SOFTALK

VOLUME 4 SEPTEMBER 1983 $3.00

Lisa Speeds to the Top

Exec BPI

Space Age Apples

Keyboard Master Bruce Zweig

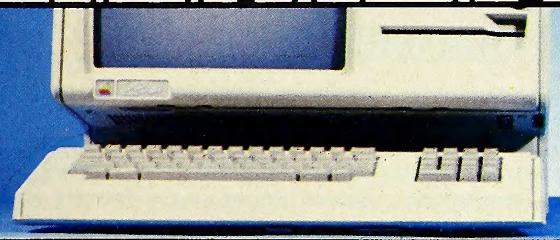
S O F T A L K

SEPTEMBER 1983

FEATURES · DEPARTMENTS

Like General MacArthur, Taylor Pohlman will return.

IN NEXT MONTH'S SOFTALK



Opalescent October . . . Astronomy comes alive with observatory Apples . . . Exec Beagle Bros . . . Adventures with WPL and Kids . . . Dr. Jeppson strikes again with an Apple III spooler . . . plus restarting Applesoft . . . Telecommunications (in print) . . . Budge . . . and more. . . .

INDEX OF ADVERTISERS

Cover: Lisa whizzes through one of the metropolitan business centers she's taking by storm. Design by Kurt Wahlner; photo by Bill Fitzgerald.

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CONTEST: "I WAS A TEENAGE APPLE"

There once was a computer company in Cupertino, California, that had lots of Apples lying around in its offices. There were all kinds—IIs, IIIs, Lisas, yet-unnamed computers, and an old Apple I used as a dart board with Peter McWilliams's picture on it.

One day, when Steve Jobs was shaving his pet gerbil ("If you shave a gerbil, will it get a tan?" was Jobs's Zen question of the month), Jobs's electric razor caused a power overload, which resulted in some of the fuse boxes catching fire and burning up several offices. (Sure, it's improbable, but this is just a contest.)

Well, one of the rooms that burned down was the Apple Computer Relics room where lived an Apple II, a II Plus, a IIe, a III, and a Lisa. All five computers were totally destroyed: crispy critters.

During their lives, each computer wrote programs in either assembly language, Cobol, Basic, Fortran, or Pascal. No computer could write in more than one language, but they all could run programs written in any language.

Each was used for only one function: database management, adventure games, arcade games, fantasy games, or word processing. None of the Apples was used for more than one application. In other words, the Apple that played adventure games did nothing else but play *Zork*, *Wizard and the Princess*, *Mask of the Sun*, and so on.

Through some strange turn of events, each one of the computers was reincarnated and became either a doctor, disc jockey, samurai warrior, lawyer, or stand-up comic, and was either single, engaged, happily married, happily divorced, or twice divorced.

One spring weekend, they all happened to meet by chance at the Legal Aspects of One-Liner Radio Personalities Impersonating Ear-Nose-and-Throat Japanese Soldiers Convention at the Motel Six in Cheeseburg, Ohio.

They really hadn't changed that much, even though they were now human and no longer computers. Naturally, they immediately recognized each other and hit it off great. Unfortunately, they couldn't remember completely which computers they were, or what their lives were like. But they did know the following:

1. The Lisa played a lot of *Wizardry*, *Ultima II*, and dungeon games.
2. The one that used to program in Cobol was divorced.
3. The one that had been a II Plus would have to leave the convention early because he had a hot date with his financee back home.
4. One of them bored the rest of the group about how he spent weeks trying to get SOS commands to execute from assembly language.
5. The IIe spoke Cobol.
6. The former II's second wife divorced him because he wallpapered the bedroom with disks full of saved games in progress, all of which he was in the process of solving.
7. The single man didn't speak a high-level language.
8. The one who used to write in Pascal did a lot of word processing.
9. The samurai warrior was a more sophisticated model Apple, and the lawyer an earlier model, than the stand-up comic.
10. In his previous life, the disc jockey tried to combine his interests by writing *Ultima XII* with all goto and print statements, and a whole bunch of for-next loops.
11. The doctor fell asleep listening to another guest reminiscing about taking inventory, collecting axes, and parsing f-words.
12. The stand-up comic's jokes mostly ended with punch lines such as "How many fields to sort?" and "By last name?"

These poor bozos couldn't figure out who was who, but we bet you can. In fact, we'll give away $100 worth of *Softalk* advertisers' products to the one who can correctly match all five humans with the computers they used to be, the language each spoke, the applications each was used for, and their current marital status.

All you have to do is write down the occupation, marital status, model of Apple that person used to be, computer language, and its application, and send it in with a facsimile of the coupon below. That's it!

In case of a tie, a winner will be dragged screaming from within the ruthless random number generator.

Mail in your entry with the following information, postmarked by October 10, 1983, to Softalk Reincarnation, Box 60, North Hollywood, CA 91603. Go!

Name: ____________
Address: ____________
City, state, zip: ____________
Phone number: ____________
My computer dealer: ____________
Here's what I wanna win: ____________
Signature: ____________

CONTEST WINNERS

What a mess. The June Final Exam contest sent readers scrambling to libraries, writing letters to Apple, and looking up Wozniak's phone number in the directory. Needless to say, it probably disrupted a lot of innocent people's lives. The carnage of contests, oh, the carnage.

It really wasn't that hard. As we said in the rules, all information was at one time or another publicly available if you knew where to look.

He Looked, He Wrote, He Entered, He Won. Brian Fleming (Los Altos, CA) knew where to look. Fleming's research skills helped him answer all but two questions correctly, which won him all of $100 in prizes. He says

ALL NEW GAMES FROM PENGUIN!

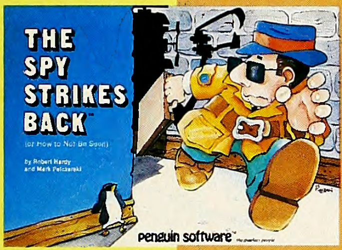
Minit Man™ by Greg Malone

When the first wave of robots hit the bridge you were having lunch. By the time you climbed into your chopper and reached the gorge, the damage was done! The bridge was shattered. That was about the time the radio started squawking about incoming missiles.

Your silos are empty, awaiting three interceptor missiles that had just been prepared for launching. Unfortunately, they are loaded on trains on the other side of the gorge, unable to get across the damaged bridge. Your job is to repair the damage and set the launch computer.

Simultaneously, the enemy's robots have penetrated the building complex in an attempt to sabotage the computer. If you don't stop them, saving the bridge would be pointless.

Available on Apple disk. **Only $19.95**



The Spy Strikes Back™

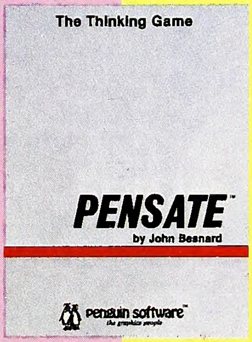
(or How to Not Be Seen) by Robert Hardy and Mark Pelczarski

The spy is back! Once again wit and stealth are the tools of his trade as he attempts to thwart an international terrorist's threat to blackmail the world community. Can you aid him in his efforts to evade the patrolling electronic guards, while searching the myriad rooms of a five-story castle, rounding up the clues needed to locate Dr. X's nuclear laboratory?

Colorful graphics, great sound, and real-time action make this new game maddeningly addictive!

Available on Apple disk,
Atari 32K disk and 24K cassette. **Only $19.95**

PENSATE™ The Thinking Game by John Besnard



A thinking game of evasion, Pensate is an original in the board game genre. The object is to get to the top of an 8x8 grid while avoiding all other playing pieces. The computer has 10 types of pieces each of which moves in a pattern relative to the player's move. The higher the round, the more pieces on the board. Pensate features both one- and two-player modes and players can plot one to four moves ahead. There is a practice option in addition to tournament play. If you lose, you can watch an instant replay or even play the same game over.

Available on Apple disk. **Only $19.95**

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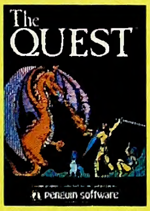

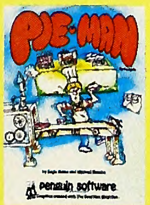

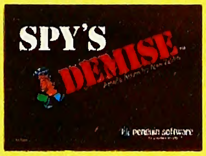

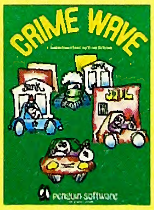

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Atari is a trademark of Atari, Inc. Apple is a trademark of Apple Computer, Inc. Penguins are prone to blissful waddling.

he's going to blow it all on part of a Sweet Micro Systems Mockingboard, which he'll pick up at his local store, Mission Computer Center.

It seems that one of the reasons some people enter these contests is just to get their names printed in this section of the magazine. Witness one entry we received that included the following note.

"When I forgot to double-space my *Why Not Kumquat?* entry, I became angry. When I forgot to send in my correct count of 349 turkeys, I had a mental breakdown. Not this time! I hope you realize I want my name to appear in *Softalk*, even if it means embarrassment. I'm desperate for attention! Please notice my smart-alecky answers."

Whoever you are, you forgot to include your name with your entry. Them's the breaks.

Resourcefulness was the key to this contest. Some contestants' references even included the corporate librarians at Apple. Larry Glisson and Glenn Parrish (Fort Lauderdale, FL) went straight to the source, the Woz himself. "We got the answers to some of the questions from Steve Wozniak (even better than interviewing Steve Jobs!)," they wrote. "If you wish to call him, his phone number is (408) 946-PQRS. Don't print the number, he doesn't want publicity! Please!"

Killer Questions. Question twenty-seven seemed to stump a few people. One person informed us that Amy Doaks is "Mr. Doaks's daughter." Tom Lullo (Naperville, IL) guessed "Amy Doaks is Steve Wozniak's fiancee. If this guess is right, tell Steve 'Congrats' for me." If Lullo's guess is right, somebody should tell Wozniak's wife, Candi.

What color feet does the blue horse have? Well, we don't know of too many blue horses; the horse on the cover of the June issue was an off-white color, and you couldn't see its feet anyway. The answer to this one was found in the *Applesoft Tutorial* on pages 85 and 104 for the II Plus and IIe respectively. It didn't matter to David Tseng (Marlboro, NJ), who let us know very concisely that "horses have hooves, not feet." Touche.

Did everyone find Richard Shacklock's sixteenth-century poem? Here's what Kevin Eanes (Fresno, CA) sent us:

"I once had a machyne called 'The Computer.'
It was a perfeckt devyce—a real beaut, sir.
But I lefte my Apple to lye
And my wyfe used it in a pye.
There was only one thing to do: scolde her."

"If you haven't guessed," Eanes added, "I don't know the answer to this question, I hate poetry, I never heard of Richard Shacklock, and I wasn't around in 1565!"

The essay question was just for fun—a big chance for people to get their names mentioned here for coming up with imaginative answers. Unfortunately, not too many people decided to have that much fun with it. Most essays explaining why the Apple is the best darn personal computer in the universe sounded like this: "It's versatile; it has more software available for it than any other; it's expandable; it's the one I have; it just is; it's a good bargain for the money. . . ."

Boring.

Contest winner Fleming decided his own reasons were unimportant. "Why is Apple the best darn personal computer in the universe? It seems quite unnecessary to make up reasons to support the statement when so many have said it so well:

'The best stands out'—Howard Software Services

'Dollar for dollar, feature for feature, nothing else even comes close!'—Sierra On-Line

'Ya gotta have one'—Sweet Micro Systems

'Penguins say frnk, frnk'—Penguin Software

"The above statements speak for themselves."

Aaron and Ben Lanterman (Bridgeton, MD) answered the essay question best by stating simply that "no one can afford a Lisa." Good answer, but try telling that to the back-ordered Lisa division at Apple.

One of the questions that caused the most confusion was number eight, the date the first Apple II was made available to the public. The correct answer to this question depended on whom you asked. The official correct answer was May 10, 1977. According to Phil Roybal, Apple's product marketing manager, Europe, and former corporate communications manager, this was the date it was available for *purchase*, hence publicly available.

However, the Apple II was *introduced* to the public at the First West Coast Computer Faire. This is where it gets messy. According to Apple's calendar, this all happened on April 20, 1977. But Jim Warren, boss of bosses at Computer Faire, the Faire's sponsor, says Apple is lying; in his diary, the West Coast Computer Faire took place April 15–17, 1977. You just can't take anybody's word anymore. So, if your answer was any of these three dates, you're in good shape.

As a closing note, here's what Richard Winslow (Wheatland, WY) had to say about the contest: "While I'll probably not win, at least I've had some fun, met some people, and learned something more about my Apple."

Isn't that what it's all about anyway?

An End to This Limerick Madness. Funny thing about voting. No matter who wins, almost nobody is satisfied. Presidential elections, legislation, World Series most valuable players, limerick contests.

The only person who'll be satisfied with the outcome of this contest is Sonia Kantor (Palo Alto, CA), whose limerick received the most votes and won by a landslide. It wasn't even a close race. Her limerick was number four, which ended with "Hugh, let Pa curd the whey" (hidden name: Hewlett-Packard).

Kantor wins the long-awaited $100 in fabulous gift items for her Apple, which, no doubt, son Jason will help pick out. Jason Kantor, the contest-winners faithful will remember, was crowned *Softalk* Slob of the Month back in May for having submitted his Puns 'n' Anagrams entry with torn and frayed edges,

smeared ink, grease stains, and other grimy marks. Since then, that title has been revoked, and all rights and privileges that go with it have been canceled. Sonia Kantor explains:

"Jason was kind of upset at first, because it wasn't all his fault. We would all work on the puzzle after dinner just about every night, and it was my husband who made most of the mess." Only after some school chums remarked to Jason that they had seen his name in *Softalk* did the former Slob of the Month realize it wasn't such a bad deal after all.

Lessons like this are always learned too late, and such is the case for Jason. The Slob of the Month for May has now been defaulted to his father, Robert.

Winning a contest always involves a bit of talent, luck, and a little strategy. In the case of the Limerick contest, it involved a lot of strategy. See, just as in real-life stuff like political elections, there's always the matter of who should have won, who wanted badly to win, and who did win. Kantor did win, that much is certain. But how she did it is another story.

The voting looked more like the petitioning process for Dr. Demento's Top Ten than it did a civil democratic event. Votes came in for every limerick, but in the final analysis it wasn't a question of which limerick was the best written or the most popular, but rather who could round up the most people to send in a post card with a number written on it.

All but four of Kantor's votes came from her home-town area of Palo Alto. At first, the contest staff was stumped. "She sure has a lot of neighbors," remarked one vote counter. "Either that or she's holding a lot of Palo Altoans hostage," added another.

It was neither case.

As Kantor tells it, all the votes came in from students of her English as a Second Language class. The limericks were given to the students (or so we were told), and they were to vote for limerick number four "if they wanted to pass the class." Well, that's one way to campaign for votes, and it doesn't seem too different from the way things work in Congress.

Congratulations are in order to Kantor for going beyond her job duties of teaching the English language and teaching the true American way as well. Hurrah.

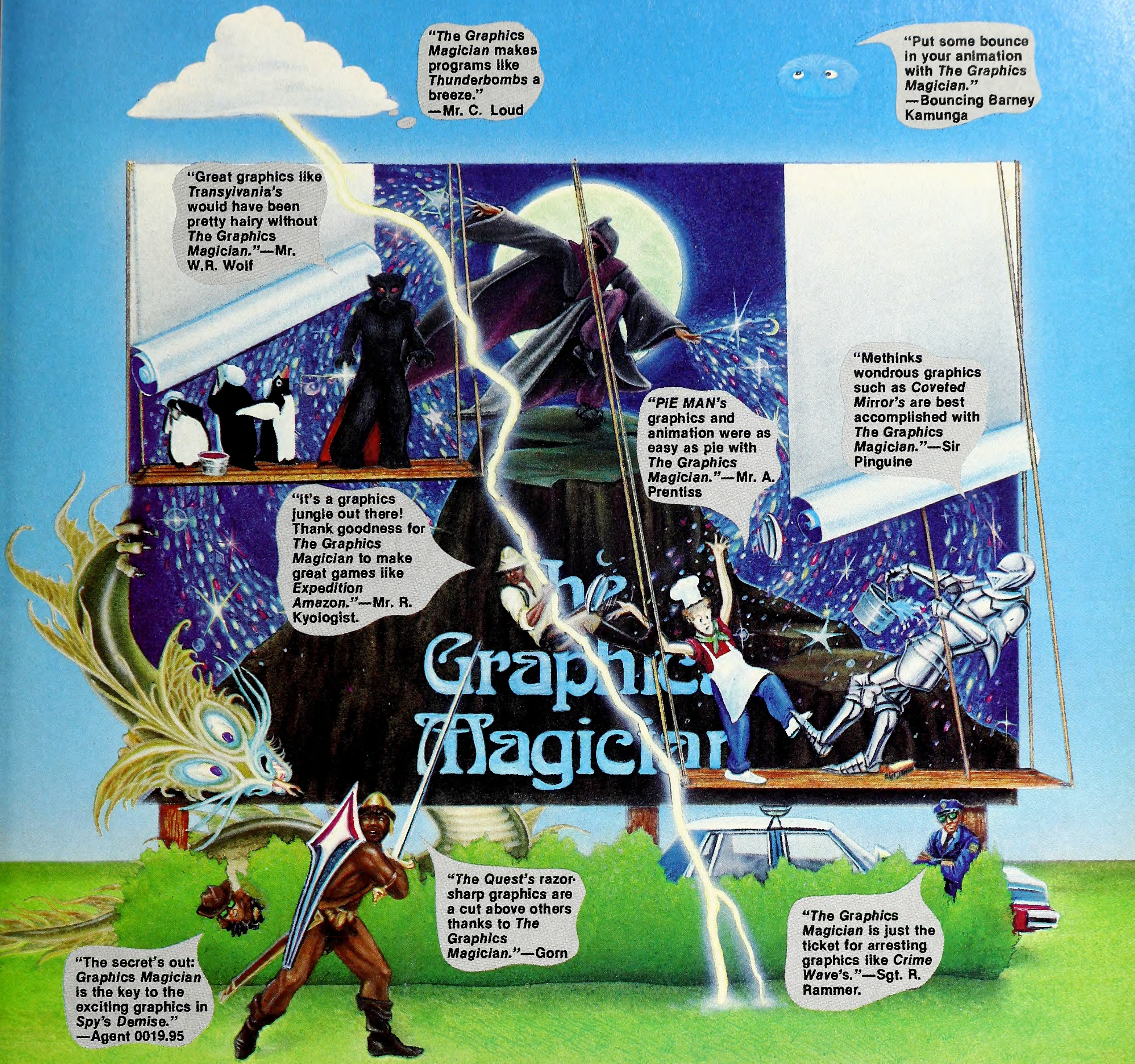
For each devious action, there is an equal and opposite reaction. Sort of. When it came time to draw from the pile of cards that voted for limerick number four in order to award the $50 voters' prize, the card that emerged was one of the four that didn't come from Palo Alto. It was one of three that came from Milwaukee, Wisconsin. At least this winner wasn't one of Kantor's Kommandos. So we thought.

No, Ellen Lang (Milwaukee, WI) isn't one of Kantor's English students. She's a sister-in-law. Nepotism, nepotism. Lang doesn't have an Apple, so she really had no use for $50 in software. Instead, she's taking the cash and will "put it toward our trip to Europe." That ought to buy her enough airplane fare to get about six miles over the Atlantic.

Who Should Have Won. Apparently, the

GOTO page 299

The Best is Better!



The best tool for creating animation and pictures for your own programs is now even better. The brand new, updated version is now easier to use, and features more comprehensive editing features, the ability to mix text and graphics anywhere on the screen, and even faster, smoother animation than before. The new *Graphics Magician* comes boxed with an all-new manual chock full of examples and sample program listings. To receive the updated version, current owners should return their master disk and manual along with $15 to Penguin Software, and we'll rush the new package to you.

For other testimonials, look for products from Sierra On-Line, Sir-Tech, Mattel Electronics, Datamost, Adventure International, Sentient Software, Software Productions, Scholastic, and others that use *The Graphics Magician*.

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FASTALK

Fastalk is a quick guide to popular, specialized, new, and classic software. When you need a particular kind of program or just want to see what's new, Fastalk is the place to look for fast answers.

If a program has been reviewed in *Softalk*, it carries the issue date of the review in italics at the end of its listing, and the capsule description given reflects the published review.

A new software entry, which must be of professional quality to be included, is designated by a check mark preceding its name. A new entry loses its check mark after its first appearance and drops out of Fastalk after one to three appearances (depending on genre) if it fails to gain popularity.

A bullet preceding a title indicates a program that *Softalk* has designated as a classic, based on its ability to stand up over time, its significance for its time (breaking new ground or introducing a new genre), or its archetypal qualities.

Other entries in Fastalk are there either by virtue of current activity (the programs are selling at least as much as the least-selling entry on any of the bestseller charts) or because they are representative of the best of programs for a special interest or need (such as card games or non-Basic-specific language terminal programs).

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

Adventure

Adventuresome story games in which players must deduce commands, make maps, and solve logical puzzles.

● **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 St., Logan, UT 84321. $10.

Critical Mass. Blauschild. Rungistanian author's next adventure; more colorful graphics, sophisticated and challenging puzzles. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95. *7/83.*

● **Cyborg.** Berlyn. Text adventure with brief action skill game hidden in plot. As a futuristic part man, part robot, you're lost in a strange forest, desperately needing food and power. At its release, in its realism and use of true plot, *Cyborg* represented one of the most significant advances in adventuring since the original *Adventure.* Sentient, Box 4929, Aspen, CO 81612. $32.95. *11/81.*

The Dark Crystal. Williams. Hi-res adaptation of fantasy movie. New puzzles challenge even those who've seen the movie. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $39.95. *4/83.*

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

Death in the Caribbean. Hess. Lush graphic adventure features a huge maze, mischievous ghost, pirate treasure. Well worth it. Micro Lab, 2699 Skokie Valley Rd., Highland Park, IL 60035. $35.

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. Two-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. The king has offered half his kingdom to the one who will bring back the kidnapped princess. Cross mountains, deserts; battle the wizard to claim your reward. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $32.95. *11/80.*

Kabul Spy. Wilson. Cold War espionage adventure in which you must slip into Afghanistan to rescue a physicist before the commies make him talk. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $34.95.

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, 12503 Bell-Red Rd., #200, Bellevue, WA 98005. $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 International, Box 3435, Longwood, FL 32750. $29.95 each. *7/82.*

Serpent's Star. Anson, Clark, Franks, Ormsby. Mac Steele searches the Himalayas for a legendary sapphire in *Mask of the Sun* sequel. Traps are less obvious. Delightful glimpse of a faraway mystical land. Ultrasoft, 12503 Bell-Red Rd., #200, Bellevue, WA 98005. $39.95. *4/83.*

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. *3/83.*

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. Superior puzzles. Infocom, 55 Wheeler St., Cambridge, MA 02138. $39.95. *11/82.*

Suspended. Berlyn. Well-plotted adventure demands control of six independent robots who can act simultaneously. Intelligent, challenging exercise in logic. A milestone. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95. *4/83.*

● **Swordthrust Series.** Set of adventures, seven so far, that integrate fantasy role playing. Create one character, make friends in each new 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.*

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. *6/81.*

Witness. Galley. It's 1938, a society woman is dead, the killer is loose and may strike again. You have 12 hours to figure out whodunit before someone else takes the deep six. It may be you. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95. *7/83.*

● **Zork I, II, III.** Blank, Lebling. Text lives! Three masterpieces of logic and grand adventure to revel in. Hard, logical puzzles with erudite parser that understands complete compound sentences and questions, has amazing vocabulary. *I* and *II* use standard scoring, standard goals; *III* has unique point system, and benevolence pays. Infocom, 55 Wheeler St., Cambridge, MA 02138. $39.95. *Zork I, 6/81*; *Zork II, 3/82*; *Zork III, 9/82.*

Business

Accounting Plus II and **IIe.** *II* version is integrated package; general ledger, accounts receivable and payable, and inventory-purchasing modules. Menu-driven; prompting. *IIe* version is stripped and rebuilt to take advantage of available functions. Software Dimensions, 6371 Auburn Blvd., Citrus Heights, CA 95610. *II*, $1,250; *IIe*, $995.

Apple II Business Graphics. Converts numerical data into charts and graphs. Features mathematical and statistical functions. Requires 64K. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $175.

BPI System. Popular six-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.

Bulk Mailer. Marinello. Hard disk mailer handles 32,000 names, retrieves a name by account number in two seconds. Floppy disk handles 1,200 names per disk. Includes zip code inventory, duplicate entry killer. A technical and functional advance. Satori Software, 5507 N. Woodlawn, Seattle, WA 98103. Floppy disk, $125; hard disk, $350. *6/83.*

Cdex Training for VisiCalc. Brandt. Self-contained Apple-assisted training program and reference guide for the #1 electronic spreadsheet. User-selectable information. Cdex, 5050 El Camino Rd., Los Altos, CA 94022. $49.95. *3/83.*

✓ **Compuquote.** Cost estimation and price-quoting system that allows user to update, inflate or discount prices, figure costs based upon labor and materials. Includes light pen for most data entry. Peripheral Visions, 5285 Elam Young Pkwy., B400, Hillsboro, OR 97123. $275.

The Data Bank. Garner, Flowers. Database management system for nonprogrammers. Generates mail lists, client files, letter files, checkbook records, student records, patient records, and recipes. FlowerSoft, 564 Tara, Manteca, CA 95336. $170.

