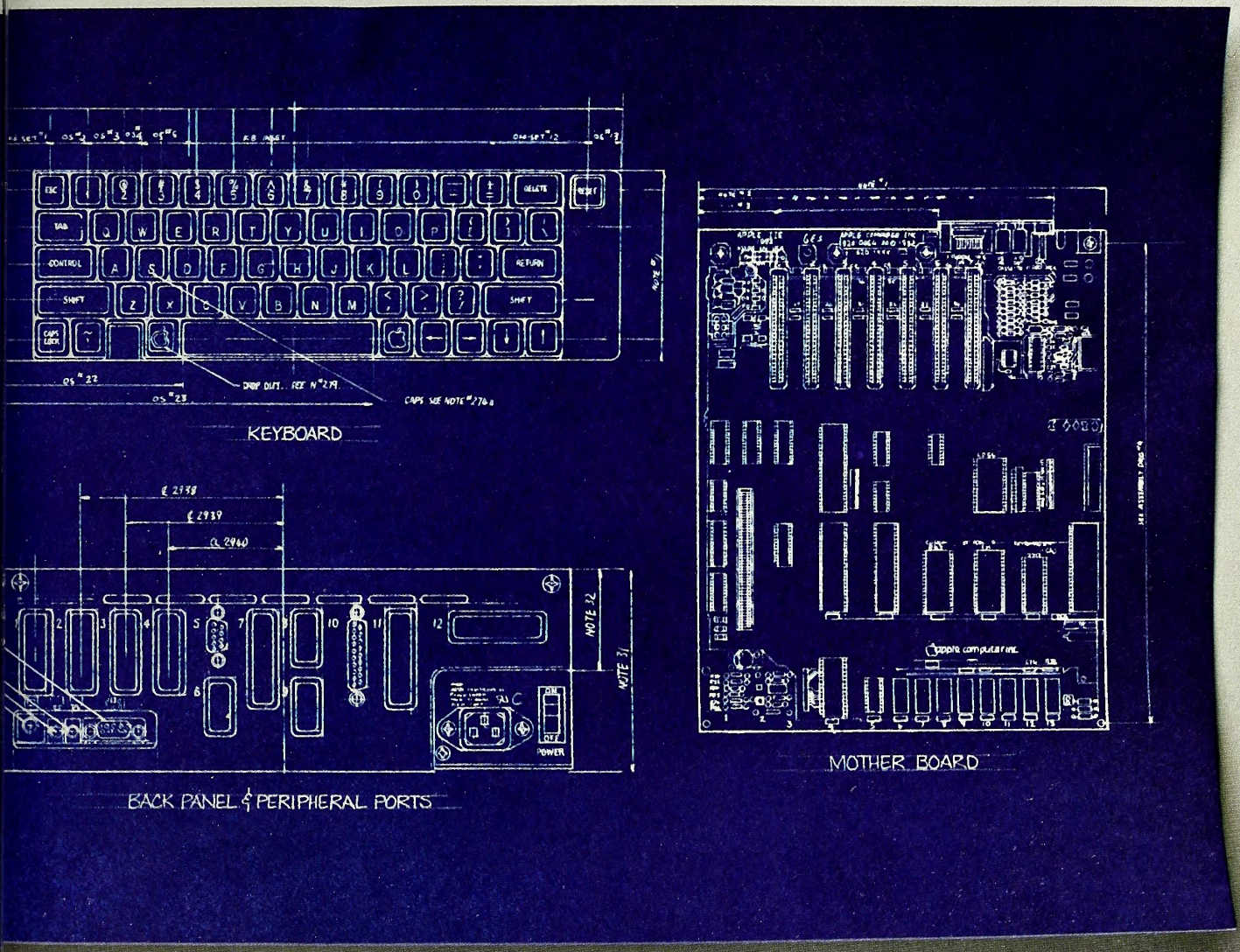
Except for the front, back and inside.



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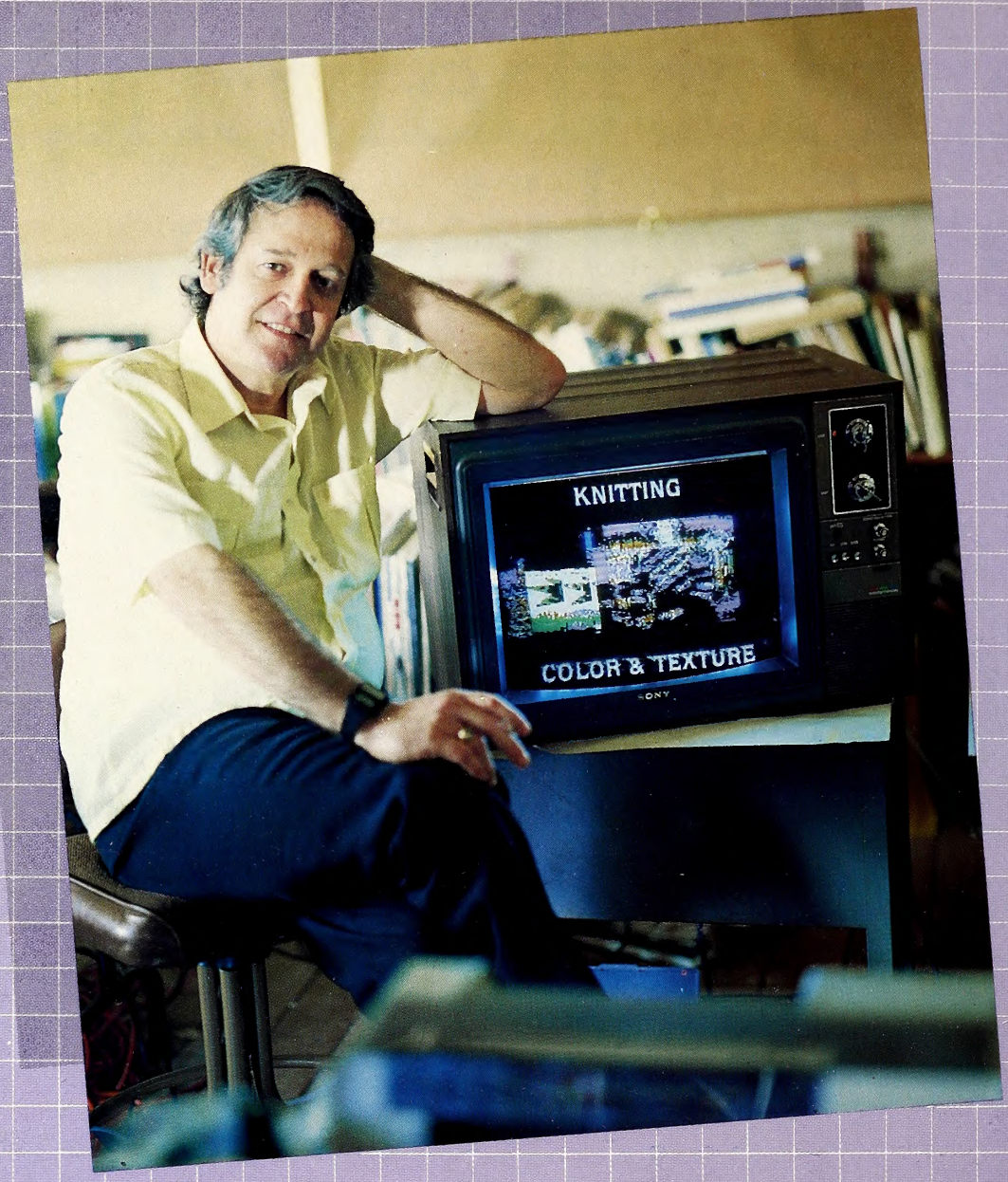
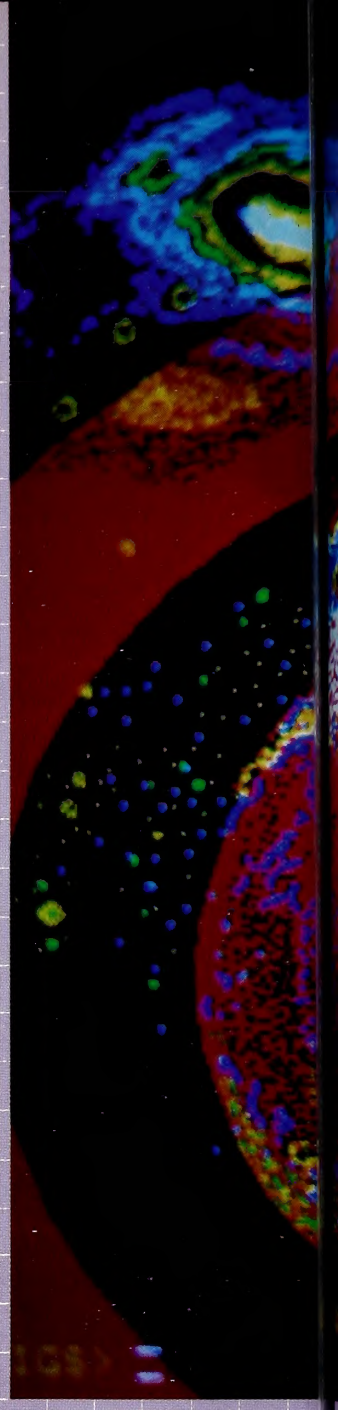
SAUL BERNSTEIN





Above: Saul Bernstein poses with a portion of the opening credits to his Emmy and West award-winning educational television show *Needlecraft*. Right: Einstein assumes his place among the other wonders of the universe.

THE FINE ART OF

BY HOWARD A. SHORE

The striking imagery of computer art is changing the way we look at the world by presenting us with detailed pictures of things only imagined.

At the Jet Propulsion Laboratory in Pasadena, California, graphic simulations of spacecraft in flight give us fantastic visions of things never before seen.

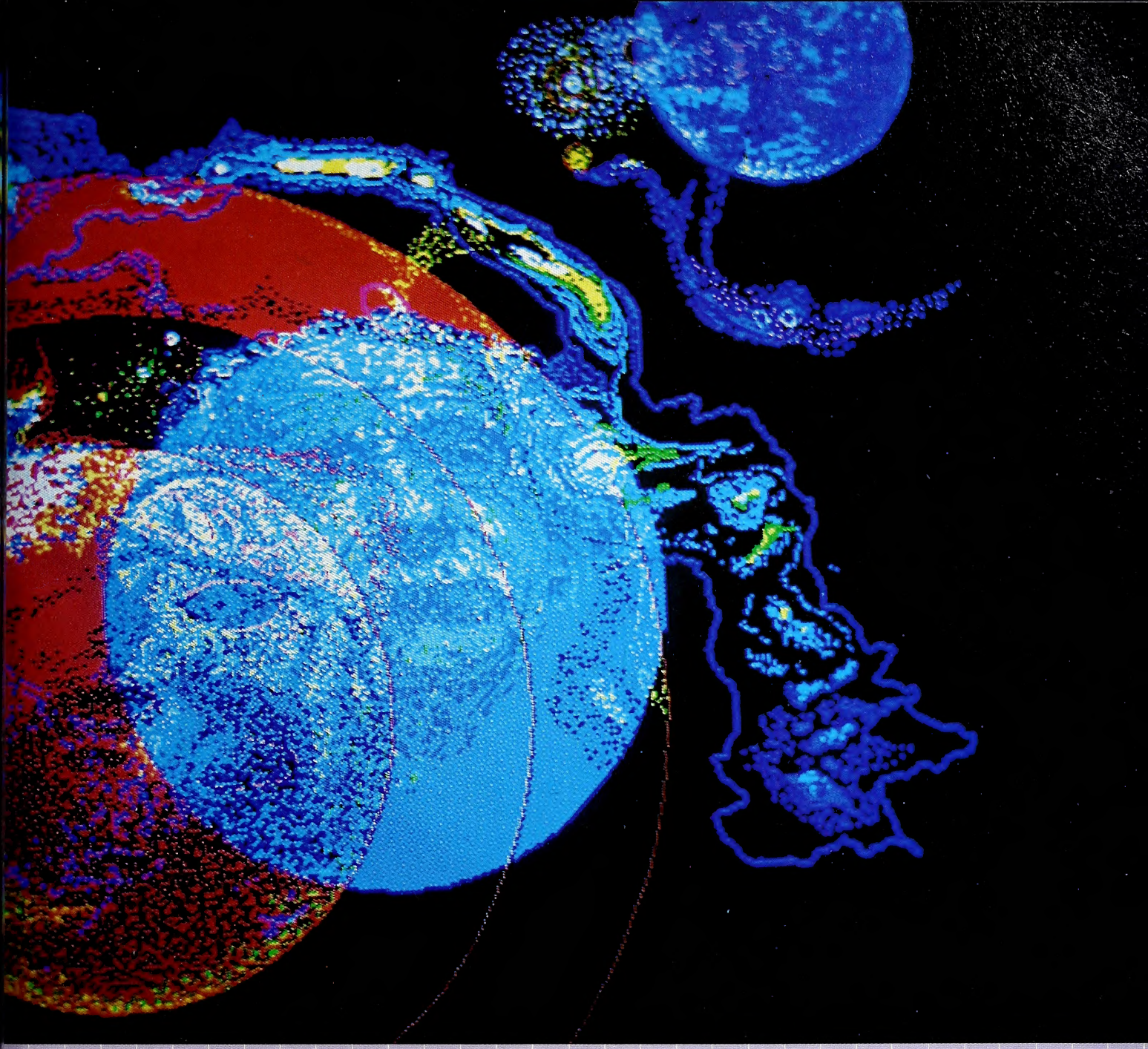
The motion picture *Tron* features a fantasy world in a computer peopled by anthropomorphized programs, a world where three-dimensional solids may mutate at will and massive multistoried conveyances defy gravity effortlessly. It is a magical world, created primarily by the computer artist.

But are these imaginings, these visions, truly art forms? Or are they, as some say, merely visual manifestations of our technological abilities, like the photographs taken while using an electron microscope?

From Computer Mozart to the Tube. Saul Bernstein is one of the leading authorities on microcomputer painting and computer/video interfacing. Famous in computer circles for his Einstein, Chaplin, and Mozart computer paintings on the Apple, Bernstein has earned even greater acclaim in the vast world of television, winning the prodigious West award for excellence in educational broadcasting as well as the coveted Emmy.

A professor of classical art at California State University at Northridge for the past twenty-two years, Bernstein seems eminently qualified to determine whether computer art is art—or the work of deranged computer programmers whose brains have mutated from overexposure to videowaves.

In his large ranch home nestled in the hills of rural Thousand Oaks, California, Bernstein has an assortment of tables, desks, and nondescript surfaces covered with photographic and electronic equipment, video cameras and recorders, monitors, printers, plotters, and graphics tablets.



COMPUTER GRAPHICS

Pictures, papers, printouts, slides, and other transparencies cover every surface, arranged in organized chaos. Huge bookcases filled with hundreds of record albums, tapes, and books decorate the opposite wall. Monitors are attached to a studio-quality three-quarter-inch Sony video recorder, as well as to an Intelligence Graphics System computer and an Apple III. The newest arrival, a Hewlett-Packard 2700 model computer, still sits in its box, awaiting a place amid the wires and equipment.

Relegated to the far end of the studio, tucked away in organizing bins, is a generous assortment of oil paints and supplies. Along the near wall hang ribbons and awards for Bernstein's oil paintings, none of which is in sight. It's obvious that he is as comfortable with twentieth-century technology as he is with seventeenth-century classical art.

"I've always loved art. I can remember as a child coloring used paper bags or anything I could get my hands on," Bernstein recounts.

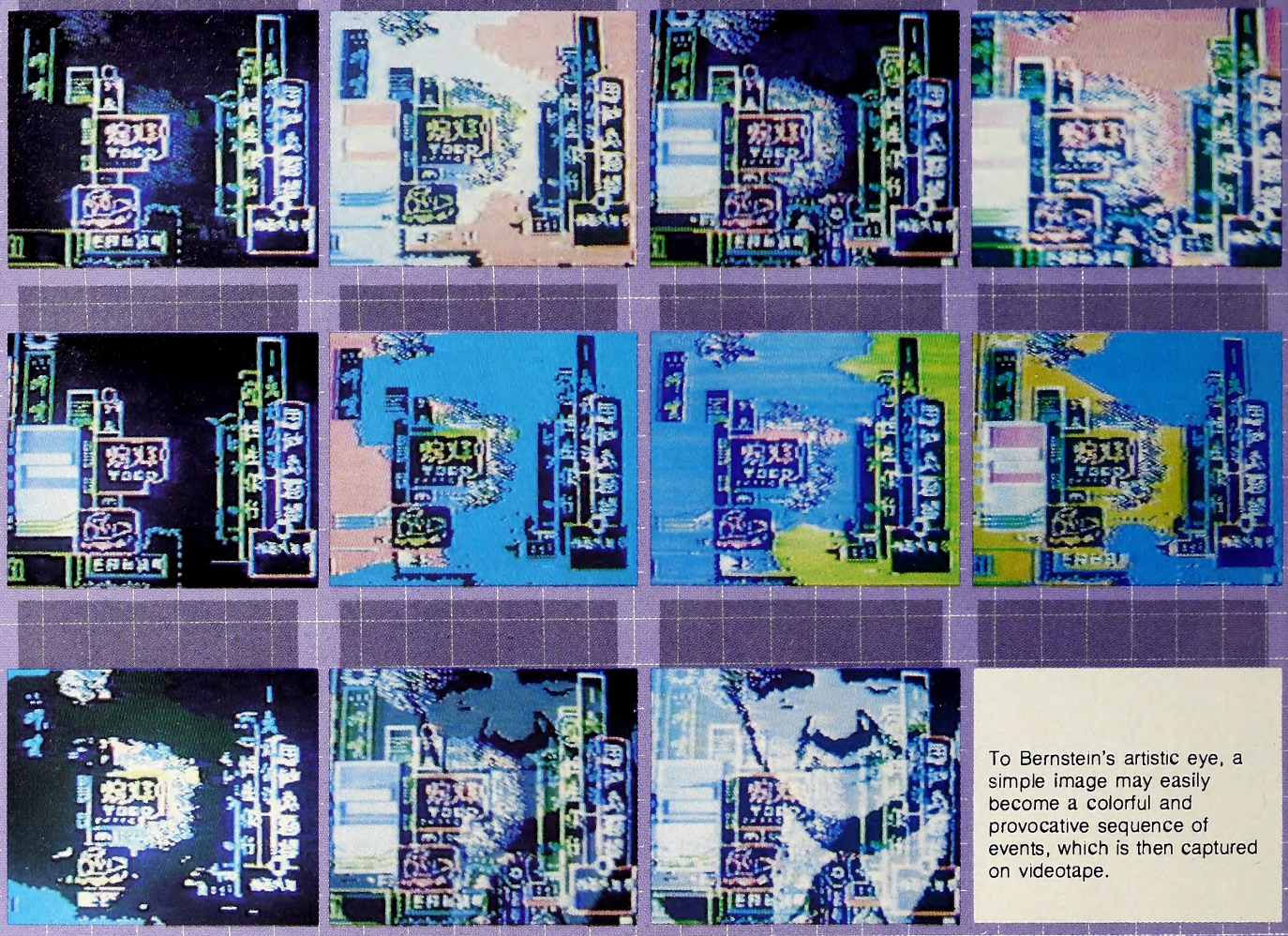
"Cecil B. DeMille inspired me when I was young. If I had had the money to buy a movie camera at the time, I might have ended up making motion pictures. Painting was my way of answering him."

It wasn't until Christmas of 1978, when Bernstein first caught sight of the color bars on the Apple II, that he decided he had to own one. He landed his first computer job the following March, when Datasoft asked him to do the illustrations for *Micro Painter.*

His computer illustrations attracted the attention of programmer Rod Mansfield, who helped teach Bernstein some basic programming techniques.

"It took me nearly three months on my own just to learn how to load and save files," he recalls. "I couldn't learn from the manuals." Bernstein pauses, gazing comfortably about the studio full of his work and work tools. "None of this would have been possible without the support and belief of the people at Apple. They were brilliant. Mike Markkula took a chance and bent over backwards to help me. He invited me to the National Computer Convention and used my Einstein illustration to help advertise Apple graphics. Bruce Hodge and Charlie Kellner, both highly skilled Apple programmers, helped develop much of the graphics software I needed."

BERNSTEIN



To Bernstein's artistic eye, a simple image may easily become a colorful and provocative sequence of events, which is then captured on videotape.

A Human Test Station. During the ensuing four years, Bernstein became a test station of sorts for software and hardware packages. "I've had an awful lot of fun. People send me programs from all over the world. I've traded my work for some of theirs."

Speaking of some of the other programmers who have helped him in his work, Bernstein cites Vern Bauman, who developed the software for an educational game for him, and Eric Popejoy, who designed much of the excellent special effects software, the dissolves and wipes, for Bernstein.

Bernstein has set up the Sony with a videotape of some of his work. Flames of color leap across the screen. "Watch this fill program. Bob Bishop did it. It's an erosion program; it finds out its own color and erodes the picture. Bob Bishop's probably the best programmer I've ever met."

The screen metamorphoses to reveal a computer illustration of a car. The picture on the screen appears to fold itself out like a spring. Bernstein grins, "This capability replaces the Qantel, which is about a five-hundred-thousand-dollar machine."

Dissolves that pour a picture onto the screen, texturing, animations, metamorphoses of all types reveal themselves on his videotape. Pictures become paintings, paintings become backgrounds for live action shots.

"All this was done in real-time on an Apple." The tape winds down and Bernstein reaches for another. "I even use the Apple to help teach my classes. It's especially effective when we're investigating the classics."

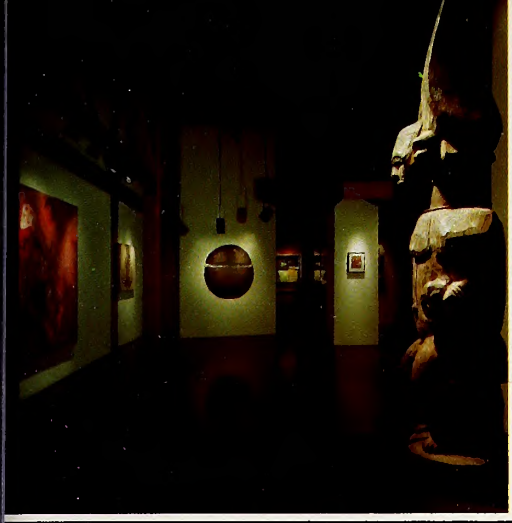
The new tape is a teacher. Bernstein speaks its accompaniment.

"Using computer technology," Bernstein's taped voice begins, "I trace the S curve along Eve's arm in this painting of Adam and Eve, by Peter Paul Rubens, and start the computer searching for other instances of that form.

"Students are inclined to think that the old masters are irrelevant because they were realistic and are now old hat, so to speak."

Even as he says this, the computer belies the students, outlining S curves as it finds them throughout the famous painting, proving the depth of meaning and abstraction in the artist of old. "The whole painting is composed of that one shape. The computer scans the painting and does a better job of finding the theme forms than I could. Since the computer does all the manipulations, I'm left free from any argument. I didn't do it; let them go argue with the computer. Well, it ends up that it's a terrific abstraction, relevant to their needs.

The subtle use of textures and shape highlights Bernstein's computer painting of David Bowie.



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BERNSTEIN

The Apple assumes a new role in an old classic. Here it can be seen tracing out an abstract S shape wherever it is encountered in this painting of Adam and Eve by Rubens. The abstractions Bernstein finds as he examines the classics are relevant to today's artistic needs.

"It leaves the student in a quandary, doesn't it?" Bernstein chuckles. "In other words, I say, 'Here's the tape, take a look at it,' and then I just get out of their way."

Unimagined Forms. A self-portrait by Rembrandt replaces the Rubens on the screen. The painting shows a full-face Rembrandt, but the computer sees more. Superimposed outlines bring out unimagined forms and devices.

"As you can see, the computer is finding a profile view superimposed with a three-quarter view. Not only did Rembrandt do this sort of thing, but Caravaggio before him, and Michelangelo before Caravaggio. Rubens, soon after Michelangelo, did it, too. In our own time, consider Pablo Picasso and George Brock."

Now the screen shows a computer-drawn silhouette entirely derived from lines found in the original face-on painting.

"The students have seen something and they're provoked. Now they either say, 'Well, the hell with it, I'm going to disregard it,' which is going to hurt their education, or they have to go for it—which means they have to study the old masters. Therefore, I win," he laughs. "It's very devious. I'm using twenty-first-century technology to explain seventeenth or eighteenth century painting."

From the time Bernstein was eight years old until he was twenty-six, the city of Los Angeles was responsible for his education: from public school during the day to scholarships at night and in the summer. "The state was terrific to me," he says. "Teaching is my way of paying society back."

Society's investment in Bernstein has been well returned to his students. "Back in the late sixties, during those campus protests, I remember seeing a girl carrying a sign that said, 'Make our education more relevant.' Best thing that could have happened to me. It was a turning point in my career."

Electronic Teacher. Searching for better ways to reach his students, Bernstein turned toward the most prevalent visual art form of today—television. "Before I used television, sometimes I felt like I was teaching seventeenth-century art like a seventeenth-century teacher," he recalls.

"Although the content of television is usually very bad, as a documentary tool it's terrific. It lets us remember the first step on the moon and the Kennedy assassinations. That's why the Super Bowl is so popular, because it's an event, and television does a terrific job with events," Bernstein explains. "What's a more eventful moment than an education? So I went ahead and built a TV studio."

Using an early black-and-white portable videotaping system, a simple special effects generator for titles, and a switcher for fades and wipes, Bernstein turned out 125 thirty-minute videotaped lectures composed of interviews and examples of art, which he used to supplement his courses.

"Of course, my earlier work didn't look as smooth as a CBS production, but the content was really super. And I did manage to quadruple my enrollment," he adds with pride. The administrators always managed to find the money he needed for supplies, shades, and video equipment.

Even when he's working with television, the educator in Bernstein

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BERNSTEIN

The tools of the contemporary computer artist are innumerable. This study of Richard Burton demonstrates the zoom and scale capabilities of the Intelligence Graphics System.

manifests himself. "I see the television tube as the greatest potential classroom in the world. It's no effort to teach people. I find a way for all companies that I work with to see a replay of the way I make a picture. If I'm working with an ad agency and I boot up the final picture, I show them the entire process, so that they become educated about how I designed the picture."

Form, Dissolve, Counterpoint. Bernstein's work on an educational television show entitled *Needlecraft*, directed by Harry Ratner, won him the Emmy and the West awards in 1981. Now the Sony comes to life with his tape of the show. "*Needlecraft* was almost all done with the computer," he says over the musical opening. His pictures form and dissolve on the screen, counterpointing the music. "All the transitions, the wipes, dissolves, everything, were done on the Apple II."

Because the Apple's output video signal is not directly recordable, Bernstein used the prototype video interface board, the VB-1, from Video Associated Labs of Austin, Texas. Now using the newer VB-3 board, Bernstein praises its capabilities as "dynamite. You can knock out the color, blur the effects, superimpose, adjust the color intensity, do all kinds of crazy things. Sometimes, as with the Intelligence Graphics System, I can't record the signal directly for the output, so I just videotape the images with a camera directly off the screen."

On the tape, a narrator describes several types of stitches while the computer draws them on the screen, demonstrating the various stitches, weaves, colors, and textures. "That's the old Venetian blind game," explains Bernstein. "The normal Apple transition, used just for the effect."

Speaking about computers, Bernstein says, "Sometimes I'm glad I don't know their limitations. I keep trying to push the machines; sometimes I get results that surprise even their creators."

Sometimes the results surprise even Bernstein himself. "I only let out of the studio about 20 percent of everything I do—not that I'm ashamed of the other 80 percent. But when I get done with a project and look at it, I say, 'Goddamn it, it could be better.' The client may not even know, but I'll have done his job again and again until it's exactly what I want.

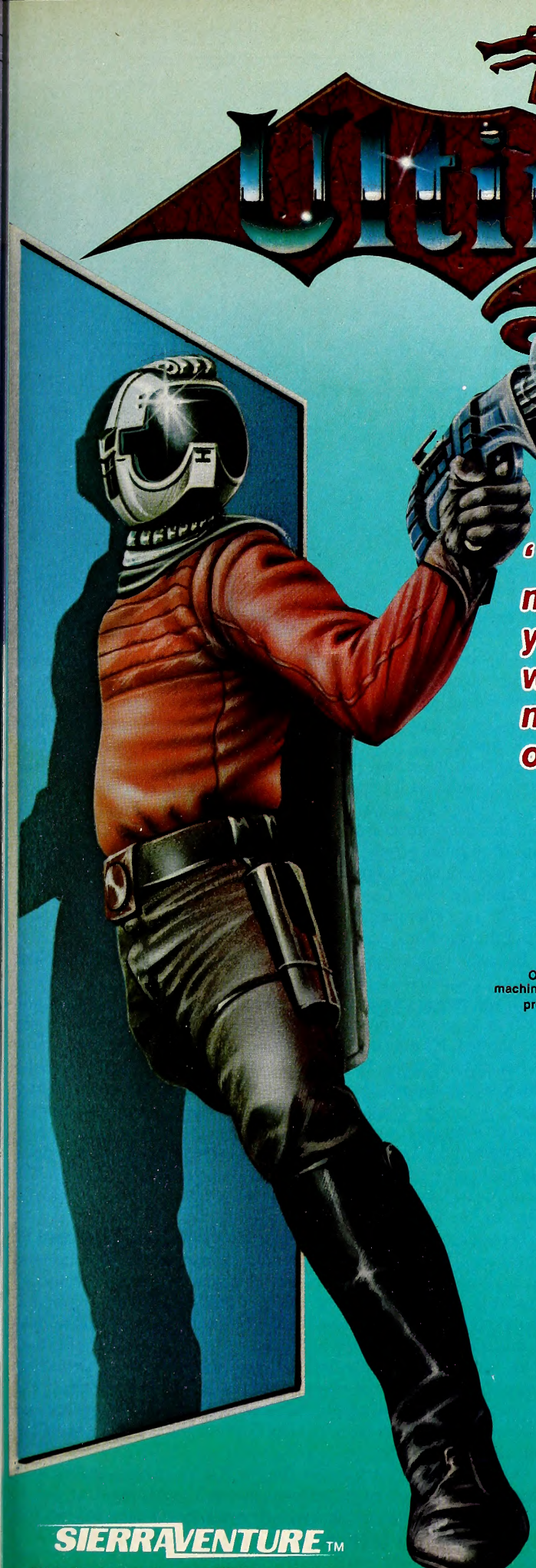
"That may be the artist in me," he says. Bernstein identifies with an old shoemaker: "I want to make every nail count; I want to make the whole shoe."

Luck has little to do with art, says Bernstein. "I believe art is a combination of talent, training, and hard work. Play is important too, if it's disciplined play; it helps get the creativity going."

Convinced that failure is often a better teacher than success, Bernstein explains, "When you have a success, you're so goddamn busy doing it that you really don't have time to think. But when you have a failure and the hurt has passed, you sit down and analyze exactly what went wrong, and what in your mode of operations enabled it to go wrong. If you learn those reasons, before long you replace them with things that might lead to success."

It's a lesson some people choose to ignore. "You hear people bitching about their failures: 'Why didn't I go to school?' or 'Why didn't I buy a computer?' They prey upon that and, looking for a scapegoat, they blame society."

Ultima II ©



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BERNSTEIN

Saul Bernstein paints Leonard Bernstein on an Apple III. Aside from their great love of the fine arts, the Bernsteins bear no relation. As Saul Bernstein predicts, "Someday the Picasso of the computer medium will come around. I think it's that important."

Bernstein believes that societies are remembered for their major contributions to world history. "The ceiling of the Sistine Chapel," Bernstein says, "was a large billboard selling God." He adds that this could only bear relevance in a monotheistic society.

"Here we have a melting pot. If I did a picture of what I thought God looked like, I'd have fifteen cults and thirty-two religions down on my neck in a minute. I wouldn't be communicating at all. Religion is not really where we are as a society.

"Ours is a technological, communicative society," he says. And as he considers where in fact we are, Bernstein's excitement approaches a benevolent zeal that may well be called religious. "We have landed on the moon, and we had the great ability to send the first pictures back to the whole world."

Although the money is good and seeing a project finished is great, Bernstein considers his biggest reward to be meeting with "bright people who feel I have something to contribute." Winning an Emmy is certainly an acknowledgment from the television industry, to which he has already contributed greatly. "I'll never forget my mother's and mother-in-law's reactions when I won the Emmy. That was worth the whole shot."

Paintings versus Computer Images. The Sony's screen is dark, its reels still. Late afternoon sunshine glints off a window jamb, and it's time to call the question.

Bernstein begins with the artist's relationship to and interaction with society.

"If you're well trained and you spend a lot of time at your craft, you owe it to society to expose your ideas. The better you are, the more you are obligated. It's only through that kind of interaction that you grow."

His pictures have the texture of paintings rather than computer images, says Bernstein. "My goal as an artist is fine art, whether on canvas or on a video screen, and whether an image gets on paper using a brush or a printer."

Imagine how Leonardo da Vinci's inspired work on human anatomy might have profited by the gift of today's modern technology. The use of X-rays, sonar, and infrared would certainly have had profound effects on the fifteenth-century artist.

Bernstein believes artists of the past have always been influenced by technology. The great masters were not only great artists, but engineers and scientists as well. Da Vinci was an architect and an inventor. El Greco was found to have kept a large collection of books on optics. Rembrandt was known to have studied the newly emerging field of etching called aquatint. Goya left his home to study the new field of lithography, a field subsequently furthered by Toulouse-Lautrec. Degas was certainly influenced by the advent of the camera. And all painters of the time benefited by the discovery that paint could be mass-produced and marketed in tubes; with the portability this brought, the whole world became the artist's studio.

"I'm convinced that someone, maybe not me, who is dealing with computer artwork will be remembered. I think it's that important. Someday, maybe the Picasso of the computer medium will come around and maybe I'll become a footnote.

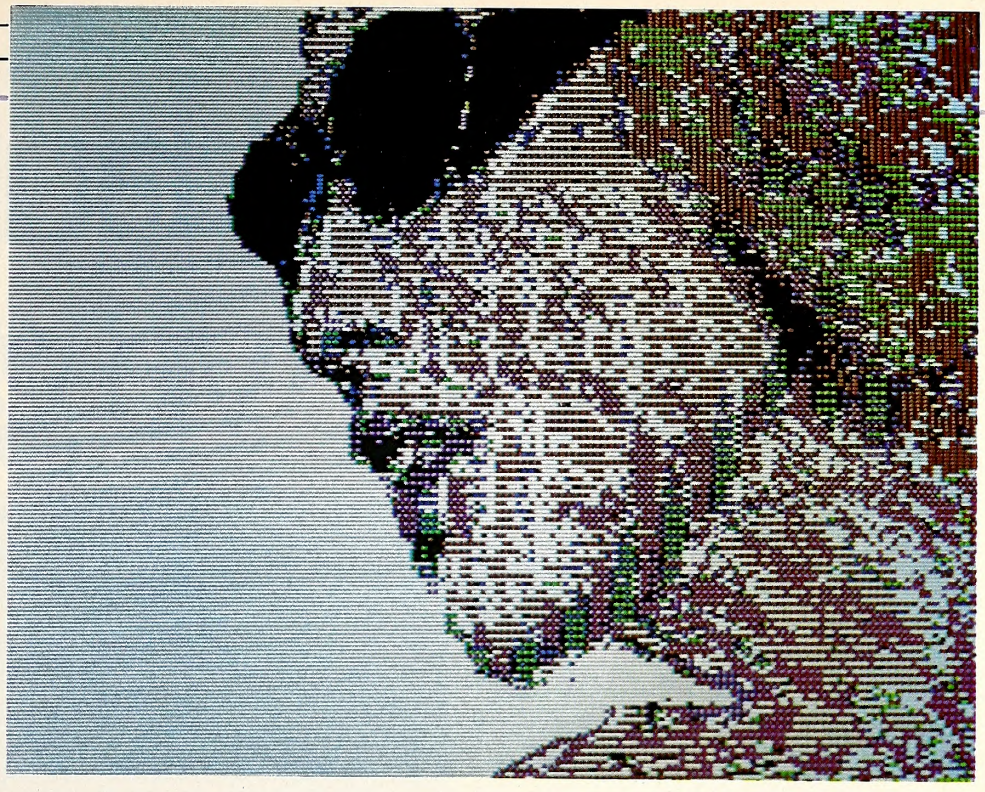
"Well, if that's the way it is, that's the way it is." ◻■

THOMAS PORETT

Title: Softlands

Artist: Thomas Porett

Medium: Apple II Plus



A scene from Tom Porett's performance piece *Softlands*. More scenes are in this month's Fastalk.

Thomas Porett has an impressive background in the visual arts, beginning with the master's degree from the Illinois Institute of Technology's Institute of Design. He has worked extensively in photography, electronic music, and computer art.

Currently an associate professor with tenure at the Philadelphia College of Art, Porett has recently created an impressive collection of artworks that Apple owners will soon be able to enjoy in their own homes. The package is called *Softlands* and comes complete with forty-eight color and black-and-white prints, two disks containing four performance programs, and a cassette of electronic music.

The process by which Porett created the images in *Softlands* is not overly complicated; indeed, the simplicity of the method ensures maximum quality for the finished product. Porett has taken 35mm slides and digitized them, storing the image on disk. He then takes the image and modifies it, as he sees fit, with a graphics tablet and mostly off-the-shelf software.

Three of the prints from *Softlands* have been purchased by the Center for Creative Photography in Tucson, Arizona, for its permanent collection. The prints are conventional dot-matrix printouts from an Epson MX-80 using Pkaso, an intelligent printer interface card from Interactive Structures.

This is high praise, and Porett is very pleased that "mere" printouts have been accepted for permanent display. Tucson is a long way from his current residence in Ardmore, Pennsylvania, but Porett wouldn't care if it was Nepal.

The complete *Softlands* package is a change of pace for the industry. You don't just admire a word processing program or game; you write or play. *Softlands* allows you to sit back and let the Apple entertain you.

One program is called *Softland* and is roughly equivalent to the title track of a record album. For *Softland*, Porett constructed a databank of shapes, with shifting colors, that continuously combine and recombine into landscapes and scenes. Theoretically, the program could run forever; a copy ran for two weeks straight at a gallery.

"It's like a live painting," says Porett, "though it's possible to stop the program and save a screen."

The three other programs on the two disks are *VisiDig* (as in VisiDigitizer), *Masks*, and *Animal Dreams*. They are "slides-cum-movie," says Porett, and vary in length from two to seven minutes. They're meant to run in synchronization with the soundtrack.

Porett interfaced an Arp 2600 analog synthesizer with his Apple to create the soundtrack for *Softlands*. "I used the Apple as a digital echo chamber and digital sequencer, with the help of an Interactive Structures card, to create the electronic music."

A minor inconvenience is having to synchronize the starting of the soundtrack and the tape manually. It's possible to interface a tape player and the Apple, but that requires a solenoid configuration and interface that is not normally part of an Apple's equipment.

The twenty-two color prints included with *Softlands* are photographs of RGB screens using twenty-two colors in the printing process. The black-and-white prints are photocopies of Epson-generated printouts.

Porett first discovered the Apple about three and a half years ago through his good friend Joe Wilson, president of Interactive Structures. At the time, Porett was only interested in interfacing the Apple with the Arp synthesizer and only later realized its graphics potential. Now he can't get enough of it and declares that the Apple will continue to be the medium for his art in the foreseeable future.

"I saw a company at the San Francisco Applefest last November that was offering a board with terrifically high resolution. I also want to explore the double-density graphics of the Apple IIe. Now that is very interesting. It could be a whole new level."

Porett is currently writing a program he refers to as an "interactive image fiction." He's also investigating mural-size blow-ups of some of the images he generated for *Softlands*.

A prolific individual, Porett also copublishes a magazine on the Source called *Muses*. And at the Philadelphia College of Art, Porett teaches in the photography and film department. "We're edging toward the computer era," he says.

Computer artists are just now acquiring wide recognition for their work. A hundred years from now they may be the only kind of artists we have. So hail the pioneers! Porett, Saul Bernstein, and a host of others deserve encouragement and praise. To them, graphic computers are more than just windows to arcade games and pie charts.

To them, microcomputers are windows allowing an infinite number of ways to look at our world.—*David Hunter* ■

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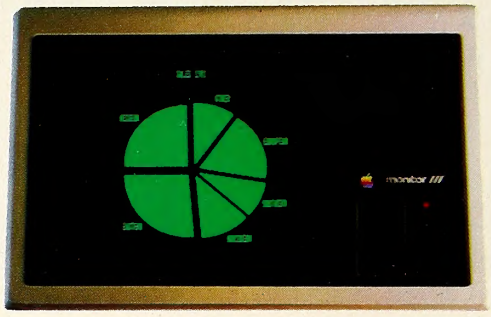
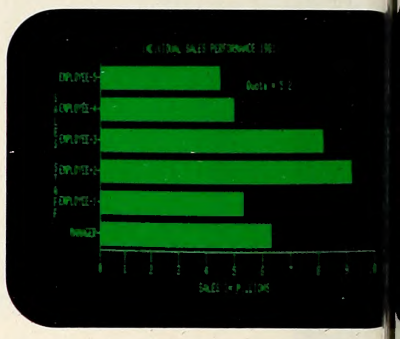
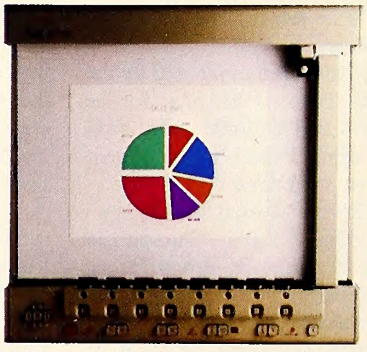
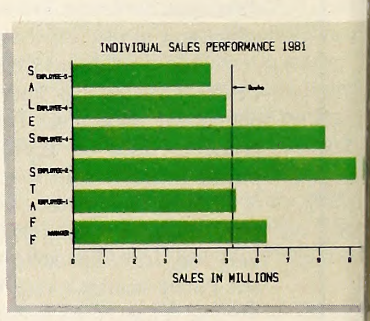


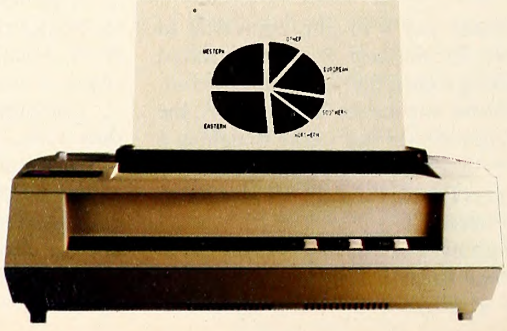


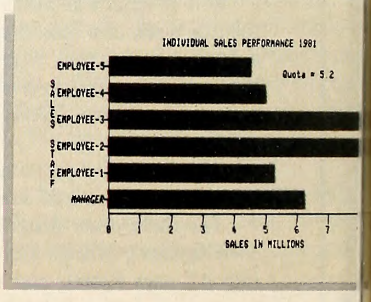
	Apple	VisiTrend/ VisiPlot	pfsGraph
Graph Types			
Line	Yes	Yes	Yes
Vertical Bar	Yes	Yes	Yes
Horizontal Bar	Yes	No	No
Side-by-side Bar	Up to 4	2	4
Pie	Yes	Yes	Yes
Partial Pie	Yes	No	No
Scattergram	Yes	Yes	No
Curve Fitting	5 Kinds	1	None
Data Points (Max.)	3500+	645	36
Plotter Compatible	Virtually Any	None	H-P7470A Only
Compatible File Types	Pascal BASIC VisiCalc	BASIC VisiCalc	pfs VisiCalc
Math Functions	Yes	Yes	No
Available Colors	6	4	4

Apple Business Graphics is available for both the Apple II and Apple III.









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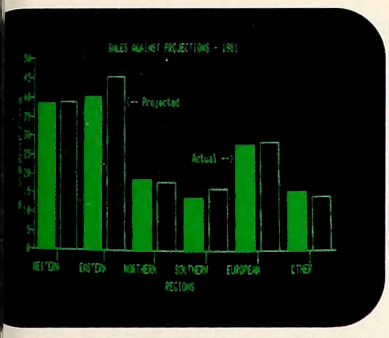

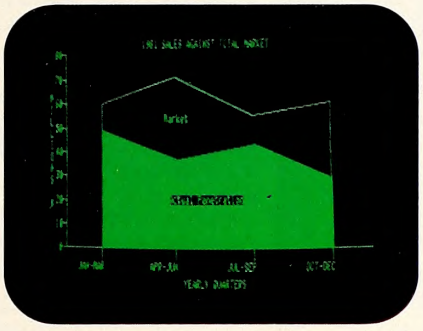

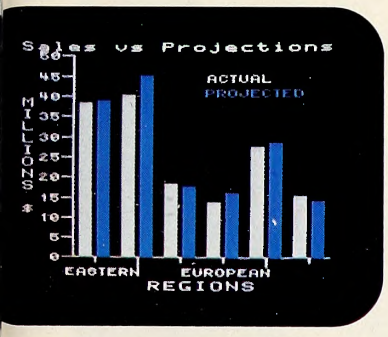

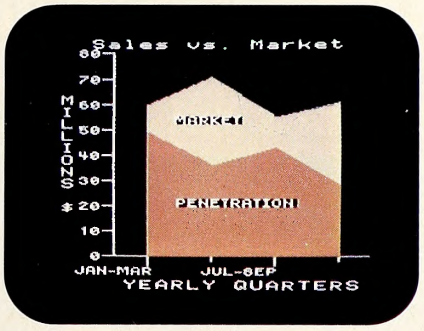

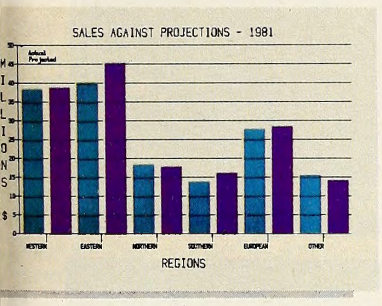

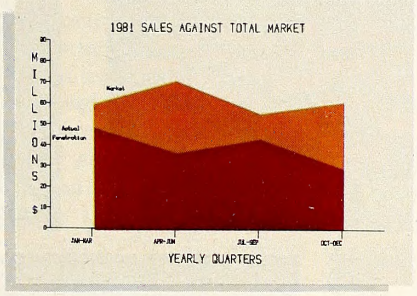

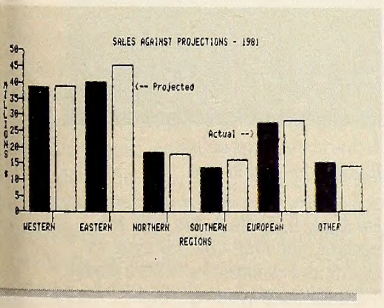

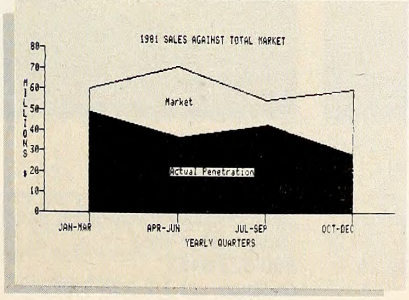

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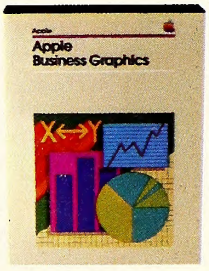

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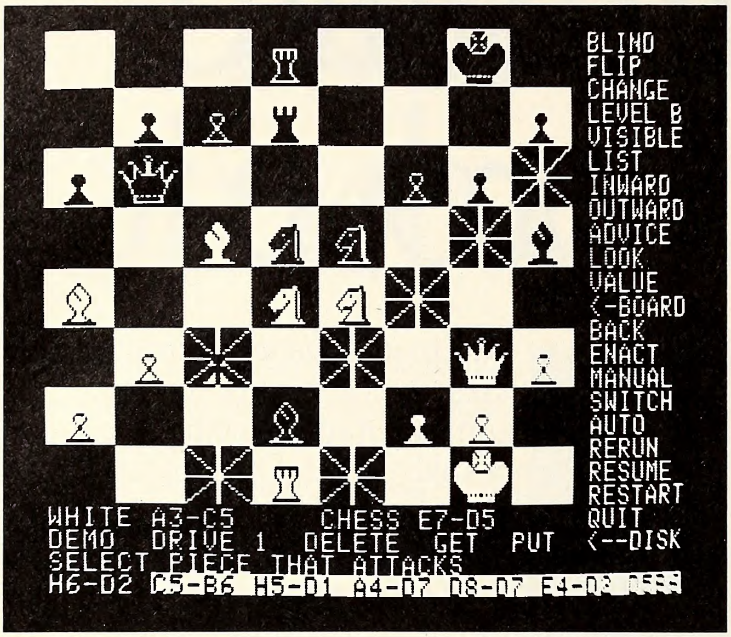

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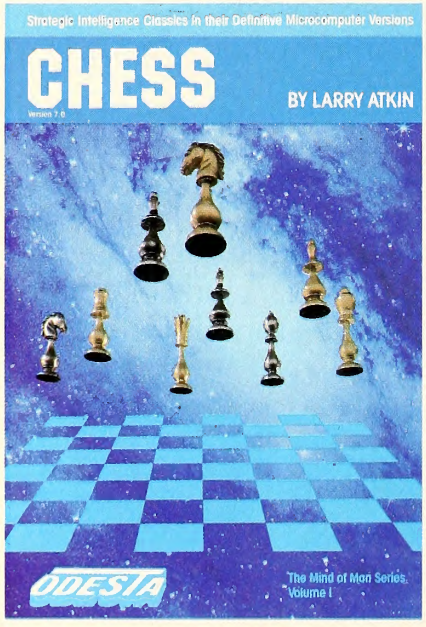
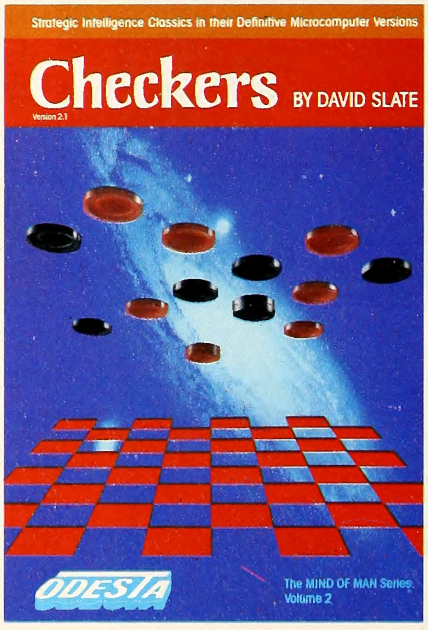
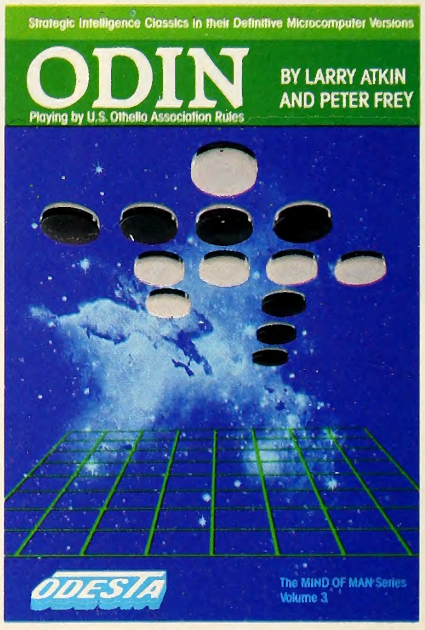
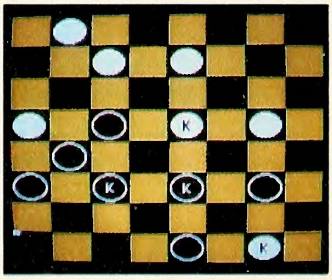


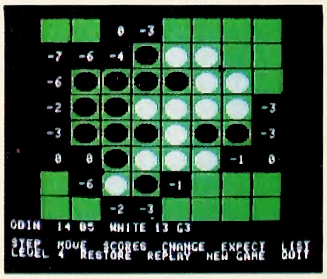




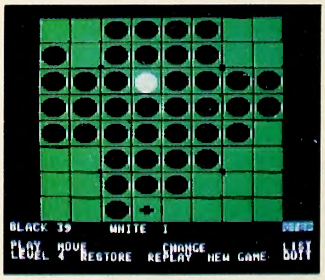
Checkers' features



Block to move and win
(From Checkers documentation)



"Scares" feature in Odin



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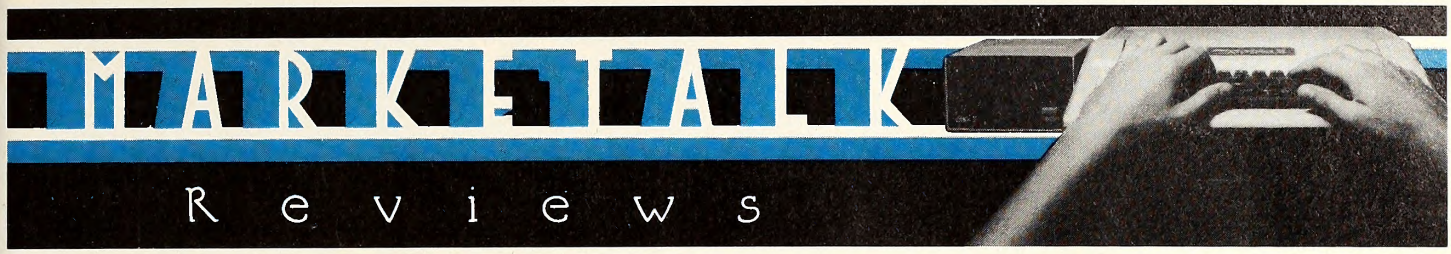

Unless otherwise noted, all products can be assumed to run on either Apple II, with 48K, ROM Applesoft, and one disk drive. The requirement for ROM Applesoft can be met by RAM Applesoft in a language card. Many Apple II programs will run on the Apple III in the emulator mode.

Caverns of Freitag. By David Shapiro. In this game, Friday's child is long, green, and scaly and breathes fire. Freitag (whose name means Friday in German, a fact of no apparent significance to the game) is a dragon who lives in the caves of the Enchanted Isles, awaiting the arrival of foolhardy adventurers to chow down. Perversely enough, Freitag seems to enjoy only tough adversaries, for he subjects the would-be heroes to an array of monsters and undesirables fit only for nightmares.

In short, *Caverns of Freitag* is a sword-and-sorcery fantasy. In this case, the game is long on the sword part and rather skimpy on the sorcery. As a Thechu warrior, out to free the Enchanted Isles from the reign of terror imposed by the evil Freitag, you know but one spell: the "Charm of Sir Robin." This spell turns you into a long-legged bird, possibly the offspring of an ostrich and a dodo, that can run twice as fast as anything in pursuit. However, this spell has definite drawbacks. As a bird, the adventurer tires quickly and must stand still to rest when the spell wears off, which allows the pursuer to overtake and pummel its hapless prey. Nevertheless, the "Charm of Sir Robin" comes in quite handy sometimes.

The hardy warrior is expected to rely heavily upon weapons, the sword and the bow, amid the abundance and viciousness of the caverns' denizens. The monsters include electric moths, serpents, flamebats, burbleblorts, invisoids, offensive (in all senses of the word) wizards, griffins, and the deceptive mimics. This gang has a tendency to home in on the hero with reckless abandon. Often the monsters stand in line in a narrow corridor patiently waiting their turn to trounce the warrior.

The game begins at an inn at the western edge of a vast labyrinth of tunnels. The hero, a lowly stable boy, is equipped with sword, shield, bow, and twelve arrows. Within moments of his stepping away from the inn, sometimes even while he's still lodged at the inn, the monsters begin to converge. Game controls allow the player to select the amount of time used in each move, but even at the slowest speed the action is quite fast. In each turn the hero and the monsters are allowed one action or move; should the player be torn by indecision and let time pass while trying to figure out what to do, the monsters will move anyway. Being fast on your feet is just one of the necessities in playing this game.

The game controls, keyboard only, take but a few minutes to master—although owners of Apples with type-ahead buffers or repeating keys face a challenge all their own. As you get worked up, the tendency to pound the keys furiously can result in a warrior literally pounding his head against a wall while the surrounding monsters chew him to pieces.

Two controls we've come to know and love are missing: there's no save-game or pause feature. This means that, once the game begins, there's no turning back and no room for interruptions. Since the monsters will move even if you don't, you'd better forget about quick trips to the fridge. Certainly, only the hardiest of adventurers will be able to finish the game. And this is undoubtedly just what author David Shapiro had in mind. Perhaps *Caverns of Freitag* should be advertised as a test of stamina and endurance.

Nevertheless, the game is a whole lot of fun. Because of the forced moves, the pace of the game is quite fast and the play very intense. Incidentally, slaying the dragon doesn't end the game. The weary adventurer must now fight all the way back to the inn—with every monster in the dungeon engaged in a personal vendetta against him.

Caverns of Freitag is Muse's first major game since *Castle Wolfenstein*, and it's a worthy successor. The hi-res graphics are delightful, the game quick-paced. *Freitag* could easily prove another blockbuster for them, every day of the week. DA

Caverns of Freitag, by David Shapiro, Muse Software (347 North Charles Street, Baltimore, MD 21201; 301-659-7212). $29.95.

Metatrak II. By Scott Gibbs. *When I was growing up and learning to play the piano, my parents ceremoniously marched me to the recording studio once every six months or so. Once there, I was placed at a monstrous concert grand. The engineer came in to adjust the microphone, then disappeared to put a virgin black disk on the cutting lathe. When the light went from green (standby) to red (record), every sound that came out of the piano (wrong notes, sloppy timing, and uneven dynamics included) went into the disk for all of posterity to hear. For a musician of my caliber, then, it was a no-win situation, guaranteed to yield nothing but frustration and embarrassment.*

No more! Nowadays, recording studios are equipped with multitrack tape recorders. With these recorders, musicians can conveniently record one track or more at a time, while correcting mistakes in individual tracks by "punching in." Then they can mix the corrected tracks into a final piece of music.

This method is standard procedure with producers of music for album, film, and TV. It enables small groups of creative musicians to build complex sounds in the same way that a painter "builds" a painting, one "color" at a time, until the desired effect is achieved. In fact, multitrack recording has become so popular that many top recording artists now have their own private multitrack recording studios. Semiprofessional multitrack recorders, costing one-tenth as much as their fully professional cousins, are now available in musical-instrument stores throughout the world.

The Syntauri people have created the *Metatrak* software to bring the basic concepts of multitrack recording to their famous AlphaSyntauri digital synthesizer. The *AlphaPlus* operating system sets up three main types of files, defining a sound's wave form; the overall shape, or envelope, of a sound; and patterns of pitches and loudness. All these are controlled by the manner in which the musician plays the Alpha keyboard.

Metatrak uses much of the *AlphaPlus* system to produce tone colors and keyboard performances. It arranges and manipulates tone colors so that as many as ten colors are available at any one time. A musician may build a piece of music one track at a time, assigning any of the tone colors to any of sixteen tracks.

Metatrak's commands actually closely parallel the control labels and functions of a conventional multitrack tape recorder: record, play back, erase, fast forward, and punch in/punch out. Here is how a typical "session" works:

The musician selects a preset master (a group of ten tone colors) or develops one with *AlphaPlus*. This step is analogous to hiring session musicians in a conventional recording studio. Then the track master display is used to assign tone colors, loudness values, and vibrato parameters to each of the sixteen tracks. This is similar to setting up microphones and adjusting levels.

One of the tracks is put into record mode. The musician starts the recording by playing on the music keyboard. He can hear what he's playing at the same time. The musician then puts a second track into record mode. He hears what is on the first track, as well as what he is now playing.

The process continues until the entire piece of music is recorded or all of the channels are filled up. At any time, the musician may edit a track by placing it in record, exercising the punch-in command at the beginning of the section needing additional work, playing over that portion, then punching out. As tracks are completed, they may be stored on disk.

Finally, the musician adjusts the tone colors, volumes, and other musical parameters of the individual tracks until they sound right together—the "mixdown" of the complete piece of music.

From the user's point of view, *Metatrak* moves easily and briskly through its functions. Tone-color selection is virtually instantaneous, single control characters set the recorder modes, and data entry on the track master and other displays is effortless. *Metatrak* is loaded with bells and whistles, features that are potent resources, handy facilities, or just fun to use. These features include a built-in programmable metronome, microtonal tuning, and programmable keyboard splitting that enables the user to play more than one tone color at a time. The new *Metatrak II* has the added feature of synching the output of the system to reel-to-reel tape recorders and to drum synthesizers.

There's a bottom line for evaluating any music system: when you work with it, does it feel good and enable you to do what you want, or does it get in the way and create frustrations? *Metatrak* is definitely a satisfying musical resource. Its range of tone colors and accuracy of recording make it useful for serious production of recorded electronic music. The well-written manual and carefully thought-out software routines make using *Metatrak* a rewarding activity. RM

Metatrak II, by Scott Gibbs, Syntauri (3506 Waverley Street, Palo Alto, CA 94306; 415-494-1017). $275.

Sherwood Forest. By Dav Holle and Dale Johnson. If it seems *Softalk* is telling you almost every month that some new adventure has the best graphics yet, you're reading correctly. Adventure graphics are making such rapid strides that three adventures, released nearly three months in a row, have indeed topped each other and everyone else with the quality of their pictures.

First there was *Transylvania*, from Penguin, that broke no particularly new ground; it simply had very well-done, attractive graphics. Then *Mask of the Sun*, from Ultrasoft, broke so much ground that it dug a huge crater. It lets you see where you're going as you move from place to place; the colors never fill in on-screen; and characters, icons, even doors are animated at times. And the general graphics are almost as good as *Transylvania*'s.

Now, comes *Sherwood Forest*. Having chosen a cartoon style of graphics, Phoenix has executed them with a sharp, clean, professional quality that appears to have been done on a drawing board rather than a computer. The colors are bright and clean and look as though they were all available as is. Round objects are smoothly round; nothing melts into anything else. Does the picture refill on-screen? Yes, but if you blink you'll miss it. And there's animation—not a whole lot, but what there is is realistic and beautifully done.

So, despite repetition, *Sherwood Forest* has the best graphics yet in a graphic adventure.

The adventure is fun to play, too. If you're bored unless you get to kill something, don't play. In *Sherwood Forest*, the player gets to be Robin Hood—only he's been away and none of his friends recognize him.

As Robin, you have to reestablish yourself with your friends and win the heart of Maid Marian, marry her, and outwit the disagreeable Sheriff of Nottingham to take your rightful place in the castle. Castle? Oh, well, nobody said it had to be perfectly true to the legend.

The puzzles are fun and mostly logical; some are pretty difficult and others pretty easy. Almost all of them require that you keep your eyes open and read all the descriptions carefully. The story hasn't great depth; but it's light, humorous, and enjoyable to play.

There's warm, refreshing sunshine streaming through the trees of Sherwood Forest. MCT

Sherwood Forest, by Dav Holle and Dale Johnson, Phoenix Software (64 Lake Zurich Drive, Lake Zurich, IL 60047; 312-438-4850). $34.95.

Cdex Training for VisiCalc. By Steven C. Brandt. Imagine you own a company with a number of people who could profitably use *VisiCalc* for various simple tasks. How do you train them to use it without wasting as much time training as they'll spend using the program?

Cdex Training for VisiCalc is one way of doing just that, a way that uses the strength of the Apple itself. Just put the first disk into the drive and boot the machine. What unfolds is a graphic, interactive explanation of *VisiCalc*'s most basic commands. As such, *Cdex* does a good job.

The three-disk set earmarks two disks for basic training, the third reserved for refresher use. Disk 1 teaches how to use the program, key terms, moving the cursor, labeling columns and rows, entering values and formulas, and working with functions. The second disk continues with using *VisiCalc* commands, saving and retrieving, printing, and replicating. The reference disk covers components, labels, values, formulas, functions, and commands.

The manual has references to the various commands, some examples to be entered into the Apple, and some exercises to be typed in.

As far as it goes, this is a good way to learn *VisiCalc*'s main strengths. It's the temporary-help approach: within a very short time, the trainee can perform beginning jobs. It doesn't give in-depth coverage. Explanations about the special functions of *VisiCalc*, such as @SUM, are not given. Also omitted are templates, DIF, and the other, more exotic elements that combine to give *VisiCalc* its strength.

Nevertheless, for a time-short individual who wishes to learn or teach *VisiCalc*'s basics in a hurry, quickly and painlessly, this is a good approach, well executed. DRA

Cdex Training for VisiCalc, by Steven C. Brandt, Cdex Corporation (5050 El Camino Real, Suite 200, Los Altos, CA 94022; 415-964-7600). $49.95.

Dawn Patrol. By TSR Hobbies. Is it a flight simulator or a shoot-'em-down dogfight? As a real-time hi-res simulation of plane-to-plane dogfights in World War I, *Dawn Patrol* leans to the fight. Choosing any of twelve World War I-era planes, the pilot must outmaneuver and destroy enemy aircraft.

On the slight chance that you're a novice at flying circa 1915 planes, *Dawn Patrol*'s training mode lets you practice in safety. There in the training mode, where enemy planes are merely dummies placed in your field of vision as reference points, you can learn to accelerate by hand via throttle, steer by foot with rudder pedals, and pull yourself out of accidental rolls and untimely dives with the all-powerful control stick. Once you've got her nose-down and stabilized, you can check your gun and look around.

Makers of Raster Blaster winner of the Softalk Award for most popular program of 1981.

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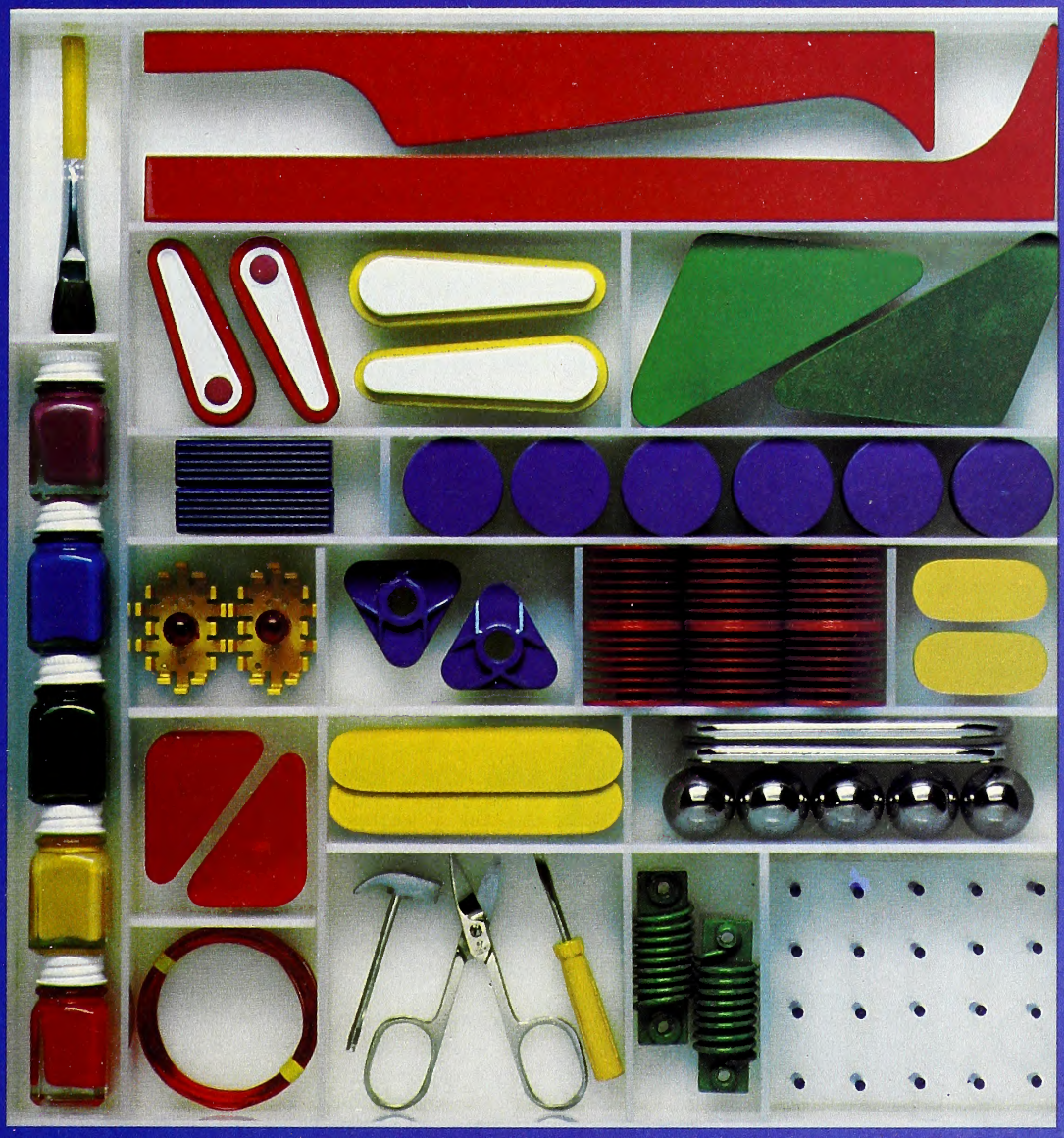

BudgeCo announces The Pinball Construction Set, the first entertainment software that has the simplicity and freedom of interaction of a toy. You don't use this program—you play with it.

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What you'll see is everything where the plane isn't. Where the plane mostly is (you did pull out of that roll, didn't you?) is beneath you, so you can't see that dear old solid ground. You can see in five other directions—up, forward, behind (those sneaky devils), and to either side. Bits of some of those views will be blocked, too, depending on which plane you're flying.

Okay, now you're an expert—aren't you? And if you don't get out of training and start the game soon, you'll probably miss the whole war.

Talk about white knuckles! Magic Mountain has nothing on this. And there's no way those dummies could prepare you for the real thing. These guys mean business. Will you return from battle an ace or a statistic? Chances are you'll build up enough statistics to feed *Daisy* for a month before you make ace.

But you'll have a heck of a lot of fun along the way. And mastery will give you well-earned satisfaction. **DAD**

Dawn Patrol, by TSR Hobbies (Box 756, Lake Geneva, WI 53147; 414-248-3625). $25.

Dungeon. By Bruce Nesmith and Keith Enge. The original fantasy role-playing company, TSR, makes its first foray into computer gaming with *Dungeon*. TSR is best known as the company that introduced *Dungeons and Dragons* to millions of game players. *Dungeon* is an exact adaptation of TSR's bestselling board game of the same name.

The setting is an eerie, six-level dungeon. Monsters lurk in every room, guarding valuable treasures and magic weapons, and fierce chamber monsters roam the passageways. In the depths of the dungeon, the monsters get stronger and the value of the treasure becomes greater. There are traps to avoid, and parts of the dungeon are accessible only through secret doors, which players must discover.

Up to eight players can play at one time, each person playing individually. Players choose their persona: elf, hero, superhero, or wizard. Elves are the weakest of the characters, but they excel at finding secret doors. Only wizards can cast magic spells.

People who are trying fantasy role-playing for the first time needn't feel intimidated by *Dungeon*. There are three levels of difficulty available; they vary in danger, capacity (only elves and heroes can venture in level 1), and potential success (the rewards are greater and more is needed to win on successive levels).

The dungeon is laid out two-dimensionally. All six levels are shown on one plane, with each level accessible from a neighboring level. The hi-res map duplicates the board of the board game.

What doesn't duplicate the board game is the hi-res representation of characters and monsters. When a character enters a room, the screen zooms in on that room, with pictures of the room's occupants. If they're monsters, combat ensues, resolved by the computer. If the player is victorious, the screen shows a picture of the treasure. Although these images aren't generally animated, they encourage the feeling of being in the dungeon much more than playing with miniatures.

Where animation does occur, it's done excellently. The wizards' spells, throwing fireballs and hurling lightning bolts, are animated. Fireballs burst from wizards' hands, growing larger as they fly across the screen to blast monsters. The illusion is exceptional; you can almost feel the heat of the fireballs.

Besides vast amounts of gold and silver, there are special treasures and magical items to be found. A secret door map discloses the location of all the secret doors. Magical swords add to the power of their owners. ESP medallions give the adventurer the ability to peer into a room before entering—very useful if the monster in the room is a red dragon! And rare crystal balls enable their possessors to gaze about an entire level and spy the treasures held by the monsters.

Dungeon is a good game for learning about the universe of fantasy role-playing. For kids and adult beginners in the genre, it's a fine, enjoyable training ground. Now if the people at TSR could just figure out how to improve the graphics and add full animation, they could bring living D&D to the Apple. What an experience that would be! **RRA**

Dungeon, by Bruce Nesmith and Keith Enge, TSR Hobbies (Box 756, Lake Geneva, WI 53147; 414-248-3625). $25.

Beamscope II. *Electronic Games* raved about it. *Video* swooned. *Computer Gaming World* ignored it. And actually, the Beamscope is pretty good. In fact, after several years of life it has undergone some technical improvements and it's now very good.

For those of you not in the know, the concept we are dealing with here is that of enlarging the screen area of your economy-size television/monitor without laying out a thousand bucks for a console television or a Sony Profeel.

The Beamscope is a rectangular acrylic Fresnel lens in an aluminum frame, which, when placed in front of your television or monitor, produces a much-magnified picture. It comes in several sizes. A model TS-25 in front of a twelve-inch diagonal screen results in a twenty-five-inch diagonal picture; a TS-30 produces a thirty-inch picture from a seventeen-inch screen; and a TS-41, flagship of the line, turns a nineteen or twenty-five-inch set into a big screen television.

Anyone who plays games on an Apple or spends a lot of time squinting at eighty-column display on a twelve-inch black-and-white CRT can see the potential here, yes? So the only question is, does it really work?

Yes. And it works better than some big screen systems you could name. The picture is not washed out, faded, or distorted. But if you have a small television and you buy a Beamscope, you will have a poor-quality big-screen picture. By the same token, however, if you play *Choplifter* on an RGB color monitor, you will think you've died and gone to arcade heaven.

A drawback to this product in the primary video market for which it's intended is its lack of peripheral viewing. That is to say, this is not something the whole family can enjoy, at least not simultaneously, at least not without everyone sitting on each other's lap. Computing, a largely solitary occupation, presents no such drawback. But no matter what the application, a darkened room is recommended. Lights that reflect minimally off of a video screen reflect a great deal more off of a magnifying lens.

A drawback for computing that is not one for boob-tubing is the fact that the Beamscope's picture is a function of distance. Optimally, the lens must be a certain distance from the screen and you must be a certain distance from the lens.

Alas, if you have your Apple hooked up to a nineteen-inch-or-larger

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video set, forget about playing *Ultima II* on a life-size playing field. Using the largest model, TS-41, you and your keyboard will never be far enough away to get much benefit out of the magnification. The TS-30, at the moment, is as big as you can go, and even then you'll need a joystick with a long cord. (Otherwise, though you'll get a big picture, it won't fill the entire lens area and the picture will have a rather extreme Cinerama effect; it can look better than that.)

But these are minor caveats: this product can give you a large picture—cheap—with no loss of clarity or definition. AC

Beamscope II, International Marketing Services (220 Commerce Street, Port Richey, FL 33568; 813-842-3231). TS-25, $59.95; TS-30, $69.95; TS-41, $219.

Labyrinth of Crete. By Cliff Johnson and Allen Pinero. *Labyrinth of Crete* represents two steps forward and one step backward for adventure gaming. Rather than going all the way with a graphics adventure, Adventure International has contrived the graphics-enhanced adventure. That is, the adventure is played in a text-only mode; full-screen graphics crop up from time to time to make things more interesting. For devotees of hi-res adventures, the graphics are perhaps rather humdrum, and altogether too sparse. That's the step backward. Next comes the good part, and it's very good.

Here's what will make the adventurer forget any failings on the graphics side: you control two characters who not only can but sometimes must act independently of each other during the adventure. Until now it wasn't possible for the adventurer to control multiple characters who might need to act simultaneously in different parts of the dungeon.

The setting is ancient Greece; the adventurer controls both Hercules and Jason, legendary heroes of the Greek mythos. The mission is to recover the golden fleece from the heart of the labyrinth, which is laid out as a three-level maze: the Labyrinth, Hades, and the Final Labyrinth. In the process, the heroes must face obstacles and characters from Greek mythology, such as multiheaded hydras, shifty titans, misbehaving gods and goddesses, and a three-headed puppy by the name of Cerberus.

The authors have tried to maintain some true connection to the myths from which the game is derived; prior knowledge of Greek mythology helps to solve this one. An unusual feature: maps of each level of the labyrinth come with the package.

The command sequence provides a precedence system (who's on first!) that allows manipulation of both heroes simultaneously or independently with great ease. When the two are together, any action that both can perform will be done by both at a single command. Should you wish one character to carry out a task that both could, merely specify the character you want to take action. When the characters are in different locations, you can control either with similar ease.

The ability to use the two characters independently is integral to solving the fairly tough puzzles in *Labyrinth of Crete*; it adds tremendous depth to the game. DA

Labyrinth of Crete, by Cliff Johnson and Allen Pinero, Adventure International (Box 3435, Longwood, FL 32750; 305-862-6917). $29.95.

Lovers or Strangers. By Stanley Crane. The ad shows a photograph of a young couple staring into each other's eyes before a sunset. But the photograph's torn in half.

Hmm. . . . Apparently something went askew. Perhaps they should have spent some time with *Lovers or Strangers*. Perhaps they already have.

It's a compatibility test that consists of thirty questions drawn randomly from a bank of sixty; that way, you get a different test each time. You sit side by side, using keys on opposite sides of the keyboard in such a way that you can't see each other's input. Each question is a multiple-choice with five choices.

The questions cover areas such as communication, love and romance, values, sex, spirituality, and play.

Both participants choose the best answer to each question as it relates to them.

As soon as both have selected their choices to a question, it's guessing time. Before moving on, you must guess how your partner answered the present question (this shows how well you know the other person).

Now, let's see how we did. Once the test is finished, your results in each area (communication, romance, and so on . . .) are displayed on a linear graph based on a one-hundred-point rating system; the higher the number, the more you have in common in that area. Next, you're given the results of how well you guessed each other's answers. Finally, you get to see your overall compatibility score.

If, for some reason, you want to keep a more permanent record of the test, you can print a hard copy of your test results. Still not convinced? Then take a look at how each of you answered each question and at how you predicted each other's answers.

Lovers or Strangers is more than just an exercise in seeing how often you pick the same answers. Each question has fifteen different scoring possibilities. Even if you pick dissimilar answers (John likes musicals; Martha likes comedies), you may get a higher score than if you picked totally opposite answers (John likes musicals; Martha hates all art forms).

The questions and scoring were designed by Dr. Al Byers and Dr. Annette Long, directors of Associates for Psychotherapy and Education. They stress that "tests don't determine how well people get along; people do." Further, *Lovers or Strangers* encourages you to talk about your similarities and differences after discovering what they are.

It's unlikely that playing *Lovers or Strangers* "will keep you up nights," as they claim.

It might, however, make the nights more interesting. MTV

Lovers or Strangers, by Stanley Crane, Alpine Software (2120 Academy Circle, Suite E, Colorado Springs, CO 80909; 303-591-9874). $29.95.

Space Vikings. By Mitchell Robbins. After being badly beaten during a raid on one of the rebel colony star systems, Alpha Centauri, a Federation starship is hobbling back to its home planet in the star system Sol. The Colonial Cruisers have made its task of supplying the Federation with equipment and supplies anything but easy. Maybe next time things will be different.

The player/commander's duty is to bring peace to the galaxy by winning the war, which means securing twenty star systems. Success wins not only the war, of course, but the games, as well.

Space Vikings is a three-dimensional combat simulation. It contains much of the real-time excitement and the visual effect of an arcade game combined with the detail and tactical considerations of a war game simulation. The galaxy and the spaceships are illustrated in 3-D graphics that surpass all previous SubLogic entries.

Planets in this strange 3-D world must be conquered one by one. The Federation forces must overcome each planet's air defense ships, then launch a massive ground assault. Conquered planets remain under Federation care and protection for the rest of the game. You can build bases on them and trade with them.

There are many decisions that must be made before undertaking the task of conquering a planet. From maximizing crew morale to supervising ship repairs, the decisions are crucial; only after many fruitless missions will the Federation begin to realize its goals.

The starship computer handles hyperspace travel between star systems automatically. Within star systems, the player/commander must guide the starship manually. And here appear the game's flaws. The control of the spaceship is slow and ponderous. The hi-res screens refresh themselves at an excruciatingly slow pace. After the outer defense battles, the descent to the planet drags on for a long while. The ascent from the planet is equally slow. The ship feels like it is flying through taffy. The program is very ambitious in its scope; perhaps a faster language should have been used to achieve its ambitions more fully.

Overall, *Space Vikings* is a well-done space adventure simulation, but it calls for the persistence and patience of the war gamer to master its many variables. Despite its problems, it establishes a new, promising genre, which is an applause-worthy victory in itself. DAD

Space Vikings, by Mitchell Robbins, SubLogic (713 Edgebrook Drive, Champaign, IL 61820; 217-359-8482). $49.95.

The Filer. Simple and snappy, *The Filer* offers some handy tools for home use—and it works with drives of thirty-five, forty, or even seventy tracks.

The Filer's four utilities perform tasks easily and quickly. The file utility facilitates locking, unlocking, deleting, and copying standard files. It also contains an option to alter disks' boot programs.

Two disk-drive-related utilities perform less accessible tasks. A diagnostic program investigates the health of your disk drive and disks, checking the read/write heads of the disk drive, verifying that the write-protect switch is functioning, and certifying and verifying disks. A disk speed

test displays the disk drive speed in milliseconds, against a norm of 200 ms. Instructions are provided for adjusting your disk drive speed if necessary.

Perhaps the most useful utility is the *Fast Copy*. This is one of the fastest straight copy programs available, swiftly reproducing the content of any unprotected Apple-compatible disk in DOS, CP/M, or Pascal. With two drives, *The Filer* copies a standard disk in less than forty seconds. *CopyA*, on the System Master disk, takes almost that long to format a disk before it starts copying.

A superior aspect of this program is its price. Shunning pretension, *The Filer* is priced inexpensively enough for nearly any hobbyist to have at hand. That's certainly a refreshing marketing approach. RRA

The Filer, Central Point Software (Box 19730-#203, Portland, OR 97219; 503-244-5782). $19.95.

Epidemic! By Steven Faber. This appears to be the year of the medical game. Robert Clardy voyaged fantastically with medicine in Synergistic's *Microbe*, Sirius is offering a similarly themed game for brand X machines, and here comes SSI with another contender. As Groucho might say, "Take two doctor games and call me in the morning."

Sirius's entrant is a shoot-'em-up; Synergistic's is a blend; *Epidemic!* is, of course, strategic.

Earth, it seems, has entered the path of a swarm of meteorites that are infested with a deadly virus. The map of the world is segmented into fourteen areas. Wherever one of these areas is hit by a meteorite, an epidemic begins.

As director of the Center for Disease Control, the player controls the forces battling the spread of this virulent disease. The arsenal of curative methods available includes interferon, vaccine, X-ray treatments, and various other remedies for the early stages of infection. You can even impose martial law. When the virus reaches its second, pneumonic stage, you have access to weapons such as cloud-seeding and killer satellites.

Epidemics may travel across borders. The Soviet Union has boundaries with five other geographic regions; South America has only one. Nuclear strike on a region is a last resort. This eradicates the epidemic by eradicating the populace. Because your score is dependent on succeeding with the least possible number of casualties, this option is one to avoid gamewise, too.

Each of the cures has a certain duration of activity. Each day it's active, a cure reduces the epidemic a certain percentage in its target area.

The mapboard shows the stages of infection in each affected region. A daily status display for each region describes the effectiveness of the current choices of remedies. A radar screen shows the meteorites entering the atmosphere and tracking paths.

The program's documentation skimps when describing how the cures differ from each other in effectiveness, which makes it somewhat difficult to choose the best cures with confidence. Nevertheless, *Epidemic!* is an absorbing game, quite different from the rest of the Strategic Simulations line. DA

Epidemic!, by Steven Faber, Strategic Simulations (465 Fairchild Drive, Suite 108, Mountain View, CA 94043; 415-964-1353). $34.95.

Amperware. By storing data in compressed binary blocks, *Amperware* reads text files twenty times faster than conventional Applesoft does. This compressed form of storage saves disk space and allows for the storage of commas, colons, quotes, and control characters in text files.

In *Amperware*'s process of creating disk files (either random or sequential), print and input statements are exchanged for &READ and &WRITE. The length of a single text file is limited only by Applesoft line lengths and may be sent with a single &WRITE command. In fact, whole arrays may be stored with the statement &WRITE B%.

Clearing out arrays from memory without setting all other variables to zero is no easy task in Applesoft. With *Amperware*, a simple &CLEAR−Q$ does the job. Sorting arrays, another tedious chore in Applesoft, is now turned from task to trick. To sort a list, you tell *Amperware* which list to sort (K), where to begin (0), and where to end (N=65). An array R with dimension 64 can be sorted completely with the statement &SRT−K=R(0), N=65.

The elaborate scheme of pokes and calls used for setting text windows in Applesoft is dispensed with. By defining top, bottom, left, and right, you may create a text window of any size. Of course, being able to set a text window also requires a positionable cursor. This, too, is easily accomplished by means of the &MOVE command, a handy combination of htab and vtab.

Like the &READ and &WRITE commands for data files, *Amperware* provides fast and flexible input routines. Commas, colons, question marks, control characters, upper-case and lower-case characters, string length, alphanumeric checks, and default values are all handled easily by &INPUT. The command &INPUT−L=5, R=S$ limits the user input to a length of five characters and defines the response as alpha code. To establish a default input (that is, a return = none), simply add to the program's code the line *if R$= then R$="none"*.

Many programmers who learned their Basic in school or on larger computers were disappointed that the *print using* command doesn't exist in Applesoft. Here, the command &PRINT WITH allows you to put a place holder in your program, producing output that will always be displayed with the decimals aligned, rounded to two places, and preceded by a plus or minus sign.

Programmers who have experienced the awe and mystery of assembly language programming may have noticed that the commands JSR and JMP will execute with either an address or a label in their operand, whereas Applesoft's gosub and goto commands require a line number. *Amperware* allows you to assign the value of a line number to a variable to execute the commands—a trick that would net you an "undefined statement error" if you were using Applesoft alone.

Amperware has many other simple and useful subroutines, such as &HOME, which will do the job on an eighty-column screen. &CLEAR PAGE and &CLEAR LINE both perform exactly the same way as call −958 and call −868.

Special characters and convenience features are also provided with this utility. Typing control-K allows you to input the elusive left bracket, backslash, underscore, and several other special characters. Both control-D and control-I act for the user exactly as *PLE* does for the programmer, deleting or inserting the characters under the cursor and shifting the following characters accordingly.

In other words, *Amperware* is an excellent tool for an Applesoft programmer. HAS

Amperware, Scientific Software Products (3171 Donald Avenue, Indianapolis, IN 46224; 317-299-0467). $49.95.

Checkers. By David Slate. It's not a hard game to learn how to play. Most of us learned the rules at an early age. But few have truly learned the game.

If you're looking for a few quick games to pass the time, go dig out the checkerboard from the hall closet and the checkers from that old shoebox. Set 'em up, and you're ready to go.

But if you're looking for a way to learn the ins, outs, hows, and wherefores of the game, Odesta's *Checkers* can provide you with voluminous help and insights that grandpa and Uncle Ed couldn't even challenge.

Checkers is not just a game. It's a textbook tutorial on a disk that includes games as a way to try out what you've learned from the manual. And there's much to learn.

The manual starts you off by teaching the most basic rules of checkers: how squares are numbered, what moves and jumps are legal, how to king, and how to control and move your pieces. Next, it explains how to read the move display. The move display lets you know the status of the game in progress. From it, you're able to see each move that's taken place, how far ahead the computer is looking when figuring out its strategy, and the skill level of each player.

Perhaps the strongest point of *Checkers* is its selection of more than twenty commands, all of which you can choose during the game. One of the most popular features is the advice command, which tells you what is probably your best move at the time. Extensive use of the command doesn't, however, guarantee your winning the game. But the computer won't try to trick you into making a bad move. It'll merely point you toward what it thinks is your best option.

Another helpful feature if you're learning the game is a command by which you can set the skill levels for yourself and for your opponent. The higher the skill level selected, the more "look-ahead" the computer provides. In other words, at level zero the computer moves its pieces randomly and quickly; at each higher level it plans further and further ahead, taking as long as several hours to make its move at its highest level, fifteen.

For those who like to know just where they stand during a game, the evaluation command lets you know which side is winning and by how much.

Other convenient options let you take back moves (so you can correct an error—not so you can cheat), play against another person and not the computer, see the board from the other side, and change the parameters of the game for everything from the scoring scheme and game penalties to the responsiveness of the game paddles.

The graphics of the game aren't fancy. Checkerboard squares and round pieces don't lend themselves to much fancy artwork. The real strength of *Checkers* lies in the manual, about a third of which consists of appendixes. Useful appendixes.

One useful appendix explains in depth about the program's fifty-eight modifiable parameters and how to change them. The second is a short tutorial that skims over the basic principles of checker strategy.

If any microcomputer software publisher produces examples of artificial intelligence, it's Odesta. If any of its programs serves as a primer on artificial intelligence, it's *Checkers*. Though Odesta's *Chess* and *Odin* are also based on artificial intelligence, *Checkers* offers an introduction to the same concept through a more simplistic game.

Don't expect to win often when playing against the computer. What *Checkers* helps you do is learn the strategies of the game, not get used to winning.

If winning is all you want, there's always Uncle Ed. MTV

Checkers, by David Slate, Odesta (930 Pitner, Evanston, IL 60202; 312-328-7101, 800-323-5423). $49.95.

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Know Your Apple. Finally, a software publisher has come to the aid of the many new Apple users. Usually neophite Apple owners spend hours wading through the two large Apple manuals, and some still end up thoroughly confused.

This program takes much of the mystique from the workings of the Apple. Every step of the program presumes that the person has a computer literacy quotient of zero. In crystal-clear hi-res pictures of the different parts of the Apple, the area under discussion flashes for easy recognition.

There's a thorough description of the keyboard and all its functions, then explanations of the back connectors and the workings of the Monitor. The best two sections of *Know Your Apple* deal with the inside of the Apple and the operation of the disk drives.

Every major aspect of the interior of the computer is highlighted and clearly explained. Most people are terrified to take the covers off their new computers, much less start inserting items. The program explains the proper placement of different boards, how to plug in the paddles or joystick, and even precisely where to put a lower-case adapter.

Disk drives and the disks themselves remain a major mystery to many longtime Apple owners. *Know Your Apple* not only provides a clear explanation of the operation of the drives, but also explains how a disk is formatted and how data is recorded.

The Monitor section shows the lo-res and hi-res colors and explains what pixels are. Then a single picture is shown, first in lo-res, then in hi-res, making clear the difference between the two modes of graphics. There's also a demonstration of the way the speaker performs.

The packaging of *Know Your Apple* is unique: the box takes the shape of a miniature Apple II Plus. The brief manual is simple and clear-cut. Written in large type for easy reading, the manual contains a five-step photo outline for initial setup of all your hardware.

For new users of the Apple, *Know Your Apple* is an outstandingly worthwhile program. People learn much more easily with visual instruction than by trudging through weighty manuals. RRA

Know Your Apple, Muse Software (347 North Charles Street, Baltimore, MD 21201; 301-659-7212). $29.95.

Pandemonium. By Norman J. Wazaney, Jr. In the entertainment software world of flashy graphics and lightning reflexes, a game relying on neither faces quite a marketing challenge. *Pandemonium* accepts the challenge and succeeds in being a well-executed, solid, thinking game.

A hybrid of *Scrabble* and various forms of *Boggle*, *Pandemonium* challenges you to form words horizontally, vertically, and from top to bottom on the two diagonals of a five-box-by-five-box grid. Letters vary in point value, and bonus points are awarded for making words of three, four, or five letters. Certain squares on the grid double or triple the scoring value of a letter within a valid word.

There are four variations of this basic game contained in *Pandemonium*. Each variation brings different analytical skills into play. Basically, the computer generates random letters one by one that you must place in the grid, forming as many words as possible. Variations allow you to bypass five letters and move the letters around after you have them all.

The game comes with a five-thousand-word dictionary that is loaded into RAM when the game begins. The dictionary isn't all-inclusive, but it's quite thorough.

Soft Images is doing some innovative marketing. *Pandemonium* is unprotected and comes with a free gift from Soft Images to its customers: a fast-load routine that users may transfer to their own disks and programs. It isn't the fastest load in town, but it's a nice gesture.

Pandemonium is a fun piece of software. The program runs quickly and smoothly; very few details have been overlooked. But watch out: this game is hard. It really makes you think. Some of us may be out of the habit. DA

Pandemonium, by Norman J. Wazaney, Jr., Soft Images (200 Route 17, Mahwah, NJ 07430; 800-526-9042). $39.95.

Knowledge Bowl. Yes, learning can be fun. Somehow, the anxiety generated in an academic testing situation becomes intellectual excitement when the context is transferred to a CRT.

Knowledge Bowl is a high-caliber educational program for those fifteen and up and is capable of doing double duty as an entertaining trivia contest.

The entire series covers virtually every academic discipline, broken down into specific subjects. The questions—all two hundred thousand of them—range from the terrifically obscure to the immediately topical ("Who was the Israeli defense minister during the occupation of West Beirut?")

A single disk contains four hundred questions plus a quiz and competition mode for two players. In the quiz mode, the user selects a topic from among several categories and specifies the number of questions to be presented. The user types in his name; then the computer-resident "Great Auk" offers a multiple choice, true-false, short answer, or fill-in.

Mind you, Auk is no dummy! The questions are a definite challenge. The user types in an answer and Auk immediately checks the response and maintains a running score throughout the game. However, Auk only knows when your answer is wrong on the multiple choice questions. On all spell-out answers, if you don't type in the precise answer Auk wants, he displays the answer he knows and asks you to tell him whether you were right or wrong. You're on your honor to be honest and, after all, Auk's pretty nice to give you the opportunity to take credit for Charlie Chaplin when he expected Charles Chaplin, or for deoxyribonucleic acid when he was primed for DNA.

After each correct answer Auk gives you a little boost by printing such exclamations as "Outstanding," "Hubba hubba," and "Kowabunga." (These also serve to make you feel darn guilty if you've been cheating.) On the other hand, if your score is very poor, Auk lets you know that also. But don't worry; you have the option of repeating the questions you missed.

In the competition mode, two players can vie against each other and Auk. Players are assigned keys on opposite sides of the keyboard. After the players agree upon a category and the number of questions to be asked, Auk throws a question on the screen. The first player to press her game key has four seconds to begin her answer. Her opponent has a chance to offer an alternate answer or pass. If both players are stumped, they can give up. Then, or if both players give wrong answers, Auk wins the round.

The competition mode is an excellent school learning tool. Classes can divide into teams for some healthy competition.

A special utility disk available for faculty features question modification and printout programs. The *Knowledge Bowl* generator prints out rounds for oral competition.

Knowledge Bowl is also a great tool for adults wanting to review old skills or increase their knowledge of literature or the social and physical sciences. What's more, it's fun.

Academic Hallmarks offers a preview disk with representative samplings on a variety of subjects. You can purchase the sampler for $5, or you can submit a blank disk to the publisher and the preview material will be copied free of charge. A heck of a bargain for a couple of evenings' fun. RR

Knowledge Bowl, Academic Hallmarks (Box 998, Durango, CO 81301; 303-247-8738). $27 each. Utility disk, $35.

Frontline. By Terry Eagan. This is a fast-moving game of wits and strategy. It combines many of the intricacies of chess with the moments of sheer terror integral to some of the meaner arcade games. In short, it's a lot like real war.

The battle is fought on three fronts. You face your opponent—the computer or another android like yourself—across a pencil-thin front line. You have airplanes, infantry, and anti-aircraft to assign to each front. The lessons of war dictate that you try to be "the firstest with the mostest." But if you pile all your infantry on the left, how will you keep your enemy from penetrating on the right?

Each game consists of five battle rounds, with a pause between rounds to get your thoughts together (and possibly walk around the block just to psych out your opponent). At the beginning of each round, each side of each front is defended by three infantry and four anti-aircraft units. You have an offensive air-strike force consisting of two planes on each front. And you also have a reserve force of fifteen infantry and six anti-aircraft at your disposal. You decide when the planes attack and where the reserves are to be assigned.

Once you start, you can just sit there and wait, but if you do your opponent may begin without you. Your orders will be executed one at a time, but you can stack up commands so there will be no hesitation in implementing them. Here is where your skill is called upon. If you hesi-

tate too long in bringing up reserves, you will lose to a faster opponent. If you stack up commands as fast as you can press the Apple's keys, you may end up sending too many men to one front (where they will wait unused in the rear line) or attempting to dispatch nonexistent reserves.

Frontline is a test of reflexes, of brains, and, if played against a human opponent, of generalship—the combination of audacity and bluff that can snatch victory from the jaws of defeat. PG

Frontline, by Terry Eagan, SubLogic (713 Edgebrook Drive, Champaign, IL 61820; 217-359-8482). $29.95.

Micro Barmate. By Brian Skiba. Have you ever wanted to impress your boss, your friends, or perhaps your enemies with your dazzling skill at mixing drinks, but ended up serving martinis so wet you could swim in them? If making a scotch and soda is totally beyond your comprehension, then *Micro Barmate* is the ideal solution. This unique program steps through the entire preparation of more than two hundred twenty popular and diverse drinks.

The drinks are indexed by name and classification. Once you choose your poison, a list of its ingredients appears. Detailed instructions for its preparation come next. Even a picture of one of the eight glass styles is shown to make sure you don't blow the show by serving that perfect Manhattan in a brandy snifter.

There is room on the disk for 255 drinks, meaning you can add your personal favorites to the roster. Also, the recipes that come on the disk may be modified to reflect preferences, and you can add disks for a truly huge library of innkeeping.

And this is only the beginning of the program. The flourishes add to the fun. When you have a limited bar—and how many home bars stock all the fill-ups possible?—give *Micro Barmate* a list of the ingredients you have available and the program will search out and list all the drinks you can make with what you have. Imagine how impressive you'll be as you rattle off twenty-one exotic drinks made with rum or eleven sophisticated scotch drinks to your guests.

Another feature of *Micro Barmate* provides considerable background knowledge on alcohol-related subjects; it can even help in planning a party. There are hints on bartending, suggestions for stocking your home bar, recipes for making your own liquors (yes, it is legal), and even a calorie chart. A unique alcohol limit guide shows graphically what the safe drinking levels are for individuals, based on their weight, to stay under the one-tenth of a percent blood alcohol content. Who can argue when the computer says you've had too much to drink to drive safely?

All the recipes can be printed out, as can a handy shopping list of ingredients needed for a party. The program even provides a selection of printer interfaces for the most popular printers.

Micro Barmate is one of those specialized programs that are timeless. It can keep you impressing those significant others for years to come. Now then, what was the "pouring order" for correctly creating a layered zombie? RRA

Micro Barmate, by Brian Skiba, Virtual Combinatics (Box 755, Rockport, MA 01966; 617-546-6553). $30.

Bomb Alley. By Gary Grigsby and Joel Billings. By the summer of 1942, German Field Marshal Rommel was rampaging across North Africa toward Egypt and the vital Suez Canal. One obstacle stood in his way: Malta. British air and naval forces based on the ancient island fortress had begun to sink an appalling number of Axis ships, threatening the very existence of the Afrika Korps. British General Montgomery had reason for his ruthlessness. The fate of the Suez Canal and, hence, of the British Empire hung in the balance.

Bomb Alley re-creates, in great detail, that desperate struggle from Gibraltar in the west to the Suez Canal in the east. Before you're finished with *Bomb Alley*, you'll understand the grim motto of the German fighting men of World War II: "Enjoy the war, because the peace will be dreadful." Almost every aspect of the entire Mediterranean theater has been taken into account in this game.

It is as much a strategic game of supply as of military maneuvers. That Hitler could not be strong everywhere led to his eventual undoing in the Libyan desert. Good thing he didn't have *Bomb Alley* to help him decide the course of the war.

Bomb Alley uses the same game system SSI used in *Guadalcanal Campaign*. Like *Guadalcanal*, *Bomb Alley* is a huge game; you can expect to spend twenty-five to fifty hours to play the full scenario, which covers eighty-two days from June to August 1942. Every plane and ship available to the historical combatants is accounted for and represented with its relative capabilities. The game is enhanced by the simulation of the "fog of war," with resulting limited intelligence reports, inaccurate information, and concealed movements.

Despite its complexity of detail, *Bomb Alley* is one of SSI's easiest games to play. For those who never seem to find a free fifty hours, two shorter scenarios are provided. "Operation Pedestal" simulates the gallant British mission to run the German blockade of Malta. The "Crete Scenario" portrays the struggle for the strategic island of Crete, which became the grave of Germany's elite paratroopers.

The combat descriptions are given in an almost *You Are There* tone. Short of having been in a war room beneath Number 10 Downing Street or in the Reich Chancellery in Berlin, the excitement couldn't be greater.

Although the graphics are once again in lo-res, none of the details of the engagements are lost. SSI rates *Bomb Alley* as an intermediate level simulation. It is a worthy successor to *Guadalcanal Campaign* and will captivate gamers of all levels. WHH

Bomb Alley, by Gary Grigsby and Joel Billings, Strategic Simulations (465 Fairchild Drive, Suite 108, Mountain View, CA 94043; 415-964-1353). $59.95.

Evolution. By Don Mattrick and Jeff Sember.

Brady: . . . In fact, [Bishop Usher] determined that the Lord began the Creation on the 23rd of October in the Year 4004 B.C. at—uh, 9 a.m.!
Drummond: That Eastern Standard Time? Or Rocky Mountain Time?
—Inherit the Wind

Most arcade games plunk you down into an artificially violent situation and let you run with it until you die. Their inherent violence is the root of many people's objections to video games. What these people tend to overlook is that the world is violent. Especially if you take a longer perspective of history.

What Mattrick and Sember have done is design a video game that takes that longer view of things: a view encompassing something like three billion years (fundamentalists may take this figure as metaphorical). They haven't done away with the violence of the arcade game in creating *Evolution*, but they have conquered the artificiality of the violent situation. Picture yourself as a simple one-celled creature (the first level of

Evolution) trying to eat DNA and avoid being eaten by spores, microbes, and antibodies. The motivation is clear: why am I eating these things? Because I'm hungry!

The next two levels have the same plot with different casts. Tadpole attempts to eat fly without being eaten by fish. Rat tries to eat cheese without being eaten by snakes. The players' personae (animae?) behave differently, but up to a certain point on the evolutionary chain, it's the same story, repeated again and again.

As might be expected, the higher animals have more complex and interesting behaviors. Instead of worrying about where their next meal is coming from, the beaver in level four must build a home. The gorilla in level five has a home, but must protect his food supply from thieving monkeys. The highest level, although it makes some sense in the progressions, unfortunately succumbs to the artificial. In it, a human in a room with walls that deflect weapon fire must kill a bunch of mutants. Oh, well.

When a nuclear explosion destroys the world and the evolutionary cycle starts over again, you might well wonder what the point of it all is. You work your tail off trying to better yourself. You save up your flies, or cheese, or oranges, trying to become human, and where does it get you? You become an amoeba again.

These are not just idle questions. Evolution is a neat idea for a game, but that ultimate regression makes it kind of depressing. Sure, this allows them to give you more playing levels, but that could be achieved in another way. Surely they could have come up with more than six steps from amoeba to human? For one thing, they skipped directly from early amphibious life forms to mammals. What happened to reptiles? Couldn't they have done something with the first multicellular forms? These are parts of evolution too.

A host of other questions remains unanswered. Where did the amoebas get shields? Where did the cheese come from if humans hadn't evolved yet? Mattrick and Sember's theory of evolution may cause as much controversy as Darwin's did; it seems to have as many missing links. Nevertheless, it's a unique concept and a challenging game. DD

Evolution, by Don Mattrick and Jeff Sember, Sydney Development (600-1385 West 8th Avenue, Vancouver, BC, Canada V6H 3V9; 604-734-8822). $39.95.

Understanding Artificial Intelligence. A book by Paul Y. Gloess. A major problem in the field of artificial intelligence (AI for short) is the lack of a really good definition of intelligence. As a result, it's hard to say exactly what is included in the field and what isn't. Roughly speaking, "artificial intelligence" refers to computers that "think"—but what exactly is "thinking"?

To put it another way, the ultimate purpose of AI research is to create a machine or system that can interact with the user just as another human being would—without the user having to learn a special language or special programming techniques to use it. For example, such a machine could answer a question like, "How big is this object?" instead of a series of questions such as "What is the distance from this point to that point?" "And from that point to the next?" "And from that point to. . . ?"

Thus the ideal artificial intelligence should be able not only to communicate with the user in his own language, but also to write and debug its own programs, select and operate the appropriate input and output mechanisms, and generally run its own life like an intelligent being—all of which is easy enough to describe, but very difficult to do.

Understanding Artificial Intelligence covers work in four general areas: game strategies, logical proofs, visual pattern recognition, and natural language behavior (that is, English or French—not Basic or Pascal).

In the section on games, the book describes a technique for analyzing ticktacktoe so that a computer can find the best move in any situation. This method does not look much like what a human does in playing the game, but it produces similar results. Of course, ticktacktoe is a very simple game; but similar strategies have been effectively applied to games as complex as chess (for example, the *Sargon* chess program or the new *Chess 7.0*).

In the area of logical proofs, *Understanding Artificial Intelligence* describes an approach to the design of a system that can write a program, given the specifications, and then test it to see if it works properly. However, the book only tells you what must be done, not how to do it.

Almost half the book is devoted to language processing. Starting with the "Predicate Calculus"—a set of rules for manipulating logical statements as if they were mathematical formulas—it goes on to describe an approach to the nonlogical types of statements we humans use in talking to each other. This is called "natural language processing," and it may be the most difficult area in the whole field of AI.

Finally, there is a short section on visual pattern recognition—another difficult area. For example, how do you get the machine to tell which part of the picture is the object we're looking at, and which part is background?

The trouble with *Understanding Artificial Intelligence* is that it's too small (forty-eight pages) for its subject. AI is full of questions such as "What is the nature of intelligence?" and "What is the mechanism of creative thought?"—and you can't cover a field like that in forty-eight pages!

However, if you're new to the field, the book is a good introduction. It will show you what AI is about and how some of the problems are being attacked. And, like all good scientific works, it has a list of references at the end. JR

Understanding Artificial Intelligence, by Paul Y. Gloess. An Alfred Handy Guide: Alfred Publishing Company (15335 Morrison Street, Suite 235, Sherman Oaks, CA 91403; 213-995-8811). $2.95.

Crystal Caverns. By Daniel Kitchen. A crumbling, deserted mansion sets the tone for Hayden's first text adventure game. Like all good deserted mansions, this one is rife with secret rooms and hidden panels. Unlike all good deserted mansions, it doesn't stop there. Somewhere on the grounds of the mansion is the lost entrance to the dark, mysterious Crystal Caverns that sprawl beneath the manor. Hidden deep within the caverns, it's rumored, is a vast treasure.

The would-be adventurer must do a lot of work in this adventure. The game gives hardly any clues. All progress has to be won, step by step. Just getting into the mansion poses quite a problem. Discovering how things are hidden away in the mansion tests the best ingenuity.

All this work is but a prelude to the caverns. In the dank caves the really hard part begins. The caverns' many inhabitants relish a meal of adventurer stew. Exotic treasures abound at every turn, but so do traps. Be careful with the underground furnace!