The Data Factory. Passauer. Database management system allows users to list files, get file statistics, select another file, transfer records to new database, and add fields to update forms. Disk swapping required; excellent product overall. Several compatible products available. Micro Lab, 2699 Skokie Valley Rd., Highland Park, IL 60035. $150. *8/81.*

dBase II. Speedy relational database-management system. Requires CP/M. 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 #1 and **Utility Pak #2.** Compatible with version III. Translates DB files to Apple text, restructures existing files, replicates and merges, and recovers crashed files. *Pak #2* includes label printer, global editor, file merge, reblocker, and forms printer. Stoneware, 50 Belvedere St., San Rafael, CA 94901. $99 each.

FCM. Schoenburg, Pollack. Formerly *First Class Mail.* Fantastically user-friendly program for specialized database applications. Twelve fields, ability to 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. Current version supports IIe and 80-column card at no extra cost. 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, plus mailing label print and sort. Gives 80-column u/lc display automatically on the IIe, with 64K, 80-column card on the II Plus. Business Solutions, 60 E. Main St., Kings Park, NY 11754. $129. *8/82.*

InfoStar. Hajicek, Collier, Rubinstein. Database management for nonprogrammers. Maintains updates, generates simple or customized reports. MicroPro, 33 San Pablo Ave., San Rafael, CA 94903. $495.

Invoice File. Zornes. Template for *DB Master* generates reports sorted by invoice number, customer number, customer name, and product description. Includes instructions for creating customized reports; requires minimal knowledge of *DB Master.* Phoenix, 64 Lake Zurich Dr., Lake Zurich, IL 60047. $89.95.

Legal Billing. Marinello. Complete billing system for lawyers prints customized statements, aging reports. Includes trust accounts, user-designated codes, automatic interest adder. For up to 200 clients and 4,000 transactions. Satori Software, 5507 N. Woodlawn, Seattle, WA 98103. $350.

Mail Merge 3.3. File-merging tool requiring *WordStar 3.3.* Combines files containing names and addresses with files containing letter texts. Personalizes form letters with specialized salutation and closing. MicroPro, 33 San Pablo Ave., San Rafael, CA 94903. $250.

MagiCalc. Graves. Electronic spreadsheet with automatic page formatting and support of additional memory boards up to 512K. Compatible with *VisiCalc* and *Magic Window II.* Artsci, 5547 Satsuma Ave., North Hollywood, CA 91601. $149.95.

Money Street. Checkbook financial system for small business, office, or home use. Keeps books, tracks deductions, helps cut expenses. CTS, Box 4845, Incline Village, NV 89450. $99.95.

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 on the IIe. Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $275.

Payroll. Faulkner. Handles payroll accounting, report generation, and check writing for 300 employees in 15 divisions at Pascal speeds on non-Pascal-equipped Apple computers. Two disk drives required. Broderbund, 1938 4th St., San Rafael, CA 94901. $395.

PFS:File. Page, Roberts. User controls data in totally unstructured database. Up to 32 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 that generates reports, sorts. Fifteen fields; files as long as disk allows. IIe, two disk drives. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $100.

Risk Simulator. Estimates probability distributions related to risk situations, such as automobile maintenance expenses or employer funding of health benefits. Actuarial Microcomputer Software, 3915 Valley Ct., Winston-Salem, NC 27106. $185.

State of the Art General Ledger and **Budget Forecasting Module.** The ledger does 12-period accounting, two-digit subaccounts; handles up to 470 accounts; enters 100 transactions before updating to permanent files. Budget module extends 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. *8/83.*

✓ **Statpro.** Imhof, Hewett, Blue Lakes Software. Complete workstation for data entry, storage manipulation, statistical and graphic analyses. Statistics module contains five sets of analyses: descriptive statistics, regression analyses, analysis of variance, time series analyses, and multivariate analyses. Wadsworth Electronic Publishing, Statler Office Building, 20 Park Plaza, Boston, MA 02116. Thirty-two disks, $1,995.

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 information 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

Apple Link. Jaffe, Pierce. Creates intelligent terminal at receiving end with no additional software. Only modem software known that can transmit *ScreenWriter* text files. Also transmits random-access text files. Computer Applications, 13300 S.W. 108 Street Circle, Miami, FL 33186. $59.95. *8/82.*

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. *7/81.*

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's displayed. Hayes Microcomputer Products, 5835 Peachtree Corners East, Norcross, GA 30092. $99. *9/81.*

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

Softerm. Stricklan. Emulation program makes the Apple II Plus into a look-alike for many other popular CRT terminals, allowing use of programs written for other terminals without programming changes. Also enables access to mainframes, timesharing services, and other Apple computers. Keyboard macros and automatic answerback capabilities. Softronics, 6626 Prince Edward, Memphis, TN 38119. $150.

TermExec. O'Neil. Turns Apple with modem into an intelligent terminal workstation. Features unattended long file capture, 300 or 1200 baud operation, back-scrolling, edited file capture of past terminal sessions from scrolling buffer, full-screen editor, macros, execs. For most modems. Exec Software, 201 Waltham St., Lexington, MA 02173. $79.95.

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 automatic redial, clock calendar, and password protection. Upgrade: difference in price between two packages plus $20 service fee. SSM, 2190 Paragon Dr., San Jose, CA 95131. $89, $149, $275. *9/82.*

VisiTerm. Well-planned, comprehensive. Hi-res sixty-character display; wide range of protocols for sending text. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $129. *9/81.*

Z-Term: The Professional. More than an update. Compatible with a great variety of modems, interface cards, and screen modes. Simple file transfer with

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integrity. Southwestern Data, 10761-E Woodside Ave., Santee, CA 92071. $149.95. *5/81.*

Fantasy

Role-playing games involving characters that develop through experience in adventuresome stories, and whose actions players determine via set commands.

Ali Baba and the Forty Thieves. Smith. Fanciful Arabian Nights role-playing game with a sense of humor. Fresh, fast action, challenging options, and secrets that are a joy to discover. Quality, 6660 Reseda Blvd., #105, Reseda, CA 91335. $32.95. *11/82.*

● **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.*

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.*

Legacy of Llylgamyn. Greenberg, Woodhead. Third scenario in classic *Wizardry* series. To save Llylgamyn, descendants of the adventurers of other *Wizardry* scenarios (requires *Overlord*) must wrest a mystical orb from the dragon L'kbreth. New full-screen dungeon, Lisa-like information screens. Sir-tech, 6 Main St., Ogdensburg, NY 13669. $39.95. *7/83.*

● **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 20 characters, six at a time on expeditions. Gripping game; superbly reproduced. 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 Complete Graphics System. 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.*

Fontrix. Boker, Houston. Character generator creates unlimited number of typefaces, uses them to write on a screen extended 16 times. Extremely significant development in graphics. Data Transforms, 616 Washington St., #106, Denver, CO 80203. $75. *7/83.*

GraForth. Lutus. A graphics language rewritten for maximum speed. Plotting, line, text display, character image, and high-speed 3-D graphics, with variety of colors and drawing options. Includes music synthesizer. Insoft, 10175 S.W. Barbur Blvd., #202-B, Portland, OR 92719. $75. *8/82.*

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 Graphic Solution. Graphics editor and bit-mapping animation system using film-editing techniques. Save hi-res screen as standard DOS file. No programming knowledge necessary. Accent, 3750 Wright Pl., Palo Alto, CA 94306. $149.95. *7/83.*

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.*

✓ **Micro-Illustrator.** Island Graphics. Fun and friendly drawing program for the KoalaPad graphics tablet. Easy to learn and use, compatible with most game software. Koala Technologies, 4962 El Camino Real, #125, Los Altos, CA 94022. $124.95. *7/83.*

Scientific Plotter, Version II. Warme. Plots lab results as line graphs. Choose data format, length and position of axes, error bars; labels anywhere in four orientations. Has standalone utility for creation of slicks and transparencies that allows printing of labels on any hi-res picture. Includes five demos, manual. Interactive Microware, Box 771, State College, PA 16801. $25.

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.*

Home

Bowling Data System. Data Dynamics. Two-disk record-keeping and report-preparation program for infinite number of leagues, up to 40 teams. Weekly recap, season average, more. Rainbow Computing, 9719 Reseda Blvd., Northridge, CA 91324. $149.95.

● **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. *10/81.*

Dow Jones Market Analyzer (formerly *RTR Market Analyzer*). Automatically collects, stores, and updates historical and daily market quotes. Provides technical analysis and plots 18 different types of charts. Dow Jones Software, Box 300, Princeton, NJ 08540. $350.

✓ **Dow Jones Market Manager.** Portfolio management and investment analysis package that acts with News/Retrieval Service. Tracks all purchases and sales, maintains 26 portfolios. Uses tax lot accounting system. Dow Jones Software, Box 300, Princeton, NJ 08540. $299.

Einstein MemoryTrainer. Rubin, Samet. Interactive tutorial with color graphics and gamelike practice sessions teaches methods for remembering names, faces, phone numbers, dates, and lists. Set your own pace, store personal memory techniques. Three disks, user guide included. Einstein, 11340 W. Olympic Blvd., Los Angeles, CA 90064. $89.95.

Family Roots. Professional genealogy database with unlimited-records capability. Unprotected; works with 80-column and u/lc. Extensive documentation. Quinsept, Box 216, Lexington, MA 02173. $185.

Golf League Statistics. McQuinn. Manages, displays, and prints golf league statistics for up to 50 players and 20 teams. Tracks more than 100 statistics for each player in league. Disk Depot, 731 W. Colorado Ave., Colorado Springs, CO 80905. $139.95.

Golf Statistician. Haberle. Helps golfers lower their scores by examining their strengths and weaknesses. GolfSoft, 10333 Balsam Ln., Eden Prairie, MN 55344. $34.95.

Home Accountant. Schoenburg. Thorough, powerful home finance program. Monitors five 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, Apple IIe. Visually oriented computer tutorials with manuals. Cover disks, drives, and peripherals. Models of clarity. Muse, 347 N. Charles St., Baltimore, MD 21201. *Know Your Apple*, $34.95; *Know Your Apple IIe*, $24.95. *Know Your Apple*, *3/83.*

Micro Cookbook. Recipe-management system allows entry and modification; selection of recipes by common ingredients, name, or classification. Calorie and nutrition guide. Virtual Combinatics, Box 755, Rockport, MD 01966. $40. *6/83.*

NFL Scoreboard. Football point-spread prediction system gives probable scores, team performance summary, divisional standings, and season play-off predictions. Can be used season after season. Micro Data, 741 Surrey Dr., Streamwood, IL 60103. $49.95.

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

Power of Words. Funk. Ten interactive word games by the author of the *Reader's Digest*'s "It Pays To Enrich Your Word Power." Humor, graphics, auditory clues demonstrate words and reinforce memory. Funk Vocab-Ware, 4825 Province Line Rd., Princeton, NJ

08540. Two disks, $49.95. *7/83.*

Special Effects. Pelczarski. Artist's graphic package for creating and enhancing computer graphics. With 108 colors, 96 brushes, magnification, and point-by-point editing. Reverse colors, create mirror images, move images. Penguin, 830 4th Ave., Geneva, IL 60134. $39.95. *3/82.*

Tax Mini-Miser. Sunrise. Tax-planning package computes six tax strategies over one year or one strategy up to six years. Starsoft, 4984 El Camino Real, #125, Los Altos, CA 94022. $295.

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. $225. *3/81.*

Think Tank. Idea processor program allows you to see ideas in outline form. Outline can be collapsed to see the big picture or expanded to reveal hidden details. Living Video Text, 450 San Antonio Rd., #56, Palo Alto, CA 94306. $150. *8/83.*

Home-Arcade

Fast-action skill games; may include elements of fantasy.

A.E. Horai. Blast 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**. Suzuki. Monsters in this classic seem to take it personally when you gun down one of their own 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. *9/81.*

The Arcade Machine. Jochumson, Carlston. Step-by-step arcade-game designer—shapes, scoring, sound, and titles. Begin with variations on five games included, then on to your own. Broderbund, 1938 4th St., San Rafael, CA 94901. $59.95. *11/82.*

✓ **Axis Assassin.** Field. Blast-away arcader that gives 3-D perspective of fighting grid; allows bottom-to-top movement. Twenty possible grids, five zones. Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. $35. *7/83.*

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

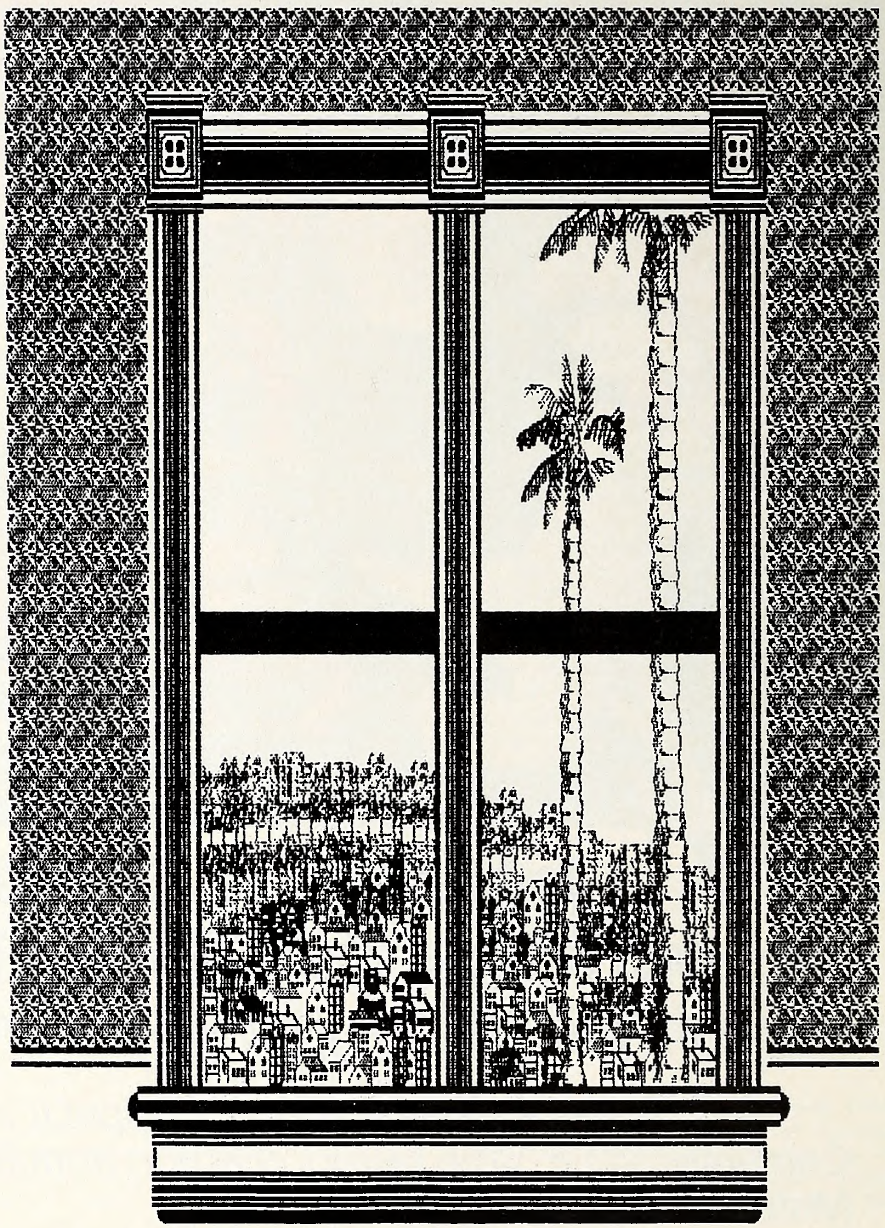
Bandits. Ngo. Fight off waves of multiple menaces intent on stealing your supplies. Delirious nonstop action, animated to the hilt. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $34.95. *7/82.*

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.*

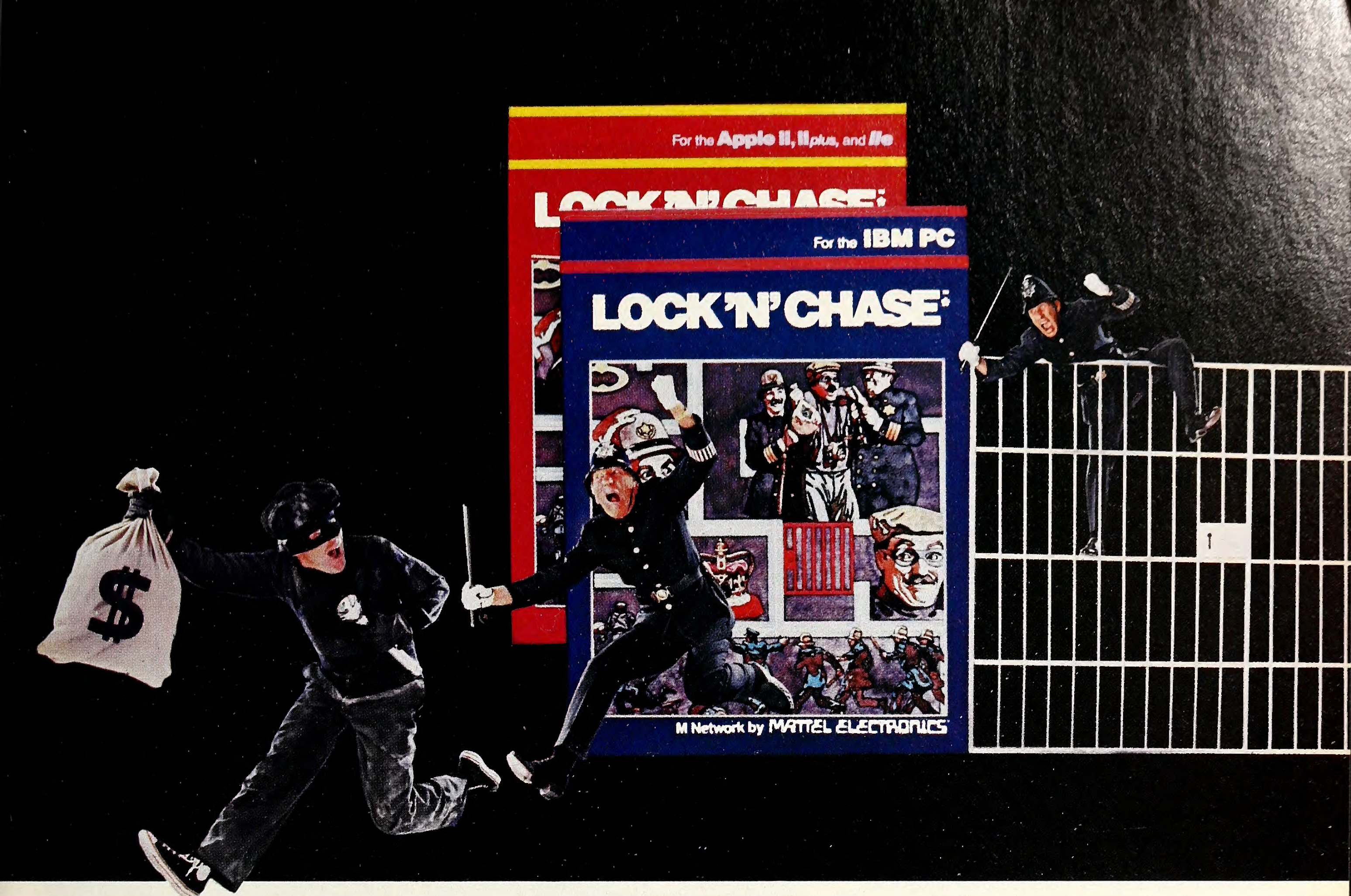
● **Choplifter.** Gorlin. Fly your chopper to rescue 64 hostages, avoiding interceptor jets, homing mines, and tanks. Challenging, realistic, and playful. Stunning graphics. Broderbund, 1938 4th St., San Rafael, CA 94901. $34.95. *7/82.*

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., #210, Renton, WA 98055. $34.95. *10/82.*

● **Crossfire.** Sullivan. Aliens come at you from four directions on a grid laid out like city blocks. Strategy and intense concentration required. Superb, smooth animation of a dozen pieces simultaneously. One of the



Computer art by M. Ramsey



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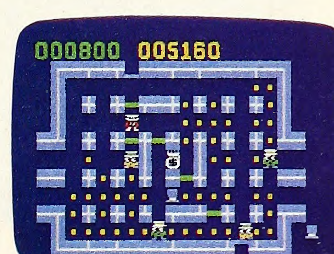

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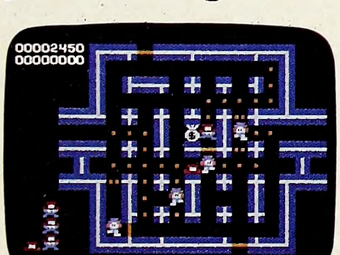

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great ones. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $29.95. *1/82.*

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

Evolution. Mattrick, Sember. Player is the prey in six stages from amoeba to human. Surprise ending isn't fun. Sydney, 600-1385 W. 8th Ave., Vancouver, BC, Canada V6H 3V9. $39.95. *3/83.*

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

● **Gorgon.** Nasir. Fly over planet shooting and dodging invaders and saving kidnapped inhabitants. Outstanding hi-res graphics, challenging refueling sequence. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95. *8/81.*

Hard Hat Mack. Abbott, Alexander. Poor Mack. He must avoid vandals, inspectors, falling rivets, and hungry cement mixers to complete his building. Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. $35. *7/83.*

Highrise. Calabrese. Hard-hat Barnaby needs a keen eye for balance as he uses a springboard to stack oddly shaped blocks and build his skyscraper. Includes a nontiming, nonscoring learning mode. Micro Lab, 2699 Skokie Valley Rd., Highland Park, IL 60035. $30. *5/83.*

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

Lode Runner. Smith. 150 unique levels in super run-climb-dig-jump game—or design your own puzzles, scenes, and setups—in quest to retrieve stolen gold from the Bungeling Empire. Use monkey bars, trap doors, and ladders to your advantage. Broderbund, 1938 4th St., San Rafael, CA 94901. $34.95. *8/83.*

Maze Craze Construction Set. Hammond. Play their mazes or construct your own. Two can enter the same maze. DTI Data Trek, 121 West E St., Encinitas, CA 92024. $39.95. *8/83.*

● **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.*

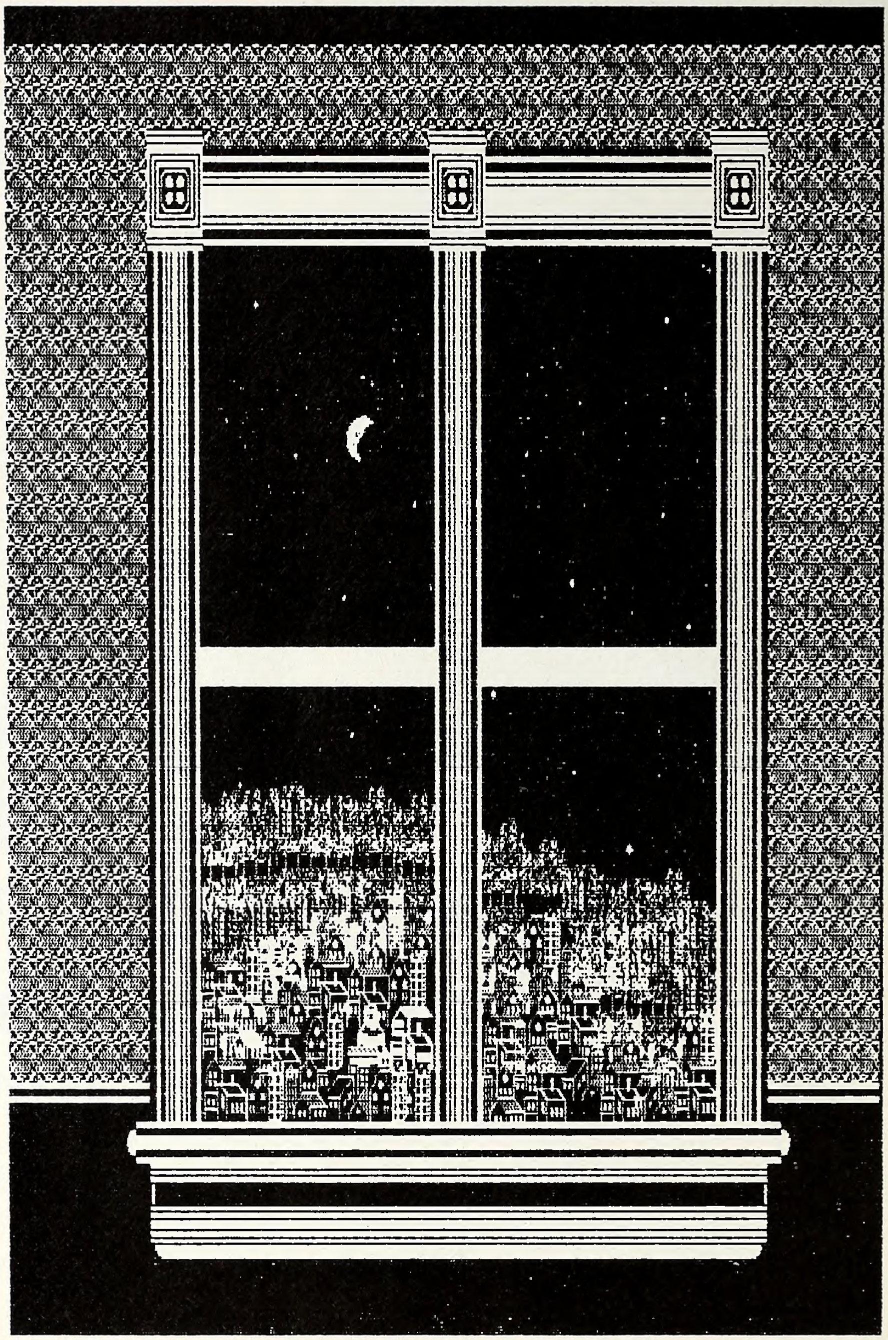
Miner 2049er. Livesay, Hogue. Run, jump, climb, and slide through the mines, reinforcing the groundwork along the way. Elevators, cannons, chutes, and ladders help; mutants don't. Hot stuff, best of the genre. Micro Lab, 2699 Skokie Valley Rd., Highland Park, IL 60035. $39.95. *1/83.*

✓ **Mission: Escape.** Schumann. Rescue the Tweenies from the twelve planets of the Appel System. Armed only with short-range torpedoes, you must pilot a shuttlecraft through an asteroid belt and return the Tweenies to the mother ship. Got it, Jim? MicroSparc, 10 Lewis St., Lincoln, MA 01773. $29.95.