Crystal Caverns is written primarily for intermediate-level adventurers. The game is quite reminiscent of the original Colossal Cave *Adventure* devised in the dawn of computer adventure gaming. Hard-thinking novices may solve most of the game, but some of the key stumbling blocks require a bit of adventuring expertise to overcome. In sum, *Crystal Caverns* offers several hours of enjoyable fun and thought.

Hats off to Hayden for bringing out a text adventure when everyone but Infocom (and its tens of thousands of devotees) has sung a dirge for the genre; and a deep bow as well for making it a good one. RRA

Crystal Caverns, by Daniel Kitchen, Hayden Software (600 Suffolk Street, Lowell, MA 01854; 617-937-0200). $34.95.

Understanding Pascal. A book by George Ledin, Jr. *Understanding Pascal* will not (as the title suggests) give you a complete understanding of Pascal; but it will enable you to recognize a Pascal program when you see one and help you to figure out its logic.

More important, it will give you an overall look at the language, an impression of its personality and flavor—more specifically, a summary of the data types and structures used and the principles of logical organization.

Pascal is very big on structure—it has rules, and rules within rules, about where to put things in the program. These rules are logical enough, but they seem arbitrary at first; however, once you learn to use them, you can untangle the logic of any Pascal program.

This book summarizes the logical structures used in Pascal and shows you how and when they are used. Once you understand that, the rest is merely detail.

Of course there are quite a lot of details, and they're all important. This book is not enough, by itself, to make you into a skilled Pascal programmer. But it can help you make up your mind about whether to become one.

One final note, about format. This book, like all the Alfred Handy Guide series, is made in an unusual shape: four inches wide and eleven inches high. This is convenient for carrying in a coat pocket, a tool kit, or other small space; but the text has been printed sideways—the book is actually four inches high and eleven wide—which makes it a bit awkward to read. You also have to turn pages a lot, because in many cases a program example will be printed on the back of the page that explains it. However, these are minor nuisances. They won't prevent you from getting the information. JR

Understanding Pascal, by George Ledin, Jr. An Alfred Handy Guide: Alfred Publishing Company (15335 Morrison Street, Suite 235, Sherman Oaks, CA 91403; 213-995-8811). $2.95.

The Creator. By Gary Haffer. It's only been a couple of years since the British announced grandly that they had the universal cure for strep code, *The Last One*. The name, we were assured by resolutely immodest representatives, stemmed from the fact that it would be the last software package we'd ever have to buy.

It was the first announced code generator for microcomputers, and we were assured that *The Last One* would write all our software.

The imagination soared. One big splurge and we'd have all the arcade, strategy and adventure games, database programs, word processors, mailing-list handlers, and accounting packages that our heart desired. Had nirvana ever been so near?

Then reality settled in. *The Last One* lived up to the name in grimly ironic fashion—no one who saw or bought the first commercial version wanted anything to do with a code-generation program again. Ever. Not only was it *The Last One*, it was the last straw.

Overselling capability was a big part of the problem. All code generators are limited by the application areas the authors choose to address. And most authors narrow the scope of their code to what are generally recognized as database applications. No word processors. No ac-

counting software. No games. No graphics. What the publishers of code generators overlooked was that existing database-manager programs were sufficiently versatile to handle most of the applications that could be written with such limited code generators.

The overheated expectations were unfortunate because code generators have a long and honored tradition among larger systems and are almost mandatory in environments where custom applications software is needed *muy pronto*. There's no reason why microcomputer owners shouldn't have the same advantage of writing large blocks of code in a short time.

That's the value of code generators. They'll write bug-free code at the flick of a wrist. Furthermore, the source code will be available to the user to modify for custom requirements, unlike commercial database managers that protect their source code and, incredibly, sometimes even leave the data files beyond the reach of the user.

The current generation of program writers ranges, in the end product, from full-fledged database managers to fairly simple file managers. The most powerful varieties belong in systems software departments of large companies using lots of micros in varied ways. The simpler programs belong to the home or small-business user who wants a simple program in a hurry, or to the programmer who wants a lot of code in a hurry that can then be spruced up.

The Creator falls into the category of a file-manager developer. It's remarkable in that it lives up to its author's claim: you don't need to know programming to obtain satisfactory results.

Satisfactory is the highest mark the end product gets, however. *The Creator* doesn't give you elegant code, or even efficient code. It gives you error-free code. If you've ever spent hours tracking down a bug in elegant code, you'll appreciate that last statement. But you won't be creating a program to rival *DB Master* for performance.

The main advantage of *The Creator* is speed in writing code. You can have a mailing-list program running in fifteen minutes. An invoice program might take twenty minutes. A complex personnel records program could stretch out to thirty. At the end of those short time spans, you get a program in Basic that runs error-free. At your leisure, you can go into the code and make it more efficient and more elegant.

Software Technology for Computers, publisher of *The Creator*, points out that its code can be compiled for greater execution speed. That's true, but the program uses pokes into memory to attain certain goals. That means you need to be proficient in the use of your compiler and understand how the code is using memory so that you can compile around crucial memory locations. A better approach might be to use the assembly-language-subroutine libraries that such companies as Anthro-Digital, Micro Lab, and Southwestern Data Systems are publishing.

Author Gary Haffer has done a complete and thoughtful job in providing a file-manager-development package. Of course, there are the necessary ingredients: input, edit, and report routines. Also included: a menu routine, a sort routine that's not half bad for being in Basic, and a five-level filter for culling only desired records from your files.

Haffer has also provided extra value in the manual. There's a chapter on how to use Basic; another chapter is a guide to writing programs. There are also sections dealing with how to enhance the final program and providing tips on maximizing Basic and using DOS. Yet another section provides useful applications. For a novice, being able to scrutinize working code and applying the manual is almost worth the price of the package.

Anybody can make *The Creator* work. So if a file manager can handle most of your database applications, the software will save you time and money. ART

The Creator, by Gary Haffer, Software Technology for Computers (430-A Main Street, Watertown, MA 02172; 617-923-4334). $200.

Ghost Drive. By Dean Phillips. For those fortunate enough to have two disk drives, there's a wide variety of business-and-accounting software packages available.

Ghost Drive is a clever piece of hardware intended to fool an Apple into thinking a second drive is connected, making these programs accessible to a wider range of users.

Ghost Drive consists of a small board occupying any peripheral slot (including zero), and a small remote box that can be tape-mounted to the side of the computer or of the real disk drive. It's just as convenient to set it on the table. Besides the small wire connecting the two modules together, there's a fourteen-pin ribbon cable with a plug that replaces one of the integrated circuit chips on the Apple disk controller card. The remote unit has an LED indicator that signals when the second drive has been requested and a small toggle switch that does the actual selection between "drives."

Installation is a snap; no soldering is required, and you end up with a spare IC in the bargain. Ghost Drive is also easy to use. When a program calls for the second drive, Ghost Drive freezes the processor and lights the LED. Then it waits for you to insert the correct disk into drive 1. That done, a flip of the toggle switch allows the program to continue—with your poor Apple none the wiser. The switch is labeled to show which drive is active, eliminating any chance of errors.

This package is a useful and imaginative accessory, and it's a whole lot cheaper than a second disk drive. EW

Ghost Drive, by Dean Phillips, Aristotle Industries (Box 21, South Norwalk, CT 06853; 203-853-6686). $79.95.

Bug Byter. By Ted Cohn and Pete Rowe. It's funny how we can use a word every day and forget its original meaning. Take the Monitor in the Apple: not the CRT, but the program in ROM. Think about what it means. It's a device—a software device, but a device nonetheless—for monitoring what's in the computer's memory. That's neat. A lot of computers don't give you that kind of access. And yet, there's a lot that the Monitor doesn't do.

And what it doesn't do is what *Bug Byter* does. They say it's a machine-language debugger, but it's really a window into the Apple. It doesn't let you see anything you can't see with the Monitor; the Monitor can show you anything in memory. With forced break points you can even see the status of the 6502 registers. But while the Monitor offers still pictures of memory, *Bug Byter* gives you movies. In color.

Bug Byter monitors your machine-language program while it's running. This is no small feat, as by necessity *Bug Byter* must be running at the same time. *Bug Byter* accomplishes this by acting as a machine-language interpreter, reading the instructions of the monitored program and interpreting them. At the same time it updates the screen display of the lines being executed, the status of the stack, the values in all the registers, each flag in the status register, and user-selected memory locations.

Because *Bug Byter* does all these things, it slows down the running of the program that it's monitoring. In step mode the monitored program executes one line at a time; you move it forward to the next line with the space bar. In trace mode, the program moves along pretty fast, although considerably slower than it would without *Bug Byter*. You can control the speed with a paddle if you want. The reduced speed is important for debugging, because normally, when a machine-language program does something unexpected, it's moving so fast that it's in the next state before you can stop it.

If you need to see what your program is doing to a text or graphics screen while you're monitoring it, you can toggle any of the Apple's soft switches that control the display mode and page while the trace is going on. Because the program uses the text screen for its display, you can't toggle between the register readouts and a text screen your program is controlling; you must choose one or the other for the entire simulated run.

Bug Byter has some other useful features. In command mode it does number-base conversions between hex and decimal. It gives you control over break points; you can insert or remove a set of breaks with a single command. A machine-cycle counter will give you an exact readout of how many cycles your code takes to execute. There's even a miniassembler built in so you can modify your code easily without having to go back to the source-code assembler to do it.

Machine-language programming need not be an arcane art. When you can see what's going on at the most elemental level of the machine, as you can with *Bug Byter*, you are one step closer to mastering the 6502. DD

Bug Byter, by Ted Cohn and Pete Rowe, Computer Advanced Ideas (1442A Walnut Street, Suite 341, Berkeley, CA 94709; 415-526-9100). $39.95. ■

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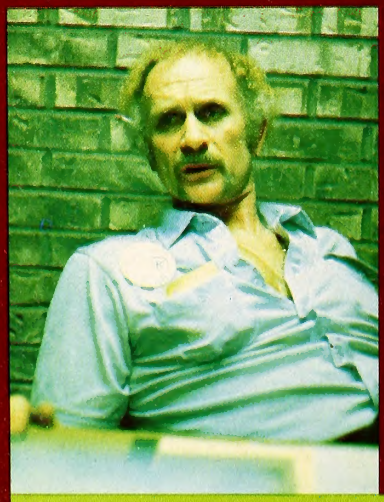
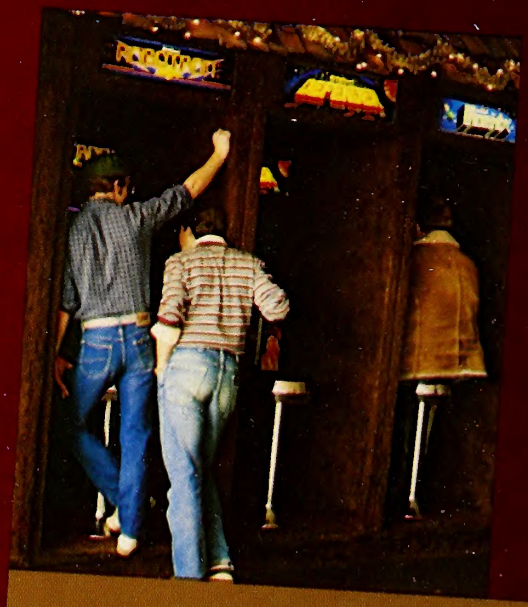
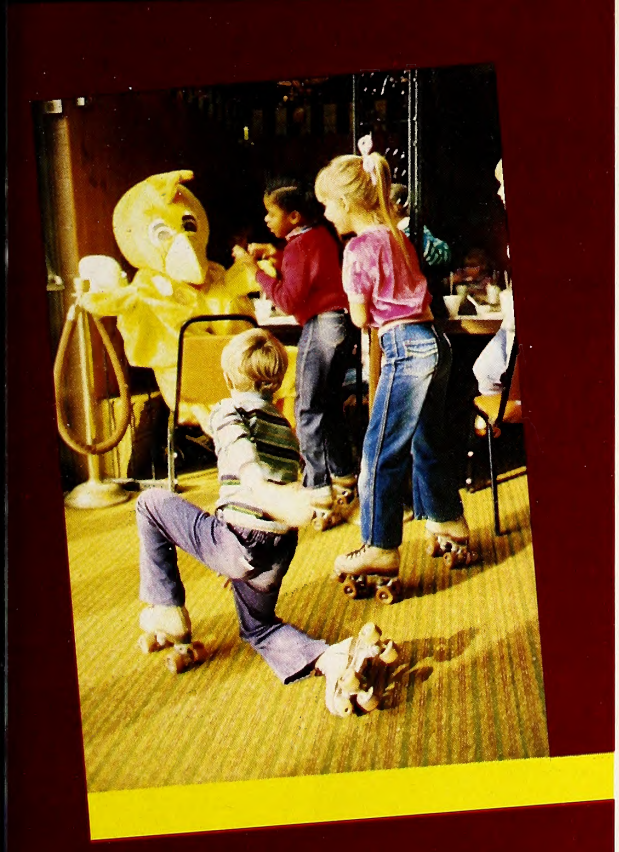
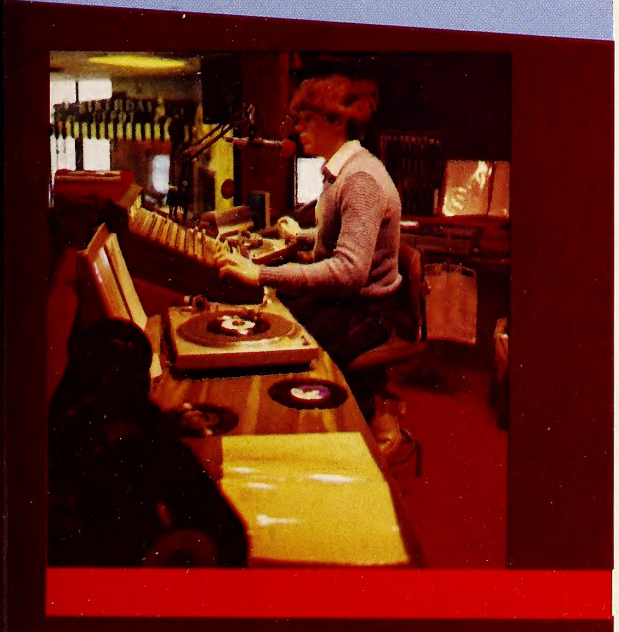




While patrons are swinging and skating, mingling with the local fauna, arcading, or wandering through any of the attractions on Funway's three levels, Joy and Dick Buri (lower left) manage everything . . . with a little help from a friend. The Apple also handles in-house video advertising, cued by disc jockey Mike La Due between tunes (lower right).





BY DAVE ALBERT

After innumerable musings on the possibilities of an Apple in a true arcade, one finally shows up . . . on the wrong side of the counter!

Five years ago, Dick and Joy Buri bought an Apple II to help run their burgeoning amusement park, Funway Square, in Batavia, Illinois. Although it may appear unassuming from the outside, Funway is something of a complex, with sixty-five thousand square feet under its roof. Its component parts include a full arcade with pinball, standup, and table video games, foosball tables, a bumper car area, a full-sized roller skating rink, a family restaurant, and a set of batting cages that are open during the summer months.

Good Times on the Funway Express. The arcade and the restaurant overlook the skating area, with the bumper car area right beside the arcade. The roller rink is festooned with posters and signs and has a huge video screen at one end. Smaller video monitors are scattered about the rest of the whole area. And nestled away in an office behind the disc jockey's booth at one corner of the rink is the Apple that keeps track of everything.

Gone is the go-cart track that started Dick Buri on the road to providing surrounding communities with good, clean fun. He began that business in 1959, after years of working in various trades to solidify his background. Previously, he had worked as a carpenter, electrician, handyman, and garment worker. All of these lines of work helped him develop skills that are useful to him in his present endeavors. (He still occasionally sews the costumes for the skaters.)

"I started the go-carts because I really love to work with kids," Buri explains. "In 1967 we put in the bumper car building, and finished it in '68." By 1974 the batting cages and the arcade were built. In 1976 a three-level building that was to house the new arcade, the restaurant, and the roller rink was started.

That was also just about the time Buri bought his Apple. "What a tool—the machine is frightening. I bought it to help do commercials on the monitors [there are eleven placed in various areas of the complex, with tapes of musical groups constantly running, as well as listings of coming events], but I haven't had time to really get it up and running." Instead, Joy Buri uses the Apple to keep track of all the scheduling for Funway.

A three-and-a-half-million-dollar complex, Funway would not be able to exist on walk-in trade from the community of Batavia. The Buris have concentrated on locating customers within ever-increasing circles around their Batavia location. Church groups, scout troops, aerobic exercise groups, youth groups, park district organizations, and other community groups are prime targets for what Funway Square offers. The computer has proved to be an invaluable tool for keeping track of what markets have been tested and which have borne fruit.

When one enters Funway, one promptly notices the pervading atmosphere of wholesomeness. Funway is a controlled environment. Everything works, all the machines are in good shape, the place is always clean, and the people who run it seem endowed with endless patience and good nature. The Buris plan everything out, from parties to security and maintenance. Every piece of equipment, from skates to video games to electronic gear to bumper cars, has its scheduled time for maintenance. All the repair and maintenance work is done on the premises by the staff. The upkeep is simplified by the Apple, which allows the Buris to keep track of all the inventory in each of the Funway Square areas.

Bohlering for Messages. To do so, they use a database management system set up by another Apple-owning friend of theirs. During the past summer a local student, Chris Bohler, worked part-time as a programmer. Bohler helped the Buris get current inventory and scheduling systems running smoothly. He also implemented a message system for putting up colored messages on all the video monitors in Funway. It took a full week of programming to work out the color incompatibilities be-

PHOTOS BY MARY LOCKE

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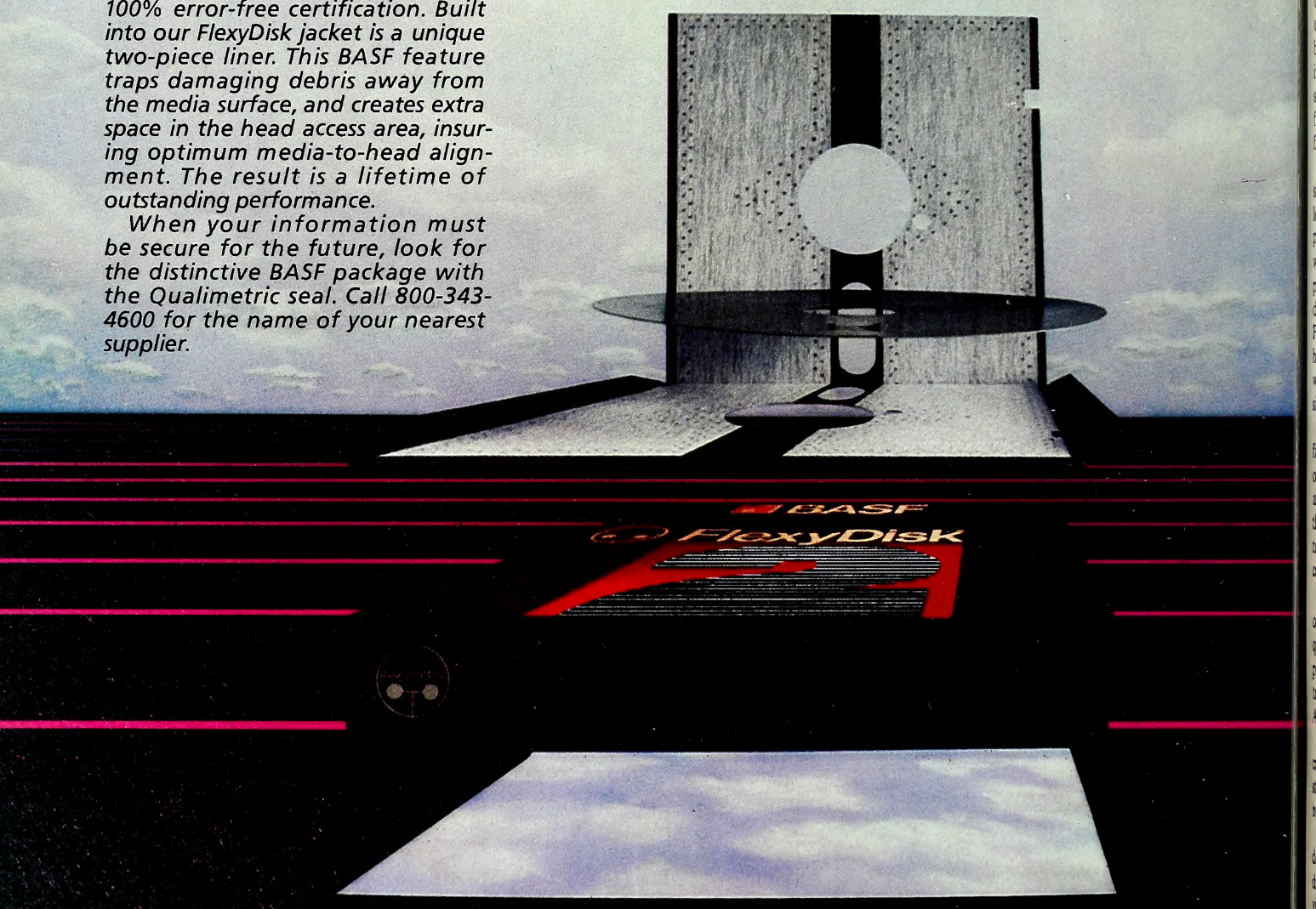

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tween what was programmed on the Apple and what showed up on the monitors after videotaping. Just as things got rolling, Bohler returned to school in the fall. That left Joy with the task of keeping data entry going and all of the scheduling on track.

"I just came in and did it," Joy explains, stressing that she is only beginning to figure out what the computer is capable of doing. "I realized it was a superexciting thing, but you need the time to learn about it. When I took the time, I found out you could do all sorts of things."

One of Joy Buri's first projects was to create a complete catalog of the hundreds of videotaped music pieces Funway uses in the roller rink and throughout the park. Garnered from a wide variety of sources, these tapes are played during skating hours, and on particular artist nights. Joy now has full lists of what each performance is, along with comments on its suitability for certain groups, and each piece's starting position on each video cassette. What used to be frantic searching is now a moment's work for the person in the control booth.

The rink is designed around a train station theme, with benches that were originally built in Chicago in 1902 and then brought back to the area from train stations all over the country and refurbished. The railway station ticket booth, where one buys entrance to the skating area, was built in 1886.

Bookings for use of the rink, which is the heart of the operation, are sometimes made months in advance. The computer is used to keep track of what group will be using the rink at what time, as well as who will be using the "Birthday Depot." On weekends the rink and depot area are booked full for three different two-and-a-half-hour sessions, and all during the week the evenings are reserved for different groups from various surrounding communities. A good part of Funway's business comes from banquets and birthday parties, all of which must be scheduled and fit in where possible.

Flaming Fox Valley Speedsters. As members of a national roller skating association, the Buris hold skating clinics in which youngsters learn to skate, working to earn merit badges for certain levels of accomplishment. According to Dick Buri, keeping track of who is at what level with group sizes of up to 275 kids can be tedious. "Before we got the Apple it was all paperwork. There was an ungodly amount of writing to be done." Funway also sponsors a speed skating group, the Fox Valley Flames, and holds meets at the rink. These meets involve some twelve hundred racers, all of whom must be registered and kept track of during what can at times be a week-long event. The Apple makes this task quite simple.

Funway employs some forty-three people, a dozen of whom work full-time. Work schedules—time off, and who is taking care of what area of the amusement center at what time—are all prepared on the Apple on a weekly basis. Besides the people running the various areas in the park, there are seven "animals," excellent skaters in specially designed costumes, who entertain the different groups of kids who come to skate or celebrate birthdays.

The vast amount of scheduling—customers, staff, and equipment—is complex and time consuming. The Apple has greatly reduced the time required to run Funway and has allowed the Buris to concentrate on improving their services and expanding their business. Yet Buri is frustrated because he feels that he has barely tapped the potential of his Apple.

"I don't have enough time to sit down and learn how to use it. I'm crazy when it comes to advertising, and when I see that fancy graphics stuff on television, I want to do it here. Sure they use bigger machines, but that doesn't mean I can't do it; I just have to think in smaller terms."

Funway's video monitors are all wired into a disc jockey's booth down in the roller rink. From that control point, using the library of hundreds of records and tapes, the disc jockey floods the entire complex with videotapes of current musical groups playing everything from top forty to disco to gospel to hard rock. It's the time between the tapes that Buri uses for advertising. Using messages typed via Synergistic's *Higher Text* and then taped on a video cassette recorder, he alerts the kids to upcoming events and specials, and to whatever promotion Funway might be running for the next couple of weeks. Hundreds of people see those messages, particularly on weekends, and that pays off.

For Dick Buri, however, typed messages are just the beginning of the kind of internal advertising he would like to do with his Apple. Losing Chris Bohler last fall set his plans back a bit, but he believes the Apple will enable him to do animated graphics commercials that may eventually find their way onto the airwaves over a local public service cable television channel. He has the equipment to do graphics work, and he has the software. What he doesn't have is the time to learn to use them. Nor does he have any programmers on his staff, a situation he is considering doing something about.

"I've got to find an individual who thinks simple," he explains, "someone who can help me get what I want out of the computer."

Coordinated Future Kids. What does an arcade owner think of the Surgeon General's recent comments about the effects of video games on youthful minds?

"He doesn't know what's going on. Just watch these kids, eight-year-olds with fantastic hand-mind coordination. They're geared to computers, their lives are hi-tech. These are the kids of the future; they have everything in their favor."

For Buri, watching the kids is everything. He sees children growing up with technology and finds it reassuring. When he encounters the less favorable aspects of youth, drug use and rowdiness, he deals with things quickly and quietly. The offenders are removed from the premises and handed over to local authorities. But to Buri that's just a small part of what goes on in an amusement park. He's more concerned with the kids who are developing sharp minds. He sees some kids not just playing games, but figuring them out and deciphering the programs behind the animation and action.

Dick Buri has found his niche. He provides entertainment for all, but for children in particular. He draws a lot of his inspiration from another man who spent his life entertaining people: Walt Disney.

"I just patterned my whole program after Disney," he says. "He was a super individual. He had a lot of foresight, and it's kind of always been man's nature not to have foresight."

It was Disney's use of technology that first steered Dick Buri in the direction of computers, and it is Disney's vision of providing good, clean fun for the family that is the guiding light at Funway Square.

Not a bad act to try to follow. ■

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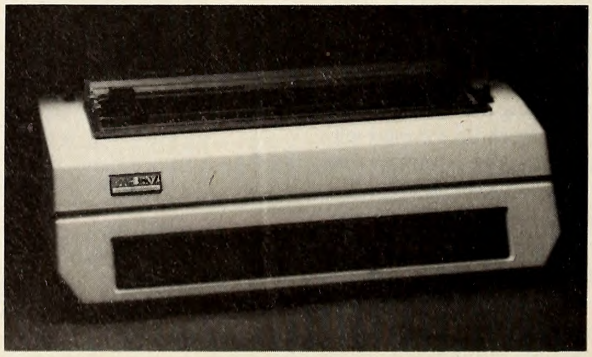

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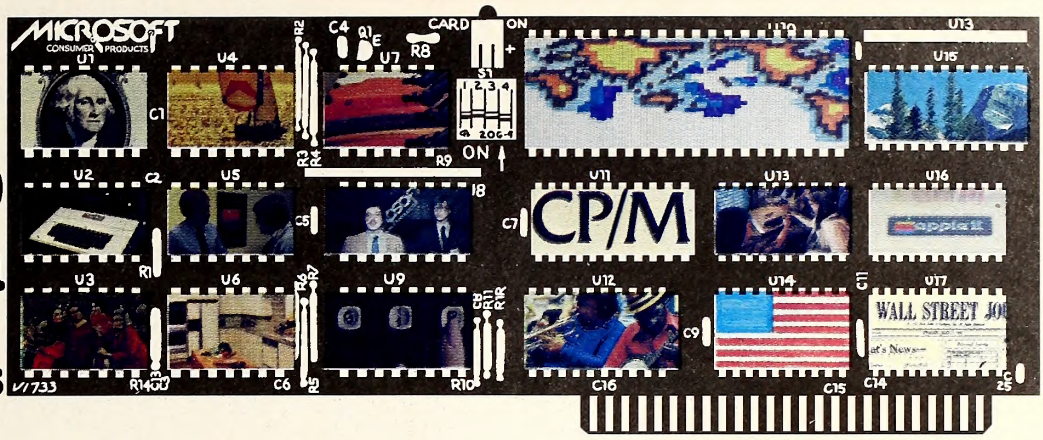

Welcome to yet another installment of SoftCard Symposium. We broke off last month's discussion of the BIOS character I/O routines after examining CONST and CONIN, the console status and console input routines. This time we'll begin looking at CONOUT, the console output subroutine.

The code for CONOUT is more complex than that for the two subroutines we looked at earlier. That's because in addition to taking care of the simple display of characters CONOUT must handle operations known as *screen functions.* Before looking at CONOUT in more depth, it's important that we understand the differences between screen functions and simple character display.

Character display is the routine process of printing a character or a sequence of characters to the video screen, beginning at the current cursor position and continuing from left to right and from top to bottom. Terminal screen functions, on the other hand, are special operations performed by the display device or video driver. Screen functions don't cause a character to be displayed; rather, they cause either cursor movement or a radical alteration of overall screen content. These functions may be as simple as moving the cursor up a line, down a line, or whatever, without altering the data being displayed, or as complex as clearing a complete line of text (with no cursor movement at all) or clearing the entire display.

Unfortunately, the difference between character display and screen functions is not so clear-cut as the foregoing descriptions may seem to imply. We have said that character display involves the output of a particular single ASCII value that causes a specific character to be placed on the screen. We've also said that screen functions usually involve a sequence of values that are output and that have some effect on the display but do not generate a screen character. However, in between these two are certain ASCII values, such as the carriage return and linefeed, that we output the way we do characters, but which, like screen functions, cause cursor movement in place of character display. These, you'll find, may be called characters or screen functions, depending on who's speaking. The difference seems to lie in how well the industry in general accepts them as standard characters.

The ASCII value 13, for example, is universally accepted as a carriage return and has the universally defined effect of moving the cursor to the beginning of whatever line the cursor is on. The same sort of thing is true of ASCII value 10, which is universally accepted as linefeed and moves the cursor down a line while maintaining its horizontal position. True screen functions, on the other hand, usually vary from one manufacturer to another and from one terminal or display to another.

For some reason, many people seem to have difficulty with the concept of screen functions. For them it's an area that seems somehow complex and mysterious. If you're one who has this reaction, you might try thinking of these functions simply as control codes, a concept we've discussed often in the past. Like printer control codes and serial device control codes, functions are not treated as data. Rather, screen functions are used by the display device as a signal to perform some operation, just as your printer performs a formfeed when it receives a control-L or whatever code it recognizes as the formfeed signal. Screen functions, then, are simply control codes for the display device. Likewise, just as the set of printer control codes varies from printer to printer, the set of screen functions varies from display to display.

In practice, there are a good number of simple standard functions normally used by all display manufacturers and a number of extra functions an individual manufacturer might see as useful. By and large, whether it alters all data on the video screen, only a part of that data, or perhaps none at all, the purpose of a function is to increase the efficiency of the data display process. In some cases the efficiency increase takes the form of speeding up the output; in others, it produces a better-looking result; and in still others, it makes possible the performance of a task that could not have been accomplished without a screen function. It's usually safe to say that the more functions a terminal or display device supports, the more flexibility it offers the programmer.

As an example, the function of clearing the display and moving the cursor to the top left-hand corner of the screen may be simulated to a limited degree by simply outputting twenty-four carriage returns. Doing this does not generate as good a result, though, as a Clear Screen/Home Cursor function. After all, the cursor is still at the bottom of the display and there is a column of CP/M prompts (A>s) down the left side of the screen.

Similarly, clearing a line of text may be simulated by issuing a carriage return, printing a full line of spaces, and then issuing a second carriage return. This creates just as nice an effect as issuing the Clear to End of Line function with the cursor in the first column. It is not as efficient, however, since as many as eighty-two character values will have to be individually printed via normal output channels.

Other functions, such as moving the cursor up a line or turning the cursor off altogether, simply can't be simulated using the standard characters. SoftCard CP/M makes use of a number of special functions in addition to standard things such as linefeed, carriage return, and backspace that are supported as part of the Apple Monitor or eighty-column display device. For purposes of this column, we'll break out the nine screen functions that can be altered using the CONFIGIO utility and consider these alone as screen functions. All other sequences, regardless of their effect on the display, will be called character output.

The nine screen functions are named and described in table 1. Such standard items as a nondestructive backspace (cursor back) or linefeed (cursor down) are not included there since, as we've said, these are pretty much standard items within the ASCII character set.

These nine functions, then, are the ones that can be modified under SoftCard CP/M to match up with the requirements of various display devices. It must be noted that such modifications don't alter the way the various functions work. Cursor Up, for example, is virtually the same on every type of display. What gets modified is the sequence of values that must be output by user software to cause the function to happen. Cursor Up on one terminal may be caused by the simple output of ASCII value 11 (the ASCII Vertical Tab), as a character value. Another terminal may require an ASCII value of 27 followed by an ASCII value of, say, 55 (a

NAME	DESCRIPTION
Clear Screen	Clear entire display to black and move cursor to upper-left corner.
Clear to End of Screen	Clear from current cursor position to end of current line and clear all following lines to black. Leave cursor in existing position.
Clear to End of Line	Clear from current cursor position to end of current line and leave cursor in existing position.
Lo-Lite Text (Inverse)	Depending on display, this function causes characters output after it to be displayed either half-bright or as black on a white background. This continues until Hi-Lite sequence is output.
Hi-Lite Text (Normal)	When issued after displaying in Lo-Lite, this causes character output to return to normal brightness, white on black.
Home Cursor	Move cursor to upper-left corner of screen.
Address Cursor	Move cursor to specific row and column screen coordinates nondestructively (that is, does not alter characters being displayed).
Cursor Up	Move cursor up one line in the same column nondestructively.
Cursor Forward	Move cursor forward one character position in the same line nondestructively.

Table 1.

sequence in which an escape character is followed by the number 7). In the latter case, the escape character is called the *lead-in character* for the function. The presence of the lead-in character lets the video driver (whether contained in ROM or RAM) know that the sequence is a screen function and not simply the character 7 to be displayed.

The use of the lead-in is probably the most common method of implementing screen functions. The reason for this is the fact that with lead-ins no individual ASCII values need to be reserved (and therefore not used in other ways). Unless a value has the lead-in character immediately preceding it, the video driver simply prints it or ignores it based on whether it is a printable character. Because of this arrangement, TYPEing to the screen a non-ASCII file that contains such values, or using software that routinely outputs the values for some purpose of its own, won't foul up the video display except on those rare occasions when the lead-in and the control code are in the correct order. Even so, some display devices do not make use of lead-ins. When these devices are being used, special care must be taken to avoid random output of values; otherwise, some bizarre things may happen in the display.

We now have enough information to begin our examination of the CONOUT subroutine.

CONOUT is the fifth entry in the jump table at the beginning of the BIOS. In 56K CP/M, this places it at 0DA0CH (in 44K, it's at 0AA0CH). The Digital Research criteria for CONOUT states that the subroutine must take the character value in register [C] and send it to the current console device. It also states that the character will be transmitted as an ASCII value with the high-order bit reset (0), meaning, of course, that the value will be between 0 and 127 decimal. Beyond that, the choices of what the subroutine will do are strictly up to the designer.

In the case of SoftCard, the implementation of the IOBYTE means that the character may be sent to a variety of possible devices (the selection is similar in structure to what we discussed last month for input devices when we were talking about CONIN). Consequently, the CONOUT subroutine itself (at 0DB43H in 56K) has as its first task the decoding of the IOBYTE to determine which of the physical devices—BAT:, TTY: (remember that TTY: is both TTY: and CRT:), or UC1:—is in effect. The first check is made for the BAT: (meaning batch mode) device, since if BAT: is in effect the output will be through the logical list device.

As you'll recall from last month, we talked about the fact that CONIN has a minor bug; namely that the address contained in Reader Input Vector #1, rather than the address of the READER subroutine itself, is used in batch mode. This means we'll always get our input from the physical RDR device instead of from the currently assigned physical device. The very same situation exists with CONOUT. SoftCard selects the address contained in List Output Vector #1 rather than the address of the LIST subroutine, meaning that our output always goes to the LST device, even if another physical device is currently in effect.

In essence, then, batch mode goes through specific physical devices and is not subject to further indirect vectoring (by letting the READER and LIST subroutines reexamine the IOBYTE). Given that BAT: is seldom used, these are not potentially serious problems. Nevertheless, they are not totally in alignment with Digital's criteria and may therefore be altered if one wishes.

Both problems can be corrected in the same manner, and although the original plan was to explain how to do this as part of the column, it's really a better use of space to issue this change separately. If you'd like to receive it, send a stamped, self-addressed envelope to SoftCard Solution, Box 60, North Hollywood, CA 91603, and we'll send it to you. (Sorry if this causes any inconvenience.)

For now, however, let's continue to look at what happens if BAT: is not selected. As soon as CONOUT determines that BAT: is not in effect, it transfers control to a subroutine at 0DB97H called TTYOU2. This subroutine first determines which of the two remaining physical devices, TTY: or UC1:, is assigned to the logical console device, storing the results in a variable location called VECFLG, at 0DEA2H.

The determination is made by using the result of the comparison with the IOBYTE at the beginning of CONOUT. When CONOUT first examines the IOBYTE, it compares the IOBYTE's value to the value it would have if BAT: were assigned. It then tests for a zero result. If the result turns out to be nonzero, CONOUT goes to TTYOU2. Essentially, it has by this time also determined whether TTY: or UC1: is in effect as well, since these values are one less than BAT: and one more than BAT: respectively.

The compare instruction sets the carry flag if the value is lower than the one it's being compared to and clears it if it's greater than or equal to that value; this leaves the carry set if the IOBYTE contains the value for TTY: and clears if it contains the value for UC1:. TTYOU2 then uses the carry value by subtracting the value in the accumulator [A] from itself with an SBC AA instruction. If the carry is clear, 00 will always be left in the [A] register, and if the carry is set, 0FFH will always be left there. The value in the [A] register is then loaded into VECFLG for use later in determining where to send the character.

For now, though, TTYOU2 ensures that the character has its high bit clear and then examines a variable called ESCNT, at address 0DEA3H. This variable is used as a counter to count down the number of characters already processed in a cursor addressing function. It is needed because cursor addressing, also called GOTOXY (from go to x, y), requires a number of values to work with—the lead-in, the function character itself, and then the row and column coordinate values. The video driver, therefore, must have a way to check (as each value is received) which value is being processed at the time.

Assuming that no GOTOXY function is in progress, ESCNT will be 00 and control will pass to a routine at 0DBEOH, called NOESC. This routine is responsible for examining the character being sent to determine whether or not it is a screen function. First, it checks yet another variable (called ESCMSK) at 0DEA4H. This variable is used as a flag to indicate whether the previous character sent was a lead-in. If it was, then it will have a value of 80H; if it was not, its value will be 00.

If the test of ESCMSK reveals that the previous character was not a lead-in, NOESC then checks to see if the current character is a lead-in. As you've no doubt guessed by this time, the most common lead-in is the escape character (although other characters certainly can be used).

The standard lead-in character (if any) is always stored at the beginning of the software screen function table in the IOCB. This table begins at 0F397H and goes to 0F3A0H inclusive.

NOESC tells whether the current character is a lead-in by loading the value of the standard lead-in character from the table and comparing it against the value of the current character being sent in register [C] to see if there's a match. If so, NOESC recognizes that a lead-in has been sent and that the next character processed should be the screen function itself. To ensure that this next character is tested, it sets ESCMSK equal to 80H and returns for the next character of output.

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You'll notice that no attempt is made to transmit the lead-in character itself. It is for this reason that in the standard version of SoftCard software a single escape character cannot be sent to an external console device. To send a single escape character successfully, you'd have to send two escapes, the first of which would be discarded as a lead-in. Since none of the functions consists of a lead-in followed by an escape, the second escape would be transmitted normally.

Note also that a moment ago we mentioned the software screen function table, implying that there is also a hardware screen function table. In fact this is correct. The relationship between these two is very straightforward. For example, the first item in the software screen function table is the same function as the first item in the hardware screen function table. This one-to-one correspondence between the two tables is complete.

Although there are many different sets of function control codes, depending on who manufactured the display, application software must send a single set of codes. In CP/M, this is one of the most difficult items for the software producer to cope with. Most companies handle it by supplying some type of installation or configuration program to allow users to insert their own particular screen function codes into the program.

SoftCard's designers decided to go this one better and allow the user to make the software screen function codes and the hardware screen function codes independent. If, for example, you're using software designed for a SOROC I-Q-120 terminal, but have a Hazeltine display, you simply set the software table to SOROC and the hardware table to Hazeltine.

Now the reason for the one-to-one correspondence between the two tables becomes clear. When a screen function value is received from the software, the BIOS translates that software value into the appropriate hardware value using the two tables. The BIOS takes care of making sure that the codes get translated properly.

Since at this point we're still examining the character received from the software, we're looking at the software function table. We'll encounter the other table when we do the actual output.

When we left NOESC, it had just found a lead-in and set ESCMSK to 80H before returning. It's now time to go back and see what would have happened if the character had not been a lead-in or if it had been the character following a lead-in.

Had the character not been a lead-in, and also not followed a lead-in, NOESC would then have transferred control to a routine called FNDFN1 at 0DBF5H. This is where the character would have been examined for possibly being a single-character screen function. Since all single-character screen functions must be control codes, FNDFN1 simply checks to see if the character value is less than 32. If not, it knows that the character is printable and proceeds to print it. If the character is a control character, control proceeds on to FNDFUN, at 0DBFAH, the routine immediately following FNDFN1. FNDFUN is also where control would have come to directly if the character had immediately followed a lead-in.

A brief summary: if the current character is a lead-in, the lead-in flag is set and control returns to the user program for the next character. If instead the character immediately *follows* a lead-in, then control passes to FNDFUN directly. Finally, if the character is neither a lead-in nor immediately follows one, it is checked for being a control character. If it is a control character, control goes to FNDFUN also; if it's not a control character, it is simply output as is.

In the FNDFUN routine, the current character is checked against all nine entries in the software screen function table to see if it matches any of the function codes. If it doesn't, it is simply output. If a match is found, however, then control passes to the function-handling routine XFUN, at 0DC0CH. It is this routine that is responsible for translating the software function code into its hardware equivalent and determining whether a hardware lead-in character is required.

If the high bit on the hardware function code is set, then a lead-in is required and everything is put on hold while that lead-in is sent. Once that has been done, control returns to a routine called XNLDN at 0DC23H, where the actual function code itself is processed. If no lead-in had been required, then control would have gone to XNLDN directly.

In XNLDN, the function code is checked to see if it is GOTOXY. If

it is, the counter ESCNT is set to 2 so that in the future we'll know that we're still processing a single function for two more characters. If it's not, the hardware function code is sent out as is.

In all of the cases where we've talked about outputting the character, we have transferred control to a single subroutine. This routine, called OUTIT, at 0DC2DH, is the actual beginning of character processing; it is also where our output vector address is chosen.

OUTIT's very first job is to clear the ESCMSC. Since by the time we reach OUTIT we have the actual function character (if a screen function is being translated), clearing the ESCMSK is done to ensure that we continue looking for lead-ins in the future. Next OUTIT must load the flag variable VECFLG and test it. If VECFLG is nonzero, then we are using the TTY: device and will output a character using the routine whose address is stored in Console Output Vector #1. If VECFLG is 00, on the other hand, we'll use Console Vector #2.

Since UC1: is a user-implemented device, just as it was with CONIN, we'll examine the #1 vector in this discussion. Also, like the CONIN routine, the CONOUT routine has its patch installed in the patch area to fix a problem in the original release. The address contained in the #1 vector, therefore, is the address of this patch routine at 0F35EH, called, naturally enough, OUTPAT.

Like the other patch routines, OUTPAT was created to correct a problem the Z-80 has with the Apple Communications card. Basically, the problem results from the fact that the Z-80 does a read before every write. Under most circumstances this would not be a problem. However, when dealing with certain kinds of control registers, an access of any kind, even a read, causes the register to change its state, lose its data, and so on. This is exactly what was happening in the early versions of SoftCard CP/M.

To correct the situation, OUTPAT checks to see if a comm card is installed in slot 3. If so, it checks the card's status register to determine whether it is able to receive a character. If it's not, OUTPAT keeps looping and checking until the card is ready. Once OUTPAT gets an okay, it does the actual sending of the byte in 6502 mode, by calling STACOM, a very short routine at the end of OUTPAT. (We'll talk about STACOM in more detail later.) In this way, the write is done in 6502 mode and no preread takes place.

The program flow, then, is as follows. From OUTIT, control is transferred to the address in Console Input Vector #1 and therefore to OUTPAT. OUTPAT checks slot 3 for the presence of a comm card and, if one is found, sends the character to it via a call to STACOM. It then returns to the caller, usually BDOS, for the next character. If no comm card is found, control proceeds to the standard TTY: output device driver, TTYOU1.

Located at 0DC3EH, this routine contains the address, patched by BOOT if necessary to take into account the presence of an eighty-column device in slot 3. TTYOU1 consists of only two instructions—the instruction to load register [DE] with 0003 (indicating slot 3) and a jump to the routine that will do the actual output. Initially this address is 0DC44H and points to a routine called WVID, designed to handle the standard Apple forty-column screen.

If a card was found in slot 3, however, the address would have been changed to point either to WCOM at 0DCDFH or to WSER at 0DD04H for a comm card or a serial card respectively. Remember now that eighty-column boards are handled the same way serial cards are. Note also that although WCOM's address may have been placed in this jump instruction, OUTPAT will never let the routine get this far if a comm card is installed.

At this point, then, we have our three basic routines for dealing with character output—WVID for Apple hardware, WSER for serial and eighty-column cards, and OUTPAT for comm cards. In the case of both serial and comm cards, no further processing needs to be done for screen functions. This is because external terminals are by definition capable of handling screen functions themselves when given the hardware function character and any necessary lead-in. Fortunately, eighty-column boards are complete in their emulation of terminals to the point that no further separation needs to take place for them either. The only situation in which we'll need to be concerned further about functions is the case of the Apple forty-column display, and we'll deal with that when we go through WVID.

For now, then, let's look briefly at the external display device routines. We've essentially covered OUTPAT already. It loads the status byte from the control register at 0E0BEH (the same as our discussion of CONIN last month) and this time checks the ready-to-transmit bit of this byte, bit 1 (remember, each byte is eight bits, 0 through 7, going through from right to left). If the bit is set, the comm card can accept a character; if the bit is clear, it cannot. OUTPAT will loop until this bit is set, at which time it will use the 6502 subroutine caller loop in the previously discussed IOCB to set up a 6502 call to STACOM. STACOM simply stores the character in the comm card data register at 0E0BFH ($C0BF) and returns to OUTPAT, which then returns to BDOS.

The process is similar for serial cards. Using the method described last month, WSER disables all other cards' C800 ROMs and enables the C800 ROM of the serial card or eighty-column board in slot 3. Data is then loaded into the 6502 register save locations and the page zero temporaries used by the serial card. The address of the serial card write routine in ROM, $C9AA, is used as the 6502 subroutine address to be called, and the 6502 subroutine caller in the IOCB is used to execute it. The byte is then written to the serial card and control returns to WSER, which itself returns to BDOS. Basically, that's all there is to serial and comm card output.

Now we'll tackle WVID, the last major section of the CONOUT code dealt with here. WVID first loads the memory address that corresponds to the screen location of the cursor. As you may know, the entire video screen is mapped into memory, such that a single character position on the screen corresponds to a single byte in this RAM. To alter the character displayed at a particular position, one only has to alter the value of this RAM, and the video hardware takes care of printing the new character on-screen. Finding out which memory location corresponds to which screen location is a bit complicated, due to the way the screen is mapped into memory. There's a reasonably complete description of this in the *Apple II Reference Manual*, however, and it's a good source for further information about the arrangement.

In standard Apple systems, most software makes use of the routines contained in the Apple Monitor ROM, which were designed to do all the necessary translation. SoftCard CP/M also makes use of these Monitor routines, but because some of the screen functions supported by CP/M are not supported by the standard Apple routines, it must also keep track of much of this information itself.

The cursor address that WVID just loaded is one of those pieces of information it needs to keep. The cursor address is always kept in a temporary variable called CSRADR, at 0DEA5H. Since this is a sixteen-bit number, it is stored with the low-order byte in that address and the high-order byte one address beyond at 0DEA6H.

Also stored in a temporary variable called CHRTMP, at 0DEA7H, is the character that's underneath the cursor at any given time. (Remember that if no character is there, we are talking about a space.) WVID loads this character and then stores it at the current screen location, since it's most likely that we'll be moving the cursor to a different location and that this character will display normally from now on.

To avoid confusion, the way the cursor is displayed on the normal Apple screen is by converting the existing character in that location to a flashing character. What happens, therefore, is that the character alternates between normal and inverse. For a space, this alternates between a white square block and a black square block. We can see, then, that this cursor is really more an imaginary point than a separate character. Wherever the cursor is said to be located, the actual character value stored in screen RAM has been modified to represent the flashing version of the character, rather than the normal character value. This is also covered in your Apple reference manual.

WVID, therefore, in preparing to move the cursor or print another character, restores the normal character value in the screen RAM at the current character position. At this point, WVID then calls a subroutine, VIDOUT, at 0DC6BH. VIDOUT's first job is to determine whether a screen function is being sent. If not, VIDOUT proceeds to normal output at a routine called VOUT2, at 0DC7AH.

VOUT2 is responsible for processing carriage returns if the character is one. If the character is a carriage return, VOUT2 returns the cur-

sor to the beginning of the current line by altering the cursor horizontal position pointer, another page zero location that is used by the Apple Monitor to keep track of where the cursor is on the screen. In this case, VOUT2 makes this value 00. Once having done that, it returns to WVID.

If the character was not a carriage return, control moves to VOUT3 at 0DC84H. VOUT3 checks to see whether it is lower case. Based on the result, it alters the character to upper case if necessary, unless the user has some type of lower-case display device in his machine. Once VOUT has done that, it uses the 6502 subroutine caller loop in the IOCB to call the character output routine in the Apple Monitor at $FDF0. Control returns directly to WVID in that case and the character has been printed.

WVID will at this point simply update the variable CSRADR with the address of the new cursor position, taking the character now under the cursor in screen RAM and storing its normal value in CHRTMP. It will then convert this value into a flashing character, storing it in screen RAM so that the cursor is displayed. WVID then returns to BDOS.

Had the character been a screen function, a different set of routines would have been used. If when we tested this value back in VIDOUT it had been a function, we would have fallen through into a routine called DOFUN. The DOFUN routine selects the appropriate function-handling routine from a table of address vectors.

In reality, to conserve space, this table, called CTRLJP, from 0DCD5H through 0DCDEH, consists only of the addresses of each of the separate function routines. Making sure that all of these routines and the table are in the same memory page (that is, sharing the same high-order address byte) ensures that only the low-order byte will be needed to find the various routines. DOFUN loads the [HL] register with the address of the beginning of the table and then simply indexes to the desired entry based on the function number, 0 through 8. Once it has found the entry, it loads the low-order byte into [L], thereby pointing [HL] at the address of the function-handling routine.

All that's required to perform the Lo-Lite and Hi-Lite functions is to store the appropriate value (0FFH for normal or 3FH for inverse) into the page zero temporary variable at $32 that subsequent character output will use to make these characters display either normal or inverse. Once this is done, control returns to WVID. The Cursor Forward function is performed by a Monitor routine at $FBF4; Clear to End of Screen by the Monitor routine at $FC43; Clear to End of Line by the Monitor routine at $FC9C; Cursor Up by the Monitor at $FC1A; and linefeed by the Monitor at $FC58.

Each of these function routines sets its individual Monitor routine address and then makes use of the 6502 subroutine caller loop, with control returning to WVID at completion. The Home Cursor routine does much the same thing but must first set the cursor horizontal and cursor vertical position pointers in page zero locations $24 and $25. It then calls the Monitor routine, which recalculates the cursor position with respect to screen RAM. The *Apple II Reference Manual* describes the activity of this routine, referring to the routine as BASCALC.

The final function routine we want to cover here is GOTOXY. As we said in our earlier discussion of TTYOU2, once the lead-in character and GOTOXY function code have been sent, we need to get the next two values (row and column) before we can actually perform the function. This is done from within TTYOU2 if we do not go to NOESC. Essentially, TTYOU2 is responsible for obtaining the other two values by continuing to return to BDOS until the last two are received. As they are found, TTYOU2 stores them in temporary locations, where they will be used by the actual function-handling routine.

Once all values are in, TTYOU2 calls OUTIT itself with a special screen function value. OUTIT then processes this value in the normal way and proceeds to that entry in the function table. The GOTOXY function handler then uses the values in the temporaries to reset the vertical and horizontal position pointers to the appropriate numbers for that row and column, and calls the Monitor BASCALC routine to do the actual positioning.

This has been a complex discussion. In the future, as we discuss alterations to these routines, what's going on should become somewhat more transparent. Reading the *Apple II Reference Manual* section on this subject will also help. Until next month. . . . ■

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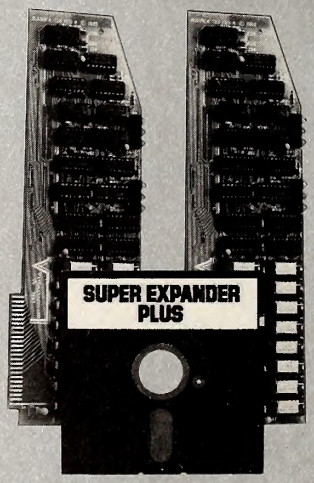

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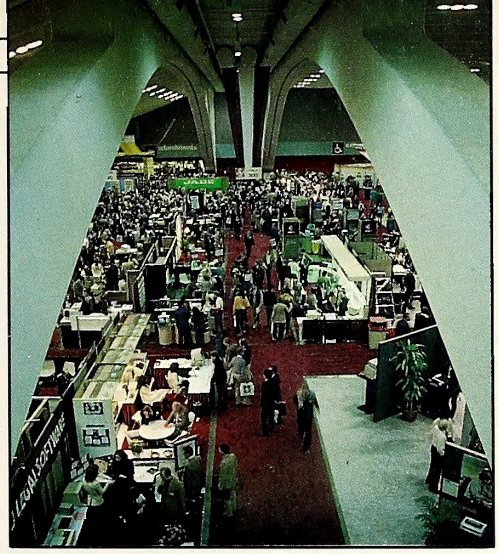
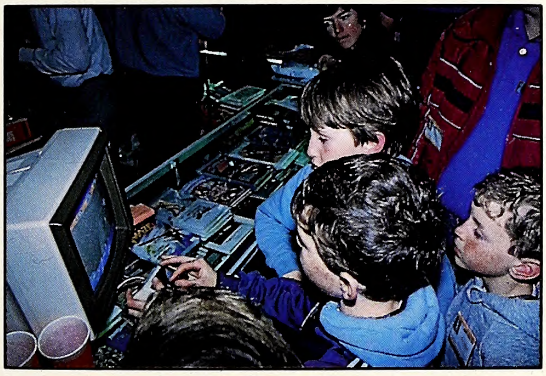




First row: Pigeon's eye view of the packed convention floor from the rafters. National Cash Register hucksters touted their new personal computer entrant. Second row: Steady rains didn't deter computerists, as this long line waiting to enter the exhibition shows. The man who started it all, Gary Kildall, gave an overview of CP/M, past, present, and future. The Digital Research booth was front and center, both in terms of location and interest. Third row: Interested spectator was *VisiCalc* creator Dan Bricklin. Retailers with Apples and Ataris on hand had the most popular displays for the younger set. Master promoter Jerry Milden set all kinds of world records for attendance at a first-time show with this effort.

Surprising was the first word of exhibitors and attendees at the CP/M '83 show held January 21 through 23 at the underground Moscone Center in San Francisco. The show, sponsored by CP/M maker Digital Research, was a surprise on several levels.

The biggest surprise was the attendance. Despite rain and the threat of a major storm, thousands more people than hoped for showed up to tackle more than two hundred booths and three days of workshops, software spotlights, and discussions.

The second surprise of the show was the number of non-CP/M users in attendance, lured by the display of more than forty different kinds of CP/M-compatible computers all under one roof, catering to both business and personal needs. Business applications were the main thrust of the exhibits.

The huge influx of people who didn't even own a computer, who were "just looking," was the third surprise of the event. Apples and the IBM pc were their top choices. Staffers in the *Softalk* booth tirelessly pointed the way to the nearest Apple on the floor.

Apple Computer didn't have a booth, but the new IIe was well represented by several retail exhibitors. The name Lisa buzzed through the crowd, as the name of any new star would be gossiped about at an industry event—no surprise to anyone.

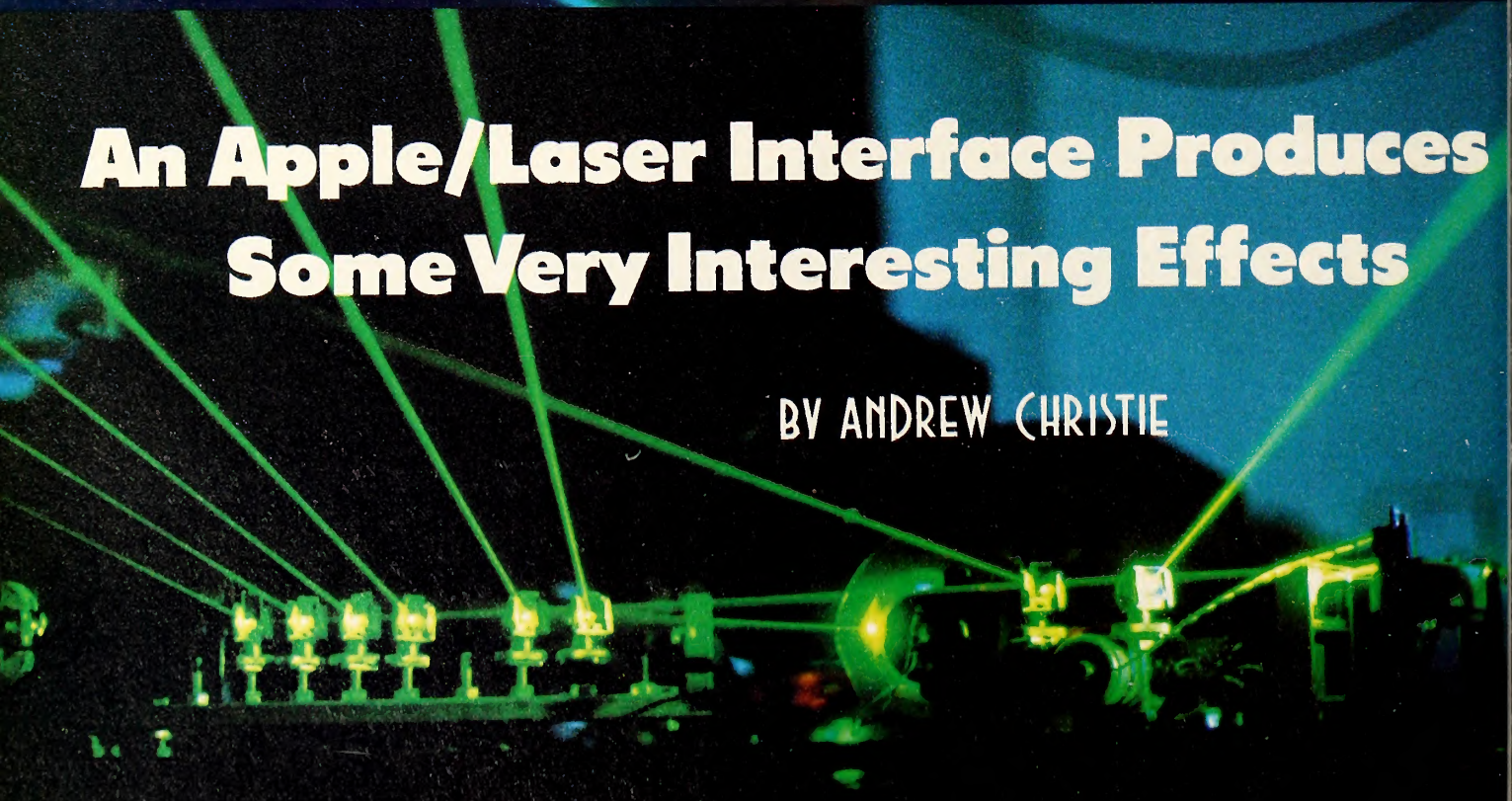
A touch of irony came from *Time* magazine, which ran a picture of Digital Research founder and CP/M designer Gary Kildall enthusiastically playing on the CP/M-less Lisa. The photo was on the newsstands the same week the CP/M '83 show was attempting to forward Kildall's own brainchild. ■

LIGHTS, CAMERA....

ZAP!

An Apple/Laser Interface Produces Some Very Interesting Effects

BY ANDREW CHRISTIE



How does a young man with artistic ambitions and a background in English literature pursue a hi-tech dream?

Howard Shore was a teenager with a yen for science fiction when he first read about lasers in *Scientific American* in the late 1960s. It was love at first sight. His growing fascination with discrete frequencies of coherent visible radiation found its first outlet in a 1976 holography class at the University of California at Los Angeles. This led to his development of the world's first holographic wristwatch—just on the verge of the price plunge for all LED products. He wound up with a lot of unique watches that he would have had to have sold for less than the manufacturing cost. Alas.

His break came in 1980 when a friend got him a job with David L. Wolper on the film *The Man Who Saw Tomorrow*, using lasers to represent atomic missiles in the movie's Armageddon finale.

A Fateful Meeting. On his way at last, Shore proceeded to buy up electronic equipment and lasers from auctions and surplus stores. One day he ran into a man with a laser for sale, for which someone else had already offered a fair sum. Shore offered more, and the seller said he'd get back to him. The next day, Shore found that his competitor had been back in the interim and offered still more. The seller had no complaints, but for Shore it was somewhat exasperating.

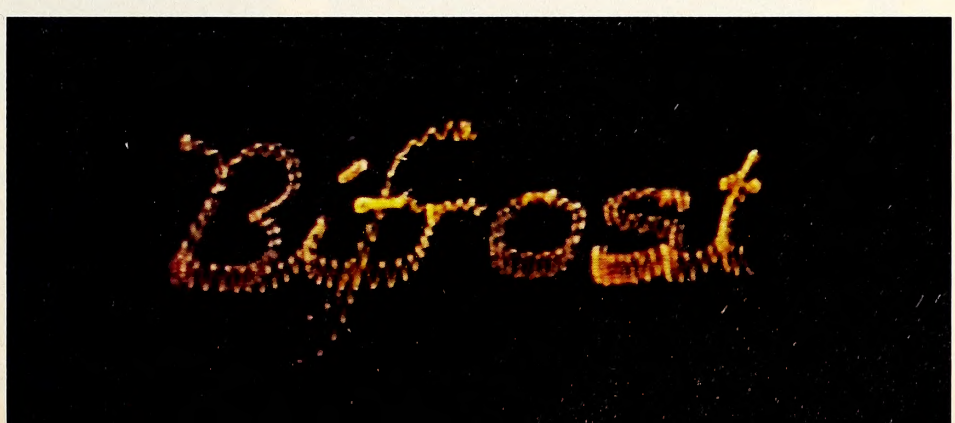
"Listen," he said, "I'm going to have this laser, but you've got to sell it to me now, and you've got to give me the other guy's name and phone number."

The deal was closed, Shore called up "the other guy," one Todd Eliot Mahon, and said, "I own the laser, I needed it very much, but I don't need it all the time. Could you use it half the time?" Mahon agreed, the two split the purchase price, and each gave the other free time on their mutual laser. While they were at it, they decided to give their partnership a name. Thus was Bifrost Technical Effects born.

Shore had heard that lasers could be linked to computers, and was taking a computer class at a local college "just in case" he might need it. He did. Todd Mahon's expertise in digital electronics allowed him to enter the name of a client onto a PROM, and thus write the words in laser light. Realizing the market potential of what they had, Mahon and Shore sold an Argentine company on the idea, used the profits to buy an Apple and attendant hardware, and called in Apple programmer Eric Popejoy to assist in the design of the Apple Lasergraph.

The Creative Process. Working in tandem, Popejoy and Mahon began development of software that would create and store an image on the Apple and then translate it into laser light. The two engaged in a friendly competition; as Shore would come up with a new "wouldn't-it-be-neat" idea, Popejoy would say, "Yeah, I can do that," and Mahon would race to complete the necessary wiring to take Popejoy's signal. Shore recalls that it was "like conducting a duet of two Spocks in a Vulcan orchestra."

When they finished, they had the basis for Bifrost's present-day system: an Apple, a beam console, and a bit graphics tablet with software that stores points—up to 1,000 per image—as x,y coordinates, runs a display program, and loads up to ten images into the computer. Hitting a key sends the coordinates to a Mountain Computer digital/analog converter, converting them to voltages that are transmitted to the tiny galvanometer-mounted mirrors of the laser beam head. The beam, now fraught with computer image, hits a prism and is bounced to mirror z before it has a chance to break up into colors; mirror z shines onto mirror x, which picks up horizontal deflections and passes the beam to mirror y



Opposite page: A krypton laser struts its stuff, guided by an Apple II Plus and fueled by the dreams of Howard Shore (above left) and the engineering skills of Todd Elliot Mahon (above right). The result is a Bifrost production—named for the rainbow bridge between Earth and Asgard.

Is this a system? An Apple, digital/analog converter, interface box, and function generator support a beam console in Bifrost's video production "Alon," a choreographed piece for dancer and laser.

for vertical deflections. The beam is then ready to carry its image onto a screen or into space.

Potentiometers on an interface box are read by the DAC (faster than joysticks or paddles) and allow for simple animation and the addition of external signals: a circle drawn on the graphics tablet can be reproduced in shimmering green laser light; then, a function generator, working like a synthesizer/oscillator, can put an analog square wave across the circle and modulate the outside rim to give a starburst effect. Mahon designed an inverter circuit that can cause the image to rotate.

The system enabled Shore to give shape and form to the visions that danced in his head when he opened that fateful copy of *Scientific American*: "When we get an image we like, we save it; when we get ten images we like, we run our *All* program and give them a sequence name. We can adjust the speed of the computer, causing animation routines; we can command the image to *draw*, *erase*, *erase from back*.

"Once the image is digitized, we can display it as laser light, stick the z axis on a sine wave, and use special filters. By the time we're done, we've modified the image three different ways, giving us a lot to play with in the tape editing."

Finicky. With lasers, the name of the game is alignment. The mir-

rors must be in the proper relation to each other, and the necessary adjustments are measured in microns. But they are done by hand. As Mahon puts it, "Sometimes you just drop a new mirror in and it works; sometimes you drop it in and there's a little piece of dust or something in there and it doesn't seat properly. You throw the beam out in different directions and rock the beam around. . . . You make a sort of raster scan to try to find the alignment."

The Apple alone can give any signal necessary to run the laser. Looking at the laser interpretation of an Apple graphics tablet can get boring, however; that's why Bifrost installed all the extra hardware.

"Ultimately," says Shore, "we'd like to videotape a live scene, enter the tape into the computer frame by frame and save the image to disk, convert it to x,y coordinates for vector display as laser light, then retape it and remix the results with the tape of the original scene."

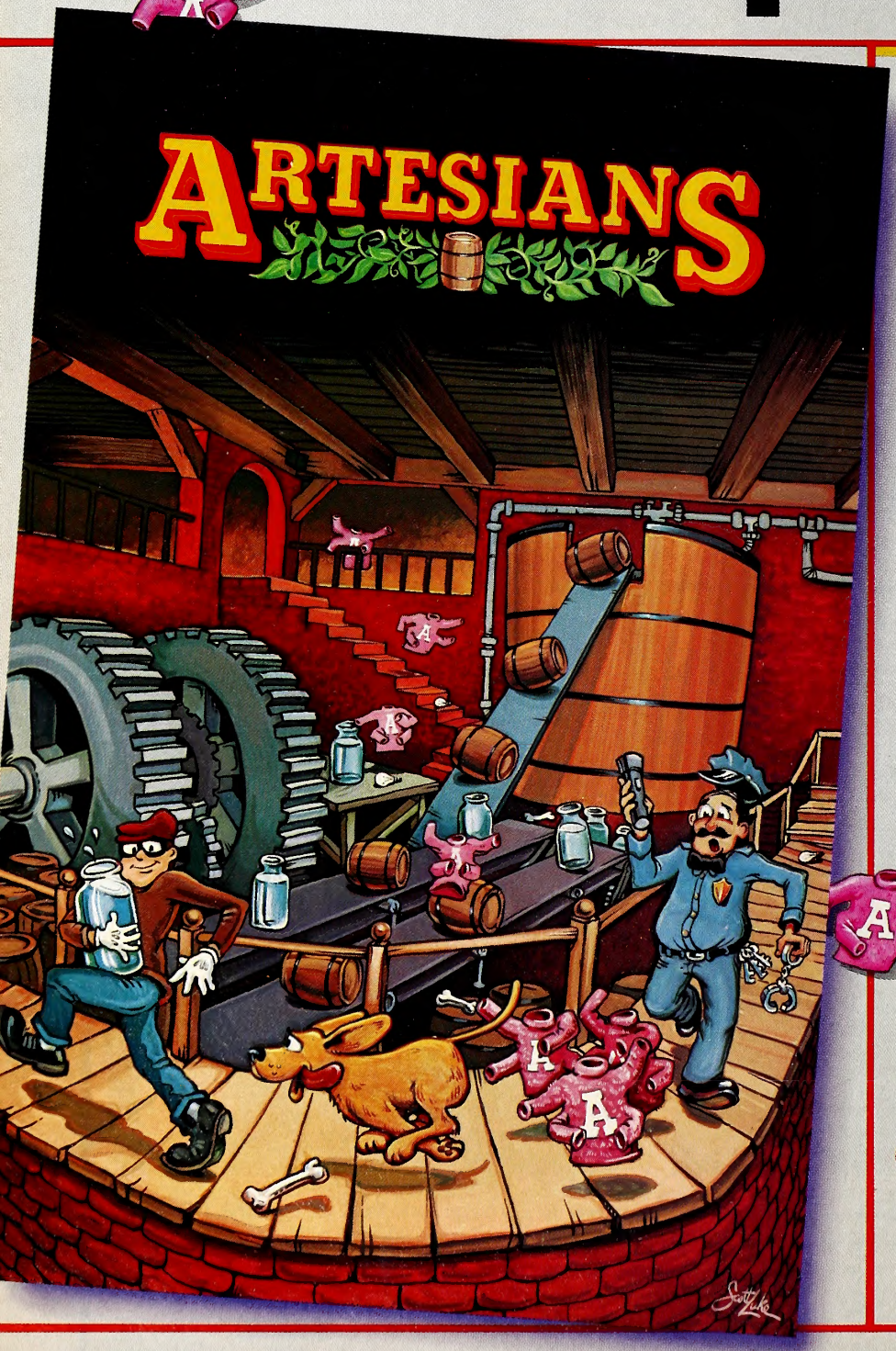
If you present that scenario to people who know about these things, they will reply with a succinct, "No way." Shore admits it will be "painful," but with an image buffer of appropriate size he is confident that it can be done.

The Future Is Yet To Come. So far, Bifrost's efforts have ranged from television commercials to live performances at clubs and parties in the Los Angeles area. Their videotape production, "Alon," is an example of the direction they'd like to go with lasers. Eventually, with the right backers, the company hopes to experiment with Apple/motion-control camera technology, possibly using Shore and Mahon's laser expertise for range finding and sighting.

But Todd Mahon is considering another possibility: "With a faster computer, we could alter the image mathematically. If you know a specific number of points in the image, you can draw another image using the same number of points, and plot a line going from one point to the corresponding point on the other image. Then every point has a line to which it must go to get to the next shape; you can draw a picture and blend it into another one. It looks like animation."

And Bifrost Technical Effects is off and dreaming. ◨

Artesians. Win with brain power. Not fire power.



Dive into a different sort of battle. Artesians. It's a battle of wits–not weapons.

And, it's the new video game that could be the most intense challenge you've ever undertaken. Playing will teach you to think like a mastermind. Your goal is to fill the jugs with precious Artesian water. But first, you must maneuver through four floors of increasingly complex maze-like paths. Dodge rolling barrels. Duck dangerous conveyor belts. And elude your pursuers–Hank, the watchman; Floyd, the dog, and an endless horde of Artesians. Then, you've got to cover all your tracks—and escape.

Artesians. The more you play, the more infinite the complications become.

So fire-up your brain power for an evening of action. And match wits with Artesians.

Artesians is a high resolution arcade style video game written for the Apple II, Apple II+, and the Atari 400/800 home computer. Available from computer stores or direct from Rena-Soft, 1070 Shary Circle, Concord, CA 94518, (415) 676-5757

Artesians, $34.95. Requires 48k.

Rena-Soft

ARTESIANS. Different from the rest.

NEWSPEAK

Meeting people and machines makes the West Coast Computer Faire a mammoth microcomputer party.

PINBALL INDUSTRY SEES THE WRITING ON THE WALL

The pinball machine won't be around for you to tilt much longer. The celebrated pastime of hoods and punks is dying out in the arcades of America. The sounds of springing flippers kicking steel balls into alleys, banging them into bumpers, and zooming them around hairpin curves have been replaced by the explosions, tick-tick-ticks, and infectious tunes of video games across the country.

Three years ago, more than two hundred thousand pinball machines were sold nationwide—an all-time record. But sales plunged to thirty-three thousand in 1982, prompting Stern Electronics, one of the big four manufacturers, to stop production.

Gary Stern, president of the company, says, "We have streamlined ourselves as a video company, concentrating on video games." *Berserk*, *Scramble*, *Cobra*, and the new *Bagman* are a few of its electronic offerings.

Bally, Williams, and Gottlieb—the other three major manufacturers—have cut production sharply. "Pinball machines are expensive, labor-intensive games that are trouble for an operator. They're more prone to break down and don't earn as much as the video games," says Stern.

Today, video games dominate the marketplace, accounting for 87 percent of the $8.9 billion in commercial game sales last year, according to *Play Meter* magazine, an industry publication.

"People today are taken with computers," says Stern. "It's even happening to me—and I was raised on pinball. I don't enjoy pinball as much anymore. When I go to a trade show I see pinball games and I don't even play them. There is just so much more you can do with a video game today—such incredible graphics."

Harry Williams, the seventy-six-year-old inventor of the electric pinball machine, has seen the birth and demise of the game. "We're in the novelty business," says the founder of Williams Manufacturing. "And novelty means one thing—sooner or later you get tired of the novelty of it."

GOTO page 195, column 1

FAIRE TIME!

Shine up your roller skates, lock up your plastic, and get ready for three days of computer madness. It's time for the Eighth West Coast Computer Faire in San Francisco.

Every size and shape of microcomputer, every kind of software, and every possible computer-related trinket and souvenir will be on display and for sale March 18–20 at Brooks Hall in San Francisco's Civic Auditorium. If you've never attended one of these gargantuan affairs, do not take these warnings lightly.

The promoter, Computer Faire, in Woodside, California, is predicting attendance of anywhere from thirty thousand to fifty thousand. There'll be approximately seven hundred exhibitors; space reservations were filled by the middle of December.

Only three-day tickets are available; they're $15. The fair is so big, according to the promoters, that it's impossible to see the whole thing in one day. Unlike the recent Applefests, the West Coast Computer Faire will feature its usual well-rounded offering of conferences and presentations. The conferences run all three days and overlap, so you'll have to be choosy.

The fair is open from 9:00 a.m. till 6:00 p.m. all three days. Attendees can pay at the door, but may have to wait in line.

Last year's West Coast Computer Faire was even better than the previous year's. The number of Apple-oriented products was mind-boggling. It'll be interesting to see if some of the personal computers that have appeared in the last twelve months show promise of commanding similarly enthusiastic support from independent software publishers.

Nevertheless, it's recommended that any Apple owners in the Bay Area during the third week of March gorge themselves at this three-day microcomputer feast. You won't be sorry, though your feet may be sore come Sunday afternoon.

IBM Fellow Computes Fractal Geometry

Creates New Branch of Mathematics

A perfect circle does not occur in nature. Nor does a perfect square, a perfect triangle, or a perfect dodecahedron. The sloppy composition of the natural world has never had much of a place in the rarefied theoretical atmosphere of pure mathematics.

And yet, out of the seeming chaos of the randomly occurring shapes so much in vogue when the world was new, an order has now been wrought. Dr. Benoit Mandelbrot's *Fractal Geometry of Nature* (W. H. Pressman, San Francisco, 1982) takes sets of irregular or fragmented shapes and groups them into families, deriving mathematical theories therefrom.

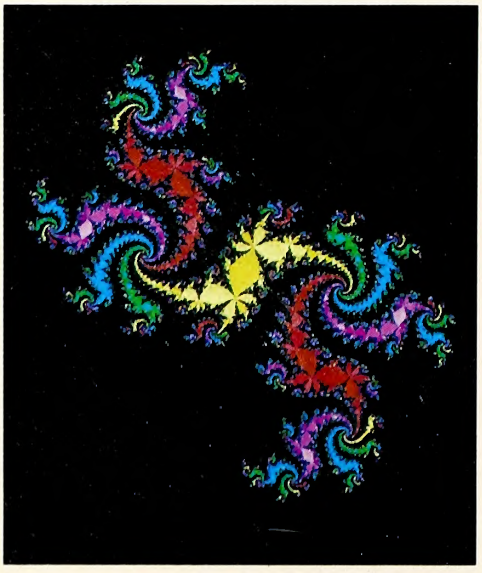
Inside a mainframe computer, this means that randomly generated numbers can be made to correspond to the irregularities of a natural surface. Given this and a little color information, the computer fills in the details. The results, seen here, are pretty spectacular.

Mandelbrot, an IBM Fellow at the Thomas J. Watson Research Center in Yorktown Heights, New York, has used the computer to create a new branch of mathematics. As he recalls, "Previously, natural shapes could be broken down into two categories: those one can tackle by the ordinary geometry of smooth shapes and those too complicated to be tackled geometrically. Between the two, I identified a new class of shapes that are complicated but whose complication is manageable. To everyone's surprise, many fractals have also turned out to be extremely beautiful."

Copyright 1982 B.B. Mandelbrot

Copyright 1982 B.B. Mandelbrot

Above, *Gaussian Hills That Never Were* by Dr. Richard Voss; "not an artist's perception of what mountains are, but the utilization of a theory," with the assistance of an IBM 3033 computer. Right, Cibachrome print of a fractal planetrise by Voss and Dr. Benoit Mandelbrot. Lower left, Mandelbrot's fractal dragon, an aggregate of infinite curves.



Copyright 1982 B.B. Mandelbrot

A fractal "dragon," seen on a computer with near-infinite resolution and magnified to a near-infinite degree, would not reveal greater simplification with enlargement, but greater complexity. These are the proposed shapes of non-Euclidean geometry—curves of infinite length or with infinite branching points—that were known as monsters by mathematicians because they were not demonstrable.

The graphic demonstration of fractals—showing beyond all argument that they do indeed exist—has greatly aided Mandelbrot and his associate at IBM, Dr. Richard Voss, in finding acceptance of the monsters in academia. He also found that the ability to see a fractal suggested modifications to his theories, and the whole process became interactive. "Every improvement in graphics ushered in a further step in the theory, and the merits of the theory led to much faster development of the graphics."

The new field is moving at least as fast as the computer industry. "The book came out a few months ago, but it was already out of date a year ago," says Mandelbrot, who also notes that the wide dissemination of his work probably had little to do with the elegance of his equations.

"I was planning to just make a good picture of a mathematical theory, and to our surprise and great pleasure the illustrations were . . . aesthetically satisfactory. The publisher thinks that for each person who buys the book for the science, nine people are buying it for the pictures."

Mandelbrot is content in the knowledge that he has forced an esoteric branch of mathematics into the area of concrete, intuitive problems "that a child can understand but science could not tackle."

Software and Video Games Galore

80,000 ATTEND WINTER CES

We have seen the future and the future is the past.

If the Winter Consumer Electronics Show (CES), held this January in Las Vegas, had a message for the world of software, it was that to survive in the world of big business one has to have a name, any name, as long as it has a past. It seemed as if every movie of any significance (and some of little or no significance) from the past twenty years is now a video game. The licensing of movie titles seemed to be the order of the day at this show, which was otherwise dominated by software of every conceivable description.

The sales pitch varied from innuendo to the time-honored technique of sensory overload. Parker Brothers showed clips from the James Bond film *On Her Majesty's Secret Service* and scenes from the upcoming *Star Wars* sequel *Return of the Jedi* as teasers for its new line of software for both video game machines and microcomputers. Visitors to the Parker Brothers booth didn't get to see much in the way of actual computer software, but the message was clear: Parker Brothers wants to penetrate the market via the vehicle of licensed movie titles converted into arcade games. Only time will tell if the games, none of which were available for play, can match the success of the movies upon which they are based.

On the other side of the movie license video game spectrum, seemingly far removed from agent 007 and Luke Skywalker, were the forthcoming VCS horror movie games. Two titles in evidence were *The Texas Chainsaw Massacre* and *Halloween* from Wizard Video Games. In each of those games, the player can be a psychopathic murderer chasing computer or player-controlled prey; or the player can be a victim pursued by another player or the computer. Attendees were treated to some of the original films' bloodier moments on videotape as promotion for the games. The games themselves were unfinished, but enough of the graphics were done to give showgoers a taste of the mayhem to come.

But movie titles weren't the only things to emerge as possible video game spin-offs. Television characters, cartoon characters both from TV and the daily newspapers, puppets, and rock groups were all in attendance as collections of pixels on the magic screen. The message was clear: big money has arrived in the software business, and the need to make one's presence felt has resulted in a loss of faith in the virtues of originality. Sigh.

There were also some new kids on the microcomputer block, along with some new toys from old hands in the neighborhood. Spectra Video unveiled a 32K RAM/32K ROM Z-80 based microcomputer geared toward the game player. Mattel unveiled its new Aquarius home computer complete with a full line of peripherals. Mattel's booth, one of the largest at the show, was the site of much curiosity, as new games were revealed for the Apple, Atari, and IBM personal computers. There was also a new version of Mattel's game machine—the Intellivision II, at half the size of the original with essentially the same features. (An Intellivision III is rumored to be in the works.) A new keyboard unit that connects to the Intellivision II was also shown.

Timex showed its latest offering, the Timex/Sinclair 2000, to selected buyers, while Texas Instruments showed off its new TI 99/2 micro. Atari also quietly showed off its latest microcomputer offering, the Atari 1200—a more powerful version of the 800, with redesigned keyboard and peripherals.

Video technology was in abundance at the show, although few if any startling breakthroughs were in evidence. Videodiscs had a lot of support, with many new entertainment offerings released, and a surprising number of videodisc players were present. Showgoers walking from the Las Vegas Hilton to the main exhibit hall had to wend their way through a veritable forest of satellite dishes in the parking lot. Backyard-receiving-station prices have come down considerably and the result is that new companies and their wares popped up like so many mushrooms in the desert sun.

Unlike previous CES shows, this one had a number of microcomputer software companies in attendance. Old friends such as Broderbund, Datasoft, Synapse, and Epyx (Automated Simulations) showed up to exhibit their products and talk to the buyers and mass merchandisers. DataMost used the show to announce a venture into the Atari market, the signing of new titles, and to let the world know of their merger with an East Coast firm. Sirius Software was also present with a whole slew of new titles and pushed their new Atari cartridges.

The Winter CES show was one of the largest ever, with nearly eighty thousand attendees from all segments of the electronics world. The convention was so large this year that the show was held in three sites simultaneously. This meant that attendees—even those who successfully resisted the gaming tables—could spend all three days there and never even see some parts of the show.

Yet software clearly held sway this year. Between the mad scramble to grab a spot in the home-video-game market and the attempts of some larger concerns to cash in on the microcomputer boom, the main exhibition hall was filled with the buzzes, squeaks, clicks, and roars of computer games. Perhaps the only louder sounds were those of deals being made.

Multi-State Computer System Lights Up When Lightning Strikes

A computerized lightning detection system is playing a major role in dramatically reducing fire-fighting costs on federal lands.

When the Bureau of Land Management initiated its pilot program in 1977, the agency's fire suppression outlays stood at $24 million. Last year, they were hovering around $8 million.

Fifty-five percent of all bureau fires are actually started by bolts from the blue. The detection system, the brainchild of BLM's Denver office and the University of Arizona, pinpoints lightning strikes in the eleven western states and Alaska, giving fire-fighters the jump on potential trouble spots.

When lightning hits, electromagnetic sensors or direction finders relay the information to position analyzers, which plot the latitude and longitude of the strike. That signal is whisked to an Intel 8080 microprocessor in the bureau's western regional nerve center in Boise, Idaho, then back to a local BLM office and a Hewlett-Packard 9845T minicomputer—all within a second.

A flashing "X" on an HP monitor display map marks the spot of the strike. During one six-hour period last year, more than seventeen hundred strikes in the Lake Tahoe region flashed on the monitor of lightning detection technician Marj Andreco. Andreco works out of BLM's Sacramento, California, office. By stroking a key, Andreco can get an instant printout of a map of California with Xs marking the lightning strikes. These are followed by listings of the time, latitude, and longitude of each strike. Andreco then sends helicopter and reconnaissance pilots to investigate.

The Automatic Lightning Detection System will eventually be merged with a Remote Automatic Weather Station, says Andreco. By combining weather reports with lightning strikes, fire investigators will be able to rank fire probabilities and conduct their air searches accordingly.

The bureau's overall system includes thirty lightning sensors, which have a two-hundred mile range, and twelve position analyzers. Andreco pegs the cost of installing and maintaining the California component at around two hundred thousand dollars, but adds, "This system pays for itself many times over each year."

PINBALL INDUSTRY

continued from page 191

Pinball was invented in the Depression era of the thirties, when you could get seven balls for a penny. The first commercially successful game was *Baffle Ball* by Gottlieb, a strictly mechanical device released in 1931. Williams revolutionized the business when he added electricity to the game for faster play with the release of *Contact* in 1932. He sold twenty-three thousand of the games for seventy-five dollars each. By 1935, more than eighty pinball manufacturers had entered the make-or-break pinball market, some lasting less than thirty days.

Many of the early games paid off winners (slot machines, for example), while others paid high scorers with free games. The cash payoffs are what linked the pinball industry to gambling and the mob, a connection they weren't able to shake for decades. Legend has it that in the early days of the game an executive of Murder Inc. was lashed to a pinball machine and dropped into a lake in the Catskills for attempting to cheat his partners out of pinball revenues.

The games' spreading underworld notoriety led New York Mayor Fiorello La Guardia personally to sledgehammer confiscated pinball machines in the late thirties. By 1942 they had been banned in New York City—Los Angeles had already banned them in 1939.

It was thirty-five years later, in 1974, that the Los Angeles ban was lifted by the California Supreme Court in a landmark decision. Lawyers and representatives of the manufacturers played pinball in front of judges to prove they were games of skill and not chance.

The same year, Bally introduced the transistorized game with advanced circuitry that allowed digital scoring and futuristic sound effects. The Who and their rock opera *Tommy* helped catapult pinball gaming to its greatest popularity in the middle to late seventies. Games got more complex, art got more risque, and the buzzers and bells got louder.

Also in 1974, the black-and-white video game *Pong* was introduced. Who knew?

Pinball had managed to survive the challenge of competing games such as air hockey and foosball, but the video revolution proved the final blow, much to the surprise of the industry.

Space Invaders, *Asteroids*, and *Pac-Man* soon came crunching into the arcades like monsters. "It was very frightening to me," says Williams, who was working as a private consultant. "I knew we had to make superior games." But the pinball game became old hat by 1981—ironically, the year after the biggest twelve-month sales period the half-century-old industry had ever had.

Gone with the electronic wind—the novelty of pinball machines has tilted toward video games.

GAME PROGRAMMERS COMPETE IN TOURNEY

Companies Send Their Best to Las Vegas Event

Catherine Mary Stewart of *Days of Our Lives* hosted the tournament. Some competitors had trouble keeping their eyes on the monitor.

Who is the best microcomputer game player of all? And how does one go about finding out? One holds a tournament, of course! And one limits the contestants to those whom one can reasonably assume are among the best players: the game programmers themselves.

At least that's what Software Distributors did, for the first annual Wizard versus the Wizards personal computer game world championships, held December 3 at the Sands Hotel in Las Vegas.

Atari pulled their sponsorship of the tournament only two days before the event. Tournament officials had to go out and buy twelve Ataris, while nonsponsor-turned-sponsor Apple donated twelve Apple IIs the same day, even though the majority of games planned were for the Atari.

And so they came, the top microcomputer arcade hackers in the country: Steve Bjork and Gerry "Clowns and Balloons" Humphrey from Datasoft; Joe "Wizard of Wor" Hellesen from Roklan; Ken "Threshold" Williams and Chuck "Chuckles" Beuche from Sierra On-Line; Dan "Twerps" Thompson and Mark "Sneakers" Turmell from Sirius; Russ "Preppie" Wetmore from Adventure International; Jay "Pig Pen" Zipnick, Peter "Night Raiders" Filiberti, and Bob "Thief" Flanagan from DataMost; and Jim "Microwave" Nitchals, free-lance gamegrammer.

For the preliminary rounds, the twelve contestants played twelve different games, with one five-minute round allotted for each game. At the completion of each game the players were ranked by highest scores, as tabulated on a DEC Rainbow. The winner was awarded one point, second place received two points, and so on. At the completion of the preliminary rounds the four players with the lowest award-points totals qualified for the semifinals.

The four semifinalists played three more games under the same scoring procedure, and the two players with the lowest award-point totals went head to head for the championship. The games for the final play-off were chosen at random by the DEC Rainbow and were not a product of either player's company. The finals lasted three and a half minutes per game for three games; the best two out of three scores won.

Obviously no one went for monster high scores here. Winning strategies were those that got the player through the game fastest, like selectively shooting for only the highest-scoring targets and bonuses.

Halfway through, the shakeout was fairly complete, and everyone could see the writing on the monitor.

"There's no way we can't take first or second," said Sirius team coach Jerry Jewell, "unless the competition behind us scores first and second for the next five games. As programmers, Thompson and Turmell have eight or ten games under their belts; most of the authors here have only written a couple of games. . . . Ken Williams would be the exception to that."

He need not have worried. The Sierra On-Line axis ran out of steam, leaving the field clear for the Sirius machine of Thompson and Turmell, who traded off first and second place all the way to the end of the preliminary rounds.

For the semifinals, it was Thompson and Turmell, Russ Wetmore, and Jim Nitchals, who came on strong after a slow start. Thompson quickly established dominance, clobbering the competition on the first game; but Nitchals broke through to place second on the other two games, acing out Turmell for a place in the finals.

The outcome of the finals was to be kept a secret, so the airing of the tournament on television sometime in April would be suspenseful. Separate line feeds to monitors backstage were attached to the computers and duct tape was applied to the scoreboard areas of each screen in hopes of keeping the audience in the dark.

But the secret wasn't to be. The pot at the end of the Rainbow clearly wasn't meant for Nitchals as it randomly chose three games in which he had been weaker in the preliminary rounds.

"I knew he had me beat," Nitchals reflected afterward, but he pressed on gamely.

Thompson and Nitchals were never more than a hundred or so points apart during play, but Nitchals made a fatal error on the second game, reaching "game over" before the end of the round, while Thompson continued to play clear to the next level. Nitchals seemed unable to shake the gaffe, and blew the last exercise in the same way, leaving no doubt in the minds of everyone present as to the final outcome.

When the dust cleared, Chris Daly of Software Distributors presented cash, checks, Amdek monitors, and Wico, TG, and Kraft joysticks to both finalists, with the winner's prize including a DEC Rainbow and eventually amounting to $10,000, plus extras. Then all contestants slipped up to the producer's suite to don inflatable suits and bounce around on air jets.

Night fell on Las Vegas. No one stopped playing games.

Mark Turmell and Dan Thompson of Sirius Software—the team to beat.

Sculptor Uses Computer To Design Works

Left, one part of Smullin's "Cleverness Is in the Hart of the Wud. . . ." (The title is from a line in Russell Hoban's book *Riddley Walker*. Right, *Labyrinth of Datalist*.

Art was once a lot easier for Frank Smullin. At the end of his college years, he abandoned his plans for a career in biophysiology and became a sculptor. He started out in the sixties, firmly in the figurative, realistic school, but soon gravitated to abstract forms, usually networks of cylinders. The networks got bigger and more complex, and Frank decided it was time to employ the services of a computer.

As sculptor-in-residence at Duke University, he had access to an Amdahl mainframe and IBM 360 in the university's computations center. A student assistant would take an algorithm Smullin developed for a sculpture and write a Basic program. "I conceive of them as fat vectors" (a vector with a radius), says Smullin.

At least it was easy until his assistant graduated. Smullin then taught himself PL/1. Programming his own sculptures made him much more adventurous. "When I was asking a programmer to do these things for me I was always very reluctant to ask for subtle changes. I didn't realize you could just slip in there and substitute a line."

With his new programming freedom, the logistics of his sculptures grew in complexity, as did his program requirements. "I was working with alphanumeric data; I wasn't getting patterns or doing plotting," he explains. "My knowledge of the sculpture was entirely in terms of parameter fitting. I would ask the computer about the proximity of one part to another and it would tell me about parts in collision." The last work Smullin attempted "flying blind" in this fashion was *Labyrinth of Datalist*, constructed from a wire model, using the computer to juggle the data to make the parts fit and join the ends of the mitered cylinders snugly.

The experience was an arduous one, and it convinced him to explore the graphic possibilities of computer-aided design. In his initial foray into mainframe graphic software he utilized Tectronics plot-10 terminal control routines and a Calcomp plotter.

"I blew my year's budget in one month and went into hock to get a show ready," he recalls. Convinced of the fiscal impracticality of his situation, he commenced rewriting everything in Basic for the Tectronics 4052 in Duke's chemistry department. When he got the plot-10 routines working, *Labyrinth of Datalist* was the first sculpture he plotted out. To aid the eye in discerning which transparent-seeming pipes were going where, he shaded the final results by hand, because he had no hidden line routine. ("I used an armstrong routine with a colored pencil interface.")

GOTO page 198, column 1

SCULPTOR USES COMPUTER

continued from page 197

Just as when he had learned how to program, the advent of the current generation of powerful microcomputers gave Smullin a new range of freedom and possibilities. Having begun work in the spring of 1982 on a CAD/CAM system that will run in a 32K environment, Smullin is now rewriting it to run on the Vectorgraphics Vector-4 terminal, taking advantage of that machine's raster screen and storage advantages over the Tectronics. For Smullin, micros meant "complete liberation. Free time is a wonderful thing. I didn't have to be concerned about every unsuccessful compile costing me $10."

Gradually, computers have altered Frank Smullin's creative process. Initially, he had to make wire models and digitize the coordinates. Before he had graphic output, he had to work with geometrical concepts where it was impossible to keep the form clearly in mind. Today, it's possible for him to go in with the most general idea of what he wants to make and watch it materialize step by step, seeing the image continuously drawn on the screen and pressing the appropriate menu key to make a change. Instead of using hidden line removal, he produces stereoscopic plots, training himself so that his right eye looks at the left image and his left eye looks at the slightly rotated right image, giving a three-dimensional sense of where things are in space.

"My goal is to create a system that allows me to manipulate a network of mitered cylinders with the plasticity of modeling in clay. Each time I want to make a new sculpture, I find I want to manipulate it in a way I haven't done before. When I was clay modeling or carving wood, I would often find I needed a different kind of tool, and I would go reforge a gouge or fit whatever I had to whatever I wanted it to do. I'm always going back and reforging tools, and I find I do the same thing with the computer."

☐ **Computerized Head-Hunting.** Peat Marwick Executive Search has published a brochure describing the challenges facing executives in today's marketplace. According to Donald F. Dvorak, partner-in-charge, "The brochure highlights the fastest-growing areas of recruiting—high technology, management information systems, health care, insurance, banking, and energy." Peat Marwick analyzes the needs of a customer and then searches for qualified candidates using a variety of methods, including Execscan—a national database of executive profiles and employment histories that is continually updated. Peat Marwick Executive Search is based in Chicago and is a consulting service of Peat, Marwick, Mitchell, a large international accounting firm.

☐ **Meeting of Machines.** Two events slated for Chicago's McCormick Place this April 26–28, the Information Management Exposition and Conference for Manufacturing (INFO/Manufacturing) and the Exposition and Conference for Advanced Manufacturing Systems (HI-TECH/Advanced Manufacturing Systems), will focus on bridging the gap between executives who manage computerized systems and those concerned with advanced manufacturing technologies. The focus of INFO/Manufacturing will be on helping manufacturing companies extend existing computer systems and integrate them into a single system with information from the marketing, accounting, R&D, purchasing, and shipping departments. HI-TECH/Advanced Manufacturing Systems will concentrate on the use of robotics, computer-aided design, manufacturing and engineering, computer-controlled machine tools, flexible manufacturing systems, automatic assembly and equipment systems, automatic guided vehicles, pro-

grammable controllers, optical measuring systems, and laser technology.

☐ **Heavy Metal Computing.** Barber-Greene Company of Aurora, Illinois, has announced the formation of Barber-Greene Information Systems, Inc. This wholly owned subsidiary was established to provide complete business computer systems for the highway and heavy-construction industries. The turnkey systems will include hardware and software programs such as general accounting, estimating, preventive maintenance, job costing, scheduling, and other functions specifically written for the highway and heavy-construction industries. Particular emphasis is put on asphalt, ready-mix, and aggregate producers and contractors. Product development and testing is underway, and specific product announcements are planned for mid-1983.

☐ **Coleco Strikes Back.** Coleco Industries has joined forces with *Star Wars* special effects guru John Dykstra. Coleco and Dykstra's company, Apogee, will collaborate on the development of video games and personal computer software. Dykstra is best known for his contributions to *Star Wars* and the television show *Battlestar Galactica,* efforts for which he won an Academy Award and an Emmy. Dykstra has already produced five television commercials for the ColecoVision video game system applying his special effects expertise.

☐ **From Professionals to Amateurs.** Qantel Business Computers, a Mohawk Data Sciences Company, has announced Intercollegiate Sports-Pac, a complete athletics management system. Ten teams in the NFL already use Qantel's Pro Sports-Pac, and the same basic features are now being offered for colleges. The system runs on one of Qantel's minicomputers and includes applications for accounting, ticketing, administration, training, coaching, public relations, and recruiting. In 1982 Penn State became the first college to try the system.

☐ **How Much for That Little Android in the Window?** You'll hear a lot about personal robots this year; several are already available. Heath Corporation's Hero I has made the biggest splash so far. Controlled by an on-board computer, with light, sound, and motion sensors, and run on rechargeable batteries, Hero I is being touted as the "first sophisticated teaching robot." With optional voice and optional arm, Hero I resembles hobbyist robots built in the past in basic design, but it's slicker on the outside. The complete assembled robot, with arm and voice, runs about twenty-five hundred dollars. ◨

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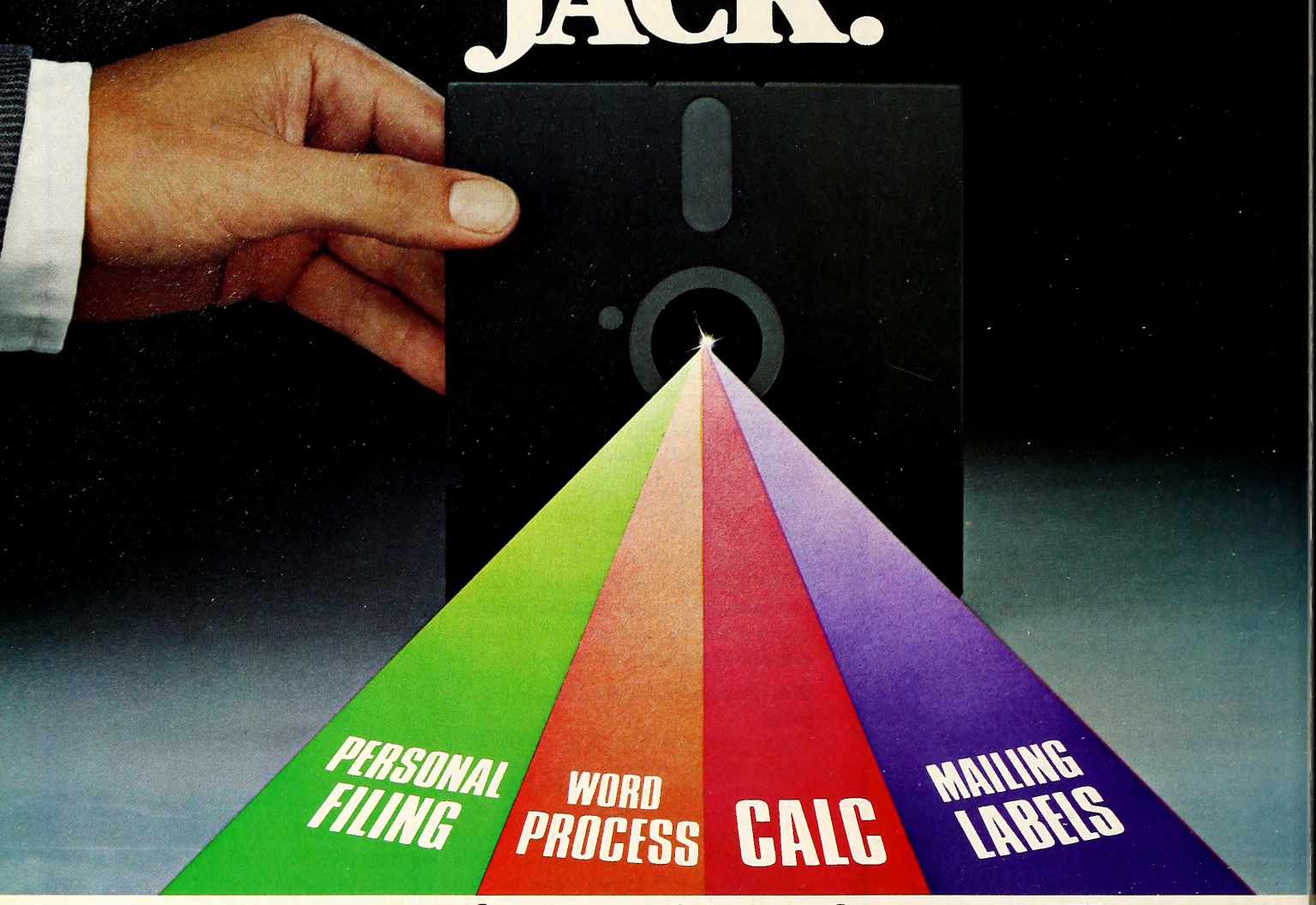

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Mind Your Business

BY PETER OLIVIERI

A sincere thank-you to all of those readers, known affectionately as B.U.G.s, who have written in to share both their problems and their expertise. As you may recall, a letter from a reader asking for help with a printer problem was included in a recent column. The response from fellow B.U.G.s was overwhelming and a solution to the problem appears this month. It seems to happen just this way with many of our reader requests. The willingness to take the time to write a note to help someone else out is admirable. If this column simply provided such a forum for assisting one another, it would certainly be a success.

By the way, if your letter doesn't appear in this column, don't fret. All of the letters are read: if you take the time to write them, we take the time to read them. Whatever you do, don't stop writing. Your voice, your opinion, matters.

So many letters are coming in that we may have to hold a B.U.G. convention one of these days. Can't you just see the headlines—B.U.G.s Meeting in Hawaii.

The New Kid on the Block. Apple has announced its new business computer. Lisa, as it is affectionately named, sounds like quite a machine.

The Lisa sells for about $10,000. It comes with an integrated package of programs, including a spreadsheet, two graphics programs, a word processing program, a database management system, and a project management program. Because the programs are "integrated," they'll be especially easy to use. In fact, ease of use seems to be the hallmark of this new machine.

The Lisa also comes equipped with a mouse, a device not unlike a joystick that allows the user to move an arrow around the screen to select items. This means that the user will be required to do less typing. The Lisa is very often set up to communicate with the business user by means of graphics. For example, when you want access to information in a particular database, you might use the mouse to point to a picture of a file cabinet.

The new machine has one megabyte of main memory, two built-in floppy disk drives (each allowing for 871K of additional storage), and a detachable keyboard with numeric keypad.

The Lisa has the potential to be one of the most exciting computers available to the business user. Consider this only a brief preview; more information should be available soon.

VisiCalc Users. As you probably know, a new 128K RAM version of *VisiCalc* is now available for your Apple II. In addition to the standard *VisiCalc* features you all know and love, the new version provides various new capabilities. It allows you to protect selected cells so that their contents can't be accidentally erased, and allows you to "hide" selected cells in order to build confidential information into a model and prevent it from being seen by unauthorized users. It also gives you variable column widths (a capability long sought after by many users), an expanded, easier-to-use replicate command, full financial capabilities (including internal rates of return), on-screen help messages that can be activated with a single keystroke, and easy multisheet consolidation.

Enough? Nope! *VisiCalc Advanced Version* does even more. Users now get much more formatting capability; new features include justification and centering, a floating dollar sign, a percent sign, commas for use in large numbers, user control of the number of significant digits in a number, the use of parentheses for negative numbers, and debit and credit symbols (DB and CR). Furthermore, you can display or print formulas at the individual cell locations or for the entire worksheet. Some additional math functions, including modulo, round, and weighted average calculations, have also been provided.

If you've already developed some *VisiCalc III* worksheets, they can easily be run with the new *Advanced Version.* This is a fine example of a good product made better. If you use *VisiCalc* often, you may find this new version worth considering.

Software Profiles. Datapro Research Corporation, a McGraw-Hill company, produces several major publications that may be of interest to you. Although these are rather expensive documents, they have the potential to be quite helpful to certain business users.

The first publication is Datapro's *Directory of Microcomputer Software.* This directory lists more than two thousand comprehensive (and objective) descriptions of microcomputer software packages for twenty-seven applications areas. These descriptions include user ratings and supplier profiles. The material is readable and thorough, and monthly updates are provided. To be sure, the directory doesn't focus solely on soft-

ware for the Apple. It is, however, a useful resource when you need to find out if there is a program available for a particular application. The materials cost around $300 and can be examined for ten days at no charge.

Datapro also publishes a series called *Management of Small Computer Systems.* You can try looking for these publications at a centrally located library or a university facility. In addition, a note or phone call to Datapro will get you free information.

B.U.G.s Have More Fun. There isn't a lot of pizzazz in business applications. Spreadsheets, word processors, accounting packages, and databases just don't have the same charisma that *Time Zone, Wizardry, Frogger,* and *Centipede* do. Be that as it may, every now and then a product comes along that's both useful and fun. One such product is the *Voice Box* from the Alien Group.

The *Voice Box* is aptly named: it allows your Apple to speak. The package includes a board to be plugged into slot 4 of your Apple, a better speaker than your Apple's built-in speaker, a disk with a dictionary, some demonstration programs on disk, and a guide to operation and installation. Once the board has been installed and the speaker connected (easy tasks), your Apple can talk. Amazingly enough, it talks pretty well. Yes, it speaks in a bit of a monotone, but the words are clear and distinct.

One option lets you type whatever you wish on the keyboard; when you press return, the Apple verbalizes what you typed. If the words you've used are in the *Voice Box* dictionary, they'll sound quite nice. If you've used a new word, it probably won't be spoken correctly. To remedy this, you simply type in the word as it would sound. For instance, the name "Tom" might have to be typed as "Tawm" in order to sound right. Once you've determined and entered the phonetic spelling of a word, you can store it in the dictionary and have it recognized in the future.