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

Plasmania. Lubar. Shoot your way past antibodies and bacteria as you take a fantastic voyage through the veins of a critically ill patient. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $34.95. *8/83.*

● **Pool 1.5.** Hoffman, St. Germain, Morock. Makes most shots you could on a real pool table, with the



Quark introduces

A deceptively simple solution to your word processing dilemma.

If you're serious about word processing on your Apple*IIe, you may be bewildered by the sheer number of programs available. And a tad perplexed by their claims and promises. After all, a glamorous package that says "easy to use," may not even be easy to open.

The dilemma is real. And Quark is happy to provide the solution.

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Quark's new Word Juggler IIe turns your computer into a dedicated word processor. You get the extraordinary ease of use, sophisticated capabilities and straightforward documentation that make our original Word Juggler a best seller on the Apple III.

For example, there's virtually nothing to memorize. Because principal editing functions are identified on a unique keyboard template — and nineteen, easy-to-install, replacement keycaps.

Changing keys is quick and simple, too. Just slide our special keycap remover over the key — twist — and pull. Your new keycaps can be in place in less than two minutes.

A flexible tool to increase your productivity.

But don't be deceived by Word Juggler IIe's disarming simplicity. The program packs the powerful features you need to quickly perform the most complex editing tasks.

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Word Juggler™ IIe.

you need to print only specific pages, multiple copies, or even documents too large to fit in memory, Word Juggler IIe can easily accommodate you.

A clever way to foil Mr. Murphy.

Even the best of us occasionally forgets when "i" does not come before "e" — and even the most agile fingers can press the wrong key. So you should also give serious consideration to Quark's new Lexicheck™ IIe — a spelling checker with a highly compressed, 50,000 word dictionary.

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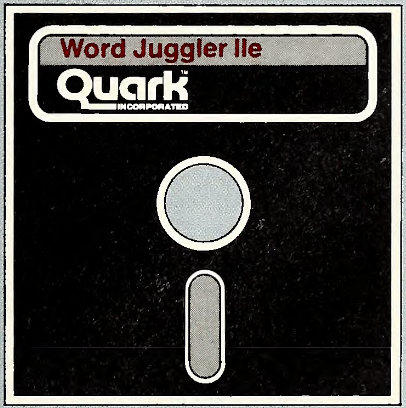
A lot more.

These are only some of the ways Word Juggler IIe and Lexicheck IIe can help solve your word processing dilemma. Your Quark dealer has even more details, as well as complete information on our line of office automation tools for the Apple III.

Ask for a demonstration today.



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Word Juggler IIe $239. sug. U.S. retail price
Lexicheck IIe $129. sug. U.S. retail price

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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.*

Sammy Lightfoot. Schwader. Sammy must dodge a variety of obstacles as he tries out for the circus. He evidently used to be a miner. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $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 Ave., San Rafael, CA 94901. $34.95. *10/82.*

✓ **Sigma 7.** Agranat. As leader of the Sigmonian race, you defend your planet against seven levels of marauding aliens. Bandinelli Software, 1206 Caddo Dr., Opelousas, LA 70570. $19.95.

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 shooting game; one of the best. Stomping sneakers and other creatures requires varying techniques. Fun. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *9/81.*

Spy's Demise. Zeldin, Hardy. 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.*

✓ **Stellar 7.** Slye. It's you against the Arcturan world in 3-D animated arcader. Seven levels, 14 types of enemies to blast in quest of the alien armada. Software Entertainment, 537 Willamette St., Eugene, OR 97401. $34.95.

● **Super Invader.** Hata. Progenitor of home arcades. Still good hi-res, still a challenge. *Softalk* readers' Most Popular Program of 1978-80. Astar International, 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.*

Vindicator. Huey. Mutants, vultures, hatchlings, and other lovelies try to steal eggs in Robotron-like game. Cute dragons. H.A.L. Labs, 4074 Midland Rd., #23, Riverside, CA 92505. $25.

● **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 a breakthrough. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95. *10/82.*

Zaxxon. Garcia. Arcades' 3-D scrolling air raid brought to the Apple with little sacrifice in playability. Datasoft, 16606 Schoenborn St., Sepulveda, CA 91348. $39.95.

Home Education

Algebra 1-4. Sets of learning units progressing from algebraic rules to 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. *Algebra I,* 5/81.

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.

✓ **Arcademic Skill Builders in Language Arts.** Chafin. *Word Invasion, Word Master, Word Radar, Word Man, Verb Viper, Spelling Wiz.* Lots of action and great detailed graphics in arcade-style vocabulary-building games. Comes with teaching package. Developmental Learning Materials, 1 DLM Park, Allen, TX 75002. $44 each. *7/83.*

Arcademic Skill Builders in Math. Chafin, Maxwell. *Alien Addition, Alligator Mix, Demolition Division, Dragon Mix, Meteor Multiplication,* and *Minus Mission.* Arcade action blended with addition, subtraction, multiplication, and division problems. Shooting correct answers to problems gets rid of pesky attackers. Choose speed, difficulty levels, game length. Developmental Learning Materials, 1 DLM Park, Allen, TX 75002. $29.95 each. *7/83.*

Arithmetic Skills. Helps children establish a strong foundation in basic math skills, computer literacy. Covers counting, addition, subtraction, multiplication, and division. Pass-fail ratios can be parent-defined. Edu-Ware, Box 22222, Agoura, CA 91301. $49.95.

✓ **Basic Tutor.** Robinson, Moreno, Courseware Applications. Basic tutorial for beginning programmer. Includes 120-page manual, six disks. SuperSoft, Box 1628, Champaign, IL 61820. $99.

Bumble Games. Six math concept games for ages four to ten. The Learning Co., 545 Middlefield Rd., #170, Menlo Park, CA 94025. $39.95

Bumble Plot. Grimm. Colorful musical introduction to concepts of graphing and plotting. Teaches positive and negative numbers. The Learning Co., 545 Middlefield Rd., #170, Menlo Park, CA 94025. $39.95. *1/83.*

✓ **College Directions.** Flanagan-Margolis, Gardner. Helps up to 20 students choose a college by exploring the features of more than 1,200 colleges. Assists students in developing a strategy for gaining admission. Systems Design Associates, 723 E. Kanawha Blvd., Charleston, WV 25301. $250.

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.

✓ **Computerized Career Assessment and Planning Program.** Hyre. Helps students determine career options through assessment of their interests and abilities; provides information on selected careers. Assists in developing and implementing career plans, includes more than 1,200 job titles. Systems Design Associates, 723 E. Kanawha Blvd., Charleston, WV 25301. $485.

Computer SAT. Prepares college-bound student for admittance test. Diagnoses strengths, weaknesses; creates study plan, exercises. Harcourt Brace Jovanovich, 1250 6th Ave., San Diego, CA 92101. $79.95.

Delta Drawing. Kids can make colorful drawings by using single-key commands. No special talent needed; this one develops programs that create complex graphics. Spinnaker, 215 1st St., Cambridge, MA 02142. $59.95. *11/82.*

Early Games for Young Children. Paulson. Basic training in numbers, letters, Apple keyboard for children ages two to seven with no adult supervision. Has a neat little drawing program. Counterpoint Software, Shelard Plaza N., #140, Minneapolis, MN 55426. $29.95. *11/82.*

Early Games Music. Paulson. Illustrates music with fun and theory. Children compose music and set to graphics or learn note reading and piano keyboard. Counterpoint Software, Shelard Plaza N., #140, Minneapolis, MN 55426. $29.95. *8/83.*

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 patterns. Spinnaker, 215 1st St., Cambridge, MA 02142. $34.95.

Fractions. Hi-res addition, subtraction, multiplication, and division of fractions. With learning manager system. Edu-Ware, Box 22222, Agoura, CA 91301. $49.

Game Show. Guess mystery words from clues given by "celebrity" partners—no threat to Liz Montgomery. Fifteen subjects cover vocabulary, history, algebra, and more. Add topics. Computer-Advanced Ideas, 1442A Walnut St., #341M, Berkeley, CA 94709. $39.

Gertrude's Puzzles. Perl, Grimm, Robinett. A delightful goose helps teach how to figure out situations given incomplete information. Super for developing reasoning skills in ages six through forever. The Learning Co., 545 Middlefield Rd., #170, Menlo Park, CA 94025. $44.95. *2/83.*

Gertrude's Secrets. Gertrude the Goose teaches four-to-nine-year-olds shape and color relationships. Solve logic puzzles, create forms. The Learning Co., 545 Middlefield Rd., #170, Menlo Park, CA 94025. $44.95. *2/83.*

In Search of the Most Amazing Thing. Snyder. Role-playing game lets kids negotiate with aliens, fly hot-air balloon. Ages 10 to adult. Spinnaker, 215 1st St., Cambridge, MA 02142. $44.95. *7/83.*

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.

✓ **Introduction to General Chemistry.** Smith. Seven-disk tutorial with demonstrations and hi-res experiments covers subject matter from simple carbon chains to reactions of carboxylic acids. For college or advanced high school students. COMPress, Box 102, Wentworth, NH 03282. Each disk, $60; set, $350.

Juggle's Rainbow. Nine learning games for prereading tots. Kids can create colorful pictures by using the

keyboard. The Learning Co., 545 Middlefield Rd., #170, Menlo Park, CA 94025. $29.95.

Kindercomp. Learning exercises for ages three through eight. Spinnaker, 215 1st St., Cambridge, MA 02142. $29.95.

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.*

Latin Hangman. Protelsch. Three games test your knowledge of Latin. Famous sayings, English-Latin, Latin-English translations. George Earl, 1302 S. General McMullen, San Antonio, TX 78237. Two-sided disk, $29.95.

Learning about Numbers. Clark, Cornelius. Three games teach children basic math skills, counting, and how to tell time. Includes special feature for prereaders. C&C Software, 5713 Kentford Circle, Wichita, KS 67220. $40. *8/83.*

✓ **Master Match.** Robbins. Matching game with a TV quiz show format. Designed to enhance memory, teach vocabulary and concepts. For one or two players. Additional subject disks include *Basic Skills*, *Science and Math*, *Math and Social Studies*, and foreign language. Computer-Advanced Ideas, 1442-A Walnut St., #341, Berkeley, CA 94709. $39.95; additional subject disks, $19.95.

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

Micro Math Magic. Courseware series instructs students in basic math, decimals, rounding, fractions, making change, geometry, and word problems. Reinforces immediately, gives score and time taken to solve problem. Deegan Learning Materials, Box 245, Mankato, MN 56001. $32.95, disk; set of 12, $395.40.

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.*

✓ **Money Manager.** Chap, Sidewater. Personal finance simulation for elementary or secondary school children teaches good financial management. Can also be played as an educational strategy game. Computer Age Education, Box 6227, Washington, DC 20015. $29.95.

✓ **Moptown.** Two appealing and educational games require children to arrange Moppet characters in imaginary Moptown. *Moptown Parade* teaches logic, strategy development, and pattern recognition for ages six to ten. *Moptown Hotel* teaches use of analogies, strategic thinking, and sequential reasoning for ages nine and up. The Learning Co., 545 Middlefield Rd., #170, Menlo Park, CA 94025. $39.95 each.

Multiploy. Coletta. From answer base, blast menacing arithmetic problems out of the sky. Ranks and scores kept for tracking progress. Reston Publishing, 11480 Sunset Hills Rd., Reston, VA 22090. $19.95. *10/82.*

✓ **My First Words.** Introduces preschoolers to beginning reading. Includes instructions on keyboard use. Encyclopaedia Britannica Educational Corp., 400 S. Edward St., Mt. Prospect, IL 60057. $34.95.

● **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.*

On Becoming a Hero. Nidorf. Nonjudgmental program for teenagers helps them evaluate their value systems, decide what kind of people they are and what kind of people they want to be. Psychological Psoftware, 4757 Sun Valley Rd., Del Mar, CA 92014. $29.50.

✓ **PFS: School Record Keeper.** Larson. Thirty different forms and reports to aid school administrators in student record management, equipment management, budget control, and room and events scheduling. *PFS:Report* and *PFS:File* required. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $150.

✓ **Plato Decimals.** Arcade-style decimal tutorial that automatically adjusts difficulty to child's performance. For elementary math students. Control Data, Box 261127, San Diego, CA 92126. $45.

✓ **Plato Fractions.** Correct use of fractions breaks balloons in elementary-school-level tutorial. Features automatic adjustment of difficulty level. Control Data, Box 261127, San Diego, CA 92126. $45.

Plato High School Skills. Helps high-school-level students master reading, English, math, social studies, science, and computers. Can assist students preparing for the GED exams. Control Data, Box 261127, San Diego, CA 92126. Each lesson, $45.

PSAT Word Attack Skills. Priven. Teaches vocabulary and techniques for deciphering unfamiliar words in pressured testing situation. Edu-Ware, Box 22222, Agoura, CA 91301. $49.

Rhymes and Riddles. Cross. Four games to teach reading and spelling to elementary school children. Fill in the blanks with the necessary phrase. Spinnaker, 215 1st St., Cambridge, MA 02142. $29.95.

Rocky's Boots. Robinett, Grimm. 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., 545 Middlefield Rd., #170, Menlo Park, CA 94025. $49.95. *2/83.*

SAT Word Attack Skills. Priven. Teaches college-bound students testing skills, vocabulary, and methods of deciphering unfamiliar words. Edu-Ware, Box 22222, Agoura, CA 91301. $49.

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, 215 1st St., Cambridge, MA 02142. $44.95 each. *9/82.*

Speed Reader II. Davidson, Eckert. Six-part reading program develops reading efficiency, tests reading rate, and provides 35 reading selections. Contains comprehension quizzes, editor for entering additional material. Davidson & Associates, 6069 Groveoak Pl., #12, Rancho Palos Verdes, CA 90274. Two disks, $69.95.

Spelling Bee Games. Hi-res games strengthen eye-hand coordination, memory, motor skills. Word lists include shapes, animals, more. Edu-Ware, Box 22222, Agoura, CA 91301. $29.95. *5/83.*

Spelling Builder. Victor. Unique set of eight programs and audio cassette teaches students and adults reasons behind spelling; overcomes spelling difficulties. Ideal for those who have mastered basic spelling but have trouble with tricky words. Superior. Program Design, 11 Idar Ct., Greenwich, CT 06830. $26.95. *5/81.*

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.

✓ **Square Pairs.** Kleiman, Minsuk. Matching games for ages seven through twelve. Includes feature for creating your own games. Scholastic, 906 Sylvan Ave., Box 2010, Englewood Cliffs, NJ 07632. $39.95.

Step by Step Two. Introduces graduates of *The New Step by Step* to intermediate Basic programming. Teaches peek and poke, hexadecimal numbers, concatenations, and more. Program Design, 11 Idar Ct., Greenwich, CT 06830. $89.95. *7/83.*

Stickybear. Hefter, Worthington, Rice, Howe. 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. In *Stickybear Bop*, ducks, planets, and balloons bop across screen in three shooting galleries. For all ages. Xerox Education/Weekly Reader, 245 Long Hill Rd., Middletown, CT 06457. $39.95 each. *5/83.*

Story Machine. Helps develop positive attitude toward

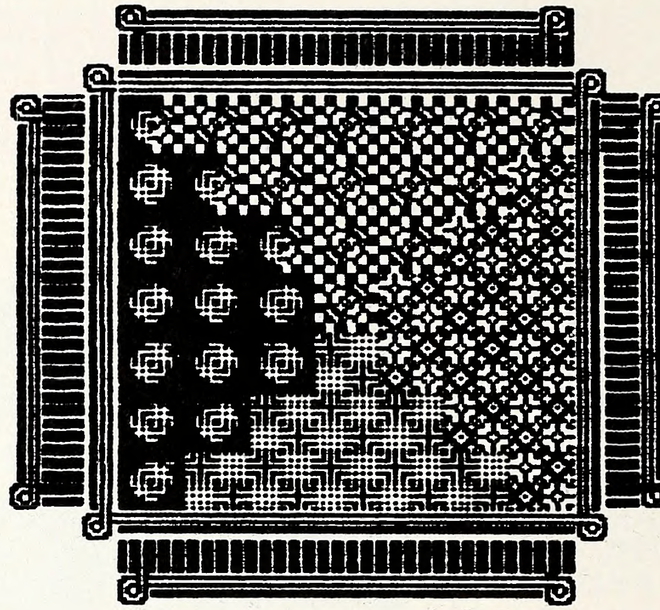
writing and ability to write correctly. Words come to life when sentence is acted out on-screen. Kids five to nine love to type "The tree ran down the street" and see it do so. Spinnaker, 215 1st St., Cambridge, MA 02142. $34.95.

Tic Tac Show. Teaches facts and concepts about the world in general. Solo or double play; add topics. Computer Advanced Ideas, 1442A Walnut St., #341M, Berkeley, CA 94709. $39.95.

Troll's Tale. Lowe, MacChesney. Kids must find the treasures taken by the terrible troll and restore them to the dwarf king. Third-grade reading level. A delight. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $29.95. *5/83.*

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

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



Strategy

Thinking, planning, plotting games, from war games to backgammon to cards.

Bomb Alley. Grigsby, Billings. Detailed re-creation of 1942 Mediterranean naval and air war, including critical supply problems. Full scenario and two short scenarios. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $59.95. *3/83.*

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 Ambush.** Williger. Gutty soldier-to-soldier street fighting in World War II France. Latest version is 40 times faster than the original, which was one of best games ever created for Apple, except for slowness. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $59.95.

● **Computer Baseball.** Merrow, Avery. Simulates individual player abilities from the teams of 13 famous World Series. Enter and play teams of your own creation. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $39.95. *9/81.*

Cosmic Balance II. Murray. Design your own ships and create your own space fleet. Tactical space game that's fast and easy to play. Strategic Simulations, 883 Stierlin Rd., A-200, 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.

Galaxy Space War 1. Tarkany. Space-war simulation with two modes. Total knowledge tells all about opponent's fleet; sensor knowledge gives only information detected by ship's probes. Galaxy, Box 22072, San Diego, CA 92122. $39.95.

✓ **Geopolitique 1990.** Ketchledge, Billings. Diplomatic, economic, and military simulation pits the United States against the Soviet Union in a struggle for world supremacy. Features two phases: global diplomacy and geowar, a simulation of nonnuclear combat. For one player. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $39.95.

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.*

Go. Erwin. Classic Oriental territory game in hi-res. Surround your opponents before they surround you. Play in solitaire or bihuman mode. Hayden, 600 Suffolk St., Lowell, MA 01835. $34.95.

Hi-Res Computer Golf 2. A masterpiece; requires judgment, strategy, and visual acuity. One of the few computer sports simulations that require dexterity. Avant-Garde, Box 30160, Eugene, OR 97403. $34.95. *6/83.*

Knights of the Desert. Kroegel, Landrey, Walker. Re-creation of Rommel's World War II drive into North Africa. Struggle to take the Suez as Rommel or to push him back as the British commander. Solitaire play possible. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $39.95. *8/83.*

Microbe. Clardy, Zalta. Detailed tour de force requires shrewd deduction and quick reflexes. Player takes a fantastic voyage inside patient's body in attempt to save him from death. Medically accurate and educational, for one to ten players. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $44.95. *6/83.*

● **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.*

North Atlantic '86. Grigsby. The Soviet Union has seized Europe. NATO has retreated to Iceland. Desperate land-sea-air strategy for one or two players. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $59.95.

Old Ironsides. Rice, Hefter. Delightful program provides simple but excellent hi-res simulation of thundering ship-to-ship combat. Package includes poster and logbook. Xerox Education Publications, 245 Long Hill Rd., Middletown, CT 06058. $39.95. *5/83.*

Pensate. Besnard. Chess-type thinking game with new tactics. Computer's many pieces move in relation to player's piece; each of 10 types of computer piece has unique rules. Makes full use of computer capabilities. Intriguing, progressive, and addictive. Penguin, 830 4th Ave., Geneva, IL 60134. $19.95. *7/83.*

Planetmaster. Cuba. Complex ecological simulation requires player to select six alien endangered species for nurturing. Watchfulness and planning required to protect your animals in an unpredictable environment. Magnetic Harvest, Box 255, Hopkins, SC 29061. $24.95. *8/83.*

Program X, The Ultimate Puzzle. Gips. Extremely challenging cryptography in brain teaser that lives up to its name. National Software, Box 686, Dover, MA 02030. $29.

Rendezvous. Huntress. Space-shuttle simulation in 3-D, created by a 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 great 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.

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.*

Utility

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-disk utility with shape editor, custom type fonts, 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 Pascal. Structured operating system featuring enhancements of color graphics, sound generation, and Apple's I/O features. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $495.

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. *6/82.*

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., #341, Berkeley, CA 94709. $47.50. *3/83.*

David-DOS. Weston. High-speed utility adds 10K additional memory to Apple, supports ROM card. Includes variable speed scrolling, single keystroke catalog, and catalog abort. Copyable. David Data, 12021 Wilshire Blvd., #212C, Los Angeles, CA 90025. $39.95.

Diversi-DOS. Basham. Well-documented, copyable program speeds up disk access, buffers keyboard input. Can be placed on RAM card; sets up RAM card as print buffer. DSR, 5848 Crampton Ct., Rockford, IL 61111. $25. *5/83.*

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.*

Double Take. Simonsen. Multiple-utility features two-way scrolling for catalogs, hex/ASCII dumps. Improved list format. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $34.95.

Einstein Compiler. Goodrow, Einstein. Translates Applesoft programs into machine language for run-time up to 20 times faster. Supports all graphics modes, defined functions, and DOS commands. Einstein, 11340 W. Olympic Blvd., Los Angeles, CA 90064. $129. *5/83.*

EPF IV. Strand. Combines data-management system, Basic editor, and DOS 3.3 System Master. Features automatic insertion of frequently used subroutines, overlay control to maximize program space. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $79.95.

✓ **Font Downloader and Editor.** Kovacs. Enhancement for the Apple Dot Matrix Printer and others teaches printer new fonts and loads them into RAM. Toggles between custom and regular styles, allows creation of new typefaces. Micro-Ware, 1342B Route 23, Butler. NJ 07405. $39.95.

● **Global Program Line Editor.** Enhanced version of *Program Line Editor* with programmable cursor and listing control. Edit line by line or by range of lines and search for strings. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $60. *12/82.*

Merlin. Does assembly language programming with a dozen editing commands and 28 pseudo-ops. Southwestern Data, 10761-E Woodside Ave., Santee, CA 92071. $64.95. *1/83.*

The Pascal Toolkit. Bringhurst. Character generator and image-creator with DOS-to-Pascal conversion of text and pictures. Includes Boolean function keypress. Wize Buys, Box 1588, Orem, UT 84057. $24.95.

Programmer's Workshop. Sixty general-purpose subroutines to integrate into Basic programs. Includes variety of visual and sound effects, math utilities, sorting, input/output subroutines, and screen controls. Hayden Software, 600 Suffolk St., Lowell, MA 08153. $49.95.

ProntoDOS. Weishaar. High-speed disk utility cuts about two-thirds of the time off bload and save functions. Compatible with all DOS commands; frees up to 15 extra sectors per disk. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50.

Sphinx. Software giving single-pass encryption beyond 10 to the 400th power. Crane Hill, Box 273, Gonzalez, FL 32560. $37.50.

● **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 48003. $30. *10/81.*

Tip Disk #1. Kersey. One hundred *Beagle Tip Book* programs on disk. Includes Apple command chart and peeks/pokes chart. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $20.

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 and IIe. Includes WPL (word processing language). Additional functions menu; continuing features and functions menu; continuous readout of characters and length. *IIe* has shift, shift-lock, and tab, four-arrow cursor control, and delete key; data files compatible with *II*. Apple, 20525 Mariani Ave., Cupertino, CA 95014. *II*, $150; *IIe*, $195.