A second option allows you to write a program that "sends" your print statements to slot 4 of the Apple. In effect, this means that what would have been printed will now be spoken. Some rather interesting applications can be achieved by means of this option. In addition, the *Voice Box* can display a face (it's not very attractive, though) that raises its eyebrows and moves its lips as it speaks.

Lastly, the *Voice Box* can sing. Barry Manilow, don't panic. All in all, this is mainly a fun option.

To build a device like the *Voice Box* ten years ago would probably have required the efforts of a Stanford University Ph.D. candidate and a grant of $200,000. Now you can have your own talking Apple for a good deal less. The *Voice Box* alone (you provide your own speaker) sells for around $140. The package, complete with a dictionary in ROM, singing capability, and speaker, costs about $215. This is a fun product with a lot of potential, particularly as an addition to CAI programs, business training programs, typing tutorials, and programs for the physically disabled.

B.U.G.s Helping Bugs. A short time ago, one of our readers asked for some help in getting *Apple Writer* to use all of the features of the Epson printer. This was, as it turned out, a problem many readers had come up against. Various readers who'd solved the problem wrote in to share what they'd discovered. Everyone who wrote indicated that finding a way to get the most out of the *Apple Writer*/Epson interface was a laborious process, and no one had been able to get much help from other sources.

It was indeed with some elation that B.U.G.s from all over wrote to share their "finds." Almost everyone's solutions were basically the same (and almost all respondents included a sample of what they could now do with their Epson, proof positive of their success in solving this baffling puzzle).

One response, from Dan Cogan of Okemos, Michigan, was particularly clear and well written. He deals with interfacing *Apple Writer* and an MX-80 with Graftrax Plus, although if you have an MX-100, the principle is the same. Cogan writes:

"I first created a glossary of print options to enable me to call any of them with two keystrokes—control-M plus the one-letter glossary definition. This file, created with *Apple Writer II,* was then saved under the name Print Glossary. It was recalled by typing control-Q to enter the additional-functions menu, followed by the number 5 to load a glossary file. A prompt requests the file name, and I enter *Print Glossary.*

"As an example, to enter the definition for double width, enter the following:

Step	Keystroke
1	d
2	control-V
3	control-N
4	control-V
5	return

"1. The small letter d defines the glossary item.

"2. The control-V tells *Apple Writer* that the characters following are not commands to the word processor but are instead to be accepted as text. As page 51 of the *Apple Writer* manual explains with regard to this mode, 'You may enter control characters as text file entries for purposes such as controlling special printer features.'

"3. Control-N, according to page C-1 of my Epson manual, turns on the double-width mode for the current line. *Apple Writer* doesn't have the ability to count spaces correctly when using double-width or compressed characters, so they're best used on a single line followed by a return.

"4. The control-V turns off text file entry of control characters so that control characters will once again be treated as commands to the word processor.

"A somewhat different problem is presented by print options, such as italics, that can't be represented by control characters. In this case, substitute escape-4 for control-N in step 3.

"Follow step 3 with control-V and return, as in the first example. This permits entry of the codes required for many options (according to the table on page B-1 of the Epson manual).

"To turn off the italics, substitute the number 5 for the number 4. Underscoring is a little different. After hitting the escape key, enter a −1. To stop underscoring, type shift-control-P (that is, hold down both the shift and control keys while typing the letter P) after the escape and

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minus keys have been pressed. According to the table on page C-1 of the Epson manual, this is the null character, and it seems to provide the zero that's required to stop underscoring.

"I enter my table of definitions using *Apple Writer II* as described earlier, separating each definition by a return. Remember that the first letter is the definition and that upper and lower case letters are separate definitions. Thus, I define double-width mode with a small d and define turning off double-width mode with a capital D. Similarly, I define underscoring with a lower-case u and turn off underscoring with a capital U. Once I've entered all the definitions, they are saved as just described and then recalled using the additional functions menu, option number 5. At this point, simply typing control-G followed by the single letter definition will allow a wide variety of print options with *Apple Writer II*, using only two keystrokes."

Cogan goes on to say that the task of writing his letter made him appreciate how difficult it must be to write good documentation. We would say that his presentation was quite well done and should be of great help to many a reader. Many thanks.

More Help from B.U.G.s. Jerry Brieger of Redmond, Washington, lets readers in on a "completely undocumented, but very useful" fact. He writes to say that "a simple control-O [not zero] will initialize the Epson for compressed print. This is especially useful when you're printing spreadsheets. Just turn the printer on, then the Apple, push reset, then pr#1, control-O, and you have compressed print until you turn the printer off. If you have Graftrax or the new Model III, hitting escape-4 turns italics on while using *Apple Writer II* and escape-5 turns italics off. Be sure to use upper-case letters!"

From Gary Mott of Mason City, Iowa, comes news that the solution to the Epson/*Apple Writer* problem lies in the fact that you must be in upper-case. "Control-K is used in the sequence of commands only if the upper-case-shift lock has not already been activated. My system doesn't have shift-key modification. I have used the commands on a system with the modification. The only difference is the escape escape sequence. With the shift-key modification, the escape key need only be pressed once. An example:

Emphasized mode on: control-K, control-V, escape, escape-E, control-V.

Eric Oshlo of Katy, Texas, suggests that readers wanting to use all the features of their printers find out more about a program called the *Universal Text Formater* by Ziggurat Software in Arlington Heights, Illinois. Oshlo has *Apple Writer 1.1* and a NEC 8023-A-C printer. The *Universal Text Formater* generates a replacement printer routine for the one that comes with *Apple Writer*. Since you can load in your specific printer control codes prior to installing it on the *Apple Writer* disk, the *Text Formater* works with virtually any printer.

In summary, most of the people who had solutions to the Epson/*Apple Writer* printer problem mentioned two important things. First, after entering control-V mode, you must press the escape key twice in order to get it into the text. Second, any letters that follow must be entered in upper-case.

Epson Books. Lots of readers wrote or called to ask for the title of "that great Epson book." It's called the *Epson MX Printer Manual*, published by CompuSoft Publishing. It comes as part of the Graftrax update package when you purchase that option for your Epson. Unfortunately, however, it's not available separately.

Another book you may find helpful is Minuteware's *Minute Manual for Apple Writer II*. This book contains step-by-step instructions for the program's six basic operating procedures, as well as information pertaining to the other operating procedures, such as print preview and pause while printing (which aren't given in the *Apple Writer II* manual). The book also contains complete Epson printing instructions to be used by those who have Graftrax and those who don't. It also contains a beginner's guide to word processing and a guide to the hardware and software enhancements available, such as eighty-column boards, lower-case adapters, shift-key modifications, Graftrax, and spell-checking programs.

Print Preview. One of our readers complained that *Apple Writer* has no print preview option. Jim Pirisino from Columbia, Maryland, suggests that you can print either a forty-column or an eighty-column display by means of the following procedure:

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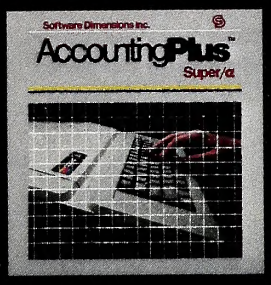

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1. Press control-P.
2. Type PD0 (zero) and press return.
3. Type SP1 and press return.
4. Type NP and press return.

Each page will be individually previewed on the screen, and you'll be asked for your approval to continue to the next page. Use control-S to stop and start the scrolling of the text on each page. Even with a forty-column display, you'll be able to see such things as page breaks and interrupted charts.

To go back to printing on the printer, do the following:

1. Press control-P.
2. Type PD1 and press return.
3. Type SP0 (zero) and press return.

It's a Plot. Ronald Sladky of Perrysburg, Ohio, provides some answers for a B.U.G. member who wondered whether a color plotter was better than a color printer. Sladky has a Hewlett-Packard eight-pen plotter and an IDS Prism printer. According to Sladky, the plotter is far superior when it comes to graphics and can vary text size more than the printer can. The plotter is much slower, however, and must have its sheets fed to it one at a time.

Daisy, Daisy, Give Me Your Answer. A Diablo owner in Lakewood, Colorado, has responded to another reader's request for information about how well daisy wheel printers do graphics. Paul Goble has been using his Diablo 620 for about four months. It's a low-cost daisy wheel printer that uses new ninety-eight-character encoded print wheels. Both the ribbon and the print wheel are easily changed. Bidirectional printing at twenty characters per second and proportional spacing are possible.

Goble uses a software package (Sensible Software's *Image Printer*) to dump hi-res screens to the printer. Graphics are printed one dot at a time. Even with bidirectional printing, the process takes a long, long time. The samples Goble included in this letter were quite nice. He said, however, that one picture (a simple half-page, but dark, picture) took seventeen minutes to print.

The image quality of the Diablo 620 is much better than that available from most dot-matrix printers, and lots of special effects can be achieved by using special characters. The paper movement of the machine is extraordinarily precise and results in very accurate graphics. If you're not going to need the capacity to print graphics very often but will need a high-quality printer, Goble definitely recommends a daisy wheel.

More B.U.G. Requests. Here are a couple of additional requests from readers. See if you can help them out. Who knows—they may help you out one day.

One reader, a builder/real estate developer, writes, "I'd like a simple word processing program to use for contracts, leases, rental agreements, form letters, and mailing lists. I also plan to add CP/M and an eighty-column board to my Apple. Any suggestions?"

A B.U.G. teacher is using his Epson to prepare dittos and stencils for distribution as class materials. He finds that the only way to get a good ditto impression is to use double strike and emphasized mode. Does anyone else use an Epson in this way? Are there better techniques?

Time Out. Well, we've only covered about half of what we were hoping to this month; we'll just have to lobby for more space in upcoming issues. Take care of yourselves. Keep writing; keep suggesting. Next month: *WordStar* and printer solutions, product reviews, and some surprises. See you then. ■

The Alien Group, 27 West 23rd Street, New York, NY 10010; (212) 741-1770. Apple Computer, 20525 Mariani Avenue, Cupertino, CA 95014; (408) 996-1010. CompuSoft Publishing, 535 Broadway, El Cajon, CA 92021; (714) 588-0996. Datapro Research Corporation, 1805 Underwood Boulevard, Delran, NJ 08075; (609) 764-0100. Minuteware, Box 2392, Columbia, MD 21045; (301) 995-1166. Sensible Software, 6619 Perham Drive, West Bloomfield, MI 48033; (313) 399-8877. VisiCorp, 2895 Zanker Road, San Jose, CA 95134; (408) 946-9000. Ziggurat Software, Box 453, Arlington Heights, IL 60006; (312) 253-5350.

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```
        MEMORY ERROR AT $D000

CHIP LOCATION   DATA BIT   CONDITION

RAM CARD            7          GOOD
RAM CARD            6          GOOD
RAM CARD            5          GOOD
RAM CARD            4          GOOD
RAM CARD            3          BAD
RAM CARD            2          GOOD
RAM CARD            1          GOOD
RAM CARD            0          GOOD

ESC -           RETURN -    ANY KEY
ABORT           RETRY       CONT
```

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The Simplicity of Modularity

BY ALLEN MUNRO

"Those who do not learn from the past are condemned to repeat it."
—George Santayana

The Apple II is an extremely versatile machine, exhibiting different personalities under different operating systems and programmable in a number of languages. These languages include Basic (the native language of the Apple II), Pascal, Fortran, Cobol, Pilot, Logo, Forth, Tiny C, Lisp, microSpeed, PL/1, and 6502 assembly language, as well as assemblers for a variety of coprocessor boards. One of the most recent additions to the Apple II family of languages is Modula-2, a compact yet powerful structured programming language.

Simplicity versus Complexity. A never-ending debate in the design of computer programming languages centers on the issue of complexity. Language designers must weigh the virtues of simplicity, which promotes rapid learning and program readability, against the advantages gained when complexity is introduced in the form of many convenient programming features.

Basic is an example of a language that, at least in its original conception, was designed to be quite simple. That Basic failed to remain simple as machine-specific dialects evolved was the consequence of its failure to provide many essential features, such as disk I/O.

PL/1, on the other hand, is an example of a language designed to provide many features, at the price of increased complexity. One consequence of PL/1's complexity is that it's difficult to fit a compiler for the language into a personal computer. (An Apple II PL/1 subset compiler exists, but it requires 64K RAM, a Z-80 card, and two eight-inch floppy disk drives—not an inexpensive personal computer configuration.)

Pascal is an example of a powerful, modern computer language that is nonetheless simple. Niklaus Wirth designed Pascal to be a straightforward teaching language, and its simplicity has contributed to its wide acceptance in colleges and universities. The advantage of simplicity in Pascal is not, however, just that it can be learned fairly easily. Pascal's simple, structured design promotes a programming style that underscores the logical structure of a program's design. Simplicity of the language also promotes the writing of programs that are easy to read and modify.

The goals of structured languages like Pascal are, first, to help programmers write correct code, and, second, to encourage the writing of *maintainable programs*. Maintainable programs can be modified by people other than the programmers who originally wrote them. Maintainability is a very important goal for major programming projects. Studies

have shown that software maintenance may account for 70 to 90 percent of the total software costs for such projects; controlling this expenditure has become a matter of vital concern to software industry managers.

Programmers have their own reasons for caring about the issue of software maintenance. It's a lot more enjoyable to design and write new programs than it is to spend 70 to 90 percent of one's time trying to figure out how to modify someone else's code. Pascal-related languages are therefore of interest to anyone who writes substantial programs expected to remain in use for some time.

The question is, which language is best?

A Committee of One. Wirth developed Pascal in response to the design of another programming language, Algol-68, which was created over a period of several years by an international committee of computer scientists. Perhaps because the language was committee-designed, it became unwieldy, as almost all the features desired by the experts were added to the language. Rejecting the notion of a language built to the specifications of a committee, Wirth produced in 1968 the much simpler and more elegant programming language, Pascal.

The verdict of history, in this instance, supports the efforts of the individual language designer over those of the committee. Today Pascal is the computer language employed most widely for teaching programming in American universities. In addition, it has enjoyed widespread success on personal computers, with many thousands of personal computer users employing UCSD Pascal, and with tens of thousands of Apple II owners making use of Apple Pascal (which is based on UCSD Pascal). By contrast, there is no demand for Algol-68 compilers for personal computers.

Enter Ada. Managers and programmers committed to the discipline of structured programming are now wondering whether history is about to repeat itself. Ada, a large, complex, feature-laden programming language, was painstakingly designed under United States Department of Defense contracts in the late 1970s. As of this writing, there is no fully validated Ada compiler available on any computer, although for some time several have been in development for large superminicomputers and IBM mainframes. Implementability was one of the design requirements of Ada, but the compiler generation process is calling into question how well this requirement was actually met.

Ada is not the first computer language to be developed under the sponsorship of the Department of Defense. Cobol, one of the languages abhorrent to structured programmers, was also the product of a committee sponsored by the defense department.

The Ada language emerged after many years of DOD-sponsored language design and development. Ada is named for Lady Augusta Ada Lovelace, daughter of Lord Byron and the world's first computer programmer. She wrote programs for Charles Babbage's analytical engine, a mechanical computer that was never completed because the machine-building technology of the day could not provide the fine tolerances called for in its design. Despite years of grant support from the British government, the analytical engine failed; Ada's critics see a parallel in the future of the language named for its programmer.

Hundreds of computer scientists and sophisticated computer users contributed to Ada's many design phases. As a result, the language provides numerous features, including some that work against the principle of simplicity. The parallels between Ada and Algol-68 are striking. Is there a candidate for the role of a simple competitor to Ada? Can any programming language become an alternative to Ada, as Pascal was to Algol-68?

The answer, of course, is yes.

All This and Modula-2. Wirth, apparently unhappy once again with the product of a language-design committee, has produced a new language, Modula-2. Wirth based the design of Modula-2 on two languages he had developed earlier, Pascal and Modula. Modula was an experimental language for multiprogramming—which is writing programs that do several different things, such as read from the keyboard and from a joystick "simultaneously." (In computers that can actually do only one thing at a given instant, such as an Apple II that hasn't been modified through the addition of a coprocessor, the simultaneousness is only apparent. Modula permitted the programmer, as well as the user, to treat the different active processes as if they were simultaneous.) Modula did not, however, have the full range of programming language features that

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Pascal has. Modula-2 incorporates these Pascal-like features with a syntax more like Modula's; hence the name, Modula-2.

Small Can Be Beautiful. Modula-2 was designed by a single computer scientist driven by a consistent vision that placed a high value on simplicity in the language. As a result, the core of Modula-2 is quite small; Wirth defined it in a book of only 48 pages. In contrast, the Pascal book has 167 pages (Jensen and Wirth's *Pascal User Manual and Report*) and the Ada document tops out at 236 (*Reference Manual for the Ada Programming Language*, Proposed Standard Document). The economy in Modula-2's syntax was achieved, in part, by not including every desirable feature in the language itself. Instead, utility features can be added in *modules*, program blocks similar in function to Apple Pascal units.

Ada, meanwhile, offers a wide range of features, many of which are quite sophisticated but may be employed only rarely. Charles Moore, the inventor of Forth, says that Ada has "tried to be all things to all people. It's much too complex a language—especially for the less experienced programmer."[1]

Ada and Modula-2 have a number of similarities. Both took Pascal as a starting point for development (although Ada deviates from that standard more than does Modula-2). The experienced Pascal programmer will find it fairly easy to follow most of the source text of programs written in either language.

Both Ada and Modula-2 seek to remedy a number of the same design flaws in Pascal. Enhancements provide for concurrent processing and more direct programmer access to the machine. An important set of changes enforces a more modular approach to programming than does standard Pascal.

Working Together, Separately. Modular programming encourages the independent development and testing of conceptually separate portions of a program. This modularity permits the assignment of different functions of a major programming project to different programmers, who, once the software interfaces among the separate parts have been specified, can develop programs independently.

Modular programming is an important prerequisite for the emergence of a software-engineering discipline. From a software-engineering viewpoint, programs are not usually the result of the artistic vision of a programming virtuoso working in isolation from other programmers. Instead, programs are built up out of a set of software components produced by software engineers who may even be anonymous to each other.

On large software projects, the software-engineering approach is particularly important. Different programming teams may be assigned different portions of the programming task. For example, one team may develop a set of user input routines, another may work on screen and printer output portions of the program, while still another might work on database manipulation procedures. The project manager sees to it that the separate portions of a program interact with each other only by means of software interfaces with an agreed-upon structure. One team cannot change this structure (in order to optimize a data representation for input or output, for example) without prior approval from the project manager. Each time a change of this sort is approved, all the teams working on the project must take it into account. Working this way can be time-consuming and expensive. For this reason the software interfaces get plenty of attention during the planning stage of a programming project.

Both Ada and Modula-2 are intended to enforce modularity in order to encourage a software-engineering approach to software development. Even UCSD Pascal and Apple Pascal provide some features in support of modular programming that are not part of Wirth's original definition of Pascal. The most important of these is the *unit*, which provides for the separate compilation of program portions that can later be used by main programs.

In the Apple Pascal approach to units, the interface portion of the unit specifies which parts of the unit are public—that is, which parts can be used by other programs. The implementation portion of a unit contains the actual code for that unit, including both the public and the "private" (or invisible) procedures and functions. The Apple Pascal turtle graphics unit, for example, contains public procedures such as PENCOLOR and MOVETO that can be used by other programs to

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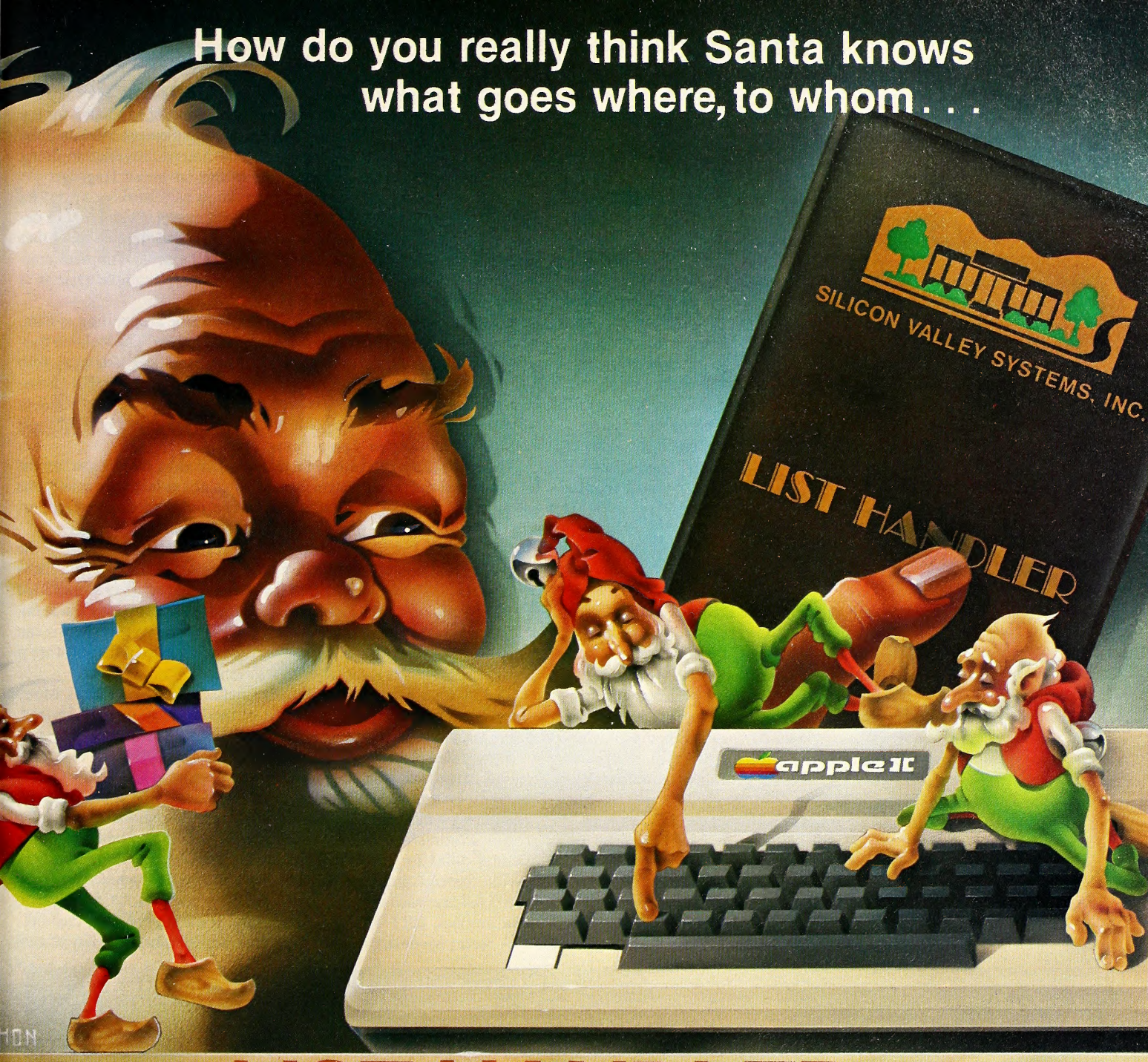

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draw on the hi-res screen. Other procedures in turtle graphics are used by the public procedures but aren't available to outside programs. These are the private portions of the unit.

Special Security. Modula-2 goes several steps beyond UCSD Pascal units in ensuring that separate program portions maintain their integrity throughout the program development process. Hugh Mackworth, a product manager in the Apple III Product Group at Apple Computer, points out that Modula-2's modules are superior to Pascal's units in that they are more secure. Modules have two parts, a definition and an implementation, which are compiled separately. The definition part of a module resembles the interface concept in UCSD Pascal and Apple Pascal. Like a unit, a module can be used by other modules and programs that are its *clients*. All communication between the implementation part of a module and its client is set forth in the module definition.

The extra level of security provided by the preset communication is that a programmer cannot accidentally (or maliciously, for that matter) alter the definition portion of a module and foist it off on an unsuspecting client module that must use it. It could be disastrous if the value of PENCOLOR were changed to be an integer (from 0 to 7, say) instead of a type COLOR (WHITE1, BLACK1, or whatever). A client module that expects to be able to say

```
IF PENCOLOR = WHITE1 . . .
```

instead of

```
IF PENCOLOR = 0 . . .
```

will clearly not perform correctly if the module it uses is changed arbitrarily. The Modula-2 system requires that the client module be recompiled if the definition of the module it uses has been changed.

A Wirthwhile Definition. Wirth's publication of the Modula-2 definition has met with approval in software engineering circles. Tom DeMarco, a structured systems development expert with Yourdon, a large software consulting house, argues, "If you go back and compare Modula-2 to the statement of objectives published for Ada, you're likely to conclude, as I do, that Modula-2 satisfies most of them as well as Ada, but with far less obfuscation."[2]

Modula-2, when first announced, was not available commercially on any computer. The original implementations in Wirth's lab in Switzerland were done on PDP-11 minicomputers and an experimental supermicro called Lilith. Further experimental implementations have been performed at the University of Utah's computer science department. Until now, however, those interested in Modula-2 have had no convenient way of getting hands-on experience with the language.

Volition Systems, a software house based in Del Mar, California, has solved this problem by releasing an implementation of Modula-2 for the Apple II computer. Volition Systems hopes to implement Modula-2 for computer manufacturers and large software houses interested in doing systems and applications programming in this advanced language.

Volition views its Apple II implementation as a working advertisement for the Modula-2 language, one that will attract assignments to develop Modula-2 systems for other computers, such as the Lisa and other advanced 68000 systems now appearing in the personal computer market. Apple II owners don't have to wait, however: the complete system is already available to them.

Used in conjunction with the Apple Pascal 1.1 operating system, Modula-2 is a complete software development system. The Volition Systems Modula-2 compiler offers the standard Modula-2 language, with two differences. These are *forward declarations*, which permit a procedure to be referenced before it is defined in a source file, and *packed data representations*, for more economical use of storage space. Both of these features are familiar to Apple Pascal users.

Using the Library. Additional features, including many based on the UCSD Pascal operating system, are available not as language extensions but rather as modules. A total of twenty-two utility modules to support program execution are provided in a module library.

As in Apple Pascal, the library is a separate file, usually kept on the boot disk, that contains frequently used program portions. This file is usually called MODULA2.LIBRARY, but other libraries can be created by the programmer and can be called from whatever disk they reside on. A module such as turtle graphics is kept in the library. From there it can be used by any program that wants to take advantage of the software it provides for manipulating the hi-res screen.

The Modula-2 language is actually smaller than Apple Pascal. Many essential capabilities are not included in the language directly; instead, they're provided in the utility modules found in the library. These library modules provide for sequential file handling, random-access file routines, standard read and write routines, storage allocation (Apple Pascal programmers will be happy to get working NEW and DISPOSE procedures), a math library, console handling, subprogram calling, and a process scheduler for concurrent processes such as the standard utility modules called for by Wirth's specification of Modula-2. In addition, Volition Systems provides modules that give the programmer access to UCSD features such as string functions and procedures, UCSD file handling routines, CRT I/O procedures, and some bit-handling facilities.

A recent Modula-2 release offers programmers the capability of call-

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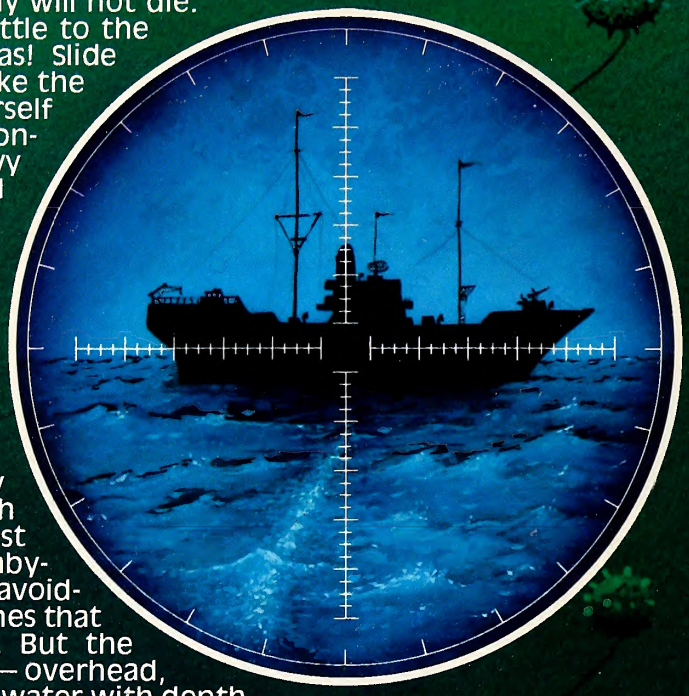

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ing Pascal programs from Modula-2, and gives them access to the turtle graphics and Applestuff library units. The new release also offers facilities for interrupt-driven processes, permitting real-time control in Modula-2.

The major advantage of Modula-2 over Apple Pascal is that Modula-2 enforces a structured development discipline. During the development of a major software product, programmers working on different interacting modules need only agree on their interfaces, not on the internal structure of the modules. Once a module definition is established and compiled, changes in the internal structure of the implementation part of the module or in the internal structure of the client—the module that uses the "slave" module—won't cause the client and the module to interfere with each other. On the other hand, whenever the definition portion of a module is changed and recompiled, Modula-2 requires the recompilation of those clients that use the module, as well as the recompilation of the module's implementation. This interface policing ensures proper communication among modules.

At the time of compilation, every module is given a "module key." This key is a number generated by looking at the system clock. The system checks for a module key mismatch between an interface and an implementation or client at run time. If a mismatch is found, a program won't run until all necessary parts have been recompiled. This enforcement policy permits the improved software development methods characteristic of structured programming by preventing users from abusing the modular approach.

Computer-Age Mad Hatters. At some point in the development of any new computer programming language, someone has to decide just which features are part of the language and which are not. International standards committees are formed to determine whether extensions to an existing language are necessary, and, if so, what form they should take. This is necessary because different computer manufacturers can, and usually do, release different versions of the same language. Rather like the Mad Hatter in *Alice in Wonderland*, who claimed that words meant whatever he wanted them to mean, the computer manufacturers and compiler developers seem to say that Basic or Fortran or Pascal are defined by their versions of these languages. The differences that result can make programs written in the same language on two different machines incompatible. This means that a lot of expensive reprogramming must be done when a program is transferred from one machine to another, even though the same language is being used on both.

Because the Modula-2 language core is small, the task of defining a standard is straightforward. The techniques used for I/O, process scheduling, and storage allocation for a particular Modula-2 implementation are not part of the language, but are rather provided in standard modules. This means that users can replace the utilities provided with others of their own invention. Furthermore, these features, because they are provided by modules, need be present in a system's memory only when they're required by an applications program, thus conserving system resources.

Comparatively Speaking—Benefits and Burdens. Modula-2 permits low-level machine access by providing pointer arithmetic and fixed-address variables, thus obviating the need for the tricky variant records required to get at machine addresses in Pascal. Furthermore, Modula-2 provides for explicit type conversion, thereby giving the programmer better access to the machine than Pascal does, while making the intent clearer than most Pascal methods for type conversion do.

Dynamic array parameters are possible in Modula-2. Pascal programmers will rejoice at not having to set array bounds for formal parameters at the time that a subprogram is written.

Procedure variables are available in Modula-2. This is a more general form of the proposed procedure parameter enhancement to ISO Pascal, the version of Pascal authorized by an international standards group.

Fewer BEGIN-END pairs are required in Modula-2 than in Pascal, because the WHILE, WITH, FOR, and IF constructs are all terminated with END.

Translation Process. Like Apple Pascal programs, Modula-2 programs must be compiled to p-code before they can be run. P-code is interpreted to a microprocessor's instructions at run time by a portion of the operating system called the *p-code interpreter*. The result is transportability; a program compiled to p-code can be executed on any system that has a p-code interpreter. Programs in compiled languages also run

faster than those written in interpreted languages like Basic.

There are other minor but welcome improvements to Pascal in Modula-2. Constant expressions are permitted, so that the programmer can make constant declarations like

```
CONST HALFMAX = MAX DIV 2.
```

Declaration order restrictions are relaxed, which makes it possible to group constant, type, variable, and procedure declarations in a natural way. Flow of control is improved through the inclusion of features such as LOOP-EXIT. The CASE statement has been improved—first, by permitting subranges as well as constants as case selectors and, second, by providing an explicit ELSE condition as an option.

Logical expressions are evaluated from left to right and the evaluation is short-circuited. This means that if a complex expression like

```
IF (A AND (B AND (C AND D)))
```

is being evaluated and A turns out to be false, the evaluation will stop and return the value *false* for the whole expression, since the expression as a whole cannot be true, no matter what the truth values of B, C, and D are.

In Pascal, the entire expression is evaluated. This "full evaluation" feature of Pascal is annoying; it means that the programmer must always insert extra if clauses to ensure that there will be no attempt to evaluate expressions that use array indices that exceed array bounds. With short-circuited evaluation, the programmer can simply put an array bounds check ahead of the reference to the array in a sequence of ANDed Boolean expressions.

Modula-2's many benefits are partially offset by some disadvantages. The simplicity of Modula-2 syntax imposes some extra burdens on the programmer. One example of this is the lack of generic I/O procedures. In Pascal, the program can use the single procedure WRITE to output integers, real numbers, characters, and (in UCSD Pascal) strings. In Modula-2, variables of each type must be output with a procedure that takes parameters of that type. This means more lines of source code for the programmer to write, but the compiled code is no less compact or efficient than that produced by a Pascal compiler. The difference is that the Modula-2 programmer must do some of the work that is handled by the compiler in Pascal.

Many programmers may find Modula-2's case sensitivity an annoyance. Upper and lower case are significant in Modula-2; the variable MyVar has a different referent from the variable MYVAR, and both are different from Myvar. It's easy to forget what you've capitalized. Fortunately for users of unmodified Apple II Pluses, the Volition Systems implementation provides a compiler option to turn off case sensitivity.

Side by Side. Listings 1 and 2 compare simple Apple Pascal and Modula-2 programs, the purpose of which is to display available memory. Each of these programs displays the memory available with only the operating system and language support features loaded, along with the simple program.

In the Pascal program, a long integer variable, *Wordsavail*, is declared in order to avoid an integer overflow if available memory was greater than 32K. In the Modula program this is unnecessary, since *MemAvail* returns a cardinal value (up to 64K). Note that extra output statements are required in the Modula-2 version of the program in order to write out strings, carriage returns, and cardinal numbers.

Modula-2 is an advanced programming language. Its enforcement of structured program development makes it an appropriate vehicle for attacking major software projects. The process scheduling and direct ma-

```
Program PascExample;
(* Tells how many bytes of memory are available *)
Var Key: Char;
    Wordsavail: Integer[6];
Begin   (* PascExample *)
  Wordsavail := Memavail;
  Writeln (Wordsavail * 2, ' bytes are available.');
  Writeln ('Type < RETURN >. ');
  Read (Key)
End.   (* PascExample *)
(* 38322 bytes are available with system swapping on  *)
```

Listing 1. A simple Pascal program.

```
MODULE Mod2Example;
(* Tells how many bytes of memory are available *)
  FROM UCSDStorage IMPORT MemAvail; (* Type of MemAvail is
                                       CARDINAL *)
  FROM InOut IMPORT WriteCard, WriteString, Wrtieln, Read;
  VAR Key: CHAR;
BEGIN
  WriteCard (MemAvail() * 2, 1);
  WriteString ( ' bytes are available.'); Writeln;
  WriteString ('Type < RETURN>. '); Writeln;
  Read (Key)
END  Mod2Example.
(* 30200 bytes are available with system swapping on *)
```

Listing 2. The corresponding Modula-2 program.

chine access features suit it to systems work. It also offers a number of small but significant syntax improvements over standard and UCSD Pascal. Because the language is small and closely related to Pascal, it can be learned quickly by Pascal programmers. This combination of advantages in Modula-2 has been accomplished at the cost of some inconvenience to the programmer when input/output programming is called for. On the other hand, it is a tribute to the compactness of this programming language that it can be used on a 64K personal computer.

When More Is Less and Less Is More. Modula-2 has been referred to as the language that Ada was meant to be. Like Ada, it remedies some of the problems of Pascal, making it an even more appropriate language for medium and large-scale programming projects. Unlike Ada, it is a compact language and can be learned in a fairly short time.

Those who believe that programming languages should include every potentially useful feature expect that Ada will prove to be a more valuable contribution to the discipline of programming than Modula-2. Supporters of simplicity in programming language design claim that Modula-2 is clearly superior to Ada, not only in learnability and implementability, but also in how well it encourages the writing of correct programs.

Modula-2 is available now for the Apple II. On the other hand, there will almost certainly never be a complete implementation of Ada for any 64K machine; it is not clear that a 256K machine is large enough. Still, larger machines will become more common in the 1980s, and we can expect full Adas eventually. History, as written by the computer programming community, will decide between these two competing successors to Pascal. ■

More detailed information on programming in Modula-2 is available in a new book by Wirth, *Programming in Modula-2*.[3] Apple owners who believe in hands-on learning can try out the Volition Systems implementation of Modula-2. The Apple system must include either an Apple IIe or another Apple II with the Apple language system (a 16K RAM card plus the Apple Pascal operating system disks) and two floppy disk drives. An eighty-column display is also recommended, but it's no more necessary than in Apple Pascal.

The Apple IIe uses the Modula-2 system without modifications to either the software or the hardware. As with the Apple II, two disk drives and Apple Pascal software are required. The upper and lower case keyboard with its full ASCII character set is a great advantage for editing. The new Apple eighty-column card is automatically recognized and used by the operating system.

What about the eighty-column card with the second 64K memory bank? The present Modula-2 release cannot make use of this extra memory, but Volition Systems expects to be able to support the entire 128K in a future version. Work is already under way to supply 128K versions of Modula-2 for other 128K computers. In the planned implementation, the new 64K bank of memory will probably be devoted to data—the stack and heap in the Pascal system—freeing up the original 64K for operating system and code alone.

1. "DOD Wants a Twenty-Five-Year Lifespan for Its New Language," *InfoWorld*, vol. 4, no. 41, October 18, 1982, p. 27.
2. T. DeMarco, "Modula-2: Why It Matters," *The Yourdon Report*, vol. 6, no. 2, March-April 1981, pp. 1–2.
3. N. Wirth, *Programming in Modula-2* (New York: Springer-Verlag, 1982), 176 pp.

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BY KEN LANDIS

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Securities and Investment Instruments. The most common form of investing is buying a security. You buy a security when you pay dollar for dollar the present market value of that security. You, or your broker, take physical possession of the instrument, and you own it. Theoretically, you stand to make an infinite amount of profit on your investment; the higher the trading price of the asset goes, the more money you make. At the same time, your potential loss is limited. You cannot lose more money than you originally paid for the security.

However, if you leverage your investment (that is, pay only a part of the purchase price out of your own pocket and borrow the rest), your loss may end up being much greater than your original out-of-pocket expense. Say, for instance, that you buy 100 shares of TTM Industries at a price of $10 per share. If you purchase the lot (100 shares), your maximum downside exposure is 100 x $10, or $1,000. But if you leverage your investment (which is also known as buying on margin), you can use the same $1,000 to control many more than 100 shares. For example, paying 10 percent of the purchase price with your own money and owing the balance ($1,000/$10 x .1) would allow you to control ten times as many shares.

If the price of TTM increased, you'd be in fat city. Your profit would be ten times as great as it would have been if you hadn't leveraged your investment. But if TTM decreased in value, you'd be in real trouble! As the price of the security went lower, you'd have to pay off more and more of the balance. And remember, the balance you owed would be for 1,000 shares, not 100.

This payment (the money you give the broker as the price of the stock declines) is known as a margin call. From the point of view of the seller, it can almost be considered insurance. If you don't have the money to pay the seller when the price of the security starts to fall, then the seller stands to lose money also. So if you don't ante up, you lose your original investment as well as any additional funds you've invested.

Options afford you an alternative investment strategy. They allow you to control the same 1,000 shares for only a fraction of their market price. If, say, you thought that TTM was going to increase in value, you'd buy a call option. A call gives you the right to purchase a specific number of TTM shares at a negotiated price for the period of the option contract. For this right, you pay the sellee, or the writer of the option, a fee known as a premium.

Let's assume that the writer is asking a $2-per-share premium. To obtain a call option for 100 shares, you'd pay the writer $200 ($2 x 100 shares). This would give you the option, the right, to buy 100 TTM shares at the preset price, known as the striking price. In this example the striking price is the current price, $10.

This $200 investment gives you the right to buy 100 shares of TTM (market value $1,000). How might you make money in this situation? If the price of the stock increased to $14 per share, you'd buy the 100 shares for $1,000 and then immediately resell them for $14 apiece. Your gross profit on this transaction would be $400 ($1,400 − $1,000). Subtract your premium cost of $200 and you'd have a net profit, before commission costs, of $200.

The Put and the Pendulum. There are also options known as puts. A put allows you to sell a security at a given price. If you believed a security was going to decrease in value, you'd buy a put.

If TTM were at $10 per share and you thought it might go down to $6, you'd buy a put at a $10 striking price per share. Then, if the price of TTM really did go down to $6, you'd buy TTM at the market price and exercise your option, selling it at a price of $10 per share. If you paid the same $200 premium ($2 per share on 100 shares), your net profit before

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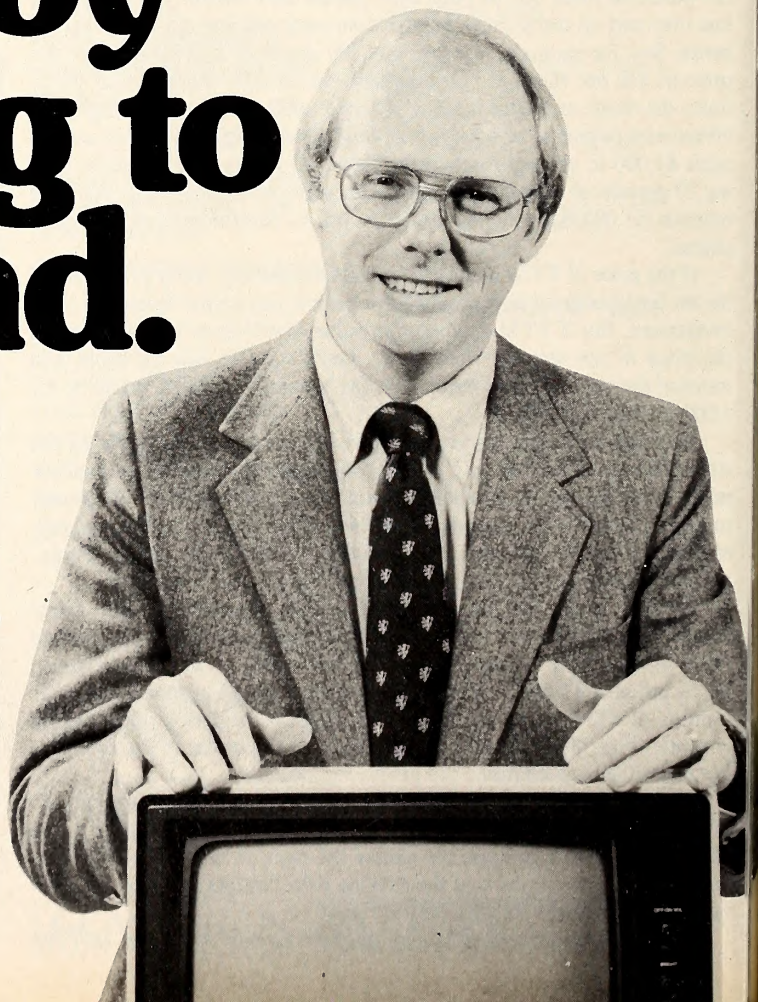

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commissions would again be $200.

Although the foregoing is a simplified explanation of options, it conveys an important point: you the investor can control a large dollar amount of securities while at the same time limiting your actual investment, and thus your potential loss.

Options investing requires a great deal more time and attention than your normal, run-of-the-mill blue chip investment. Market moves can be quick, complicated, and broad. Options analysis can be divided into two major components. The first is the analysis of the value of the optionable security. Is it sound? What are its prospects? The second is pricing. "How much should I pay to control this security," you ask yourself, "based on its underlying value and prospects?"

Practitioners and academicians have tried for years to find the best way to price an option accurately. One of the most significant formulas to come out of these efforts is the Black-Scholes options pricing model. This model is the theoretical basis for the package we're going to look at now, the *Stock Options Analysis Package* (*SOAP*).

Stock Options Analysis Program, H&H Scientific (13507 Pendelston Street, Fort Washington, MD 20744; 301-292-3100). $250.

Backup policy: Within six months of purchase, no charge; after six months, $25. If the registration card is returned within ten days of purchase, an additional copy of the program disk may be purchased for $25.

System requirements: DOS 3.3, Autostart ROM, 48K RAM, and Applesoft in ROM.

Optional hardware: Printer; D.C. Hayes Micromodem II.

SOAP uses the Black-Scholes options pricing module in determining the fair price of an option. The fair price is based on the price of the underlying optional security, the dividends paid, the security's volatility, current interest rates, and the remaining time (life) of the option. *SOAP* can calculate the expected profit or loss for any trade or spread (an options strategy) involving up to three classes of options on any one security.

SOAP uses five different files to perform its analysis, each of which holds one or more of the variables used by the options pricing model. These files are *volatility*, *daily*, *option download*, *dates*, and *commission schedules*.

The Volatility File. Stock price volatility is important data used in "options pricing" calculations. The more up-to-date your volatility information is, the more accurate the output of your model will be. *SOAP* has a volatility file update program that is used for file maintenance. The program documentation recommends that you update the stock prices stored in the volatility file every month or so.

The Black-Scholes model can also be used to calculate the market volatility. If the market-assigned option price is known, the model will calculate the market-assigned volatility.

The authors estimate that it takes twenty minutes to update by hand a file that contains seventy-five entries, as opposed to five minutes to accomplish the same task automatically by means of the Dow Jones retrieval module within the program. Their estimates appear to be on target. And if you have trouble finding your way around the financial section of your newspaper, the manual update process may take you a little longer. Updating using the modem whenever possible is a good idea; modem updates minimize the chance of human error.

The volatility file also stores the dividend payment history, ex-dividend data, and the expiration cycle for each option. An investor should update the dividend information whenever a company under study announces a dividend change. The suggested reference for this is *Barron's*; it carries both dividend information and ex-dividend dates.

Daily. The Dow Jones auto price fetch module creates the daily file. The file contains the current prices for all of the securities you have studied or for any subset you select. Each time *SOAP* is run, it checks for the daily file. If the file exists, you're asked if you want to use the information contained in it. If you say yes, then any option carried in the *SOAP* program will use the daily file price as the current price. Make sure when you use it that the file does indeed contain the most recent prices.

Option Download. This file carries the ticker symbols for the programs fetched by the Dow Jones fetch module.

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Dates. This file contains the number of business days within each month of the year and the number of business days remaining until the options you're studying expire. The time remaining on any option is a very important parameter and should be kept current. The authors recommend that you update this file every three months.

Commission Schedules. Options to buy and sell will usually incur a broker's commission cost, just the way any other security will. *SOAP* allows you to store the commission schedules of the brokers that you do business with. The program then analyzes the net profitability effect of the commission cost on the option being considered. If the commission schedules of any securities change, you can use *SOAP* to edit this file and make the adjustment.

Using the Program. *SOAP* supplies three numbered commission schedules: the pre-1976 standard NYSE commission schedule, a discount broker's schedule, and a full service broker's schedule. If you wish, you may add your own broker's commission schedule, which should be identified by its own number. Once you've selected the schedule you want, the program displays the name of the broker you've selected. If you've chosen the right schedule, just continue on; if not, you may specify another commission identifier and the process will be repeated.

Next *SOAP* searches for the daily file and, if it finds it, displays the date the file was last updated. If you tell *SOAP* that this is the file you want to use, the program automatically reads the price of any option you've specified in the volatility file. (Otherwise, the file is ignored.) It then requests the ticker symbol for the security you're going to analyze. The program then checks the volatility file, and if the security is there, *SOAP* automatically gathers the data needed for the analysis. If the necessary information (including the security's current price) is not in the file, you're prompted to supply it.

Next you're asked what volatility information should be used. You have three choices: supplying the information yourself, telling *SOAP* to compute the volatility, and instructing the program to get the data from the volatility file. A short discussion in the documentation describes what volatilities are most suitable for the types of analysis performed by *SOAP*.

Fun, Fun, Fun, with T-Bills. The program also requires you to supply a short-term interest rate. This may be input as either a decimal or a percentage. Most investors use the T-bill rate, which can be found in the *Wall Street Journal*, *Barron's*, or the business section of your local newspaper.

SOAP then requests the current date and the number of business days remaining in the month. The Black-Scholes model uses this information in its calculations. Be very careful that the information you provide here is correct; the accuracy of the model's predictions will be severely affected if incorrect information has been supplied.

When it comes to investment strategy, *SOAP* offers you five choices—calendar spreads, vertical spreads, a straddle position, writing a covered call, and "other."

The term calendar spread refers to buying a put or call and simultaneously selling a put or call on the same security at the same striking price but on an earlier expiration date. If, when the first option expires, the security closes at or below the striking price for calls, or at or above the striking price for puts, you will not have to buy the security back. You can therefore recognize the premium received as profit. The remaining option will still have some value. The investment's performance will decline if the security's price closes far from the striking price. If the security closes very high or very low relative to the striking price, the entire investment will be lost.

A vertical spread consists of buying a call at one price and simultaneously selling a call with the same expiration date at the next highest strike price. If this strategy is being followed, the put is sold at the next lowest strike price. Using calls, this spread generates a profit if the security closes at the upper strike price or higher. If puts are sold, the position is profitable if the security closes at or below the lower strike price.

A straddle position entails buying a put and a call at the same striking price simultaneously. This strategy is profitable if the price of the security makes a large movement up or down, and unprofitable if the security's price closes at or near the strike price.

If you own a security you can write a covered call. For each 100

shares of the security owned, you may sell (write) one call contract. This strategy is most often used as a way of increasing the income stream from a security that has a stable price history or during periods of market stability.

The "other" section is used to analyze any combination of up to three stock or security classes not covered by the previous investment strategy choices. You can also make use of this section in evaluating an existing position: the potential gain of the investment is measured against its present liquidation value.

Volatile Expiration Cycles. *SOAP* now has all the data it needs to calculate the market assigned volatility of the security you're looking at. If the date of the next dividend is not included in the volatility file, you're asked to supply it. *SOAP* assumes that there's one dividend pay-out between each expiration cycle.

If historic volatility is being used, the program displays the stock name, the quarterly dividend, the dividend date, the volatility of the security, the date the file was last updated, and the stock price at the last update.

The program then requests volatilities to be used in subsequent calculations. If more than one option class is being analyzed, you may choose an average value, a higher value, or a lower value. Your choice will be contingent on your estimate of the security's future market performance.

Now that all the data required has been input, a summary menu appears and displays the information you've entered. If you wish to change a value or double-check an entry, this is the time to do it. Once you're satisfied, the analysis begins.

SOAP prints a summary of the transactions to be analyzed. You tell it the number of days for which you'd like a projection. Ordinarily, your choice would be the number of days remaining on the earliest option.

The standard deviation of the stock price projected is displayed. The range of prices to be analyzed will be plus and minus three times the standard deviation. The calculations are performed using the logarithms of the prices and standard deviations.

During the main analysis phase, *SOAP* examines fifty-one different prices of the underlying security within the limits defined earlier. At each price, the program will calculate the fair price of each option class and the proceeds, including commissions, from closing that transaction. The net gain or loss at that price is calculated. Every fifth calculation is displayed and you're shown the results of eleven computations.

The probability of the occurrence of a particular stock price multiplied by the option-dependent profit or loss is calculated. The sum of all fifty-one calculations is the statistically expected gain or loss for the investment. If the end result is a gain, the annualized percentage rate of return, based on both principal and the time period involved, is calculated.

Graphic SOAPs. If you like, you can display the results of *SOAP*'s analysis as a graph on the hi-res screen. The vertical scale is the profit or loss in dollars. The horizontal scale represents the security's closing price. The profit or loss for plus or minus the three-standard deviation range comprises the rest of the plot.

You can save the screen to disk and/or print it out. If you save it, the program checks to be sure that you haven't already saved a plot using this ticker symbol. If you have, you're asked if you want to overwrite the earlier plot or if you wish to change the name of the plot you're saving now; this ensures that you won't inadvertently destroy the earlier plot.

The program then asks if there's another case to analyze. If so, it asks you to specify the security to be used; if you're using a new security, the entire input sequence begins again.

Fixed Parameters. The fixed parameters file contains the investor's computer configuration. Information stored in this file includes the number of disk drives available, whether or not a micromodem is being used (and, if so, what slot it's in), the local Dow Jones access number for the auto fetch module, the Dow Jones password, the log-on characters required for the communications network used (Telenet or Tymnet), the printer slot and type, and the required printer control and graphics characters.

SOAP is compatible with Trendcom 200 graphics and Apple Silentype graphics. In order to print the hi-res screen graphics using another printer, you must enter the necessary instructions in the parameter file. Any command directly addressable through the Apple's keyboard may be sent. If your printer requires peek or poke setup commands, you'll have to save the hi-res graph to disk and print it out later using a graphics driver program.

Control characters for the printer are then displayed in flashing mode until they have been verified by you. When you've entered all of the control characters and verified them as correct, they will be saved to disk. At this point you may place a write protect tab on the program disk, since no other information needs to be recorded there.

The documentation that accompanies the program contains two helpful appendixes. The first contains a sample case, which can be used as a sort of script to follow in learning to use the program, and the second is a well-written and comprehensible discussion of the theory underlying the Black-Scholes option pricing model. Black-Scholes is steeped in theory, but it is not black magic. The second appendix gives the less quantitatively oriented reader a feeling for what this technique does. Three references that can help the investor understand option theory and options as a practical investment are also listed.

Trapped Errors and Checked Ranges. Overall, *SOAP* is a good implementation of the Black-Scholes options analysis model. There are, however, a few things about the program that need to be improved. The ability to catalog the files on the disk from within the program is lacking, and error trapping and range checking for many of the inputs are inadequate. Right now it's possible to put alphabetic characters into strictly numeric fields and numeric characters into fields designated alphabetic. If you should do this, the program will continue until you run the analysis section, at which point you'll get an error message that refers you to the DOS 3.3. manual. A program should not refer the user to the manual for another program. It should either tell users what's wrong vis-a-vis the screen or refer them to its own manual.

Investors should decide to buy *SOAP* or not based on their understanding of options, option strategies, and the Black-Scholes pricing model. The program is reasonably priced and can be considered a useful analytical aid for the options trader. ■

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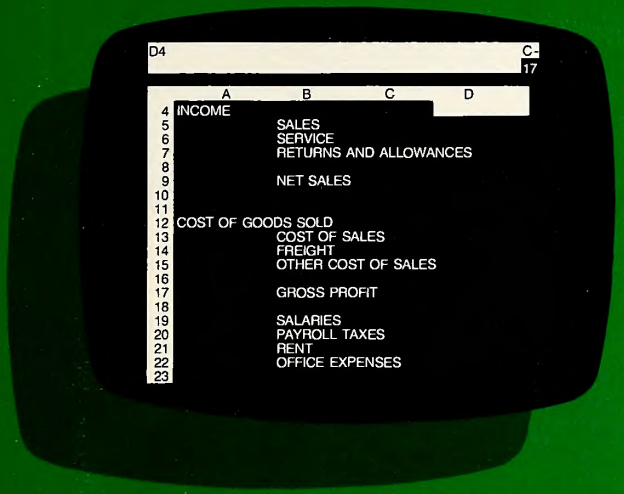

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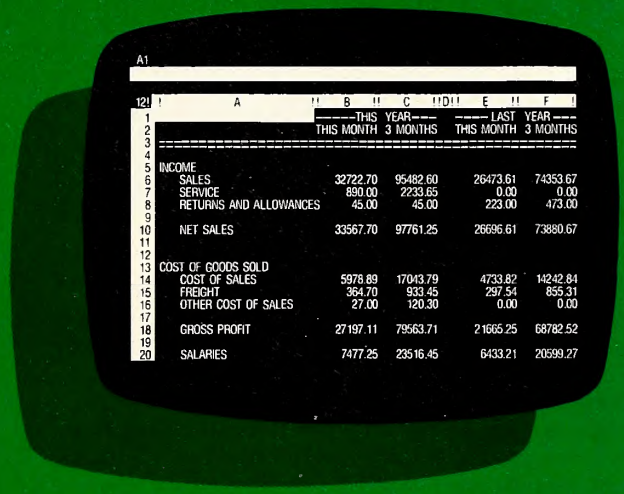

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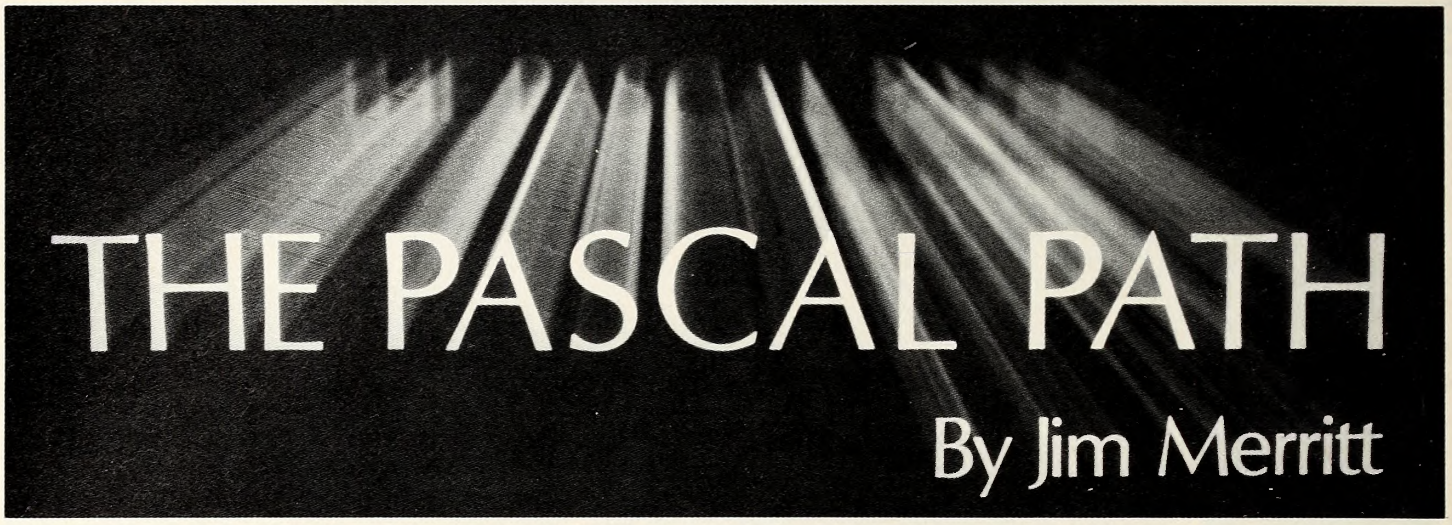

Tools of the Craft, Part 21

We've covered a lot of territory in the last couple of years, and have finally come to the end of the well-traveled segment of the Pascal Path. From this point on, we head into the dense underbrush, wherein lie all manner of interesting secrets and techniques, each waiting to be discovered and tamed by you, the bold and inquisitive programmer. Do those distant drums make you nervous? This is no place for the squeamish, you know; here you survive by sheer strength of will and speed of wit. If you're careful, you can return from your jungle sojourn a master of the Apple Pascal system. If not . . . well, there's no point in dwelling upon the unpleasant possibilities.

As we proceed, you'd do well to keep eyes and ears open. Observe everything, and do your best to understand. For instance, take that snake on your right—the one swallowing its own tail. That's a recursive reptile. But you say the word *recursion* means nothing to you? Well, then, hold a moment and pay close attention. What you're about to learn could someday save the life of (or breathe new life into) your favorite program!

Recursion: Passing Bucks and Peeling Onions. Many a problem or process is like an onion or a pearl. Either of these familiar objects consists of layers and layers of virtually identical material, all surrounding a small, simple core, or kernel. Each layer bears a straightforward relationship to the one beneath it, except that the innermost layer is based on the kernel itself.

Consider the mathematical operation, *factorial.* The exclamation point is used to signify factorials: "3!" is read as "three-factorial," "10!" as "ten-factorial," and so on. *The factorial of a positive integer* n *is the product of all the integers from 1 to* n*, except that 0! is defined as 1.* Thus, 1! is 1; 2! is 1*2, or 2; 3! is 1*2*3, or 6; 4! is 1*2*3*4, or 24; and 5! is 1*2*3*4*5, or 120. There is nothing mysterious about computing factorial values using Pascal; a FOR-loop is aptly suited to the task, as in the following function:

```
FUNCTION
  Factorial(N: Integer)
    :Integer;
(* AUTHOR:      Jim Merritt
  VERSION:     1.0 (1-Jan-83)
  DESCRIPTION: Compute and return N! for all nonnegative N. Return 0
    for negative N, which is not mathematically correct, since the
    mathematical operator ! does not apply to negative numbers; still,
    the function has to return something in such cases. This version
    uses FOR-loop iteration to do the trick. *)
  VAR
    I, TempF
      :Integer;
BEGIN (* Factorial *)
  IF (N < 0)
    THEN
      Factorial := 0
    ELSE
      BEGIN
        TempF := 1; (* 0! and 1! — trivial cases *)
        FOR I := 2 TO N DO
          TempF := TempF * I;
          (* Loop body won't execute if N = 0 or N = 1, leaving
            TempF as 1. *)
        Factorial := TempF;
      END;
END   (* Factorial *);
```

The factorial operation, however, has an interesting, onionlike nature that suggests another method of computation. This deeper nature becomes clear after parentheses have been inserted at appropriate points within the expression defining any particular factorial. Consider 5!, for instance:

((((((1)*1)*2)*3)*4)*5)

By modifying this diagram slightly, we reveal that each layer of the factorial "onion" represents a valid factorial value in its own right, but only by virtue of building upon inner layers:

[[[[[[0!]1!]2!]3!]4!]5!]

The value of 5! depends on that of 4!, which depends on that of 3!, which depends on that of 2!, which depends on that of 1!, which depends on that of 0!, the kernel. This chain of interdependence between factorial values implies that the Pascal function Factorial might be written in the following fashion:

```
FUNCTION
  Factorial(N: Integer)
    :Integer;
(*AUTHOR:      Jim Merritt
  VERSION:     1.0 (1-Jan-83)
  DESCRIPTION: Compute and return N! for all nonnegative N. Return 0
    for negative N. This version is recursive, and is not recommended
    for those subject to chronic dizziness. *)
BEGIN (* Factorial *)
  IF (N < 0)
    THEN
      Factorial := 0
    ELSE
      IF (N = 0)
        THEN
          Factorial := 1
        ELSE
          Factorial := N * Factorial(N-1);
END   (* Factorial *);
```

The new version of Factorial may be translated into somewhat unwieldy English: *"For any nonnegative integer* n*, the factorial of* n *is equal to 1 if* n *is zero; otherwise, it is equal to* n *multiplied by the factorial of one less than* n*."*

You wouldn't be alone in objecting to the definition of a function that calls itself. The human mind tends to reject such trickiness, branding the reasoning behind it as invalid, or "circular." The apparent para-

dox impedes many an honest attempt to understand and apply the principles of recursion.

Actually, however, there are *no* paradoxes in a properly constructed recursive routine, such as Factorial. All such routines are designed to handle hierarchical, "onionlike" problems, according to the principle of "simplify and pass the buck," which is a variation on "divide and conquer." A recursive routine knows how to do three things:

It can handle a very simple problem directly. For instance, Factorial can hand back the value of 0! without further computation.

It can handle the level of problem complexity presented to it, so long as the issues at all lower levels have been resolved. Accordingly, Factorial can generate $n!$ if it knows the value of $(n-1)!$.

It can identify and isolate the problem level that lies directly beneath the current one, then call itself to handle this simpler situation. Action at the current level is postponed until the lower-level call is complete. Unable to generate the value of $n!$ directly, Factorial therefore issues the function call Factorial $(n-1)$.

Recursion works because (and only when) the chain of calls produced by the "simplify-and-pass-the-buck" policy eventually leads to the trivial situation that the routine can handle directly. Finally, the routine is able to act, thus resolving the issues at the lowest level of concern. This, then, permits it to take action at the next higher level, and so on, until the original problem is solved.

Going back to our "onion" analogy, each recursive call to Factorial "peels away" one layer of factorial computation until the trivial kernel operation, 0!, is exposed. This operation is performed explicitly, without recursion, thus allowing the computation at the next higher level of complexity (that is, 1!) to proceed. When that level is reached, the result is passed to the next higher level (2!), and so on, until a correct value is returned for the original call to Factorial.

The existence of the "trivial case" in any recursive definition acts as a brake for the recursive process, just as a termination condition or continuation condition acts to halt iteration (looping). Clearly, a recursive routine must have some way to stop calling itself, or it will do so forever, in the same way that an uncontrolled loop will cycle endlessly. However, for reasons that will become clear momentarily, a "runaway" recursive routine cannot go on forever, the way a "runaway" loop can.

Try rewriting Factorial without the IF–THEN clauses that deal with negative or zero values of n. In other words, modify the definition of Factorial so that, for any and all n, Factorial := n*Factorial$(n-1)$. This should produce "endless recursion." However, if you compile and execute the program, you'll see that the theoretically infinite recursion is cut short by the occurrence of a "stack overflow." (And, by the way, this will also clobber your system and force a reboot.) To see why this happens, read on!

The Mechanics of Recursion. Many people like to think that recursion is a process whereby a routine can create and employ duplicates of itself, in order to whittle a large problem down to size by sheer strength of numbers. In view of our discussion so far, it is clear that this colloquial definition, appealing and colorful though it may be, captures only some of the flavor of recursion. In truth, a recursive call does not spawn a copy of the recursive routine; the "original" is the only copy that exists in RAM at any time. So, how does recursion work at the level of the p-machine?

It often helps to visualize the p-machine as an office clerk, modeled after Dickens's Bob Cratchit. This clerk does his job according to several instruction sheets, which he keeps in a binder on his desk. It goes without saying that he obeys any instruction faithfully, to the letter. Every time he starts a new job, he turns to the appropriate instruction sheet and pulls out a blank sheet of paper, on which he will do any figuring required to complete the task.

Sometimes, an instruction will direct the clerk to carry out the task described on another sheet before proceeding with the task at hand. Whenever this occurs, the clerk first writes on the current sheet of scratch paper, indicating the instruction sheet that was being used, and the particular instruction that was next in line, at the time the current task was

postponed. Then, he throws the scratch paper onto the pile of papers in his "things-to-do" box. Finally, he flips to the new instruction sheet, pulls out another blank sheet of scratch paper, and resumes work with the instruction at the top of the new sheet.

Whenever the clerk carries out the last instruction on any given sheet, he throws away the current scratch paper and pulls a sheet of old scratch paper from the top of the pile in the "things-to-do" box. If the box is empty, of course, he waits patiently for more work, but let's assume that something is there. By reading the scratch paper, he determines which set of instructions corresponds to it. Then, he opens his binder to the appropriate instruction sheet and resumes work at the point indicated on the scratch paper. However, before proceeding, he crosses out the reminders that helped him resume the postponed task, since they are now superfluous.

Except for the fact that the p-machine uses portions of semiconductor RAM memory inside your Apple computer as its "instruction binder" and "scratch pad," it behaves very much like our highly methodical clerk. In particular, it maintains a stack of "things to do," such that the last item thrown on the pile is the first to be retrieved. Instead of being called "scratch paper," though, each item is called a "stack frame."

A stack frame contains space for a routine's parameters and local variables. If a routine must be postponed (that is, if another routine is called), information that permits the p-machine to resume the postponed task is stacked on top of the current stack frame, and a stack frame for the newly called routine is constructed on top of that. Stack frames vary in size; the amount of memory occupied by a stack frame is only slightly larger than the amount of local storage required by the corresponding routine. Note that a separate stack frame is constructed for *every* function or procedure call, whether or not it is recursive. Every call starts with a "clean slate."

It is the stack frame mechanism that facilitates recursion in the Apple Pascal system. Suppose for a moment that a chain of recursive calls actually did generate several "clones" of the calling routine. It stands to reason that the code for each "clone" would be identical to that of its siblings, since the same procedural instructions apply at any level of a recursive process. However, each of the several stack frames would differ from its fellows, because of the differences between the situations addressed by each recursive call. In the case of Factorial, it is easy to see that at least the value of *n* must be different in each stack frame produced during Factorial's chain of recursion.

Since the difference between "clone routines" would amount only to a difference between their respective stack frames, a single copy of the recursive routine can appear as a group of "clones," if that single routine can be applied successively to the different stack frames the "clones" would use. This is exactly what happens inside the p-machine. One set of p-code instructions, corresponding to the definition of a recursive routine, is applied to each of a chain of stack frames, one for each recursive level.

Recursion versus Iteration. In theory, any program written using iterative methods—that is, explicit looping—may be rewritten to use recursion, and vice versa. Many programmers prefer to use recursive routines, because they are usually much more concise than equivalent iterative specifications. A recursive definition is generally very efficient in terms of saving programmer time. On the other hand, such a definition is usually wasteful of computer resources. Each recursive call requires RAM memory for its stack frame and related information. (This is why an "endlessly recursive" routine eventually causes a "stack overflow"—it eats all the remaining RAM in your Apple, and even asks for more!) Furthermore, the process of calling a procedure or function takes a finite amount of time, more time than that required to begin a new loop iteration. Thus, recursive routines tend to need more space and run more slowly than their iterative counterparts.

To expedite program development and promote program clarity, any problem defined recursively should be solved using recursion; any that is defined iteratively should be solved using iteration. If a recursive routine ends up being too slow, or using too much RAM, you can always attempt to convert it to pure iteration.

In practice, the conversion between iteration and recursion is often very difficult. Don't be lulled into a false sense of security due to the straightforward relationship between the iterative and recursive versions of Factorial; that example was deliberately chosen for its simplicity and transparency. The routine Permute, on the other hand, is a bit more complex. It generates and displays all the possible permutations (rearrangements) of characters in an arbitrary character string S.

```
PROGRAM
  Permutations;
  CONST
    VersionMark=
      'PERMUTE Ver 1.0 (29 Dec 1982 / jam)';
    Empty=      '';
  VAR
    InStr
      :String;
  PROCEDURE
    Permute(N: Integer;
            VAR S: String);
  (* Generate and display on standard output all permutations of the
    1 . . Nth characters of String S. The recursive logic is a bit tricky
    here; step carefully. This routine assumes length(s) > = N. If S
    contains more than N characters, those beyond position N remain
    untouched, yet all of S is displayed. *)
    VAR
      I
        :Integer;
      CharCooler
        :Char;
  BEGIN (* Permute *)
    IF (N = 1)
      THEN
        WriteLn(Output, S)
      ELSE
        BEGIN
          Permute(N-1, S);
          For I := 1 TO (N-1) DO
            BEGIN
              (* Exchange S[I] with S[N] *)
                CharCooler := S[I];
                S[I] := S[N];
                S[N] := CharCooler;
              Permute(N-1, S);
              (* Exchange S[N] with S[I] *)
                CharCooler := S[N];
                S[N] := S[I];
                S[I] := CharCooler;
            END;
        END;
  END   (* Permute *);
BEGIN (* Permutations *)
  WriteLn(Output, VersionMark);
  REPEAT
    WriteLn(Output);
    Write(Output, 'String to permute: ');
    ReadLn(Input, InStr);
    IF (InStr < > Empty)
      THEN
        Permute(Length(InStr), Instr);
  UNTIL (InStr = Empty);
END   (* Permutations *).
```

A call to Permute begins on the premise that it will display all permutations of the first *n* characters in S. It proceeds to accomplish this by leaving the *n*th character fixed in place, while it calls itself to display all the permutations of the first *n*−1 characters. Then, for every character position, not including the *n*th, Permute exchanges the corresponding character with the *n*th one, displays all the permutations associated with the first *n*−1 characters in the altered string, and finally undoes the alteration, in preparation for the next iteration. Sooner or later, during the chain (or in this case, the "tree") of recursive calls, *n* will eventually be 1. When this happens, Permute finds itself with nothing to rearrange; so it displays the entire String S, which at this point contains a unique permutation of the original S.

If you find it difficult to agree that this procedure does indeed generate all permutations of S without repeating any, you should enter, compile, and execute the program *Permutations*. Use a small string (three or four letters) as your test data. In order to appreciate fully the validity of

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this method, however, you will probably have to put yourself in the role of the p-machine and try tracing the execution of the procedure Permute as it processes some representative input, such as the three-letter String 'abc'. Tracing recursive routines can be tricky, so proceed slowly and carefully. To avoid getting lost, consult figure 1, which is a chronological summary of the major events that take place while Permute deals with the String 'abc'. Note that *figure 1 is not a Pascal program listing*, but an attempt to reflect the operation of Permute. Indentation has been supplied to help you distinguish between the various levels of recursion.

Permute's recursive definition is concise and even elegant, but, as you can see from trying to trace the routine, its apparent simplicity is highly deceptive. To get a feel for the amount of computing power hidden in Permute's recursive calls, the fearless reader should attempt to rewrite the routine, without benefit of recursion!

Before we press on, you who believe that Permute would be handy in solving anagram puzzles should be warned! A String of Length *n* has *n*! unique permutations. Thus, the three-character String 'abc' has 3!, or 6 permutations; a six-character String has 6!, or 720 permutations; and a ten-character String has 10!, or 3,628,800 permutations! Because you anagram fanatics generally attempt to unscramble entire sentences, most longer than ten letters, Permute would probably be of little use to you.

```
CALL Permute(N=3, S= 'abc')
    CALL Permute(N=2, S= 'abc')
        CALL Permute(N=1, S= 'abc')
            *** TO SCREEN: abc
        EXIT FROM Permute(N=1, S= 'abc')
        FOR I := 1 TO (N - 1) (*=1*) DO
            New iteration — I = 1:
                After S[I] and S[N] exchanged, S= 'bac'
                CALL Permute(N=1, S= 'bac')
                    *** TO SCREEN: bac
                EXIT FROM Permute(N=1, S= 'bac')
                After S[N] and S[I] exchanged, S= 'abc'
    EXIT FROM Permute(N=2, S= 'abc')
    FOR I := 1 TO (N-1) (*=2*) DO
        New iteration — I = 1:
            After S[I] and S[N] exchanged, S= 'cba'
            CALL Permute(N=2, S= 'cba')
                CALL Permute(N=1, S= 'cba')
                    *** TO SCREEN: cba
                EXIT FROM Permute(N=1, S= 'cba')
                FOR I := 1 TO (N-1) (*=1*) DO
                    New iteration — I = 1:
                        After S[I] and S[N] exchanged,
                            S= 'bca'
                        CALL Permute(N=1, S= 'bca')
                            *** TO SCREEN: bca
                        EXIT FROM Permute(N=1, S=
                            'bca')
                        After S[N] and S[I] exchanged,
                            S= 'cba'
            EXIT FROM Permute(N=2, S= 'cba')
            After S[N] and S[I] exchanged, S= 'abc'
        New iteration — I = 2:
            After S[I] and S[N] exchanged, S = 'acb'
            CALL Permute(N=2, S= 'acb')
                CALL Permute(N=1, S= 'acb')
                    *** TO SCREEN: acb
                EXIT FROM Permute(N=1, S= 'acb')
                FOR I := 1 TO (N-1) (*=1*) DO
                    New iteration — I = 1:
                        After S[I] and S[N] exchanged,
                            S= 'cab'
                        CALL Permute(N=1, S= 'cab')
                            *** TO SCREEN: cab
                        EXIT FROM Permute(N=1,
                            S= 'cab')
                        After S[N] and S[I] exchanged,
                            S= 'acb'
            EXIT FROM Permute(N=2, S= 'acb')
            After S[N] and S[I] exchanged, S= 'abc'
EXIT FROM Permute(N=3, S= 'abc')
```

Figure 1. Trace of Permute.

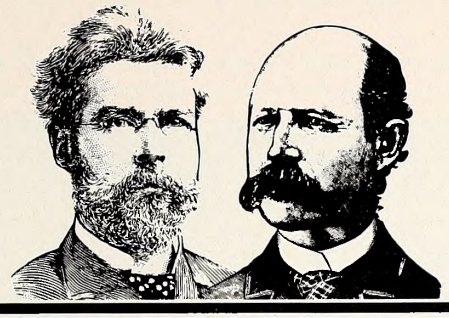
Certainly it would be more fun for you to solve a long anagram in your head than to scan through a computer printout consisting of millions of possible solutions! As stated on the front cover of Apple's financial report for fiscal 1982, "Man is still the most extraordinary computer of all."

A Promise Kept. We've explored the iterative conversion of Integers to character strings by writing such routines as IntegerOutput and IntToString. As you can see in the following version of IntegerOutput, certain data conversions may also be expressed recursively:

```
PROGRAM
  TestIntOut;
  PROCEDURE
    IntegerOutput(VAR
                    OutFile
                      :Interactive;
                  Source
                    :Integer);
  (* AUTHOR:  Jim Merritt
     DATE:    1-Jan-1983 @ 3:03pm
     SYSTEM:  Apple Pascal 1.1
     DESCRIPTION: Copies the character representation of Source to
       the specified Outfile . . . character representation begins with a
       hyphen if Source is negative, and is unsigned if Source is 0 or
       positive. WORKS FOR ALL POSSIBLE INTEGER VALUES.
       This routine uses recursion. *)
    CONST
      Base=              10;              (* Base 10 arithmetic *)
  BEGIN (* IntegerOutput *)
    IF (Source < 0) (* is negative *)
      THEN
        BEGIN
          (* emit leading hyphen *)
            Write(OutFile, '-');
          (* From now on, work only with magnitude *)
            Source := Abs(Source);
        END;
    IF ((Source DIV Base) > 0)
      THEN
        IntegerOutput(OutFile, (Source DIV Base));
    (* Display rightmost digit *)
      Write(OutFile, Chr((Source MOD Base) + Ord('0')));
  END   (* IntegerOutput *);
BEGIN (* TestIntOut *)
  IntegerOutput(Output, MaxInt);
  WriteLn(Output);
  IntegerOutput(Output, 1);
  WriteLn(Output);
  IntegerOutput(Output, 0);
  WriteLn(Output);
  IntegerOutput(Output, -1);
  WriteLn(Output);
  IntegerOutput(Output, -MaxInt);
  WriteLn(Output);
END   (* TestIntOut *).
```

The recursive IntegerOutput is concerned only with the rightmost digit in the Integer that is presented to it. The routine "knows" that it should transmit this digit to the screen only after all remaining digits in the number have been displayed. So, it separates the digit for which it has responsibility from the bulk of the number. If that "bulk" is nonzero, then there are yet more digits to display, and IntegerOutput will call itself to handle them. The "inward chain" of recursive calls to IntegerOutput may be considered as a right-to-left scan of the original Integer I. Of course, once every digit in the number has been examined, the chain must be followed back out to the original call. At every link on the return trip, a digit is displayed, in exactly the opposite order to which it was acquired. Since the digits were collected from right to left, they are displayed in the normal fashion, from left to right.

Because of its relative inefficiency, as compared to the iterative version, the recursive IntegerOutput is more a curiosity than a serious tool. It is presented here primarily because your Pathfinder, in one of his weaker moments several months ago, claimed it could be done, and promised to show you how "when the time came." Never let it be said that promises are ever broken along the Pascal Path! ◻■



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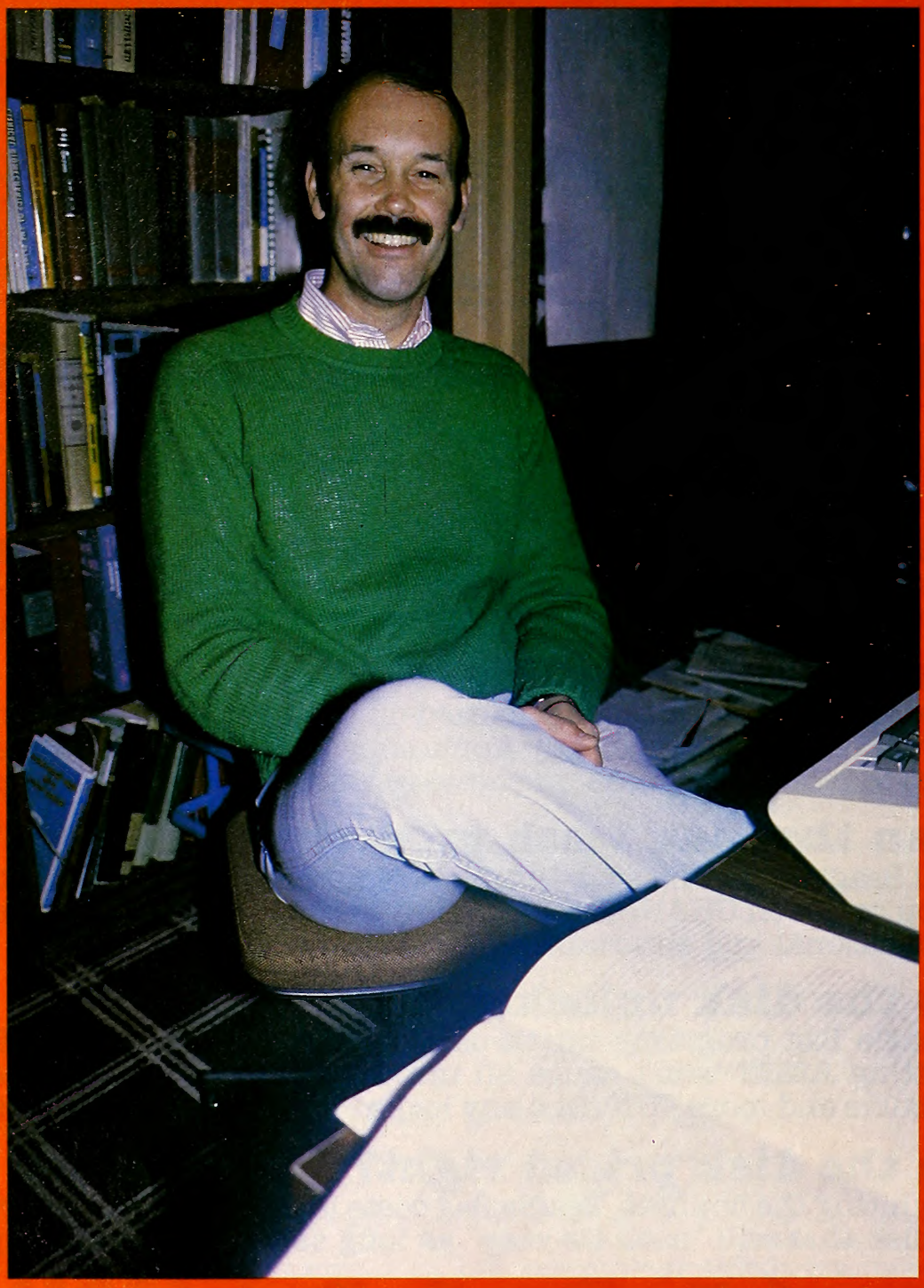

Dem Bones, Dem Bones, Dem PIE Bones

BY JONATHAN MILLER

San Francisco has long been known as a drinking town, but that convivial reputation was sullied on the night of September 5, 1982. Singer Mary Martin, the original Peter Pan, had come up from her home in Palm Springs to do a taping of her PBS show, *Over Easy*. The session behind her, she looked forward to good food and company as she and three old friends piled into the rear seat of a taxi and headed for Chinatown. They never made it.

As the cab entered the intersection of California and Franklin streets, it was broadsided by a drunken driver—a speeding van that had run a red light. The impact was so great that it sent the taxi skittering eighty feet and into a tree, seriously injuring the four passengers. Martin, sixty-eight, suffered multiple rib and pelvic fractures as well as internal injuries. Her longtime friend, seventy-six-year-old actress Janet Gaynor, winner of the first best-actress Oscar, suffered eleven broken ribs, a severely damaged kidney, a perforated bladder, multiple pelvic fractures, and other injuries. Gaynor's husband, impresario-producer Paul Gregory, had three broken ribs. Ben Washer, seventy-six, Martin's longtime associate and press agent, was dead.

Opposite page: Peter Trafton's specialty gets down to bare bones. But his thinking is full-bodied. He uses *Pie Writer* to put his thought in a form publishers can understand and share. This page: Trafton's Apple, all decked out with *Pie* commands.

Mission of Mercy. The intersection of California and Franklin looked like a war zone. Tending the injured would require the same kind of battlefield medicine that doctors had perfected in Korea and Vietnam—immediate evacuation and treatment of the injured. Within minutes of the accident, paramedic teams were rushing the victims to San Francisco General Hospital's Mission Emergency. It wasn't the nearest hospital, but it was the best equipped to perform life-saving emergency surgery. Mission is San Francisco's designated trauma center and is to that city what the 451st was to troops in Korea—a kind of twenty-four-hour urban M.A.S.H. unit.

Martin and Gaynor eventually recovered from their injuries. Martin, in fact, was back on her feet within two weeks, but victims of serious injuries don't always receive the intense team care provided by trauma centers.

"Thirty to 40 percent of the trauma deaths in the country are probably preventable by trauma centers," says orthopedic surgeon Peter G. Trafton. Trafton, an orthopedic consultant to one of the round-the-clock trauma teams at Mission Emergency, specializes in multiple injuries to bones, muscles, and joints, like the pelvic fractures suffered by Martin and Gaynor.

"Trauma is probably the least known and yet most serious health problem in the country today," he says. "We spend millions for research into heart disease and cancer, but in terms of real loss of comfort and of the productivity of young individuals in our society, trauma is a worse culprit. It's the commonest cause of death among children."

Trafton usually gets called when trauma victims arrive with major open fractures. Such injuries always pose a danger because infection could lead to the loss of a limb.

"Many of the doctors doing trauma work are general surgeons," Trafton explains. "They're not specifically trained in the care of patients with musculoskeletal injuries."

Trafton wears several hats at San Francisco General, a teaching hospital run under contract by the University of California at San Francisco. In addition to advising the trauma team, Trafton performs surgery and, in his capacity as an assistant professor of orthopedic surgery, teaches at the affiliated med school campus across town.

Trafton sees himself primarily as a teacher. He oversees residents in the orthopedic service and keeps staff and students abreast of what's happening in his innovative specialty, a discipline currently embroiled in a lively discussion of the pros and cons of treating multiple injuries surgically. Spreading the word under these circumstances becomes a full-time job, particularly given the publish-or-perish realities of academic life for the untenured profs like Trafton.

Rx for a Doctor's Dilemma. Two years ago, when Trafton was asked to contribute a chapter to a book on the complications of fractures, he found himself apparently facing the horns of a doctor's dilemma. He could dictate the chapter to the already busy secretary he shared with another staff member, or he could write the magnum opus by hand—a hand he admits that not even he can always read.

Forced to look beyond the unacceptable horns, Trafton hit upon the idea of word processing. Straight typing was not outside Trafton's purview; it was correcting and formatting that caused him problems, and word processing would solve these. Considering the additional research potential, Trafton decided to purchase a computer. The choice of an Apple was a simple one; choosing a word processor was more difficult. In the end, it was *Pie* that took the cake.

"It was the description in *The Book* that made the difference," Trafton says. "It struck a subjective chord."

After Trafton balanced price, power, and performance to the best of his ability, his choice was *Apple Pie*, then from Programma and now, in a recent upgrade with a change of name to *Pie Writer*, from Hayden.

"The *Pie Writer* available now is a significant improvement over a product I was already quite satisfied with," Trafton says, noting that he was pleased to pay seventy-five dollars for the update. "I'm especially impressed with the attention the company's given to the questions I've had."

Word processor users seem to fall for the first package they really get to know; Trafton is no exception.

"I tend to look at *Pie Writer*'s weaknesses and accept its strengths," he says, "and I'm so happy with its strengths that when I went to look at programs offering a little more space in memory I decided it wasn't worth the effort to learn the new one."

Disk-Jockeying. Trafton's only complaint concerns the length of the binary text files that *Pie Writer* allows. He estimates that a file holds about three thousand of his polysyllabic medi-

cal terms—not enough for many of the technical articles he writes. His book chapter, for example, filled a disk and a half. Jockeying among files can be a hassle when editing, Trafton concedes, but the program makes it so easy to link files during printing that it really doesn't matter much.

"All I have to do is execute a simple command and I can print a whole disk's worth without further attention."

Pie Writer, back when it was *Apple Pie,* acquired a reputation for being one of the most difficult word processors to learn. But Trafton thinks much of its complexity has been eliminated in the update. Wherever possible, Hayden simplified *Pie*'s command structure to single and double keystrokes; there are still plenty of commands to learn, since the user formats as he goes by embedding text commands. A three-page, fold-out reference card helps the forgetful keep track of this impressive array of power. The card is helpful, but Trafton remains partial to the even friendlier stick-on key labels that came with the original program.

Dualing Screens. The most striking feature of *Pie Writer* is the way it appears on-screen. It creates the illusion of a printed page by using dashes to define a square. Text appears within this window, under which is a sill, or status line. On the status line are displayed the values for the cursor's position by line and column and for the case and mode. And *Pie* is unusual in one other respect: it has two screens.

Pie was among the first word processors to offer primary and secondary screens to users of both forty and eighty column versions. Trafton picked the forty column package. This means he can use a normal forty column screen, in which the word-wrapping occurs at the normal end of the screen, or he can use the dual screens, in which case his text is spread horizontally across both screens. When a line of text reaches column thirty-nine of the first screen, the second screen is displayed and the line continues, wrapping at the end of the second screen—back to the first.

About the only time Trafton avails himself of the second screen is when he's writing a title that exceeds the row length of the single screen, an event that occurs usually when he's preparing a slide presentation.

Pie boots up with a system menu, but it's not truly a menu-driven program, Trafton points out. It's closer to free-form entry, with the user formatting by means of the embedded commands. A screenful of command-embedded text provides greater formatting versatility, but it resembles a cross between scientific notation and stenographic hieroglyphics.

Such an esoteric appearance may help explain *Pie*'s popularity among research types, but it's not likely to win converts among the typewriter-oriented. What it comes down to in visual terms is that what you see is not what you get—at least not in the text-entering mode. What you see is a lot of embedded commands; what you get is a custom-formatted page.

Trafton professes to have no problems with this minor inconvenience. By directing the format mode to print only to the screen, he can preview the layout of a document to be printed—as it will appear on the page. Even here, there's the standard qualification: niceties such as underscoring and boldfacing don't show up.

For Trafton, a big program plus is being able to designate the number of copies he wants printed. "Very often I'm producing something that needs to go to thirty-four residents," he explains. "Rather than use a copy machine or get secretarial help, I run off thirty-four copies sequentially." The principal drawback to that, of course, is having to endure the racket as the

Olivieri's Outline of Word Processors

by Peter Olivieri

We're catching up, slowly but surely. This month's word processor profiles zero in on *Pie Writer* and *Executive Secretary.*

Pie Writer. Hayden Software, 600 Suffolk Street, Lowell, MA 01853; (617) 937-0200. Equipment required: 48K, monitor, one disk drive, printer. Lower-case adapter needed for lower-case display. Eighty-column board optional. Compatible cards include Full View, DoubleVision, Vision-80, Smarterm, Videx, Sup'R'Term; appropriate eighty-column version of program required. $149.95.

Processing with Pie. *Pie Writer* is a very thorough software package. Indeed, it is perhaps one of the more powerful word processing programs we've considered so far. Before we go any further, however, one significant reservation about *Pie Writer* should be mentioned up-front, and that concerns the program's ease of use.

A computer user who buys a word processing program should be able to count on getting clear, well-illustrated documentation of the program's capabilities. It can be very frustrating to find a powerful word processing package, one offering features that aren't commonly found in competing systems, only to discover after you buy it that the accompanying documentation doesn't clearly explain how to use the program.

Unfortunately, *Pie Writer*'s documentation fits this description. It's thorough, but it's not very easy to read and follow. This means that word processing users, especially those without a fair amount of computing experience, may find it difficult to get up and running with the program. Of course, various software packages (the *DB Master* database system, for example) require users to put in a lot of time and effort in order to take full advantage of their many features, so you might want to take all this with a

printer does its job.

Moving in, out, and around files can sometimes be a headache, but not with *Pie*, says Trafton. He can save portions of a text file or insert portions from another file simply by designating beginning and ending line numbers.

What's My Line Number? The program uses line numbers to track the text entered on the screen or saved to disk. The numbers correspond to lines as they'd appear on the screen rather than as they'll appear on the printed page. This internal control makes for versatile block moves. Although the text editor's move buffer is limited to a single screen, designating line numbers overcomes that limitation and makes possible the juggling of whole pages from one end of a document to the other.

In Trafton's opinion, versatility is the program's major strength. If you leave the editor and then come back to it, the cursor remains where you left it. Not only does *Pie* offer multiple tabbing, it also permits you to save any set of tabs you wish. And the same principle applies to formatted files, which can be transferred to disk exactly as printed out. If you want to mix text and columns of numbers by toggling in and out of word-wrap, *Pie* allows it.

When Trafton wants to format slide presentations, he can reverse-indent to insert a corresponding number in the left margin. Moreover, *Pie* has also let Trafton talk to himself, in effect. He can write notes either in the margins or in the body of the text, and he can print these comments or not, as he chooses. "This is very useful when I want to remind myself where I obtained some material for an article but don't want to print it out," he says.

So what is the doctor's diagnosis of *Pie*? "It's a marvelous tool," Trafton says. "I bought a computer and a word processor thinking it would just make it easier to do rough drafts. To my amazement, I found I was able to produce perfect finished typewritten texts."

And that, in word processors, is the bottom line.

grain of salt. Despite the drawbacks in its documentation, *Pie Writer* just may be the best word processor for you.

With that out of the way, let's look more closely at this comprehensive system. To begin with, some special features are worthy of mention. These include the ability to search for and replace strings (and to use "wild card" searches), built-in list processing capability (often an add-on with other packages), the ability to print labels, and a built-in telecommunications program allowing you to transmit data over a modem (unusual and nice).

Another of *Pie Writer*'s powerful features is its editor. While in the edit mode, you can control the movement of the cursor up, down, left, and right; you can also move by spaces, words, line, or tab stop.

It's easy to make insertions and deletions. You don't have to go through lots of intricate steps in order to insert text; rather, you can insert text anywhere simply by typing it. In fact, you can even define a key to contain a phrase and then have a line of text "open up" so that the phrase can be inserted. The back arrow has a backspace or erase feature that allows you to erase on a character-by-character basis, and it's also possible to delete words or lines. You can even specify that you want a range of lines to be deleted. This task, however, can take as many as eight or nine keystrokes.

While in the edit mode, you can scroll by line, or by a number of lines of your choosing. Text can be copied into a buffer and moved to another spot in your document, it can be deleted from the spot at which it was originally located, or, if you wish, the original can "stay behind." In this fashion, you can move up to twenty-one lines of text. You can search either forward or backward from the current cursor position for a particular word or phrase, and during this process you can replace the word or phrase with another of your choice.

Pie Writer also provides impressive formatting capabilities. You can configure your printer and add any particular control characters you need in order to take advantage of its special features. This gives the package a great deal of flexibility.

Pie Writer's format list is quite extensive. You can put titles on every page (headers or footers), number the pages, center, underline, print in boldface, and print in columnar format. You can vary the margins on either side of your document, control indentation, and control page length. And you can use single sheet or sprocket-fed paper.

To enter formatting commands into a document, you precede a one or two-letter command with a period. This is not an uncommon method of handling formatting commands, but not all users like it.

Some auxiliary commands allow you to determine how much space is left on your disk, get a catalog of the disk's contents, count the number of words or lines in a document, delete files, and back up files. Various other disk commands are also available.

In addition, *Pie Writer* permits you to enter a letter interactively; that is, while a document or letter is being printed you can cause the printer to halt until you enter some text. That text is then inserted in the document being printed, and printing resumes. This is a nice feature.

The documentation includes a very helpful picture of the keyboard, with all the keys relabeled to reflect their word processing functions.

As mentioned earlier, the rest of the documentation is thorough, very detailed, and not quick and easy reading. The table of contents and the index are very complete, making it easier for you to locate items that are of interest to you. However, there's plenty of information to absorb.

All in all, *Pie Writer* is one of the most thorough word processing packages available. Indeed, for the knowledgeable computer user, it can perform many functions in addition to word processing. On the minus side, there's no question that learning to use this package well requires time and effort. For some people, this will be enough to discourage them from getting the package; for others, it will be a motivating force.

The only other drawback worthy of mention is the number of keystrokes necessary to enter some of the commands. It's not unusual to have to type five or more keys to communicate a particular command. This is, at best, cumbersome. However, the extra features *Pie Writer* offers may override these concerns. For the more experienced user, *Pie Writer* just may be the best buy.

Executive Secretary, Sof/Sys, 4306 Upton Avenue South, Minneapolis, MN 55410; (612) 929-7104. $250.

Equipment required: 48K, one or two disk drives, monitor, printer, shift-key modification. Lower-case adapter and/or eighty-column card also required. Compatible cards include the Bit 3 Full View 80, Videx Videoterm, A.L.S. Smarterm, and M&R Sup'R'Term.
Optional: Hayes Micromodem, Thunderware Thunderclock.

Executive Sweet. This is a good, versatile package. You can use it to create and work with files that contain approximately sixteen thousand characters (about three thousand words). Larger documents can be created by stringing files together. In fact, by carefully arranging files and connecting them to one another, it's possible to create a printed document of more than twenty thousand words (the equivalent of fifty double-spaced typewritten pages).

Since we always seem to be complaining about user manuals, it would be a mark of inconsistency if we didn't call attention to a good one when it came along. The *Executive Secretary* manual certainly fills the bill. To begin with, it is professionally done. It comes in an attractive, rectangular-shaped notebook that stands up like an easel, making it easy to refer to while you're learning and working with the package.

The first page of the manual describes how to get a free backup copy of the software, how to get a damaged disk replaced (for $7.50), how to get upgraded copies of the programs when enhancements have been made to it (also $7.50), and how to use the telephone support service Sof/Sys operates.

The text of the manual is divided into twenty-five separate lessons. It is readable, easy to understand, and well organized. It is also attractively formatted, with different sizes of type and boldface printing contributing to a very effective and helpful presentation of the material. (In fact, some school systems have even adopted the guide as a classroom text.)

In addition, the manual is thorough. It includes a complete discussion of all the aspects of a professional word processing system and has a very complete index.

Executive Secretary allows you to use the editor in either a typing mode or an editing mode. In the typing mode, the system works pretty much the way a standard typewriter does. Fast typists will have no problem using it, since the system reacts very quickly. While you're in this mode, the only way to make corrections is by backspacing and thereby erasing the text you backspace over. To make more extensive corrections, you'd have to switch over to the editing mode.

From the editing mode, it's easy to make changes in a document. Most of the commands are of the single-keystroke variety. For example, to add some text, you'd position the cursor at the point where you wish to add some text, type the letter A, and then add all the text you wanted to. When you'd finished adding text, you'd press escape. Most of the program's commands follow this same format; that is, the keys tend to represent the operation to be performed.

The program features word wrap, global search and replace, and easy movement of blocks of text. In addition, it offers you the ability to define a two-letter sequence (preceded by a period) as a word or line of your choice. Then when you're typing text, you need only type the abbreviated sequence in order to have the word or line entered into the document.

You can also adapt this system to your printer by embedding printer control commands in the text of your document. In fact, you may declare any two-letter sequence (again, preceded by a period) to be representative of a particular sequence of ASCII code.

The Document Printer portion of the package is quite powerful. It's here that you set margins, determine the page length, and specify the width of the lines. Lines of printed text can be indented, centered, and justified. In addition, page numbers can be placed wherever you wish on the page. All of these functions are accomplished by means of essentially two-letter commands embedded in your document.

It's also possible to insert prompt commands within a document so that the document will pause during printing and allow someone sitting at the Apple to enter text at that time. This capability can be very useful in a great many professional settings. In addition, you can preview final documents before printing them.

Another handy feature is the ability to index a document. In fact, if an entry to be indexed extends over two or three pages, the index entry will so specify. This is a very important (and not very common) feature.

Two other features are standard in the *Executive Secretary* that aren't necessarily so in other packages. These are an electronic card file and a mailing list option.

The electronic card file is essentially a database management system. Because it's part of the word processing package, you can extract information from the database for inclusion within a document. This is a very powerful feature. Furthermore, *Executive Secretary* interfaces with (talks to) several other database packages, including *DB Master* and *The Data Factory*.

Of course, mailing list merging is possible. What this means is that you can merge a list of names and addresses with a letter or document. In addition, a variety of conditional printing criteria can be specified. Such commands as *and*, *or*, *not*, *if not*, and *and not* are available.

And there's more! The *Executive Secretary* has document transmission capability and is compatible with the Hayes Micromodem.

The *Executive Speller*, a companion product, contains a list of more than ten thousand words. You can add your own words to this dictionary to create a lexicon of up to twenty-five thousand words. The package can then be used to check your document for any words that aren't spelled correctly. Once a possible misspelling has been identified, you have a variety of options, which include correcting the spelling, leaving the word as it is, and adding it to the dictionary.

The only problems with *Executive Secretary* are relatively minor. The package doesn't support automatic hyphenation, which for some users could be a significant shortcoming. In addition, there's no provision for including footnotes in a document. Again, some users might find this unacceptable.

In summary, *Executive Secretary* is an easy-to-use, well-done, professional package. Since it includes a database system and a mailing list system, it's pretty much a one-stop shopping package that addresses the most common word processing needs. It should certainly be one of the packages you consider. ❑■

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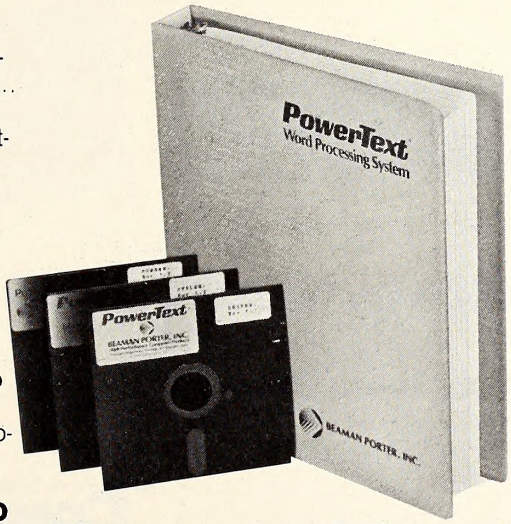

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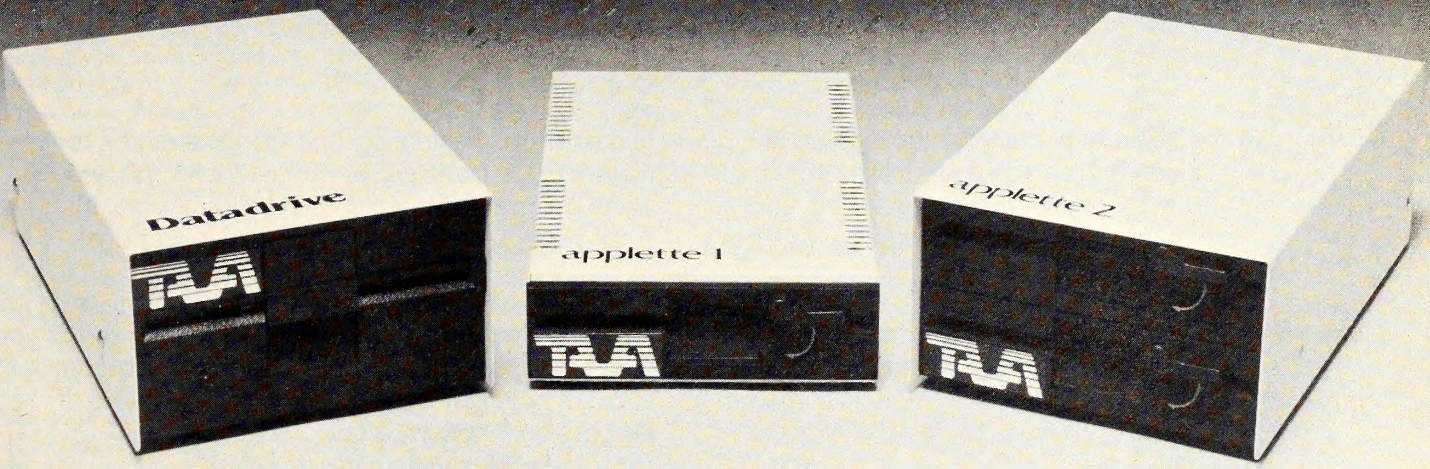

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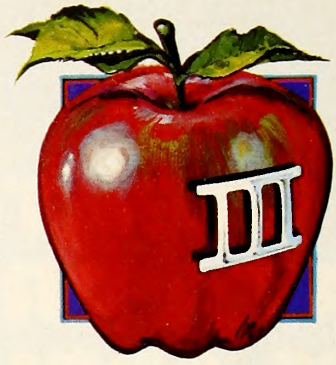

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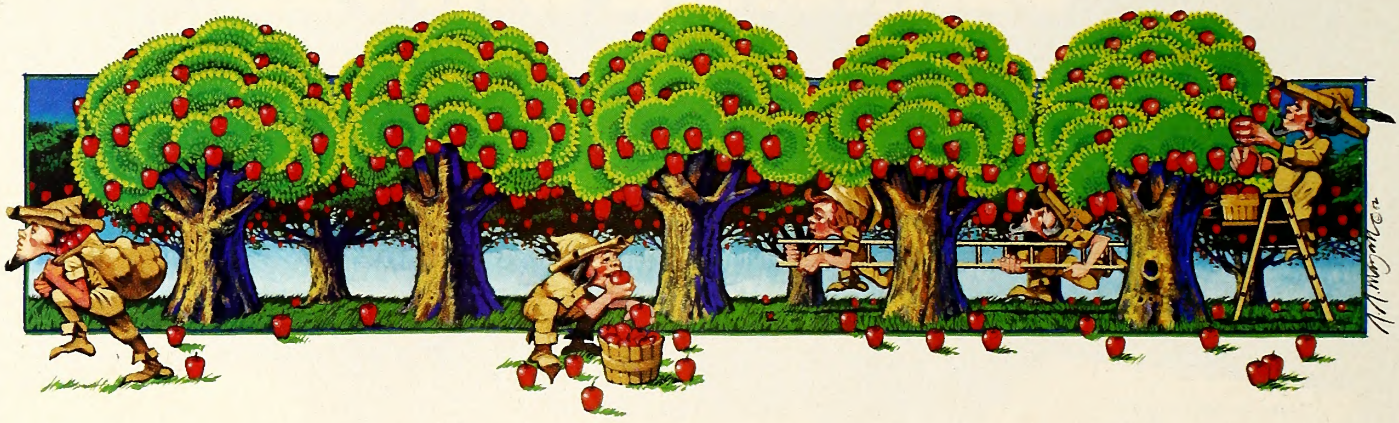

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Exploring Business Basic, Part 18

Looking through a Glass Backward. Last month's article was a lengthy tome on editing character fonts and shapes, delivered with the promise that it could be used to create "fun stuff." What else justifies having to type in such a long program? That program, or something equivalent, is going to become pretty important this time, as we continue our discussions of graphics by developing an arcade shoot-'em-up called *Bug-Mania.* In the process, we'll explore an area of graphics that most people overlook, the forty-column color-on-color text mode.

Now that we can create special character shapes and load them into the standard character set, a class of graphics known as "character set animation" is not only possible but highly practical and rewarding. Most people don't realize it, but the capabilities of the Apple II *DOS Tool Kit* package, *Animatrix,* program are supplied as standard in the Apple III and work at hardware speeds! However, to make all this neat stuff really work for you, you need a character set editor such as the one discussed last time. If you don't have last month's article, you can still use the programs, but they won't make much sense, and they certainly won't be pretty.

Since last month's article was written, a set of Business Basic invokable modules called *Basic Extension* has appeared on the market from Foxware Products of Salt Lake City, Utah. In addition to routines to manipulate and search arrays, it contains useful functions such as reset lockout, reboot, upshift, and, most significant to last month's article, the ability to change file types. Specifically, the editor from the last article can be modified with this routine to change the edited font file automatically to the system file-type font, so that it can be used by other system procedures. This allows you to edit a font and then configure it with SCP. Congratulations, Foxware!

Doing the Sideways Scroll. One of the critical elements of any shoot-'em-up game is the ability to keep more than one activity going on the screen simultaneously. This means that the targets should move as well as the weapons, and firing at objects should not bring everything to a halt. Since each of these activities takes some processing time, it is important that each be accomplished as quickly as possible in order to make the whole game smooth and fast.

Normally on the Apple II and other similar systems, this speed is accomplished with assembly language routines, which execute fast enough to make up for the fact that it takes a lot of work to move objects around on the hi-res screen. Careful use of the Apple III built-in routines and the user-definable character set will allow us to do much the same thing in Basic. To begin, let's look at a routine that scrolls objects horizontally across the text screen. We'll start with groups of asterisks (realizing that we could redefine them to almost any shape).

The program looks like this:

```
10   m$=" ** **** ** **** *** * **** ** ***"
20   start$=CHR$(26)+CHR$
     (0)+CHR$(10)
30   PRINT CHR$(21);"1";
40   PRINT CHR$(16);CHR$(1);
50   PRINT CHR$(19);CHR$(4);
60   PRINT CHR$(20);CHR$(13);
70   HOME
80   FOR i=0 TO 39
90     PRINT start$;MID$(m$,41-i,i)
       ;MID$(m$,1,40-i)
100    GET a$:IF ASC(a$)=27 THEN 130
110    NEXT i
120  GOTO 80
130  TEXT:HOME
140  END
```

Line 10 defines a forty-character string, exactly as wide as the screen mode we will use. Be sure when you type it in that the result is exactly forty characters in length. Line 20 puts a starting location to display the strings on the screen into start$, using the cursor positioning command of the console driver. The code shown will set a starting location at column 0, row 10. Line 30 sets the cursor movement options to disable everything but "advance after character." You should check out the *Standard Device Drivers Manual* for more details on the cursor options of the Console Driver. Line 40 puts the screen into forty-column color text mode, and lines 50 and 60 set the foreground color to dark green (4) and the background color to yellow (13). The home command sets the whole screen to the background color, and then the routine to scroll m$ begins in line 80.

It is important to go through the routine in lines 80 through 110 to see how this accomplishes the display of the string m$. For each value of i, the string is split into two parts, on the boundary between the beginning and end of the string. When i equals 0, the result is MID$(m$,41,0);MID$(m$,1,40). This is the combination of a null string together with the entire string (1,40). When i equals 1, the combination is MID$(m$,40,1);MID$(m$,1,39), that is, the last character of the string, coupled with the first thirty-nine characters. The end of the sequence, where i equals 39, is equivalent to MID$(m$,2,39);MID$(m$,1,1) and finishes rotating the string around to start again. The get statement in line 100 allows the display to freeze after each step, so you can see exactly how this works. To see the effect of the scrolling, simply hold down any key (except escape) and the pattern will scroll rapidly to the right. Holding down the closed-Apple key in combination with the other key will cause faster scrolling (since the characters are presented to get faster). If you want to see how fast this thing will really run, cut out line 100 completely. Those asterisks will really fly!

Line 130 is important since it snaps you back to eighty-column reality with the cursor

options restored.

Well, so much for the simple stuff. Now it's time to add the options to create objects and creatures of your own to populate your game world.

"Oh Scroll a Mio." We'll start by defining the characters that will bring our creature to life. To make things interesting, we'll use two versions of the bug to produce some simple animation without getting too complicated. We'll redefine the characters from decimal 20 through 25 to be our graphics characters. These are normally control characters and aren't displayed unless referenced by their character number plus 128, that is, decimal 148 through 153. This prevents the animation characters from interfering with any other normal characters we may have to print. If you haven't seen the last issue, and don't have access to a character set editor, you may simply use the same character numbers without changing their definition, but the creatures on the screen won't make much sense.

In any case, figure 1 offers a suggestion for the bug set.

Creepy, right? Actually, you can probably create a better-looking bug than this, so play around with the editor until you are satisfied. Watch the "280 x 192" window on the editor to get an idea of how your creature will look in forty-column mode. The changes from the set in characters 20 through 22 to the set in 23 through 25 are designed to make the mouth open and close, the legs move, and the tail wag! This is the basic concept of character set animation; the animation of an object is accomplished by displaying several related versions of the object rapidly on the screen as characters.

Since the shapes will be displayed as a character font, remember the rules for character fonts: Use the first seven dot positions only (the eighth is used for a flash/no flash flag in inverse mode and will not be displayed) and make sure the characters are no more than eight dots high. Save the character set using the font option, with any name you like. If you have a way to change the resulting file to the official font type (via the invokable module discussed earlier, or the Pascal System Filer), do so now. This will save some hassles later.

Can't Tell One Bug from Another without a Program. Now for a program that will display these characters on-screen and accomplish the animation! We'll use the scroll technique from the last program, together with character strings made up of our new character font.