Apple Writer II Preboot. Armstrong, Borgorsen. Allows you to run *Apple Writer II* in 80-column format

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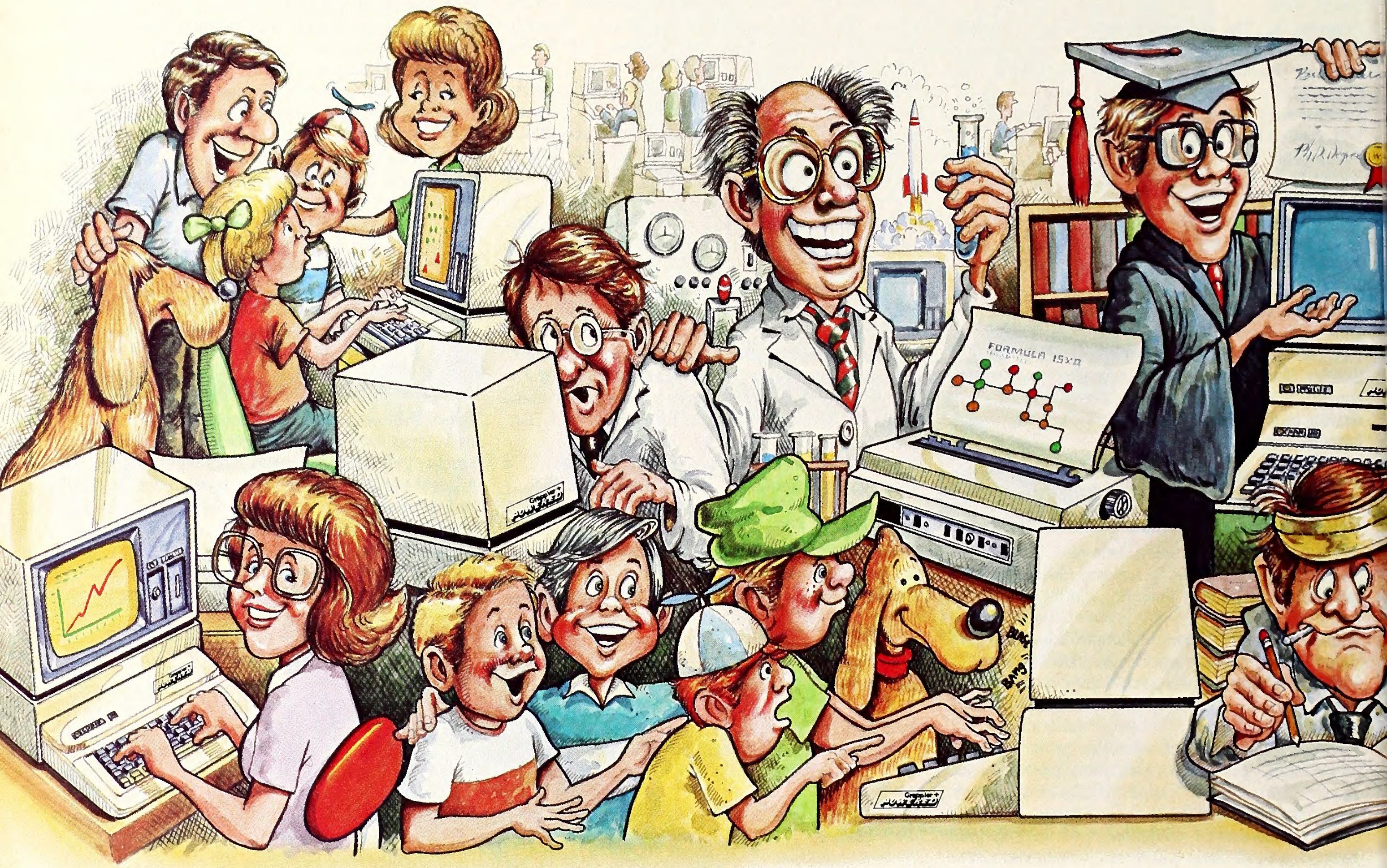

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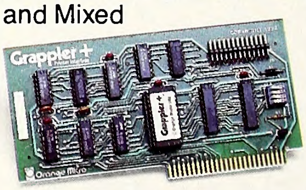

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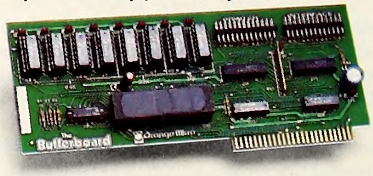

*Versions for standard Grappler +, Epson APL and Apple Parallel Interfaces.

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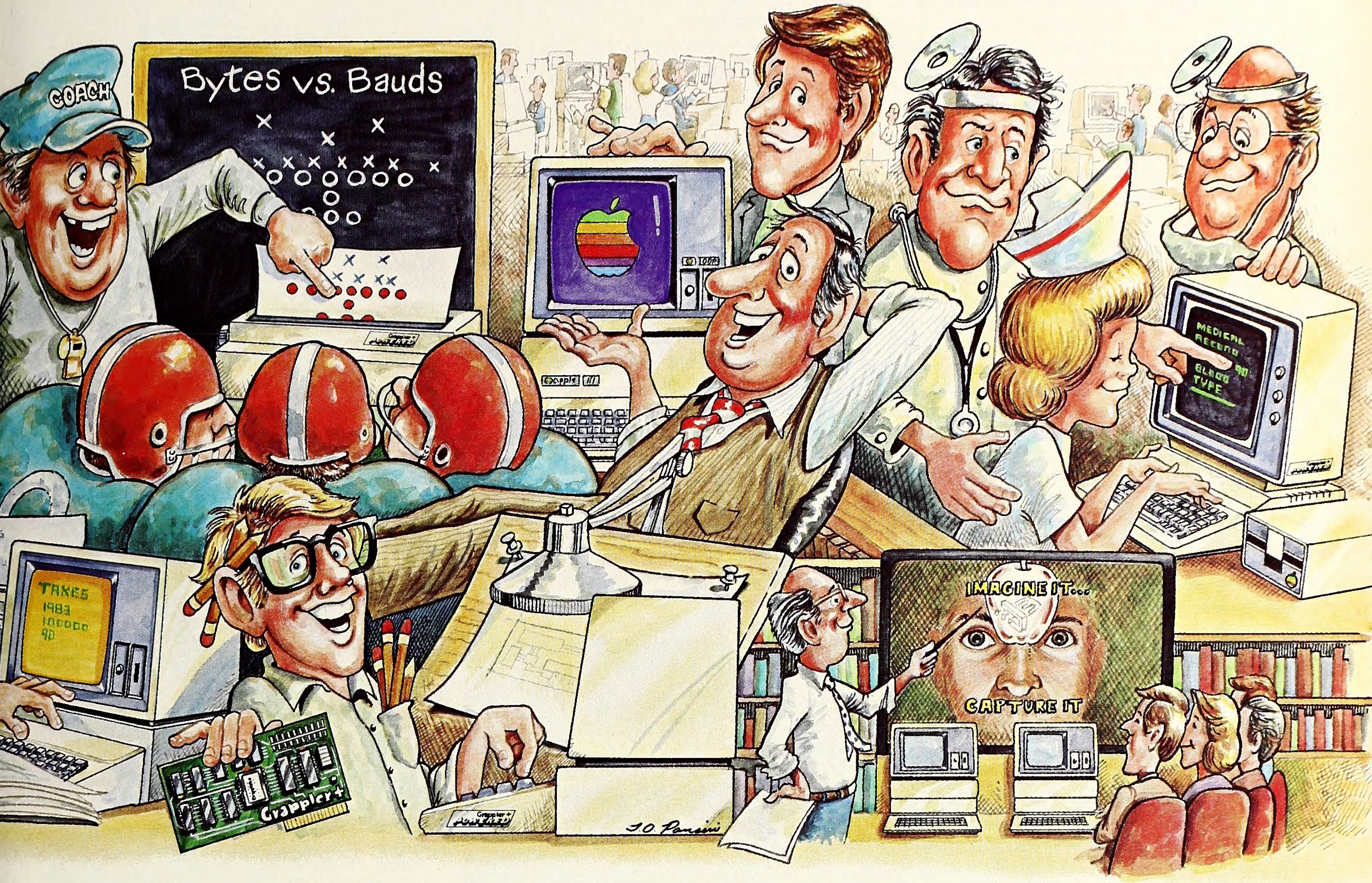

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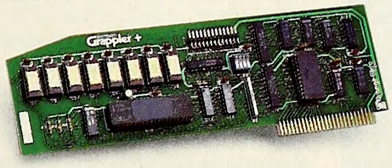

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with the Videoterm 80-column card. Videx, 897 N.W. Grant Ave., Corvallis, OR 97330. $19.

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.*

Format-II, Enhanced Version. Hardwick, Beckmann. Word processor supports all popular 80-column cards, stores up to 50 pages of text on one disk. Includes single keystroke editor, mailing list database; displays text on-screen exactly as it will print out. Compatible with hard disk drives. Kensington Microware, 919 3rd Ave., New York, NY 10022. $150.

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.

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. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $129.95. *1/83.*

● **Sensible Speller.** Hartley. 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. *11/82.*

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. $99. *12/82.*

Word Handler II. Elekman. Simple program with straightforward documentation. Allows folded paper printout for two-sided printing. 80-column with the IIe. 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 word processing features. Considerable extras including optional 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 timesharing and standalone tasks; gives access to remote information services, minis, and mainframes. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $150.

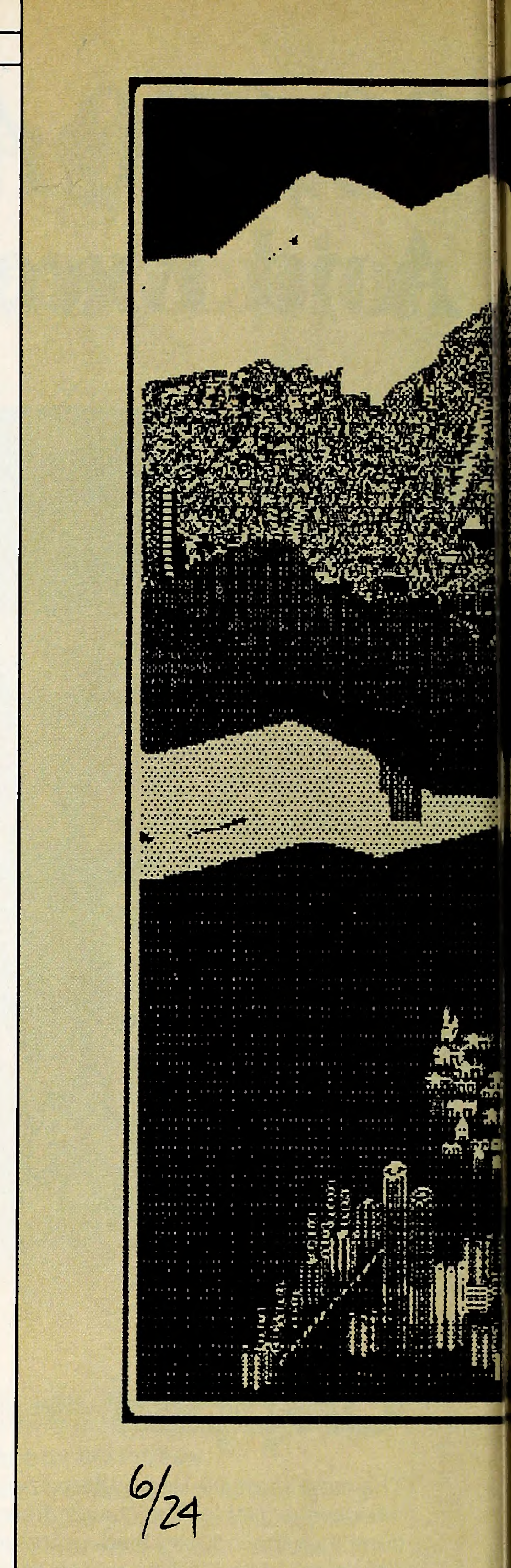
Apple Business Basic. High-level structured programming language. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $125.

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 III Pascal. Program preparer with editor, compiler, disassembler, linker, filer, system library. Features cursor control, text modeling, formatting. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $250.

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.

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



"BIRTHDAY CITY" M. Ramsey

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, 123 N. 15th St., Fargo, ND 58102. $395 to $595 per module.
Inkwell. Wunderlich. Word processor prints documents as they appear on-screen, simulates typewriter or creates form letters from mailing list. Horizontal scrolling allows text up to 155 characters wide. Foxware Products, 2506 W. Midwest Dr., Taylorsville, UT 84118. $185.
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, 1400-A Providence Hwy., Norwood, MA 02062. $99.95.
PFS:File. 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:Graph. Chin, Hill. Works alone or interfaces with *PFS* databases and *VisiCalc* files. Produces bar, line, and pie charts, merging data from several sources. 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 that generates reports, sorts. Fifteen 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* can handle 470 accounts, 100 transactions before updating files. Modules for budget and financial reporting, accounts receivable/payable, and inventory control. 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. *8/83.*
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 viewed on-screen prior to printing; multiple copies printed of selected pages. Quark Engineering, 1433 Williams, #1102, Denver, CO 80218. $295. *12/82.*

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.*

Superstandards

I am prompted to write after spending the better part of a year owning and playing with, as time permits, an Apple II Plus. My play consists of trying to find the all-purpose system for my business. During this process I have read everything I could get my hands on, talked with whomever would respond, and shopped at five or six places here in Tampa. My criteria for such a system are high.

Although I now have a small kaleidoscope-and-stained-glass business, I used to work on mainframe beasts as a social-science consultant. This position meant knowing an excessive amount about relatively nothing (esoteric academese). However, the packages I dealt with were integrated systems featuring high-level language components and reasonably high-level detailed functioning—meaning a little manipulation would get a lot of information and a fair amount of detailed control over analyzing it.

Now I wish to have the all-purpose small-computer complete turnkey business system. Sorry if my criteria are high, but I can't settle for anything less and get the kind of performance that is usable. I refuse to buy into anything less than a single transaction-based system, where I can key in a customer's name once and only once. I don't want to have to add the same name multiple times to a correspondence file, an invoice file, an inventory file, a word processor business card file, or whatever else might be needed. I can't get an improvement in efficiency if I duplicate my paperwork system. I need to condense to a single transaction-based system, that's all.

My criteria are as follows: All components of the system should be readily modifiable and all modules should be integrated, meaning that files be open and accessible to all modules included in the package or written by the user; a high-level language permitting easy modification and module development should be used; the system should entail a database, modules for general ledger, accounts receivable, accounts payable, inventory and point of sale, payroll, word processing and mailing labels, and the ability to communicate with other machines, databases, and files created in other languages; graphics should be an integral part of the word processing features; and, of course, modules should permit easy specification for different types of business.

I offer these criteria as a reference for business-software evaluators, who might consider ranking products along these lines, and for product manufacturers who are welcome to bid, offer, or sell me their products to the extent that they meet these standards. I applaud the efforts made so far. With little money, slow disk drives, and a volatile market, it's a wonder so much exists that is so good. But it's not enough.

Here is a running commentary on some packages I've looked at. *Savvy* ranks quite high on many of my criteria, but it fails because all data and all modules must be keyed in, and it doesn't access any other types of files, databases, or machines. *WordStar*, *dBase II*, and *Mailmerge* rank high, but for me, I figure I might as well buy a Z-80-based machine with all these bundled in, rather than add them to my Apple. I'm not terribly happy with all the Pascal-based stuff, nor am I impressed with Apple Pascal's reliability or the practicality of the p-System transportability. *BPI* and its ilk are too special purpose, and *Multiplan* and *VisiCalc* are cumbersome; nor have I seen applications written for them that do all I'd like.

Doug Johnson, Tampa, FL

A Satisfying Set of Tools

For many years it has been my practice to consider the likelihood of repeated use of any tool I might purchase. For a one-time application I might choose the least expensive tool for the job, but for continued use I choose quality and pay the price. That philosophy has paid off, and today I have a lot of dependable tools.

Not the least of these, by any means, is *dBase II.* I had been looking for software that would handle the paperwork for the small business that my wife and I were running from our home. As a beginning amateur programmer, I was mildly shocked at the idea of learning a new language when I didn't even know Applesoft Basic yet, but it was apparent that *dBase* would do the job.

Things went well for nearly two years, and several people have purchased *dBase* on my recommendation. A few days ago, though, I ran into a problem in building a form on my new IIe. My *dBase* dealer was baffled and so was my Apple dealer. In desperation I called Ashton-Tate, publisher of *dBase.* I was given the number of the company's technical advice staff and was handed over to Kevin Shepherd. Mr. Shepherd understood my problem the first time I went through it. He then led me through an installation patch, which I managed to botch. I called him back the next day and he patiently led me through it again. This time I got it right and everything works now. It was a real comfort to be able to talk to someone who treated me as if I were the only person in the world who had a problem.

Ashton-Tate is to be congratulated for building a first-class organization to support a first-class software package.

David M. Hoban, Fort Worth, TX

On Easy Street

After using a checkbook program called *Money Street* for about a month I just had to tell everyone that it's the best program I have ever seen. I was almost six months into the year when I got *Money Street* and I already had all three of my checking accounts on another program. I really intended to wait until next January to begin using it. After reading the manual and trying out the tutorial, I just couldn't wait. I entered all six months' worth of back checks from all three accounts.

The program has proved that the hype of the *Money Street* ad is really too modest. How many programs do you own about which you can say that you can't think of anything you would like to see improved? The program raises the standard of the term user-friendly for the rest of the industry. All information is available at all times, and there are no monthly closings. Anything can be changed at any time, and all dependent balances and totals are instantly adjusted. I do mean instantly—everything in this program is fast. The report options are extensive, and bank reconciliation is almost fun.

If you really want to see how that Apple of yours can be put to good use, give *Money Street* a try.
Daniel J. Thomas, Elgin, IL

Covering the Bases
I started my database search with *CCA Data Management*, distributed at the time by Personal Software/VisiCorp. I learned a lot through the basic user interface suggestions and helps included. After getting several business programs on-board, I felt the need for a more advanced database system—specifically, the newer screen-editing functions to enhance data entry, as well as some kind of break from sorting. I gave *VisiFile* a short trial, which seemed to go in the right direction for screen editing, but the sorts were too closely akin to *CCA*. Also, my upgrade cost to get into the new program by the same supplier was about one hundred fifty dollars. The upgrade policy got my goat.

I moved to *DB Master* and then bought the *Utility Pak #1*. The screen editing was there, with the ability to make the entry screens and the database appear the way I wanted. The "auto-sort-on-entry-by-key-fields" functions of this database freed me of most sorting (it was already there). I also felt that many of the data handling routines were aided by machine language, which gave an overall performance jump from where I had been. I could not get the database to do everything I needed, so the *Utility Pak #1* was necessary to DIF (Data Interchange Format) data from *DB Master* to a DIF text file for user processing. I grew to hate that slow and awkward transfer process. The programs were locked and so was the data, and DIF was the only door to get in and out other than the keyboard. Give me back my data!

General Manager, by Sierra On-Line, claimed to have all the features of a first-class database, with direct access to the data for reading, entry, or editing from Applesoft Basic with user interface commands (using & calls to execute fast *General Manager* routines from your own programs). The original price was $100, which made it harder to believe, but a phone call confirmed that they thought it really did what they claimed. I bought it and decided shortly that it was the best option yet (a sleeper). I was disappointed in the original version's reporting functions, but otherwise extremely pleased on all counts. One upgrade cost me about five dollars during the process, and then version 2.0 came out with a completely new manual (super) and new reporting functions along with other general enhancements. (Surprise—no need to change user programs; it worked with any obsolete command format of the old system, as well as the new ones.) This major upgrade cost twenty-five dollars and was quite a buy, considering that it upgraded my system to the new $229.95 version. I suspected on purchase that Sierra On-Line would take care of me on upgrades because of what I had heard about the company's policy on *Superscribe* to *Screen Writer* upgrades.

How about the lock? You must boot with an original program disk on first boot. After the master is booted, you can use a copy of the original disk. You can load, list, and change the basic routines of the *General Manager* programs if you're so inclined. The basic interface has enabled me to do anything I want to with the data—even if it's outside the design of the database. I can do most of it with & calls to fast machine language subroutines, for everything from data reading to print using.

I am extremely pleased with the lock, data access, and upgrade experiences I have had with this program.
Phillip Wear, Fort Smith, AR

A Prompt Response
I am writing to tell readers about the Microtek Dumpling 64 Graphics card. I recently purchased one from my computer supply shop and found that one of the chips was not functioning properly with my home accounting program. I called the Microtek people, who were aware of the problem, and they immediately sent out a new chip for replacement. That's exactly the kind of service that warrants comment from a satisfied user. Unfortunately, I have found that other suppliers are not as cooperative as Microtek. When one shops for equipment, one should consider the after-sale service. I will surely consider other Microtek products when it comes to buying additional items for my Apple.
Lawrence I. Stern, Claremont, CA

Two Good Buys
I have used *The Accountant* for several months this year and have had several occasions to correspond with Decision Support Software. For those who need more than a check-register program, including asset and liability management, flexibility to tailor applications (home and/or business), and a comprehensive *VisiCalc* interface, *The Accountant* may be just the thing. In all fairness, it is not suitable for beginners or those who don't have a clear application defined.

The program includes a sample data file, produces a balance sheet with a couple of keystrokes, and grows with the user's needs. I use more than fifty accounts and twenty-four codes for tax summaries. I have chosen to upgrade to the larger business version in order to have automatic check-numbering in the posting of automatic transactions. I commend the manufacturer on its support, both by phone and in upgrade turnarounds.

As to shortcomings, *The Accountant* can use some improvement in its on-screen prompting. For example, the user needs to remember the commands for split transactions for entry into the desk-calculator mode and how to quit when it is appropriate. The program includes comprehensive printed reports, a couple of which use too much paper. A command-summary card would reduce this awkwardness somewhat. While there is a graphics-display mode, it is unscaled and not very useful. All in all, it is a well-thought-out system that I predict will continue to find satisfied users.

I have upgraded my *Apple PIE* word

processor to *PIE Writer* version 2.2. There is new documentation and the program now includes a two-disk system. With it the program can be configured to take advantage of the Apple II or IIe, as well as forty and eighty column computer configurations. *PIE Writer* is underrated in my opinion. Hayden does not seem to be taking advantage of its potential. The program uses the 16K RAM card (if present) to load both modules so that they're coresident. This makes document previewing very convenient. The system is very fast in searches and allows both freeform and formatted entry. What you see is what you print. While interfacing with various printers can be a problem for many programs, *PIE Writer* provides default initialization, the capability to embed an unlimited number of control characters for the printer, and the capability of addressing a custom printer driver. As to shortcomings, I would say only that in my several years' experience I have not yet begun to use all the capabilities of *PIE Writer*.
Norman J. Wood, Saratoga, CA

Applefest Hits and Misses
I would like to comment on the Applefest held at Anaheim, California, earlier this year. I have both a positive and a negative comment about the fest. On the positive side, it was nice to see Apple wares at every booth. At many of the computer expositions I have attended, it seems as though very few of the displays deal with Apple products.

On the negative side, I had a list of fourteen companies in whose products I was interested. While I enjoyed seeing all the displays, my real reason for attending the Applefest was to see certain products that I had not been able to find in the local computer stores or about which I had hoped to get more detailed information directly from the source.

Of the fourteen companies on my list, only four (Apple Computer, *Call –A.P.P.L.E.*, Executive Peripheral Systems, and Penguin) were actually at the show. Among the missing were Beagle Bros, Business Solutions, Iver, Videx, Microtek, Control Data, H.O.M.E., and Synergistic Software. I realize not every company can attend every exposition, but it certainly would be nice if there were some way at least one of the major Apple publications could publish a list of those companies that were expected to attend each Applefest.
Thomas E. Militello, Rancho Palos Verdes, CA

A Jumpy Reaction
It's nice to know that *Softalk*'s game reviewer has managed to retain his sense of humor in this day and age. It's less fortunate that he's used an excellent arcade game as his comic vehicle. The game is *Jump Jet*, and I heartily suggest that readers see the game for themselves—with the *Softalk* review in hand. That way, players can have the last laugh when they try to compare the review to the game. They'll learn what hundreds of software dealers already know—*Jump Jet* is action-packed and exciting.

The reviewer seems to be a clever writer, but a poor researcher. He attributed the jet's ability to take off and land vertically to poor programming, rather than to the capabilities of the Harrier jets upon which the game is founded. And this is just one example.

As the president of Avant-Garde, the publisher of *Jump Jet*, I suggest that our two companies join efforts to create an adventure game in which the readers try to find their way through the review and, if successful, arrive at an actual understanding of the game. It could be the hottest seller on the market—but I'm not sure what kind of review it would receive.
Mary Carol Smith, president,
Avant-Garde Creations, Eugene, OR

Turning It Over in His Mind
After reading reviews of *Miner 2049er* and seeing the game played I knew that I really wanted it. I shelled out the bucks at my local computer store, brought it home, and booted it up. The game worked beautifully. I loved the way it allowed me to set the controls to my own joystick (which is a new Hayes Mach III that just might be the best joystick out right now). Then, when I got to playing it, I was even more thrilled at the smooth, fast graphics. So it went for about two weeks. I gradually worked my way through the levels, totally amazed at the quality of programming. It even occurred to me that *Miner* might make a good quarter-eating arcade game.

Finally, I gained the tenth level. Proud of my achievement, I continued to try to conquer the nasty level. After many days of labor, I succeeded in filling in all the platforms. I already knew that there were only ten different screens, so I expected to see the first level again. To my amazement, I found myself going to level 1 instead of level 11. I thought that this little oversight by the programmers was not too much of a problem. Still, when I saw the screen, nothing at all had changed: not the placement of the mutants, nor the apples, nor the time. It was as if I had started the game over. But I was still only slightly taken aback by this total lack of change. I continued to play on through the levels, watching my score climb to superhigh levels. It was then that the game started to bother me. When my score reached 100,000 the game considered it to be zero. This in itself was not too surprising if you consider that the game has only five digits for scoring. Anyway, when I finally died and it came time to view the much-coveted top five list, I found that the game hadn't even acknowledged the fact that I had turned it over. This was the final blow.

In my opinion, there seems to have been a total lack of foresight by the author and publisher of *Miner 2049er*.

Brian Herrin, Kansas City, KS

A Professional Opinion

As a physician with a good deal of experience in computer-assisted medical instruction, I was fascinated by the enthusiastic review in the June *Softalk* of *Microbe* and consequently bought the program. I couldn't agree more with the praise for *Microbe* as "a graphic tour de force."

However, after using the game for several weeks, I find that the claim made for *Microbe* as an educational tool for physicians and medical students is unjustified. While the program does contain useful information, its distortion of anatomy and its simplistic "cookbook" approach to treatment make it unsuitable for serious medical teaching. Those who purchase *Microbe* as a game will be entertained; those (especially medical students and physicians) who buy it as a learning aid will have been misled.

Franklin Tessler, M.D., Los Angeles, CA

Just Rewards for the Rescue?

I have recently read of a few game players complaining about games in which there is a ceiling score. *Choplifter* is a good example. No matter how hard you try, you can only rescue sixty-four world delegates held hostage. I can shoot all the tanks and planes (let's not forget the mines) and never get any points for them.

All I can say is that I agree with Margot Tommervik in July's "The Art and Craft of the Game" article, where this issue was mentioned. If points were awarded for the tanks, players would just let the hostages explore the countryside while destroying tanks for extra points. *Choplifter* was not intended as a tank battle. It was intended as a rescue mission; therefore points are awarded only for saving the hostages.

To those people who complain, just come back when you have saved all sixty-four delegates. It took me a while, but I've done it. To keep those out there who haven't rescued all sixty-four in mystery, I won't tell you how the game ends, but it's best not to get your hopes up. On the box it says that if you rescue all the hostages there will be world peace. I would have thought with all that extra disk space (*Choplifter* doesn't use the entire disk) that for a finale Broderbund would boot a world peace demo, cartoon, picture, or even congratulations. This would encourage players who have rescued all the delegates to want to try again. It's unfortunate—I hardly play the game now because completing it (and beating the computer) is unrewarding.

Alan Dundas, Pittsford, NY

Shakedown Time

I would like to comment on the "flat" software sales that *Softalk* has been reporting the past few months. I bought one of the first Apple II Plus computers in 1979 and since have bought four more for use where I work. I have bought fifty-five commercial software packages, searching for ones that will be useful. Sadly, most are gathering dust. The novelty has worn off and the frustration has set in.

I am on strike! I refuse to buy any more Apple software, with a few exceptions. What I object to is having the software locked up so I can't see how the calculations are made, can't correct the problems, and can't solve the equipment interfacing. I have word processors that can't send the proper commands to my printer. One graphics program will send graphics output only to the Silentype or Qume. (I don't have either.) My latest fiasco was buying a $500 disk emulator card. I thought that since my database manager used standard DOS 3.3 data disks, I could mount the data disk in the emulator in order to speed up record searches and read/writes. Nope! When I load the database program, the custom DOS clobbers the disk emulator software, which works only with DOS 3.3.

Even if all the interfaces in a software package are okay when I buy it, I find in a year or so that I can't add equipment without creating system conflicts. Since the code is locked up, I can't correct even the slightest problem, and even a trivial change becomes a fatal flaw. This is no longer acceptable—I just won't buy any more.

A big shakedown has started in the computer industry, and I predict that Apple and all its supporting vendors will feel the crunch unless they change. Atari found out last Christmas that there is a limited market for $30 games. The people at Texas Instruments just dropped $100 million to find out they couldn't lock up all their computers for themselves. One of the most important insights the two Steves gave the original Apple was to open up the guts so that people could see how it worked and tailor it to their needs. Are the software vendors going to follow TI's example and keep all their secrets, or are they going to provide software and interfacing information so we can use the Apple? With the wide variety of software and hardware for the Apple in almost infinite combinations, it is intolerable to have each software package have its own system that only the author can change.

I read in the *Wall Street Journal* that Microsoft and fourteen Japanese computer makers have agreed on a standardized software format that will be interchangeable in all their products. I see that Coleco is going to sell a computer with a daisy-wheel printer and word processor software for $600. The company is also going to have a version of Microsoft's *Multiplan* for "about $50." Apple has had a standard software system for some time. It consists of DOS 3.3, binary, and Applesoft for you vendors who need to know. Why don't you use them?

I don't buy the argument that holds that copy protection is necessary. I bought my first copy of *VisiCalc* for $80 in 1980 from an Apple dealer. *VisiCalc* listed for $100 then. You can't tell me they haven't gotten a satisfactory return on the investment of their time, or that they need to charge $250 now. If copying is so serious, how come *VisiCalc* remains on top, even though it could be copied by any of the bit copiers? If this were really a problem, wouldn't everyone in the world have a copy by now? Couldn't it also be true that *VisiCalc* remains on top because most people would prefer to have a registered copy and original documentation? And how about Penguin's *Graphics Magician*, which is a top seller and is unprotected? (Bless them; *Magician* was one I bought last year!)

There are about seven hundred fifty thousand Apples out now. If a vendor sold 10 percent of these owners a package for $20, that would represent $150,000 in sales! Isn't that enough for any program? Is Penguin the only one that understands this arithmetic?

I foresee the day when a computer software store will be like a bookstore. Sure, a bookstore has hardbacks at $20 and a few coffee-table books at $50, but the bulk of its sales and profits are from the $3.95 paperbacks. A few people will buy $40 games, but I won't. I can't afford $100 programs for personal use and won't buy them for business use until the locks come off. Time just costs too much to mess with all the problems. Software sales would not be "flat" if you could get a big assortment that included a word processor, spreadsheet, database, communications package, all programming utilities, graphics, and a dozen good arcade and graphics games—all working together on a common file system and not costing more than $400 total!

Impossible, you say? Keep in mind that at $400 an Apple, this would amount to about $30 million.

If Apple owners were assured of getting a big pile of good software, with more to come each year, they would feel they were getting continuing value for their investment. How are all those people who are buying computers (but not buying much software) going to view their purchases after the newness wears off? Will the computers gather dust because their owners didn't find them as useful as expected? I think greed, expensive marketing, and ignoring the non-Apple competition is severely limiting the usefulness of the Apple computer and is going to cause the bubble to burst for Apple, just like it did for Atari and TI.

The final question is, will the name on the software store of the future be Apple or Hitachisan? I have a large investment in Apple equipment and in time spent learning to use it—but I am also reading ads for other computer systems!
Don Shannon, Richland, WA

The Novel Approach
About the *Apple Business Basic Reference Manual*—it is poorly written and rarely illustrates the subject matter with examples. It is wordy and not written as a set of instructions but as a novel. That includes both volumes.

Writing to Apple about it is like throwing the letter out the window. If you call, they don't call back. I suppose with Lisa available now, they just don't care about the Apple III.

On the positive side, Taylor Pohlman's Third Basic is really excellent.
Julian LeRoi Altenhaus, Maplewood, NJ

An Intelligence Test
Only very rarely does an article seem to sum up decades of experience with the perceptive insider's point of view that characterized Jean Varven's discussion of the educational uses of microcomputers in Schoolhouse Apple, June *Softalk*.

The potential value of microcomputers for educational uses goes beyond the wildest dreams of the science-fiction writers. Except for the direct teaching of programming (or the computer's own seductive capture of its students) and the more recent teaching of word processing in business classes, the benefits spoken of have been meager indeed.

I don't want to belittle these applications, as any kind of computer access profoundly changes the lives of the students it reaches. At the same time we need to realize that there are many more important educational applications that can happen only if someone shows the way.

I understand that Apple is making a realistic effort in this area, though I have seen no published material on its program.

There are so many subtle realities in the computing field, and we desperately need to focus more of our top intelligence on the secondary effects. Three decades into the computer age, we should be acknowledging the fundamental truths: that the available creative intelligence must be used more wisely, and that every possible effort must be made to expand our intelligence resources.
Joe Fulford, Pacifica, CA

Experiment in Optimism
I look forward to *Softalk*'s Hardtalk column every month. It covers an area about which I know nearly nothing. In a recent discussion of monitors, it's mentioned that video incompatibility usually prevents linking the Apple with other NTSC standard equipment such as VHS-format video recorders.

With the innocence of the amateur that I am, I awoke one morning early (to beat the patter of little feet) and hooked up a portable RCA Selectavision video recorder (VGP 170) to the Apple, connecting the monitor cable from the computer to the auxiliary video input of the recorder. I ran about twenty minutes of the Vagabondo program *Fire Organ*, one of the most colorful and visually interesting programs I know. When I played the recording back through our color TV, I was astonished at the vividness, resolution, and overall quality of the recording. The colors were faithful and sharp.

I am not sure of the practical applications of this. Certainly twenty minutes of watching *Fire Organ*, as pretty as it is, has obvious limitations. On the other hand, I did want to share my experience with other readers who may have been put off experimenting by the pessimistic tone of that part of the Hardtalk article.
Frederick M. Gise, Wagoner, OK

A Zardax To Grind
I wonder if there might have been an omission in the word processing section of the July Fastalk column? *Zardax* wasn't listed! My inquiry is based upon a great respect for this product and a sense of social justice.

In the last four years I have used nearly a dozen word processors and have become a very tough critic. As such, I strongly believe *Zardax* should remain in the list. I have been in positions requiring me to write extensively and I find this program to be quick and transparent to my creative bursts. More important, I have trained more than a dozen secretaries to use word processing systems, and I find *Zardax* to be the most easily learned.

In addition to an extensive set of editing and processing functions, it has some subtle strengths that are not immediately evident. It is very reliable under heavy use. It uses standard sequential text files, which provides a good degree of data interchange both into and out of *Zardax*. In addition, it is compatible with a wide assortment of peripherals and is often updated by the mother company to grow with product advances. The distributor has given me prompt, friendly support through phone calls and correspondence.

Less tangibly, I have a sense of creativity with *Zardax*; it allows me to compose at the keyboard, as well as to design creative text layouts. Since there is a simple way to embed nonprinting ASCII codes, the program can accommodate almost any printer's cryptic control codes.

I work in a community college where I encounter the needs of faculty, secretaries, students, and administrators. All have different needs, and all are well served by *Zardax* with a minimum of training. Here, productivity is the issue. I know there are cheaper text editors and word processors, but they are terribly expensive when time is valuable or dependability critical.

Softalk is very influential and thus morally bound to present aces as aces and jacks as jacks. The inclusion of *Zardax* in Fastalk will help users become more discriminating consumers when they make comparisons.
Jeff Whittaker, Bethel, AK

A Savior of Lives, Files, and Your Time
The June Open Discussion contained a letter from Dick Rettke warning of possible problems with *Diversi-DOS* not verifying data after writing to the disk. When I wrote *Diversi-DOS*, I considered this very carefully. With almost two thousand copies of *Diversi-DOS* sold, this has not caused any problems at all. And, believe me, if people start losing their data, I'm going to hear about it!

First of all, let me explain what DOS 3.3 does that *Diversi-DOS* doesn't. DOS 3.3 automatically does a verify command after every save or bsave. *Diversi-DOS* skips this automatic verify. However, you can still get the very same effect by typing the verify manually (or adding it to your program) whenever you save or bsave.

Standard DOS 3.3 does not do an automatic verify after writing text files. When you are running a program, most of the writing on the disk is done to text files, not Basic or binary files. That is, most of the writing to disk is already done without verifying, and it works reliably.

The reason this works is that writing a sector to disk first requires reading the disk to find the location of the sector. If the disk is bad, you usually can't find the sector location, so you get an error.

Furthermore, the verify command doesn't really live up to its name. It only reads through every sector in the file to check for read errors. DOS 3.3 contains a serious bug that makes it likely that read errors will be missed. When DOS writes a sector, it also writes a checksum at the end of the sector, which should be the sum of all the data in that sector. Unfortunately, the checksum depends only on the last two data bytes. Thus the checksum cannot be used to find read errors in the first 340 data bytes in a sector. Gross data errors are sometimes detected in another way (trailing bytes), but single-bit errors will often go undetected.

To summarize, the automatic verify after save and bsave provides very little additional protection against disk errors. The only true protection is to back up your disks.

Also in the June issue, Stewart Loving-Gibbard asked about using *Diversi-DOS* with forty-track disk drives. The following procedure works with standard DOS 3.3 as well as with *Diversi-DOS:*

```
POKE 44725,160
POKE 48894,40
POKE 46063,40
(put in blank disk)
INIT HELLO
```

Boot this disk to run forty-track DOS. Init will initialize forty-track disks, but you can still read and write old thirty-five-track disks correctly. Just be careful not to put a forty-track disk in a thirty-five-track drive. For backups, you can make a forty-track *CopyA* as follows:

```
LOAD COPYA
70 PRINT CHR$ (4);"BLOAD COPY.OBJ40"
SAVE COPYA40
BLOAD COPY.OBJ0
POKE 770,40
POKE 863,40
BSAVE COPY.OBJ40,A$2C0,L$10B
```

Finally, I wish to thank *Softalk* readers for all the nice letters I have received about *Diversi-DOS*. I worked five years saving people's lives (among other duties) as an emergency physician, and I received one thank-you letter. After five months of saving people's time with *Diversi-DOS*, I have a whole file full of thank-you letters.

I'll end my letter by congratulating the *Softalk* staff for producing a great magazine that keeps getting better.

Bill Basham, president, Diversified Software Research, Rockford, IL

That's Entertainment

I found the letter from Peter T. Clark (April Open Discussion) to be absurd and ridiculous. If he does not like Storytalk Fiction, that's fine with me. He doesn't have to read it!

I happen to like some of the stories. I find they help me to get through some of the more boring days at work. So what if the stories are, in a number of cases, absurd. I find them entertaining and have acquired a number of good ideas from them.

An example is the April Fool story. I got several ideas from that on hooking the computer into the household wiring system and overriding my obsessive roommate's habit of turning everything off to avoid paying two cents here and a penny there on the electric bill. I can't stand it, and that story helped me to figure out how to solve my problem. (Maybe if I hook it up so that if he tries more than three times to turn off the lights or air conditioning, it will give him a mild shock, say 300 volts at about 60 amps. Just kidding.)

Don't remove the Storytalk Fiction just because one person (or even a hundred) doesn't like the fact that two or three pages of the magazine are too much for him to handle. I find that I like to expand my awareness and perceptions, even with fiction.

The first landing of men on the moon was prompted by the fiction that Robert Goddard read, which led him to build the first crude rockets. He refused to accept those Buck Rogers stories as fiction and went about the task of making them into reality. I do not see how fiction makes *Softalk* into *Playboy*. Is *Reader's Digest* another *Playboy*? How about all those fiction books at the local library? Almost everything ever accomplished started out with wild stories being told about an idea and someone turning those wild stories into reality.

Jeffrey Jones, West Hollywood, CA

Making Himself Clear

In the June Open Discussion I saw a letter that caught my eye, dealing with my personal views and opinions that I've expressed in Open Discussion. This letter stated that I should rip out the fictional stories in my *Softalk*. It also said that I should not try to take them away from those who do enjoy reading them. The author of the letter does not understand Open Discussion. It is a place to state your personal likes and dislikes about the computer world and its products. That is why it is called "Open" Discussion.

Just because I do not like a part of *Softalk*, that certainly doesn't mean it should be done away with. However, if enough requests are received saying the fictional stories should be removed from the magazine, they probably will be. Also, I never stated that Marketalk Reviews should be cut short. I quote: "I have noticed the number of reviews declining, as well as the length of the reviews. Please try to cram in a few more." That means I want to see more, not fewer, reviews of Apple software.

Peter T. Clark, Sacramento, CA

No Time for Proofs

I am responding to a few letters appearing in the June Open Discussion. I agree with Bear Braumoeller's advice to Peter Clark with respect to the fiction in *Softalk*: Skip it! It is not dull and boring, as Mr. Clark stated. It is inane, dull, and boring.

For Al Goodwin: I can't answer your question, but I ran across a similar problem in one of my programs. I had opened three files in a loop (10 FOR X= 1 TO 3: F$= "BIN" + STR$(X): PRINT D$;"OPEN";F$: NEXT). The MON showed the correct material (selected alphabetically) being written, later on, to the

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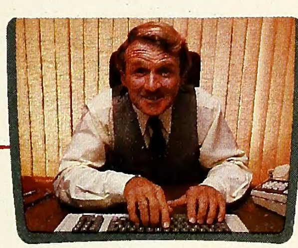

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correct Bin file buffer. However, a later catalog showed only one sector allotted to Bin1. Apparently the buffer was never sent to the disk. I solved the problem by opening a dummy file, Bin0, starting the loop with zero instead of one. I don't know why, but this worked.

To Stewart Loving-Gibbard: *Diversi-DOS* is superb, but apparently Rana is going to use *The DOS Enhancer* instead. I regret its decision; *Diversi-DOS* should be supported, not only because of its excellence, but because of its appeal to morality. A note of appreciation to Dick Rettke: I will have to decide whether the decrease in performance is worth it. I wonder if it would be too much to ask that DOStalk discuss that particular issue in depth? One of the best features of *Softalk* has been its comparative reviews of programs and, occasionally, of hardware. A discussion of the problems arising out of the use of attractive programs like *Diversi-DOS* would be of supreme help. I would especially like *Softalk* to devote some critical comparison time to some of the hardware spoolers now available. Especially the Angel, Printer Optimizer, and Pipeline.

Now for everybody's favorite topic: piracy. I have an Apple at home and another at work. I would like to use some of my favorite programs in both places. To do so, I must lug the stuff back and forth, buy an extra copy for each site, or make a pirated copy to keep at one place or the other. Since a secretary is using the one at work (even if I am not there), and the one at home is typing out a ninety-page manual for the office billing package I wrote, it is obvious that I will need copies of the word processor at both locations. Since I can't do that without giving up other capabilities, perhaps I'll use one word processor at home and another at the office. Or perhaps I'll make an illegal copy. I don't consider this piracy, but personal use and convenience. The one-user, one-computer rule, seen in some licensing agreements, is not reasonable.

I don't protect the software I write. It is sent out with a request that the customer respect the time and effort I have put into it, as well as the support I provide after the sale. So far, I know that one person has been reselling my work. Proving this would be very difficult—I don't have the time.
Jerome B. Blumenthal, Binghamton, NY

Public Confession

Although I am only twelve years old, I own an Apple and know quite a bit about it. I am the only one in the family who uses it. I've got a confession to make: I am a software pirate. So far, I have pirated about two hundred games, utilities, and business programs. I have bought only three disks out of sixty-eight, but I have a very good reason. I will keep on pirating software for myself and my friends until software manufacturers find a good way to sell their software items cheaper. Torture me! Arrest me! Beat me! Kill me! You'll never stop me from copying software. As one dealer says, when one person has a new game, the whole neighborhood has it. And that's a fact.
Drew Cheng, Diablo, CA

Guiltless Gamer

I am not a software pirate and I do not profit by selling cracked software, but I am not above accepting free copies of pirated games. Copy protection is not worth a company's efforts. It simply is not an effective piracy deterrent. Period. Those of you who are shaking your finger at me can save your tisk, tisk, tisks for someone else. I do not feel guilty for robbing any software author of business because I would not have purchased the product in the first place. Want to know why? Price! You can get a novel for $2.50 and a record or tape for less than $10. There is no reason a game needs to cost $30 or more, unless it's because of copy protection costs. All you software companies out there get on the ball and follow Penguin's lead.

To William J. Evans (July Open Discussion): I'll tell you why the word *kludge* is spelled with a "d" and pronounced like "huge" if you'll tell me why the two words "good food" are pronounced the way they are.
David Belkin, Houston, TX

One Man's Diagnosis

This letter is an open reply to Bill Jones's letter in the June Open Discussion.

Mister, you don't seem to realize it, but you're just a thief. Part of your rationale for stealing software, the fact that you can't afford it, is simply flabbergasting. It's difficult to convey adequately how warped that kind of thought process is. I *want* a Ferrari 308; however, I can't afford it. With your line of thinking, it would be a perfectly rational act therefore to steal it. Incredible!

You also say that you and your fellow criminals steal programs that "aren't worth the disks they come on." That statement alone speaks volumes about the mentality of software thieves. That's known as kleptomania: the irresistible urge to steal, without regard for personal needs. It doesn't make any difference how highly you rate your intellectual skills in subsequently manipulating your stolen goods. You intimate that you occasionally sell software you write yourself. Get serious. Nobody needs the kind of program that someone like you would produce. Get yourself some help.
Rudy J. Stricklan, Mesa, AZ

Terms of the Social Contract
I believe that programmers should be rewarded for their time and ingenuity. An excellent program deserves all the support its audience can provide. In the history of humankind, the biggest obstacles to growth and creativity have been the pillage of the nonproducer (barbarian, pirate, and so forth) and the barriers needed to prevent it.

I wish to reply to Daniel Shine's "frumple" in the July Open Discussion. I don't believe semantics is a decisive factor. Piracy will be allowed to continue until the economic irritation it creates forces the productive members of society to find adequate protection. To the extent that these protections are a burden to all users, we are all paying for the rip-offs of the unethical.

On a longer time scale, the social contract ("Moral codes and ethical distinctions") is the only framework within which our species can continue to exist. Cultures thrive in direct proportion to the degree to which they honor the principles of justice and equity. Cultures that allow the nonproductive to operate (or worse yet, dominate) inevitably fail.

Finally, the need for moral codes—for defined and agreed-upon rules for dealing with each other—*increases* with the density of the population. Those who choose to ignore the social contract are often excluded from it, ostracized, and (for offenses like murder, not software piracy) sometimes eliminated. Doing "what seems right at a given time" is a flabby use of situational ethics, the lowest common denominator of human existence. The value we give to ourselves, our culture, and its future is reflected in our contributions to the common good and our respect for the efforts of others. I vote against piracy.
George Docken, Minneapolis, MN

Advice from a Pro
To Ira Strum: I felt that I must write and tell you how inspiring your letter in the July Open Discussion was. You're a kid after my own heart! Like you said, "Everyone copies something in their lifetime for their own use." What I don't understand is why you stick with penny-ante stuff like software. Listen, you're never going to get anywhere that way!

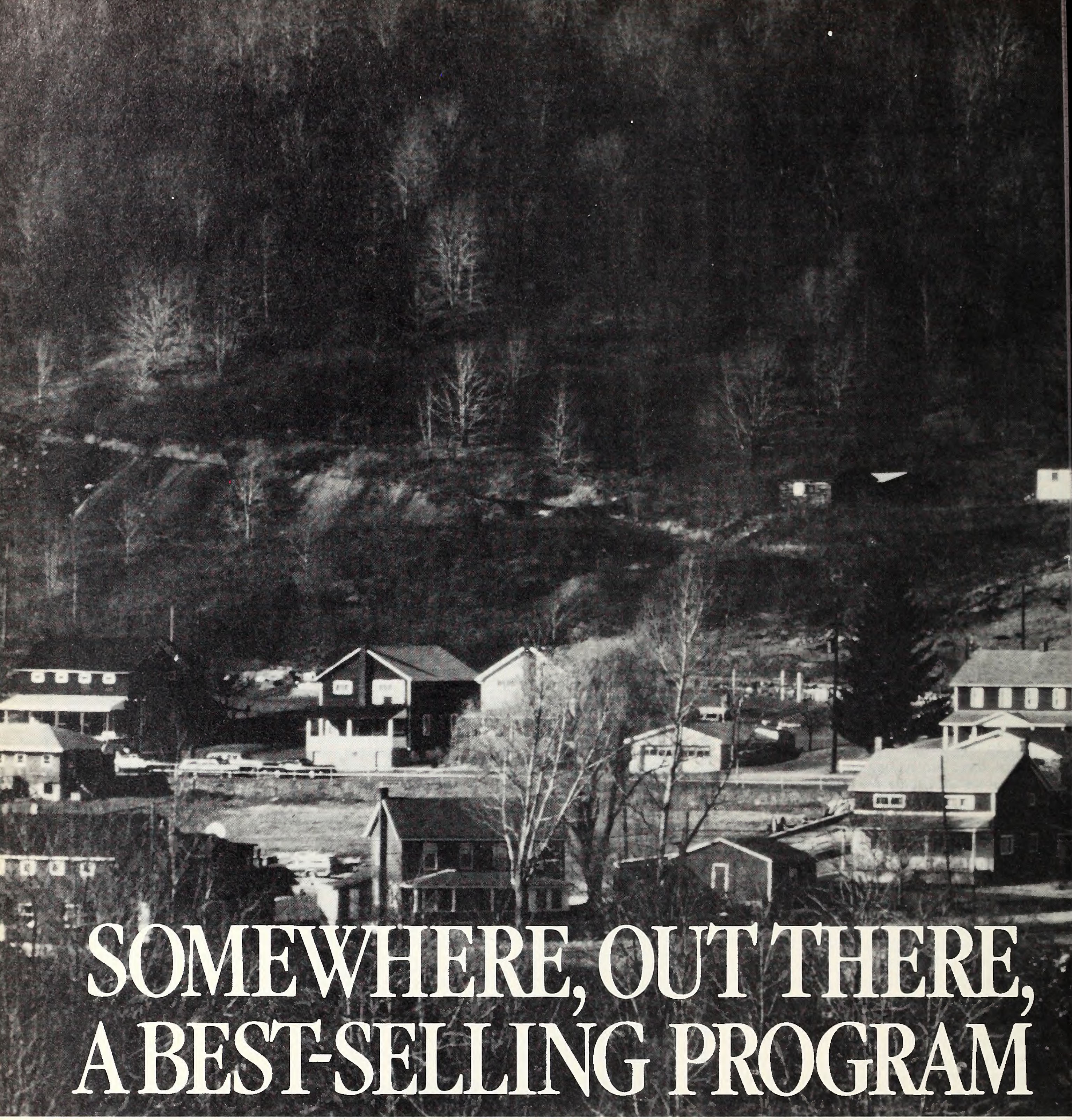
Follow my advice, kid, and move to some bigger-ticket item like "copying" cars. That's what I did. I, like many other people, "copied" any car I could get my hands on. In fact, I own only one car that I bought from a store. Everybody I know "copies" cars.