```
10  DIM a%(511),char$(3)
15  q$=CHR$(34):esc$=CHR$(27)
    :slen=40
20  array$="a%":char$(0)=" "
25  text40$=CHR$(16)+CHR$(0)
30  b$=" ":b2$=" ":b3$=" "
35  INVOKE"/BASIC/download.inv"
40  INPUT"Name of font file: ";flname$
45  name$=q$+flname$+q$
50  INPUT"Line number to crawl on: ";l
55  tc$=CHR$(26)+CHR$(0)+CHR$(1)
```

These lines do the initialization of several arrays and values. Note that the array a% is dimensioned to hold an entire character set, which Download.inv will load off disk. You'll have to change the pathname of Download.inv to be correct on your own system. In addition, text40$ contains the console commands to turn on forty-column black-and-white mode (mode 0), and tc$ contains the cursor addressing command to position the cursor to row 0, line 1, using the line number that was input in line 50.

```
60  char$(1)=CHR$(148):char$(2)
    =CHR$(149):char$(3)=CHR$(150)
65  m$=".23...123.1223..13.
    123.3.23...123.1223.."
70  FOR i=1 TO 40:SUB$(m$,i,1)=char$
    (VAL(MID$(m$,i,1))):NEXT i
75  char$(1)=CHR$(151):char$(2)=CHR$
    (152):char$(3)=CHR$(153)
80  n$=".23...123.1223..13.123.3.23
    ...123.1223.."
85  FOR i=1 TO 40:SUB$(n$,i,1)=
    char$(VAL(MID$(n$,i,1))):NEXT i
```

Lines 60 through 85 look complicated, but they are simply the instructions on how to set up the strings to be scrolled across the screen. First, line 60 creates values in the char$ array that correspond to the pieces of our first bug. Then the m$ string in line 65 tells what piece to put in what position. This allows us to create bugs that consist of a head only, a head and a tail, a head, body and tail, or any combination our imagination permits. The periods in between the numbers are simply place-holders, which have a value of 0. Remember that we assigned a space to char$(0). Line 70 reads the values in m$, one character at a time, and substitutes the appropriate value from the char$ array. Then lines 75 through 85 do the same thing for a second string, n$, which will contain the shifted versions of our bugs. Although we kept the bug structures the same in m$ and n$, nothing prevents us from redefining even the length of the shapes from one string to the next. This would allow us to create bugs such as caterpillars, which move by shortening and lengthening their bodies!

```
90  PERFORM getfont(@name$,@array$)
95  PRINT text40$;:HOME
100  PERFORM loadfont(@array$)
105  PRINT CHR$(21);"1";
```

Lines 90 through 105 get the font specified

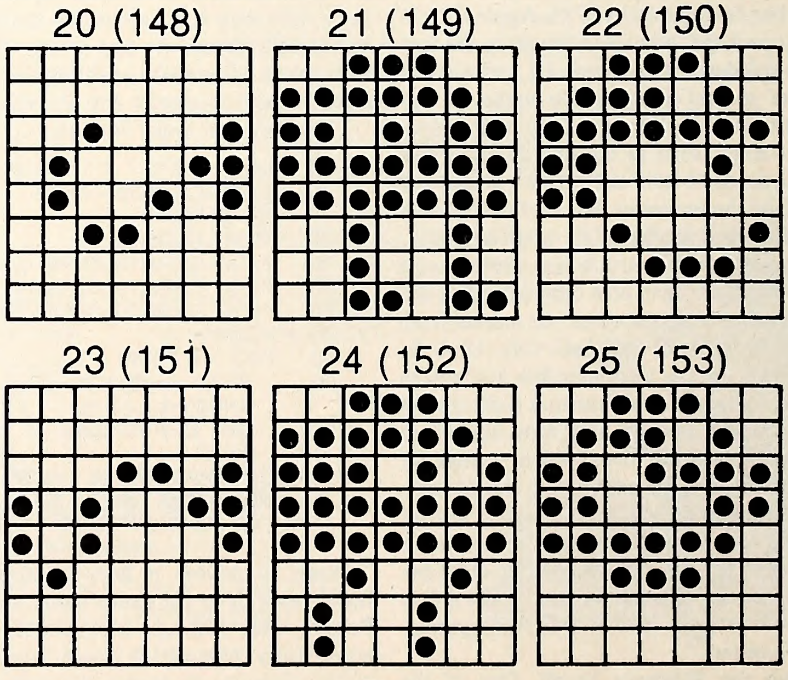

Figure 1.

earlier, set up the screen mode, load the font into the standard character set, and turn off all screen options except advance, allowing us to write to the screen without interference from scrolling.

If you used the font editor from the last issue, or some other font editing technique, and cannot change the saved file as an official system type font (as shown by the catalog listing), you must make some modifications to what's been described so far. The changes are:

```
35  INVOKE "/BASIC/download.inv",
    "/BASIC/request.inv"
90  OPEN#1,name$:PERFORM
    filread(%1,@array$,%1024,@ret%)
92  IF ret%<>1024 THEN PRINT "Not a
    font file":GOTO 40
```

Remember, make these changes if you use the font editor from the last article and cannot change the saved file type to font. And now, on with the show. . . .

```
110  FOR i=0 TO 39 STEP 2
115    PRINT tc$;MID$(m$,slen+1-i,i);
       MID$(m$,1,slen-i)
120    GET z$:IF z$=esc$ THEN 200
125    PRINT tc$;MID$(n$,slen-i,i+1);
       MID$(n$,1,slen-i-1)
130    GET z$:IF z$=esc$ THEN 200
135    NEXT i
140  GOTO 110
```

Lines 110 through 140 are the main scrolling loop. As you can see, it looks basically (heh, heh) like the lines in the last program, with several important differences. Since we have two strings to print, we cut the number of iterations in half, and we adjust the subscripts in each MID$ function to print successive strings in the sequence. We still use the get statement to pause between each change, but now it permits us to see the animation as it progresses. Again, holding down any key will permit smooth scrolling and motion as the little creatures open and shut their mouths, move their legs, and wag their tails.

```
200  PRINT CHR$(21);"=";
205  PRINT CHR$(22);CHR$(14);
210  TEXT:HOME
215  name$=q$+"/BASIC/standard"+q$
220  PERFORM
       getfont(@name$,@array$):PERFORM
       loadfont(@array$)
225  PRINT CHR$(15);
230  END
```

Lines 200 through 230 perform cleanup, but in this case there's more to clean up than before. After setting console options back to normal (line 200), line 205 shuts off the screen while the cleanup is being done. The CHR$(22) is there to synchronize shutting off the screen with vertical blanking, avoiding funny flashes on the screen. Line 210 restores the eighty-column screen and clears it to blanks, and then lines 215 through 225 restore the standard character set and turn the screen back on. You should change the pathname to the name of the character set you normally use.

So much for the example program. When you run it, the creepy creatures should crawl across the screen at your command. It's fun to elaborate on this program by editing more complex characters or creating more versions of them to get smoother animation. In fact, the *Running Horse* demo on the System Demo disk was done somewhat in this way.

Business Basic Gets a Little Gamey. By now we've covered the essentials necessary for you to follow the discussion of the arcade type game below. Basically, we're going to take our scrolling creatures and make them targets in a shooting gallery ("Oh, no," you cry, "not our poor creatures!"). To be a little fairer, we'll put some moving obstacles between the shooter and the creatures and deduct points when the bullets hit the obstacles. Both the creatures and the obstacles will be moving using the techniques from the previous program. In addition, every good game needs some sound effects. We'll use the .audio driver to make some tones to liven up the game. With that said, let's look at the game:

```
5   DIM a%(511),dq$(39),eq$(39),
    fq$(39),lin$(3),blk$(3),
    j(255),pnts(4)
10  DIM m(40),char$(3),beep$(3)
15  INVOKE".d3/download.inv"
17  OPEN#1,".audio"
20  bell$=CHR$(7):bp$=CHR$
    (128)+CHR$(63):ep$=CHR$(1)+
    CHR$(0)
22  beep$(0)=bp$+CHR$(7)+
    CHR$(4)+ep$:beep$(1)=bp$+
    CHR$(8)+CHR$(6)+ep$
23  beep$(2)=bp$+CHR$(18)+
    CHR$(5)+ep$:beep$(3)=bp$+
    CHR$(197)+CHR$(6)+ep$
```

These lines set up the arrays to be used and create the tones that will indicate different kinds of hits. To better understand lines 20 through 23, you should read the section of the *Standard Device Drivers Manual* on the .audio driver. It's not very long and will add a lot of interest to your programs.

```
25  q$=CHR$(34):array$="a%"
    :b$=" ":b2$=" "
    :b3$=" ":char$(0)=" "
30  fg$=CHR$(19):bg$=CHR$
    (20):slen=40:na$=CHR$(21)+
    "0":av$=CHR$(21)+"1"
35  orange$=CHR$(9):green$
    =CHR$(12):mblue$=CHR$(6)
    :white$=CHR$(15)
40  og$=fg$+orange$+bg$+green$
    :bw$=fg$+mblue$+
    bg$+white$
45  text40$=CHR$(16)+CHR$(1)
    :t$=CHR$(26):t1$=t$+CHR$
    (0):bu$=CHR$(11)
50  tc$=t1$+CHR$(4):t2$=t1$+
    CHR$(6):t3$=t1$+CHR$(8)
55  t5$=t$+CHR$(8)+CHR$(23)
    :t7$=t$+CHR$(35)+CHR$(23)
```

Lines 25 through 55 set up more constants for the program, especially the values for various foreground-background color combinations. This time we'll be using the forty-column color-on-color mode for more visual excitement. If you have a black-and-white (or black-and-green) monitor, the result will be shades of gray (or green). The strings tc$, t2$, t3$, t5$, and t7$ will be used later on to position various other strings on-screen.

```
60  l$="l"+bu$:l4$=l$+l$+
    l$+l$:l12$=l4$+l4$+l4$
65  e$=" "+bu$:e4$=e$+e$+e$+
    e$:e12$=e4$+e4$+e4$
70  lin$(0)=na$+l12$+l4$+"*"
    :lin$(1)=na$+l12$:lin$(2)=
    na$+l12$+l$+l$:lin$(3)=lin$(1)
75  blk$(0)=e12$+e4$+av$:blk$
    (1)=e12$+av$:blk$(2)
    =e12$+e$+e$+av$
    :blk$(3)=blk$(1)
80  j(32)=1:j(8)=2:j(21)=
    3:j(13)=4:j(141)=5:j(27)=6
```

Lines 60 through 80 set up additional variables and strings needed for the program. In particular, the lin$ array contains various versions of the characters used to represent a shot being fired at the creatures. It is made up of sets of vertical bars (the "l" character) combined with the vertical tab character contained in the bu$ string. Vertical tab is used because the shot is fired from the bottom of the screen toward the top. Each string in the array is prefixed by the na$ string, containing the screen control codes to turn off character advance. This comes in handy in printing vertically, since it is only necessary to go up after printing, not back up and then go up, as would be true if advance were on. Anything that reduces the number of characters printed on the screen speeds up the action. Notice also that lin$(0) has an asterisk as the last character. This represents a burst as the shot goes through the barrier and explodes. By adding some extra characters, you could make the line and the burst different colors. Line 75 defines blk$, which erases a shot right after it's fired. This gives the impression of a quick blast from the gunner. Notice that av$ is added to the end of each occurrence of blk$ to turn advance back on.

Line 80 sets up the values for the routine that decodes keystrokes and decides what to do. More on that later.

```
90  e$="== == === == === = =="
95  f$=" === == = == === ==
    ==="
100 FOR x1=0 TO 39 STEP 2
    :dq$(x1/2)=MID$(e$,slen+
    1-x1,x1)+MID$(e$,1,slen-x1)
    :eq$(x1/2)=MID$(e$,slen
    -x1,x1+1)+MID$(e$,1,slen-x1
    -1):NEXT
105 FOR x1=20 TO 39:j=x1-20
    :dq$(x1)=dq$(j):eq$(x1)
    =eq$(j):NEXT
110 FOR x1=0 TO 39:fq$(x1)
    =MID$(f$,x1+1,slen-x1)+
    MID$(f$,1,x1):NEXT
```

Lines 90 through 110 set up the scrolling barriers. E$ and f$ can be any arrangement you like, but be sure to make them exactly forty characters long. Notice that, instead of waiting and performing the MID$ functions when the string is actually printed on the screen, they are done in this loop and the results stored in string arrays to be printed later. Since these strings won't change, this is a more efficient, and therefore faster way to handle them. Line 110 handles this straightforwardly, but lines 100 and 105 create dq$ and eq$ in a more confusing way. Basically, the process is this: dq$ and eq$ contain every other occurrence of e$, the string

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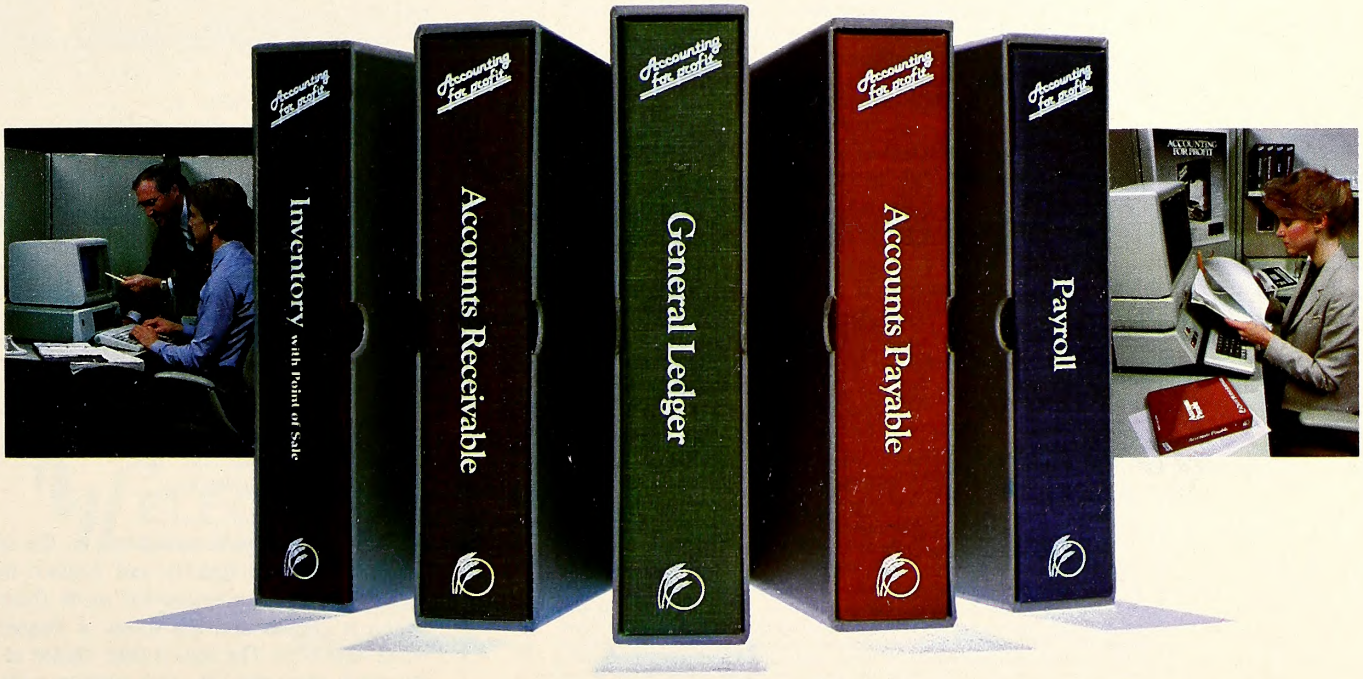

to be scrolled. By printing them both successively, along with one occurrence of fq$, the result is that one set of barriers appears to scroll twice as fast as the other. Try this out in a simpler program if this one is hard to follow.

```
140  GOSUB 700:REM get font
150  hr=20:points=0:hits=0
160  pnts(1)=0:pnts(2)=0:pnts
     (3)=0:hit=0
170  pnts(1)=pnts(1)+4:pnts(2)
     =pnts(2)+2:pnts(3)=pnts(3)
     +6:hit=hit+5
175  t4$=CHR$(26)+CHR$(hr-2)
     +CHR$(21):t6$=CHR$(26)
     +CHR$(hr-1)+CHR$(20)
180  GOSUB 800:REM load up the bugs
185  GOSUB 600:REM set up screen
```

Lines 140 through 185 do the last of the setup and prepare the game for play (at last! at last!). We'll discuss the subroutines in a minute. First, note that line 150 defines the initial position of the gunner, hr=20. Hr will contain the horizontal position of the gunner at all times. Points scored and number of hits are also set to zero. Line 160 clears the point value array and sets the value of a hit to zero, and line 170 increments them by a standard amount. This allows us to up the points values in each round, or start over, by going to line 150, 160, or 170. The values in the pnts array are to be subtracted for hitting various combinations of barriers, and hit is a multiplier for scoring a hit on various parts of a creature. T4$ contains the position of the gunner, and t6$ is the position from which the firing of lin$ takes place.

Now we're ready to look at the additional setup subroutines. The first, at line 700, loads the font of our choice. It looks very similar to the routine from last time:

```
700  INPUT"Name of font file: ";flname$
705  name$=q$+flname$+q$
710  PERFORM getfont(@name$,@array$)
715  RETURN
```

Again, if you can't change your edited font files to type font, make the changes in this routine that were suggested in the last program.

The routine at line 800 is used to set up the bug character strings. It is derived from the last program and looks like this:

```
800  temp$=".12...123.1234..12.
     123.1.12...123.1234.."
805  char$(1)=CHR$(148):char$
     (2)=CHR$(149):char$(3)
     =CHR$(150)
810  m$(0)=".23...123.1223..13.
     123.3.23...123.1223.."
820  FOR i=1 TO 40:SUB$(m$(0),
     i,1)=char$(VAL(MID$
     (m$(0),i,1))):NEXT i
830  char$(1)=CHR$(151):char$
     (2)=CHR$(152):char$(3)
     =CHR$(153)
840  m$(1)=".23...123.1223..
     13.123.3.23...123.1223.."
850  FOR i=1 TO 40:SUB$(m$(1),
     i,1)=char$(VAL(MID$(m$(1),
     i,1))):NEXT i
855  FOR i=1 TO 40:m(i)=VAL
     (MID$(temp$,i,1)):NEXT i
860  RETURN
```

The only real difference between this section and the same function of the last program is in lines 800 and 855. These lines combine to create the array m, which is used to score hits and quickly decide how long an individual creature is. The game uses the principle that if you hit a creature you destroy everything from the point of impact back, but whatever's left in front of the hit keeps going. We'll see exactly how this is done later.

The last setup routine creates the screen and playing area.

```
600  PRINT CHR$(14);
605  PRINT text40$;bw$;:HOME
610  PERFORM loadfont(@array$)
615  PRINT av$;:REM turn everything off but
     advance
630  PRINT og$;:PRINT USING"40c";b$
635  PRINT USING"40c";
     "Bug-Mania":PRINT USING
     "40c";b$
645  VPOS=23:PRINT USING"40c"
     ;b$:PRINT USING"40c";b$
650  PRINT" Score:";:HPOS=31
     :PRINT"Hits:";
655  PRINT t5$;points;"  "
     ;t7$;hits;
660  PRINT bw$;t4$;" X ";
665  PRINT CHR$(15);
670  RETURN
```

First the screen is turned off, so the setup can be completed quickly and without being seen. Then forty-column color mode (blue on white) is chosen and the screen is cleared to white (line 605). The font is then loaded as the standard character set, and various parts of the screen are filled in using orange-on-green

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color text. Then line 660 turns blue-on-white mode back on, and an "X" is printed at the current location of the gunner. If you want, you can edit the "X" character to any shape you like. Then the screen is turned back on in line 665 and the game is ready to play

Getting Under Way in Bugland. The preceding gets us ready for the actual playing procedures. To make the game fun, we want to have scrolling and player motion taking place all at once. As we have seen in previous articles, the best way to tackle that is the ON KBD capability, where the Apple III can be doing something but still respond when a key is pressed.

```
190  ON KBD GOTO 300
200  FOR i=0 TO 39:c=(i/2=INT
     (i/2)):g=(MID$(fq$(i),hr,1)<>
     b$)+(MID$(eq$(i),hr,
     1)<>b$)*2:PRINT tc$;MID$
     (m$(c),slen+1-i,i);MID$
     (m$(c),1,slen-i);t2$;dq$
     (i);t3$;fq$(i);t2$;eq$
     (i):NEXT:GOTO 200
```

Line 190 sets up an ON KBD jump to 300 when a key is pressed. In the meantime, line 200 is continuously executed. This is a complicated routine, so let's look at each part of the line. First, the scrolling loop is set up as before. Then a value for c is calculated. C will be 0 if i is odd, 1 if i is even. This allows us to choose which version of the creatures we will display on this round. Then g is calculated. G is a number that indicates what the state of the barriers is. When you analyze the complicated logical expression, you will find that g is 0 if both fq$ and eq$ are blank at the current location of hr (the gunner's position). This would indicate that the barriers are open at that spot. G is equal to 1 if the bottom barrier (fq$) is closed, and 2 if the top barrier (eq$) is closed. If both barriers are closed, then g is 3. This will affect scoring, as we'll see later. We really only need to calculate g when a shot is fired, but we've got time to waste in this loop. We'll need every millisecond when the shot is actually fired to avoid slowing down the animation.

Next the appropriate version of the creature string is printed, and then the barrier strings are printed. Notice that printing dq$, fq$, and eq$ (in that order) has the effect of scrolling the top barrier twice as fast as the creatures, in the same direction, and scrolling the bottom barrier at the same speed. Because of the way fq$ was created, the bottom barrier appears to scroll backwards. After scrolling through the entire m$ array, the routine goes back and starts over endlessly, until a key is pressed.

Which brings us to the ON KBD routine at line 300:

```
300  OFF KBD:z= KBD
305  ON j(z) GOTO 400,330,
     340,150,170,500
310  ON KBD GOTO 300
315  RETURN
```

First we turn off the keyboard interrupt, and assign z the ASCII value of the character typed. This is used in line 305 to determine which processing routine to jump to. Check the definition of the j array in line 80 for more information about what is happening. This technique of branching is very wasteful of space (the j array takes up 1K of memory) but is extremely fast, which is what we need in processing these keystrokes. Cross-referencing line 80 tells us that the jump to line 400 occurs if z equals 32 (space bar). This is the firing signal. Lines 330 and 340 process right and left arrow keys (ASCII 8 and 21, respectively), which are used to move the gunner around. A return (ASCII 13) jumps back to line 150 to begin a new game, and an open-Apple return (ASCII 141) restarts with doubled point and penalty values. Finally, an escape (ASCII 27) jumps to 500 and ends the game. Looking at these individual routines will end our discussion of this game and get us down to playing it.

```
330  hr=hr-(hr>2):GOTO 350
340  hr=hr+(hr<39)
350  SUB$(t4$,2,1)=CHR$(hr-2)
     :SUB$(t6$,2,1)=CHR$(hr-1)
     :PRINT t4$;" X "
360  ON KBD GOTO 300
370  RETURN
```

This sequence simply resets the value of hr after being sure that hr is not already at the left or right edge. You could reduce these values to restrict the gunner to a certain section of the screen. Line 350 changes the values of t4$ and t6$ to represent the new value of hr and reprints the gunner with spaces on each side. Printing the spaces erases the previous image of the gunner in the old position, no matter which way he moved. Then the ON KBD statement is reactivated, and the routine returns to the loop at 200.

```
400  IF i=40 THEN 460
405  PRINT t6$;lin$(g);
     t6$;blk$(g)
410  IF g THEN points=points
     -pnts(g):PRINT#1;
     beep$(g):GOTO 450
415  ch=slen*(i>hr)+hr-i
420  IF NOT m(ch) THEN PRINT#1
     ;beep$(g):GOTO 450
     :ELSE:PRINT bell$;
425  FOR j=ch TO ch-m(ch)+1
     STEP-1:IF m(j)
     THEN points=points+m(j)
     *hit:m(j)=0:NEXT
430  SUB$(m$(0),j+1,ch-j)="  "
     :SUB$(m$(1),j+1,ch-j)="  "
     :hits=hits+1
450  PRINT og$;t5$;points;"  "
     ;t7$;hits;bw$
460  ON KBD GOTO 300
470  RETURN
```

Lines 400 through 470 are the firing subroutine, and this is where all the action takes place. First, a check is made to see if the keystroke occurred during the loop exit and restart time. If so, a return is made with no action taken. This rarely happens, but must be provided for. Next, the gun is fired, by printing lin$ and blk$ at the current gunner location. Then g is checked to see if the bullet struck a barrier. If so, the appropriate number of points is deducted and a tone is sounded, with pitch corresponding to which barrier was struck. Then a jump is done to 450 to print the new point values and return.

If g equals 0, then the bullet made it through the barriers; a check is made in lines 415 and 420 to see if anything was hit. If the m array contains 0 at that point, then the shot was a miss; the appropriate tone is sounded and a return is made. If m is not zero, then a machine bell is sounded (note that a bell character sounds without slowing down the program as a tone does).

Line 425 then backs up along the string adding up points and zeroing out the m array. Line 430 blanks out the appropriate parts of the m$ strings and bumps the hit count. With the strings changed, the next printing of m$ will erase the bug from the point of the hit backwards. Line 450 then prints the new score, and play resumes.

Notice that the major work of the game is done in this routine. Anything that makes this routine simpler or faster has the effect of speeding up play, and making the game more fun.

This finally brings us to the last routine, which ends the game:

```
500  PRINT CHR$(21);"="
505  PRINT CHR$(22);CHR$(14);
510  TEXT:HOME
515  nam$=q$+"/BASIC/
     standard"+q$
520  PERFORM getfont(@nam$,
     @array$):PERFORM
     loadfont(@array$)
525  PRINT CHR$(15);
530  CLOSE:INVOKE
540  END
```

This is essentially identical to the routine used in the previous program.

A Game a Day Keeps Pac-Man Away. Sure, this game won't save you many quarters if you're an arcade freak, and it's not exactly going to drive Bill Budge out of business, but the techniques may prove useful, and prove something else as well. You don't need assembly language to get reasonable performance out of the Apple III, even in games, a realm of programming thought absolutely to require it. If you're careful, use clever techniques, and remember that you can trade off memory space for additional speed by using tables, you can create some interesting things. There is certainly a lot you can do to make this game more interesting too. Try to figure out how to have the bug heads dive down through the barrier and attack the gunner when their bodies have been blown away. You might also try to speed up the scrolling by printing just one-third of the gun blast at a time, with scrolling in between, and then figure the hit out at the end of the process. This would look more natural and require the gunner to "lead" the target, quite a challenge. You can also change the scoring rules to your liking and, of course, completely redefine the barriers and bug shapes. Have fun!

Next month we'll add smooth scrolling to this game with the character download capability. That's the real way the *Horse Demo* works. In addition, we'll start our exploration of how these techniques, and some brand-new ones not possible in text mode, can be implemented on the hi-res graphics screen. Until then, blaze away!

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BEGINNERS' CORNER

BY CHRISTOPHER U. LIGHT

As we have noted in previous months, even beginners who have no intention of ever writing their own Basic programs—much less machine language ones—can benefit from a little knowledge of machine language. Having such knowledge makes it easier to use many of the various available commercial packages to the fullest.

It can also be useful to know where in memory Apple's designers chose to put things so you'll know where it's safe to put other things. We'll spend this month taking a cartographic expedition through memory. Because the Apple II Plus with 48K of memory has been the standard machine for a couple of years, we're going to assume that that's the one you have.

To begin with, you're probably aware that 16K, 32K, and 64K don't really mean 16,000, 32,000, and 64,000 bytes. They're a convenient shorthand that understates the true figures. The actual numbers of bytes are two to the fourteenth (16,384), two to the fifteenth (32,768), and two to the sixteenth (65,536). Because the computer internally uses the binary number system and has to translate to decimal, it sees these numbers as nice round figures. They only seem strange to us.

Counting the Ks. You may or may not be aware that your 48K Apple is actually a 64K machine. Its 6502 microprocessor can read from and write to a full 65,536 bytes of memory. The 48K refers to the amount of RAM memory, but there's also 16K of ROM, in which Applesoft and the Monitor are stored. However, because the programs controlling Applesoft and the Monitor are embedded in their own set of chips to prevent the user from overwriting those programs, only the 48K bytes of RAM can be controlled by the user.

The terms RAM and ROM refer to the two types of internal memory of the Apple. RAM is the memory to which the user has complete access. That is, individual bytes of RAM can be read from and written to. The acronym stands for *random access memory*. Random access means that each byte has an address assigned to it, and that the user, or a program, can look at any byte without having to deal with the surrounding bytes.

ROM stands for *read-only memory*. One confusing thing about these terms is that ROM is also random access. Any byte within a bank of ROM can be read by referring to its address without having to read the surrounding bytes. What distinguishes ROM from what we call RAM is that ROM cannot be written to, and ROM can hold its data even after the power has been turned off. That is because the data stored in ROM—in the Apple, the programs that operate Applesoft and the Monitor—is permanently burned in at the factory. Barring some kind of physical damage to the chip, the data in ROM can't be erased, and it can't be overwritten by other data under any circumstances.

As we mentioned briefly last month, the Apple's memory is divided into 256 pages, each containing 256 bytes. This convention is used because 256 is to hexadecimal (base 16) what 100 is to decimal (base 10). Just as the latter is 10 tens, the former is 16 sixteens.

One eight-bit byte in Apple's memory can store one of 256 (or 2^8) different values. These values can represent decimal numbers 0 through 255 or hex numbers $0 through $FF. Alternatively, depending on the context, they can represent alphanumeric characters, graphic displays, line numbers, Basic or machine language commands, and other things.

The Logic of the Machine. Although the page system doesn't have any particular logic in decimal notation, it is logical in hex. Each byte is addressed with a four-digit hexadecimal number. A new page begins whenever the third digit from the right in the hex address is incremented by one. Thus, page zero goes from $0000 to $00FF (0 to 255), page one from $0100 to $01FF, and so forth through page 255, which consists of locations $FF00 through $FFFF (65280 through 65535). You won't always see addresses as four-digit numbers; leading zeros may be left off. Such page organization is helpful to the Apple's designers and programmers, who can reserve whole pages of memory for special purposes and easily remember what goes where by the page reserved for it.

Most of the programs that go into memory, whether in Basic or machine language, occupy much bigger chunks than a page and are more often referred to by their absolute address or size. Pages zero through three, which we'll discuss later, are the only pages of this kind that are reserved by the Apple itself for a distinct purpose. The word *page* is used more commonly to refer to the areas of memory reserved for the text and graphics displays. Each of these pages is actually much longer than the 256-byte kind of page. We'll talk about these later also.

Plunging In. Now to begin our expedition. Use the memory map on page 69 of your *Apple II Reference Manual* as a guide to the locations mentioned in the rest of the article. Note that address numbers and page numbers can be spoken of in decimal or hexadecimal, so the map has the hex addresses on the left and the decimal ones on the right.

The top sixty-four pages, locations 49152 through 65535 ($C000–$FFFF), are taken up by the ROM chips that contain Applesoft and the Monitor. Any memory below that, from location zero through 49151 ($BFFF), is RAM memory and can be changed by the user or running programs.

Immediately below Applesoft is an area of memory used by peripheral cards, the game controllers, the speaker, and a few other things, for input and output. Beneath that is the memory used by the disk operating system (DOS) if it has been loaded.

When you boot the disk, DOS is loaded into locations 40192 through 49151 ($9D00–$9CFF). DOS also needs to reserve locations 38400 through 40191 ($9600–$9CFF) for buffers to store input and output data temporarily while the Apple waits for the disk to catch up with it. Although you can increase or decrease the size of these buffers, at this stage it's safe to assume that the default value will be used and that DOS will not need any memory below 38400 ($9600).

From the Bottom Up. Now let's jump down to location zero and work our way back up to where we are now.

The first three pages of memory, zero through two, are used extensively by Applesoft, DOS, and the Monitor. You shouldn't plan to store anything in these locations because altering the contents of some of them can cause drastic errors.

The first memory page, often called *zero page*, has a special significance to the 6502 microprocessor. There are some forms of machine language addressing that require the use of one or two zero-page locations. Therefore, zero-page locations are used primarily as pointers by Applesoft, DOS, the Monitor, and other machine language programs. A pointer, by the way, is a place in memory that a machine language program can read to find the address in memory of a particular table or subroutine.

Page one, the second page, is another special-purpose area called the *system stack*. A stack is an area of memory that works like a pile of data.

When you put some data on the pile, you put it on top. When you take it off the pile, you take it off the top. Picture a stack of dishes. The last dish you put on the stack will be the first one you take off of it. This is called a last-in-first-out, or LIFO, method of storing data. When a Basic program executes a gosub statement or for-next loop, the return address is put on the stack for easy retrieval later on.

Page two is called the *input buffer*. When you type in a Basic program line or answer a question the computer asks, what you type is stored temporarily in the input buffer before being processed.

Although substantial parts of these three pages may be unused at any given moment, you never know which they are and whether or not they're going to be needed in the next moment. It's best to leave everything below page three alone.

After the initial boot, most of page three is available for storing the user's machine language programs. Of the 256 bytes on the page, the first 208 (768–975 or $300–$30F) bytes are free. This is a favorite place for commercial packages to load short machine language programs. Here they're safe from the Apple's automatic internal operations. The last forty-eight bytes on this page (976–1023 or $3D0–$3FF) are needed for certain operations of both DOS and Applesoft.

Turning the Page. Locations 1024 through 2047 ($400–$7FF) just above page three contain the information the screen needs to print either text or lo-res graphics. This is called the text page, even though it is four pages (of the 256-byte variety) long. If you haven't added an eighty-column board to your machine, your screen can display forty characters per line and twenty-four lines of text, for a total of 960 characters. If you divide this total by 256, you'll see that only three and three-quarters pages of memory are needed in order to give each screen position its own byte. Whatever peripheral devices you have use the remaining sixty-four bytes as temporary storage locations; these bytes should not be considered available either.

To see how the text display works, enter and run the following program:

```
10 HOME
20 FOR I = 1024 TO 2047
30 POKE I, 65
40 NEXT I
```

As stated on page 139 of your Applesoft manual, the number 65 is the ASCII code for the letter A. When you run the program, your screen should fill with As. They'll be flashing because, in the screen memory, the number 65 is displayed as a flashing A; the number 193 is displayed as a normal A. When you're in text mode, each character location on the screen corresponds to its own memory location and displays whatever is in that location.

Lo-res graphics mode uses the same memory locations as text mode, and each byte corresponds to the same screen location. The display, however, is different. Each of the 960 bytes of text screen memory controls two dots, one on top of the other, resulting in 1,920 rectangular lo-res dots on the screen.

A byte can be divided into two four-bit halves, called *nibbles*. Each nibble contains a value of from 0 to 15 and controls the color of one dot on the lo-res screen. In binary notation, the possible values of a nibble range from 0000 to 1111.

Lo-res graphics mode allows sixteen different colors. To demonstrate this, type in the following short program:

```
10 GR
20 FOR I = 1024 TO 2047
30 N = N + 1
40 IF N > 255 THEN N = 0
50 POKE I, N
60 NEXT I
```

If you're using a color monitor, you should see lines and dots in different colors plus four lines of text at the bottom when you run this program. If your display is black and white, the pattern will differ.

Beneath the Pretty Pictures. If you were to enter the Monitor now and examine the appropriate memory locations, you'd find the hex values corresponding to the colors your program produced. For example, 1 is Applesoft's lo-res color code for magenta. The eight-bit binary representation for 1 is 00000001. Since the first four bits are zero, the upper of the two lo-res dots is black and the lower takes the color that is coded 0001; this is magenta. To see this, change line 30 to *N = 1* and you should see your screen fill with alternating magenta and black lines. Now run it again with *N = 17* in line 30. The binary number for 17 is 00010001, which turns on magenta in both dots.

Before moving on, try using 255 for N. Since 255 is the largest number one byte can hold, the binary representation of it is 11111111. Both nibbles now contain their maximum values (1111 binary or 16 decimal) and instruct the screen to display the associated color, which is white. Binary 0000 for one nibble is black, which produces what we think of as an empty dot, while binary 1111 (16 or $F) produces the opposite color, which is white. In between are the other fourteen lo-res colors. If you'd like to see them and their associated numbers, boot your system master and run *Color Demosoft*.

Immediately above the text/lo-res memory area (2048 or $800) is where Applesoft Basic programs begin. To see this, first enter the following one-line program.

```
NEW
10 PRINT "AAAAA"
```

Now type *call −151* to enter the Monitor. When you see the asterisk prompt, type *800.80F* to list locations $800 to $80F (2048–2063). This is what you should see on your screen:

```
0800- 00 0E 08 0A 00 BA 22 41
0808- 41 41 41 41 22 00 00 00
```

That's what a Basic program looks like in hex code. Hex $0A is equivalent to decimal 10, your line number. Hex $BA is the code corresponding to the print command. ASCII codes $22 and $41 are the quotation mark and letter A, respectively. The zeros at the end indicate the end of a line.

It's possible to write Basic programs that take up all the space from $800 to the bottom of DOS. If you plan to use hi-res displays, however, you'll probably need to keep the program below location 8192 ($2000), where page one of hi-res graphics begins.

Getting Really Graphic. There are two hi-res graphics pages. As with the text/lo-res page, we're not talking about 256-byte-long memory pages but about two areas of memory, each consisting of 8,192 bytes. Just as lo-res graphics uses one nibble to control one screen dot, so hi-res graphics has a one-to-one correspondence between specific memory locations and specific screen locations. In this case the relationship is one bit per dot, and the dots are much smaller. Although the hi-res screen is more complicated than this description may imply, you can think of it as being 280 dots wide by 160 high, resulting in a total of 53,200 dots. Since one bit per byte is reserved for a color code, each byte controls seven dots. Thus 7,600 memory locations (53,200 divided by 7) are needed for hi-res display, but 8,192 are actually set aside for each hi-res page. Hi-res page one then uses memory locations 8192 through 16383 ($2000–$3999), while graphics page two occupies locations 16384 through 24575 ($4000–$5999).

Just as we could poke numbers into specific memory locations to control the lo-res display, so can we poke numbers into hi-res graphics to accomplish the same thing. We can get some idea of what's happening by running the following program:

```
10 HGR
20 FOR I = 8192 TO 16383
30 POKE I, 255
40 NEXT I
```

This program sets all bits in all the bytes to 1 (or on), which means that all the dots on the screen will go on and the whole screen will display white.

As we saw in January, the usual place to put machine language programs is between the end of hi-res page two and the beginning of DOS.

At this point in your Apple-using career this ought to be enough about memory. Later, when you need a truly detailed Apple atlas that covers every byte of memory, you might want to look at the book *What's Where in the Apple*, by William F. Luebbert, published by Micro Ink (Chelmsford, MA). Be sure to get the revised edition.

Another class of beginners moves on. April's Beginners' Corner begins at the beginning with the IIe; Matt Yuen takes over the writer's block. Chris Light will continue intermediate-level stuff from time to time in IInd Grade Chats. ■

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VENTURES WITH VISICALC

BY JOE SHELTON

Last month's *Softalk* contained an article about how *VisiCalc Advanced Version* was used to calculate the statistics of an Apple Computer-sponsored tennis match between Jimmy Connors and Bjorn Borg. We are now going to build the *VisiCalc* template that was used at that match. Then we'll look at how we can use the same type of model to do a more complete analysis of a tennis player's game.

Tennis, Anyone? A simple explanation of the relevant parts of the game would probably make this discussion more meaningful to those of you who haven't played tennis. Scoring a tennis match requires keeping track of points, games, and sets. Each player's goal is to win enough points to win a game, enough games to win a set, and finally, enough sets to win the match.

A point is won by one of the two players (or by a team in doubles) each time the tennis ball is put in play. When the game is scored the usual way, a minimum of four points must be scored in each game. The winner must win at least four points and must win by a margin of two points. This means that a game could, theoretically at least, have an unlimited number of points if the players won points alternately.

Games usually average between four and ten points total. The first player to win six games with a two-game margin wins the set. If it should happen that both players win six games, there are two options. Play can continue until one player has a two-game lead or a tie-breaker can be played. Normally the winner is the player who wins two sets out of three, although in some major championships the winner must triumph in three sets out of five.

Various rules determine how points are won (or lost) in tennis, but for our purposes only three situations need to be discussed. One way a player can win a point is by hitting the ball somewhere in the opposite court so that the other player can't reach it. This is referred to as a "winner." Another way of winning a point is by hitting the ball so well that the other player can reach the ball but can't return it into play. This is referred to as a "forced error." When one player is in a good position to hit the ball and misses, hitting the ball out of the court or into the net, his opponent wins a point. This is the third—and incidentally the most common—way a point is won.

To be able to analyze a match using *VisiCalc*, that is all we really need to know. The statistics usually calculated for tennis matches (and used by those doing the commentary) are shown in figure 1. Don't worry if you don't understand all of them; the principles underlying them will quickly become apparent.

First-service percentage—A server gets two chances to put a ball in play or the server loses the point. This statistic is the percentage of times a player gets the first ball in play.

Aces—This is a service winner where the opponent doesn't touch the ball.

Double faults—A player who misses both serves loses the point and is said to have double faulted.

Forehand and backhand winners—Points won when a player hits a ground stroke the opponent can't touch.

Forehand and backhand unforced errors—Points lost when a player can reasonably be expected to keep the ball in play with a groundstroke but doesn't.

Trips to net and won at net—A player may approach the net and hope to win the point quickly. It's important to know how many points are won at net versus how many are attempted.

Figure 1.

Our next step is to begin creating the model. Boot *VisiCalc* and let's get started. Refer to figure 2 and enter the labels as shown there. Leave rows 1 through 3 blank; we'll be entering additional information into them later. Set the column widths to 5 (/GC5 or whatever is appropriate for your display) to permit more of the model to be visible.

If you're using *VisiCalc Advanced Version*, you can set the width of column A (/GCC14) so that all the title text can fit in the same column. Continue entering the rest of the information into the cells, with cell references matching those shown here so you won't have to adjust your model until after it's completed. Then delete the blank columns B and C.

	A	B	C	D	E	F	G
4				Set 1	Set 2	Set 3	Match
5	1st Serve Percent						
6	Aces						
7	Double Faults						
8	Forehand						
9	Winners						
10	Unforced Errors						
11	Backhand						
12	Winners						
13	Unforced Errors						
14	Trips to Net						
15	Won at Net						
16	Percent Won at Net						

Figure 2.

How Do We Score? Let's think for a moment about what we are trying to accomplish. Take forehand groundstrokes for example. As you can see from figure 2, we've divided forehands into winners and unforced errors. That means we are going to ignore forced errors. If we wished, we could simply enter a value in E9 or E10 and increment it each time we saw another winner or error. That would be easy, but in the heat of the match we might accidentally enter the wrong value and then forget the original value. There must be a safer way. And there is. (Surprised?)

If we use columns at the bottom of the model for scoring, we can make an individual entry for each point by entering points consecutively down the column. Working in that manner means that at the very most we'll change only one value and won't have to remember the running total. Now, it's simple; each statistic can have a separate column and we only have to enter a value in the appropriate column. But can things be made still simpler? Yes.

Look again at our forehand statistics. We are looking only for winners and unforced errors. We can have one column for forehands and enter one value if the player hits a winner and a different value if he makes an unforced error. But now things get complicated again. We have to be able to tell the two values apart. How can we tell the difference between them? If we enter a 1 for a winner, we can @SUM the column and determine the number of winners. If we enter a 2 or some other value for unforced errors, our sum won't be accurate anymore. However, if we enter a 0 for unforced errors, the @SUM of winners will be correct. Now we total unforced errors. There is no function to sum 0s. Before reading further, look at your reference card or your manual and see if you can find a solution.

There is a way to enter 0s and 1s in a column and count each value independently, as well as to count both if we wish. This, by the way , is an important idea that can be applied to other areas besides sports scoring. The functions @SUM and @COUNT can do it all.

We know what @SUM will do; it will total all the 1s that we enter in the column. @COUNT will, according to the reference card, count the "number of nonblank entries in list." That isn't exactly true; @COUNT only counts *values*. If you enter text in the list, @COUNT ignores it. In our application, this means that @COUNT counts the number of 1s and 0s. Now getting the number of 0s is a simple matter of subtracting @SUM from @COUNT.

There's another facet of @COUNT and @SUM worth discussing. We can actually track a third value if we want to. Both @COUNT and @SUMrequire a list of values or cell references to complete the formula. We'll use a range that starts at our first game point and continues for a specified number of rows.

The third value we can track is the number of cells in our range. This could be the maximum number of entries and could be used in calculating another statistic. We can determine this value by manually counting all the cells in the range or we can enter 1 in A21 and +A21+1 in A22, replicating those two cells for the same number of rows using relative reference. It's a simple matter to use @MAX on that column to determine the total number of cells used. @MAX displays the final (largest) value. Thus we know the total number of possible values, the number of 1s, and the number of 0s. This isn't appropriate for our model, but it might be useful for other analysis.

In our column, we can now enter 1s for winners and 0s for unforced errors, and we can keep a running total. Figure 3 shows our model with the scoring section complete.

	A	B	C	D	E	F	G
4				Set 1	Set 2	Set 3	Match
5	1st Serve Percent						
6	Aces						
7	Double Faults						
8	Forehand						
9	Winners						
10	Unforced Errors						
11	Backhand						
12	Winners						
13	Unforced Errors						
14	Trips to Net						
15	Won at Net						
16	Percent Won at Net						
17							

	A	B	C	D	E	F	G
18	Set 1		1st	2nd			Won @
19	Point	Aces	Serve	Serve	Frhnd	Bkhnd	Net
20							
21	1						
22	2						

Figure 3.

You'll notice that we have used a window (/WH) to separate the statistical area from the scoring section. If you don't have an eighty-column display, you should synchronize the windows (/WS) so that when you scroll the entry and statistics sections will remain together. We have also set a horizontal title (/TH) in row 19. This setup allows us to continue entering points down the column. The titled area lets us see the column headings while we're making entries.

If you haven't done so already, enter the additional information displayed in figure 3 into your model now. Enter 1 in A21 and +1+A21 in A22, replicating those two cells through A40 using relative reference. If you were analyzing an actual match, you'd replicate through A150 to provide enough cells to contain points for a complete set. At the end of each game enter a 1 in column A in the row on which the next game will begin. Later you'll be able to scroll down the model and see how many points were played in each game. You could also do an @MAX, limiting the range to just that used in the set, to determine the number of points played in a single game.

Another important thing to remember is that the ranges specified in our functions will determine how long it takes a model to recalculate. If all the ranges are only ten rows, the model will complete a recalculation about thirty seconds faster than if the ranges had been two hundred rows. As always, *VisiCalc* pays dividends if you are as simple and precise as possible.

It's also a good idea to set the recalculation mode to manual (/GRM), especially when you have normal ranges. This will enable you to enter formulas and to score during a match without having to wait for a recalculation after each point. Apple III owners can speed up the recalculation by "turning the lights out." Pressing control-5 will blank out the screen display during the recalculation, speeding up recalculation time by about 25 percent.

Two points require additional comment. First, we usually complete statistics for two players, so you'll want to complete a duplicate section starting further to the right in your model (for example, beginning at column K). Second, it's interesting to note that now we require only six columns to complete the ten statistics for one player.

Service Statistics. We'll complete our model by taking all of the statistics and filling in their formulas in column E. The first three statistics relate to serving (first-serve percent, aces, and double faults) and involve entries in the first three columns (columns B, C, and D) in the scoring section.

Every time a player aces his opponent, enter a 1 in the appropriate player's aces column (for example, in column B for player one). Move to the top window (;) and go to cell E6. Total the aces using @SUM(B21...B40). Normally, you'd change the range to something approximating B21...B150. As mentioned earlier, we want to keep the recalculation time short during model development.

First serve and second serve are the next columns. Where aces constitute only a sum, first serve uses 1s and 0s in the manner we talked about earlier. If a player gets his first serve in play, enter a 1 in column C; if he faults (misses), enter a 0. Note that serves will be treated slightly differently than the remaining statistics; a 1 doesn't mean that the player won the point, only that he succeeded in putting his serve in play. By the same token, a 0 doesn't mean that the player lost (on the first serve), only that he missed the serve. This statistic will require our model to reflect an understanding of the difference between 1 and 0.

Go to E5. The first-serve percent is a measure of how many times a player gets his first serve into play divided by how many times the player attempts a first serve. Keeping in mind our solution, we would enter the following in cell E5:

```
@SUM(C21...C40)/@COUNT(C21...C40)
```

If a player aces his opponent, enter a 1 in column B and a 1 in column C. If the player misses the first serve, enter only a 0 in column C. Doing things this way requires making two entries for an ace. We can simplify this.

If a player aces his opponent, that is also the equivalent of getting a first serve in play (albeit not for long). So aces should be included in our first-serve percent. We can accomplish this by doing a separate percent for column B, but it's easier to set things up in our original percentage formula. All we have to do is include the @SUM and @COUNT for column B. The formula in E5 should now look like this:

```
@SUM(B21...B40,C21...C40)/@COUNT
(B21...B40,C21...C40)
```

Now an ace entered in column B will automatically count as a first serve in play. No additional entry will be required in column C. (By the way, the two ranges in each pair of parentheses are treated as a single list of values.)

Double faults are calculated by entries made in the second-serve column (column D). If we wanted to, we could simply enter 0 for each second-serve fault (a double fault because the first serve was already a fault). But it would be nice not to have a different set of rules for the two different service columns. To be consistent, enter a 1 for a serve in play and a 0 for a fault in both columns C and D. The formula in E7 will calculate only the number of 0s, however. The formula in E7 is:

```
@COUNT(D21...D40)-@SUM(D21...D40)
```

Forehand and Backhand Statistics. The forehand and backhand statistics are calculated in the same way. The only difference is that the formulas reference different columns. Because of the similarity between the forehand and backhand statistics, we'll discuss only the forehand.

Forehands are divided into winners and unforced errors. Remember, we've decided to forego calculating forced errors. We'll make all en-

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tries for forehands in column E. The scoring is simple. If a player hits the ball inside the court that the other player can't reach, enter a 1; if the ball is hit into the net or out of the court, enter a 0. The formula for computing winners (in E9) is:

```
@SUM(E21. . .E40)
```

The formula for computing unforced errors requires counting the total number of entries and subtracting the winners. The formula in E10 is:

```
@COUNT(E21. . .E40)-@SUM(E21. . .E40)
```

The backhand formulas are the same, except that column F is used for scoring. The backhand formulas are:

```
Winner (E12): @SUM(F21. . .F40)
Unforced Errors (E13): @COUNT(F21. . .F40)
 -@SUM(F21. . .F40)
```

Points at Net Statistics. This series of statistics may seem slightly more complex than the ones we've been dealing with up until now, but it's not really. The same mathematical formulas are used. The complex part is trying to understand what we are attempting to accomplish. Experienced tennis players and watchers won't have difficulty; for those who don't fit either of those categories, a little explanation might be helpful.

In the course of playing a point, one of the players might choose to approach the net and try to end the point with a quick volley winner (hitting the ball before it touches the ground). The winning or losing of a match can depend on how successful this strategy is. Some players, such as John McEnroe, rarely hit a lot of groundstrokes; they choose instead to attack at the first opportunity and attempt to win at the net. Others, such as Bjorn Borg, are content to hit groundstrokes. But even Borg realizes how important the net is and has changed his game to include going to the net occasionally.

You'll notice that we have only one column for three statistics (trips to net, won at net, and percent won at net). In fact, these statistics are just as simple as the others we've been dealing with. When a player approaches the net, enter a 1 if he wins the point and a 0 if he loses it. Using @COUNT, we can determine the number of times the player attempted to come to the net (the total number of 1s and 0s); @SUM will then tell us how successful the player was. In E14, enter:

```
@COUNT(G21. . .G40)
```

And in E15, enter:

```
@SUM(G21. . .G40)
```

The percentage won at net is calculated by entering the following into E16:

```
+E15/E14
```

Now the basic statistics are complete. Of course, we've neglected the statistics for sets 2 and 3, as well as the match statistics. The simplest method of handling sets 2 and 3 is by entering additional scoring titles in row 20. In the author's model, for example, the second set of player-one aces (remember, there are two players in each set) begins in column R, the third set in column AH.

After each set has been completed, simply scroll the bottom window across to the new section and begin entering. The statistics for these sets should be completed in the same way as they were in set 1, but with different ranges. An easy way to accomplish this is to replicate all the formulas across (with no change) and then to edit for the new columns (the rows will stay the same).

Figure 4 gives the formulas used in the author's model.

One final note on scoring. If you're already a bit confused as to what to enter in the scoring column, you'll be relieved to see that we've left an empty row (row 20) for comments. The author's has the reminder "Enter 1 for ace, nothing else" in cell B20. It won't matter that you can't see the complete message in the model. Move the cursor to the cell and read the message on the edit line. If the message bleeds off the screen, use the edit (/E) command and the arrow keys to scroll so you can see the complete text. If your version of *VisiCalc* doesn't have editing ability, be care-

	Set 2	Set 3
First-Serve Percent		
Aces	@SUM(R21. . .R40)	@SUM(AH21. . .AH40)
Double Faults	@COUNT(T21. . .T40)−@SUM(T21. . .T40)	@COUNT(T21. . .T40)−@SUM(T21. . .T40)
Forehand		
Winners	@SUM(U21. . .U40)	@SUM(AK21. . .AK40)
Unforced Errors	@COUNT(U21. . .U40)−@SUM(U21. . .U40)	@COUNT(AK21. . .AK40)−@SUM(AK21. . .AK40)
Backhand		
Winners	@SUM(V21. . .V40)	@SUM(AL21. . .AL40)
Unforced Errors	@COUNT(V21. . .V40)−@SUM(V21. . .V40)	@COUNT(AL21. . .AL40)−@SUM(AL21. . .AL40)
Trips to Net	@COUNT(W21. . .W40)	@COUNT(AM21. . .AM40)
Won at Net	@SUM(W21. . .W40)	@SUM(AM21. . .AM40)
Percent Won at Net	+F15/F14	+G15/G14

Figure 4.

ful to make the complete text visible in the window. (You might also consider purchasing the new version of *VisiCalc*; it has many features that make it more powerful than the original version.)

Match Totals. The remaining column completes the match statistics. It will keep a running average of the totals. Thus you'll be able to see how each player is faring overall, as well as how he's doing in each individual set. It's an interesting comparison because a player's consistency often changes during a match.

Most of the formulas in column H are straightforward summations of columns E, F, and G in the same row. For example, in H6,1 the total number of aces is either E6+F6+G6 or @SUM(E6. . .G6). Replicate that formula (with relative reference) into H7, H9, H10, and H12 through H15.

The formulas in H5 and H16 are different. You can't sum a series of percentages and divide by the number of percentage values and get the correct answer. So we have a dilemma. We want to keep it simple. The answer for H16 is to use the values we already have. In cell H16, enter:

```
+H15/H14
```

The answer for H5 is more complicated. The method that would take up the least number of cells would be to enter the @SUM of all the aces and first-serve columns and divide by the @COUNTs of the same columns. The problem with that option is that *VisiCalc* limits the number of characters in a cell to 125. Incidentally, *VisiCalc* allows nine levels of nesting, in case you're inclined to try such complex methods of saving space.

So, for once we bite the bullet and use additional cells (why do you think we left rows 1 and 2 open?). Of course, we don't have to place the formulas in rows 1 and 2. We could place them anywhere. Stop and see if you can determine why rows 1 and 2 are better than, for example, rows 21 and 22.

Why this is so has to do with the recalculation order in *VisiCalc*. The recalculation order was explained in this column just a few months ago; so we won't discuss it in depth now. However, it's always good to keep in mind. *VisiCalc* starts scanning from cell A1 and either goes down the columns or across the rows, depending upon the recalculation order. If we placed our @SUM and @COUNT in rows 21 and 22, row 5 would see values in rows 21 and 22 and use them for its calculations. Then, when *VisiCalc* recalculated rows 21 and 22, it would update them to the correct values. The values represented in row 5 would be incorrect until the

next recalculation. Thus, to ensure accuracy, two calculations would always be required.

If our sums are above row 5, then they are recalculated before row 5 and always provide accurate values. The formulas for rows 1 and 2 in the author's model are shown in figure 5.