Perhaps I wouldn't "copy" so much if the price of a car weren't so high. I'm twenty-four years old and I make only $2,500 a month. After taxes, rent, utilities, food, and so on, it might take me months to save up enough money to get a decent car. If I "copy" cars, I can get up to fifteen cars without paying a cent in one month! (The only problem is finding parking spaces for them.)

Keep up the good work, kid. Maybe someday you'll really be a pro, like me.
Imnot A. Crook, San Quentin, CA
(a.k.a. S.E. McClure, Sunnyvale, CA)

View from the Lighthouse
David Chandler (June Open Discussion) believes that the Applesoft tutorial that comes with the Apple is bad because it is obsolete. Of course I disagree, as anyone must who had to teach himself Applesoft. What a marvelous way to learn the mysteries of the Apple! Compare it to the Radio Shack book I tried to decipher, or to the CP/M handbook. It's a lighthouse in a stormy sea of mystery indeed.

Even now, with my Apple IIe, I still have my Panasonic tape recorder hooked up ready to



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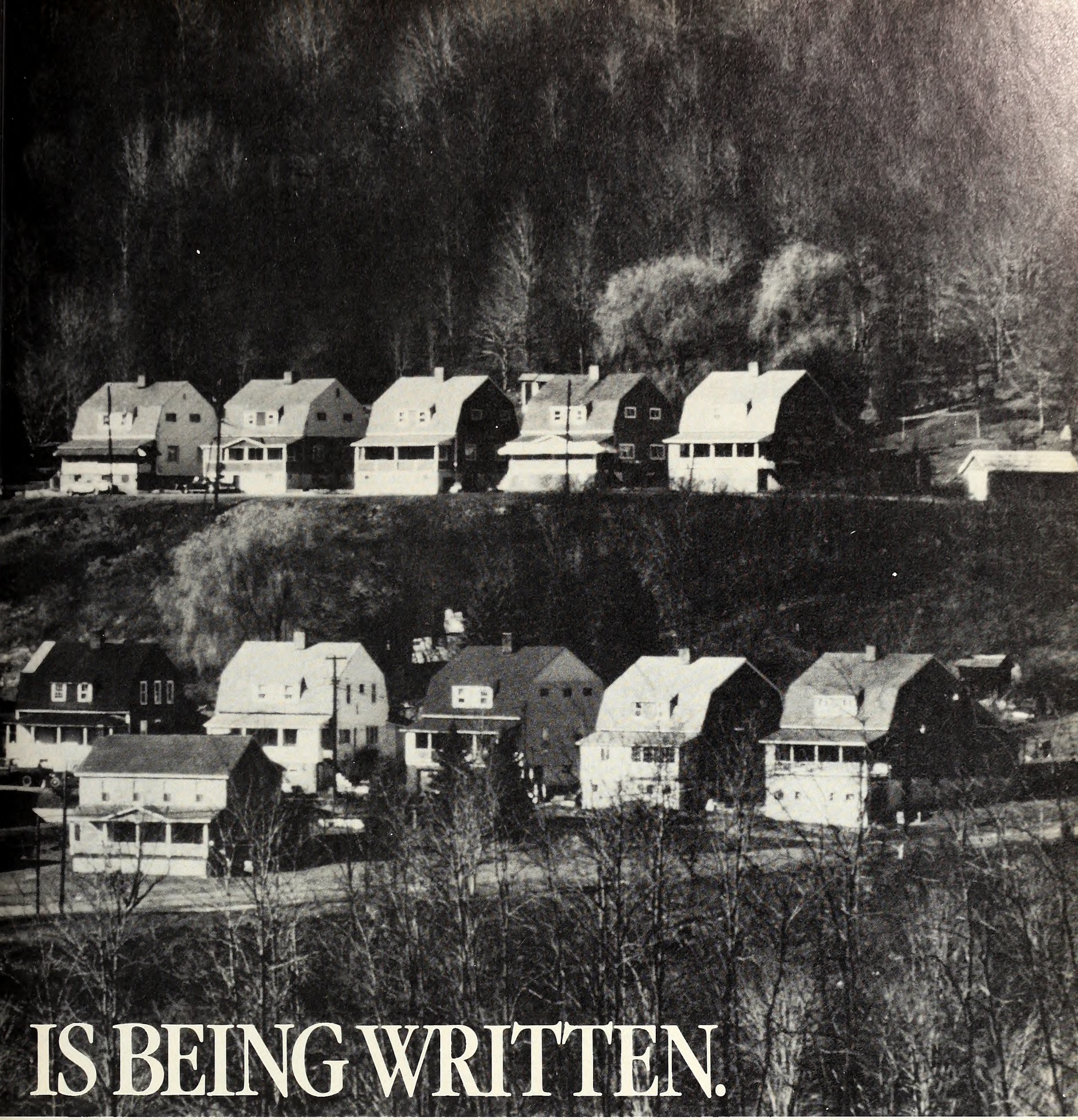

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save a program if my disks go goofy on me. I've saved more than one program on tape when the drives failed. Don't knock it.

Not use color graphics? I'm sure there are thousands of Apple owners out there just smiling at that. Why, you may as well have a Timex as an Apple without color.

Mr. Chandler should be pleased to know that the folks at Apple apparently agree with him and not with me. My new Apple IIe came without the tape recorder cable, without the Applesoft tutorial, and, to do Mr. Chandler one better, without an instruction manual at all!

In reply to Andrew Fishburn, to print ASCII codes past 96 without a printer, run the following program:

```
100  FOR X = 96 TO 255
110  PRINT X:" = ";CHR$ (X)
120  NEXT X
```

What you see on-screen is what you get. With a lower-case adapter (now as little as $20) you can see all the lower case, without the weird stuff. Whatever you see when you finally run it out on a printer will be correct.
Paul Raymer, Las Vegas, NV

Another Point of View
I disagree with David Chandler's comments in the June Open Discussion about the MX-80 printer manual.

I agree that it is a bit "folksy" in places, but if you compare it to the documentation for other printers it rates very high. Take, for instance, the Apple printer, which is amazingly similar to the Prowriter and several other printers. What you get is a general operation manual and a reference card that outlines all the escape sequences, but you have to have some programming experience and/or a natural gift for understanding computer documentation to figure it out.

The MX-80 manual, contrary to Mr. Chandler's claims, does not wait until page 87 to explain that the sample programs work only on a TRS-80. It clearly states this before the very first sample program, and it should be obvious to anyone familiar with Applesoft that lprint is not a valid command. Furthermore, at the beginning of most sample programs it adds the line:

```
9 PR#1 (Apple)
```

As to his comment on the author's avoidance of factual content in the manual, I can say only that I can't find more than ten pages without factual content. In addition, the author includes a summary of commands at the end of each section that you can refer to when reading the sample programs.

In general I have found the MX-80 very easy to use. Unfortunately, I traded it in for an Apple printer thinking that the extra speed would make up for its other drawbacks. So far, the MX-80 seems to me to be the best bet for a beginning computer user who wants to exploit the full potential of his printer.
Bret Mulvey, Woodinville, WA

Fellow Conscriptee Speaks
Having been inspired by David Chandler's remarks in the June issue, I want to share my experience with software. What got me started was his observations about *Home Accountant* by Continental. Using it is "like being conscripted into the Albanian army," says Chandler.

The program is so awkward that it has completely changed my financial record-keeping habits. With the old ball-point and calculator way, I used to balance my checkbooks at the end of each month. Not anymore. *Home Accountant* will not let you go back and make an entry in a previous month once you have started a new month. Result: I now wait until June before closing out April just in case an item comes along for May that has not been entered. You wouldn't believe some of the other craziness it puts you through.

I am positive that the good notices for *Home Accountant* are from reviewers who looked at the manual and read the advertising but did not bother to give it a try.

Now on to a couple of well-earned bouquets. I have had an Apple for eighteen months (I'm no expert), and I bought my first Beagle Bros program, *Apple Mechanic*, on impulse in a software store. I currently have about six more Beagle Bros programs. Each one is a gem. Talk about having respect for the user! They are witty and instructive, and they are mind stretchers. Also, I would buy anything put out by Sierra On-Line on the strength of *Screen Writer II*. It's an incredible piece of software.
Herb Abelson, Princeton, NJ

Tackling the Tackler
In response to Nancy Stanger (May Open Discussion), there is a very good recipe program written by Jim Ganz called *Recipe File*. It appeared in the February 1983 issue of *Call –A.P.P.L.E.*, page 43. This same program has also appeared on *Softdisk*, the monthly disk magazine.

I have a plea for anyone who knows about the Tymac Tackler printer interface card. I have one connected to a Gemini-10 printer, and I have yet to figure out how to do hi-res screen dumps like the manual says it can do. I would appreciate any information.
Margie Zembal, Vancouver, WA

Go Forth
I have just finished reading a very good book titled *Starting Forth* by Leo Brodie. If you want to learn Forth (on any computer), I recommend it. I'm so impressed with Forth that I'm planning to buy a Forth interpreter for my Apple. Now, can anybody tell me where to get a good but inexpensive Forth? I haven't seen any reviewed. Any suggestions?
Hari Wiguna, Lincoln, NE

Playing a Shell Game with the Thick-Skinned
I am looking for a program to track sales calls for a department of a bank with five salespeople and ten products. Everything I have found is in the category of an elephant squashing a walnut. Plus, the pachyderm won't fit through the office door! Can any readers help?
John Stewart, Fair Haven, NJ

Something To Discuss
I am writing with a couple of suggestions I think might increase contact between *Softalk* readers through Open Discussion.

I feel it would be to the readers' advantage to print the actual addresses of the people who write in asking for answers to questions. Most magazines that have a readers' column print a response to letters sent in, and also give suggestions to solve problems that the readers may have encountered. I feel it would increase the effectiveness of Open Discussion.
Randy Cain, Burwell, NE

Open Discussion is intended to be a forum in which Softalk *readers can exchange ideas and helpful suggestions with other readers. Out of respect for the rights of those subscribers who would not appreciate having their addresses printed publicly, it is* Softalk*'s policy not to print them at the end of letters. Besides, it's more fun when many people can share in the dialogue—each contributing a unique point of view. We will gladly forward any correspondence to fellow readers; just include a stamped envelope with your letter and send it to Open Discussion.*

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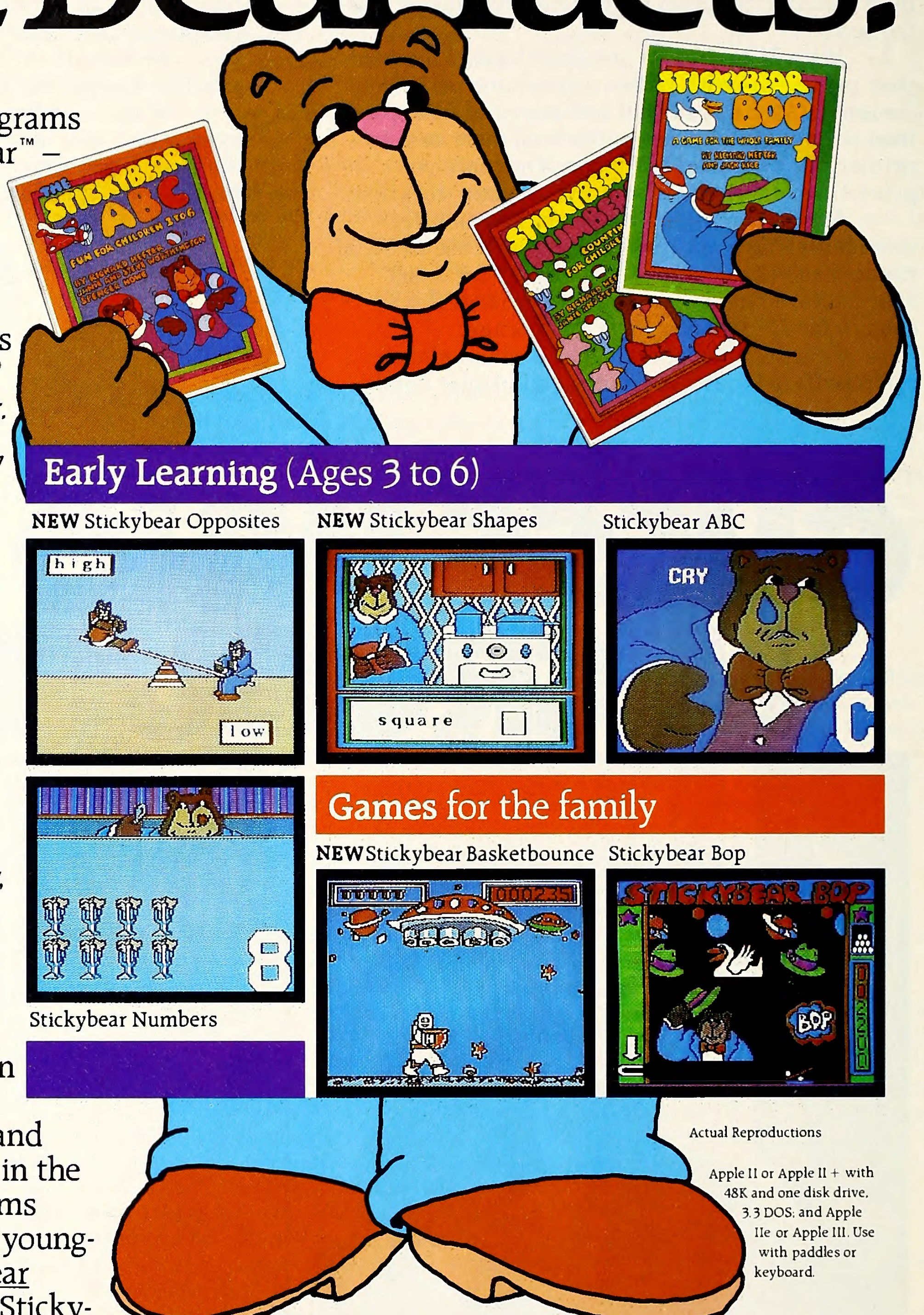

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IF From time to time one of the fourteen Apple II disk drives in my school's computer lab refuses to boot, giving the usual series of protesting clacks and clatters and finally yielding an I/O error. Why, then (and this is a fairly consistent solution), does it finally agree to boot only after I've taken it off the top of the computer and placed it on the table beside? I don't think it's the cables because they are well secured to the back of the computer. It seems to happen more frequently with four or five machines in particular but probably could happen to any of them. Could it be electromagnetic in nature? I would like to hear your diagnosis. *Gary M. Lee, Gardner, MA*

THEN In my picture above the DOStalk column, there's a diaper in my hands—symbolic of my expertise in softwear. What you have sounds like a hardware problem. (Have you noticed how that line is beginning to have the same ring as "Your check is in the mail"?)

I remember reading a letter in a magazine from someone who had a problem similar to yours. After several faulty diagnoses, the problem was traced to interference from the display screen. The problem was solved by inserting a metal shield somewhere inside the sensitive drive. I did take one of my drives apart once; I remember that it had a metal shield inside. You might compare the inside of your faulty drive with one of your good ones to see if the shield is there. *Tom Weishaar, Overland Park, KS*

IF I recently purchased a used Videx Videoterm from a friend. The eighty-column display worked fine on his monitor but not on the Monitor III. Instead of getting the supposed eighty columns, I get only seventy, with the other ten spilling off the screen. If there's any way of getting those lost columns, I'd sure like to know how. *Stanley Ho, Briarwood, NY*

THEN Try fiddling with the video adjustments for the top and bottom heights. This adjustment is on the back of the monitor labeled V.Size. For the horizontal width, the adjustment is located on the inside of the monitor. Remove the four screws and the cover. Locate the yoke on the neck of the monitor tube. You will find a round hole on the bottom side of the yoke. This adjustment requires the use of a hex adjustment tool, preferably plastic. Adjust it to allow for all the characters in the horizontal plane. Also, right above this adjustment you will find two rings going around the neck of the tube. You may rotate these two rings to center the picture slightly. General-purpose hex head alignment tools may be purchased at most electronic parts supply stores. *Roy Hicks, Buellton, CA*

IF I enjoyed the recent articles on putting text on the hi-res screen. I like the output routine described in the April Assembly Lines column. Annoyingly, Roger Wagner suggests using a $2FB long data table. This involves way too much typing of numbers! Why couldn't one use the fonts built into the Apple? The character shapes must be in ROM somewhere. Personally I like the Apple character definitions. I'd like to see an article on how this could be implemented. *Alan Kaufman, West Newton, MA*

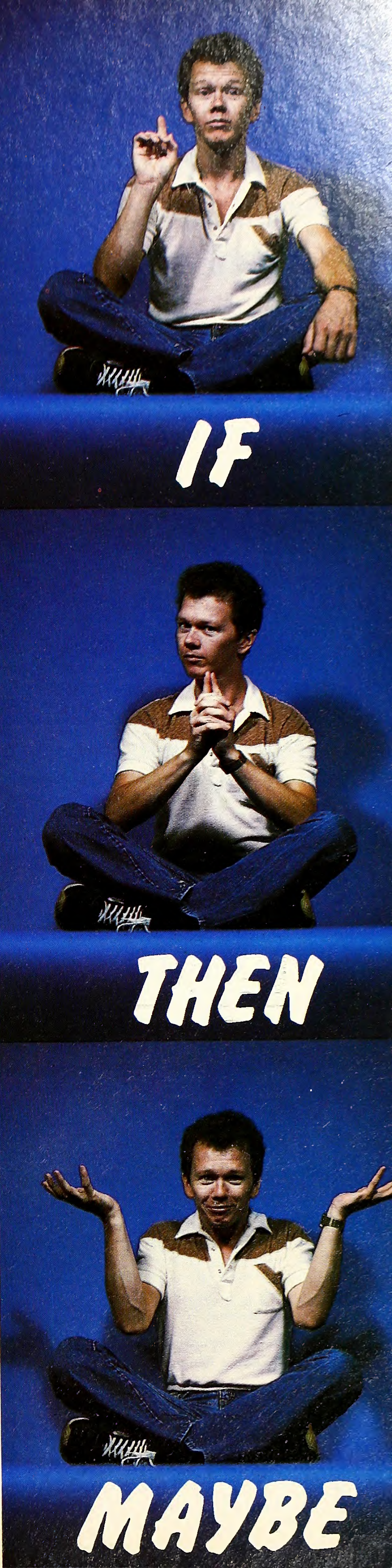
THEN Unfortunately, the character set that the Apple II Plus uses is not addressable by the microprocessor. The chip that generates the font is on the very front row of the motherboard, directly underneath the keyboard. This is the chip that you would replace if you were to install a lower-case adapter in the II Plus. The ROM, which contains the built-in programs that the microprocessor can read, is a row of six chips about six inches from the back of the motherboard. In the Apple IIe, the configuration is different but the result is the same. There is no character set in memory that the Apple, operating in Basic or machine language, can read. *David Durkee, Burbank, CA*

IF Looking through computer magazines lately I've seen advertisements for punches to turn single-sided disks into double-sided disks. I have spoken with several computer-repair persons about this practice. They claim that the other side of a single-sided disk is not polished, and that it damages the head on your disk drive. If this is true, it should be made public knowledge so that disk heads are not damaged.

Can anyone please comment on the safety of this practice and whether the emulsion on the other side is adequate for storage. *Jeffrey S. Grudin, Newbury Park, CA*

THEN Yes, you can use the back side of the disk. I call this a flippie. You punch the write-protect hole on the opposite side of the disk and turn it over. Now you have doubled the storage.

Some problems can arise from this. When you turn the disk over, it rotates in the reverse direction. This can dislodge dust particles that may have become trapped in the jacket liner, and this may cause scratches on the disk surface. Single-sided disks have been tested by the manufacturer on only the one side. Personally, I have found more disks with bad fronts than bad



backs. My recommendation is to double (flippie) only the disks you're going to keep in your library. For the working disks that may have high value or be used daily, use only one side.

Using the back side of a disk will have no effect on the head wear. As for the polishing, all disks are treated on both front and back sides. The head load button in the drive should be changed periodically, usually every six months to a year. The head load button collects a lot of particles and can scratch the back side of the disk. If you are in a dirty environment, the monthly use of a head cleaning kit is recommended, or you can use a head cleaner and a cotton swab. Head cleaners do nothing for the head load button, however. Also, head cleaners can dissolve the glue holding the head load button in place, so don't get the cleaner on this button. A new head load button can be obtained at your Apple dealer; just ask for part number 815-0064. *Roy Hicks, Buellton, CA*

IF Can anyone tell me what file types R and S are? Also, what is the significance of the number found at location 2049 (decimal) after an Applesoft program is loaded? The January DOStalk touched on this location as a means of making programs unlistable, but I am curious about the significance of the value.

Is there any documentation about how an Applesoft program is stored in memory, and where can I get it? I am aware of the tokens for commands, but I'd like more information. *Ed Melo, Piscataway, NJ*

THEN Unless the user changes the start of program pointers, an Applesoft program will always begin at location 2048 ($800 hex). Location 2049 is part of the pointer (the low byte) to the second line of the program. The table illustrates memory usage for this simple Applesoft program:

```
10 PRINT A
100 END
```

Line 100 appears starting at hex location $808. The numbers at locations 2049 and 2050 "point" to this location. If you want to have fun with a friend, load a program and type *poke 2049,1*. Then list it.

For more details on Applesoft memory usage, the best reference I have seen is *All About Applesoft*, published by Apple Pugetsound Program Library Exchange (21246 Sixty-eighth Avenue South, Kent, WA 98032). Your local dealer should be able to order it if he doesn't carry it already. You cannot order it directly from A.P.P.L.E. unless you are a member or a dealer. The book also contains a large number of utility programs, information about ampersand functions, hi-res graphics, revectoring reset, and a variety of other resource material about Applesoft useful to novices and experts alike.

There are provisions in DOS for eight different file types. The familiar ones are B, A, I, and T. These stand for binary, Applesoft, Integer Basic, and text files respectively, and they are the only file types that you can ever get using normal DOS commands. If you are more adventurous you can use a disk access utility program to modify directory entries directly and produce the other four file types. To do this you will need to modify the third byte of any directory entry (track 17, sector 15, byte 13, for instance). If this sounds foreign to you, read the manuals that come with the disk access utilities, or study pages 127–134 of your DOS manual.

Changing the file type byte allows you to produce four new file types: B, A, R, and S. The new B type will not bload. The *Lisa* assembler uses this file type to indicate its file types and to prevent them from being bloaded outside of the program. I don't know of anyone who uses the other A type. The R stands for relocatable file and is used by the *DOS Tool Kit* to indicate relocatable machine language files. The S type was put in for some future expansion use that Apple never implemented. As far as I know, it has no valid use. A number of software publishers set up title files that simply print the name of the disk and copyright information in the catalog. Since these directory entries do not actually have any program associated with them, the file type may be changed to S to prevent anyone from loading, bloading, or execing them. At this time, they have no other use. *Robert Clardy, Renton, WA*

	Decimal Location	Hex Location	Contents	Meaning
	2048	$800	00	Must *always* be 0 *
Line 10	2049	801	08	Pointer to next line
	2050	802	08	
	2051	803	0A	Line number 10
	2052	804	00	
	2053	805	BA	PRINT token
	2054	806	41	"A" character
	2055	807	00	End-of-line delimiter
Line 100	2056	808	0E	Pointer to next line
	2057	809	08	
	2058	80A	64	Line number 100
	2059	80B	00	
	2060	80C	80	END token
	2061	80D	00	End-of-line delimiter

*If you try to run a program in which the first byte (usually 2048) is not zero, it will stop and print *** SYNTAX ERROR AT 65124

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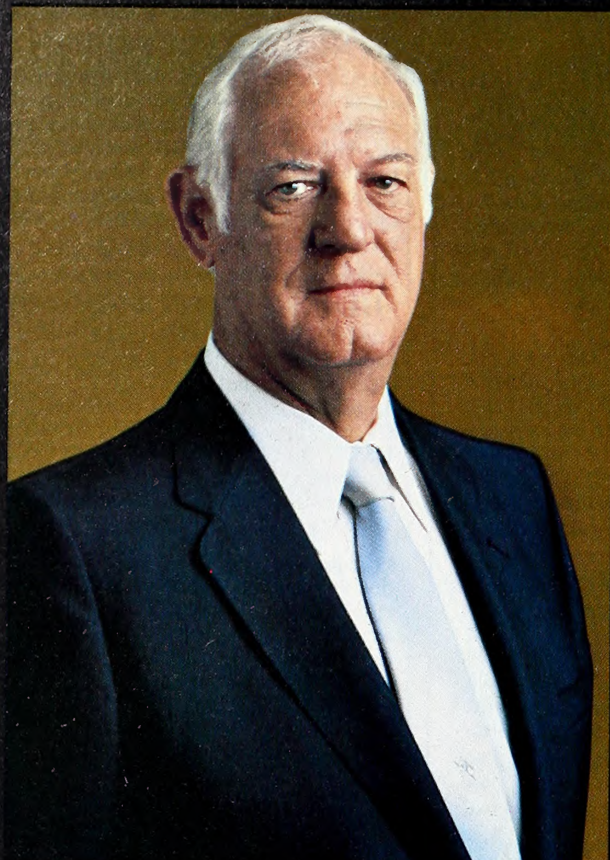
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EXEC BPI SYSTEMS

Accounting For Lisa and The Future

BY DAVID HUNTER

When the Apple II first appeared in 1977, Apple cofounder Steve Jobs made an analogy between the automobile and the personal computer. He predicted that the personal computer would be put to many uses as yet unimagined—just as cars have, since their introduction, been put to many uses that turn-of-the-century automobile makers couldn't have foreseen.

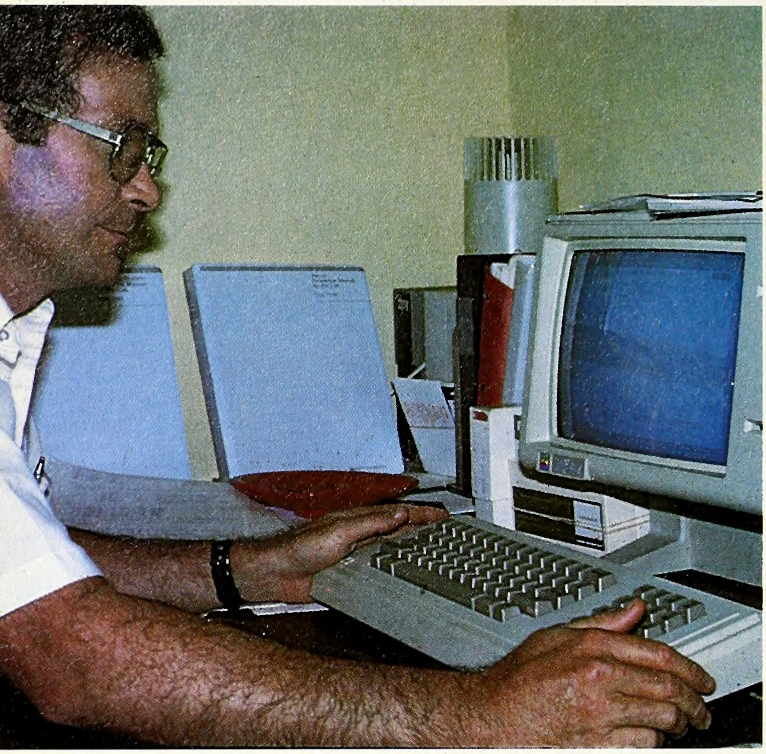
Practically every day, Jobs's forecast is proven accurate. Who could have imagined seven years ago that the Apple would be used for controlling the environment of a home, creating music, designing everything from ultralights to solar-heated houses, and helping the handicapped? Who could have imagined that the Apple would play an integral part in the running of tens of thousands of small businesses in this country and around the world?

When they first appeared, automobiles were by themselves a promising technology, but without good roads they couldn't have competed with horses or even a physically fit individual. Software is to computers what roads are to cars. The usefulness of the Apple II, Apple III, and now the Lisa depends on smooth, well-designed routes that lead to desired goals.

Paving the Way. Apple Computer has attracted some of the most innovative and expert road builders in the computer world. Some of these master paviors work directly for Apple, but by far the majority are independent, strong-spirited individuals or groups that have adopted the Apple as the informational tool of today and tomorrow. Apple has been lucky and so have the rest of us, the users.

BPI Systems of Austin, Texas, is one of these master paviors. By last count, upward of one hundred thousand microcomputer systems are equipped with one or more of BPI's accounting software packages. BPI is a remarkable success story that begins, like so many others, with a small, tight-knit group of entrepreneurs and their recognition that a personal computer needs a good road.

This page (top to bottom): Ann Oppenlander, BPI's vice president of customer service and documentation; Jerry Greifer, comptroller and assistant secretary; Larry Pickel, vice president of operations. Opposite page (clockwise from upper left): John Moss, cofounder and chairman; Randy Ferguson, cofounder and president; Tom Meadows, senior vice president and secretary; Ken DeBower, cofounder and executive vice president.



BPI's Pascal systems group manager, David Powers, runs through a demo of the company's new accounting software for the Lisa.

John Moss, chairman of the board at BPI, is semiretired nowadays, not taking part in the day-to-day activities of running the company. An accountant by trade, Moss spent thirty years of his life owning and operating small businesses. It was his energy and business instincts that got BPI started in the late seventies and steered the company onto its continuing course of success.

In 1977, Moss was overseeing a franchise chain of retail food stores in Texas when he realized that an accounting system using microcomputers could improve the operation. The general accounting for Moss's operation was sent to an outside accounting firm that used mainframes.

The time required to get the information to and from the accounting firm caused some of the smaller stores in Moss's chain to be behind the times. They couldn't react very fast to the changing market scene. Moss, who had seen Radio Shack's TRS-80 Model I, realized that microcomputers could offer the individual accountant a way to manipulate financial data quickly and easily. He envisioned a system similar to, but scaled down from, what the big accounting firms used.

"John is not a programmer," says Randy Ferguson, BPI's president. "But he's a visionary who saw the potential of the microcomputer to help with these aspects of running a small business."

General DeBower. In 1978, Moss met Ken DeBower, a data processing professional with nearly eighteen years' experience. Moss hired DeBower to write a general ledger program for use in his retail food store chain. Working weekends, DeBower wrote the general ledger program on the Apple II; and, other than one major revision, the program has remained the same through the years and is used by tens of thousands of businesses.

Woe to the entrepreneur who misses an opportunity. Moss showed the general ledger program to a computer store dealer in Dallas and struck up a deal wherein he and DeBower would deliver five hundred systems over the course of five months. Moss wrote the user manual for the product and the program became very popular with those who ran across it in those early days.

At the same time that Moss and DeBower were starting their modest accounting software business, Randy Ferguson, a native Texan, was starting a similar scheme.

Ferguson, who was vice president of operations at the Austin National Bank, was trying to find an accounts-receivable system for his twin brother's small business. Ferguson had spent five years in the data processing department at the Austin National Bank working in sales. He'd also done a small amount of programming on Wang minicomputers.

Early in 1979, Ferguson wrote an accounts-receivable program for his brother on the Apple II and was so impressed with the outcome that he decided to start selling it.

As fate would have it, Ferguson and Moss met in a Waco computer store when Ferguson went searching on his brother's behalf for a general ledger program. Ferguson found the program and his future business partners.

In the summer of 1979, Moss, DeBower, and Ferguson each put up a thousand dollars and formed BPI Systems. The company's initials stand for business, professional, and industrial, which are the three main markets the trio decided to go after. The first general ledger programs started shipping in July 1979 and BPI was off and running.

Good News Travels Fast. From the start, the company seemed destined for success. Within half a year of having formed BPI, DeBower and Ferguson quit their regular jobs to devote all their time and energy to the company. Their first two products were well received and, despite the lack of firm distribution networks, the good word about BPI's products spread—it spread all the way to the heights of Mount Olympus.

Both Commodore and Atari were impressed with BPI's accounting software and struck up mass purchase deals in 1980. In those early days, BPI hit upon a good scheme that circumvented the dearth of distributors—sell programs en masse to computer manufacturers and let them handle the distribution. By 1980, small business applications and microcomputers seemed the perfect marriage. The personal computer manufacturers saw a way to sell more machines, and a remarkable number came knocking on BPI's door.

By midyear BPI was shipping three to four hundred packages a month. The company was run entirely by Moss, DeBower, Ferguson, and Moss's wife Margaret. In November of that year, the company hired its first salaried employee.

The biggest milestone in the company's history came when Apple Computer inquired about distributing BPI's accounting software for the Apple II. A deal was struck in short order and BPI started shipping thousands of products a month.

The mutually beneficial relationship between Apple and BPI relies on the particular strengths of the two companies. BPI produces the products, including packaging and documentation, and provides support, while Apple markets and distributes them. It's a relationship that both corporate entities have been pleased with and hope will continue for some time.

BPI and Apple are of like mind. Recent estimates put the penetration of microcomputers into the potential small business market at 5 percent. And the size of the small business market is enormous. Ferguson calls it "the Fortune fourteen million." Any serious attempt to capture a large part of that market cannot be a half effort. Joining forces gives both parties a fighting chance and is often the most efficient use of available resources.

The OEM Connection. Until this year, BPI operated for the most part like an OEM (original equipment manufacturer) supplier, shipping its prepacked accounting software to computer manufacturers, who marketed and distributed it. The level of expertise—in documentation, support, packaging, and programming—demanded of BPI is no less than that demanded of a more maverick operation, which must attract distributors and dealers by the quality of the product and not by the fact that an Apple Computer or an IBM has put its name on it.

Many factors go into the making of a successful software publishing firm like BPI. One vital factor is skilled, creative people. Once the business began to take off, BPI was fortunate enough to attract a number of talented individuals.

Ann Oppenlander, BPI's vice president of customer support and documentation, joined the company in January 1981. Oppenlander, who has a Ph.D. in English, brought to the firm considerable experience in documentation writing. Prior to joining BPI she'd worked at NCR, programming business applications on DEC mainframes, and had spent two years as manager of Texas Instruments's publications department.

When she saw BPI's products, Oppenlander was impressed and accepted Moss's offer to join the young company. She started on the telephone, answering customer-support calls and learning the "audience," which she says was quite different from what she was used to at TI.

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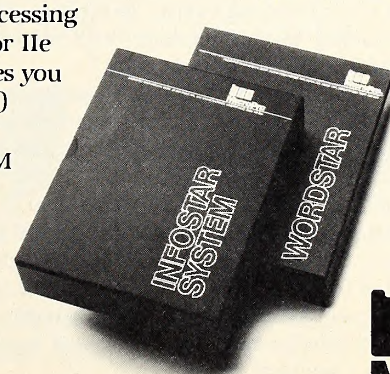
To take us up on our offer, hurry down to your local computer store between June 1 and October 31 and pick up WordStar or InfoStar.

Either one will make your Apple shine.



MicroPro®

Technical Data: Board Includes 6 MHz Z-80B Processor, 64K RAM, CP/M 2.2, 70 Column High Resolution Capability, Shift Key Modification Device, And Expansion Interface Connector.

"At Texas Instruments, we were writing manuals for programmers. Here was a challenge to make them understandable to everyday people."

Both Ferguson and Oppenlander are convinced that a clear, concise, understandable manual is a critical aspect of putting out a successful software product for the personal computer market. "In this industry," says Ferguson, "it's a case of data processing products being produced by data processing people for non-data processing users."

By having the dual responsibility of producing the manuals and overseeing the customer-service area, Oppenlander knows how users are responding to BPI's products on a daily basis. The company regularly receives between five thousand and six thousand calls a month, and a careful tally is kept on the nature of the calls.

Master of Operations. BPI's vice president of operations, Larry Pickel, joined the company early in 1981. He spent nine years with the Austin National Bank in a number of diverse positions, including operations and data processing. For a while, he worked with Ferguson at the bank, and that previous association helped land him the job at BPI.

Pickel refers to his basic responsibilities as making sure "the ox gets out of the ditch." He oversees the product management and administration of BPI. He has two adept managers working under him, one in charge of production and one in charge of administration.

Pickel, like so many in the microcomputer software industry, left a good, solid job for the uncertainty (and excitement) of software publishing and is glad he did.

"Where I'm going I can't tell you," he says. "But it took something to make me leave an officer's chair at the bank to come here. All of us—Ken, Randy, Ann—are not here just to make a quick profit. We're here for the long haul."

Gerald I. Greifer is BPI's comptroller and assistant secretary. A CPA by profession, Greifer comes from the world of New York City high finance, where he was with Peat, Marwick, and Mitchell, the largest accounting firm in the world.

In the spring of 1981, Greifer helped Moss and Ferguson on BPI's *Payroll* package update as a private consultant. With his knowledge and experience, Greifer has been invaluable to the development of BPI's products. He joined BPI full-time in November 1981.

Greifer believes that BPI's potential for growth is "unlimited, if we do the right things. This is a small company by New York standards, but it's not disorganized. They say that large companies have meetings too often and that small companies don't meet often enough. Large companies can get very political in their structure. BPI is the perfect world for me."

Accounting Triumvirate. The three top execs that hold the reins at BPI, now that Moss is not in the office on a day-to-day basis, are Ferguson, DeBower, and Thomas Meadows.

DeBower attended the University of Nebraska and discovered computers in the early sixties. He's worked as a programmer at Texas Instruments and Radian Corporation, an environmental and energy consulting firm. The only bonus he ever got at Radian he spent one afternoon on an Apple II. He saw the computer as his ticket to greater things.

As BPI's executive vice president, DeBower spends a lot of time helping to move the company's programs over to other microcomputers. He sees computer hardware getting smaller and faster in the future. "Computers are still almost a toy, kind of backward," he explains. "The microcomputer industry is heading toward machines with minicomputerlike performance and capabilities for multiple users."

BPI's senior vice president and secretary, Thomas Meadows, came from IBM, where he held various marketing and management positions. For a while after that, he had his own consulting firm. A little over a year ago, he came to BPI.

Meadows is a confident and likable marketer who spends a lot of his time on the road, spreading the word about BPI's products. His job is of paramount importance because the basic strategy at BPI is changing.

Last year, the company was totally an OEM supplier, but this year it's trying something new. Ferguson says the firm is moving into selected vertical markets on its own and that these kinds of efforts will account for 40 percent of the company's products in 1983.

Programs like *Church Management*, *Speed Reading*, *Professional Time Accounting*, and now BPI's accounting software for the Lisa are just some of the products that the company will market and advertise on its own.

The Third GAP. BPI's and Apple's relationship has continued with the Apple IIe and the Apple III. BPI's *General Accounting Package* for the Apple III is currently going into full distribution. The experience BPI has accumulated while creating accounting software for the Apple II family of computers over the years is reflected in the Apple III package.

Last year, in September, Apple approached BPI about producing accounting software for the Lisa. Apple shipped a Lisa to BPI in the first week of October and sent a couple more in the early part of this year. Under the guidance of Pascal systems group manager David Powers and programmer Andy Chisholm, the project has gone smoothly and matured quickly. BPI's accounting software is the first from an independent publisher to take advantage of the Lisa's advanced features.

The Lisa project came at a good time because BPI was well into creating the Pascal code for the *General Accounting Package* for the Apple III. Doing so was simply a matter of moving the application code from the III to the Lisa and then building a software shell that capitalizes on Lisa's functions.

BPI has three accounting programs that run on the Lisa: *General Accounting Reports*, *Accounts Receivable Reports*, and *Accounts Payable Reports*. After booting the system, you put in one of BPI's application disks (or "twiggies," as Powers likes to call the Lisa's new style of high-density, dual-window disks). The software takes you right to what is called the environment window, a menu that allows you to use Lisa's Desktop Manager, the ProFile hard disk, or the BPI system.

The program shell is similar to Lisa's office environment. It uses hierarchical menus and icons for particular functions, all controllable by the Lisa's mouse/pointer. Except when you're entering the basic financial data, which is done by using Lisa's ten-key numeric keypad, the mouse is all you need to work with the system.

Each of BPI's programs for the Lisa includes the Disk Document Manager, which permits you to delete or preserve documents on disks and perform a variety of other related data management tasks. Within the Disk Document Manager is the query feature, which allows you to look at a particular listing or find a stored document without terminating the primary function in process.

BPI's Lisa packages should be appearing in a matter of months, released by BPI but not distributed by Apple. A payroll package for the Lisa is also in the works.

Streets of Financial Fire. In June 1982, BPI made a public stock offering, and a little over a month ago the company had its first annual stockholders meeting. For the fiscal year ending March 31, 1983, BPI reported total revenues of a little more than $6 million and net earnings of $1.5 million. Three years earlier, those figures were seventy thousand dollars and twenty-five hundred dollars respectively.

The company has grown in three years from a half dozen or so employees to around one hundred twenty. BPI occupies several buildings within a mile of each other off Guadalupe, one of Austin's main drags, just up the street from the University of Texas. BPI has purchased land and is constructing its own building, which the company hopes to occupy by the end of 1984.

Austin, as it turns out, is a good location for a high-tech company. The University of Texas regularly turns out a large crop of bright and eager graduates in computer science and engineering. There are also several large computer firms in the area, such as Texas Instruments and Intel. Most recently, the Microelectronics and Computer Technology Corporation, a research corporation founded by a consortium of American computer firms, moved into the area.

BPI serves nine main clients as an OEM supplier. The nine are Apple, Atari, Commodore, DEC, Hewlett-Packard, IBM, NEC, Sanyo, and Texas Instruments.

"We view ourselves as an extension of the hardware manufacturers' organizations," says Meadows. "Each of the nine is different. Yet we have the ability to adapt and do things their way."

With new directions, a solid working relationship with most of the big-name microcomputer manufacturers, and a competent, professional staff, BPI is a vital element in the world of financial software. Ferguson believes the company has brought together three professions—journalism, accounting, and programming—into a triple-threat force.

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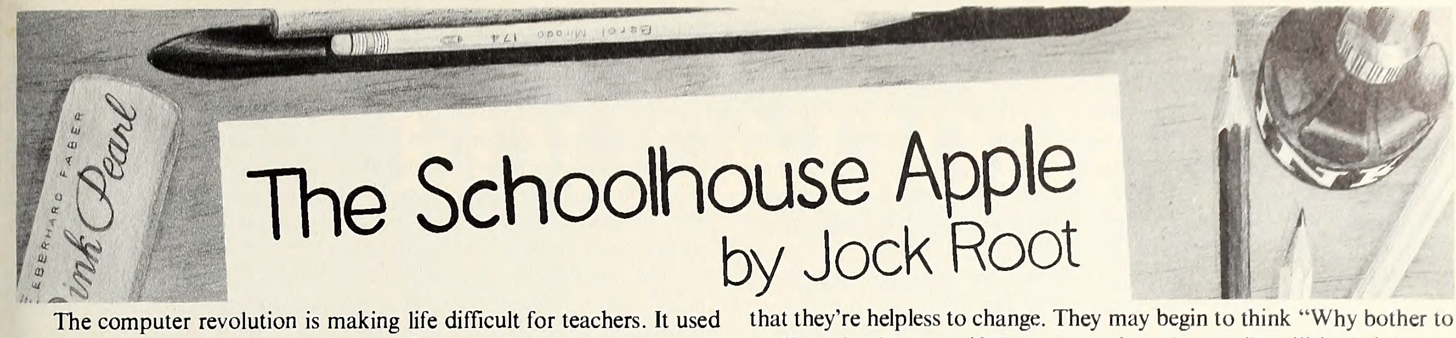


The Schoolhouse Apple
by Jock Root

The computer revolution is making life difficult for teachers. It used to be that a teacher could answer most of a student's questions, even outside of the classroom, simply because the teacher was older and therefore more experienced than the student. But microcomputers have disrupted that pattern—they're coming on so fast that the teachers can hardly stay ahead of the students.

This month's column is dedicated to those teachers. We're going to discuss resources; if your school has just acquired a new Apple and people are asking you what your department plans to do with it and what software you'll need, then this column is for you. We can't answer those questions for you, but we can show you where to find some answers.

Several kinds of resources are available. We will consider four varieties—professional organizations, computer education centers, magazines, and software directories. These categories overlap a good deal. Most of the professional groups publish journals, and some of them maintain computer centers or publish software directories.

Let's start with the magazines. One of the fastest and most pleasant ways to acquire literacy in any field is to read the magazines of that field; and, in the case of magazines about computers for teachers, there's a special advantage. Magazines by teachers for teachers, which most of these are, teach you more than most other magazines could.

The Computing Teacher. One of the oldest and best magazines for teachers is the journal of the International Council for Computers in Education (ICCE), *The Computing Teacher.* It's a big one—sixty to eighty pages, mostly editorial—and it's all fascinating. Consider, for example, the August 1983 issue.

A college English teacher, Helen J. Schwartz, writes about a CAI program she developed to introduce her students to literary analysis. She has combined the patient, nit-picking thoroughness of the computer with the human cleverness of the students themselves to create the Seeing-Eye Elephant Network, SEEN for short.

The Seeing-Eye part of the program is an interactive tutorial on getting your thoughts together about a story idea or a character. It prompts students to create hypotheses about characters in stories they've read and to support their hypotheses with evidence from the stories. They're prompted to put these thoughts in the form of "notices," which are remembered by the Elephant part of the program.

The notices are also posted (under pen names) in the network, which makes them available to be read by the other students. The other students can then make comments (also under pen names), which the authors of the notices can read. Thus students can get thoughtful and considered feedback from their peers—which may be more effective than what they get from the teacher, since it's in their own language.

Incidentally, this program is a clear demonstration that a computer in the classroom is not necessarily an impersonal influence.

The SEEN program is available, at cost, from Helen Schwartz, English Department, Oakland University, Rochester, MI 48063. The Apple II Plus version, which requires 48K, one or two disk drives, and CP/M, costs $5 for a listing of the code or $10 for a disk. Both versions include instructions for user and instructor.

Another August article, by Kenneth A. Ryba and James W. Chapman, makes the point that computers can actually have a "humanizing" effect on instruction, at least in the sense of giving the student more control over the instructional process. This can be very important to some students, particularly those whose feelings of internal control are weak.

A strong feeling of internal control corresponds roughly to "I am running my own life," while a feeling of external control corresponds to, "They are doing this to me, and I can't help it." Students who do poorly in school consistently may come to accept that as a permanent pattern that they're helpless to change. They may begin to think "Why bother to try?" And, of course, if they stop trying, they really will be helpless to change the pattern. This attitude has been called "learned helplessness."

The article describes how a computer with well-designed software can develop and strengthen a student's feeling of internal control. For one thing, a program can give the student a measure of real control over the flow of instruction in terms of choosing what to do next (for example, learn new material, review old, or take a quiz), choosing the presentation speed of new items, and the like. For another, a program can provide personalized positive feedback ("You learned that quickly, Ellen!"). In fact, a program can demonstrate to students in their own terms that they really are learning from it. They're prompted to set goals for themselves; later they're asked to evaluate their own performances in reaching those goals.

We have all been warned about becoming dependent on our computers, but now it seems that computers, intelligently used, can help to *cure* dependency behavior problems.

There's lots of other good stuff in the issue—a piece on Logo, a model for software evaluation, an article on how to find community funding for a school computer, and more.

The Computing Teacher is an elegant and highly readable magazine, full of thought-provoking ideas, but it isn't aimed at beginners. If you're just getting started with computers, you might be more comfortable with one of the commercial magazines. They dress differently from the academic journals—slick paper, color, more advertisements—and they don't take themselves quite as seriously, but the teachers and other specialists among their contributors seem as knowledgeable as those of the more serious journals.

Electronic Education. Despite its high-technology title, this magazine has a friendly feeling and a general outlook rather like that of a group of specialists meeting for coffee after work. In the May/June 1983 issue, the group starts its meeting by discussing the question, "Are schools without computers cheating their students?" The conclusion of this article, which is based on a poll of the magazine's contributing editors, is unanimously positive, although some feel that the community must share responsibility with the schools. The editors end by noting that the question will "answer itself before too much more time goes by. The next generation of computer literates (or illiterates) will give living testimony to the answer."

Another article takes a look at how computers are opening doors for handicapped people by giving them tools that help to minimize handicaps. Software that provides enlarged character display or special typefaces (such as *Higher Text*, by Ron and Darryl Aldrich) can be very helpful for people with impaired vision. The article also describes an enlarged keyboard that can be made for people with motor-coordination problems.

The lopsided use of microcomputers in most schools is another topic the magazine discusses. It points out what administrations are missing out on by letting computers sit idle between classes. Another feature addresses the urgent need for books to help computer beginners; the message of this article is, "You could probably write one."

The issue includes a couple of long and thorough courseware reviews and a column of news notes, including mention of a number of sources of free software.

Educational Computer. *Educational Computer* has something of the flavor of a hobbyist's magazine. It's always interested in how things work—not mechanical things usually (though there's a little of that, too), but abstract things, such as computer-managed instruction, touch-typing courseware, and computer camps.

The table of contents of each issue offers a brief description of what each article in that issue contains. Some highlights from May/June 1983 are an article on computer-managed instruction describing specific CMI software packages and how and where they're being used; and another, on computer-assisted instruction in typing, which discusses the performances and pedagogical approaches used in four different typing programs, with critiques of their potential usefulness. In "Data Processing and Special Olympics," we see how a winning team saved time using a data management system for a very Special Olympics event.

You see? Always, the approach is how it works or how people did something. You can get ideas from pieces like that.

Educational Computer also has the hobbyist magazine's collection of columns, covering a range from preschoolers to the media center. Departments offer various kinds of news, including answers to questions like what's new in courseware? In books? And how good is it?

Two from Scholastic. If there's anyone who should know how to write to an audience of school people—teachers and students—it's Scholastic, which has been doing it for several decades throughout most of the English-speaking world. Its material often combines the viewpoint of the hobbyist with the style and polish of the professional. Scholastic has had a magazine aimed at teachers and interested adults for a couple of years called *Electronic Learning*, and it's about to start another.