```
E1:  @SUM(B21. . .B40,C21. . .C40)
F1:  @SUM(R21. . .R40,S21. . .S40)
G1:  @SUM(AH21. . .AH40,AI21. . .AI40)

E2:  @SUM(B21. . .B40,C21. . .C40)
F2:  @SUM(R21. . .R40,S21. . .S40)
G2:  @SUM(AH21. . .AH40,AI21. . .AI40)
```

Figure 5.

The formula for cell H5 is:

```
(E1+F1+G1)/(E2+F2+G2)
```

One last thing. Since our model is row-oriented, change the recalculation order to rows (/GOR). Now we're finished.

There are a number of personalizations of the model that you might want to try making. You can go back to cells E5, F5, and G5 and divide row 1 by row 2 if you want. You can also calculate a number of other statistics, but we'll get to that later.

You'll notice that some of the cells display ERROR. That refers to a division by 0 error. Using the information provided in a prior column, you could make these cells display 0 until you entered a value into them. Hint: doing this involves using @IF. *VisiCalc Advanced Version* users can employ the @LABEL function as the else value. But that's another column. . . .

Score Yourself. Scoring other people's matches can teach you a lot about tennis and other sports. You might also wonder how you can use this model to help improve your own game. One way would be to ask a friend to use this model to chart your game. You don't have to take the computer out onto the court, either. Have a paper filled out with the six columns and the person doing your scoring can enter 1s and 0s on the paper as if it were the *VisiCalc* model on the computer. Afterward, you can enter the results yourself and see how the same comparisons used on the pros apply to your own game.

Another option, and a much more revealing one, is to design a different model to chart your strokes and give you more insight into your own game. The model itself is straightforward, using the principles you've already learned. The difference is that every normal stroke is scored. Figure 6 shows the completed template.

	A	B	C	D	E	F	G	H
2		1st	2nd			FH	BH	
3		Serve	Serve	FH	BH	Volley	Volley	Ovrhd
4	Won							
5	Error							
6	Percent							

	A	B	C	D	E	F	G	H
9		1st	2nd			FH	BH	
10		Serve	Serve	FH	BH	Volley	Volley	Ovrhd
11	Point							
12	1							
13	2							

Figure 6.

You'll notice many similarities to the first model. The screen is still divided into two windows: a statistical window and a scoring window. The points are still numbered in column A, enabling you to tell how many points were played per game.

The differences aren't extreme. There are now seven columns for scoring. You'll have to set the cell widths narrower to display all eight columns (including column A). The statistics are only won, error, and percent won. Won uses @SUM, error is @COUNT−@SUM, and percent won is @SUM/@COUNT. You should be able to figure out how to make the model work by now. Good luck.

Attention VisiCalc Advanced Version Users. If there are enough of you out there who would like a Ventures column or two dedicated to *Advanced Version*, write and let us know. ■

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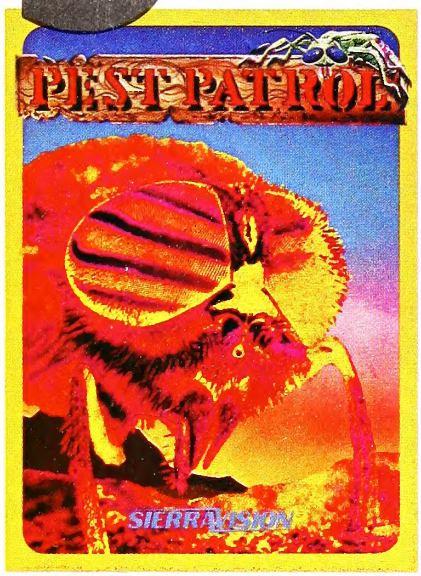

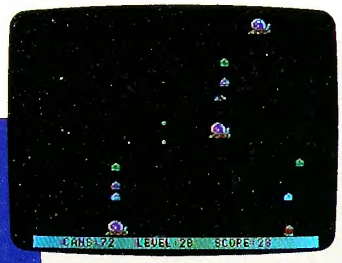

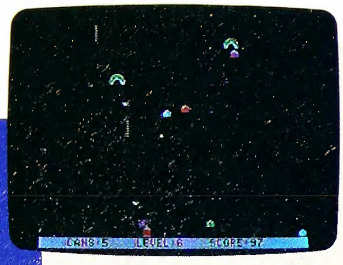

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WOODSONG

by DAVID HUNTER

Quaking, rustling from an unseen, unfelt breeze, a branch of the quiverleaf tree cast a shimmering, dancing shadow on the one hundred second and one hundred third pages of *War and Peace* (Simon and Schuster, The Inner Sanctum Edition, 1942). The 1,370-page novel, plus 62 pages of introductory material, was comfortably propped in the lap of Vladimir Kozintsev.

Wrinkled, slightly yellowed, a steady index finger pulled at the upper-right-hand corner of page 103 and flipped it up and over. The old prince, Nicholas Andreevich Bolkonski, is using Michael Ivanovich to illustrate the theory that all men are equals. Sunstruck, very much alive in the new spring, the quiverleaf touched the old man and his old book with its shadow. Swimming fractals collided and interfaced with the straight and orderly words of Tolstoy in a random underwaterlike ballet.

Kozintsev first saw the girl when she was standing next to the trembling quiverleaf, with the sun behind her. He looked straight at her, through his one-hundred-thirty-one-year-old eyes. So *tall, so thin. Must have been raised in zero gravity.*

Long black hair twirling like an olive branch in a storm, the girl turned her back on Kozintsev and commenced to look about. She acted nervous and very unfriendly.

"Please don't go. Stay." Kozintsev's voice was steady and not threatening.

The girl clapped small white hands to her ears and made a long, loud, full-throated wind-call. Kozintsev closed the book and put it down. *What an inhuman sound.*

As if on cue, a slight breeze came rustling through the woods. The girl turned and her eyes were bright with water.

"Come here." Vladimir stood up and gave her his best post one hundred grin. She walked forward slowly.

She carried only one small pack and a walking stick. She was wearing shorts, knee-high mountain boots, and a bright green sweater. Kozintsev guessed her age to be around sixteen. She stood a full six foot six inches but was almost unhealthily thin. She was not well muscled or particularly tan. She seemed oddly older than she looked, and yet she had a certain innocence and mystery.

"My name is Vladimir Kozintsev. What is yours?"

The girl put her hands on her ears again and gave him an unhappy look.

Maybe she doesn't speak English.

The girl stamped her stick twice on the ground and made a sound very much like a loud yawn.

Kozintsev leaned on the waist-high rail of his front porch and peered at the girl standing only fifteen feet away. She looked back with a very blank expression that Kozintsev strangely felt said more than a book the size of *War and Peace. Natasha! No. There is something wrong about her.*

"Look," he said, brandishing his right index finger, pointing toward the quiverleaf. "I'm Vladimir," the finger touched his chest. "You are . . ." the finger pointed at the girl.

"Dorothy!" She said it loud, but perfectly.

I wonder what happened to her brain-mate. Maybe it malfunctioned. Dorothy is an odd name. Never met a Dorothy.

"Where do you come from, Dorothy?"

She pointed behind her at the forest line.

"Do you speak another language?"

A blank, powerful look.

"Blaademirrour," she blurted. She pointed at the quaking quiverleaf.

"That tree is called a quiverleaf. It's the American Aspen."

Dorothy scratched her head and stamped her stick. She sang a short, merry verse of monosyllabic nonsense.

"Queverrdeef," she said.

Kozintsev walked over to the top of the stair that led from the porch to the ground. His great-great-grandfather had built a beautifully rugged cabin, perfect for the chilly winters and balmy summers of central Appala-Penn. Dorothy stepped lithely up the handmade stairs.

"Goodsdaya," she said cheerfully when she reached the porch. "Blaademirrour."

"Actually that's Vladimir. I think you should meet Andromeda; she lives here too. She's inside making dinner. Would you like to come in?"

"Gaaah . . ." Dorothy shook her head up and around and pointed at the door.

She smells the food.

"Andromeda! We have a visitor." Kozintsev shambled on in with Dorothy following. His six-foot frame fit in handsomely with the homey, wood paneled interior of the cabin.

"Waaiouts." Dorothy pointed at *War and Peace* in Kozintsev's right hand.

"This is a book." *She's either had a terrible shock or she is illiterate, or both. It's almost English she's speaking. Almost. It could be a case of apraxia—a disorder late in the neurological chain of command. She may be making perfect sense in her own mind.*

"Buuk." Dorothy was looking everywhere at everything. Smiling, she ran over and touched a lit-up phosphor screen.

"That is a data window to an info-slate."

Andromeda Houston came through a door behind Dorothy. Lifelong friend of Kozintsev, Andromeda searched him now with her one-hundred-twenty-nine-year-old eyes.

"Dorothy this is Andromeda. Andromeda this is Dorothy. She just walked out of the woods and I'll bet she's half-starved." Kozintsev winked at Andromeda, who nodded her head.

"There's plenty for the three of us. Here child, put down your things and come sit by the fire. The spring air is still chilly, especially in the deep forest." Dorothy silently let herself be led to a plush armchair.

Vladimir and Andromeda went to the cookery and had a quiet talk while they prepared salads and a creamy vegetable casserole.

"She just walked out of the forest?" Andromeda asked.

Vladimir took apart a head of lettuce, leaf by leaf, layer by layer.

"I can't figure her out. She seems to understand certain words, but she's unable to handle sentences."

Andromeda chopped a carrot. "I wonder what happened to her brain-mate."

"Either it malfunctioned, or. . . ."

"Or?"

Kozintsev stared mysteriously at the lobotomized head of lettuce. "Or, she doesn't have one."

"But that's incredible. Everybody born on Earth in the last two hundred some-odd years has had one implanted a year after birth. It's standard equipment these days."

"By her appearance, I'd say she was born and raised in space."

Andromeda dished a heaping portion of steaming vegetables into a pewter porringer. "Dimi, do you think she's dangerous? It's a long ways between us and the authorities."

"She seems harmless to me. Very much confused and uncertain, but no threat. She might be suffering from amnesia or some form of apha-

sia. Her first reaction on seeing me was to run away. Fascinating."

Andromeda walked over to Vladimir and put her arms around him. "You old Russian bastard, pretending you're Tolstoy, eh? Wise old man, indeed. I love you, even after half an eternity." She kissed him on his whiskery cheek.

"Has it been that long?"

Andromeda took two dishes of food into the living area and was gone for a minute or two as Kozintsev made the hot herbal tea. *There is something raw about Dorothy, unfinished.* Kozintsev's thoughts were interrupted when he heard Andromeda talking to Dorothy in the other room.

In a moment, Andromeda returned to the cookery.

"Does she know about the collection?" she asked. "She seems fascinated by that old Encyclopaedia Britannica set. I found her breezing through one volume, looking at the pictures. I tried to tell her that the pictures are of a different Earth, back when it was fully populated. She just put her hands over her ears and made a whooshing sound."

"I don't think she ever saw a book before today. That's not unusual, though. Do you realize it's been more than eighty years since they stopped printing." *So many people now who don't know what a book or a magazine was. So many now who have never even seen Earth, who don't care.*

Vladimir and Andromeda brought in the tea and salads. Dorothy let the encyclopedia fall from her lap like it was nothing of value. Kozintsev winced.

For a few moments no words were said among the three as all were busy relieving the most powerful hunger pains. Finally, Vladimir broke the moratorium.

"Where are your parents, Dorothy? Do you have a mother and father?" He spoke slow and distinctly, hoping she would recognize some of the words and understand.

"Fathertn mutherin spaysht. Fathertn gonna nowww." Dorothy made a windlike sound. "Mutherin hopshpital gonna nowww auhhh Dorothy yaaah whoosh zoolkooshwaaygo."

Kozintsev put down his fork. *Connect: did you get that?* His info-file answered: *yes, will keep saving.* Vladimir looked at Andromeda, who also seemed to be conversing inwardly with her brain-mate.

"Your father is dead. I'm sorry," he said to Dorothy, hoping he had understood her.

"Dorothy derree nfathert." She looked sad and grew still.

They ate again and Vladimir wondered what to ask Dorothy next. He was beginning to understand her a little. It was exaggerated English, he thought, and maybe some invented words.

In all his years, Kozintsev had never met anyone like her. He had been all around known space, been all around the earth a dozen times. He and Andromeda still made trips to acquire rare books. Not so often anymore, it's true. Still, Kozintsev fancied himself a wise old man and he was mystified and intrigued by the wild young girl who apparently was without brain-mate and central info-file, who knew very little English or any other language, and who wandered the Appalachian Mountains alone, in this twenty-fifth century.

He regarded her while she plowed into the lettuce, tomato, and carrot salad. *She knows how to handle a fork. Her eyes are quite intelligent, though dreamy, foresty. She also seems to take good care of herself. Her slimness is not as unhealthy-looking as I first thought. She isn't starving. Her bones and muscles can't support much weight. A legacy from space—which her body knows, if her mind doesn't.*

After dinner, the three had a long discussion. Andromeda pulled out a note pad and doodled with a pen. Dorothy was fascinated.

"Here, you try it," said Andromeda.

Dorothy gave happy chirping sounds as she made wide, sweeping marks on the paper. The two wise old humans were amused and touched.

Later, Kozintsev asked questions and Dorothy answered in her strange, convoluted dialect. Andromeda took notes and eventually got tired around 11:00 p.m. She and Kozintsev made up a sleeping bag for

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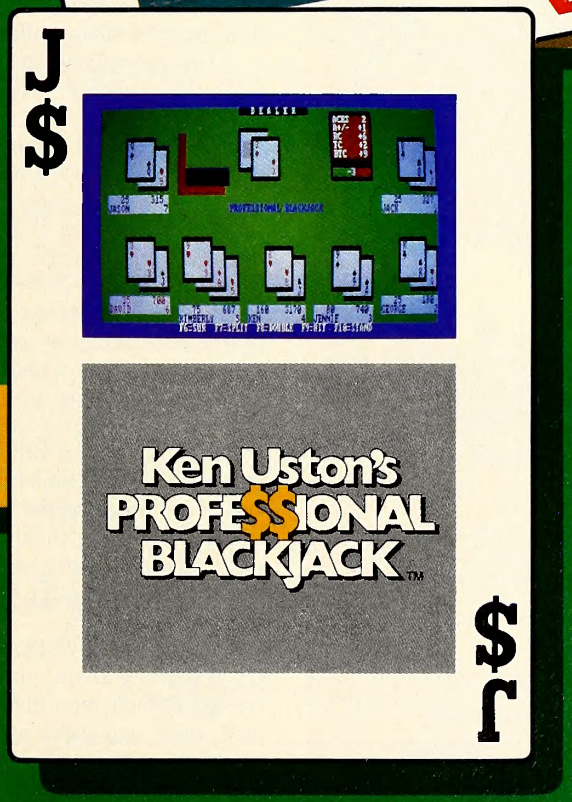

IBM PC* requirements:
48K RAM, disk drive, PC DOS,* 80-character display. Color and monochrome versions supplied with each package.

APPLE II requirements:**
DOS 3.3, 48K RAM, disk drive, 40-character display.

Osborne 1™ requirements:
Standard Osborne 1 package.

Display shows actual photograph of IBM PC version. Apple color graphics and Osborne monochrome graphics are similar.

Versions for Atari,** TRS-80** and other brands will be available shortly.

intelligent statements™

GROWN-UP GAMEWARE™

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Dorothy and then Andromeda said goodnight.

With the fire blazing and several candles lit, Kozintsev and Dorothy stayed up for a few more hours. The atmosphere in the cabin was magical, with their shadows skipping haphazardly over the rows of books on elegant hardwood shelves. Kozintsev learned much about Dorothy and she became easier to understand. She learned fast.

Through the course of the evening, Kozintsev pieced together her story as best he could. Dorothy was born and raised on an n-drive ship out of Europa. He inferred that her father and mother were stowaways and fugitives. Dorothy lived in space until she was five years old. When she was four, her mother was taken away to a hospital and never seen or heard from again.

Dorothy's father fled to Earth and settled away from people, in the wilderness. He was very rich but had no imagination. They lived in a small cabin with no info-slate, not even a radio. Dorothy had never had a brain-mate installed. She was on her own.

When she was six, Dorothy's father withdrew from the world; he ceased to talk and hardly moved at all. He sat silent in his chair and stared at a picture of Jupiter, year after year.

They lived on the money her father had; Kozintsev believed that it was stolen. Dorothy would go into town three or four times a year and buy containerized supplies. Those trips were the only time she interacted with other humans who talked. She knew just enough English to get what she needed and would leave right away.

For the previous ten years Dorothy had been alone, with no one to keep her fluent in the language. She wandered the forests, singing in her own sound-oriented tongue, talking to the trees in their own language, as best she could.

The next morning, a sleepy Kozintsev and Andromeda sat on the front porch drinking coffee. Dorothy was still asleep in the spare room.

"Her father finally snapped out of his silence three or four days ago," Kozintsev explained. "He started yelling and smashing things. Dorothy ran into the woods. She came back when she saw smoke. Her father had started a fire in the cabin and she found him sprawled outside. He was dead, probably from a heart attack."

"Ah, the poor thing," said Andromeda.

"She buried him, with great honor. He must have asked her to do that, before he stopped talking. He was a strange, powerful man from what I can gather. She marked the grave with his hat and boots. The shock probably has something to do with her speech problem, but its real genesis goes back ten years."

Morning birds skimmed through the air and squirrels scampered about. Soft morning light shone through the trees and the quiverleaf.

"She knows how to say her name perfectly because that is the one thing she remembers her mother saying.

"Without a personal info-file she had no way to store and recall events and people perfectly, like we can. She saw data-windows and info-slates during her childhood and on those trips to town. But she never really knew what they were for. She had never even seen books or pen and paper. She had her memories, of course, but they have faded with the passage of time."

Kozintsev tugged thoughtfully on his beard.

"I told her about our book collection and she got excited. She's as free as the wind, but I think she'd like to stay with us a while and learn to read, write, and speak properly."

Andromeda set down her coffee cup.

"That sounds like fun," she said. "Beats worrying about whether the robots have wandered into a bear's territory."

"I told her she can sing to our trees all she wants. They'll listen and enjoy." *Oh, how they'll listen.*

Kozintsev suddenly burst out laughing and dribbled coffee on his plaid shirt.

"If there are more like her on this almost-empty, forgotten planet, we'll live longer than my father yet."

Ten, twenty, thirty years more. It'll be worth it if there are more like Dorothy, who needs us.

A slight wind rustled through the woods. The quiverleaf sang to its leather and cloth-bound cousins in Kozintsev's cabin. The trees gathered around and guarded the sacred treasury of knowledge. ◨

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Softalk Presents The Bestsellers

Making heads or tails out of the current Apple marketplace is no job for beginners. Things just keep getting stranger. And very little light was shed on the subject in the poll of January software sales.

January turned out to be a disappointing month for most retailers. That should set off alarm bells all over the industry, because January is traditionally the second or third strongest month of the year. And this January should have been a blockbuster.

January sales are usually strong because of the large number of new computer owners entering the market during the late December Christmas buying period. By the time their New Year's Day dinners have settled, they realize some of what they should have bought with their systems and head back to their local retailers. This overlay of new users on the established base creates strong sales to kick off the year.

That should have been especially true this year. Apple computers went flying out of the stores in unprecedented numbers in December, auguring a boom January. But it wasn't to be, and there's no hard evidence as to why this year didn't fit the pattern.

Speculation that the imminent introduction of the IIe depressed the market won't hold water. As those things go, it was a relatively well kept secret as to the exact day. Furthermore, any announcement about a new model should not have affected the buying habits of those who bought systems in December.

Extrapolating from the number of computers sold in December, it figured that January would be the second biggest software month in history. It only got fifth or sixth.

Fifth or sixth isn't all that bad, but the failure of the marketplace to perform as strongly as expected is not a publisher-friendly development.

Quite possibly some of the weakness stems from a fragmentation of the delivery support system. That development is causing some confusion among retailers. Three years ago, it was difficult for dealers to keep up with the good software because of the lack of a well-focused delivery system. They were in the position of having to deal with each software publisher individually—a method that was time-consuming and inefficient.

The advent of Softsel brought some order to the marketplace. They carried virtually every major software publisher and became an ex officio one-stop shopping center for dealers. Keeping the best software on the shelves was as easy as calling Softsel.

That's all changed. First, Softsel's success engendered the Softsel emulation mode, with new distributors entering the market on almost a weekly basis. Dealers now contend with almost as many distributors as they once did with publishers. Second, the collective body of distributors fell down on the job.

The failure came from lack of recognition that most Apple dealers were adding at least one other computer brand to flesh out their line. When the distributors didn't move quickly into such areas as CP/M and IBM, the dealers were forced to go shopping for product—either by using several distributors or by returning to the method of dealing with

Apple III

This Month	Last Month	
1.	1.	**VisiCalc: Advanced Version,** Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
2.	3.	**Word Juggler,** Tim Gill, Quark Engineering
3.	3.	**PFS: File,** John Page and D. D. Roberts, Software Publishing Corporation
4.	2.	**Apple Writer III,** Paul Lutus, Apple Computer
5.	—	**QuickFile III,** Apple Computer
6.	7.	**The Catalyst,** Tim Gill, Quark Engineering
7.	—	**PFS: Graph,** Bessie Chin and Stephen Hill, Software Publishing Corporation
8.	5.	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
	8.	**VersaForm,** Joseph Landau, Applied Software Technology
	—	**Micro Terminal III,** Microcom

Arcade 10

This Month	Last Month	
1.	1.	**Choplifter,** Dan Gorlin, Broderbund Software
2.	3.	**Miner 2049er,** Mike Livesay and Bill Hogue, Micro Fun
3.	2.	**Frogger,** Olaf Lubeck, Sierra On-Line
4.	6.	**Aztec,** Paul Stephenson, DataMost
5.	5.	**The Arcade Machine,** Chris Jochumson and Doug Carlston, Broderbund Software
6.	—	**Pinball Construction Set,** Bill Budge, BudgeCo
7.	10.	**Crisis Mountain,** David H. Schroeder, Synergistic Software
8.	4.	**Snack Attack,** Dan Illowsky, DataMost
9.	—	**Repton,** Dan Thompson, Sirius Software
10.	7.	**Cannonball Blitz,** Olaf Lubeck, Sierra On-Line

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Hardware requirements: Apple version requires Apple II or Apple II + with 48K and Applesoft in ROM of language card, DOS 3.3. Atari 400/800 version requires 48K and BASIC cartridge. Both versions require only one disk drive.

Brøderbund Software

1938 Fourth Street, San Rafael, California 94901, Telephone (415) 456-6424

the publishers directly.

Stepping into that breach was Micro Lab, with a program that provided dealers with Micro Lab and Micro Fun software on consignment. No need to call; a salesperson visits the store to check the racks monthly and restocks as necessary.

Industryites generally thought that Stan Goldberg, president of Micro Lab, had gone off his rocker. The program was expensive to implement and didn't appear to hold significant advantages over using distributors. For the first six months, that conventional wisdom seemed to hold true.

Then came *Miner 2049er. Miner* is the first truly innovative package in some time from the Chicago software publisher. And it provided a good test of the flooring plan because approximately 50 percent of the stores were buying directly from Micro Lab and 50 percent were buying from distributors.

Micro Lab creamed the distributors. They've been outselling the entire body of distributors by a factor of at least five to one. Goldberg was crazy like a fox.

Similar incidents of success outside the normal distributor channels are cropping up. State of the Art sells most of its product direct, and its *General Ledger* crept onto the bottom rung of the Top Thirty in January.

Apple's got clout selling bread-and-butter software, but they've been truly underwhelming with their entertainment and more esoteric packages. Lately, however, their educational offerings from Children's Television Workshop are clobbering the arcade games at the cash register.

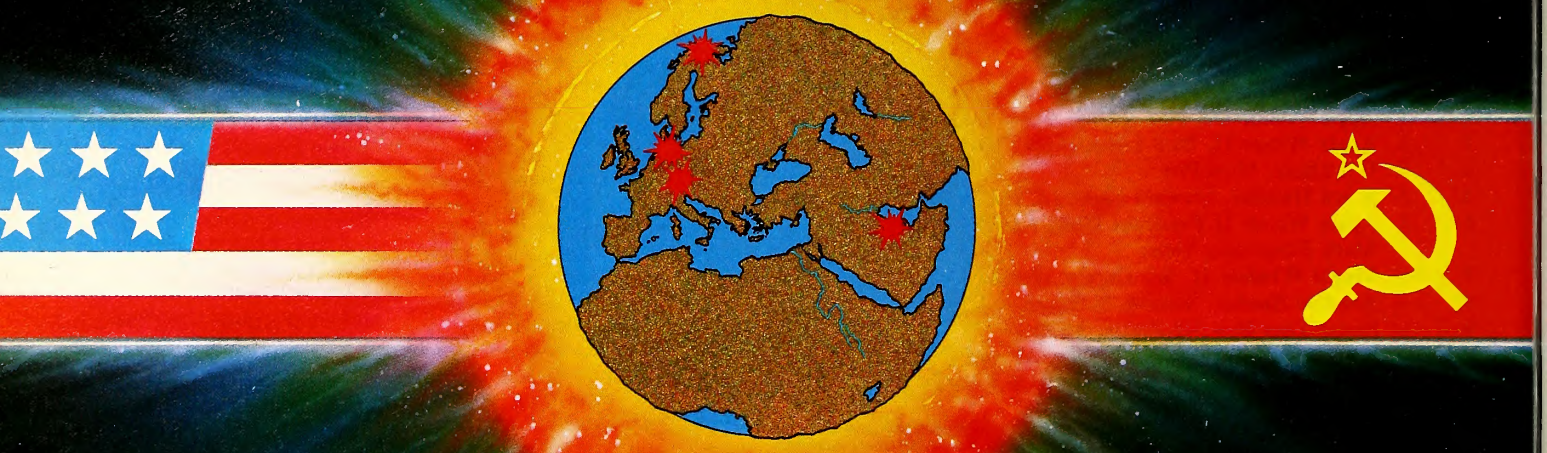
Word Processors 10

This Month	Last Month	
1.	1.	**Screen Writer II,** David Kidwell, Sierra On-Line
2.	—	**Apple Writer IIe,** Paul Lutus, Apple Computer
3.	3.	**Apple Writer II,** Paul Lutus, Apple Computer
4.	5.	**WordStar,** MicroPro
5.	2.	**Word Handler,** Leonard Elekman, Silicon Valley Systems
6.	3.	**Apple Writer II Pre-Boot Disk,** Kevin Armstrong and Mark Borgerson, Videx
7.	6.	**Magic Window II,** Bill Depew, Artsci
8.	—	**Sensible Speller,** Sensible Software
9.	—	**Super-Text Pro,** Ed Zaron, Muse
10.	—	**Bank Street Writer,** Gene Kusmiak and the Bank Street College of Education, Broderbund Software

Home Education 10

This Month	Last Month	
1.	1.	**MasterType,** Bruce Zweig, Lightning Software
2.	4.	**Mix & Match,** Children's Television Workshop, Apple Computer
3.	2.	**Early Games for Young Children,** John Paulson, Learning Tools
4.	—	**Story Machine,** DesignWare, Spinnaker Software
5.	7.	**Snooper Troops I,** Tom Snyder, Spinnaker Software
6.	3.	**Ernie's Quiz,** Children's Television Workshop, Apple Computer
	9.	**Facemaker,** DesignWare, Spinnaker Software
8.	—	**Snooper Troops II,** Tom Snyder, Spinnaker Software
9.	5.	**Typing Tutor,** Image Producers, Microsoft
10.	—	**Spotlight,** Children's Television Workshop, Apple Computer

1985 WAS NOT A VERY GOOD YEAR. THE RUSSIANS INVADED GERMANY, STORMED THE PERSIAN GULF, ATTACKED NORWAY, AND OVERRAN THE BALTIC.



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Clearly, Apple has the inside track on selling to their own franchisees, but that's been no guarantee of success in the past.

For all of *Miner*'s success, the best it could manage in January was a solid third place. *Choplifter* and *VisiCalc* traded places again at the top, with *Choplifter* regaining the lead.

VisiCalc sales are clearly being impacted by *Multiplan*, which jumped from twenty-ninth to thirteenth. Those sales are coming directly out of VisiCorp's pocket. *VisiCalc* has successfully held off *SuperCalc* in the IBM market; now it'll have to test its muscle in the Apple market.

The highest-rated new package was *Apple Writer IIe* at eleventh. Bill Budge's *Pinball Construction Set* scored eighteenth and *Crisis Mountain* nabbed twentieth.

The introduction of the IIe threw the Word Processing 10 into a dither. Dealers quit bundling *Apple Writer* with systems, and the result was unexpected—new buyers opted for one of the *Apple Writer* packages instead of their competitors.

Screen Writer II hung on to the lead, but *Word Handler* dropped to fifth as both *Apple Writer IIe* and *Apple Writer II*, as well as *WordStar*, advanced. *Super-Text Pro* was the second choice of IIe buyers. After an unexplainable dip in sales, *Sensible Speller* regained its claim to the lead

Adventure 5

This Month	Last Month	
1.	1.	**Zork I,** Infocom
2.	3.	**The Mask of the Sun,** Chris Anson, Alan Clark, Larry Franks, and Margaret Anson, Ultrasoft
3.	4.	**Zork II,** Infocom
4.	2.	**Deadline,** Infocom
	5.	**Zork III,** Infocom

Fantasy 5

This Month	Last Month	
1.	1.	**Wizardry,** Andrew Greenberg and Robert Woodhead, Sir-tech
2.	2.	**Ultima II,** Lord British, Sierra On-Line
3.	3.	**Knight of Diamonds,** Andrew Greenberg and Robert Woodhead, Sir-tech
4.	4.	**Ultima,** Lord British, California Pacific
5.	—	**Ali Baba and the Forty Thieves,** Stuart Smith, Quality Software

Strategy 5

This Month	Last Month	
1.	1.	**Castle Wolfenstein,** Silas Warner, Muse
2.	2.	**Flight Simulator,** Bruce Artwick, SubLogic
3.	3.	**Sargon II,** Dan and Kathe Spracklen, Hayden
4.	—	**Chess 7.0,** Larry Atkin, Odesta
	—	**Epidemic!,** Stephen Faber, Strategic Simulations

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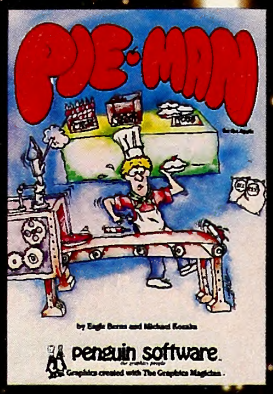
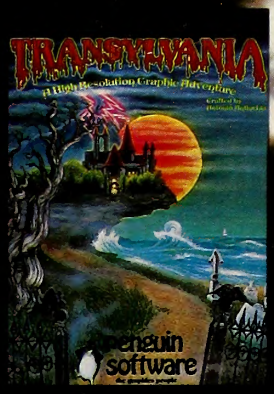


Chaos in the bakery as you contend with a cantankerous conveyor belt in an effort to make pies.

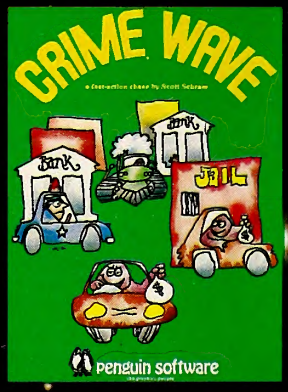
See if you can sneak past the security guards in this best-seller.



"Best graphics ever in a hi-res adventure ..."
– Softalk

NEW RELEASES

Run a gauntlet of deadly alien sharpshooters.



The criminal element has run amok. Can you round them up?

We believe games should be fun and that the price of games shouldn't dampen that fun. The growth of the market over the past couple of years leads us to believe that $19.95 may work now as a reasonable game price, so we're trying it for the next six months, and if we're right, longer. This policy does not just apply to new games, but to ALL our games, including our past and current best-sellers! Our bet is that we'll sell more and that the increased sales will offset the decreased income per product. If so, more people get to play our games, and we still make enough to keep developing newer and better software.

As our customers know, at Penguin Software we take a great deal of care and pride in our products. This change in our pricing in no way affects our standards of quality. We pioneered the removal of copy-protection from applications software last year in an effort to give you a better product. This year we are trying again to lead the way in putting the customer first.

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in proofreading programs.

Spinnaker scored well in the education category as *Story Machine* reached fourth and *Snooper Troops II* rose to eighth. Apple's CTW series held its own: gaining *Spotlight*, but losing *Instant Zoo*.

Some lists remained relatively stable. Only *Micro/Terminal II* cracked the Business 10. Only *Pronto DOS* made the Hobby 10, and that was at the expense of *Utility City*, also from Beagle Bros.

Business 10

This Month	Last Month	
1.	1.	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
2.	2.	**PFS: File,** John Page and D. D. Roberts, Software Publishing Corporation
3.	4.	**Multiplan,** Microsoft
4.	9.	**VisiFile,** Creative Computer Applications/Colin Jameson and Ben Herman, VisiCorp
5.	3.	**DB Master,** Alpine Software/Stanley Crane and Jerry Macon; and Barney Stone, Stoneware
6.	8.	**General Ledger,** George Shackelford, State of the Art
7.	7.	**PFS: Report,** John Page, Software Publishing Corporation
8.	6.	**BPI General Ledger,** John Moss and Ken Debower, Apple Computer
9.	5.	**PFS: Graph,** Bessie Chin and Stephen Hill, Software Publishing Corporation
10.	—	**Micro/Terminal II,** Microcom

Hobby 10

This Month	Last Month	
1.	10.	**DOS Tool Kit,** Apple Computer
2.	6.	**Apple Mechanic,** Bert Kersey, Beagle Bros
3.	2.	**Graphics Magician,** Chris Jochumson, David Lubar, and Mark Pelczarski, Penguin Software
4.	5.	**Zoom Grafix,** Dav Holle, Phoenix Software
5.	4.	**Bag of Tricks,** Don Worth and Pieter Lechner, Quality Software
6.	10.	**The Complete Graphics System,** Mark Pelczarski, Penguin Software
7.	8.	**Flex Text,** Mark Simonsen, Beagle Bros
8.	3.	**DOS Boss,** Bert Kersey and Jack Cassidy, Beagle Bros
	—	**Pronto DOS,** Tom Weishaar, Beagle Bros
10.	7.	**GraForth,** Paul Lutus, Insoft

Home 10

This Month	Last Month	
1.	1.	**Home Accountant,** Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software
2.	9.	**Transend 2,** Tim Dygert and Bob Kniskern, SSM
3.	2.	**ASCII Express: The Professional,** Bill Blue and Mark Robbins, Southwestern Data Systems
	3.	**Transend 1,** Tim Dygert and Bob Kniskern, SSM
5.	—	**Chequemate,** Masterworks
6.	—	**The Accountant,** Ernest Forman, Decision Support Systems
7.	6.	**Know Your Apple,** Muse
8.	4.	**Dow Jones Market Analyzer,** B. C. Burch, RTR Software
	5.	**Data Capture 4.0,** David Hughes and George McClelland, Southeastern Software
10.	—	**VisiTerm,** Tom Keith, VisiCorp

Softalk Presents The Bestsellers

There were no changes in the composition of the Adventure 5, although the order varied. Only *Pinball Construction Set* and *Repton* were new to the Arcade 10. *Ali Baba and the Forty Thieves* returned to be the only change in the Fantasy 5.

The Strategy 5 list saw two new entries, *Chess 7.0* from Odesta and *Epidemic!* from Strategic Simulations.

Considerable weakness was noted among programs considered for the Home 10. Other than *Home Accountant* and *Transend 2*, none of the programs were strong enough to write home about. Oddly enough, two *Home Accountant* competitors made the list: *Chequemate* and *The Accountant*. *VisiTerm* rejoined the list after missing last month.

There were also three new programs in the Apple III list. *QuickFile III* nabbed fifth, *PFS: Graph* reached seventh, and *Micro/Terminal III* was tied for eighth. Just as interesting was *Word Juggler*'s accession to the mantle of most popular word processor, at least for one month, as it pushed *Apple Writer III* back.

The depth of the sales drop-off in January should serve as a warning sign to distributors and publishers. Whether there will be a shakeout of distributors, more publishers going to flooring plans, a combination of those alternatives, or something totally new may be the focal point of interest this year.

Stan Goldberg thinks he knows the answer. *Miner 2049er* whispered it in his ear. ■

Apple-franchised retail stores representing approximately 5.9 percent of all sales of Apple and Apple-related products volunteered to participate in the poll.

Respondents were contacted early in February to ascertain their sales for the month of January.

The only criterion for inclusion on the list was the number of units sold—such other criteria as quality of product, profitability to the computer store, and personal preference of the individual respondents were not considered.

Respondents in February represented every geographical area of the continental United States.

Results of the responses were tabulated using a formula that resulted in the index number to the left of the program name in the Top Thirty listing. The index number is an arbitrary measure of relative strength of the programs listed. Index numbers are correlative only for the month in which they are printed; readers cannot assume that an index rating of 50 in one month represents equivalent sales to an index number of 50 in another month.

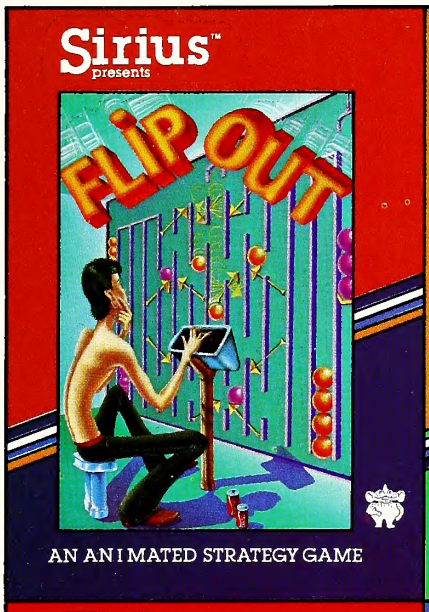
Probability of statistical error is plus or minus 4.3 percent, which translates roughly into the theoretical possibility of a change of 4.82 points, plus or minus, in any index number.

The Top Thirty

This Month	Last Month	Index	
1.	2.	137.15	**Choplifter,** Dan Gorlin, Broderbund Software
2.	1.	131.99	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
3.	8.	99.11	**Miner 2049er,** Mike Livesay and Bill Hogue, Micro Fun
4.	5.	92.53	**Home Accountant,** Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software
5.	3.	75.15	**Wizardry,** Andrew Greenberg and Robert Woodhead, Sir-tech
6.	6.	74.68	**PFS: File,** John Page and D. D. Roberts, Software Publishing Corporation
7.	4.	67.17	**Frogger,** Olaf Lubeck, Sierra On-Line
8.	7.	52.61	**Ultima II,** Lord British, Sierra On-Line
9.	12.	49.79	**Aztec,** Paul Stephenson, DataMost
10.	9.	45.09	**Screen Writer II,** David Kidwell, Sierra On-Line
11.	—	44.62	**Apple Writer IIe,** Paul Lutus, Apple Computer
12.	17.	40.39	**Apple Writer II,** Paul Lutus, Apple Computer
13.	29.	39.45	**Multiplan,** Microsoft
14.	11.	35.23	**The Arcade Machine,** Chris Jochumson and Doug Carlston, Broderbund Software
15.	14.	31.00	**MasterType,** Bruce Zweig, Lightning Software
16.	21.	29.59	**Knight of Diamonds,** Andrew Greenberg and Robert Woodhead, Sir-tech
17.	15.	26.30	**Castle Wolfenstein,** Silas Warner, Muse
18.	—	24.32	**Pinball Construction Set,** Bill Budge, BudgeCo
19.	30.	23.01	**Mix & Match,** Children's Television Workshop, Apple Computer
20.	—	22.08	**Crisis Mountain,** David H. Schroeder, Synergistic Software
21.	10.	21.61	**Snack Attack,** Dan Illowsky, DataMost
	19.	21.61	**Zork I,** Infocom
23.	—	21.14	**VisiFile,** Creative Computer Applications/Colin Jameson and Ben Herman, VisiCorp
	—	21.14	**WordStar,** MicroPro
25.	—	19.73	**Transend 2,** Tim Dygert and Bob Kniskern, SSM
26.	22.	19.26	**Early Games for Young Children,** John Paulson, Learning Tools
27.	27.	15.97	**The Mask of the Sun,** Chris Anson, Alan Clark, Larry Franks, and Margaret Anson, Ultrasoft
28.	24.	15.03	**DB Master,** Alpine Software/Stanley Crane and Jerry Macon; and Barney Stone, Stoneware
29.	—	14.56	**Story Machine,** DesignWare, Spinnaker Software
	—	14.56	**General Ledger,** George Shackelford, State of the Art

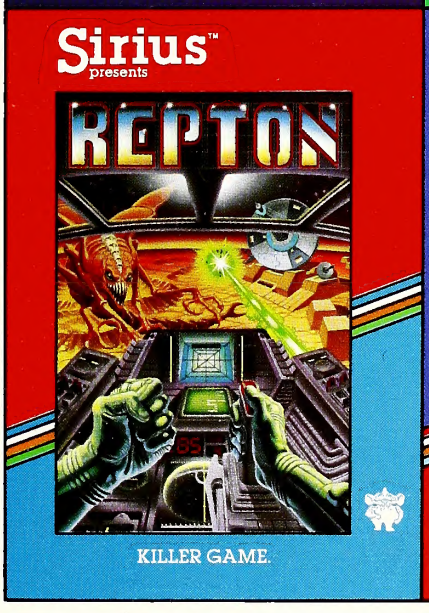
Have A Great Playday!

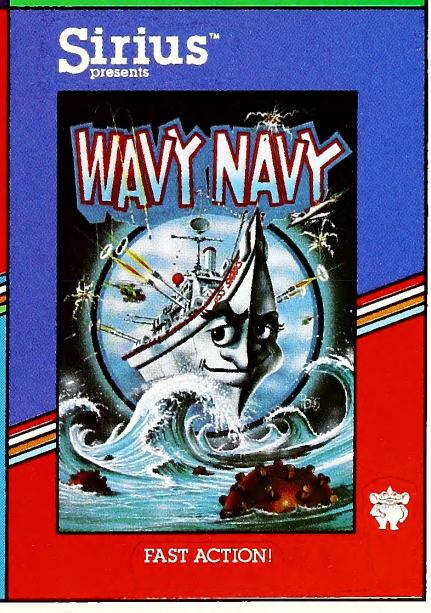
Take your marble to the top. Pick your spot and let it drop. Hope for a flip instead of a flop. Once you get it, the fun never stops! It's FLIP OUT — a crazy new strategy game for one or two players. Each marble you drop causes a chain reaction, so take your time and plan carefully. Plan right and you'll flip, if you didn't you Flip Out!



Turn your keyboard into a typing arcade! You can blast attacking letters and words right out of the sky. Type Attack was designed by a professional educator and the fast action game experts at Sirius. It features 39 preprogrammed lessons and 60 user defined lessons. Great sound, graphics and a real-time words per minute bar make improving your typing skills fun!

It is up to you to stop the invasion of the evil Quarriors and save Repton. You are armed with devastating Nuke Bombs, a Radar Screen, a Laser Gun and an Energy Shield. You'll need them all! You'll be attacked by Nova Cruisers and Single Saucers. You must avoid Spye Satellites and deadly Dyne-Beam Shooters and you must stop the Draynes from depleting the Reptonian power supply. Repton is a battle so thrilling you'll be relieved to find out you're still on earth when it's over!





Talk about adventure on the high seas! You're blasting away at a squadron of enemy bombers and Kamikaze fighters from the deck of your P.T. boat. Suddenly you notice the sea is loaded with mines and an Exocet missile is screaming toward you on the horizon. Instinctively you jerk the joystick to the starboard, keeping your thumb on the fire button. Phew! That was close! Sometimes it's hard to believe Wavy Navy's just a video game.

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Kids Protest Maze Games

COARSEGOLD, Calif.- Carrying placards and shouting slogans, kids across the United States took to the streets today to protest tedious and outdated computer maze games.

No injuries were reported, and damage was limited to games based on stale mazes.

"The turnout doesn't amaze me," said R. Kaid, chairman of "M.A.D. - Mazes Are Dumb."

"Kids are tired of moving in and around stationary walls," he said.

News of the demands struck to the heart of the computer software industry, and Sierra On-Line, Inc. responded with the NEW Jawbreaker.

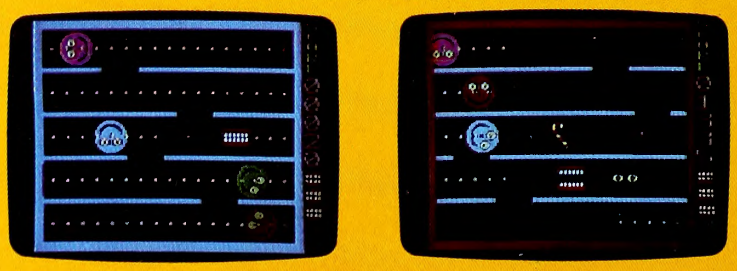
"The entire screen moves - the happy faces, the set of chompers, even the walls," said Chuckles, creator of the innovative game for Sierra On-Line.

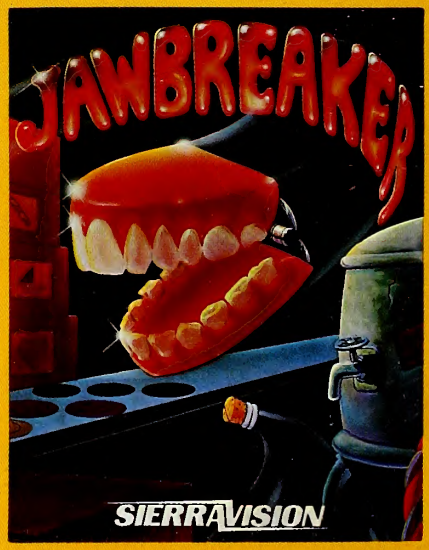
"No maze creates as much excitement as our Jawbreaker," he said, and added, "The colors are brighter, the figures bigger, the action faster."

While maze makers waited for someone to buy their games, kids and other M.A.D. members were buying their NEW Jawbreaker for $29.95 from dealers or directly from:

SIERRA ON-LINE
Sierra On-Line Building
Coarsegold, Calif. 93614
(209) 683-6858

THE END OF THE MAZE CRAZE





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