Electronic Learning is for the hobbyist who has grown into a do-it-yourselfer. This publication also describes its articles on the contents page, and the descriptions of three out of the four feature articles in the April issue begin with "How . . .". The topics of the articles are raising SAT scores, retooling your business education curriculum, and exploring new horizons with Logo. Even the fourth article is a how-to by implication—it's a buyer's guide to videocassette recorders.

The columns follow the same pattern, specific and practical; and the departments contain news, announcements of new books and software, reviews, and information about resources.

Scholastic's new entry, *Teaching and Computers*, has a quite different flavor. Judging by the preview issue, spring 1983, it's aimed more at the beginner than the hobbyist. The introductory editorial says it will have material for both groups, but this issue is devoted more to preparing and reassuring the beginner than to challenging the hobbyist.

"A Day in the Life of a Computer-Using Teacher" follows Dr. Beth Lazerick through a delightful day: She's clearly in love with the power and the challenge of computers and she spends her time sharing this love with the kindergarteners through sixth-graders of Moreland Elementary School in Shaker Heights, Ohio. Her fifth-graders are writing fairly complex programs, with loops and subroutines; and her sixth-graders are studying the programmer job market.

The other feature articles are "Ten Things To Do the Day the Computer Arrives," which contains practical suggestions to smooth the first meeting between class and computer, and a piece on introducing your class to a word processor (which is also helpful in introducing you to a word processor if you haven't met one yet).

The columns and departments are what you would expect from Scholastic in this context: extensive and informative. For example, the departments include a convention calendar and a question-and-answer column dealing with questions teachers ask most about computers.

And Then Some More. There are several other good magazines in the field. *T.H.E. Journal* (short for *Technological Horizons in Education*) has a format somewhere between a journal and a commercial magazine. The magazine focuses on the area of impact between computers and education at every level, from the classroom to the administration to the society beyond. *Collegiate Microcomputer*, a full-dress academic journal, concentrates on college-level applications.

There's one type of resource we haven't touched on yet.

Software Directories. *Swift's Educational Software Directory* is a good example of the catalog type of directory, containing brief product summaries and simple listings of program specifications as provided by the manufacturer. This book doesn't tell you a lot about each program but it does tell you about a lot of programs. There are more than four hundred pages of listings, with typically five or six programs described on each page.

All the programs listed in the Apple II edition of the Swift directory run on the II and II Plus; most also run on the IIe, which is noted.

The programs are listed in a standard format, which makes comparisons easy. Each listing includes program name, publisher, a brief description of the content, the target audience, any special equipment requirements, and price. Other information is included if it's available, such as a description of support materials, time required to complete the program, references to published reviews, and the like.

The directory includes a master index alphabetized by program name and a cross-index alphabetized by publisher and program. The cross-index includes publishers' mailing addresses.

But suppose you need to know more than this? Suppose you want to see a critical evaluation of the program—or better, several evaluations—before you buy it? Then you may need a different kind of directory: a collection of reviews. Read on.

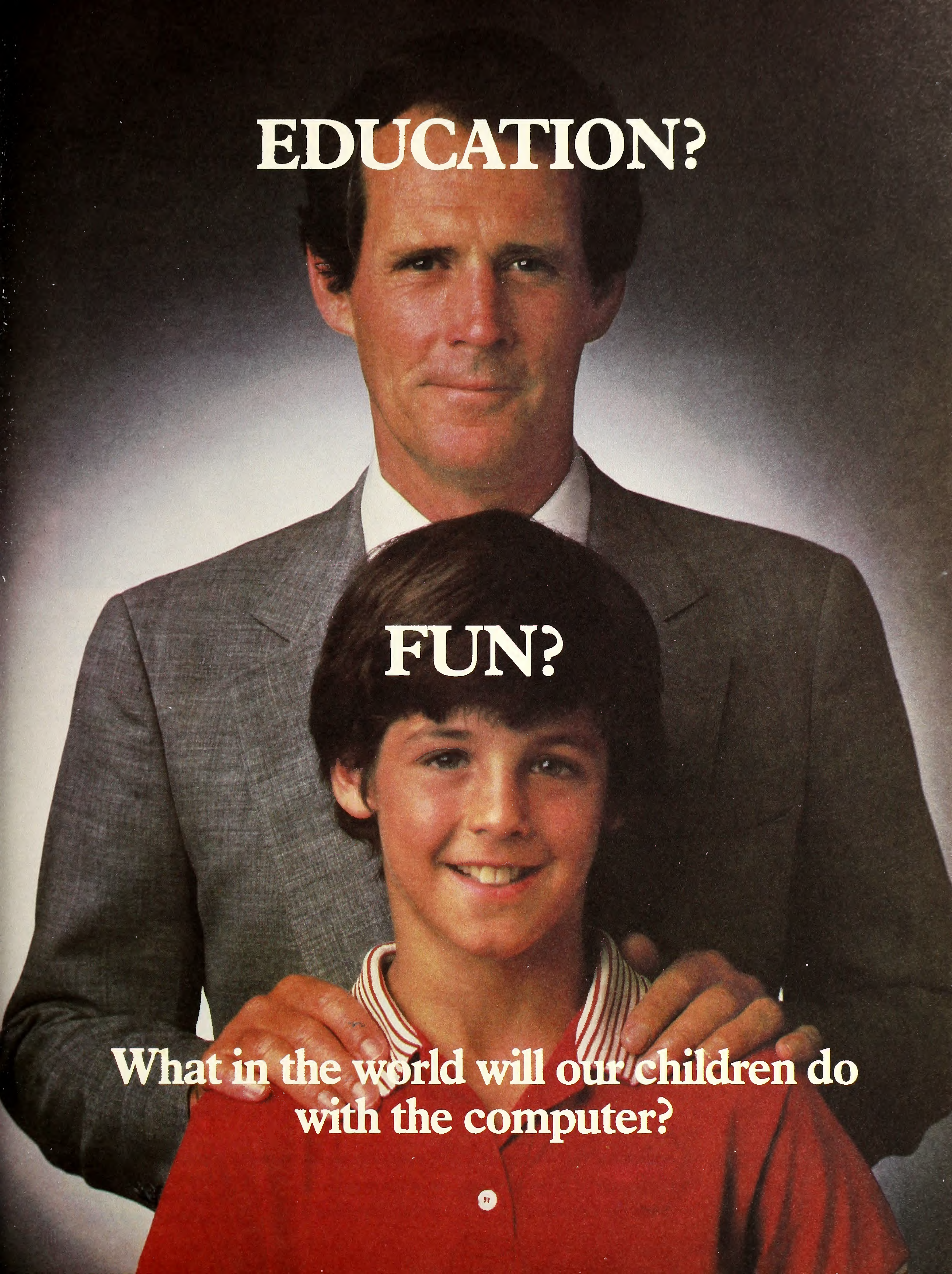
The Digest of Software Reviews: Education. The *Digest* doesn't list quite as many programs as the Swift directory does, but it gives more information about each one (for example, "instructional mode" and "suggested group size"); and it includes quotes from several published reviews. The *Digest*'s publishers, School & Home CourseWare, currently index and abstract critical reviews from more than sixty journals and newsletters.

A number of other resource books are available—including publishers' catalogs, another source of useful, if sometimes biased, information.

A Thought To Make You Smile . . . and Think. All the publications we've discussed share at least one goal—to understand and help spread that ephemeral quality we call computer literacy. A poem submitted by a sixth-grader at Hiawassee Elementary School, Orlando, Florida, to *The Computing Teacher* presents a refreshingly simple and accurate description of that term. We hope you'll enjoy it.

The Computer Programmer
by Danny Hislop

Lights, numbers, Bleeps, bloops
Pac-Man does his thing;
Countdown starts, The shuttle's gone
What will tomorrow bring?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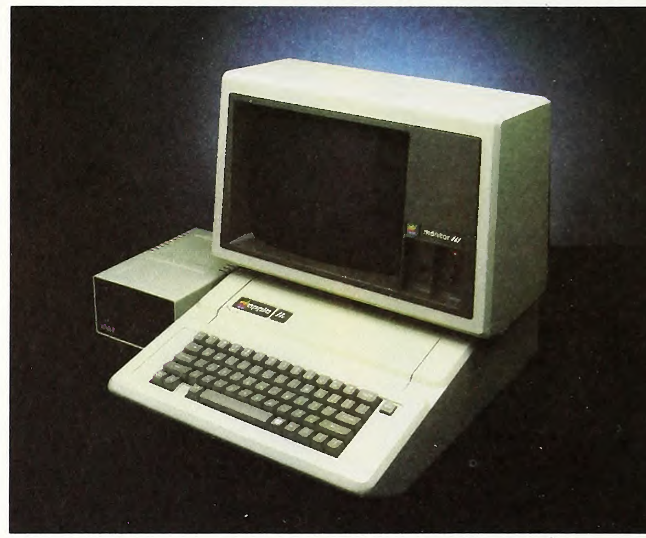

1. WHAT IN THE WORLD IS A "MICROZINE?"

Microzine is an interactive magazine on a computer disk, and it can open up the world of computer learning to your children *more effectively than any other children's software available today.* Microzine comes to you from Scholastic. We've been trendsetters in children's publishing for over 60 years. Now that traditional teaching methods are being enhanced by computer-taught materials, Scholastic is ready with the innovation that creates an ongoing "dialogue" of fun and learning between your children and your computer. Like a magazine, but unlike other software for children, Microzine is constantly current and topical. Your children receive a new four-program Microzine disk every other month and build their own Microzine Library!

2. WHAT CAN YOUR CHILDREN DO WITH MICROZINE?

Microzine can help your 9-13-year-olds take advantage of one of the most important uses your computer can have: exploring new and more efficient ways of learning and thinking. (If you don't own a computer, your children may be able to use one at school or a friend's home, or borrow one from your local public library.)

Microzine was created with the recognition that today's children take naturally to computers and that tomorrow's adults will need to be computer literate—no matter what their careers.

3. WHAT IS "COMPUTER LITERACY" AND HOW DOES MICROZINE HELP ACCOMPLISH IT?

At Scholastic, we believe that learning how to utilize a computer's wide-ranging capabilities should be an important part of every child's education. This kind of computer literacy is no longer an option, but a necessity, if our children are to take their places in the computer age. To this end, Microzine is designed to spark enthusiasm and teach these essential skills:

★ following directions
★ vocabulary
★ what a computer can do
★ learning to use a computer
★ the nature of programming
★ using the keyboard
★ everyday applications
★ word processing
★ data handling
★ graphics
★ logic
★ parts of a computer
★ problem solving

4. WHAT WILL THE FIRST YEAR OF MICROZINE BRING?

An ever-expanding library of fun and learning!
Every eight weeks there are four full-length programs and the variety is incredible:

Who's that trying to solve the *Mystery at Pinecrest Manor,* lost in the *Northwoods Adventure* and challenging the far reaches of space on *Mission to Planet XII*? Could it be someone we know? (With Microzine, *anything* is possible.) All set for takeoff on the *Space Shuttle*— or maybe a hot air balloon race? Wow! (Will Microzine *ever* get down to Earth?)

Back safe on Planet Earth, visit the *Pet Store.* "A flamingo for your bathtub? Or maybe a rare three-humped camel?"

Too wild? *Gift Store* offers practical suggestions for everyone from Great Uncle Oscar to your 16-year-old twin sisters. Or explore your creative options by composing a song, writing and illustrating a book, or inventing your own game.

Microzine is *always* full of questions. If you've ever dreamed of talking to a computer game designer, *Ask Me* gives you the chance. You won't believe all the current big stars waiting to ask you questions, too.

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Synthesizers sing their song.

What makes these things work so well?
Are they alive and breathing machines?
They seem so smart and talented
Yet on their own they don't know beans.

The brains behind these magic toys
Is very plain to see—
The computer programmer, yes indeed
That's what I'd like to be.

Collegiate Microcomputer, Rose-Hulman Institute of Technology, Terre Haute, IN 47803. *The Computing Teacher*, 135 Education, University of Oregon, Eugene, OR 97403; (503) 686-4414. *Educational Computer*, Edcomp, Box 535, Cupertino, CA 95015; (408) 252-3224. Electronic Education, Electronic Communications, 1311 Executive Center Drive, Suite 220, Tallahassee, FL 32301; (904) 878-4178. School & Home CourseWare, 1341 Bulldog Lane, Suite C, Fresno, CA 93710. Sterling Swift Publishing Company, 7901 South I-35, Austin, TX 78744. *T.H.E. Journal*, Information Synergy, Box 992, Acton, MA 01720.

The Voice of THE TURTLE

A Schoolhouse Apple Tutorial

LOGO

DONNA BEARDEN

September seems a fitting time to resume the Logo portion of the Schoolhouse Apple. Donna Bearden returns to provide challenging Logo fun for kids, parents, and teachers.

The ABCs of X and Y

Do you know exactly how many steps the Turtle takes from HOME to the top of the screen before he wraps? How about to the right before he wraps around to the left? If you do, you can begin to position the Turtle quite quickly, anywhere you want him, without all those forward, back, right, and left commands.

Let's start with X positions, which are the positions to the right and left of HOME. First pick the pen up (PU) and then give a few commands: SETX followed by a number. If the number gets too high, the Turtle will wrap, so the trick is to figure out the highest number he can handle without wrapping. If you want him to go to the left-hand side of the screen, use SETX followed by a negative number.

Y positions are the up and down positions. Use SETY followed by a positive number to make the Turtle move toward the top of the screen or a negative number to make him move toward the bottom. Once again, find the highest number you can use before he wraps.

What happens when you give an X command followed by a Y command?

Once you've experimented with the commands separately, they can be combined into one command. If you're using Apple Logo, the command to use is SETPOS [40 90] (or whatever numbers you choose). The first number is always the X position and the second is always the Y. If you're using MIT Logo, the command is SETXY followed by two numbers. In MIT Logo, if the second number (the Y position) is negative, it must be enclosed in parentheses.

If you've never used these commands before, take some time to play with them. You'll soon be able to estimate exact positions on the screen. If you think you're good enough, maybe you should try a little target practice.

Target. Target is a very simple program that draws a small circle at a random position on the screen and then returns the Turtle to HOME. The player must try to command the Turtle to land on the target. When you first start playing the game you can have three tries to hit the mark. A "sure shot" can hit it in one. (But even Annie Oakley had to practice a lot.)

```
TO TARGET
CS PU
* (see below for Logo-specific commands)
PD
CIRCLE
PU
HOME

*Apple: SETPOS LIST (RANDOM 260) (RANDOM 115) - (RANDOM
 70)
*MIT: SETXY (RANDOM 260) (RANDOM 115) - (RANDOM 70)

TO CIRCLE
REPEAT 36 [FD 1 RT 10]
END

TO T
TARGET
END
```

Look at the line that tells the Turtle the X and Y positions. The first number is RANDOM 260, which tells the computer to pick any number between 0 and 260. If you fooled around with very many numbers with the X command, you'll realize that 260 will make the Turtle wrap completely around the screen and back to HOME. So with one random command, we've covered the entire screen. (This number may differ slightly from screen to screen.)

The Y command is a little trickier. We don't want the target to be drawn underneath the text lines. Through experimentation, we can determine that the Turtle can go about 70 steps toward the bottom of the screen before he slips behind those text lines, so −70 is as far as we want him to go. It's about 115 steps to the top. So to cover the screen from top to bottom without going behind the text lines, we tell the computer to select any number from 0 to 115 and then to subtract any number from 0 to 70.

By the way, the T procedure was written because it's nicer to be able to type T every time you want to play than to have to spell out TARGET.

Connect the Dots. If you've mastered Target, try your hand at Connect the Dots. It's the same concept as Target, but this time the Turtle will draw four random dots that you must try to connect in the least number of moves. If you go through a dot, that's okay; you can continue on to the next one. But you must at least touch all four dots and return to HOME. The least number of moves you can take is five—unless you're lucky and two of your dots are lined up such that you can pass through the first one and land on the second.

```
TO DOTS
CS
REPEAT 4 [SPOT]
PU
HOME
PD
END

TO SPOT
PU
* (See below for Logo-specific commands)
PD
CIRCLE
END

*Apple: SETPOS LIST (RANDOM 260) (RANDOM 115) - (RANDOM
70)
*MIT: SETXY (RANDOM 260) (RANDOM 115) - (RANDOM 70)

TO CIRCLE
REPEAT 36 [FD 1 RT 10]
END

TO D
DOTS
END
```

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(ej' o͝o wâr) *n.*
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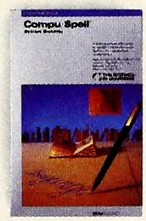

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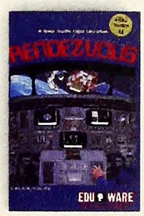

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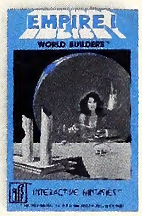

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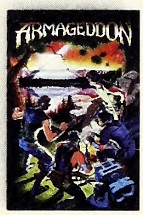

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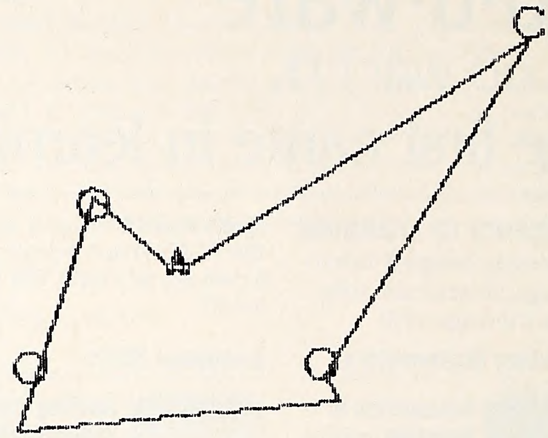
In the example shown here, the player connected the dots in six moves.

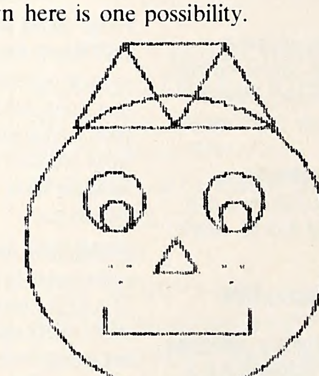


Another Kind of Dot. The DOT command is another fun way to use the X and Y coordinates. By giving the command DOT followed by two numbers representing the X and Y coordinates, you can make a dot appear at that position on the screen. It's very helpful if you're drawing an hourglass with sand trickling through it, plotting a constellation, or drawing a face with freckles.

Here are the commands to draw some freckles. Why don't you see if you can draw a face around them! (Note the differences in the Apple and MIT versions.)

```
Apple: TO FRECKLES
       DOT [20 -14]
       DOT [27 -14]
       DOT [23 -20]
       DOT [-16 -14]
       DOT [-23 -14]
       DOT [-19 -20]
       END
MIT: TO FRECKLES
       DOT 20 (-14)
       DOT 27 (-14)
       DOT 23 (-20)
       DOT -16 (-14)
       DOT -23 (-14)
       DOT -19 (-20)
       END
```

The face shown here is one possibility.



By combining the RANDOM command we learned in the Target game with the DOT command, we could fill up a whole nighttime sky with stars. The numbers were changed slightly so the stars wouldn't come down quite so far. After experimenting with several possibilities, it was decided that DOT LIST (RANDOM 260) (RANDOM 115) – (RANDOM 20) was the best choice. Some of the stars may end up on the roofs of the tallest houses, but the sky looks more natural if some of the stars come down between the houses, so just consider those falling stars!

(For MIT Logo, change all of the SETPOS commands to SETXY. If the second number is negative, enclose it in parentheses.)

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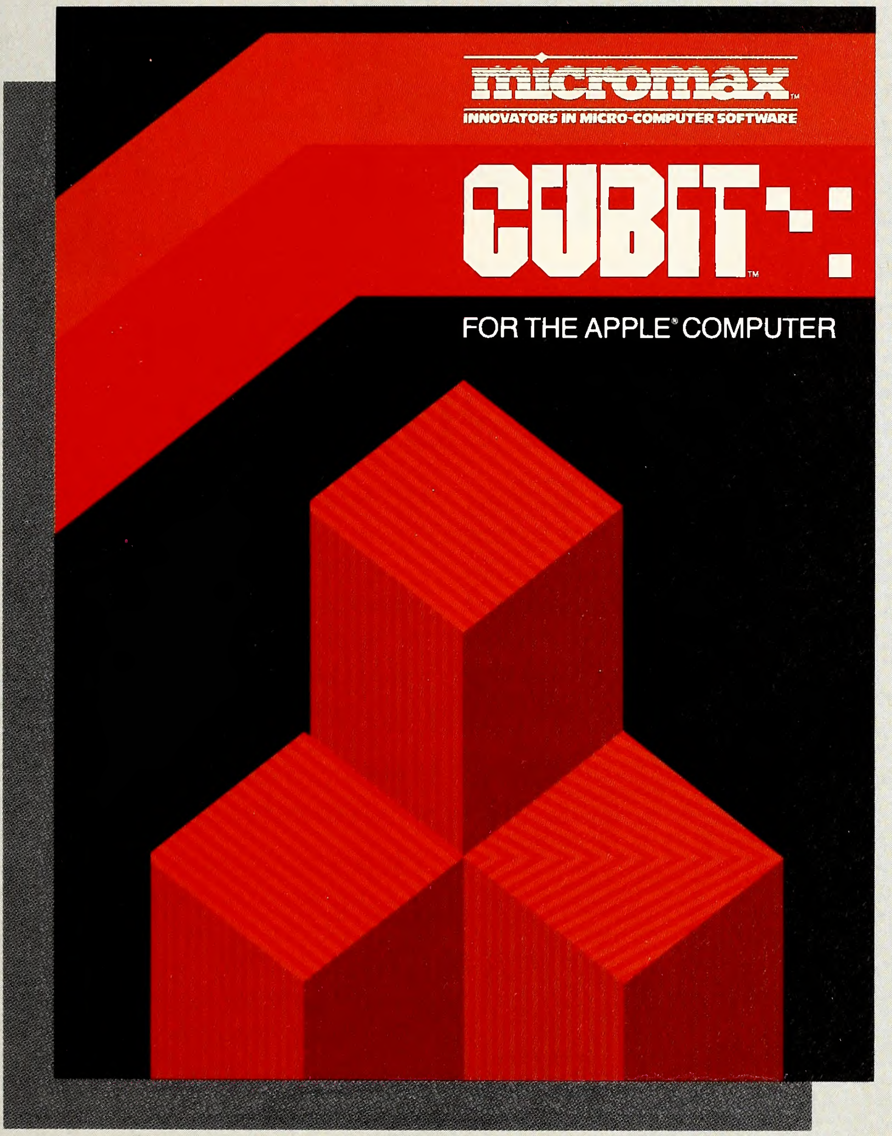

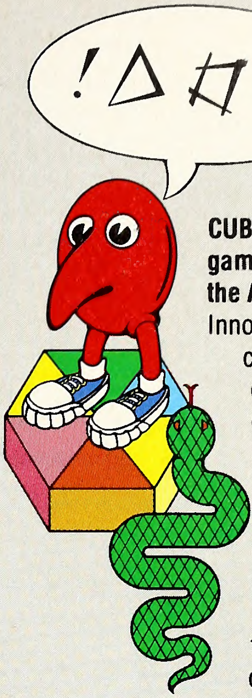

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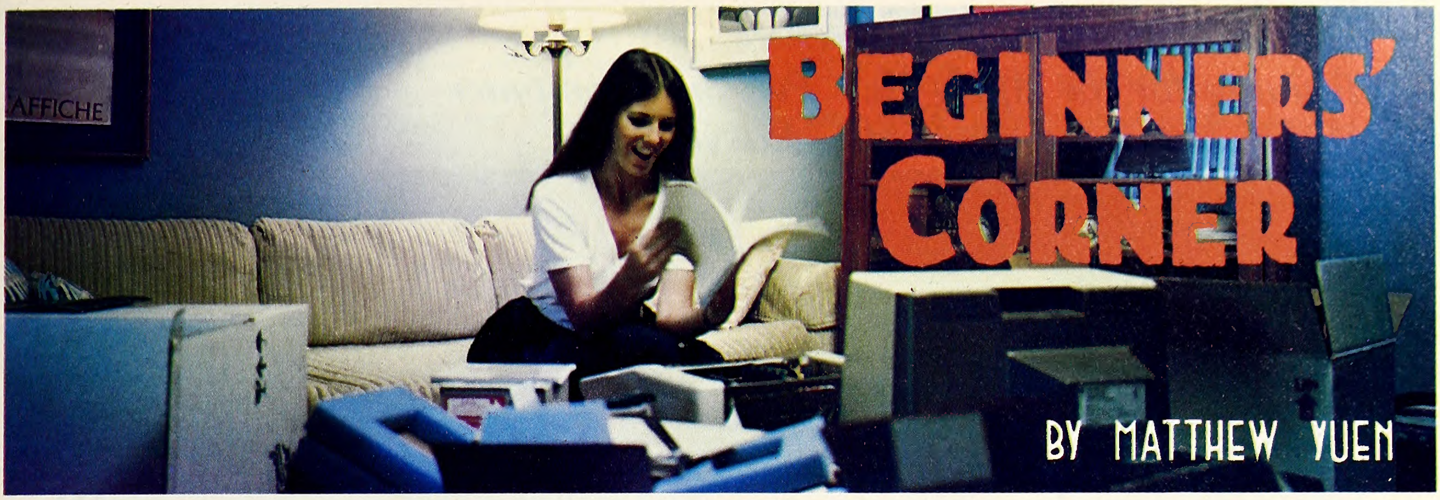
```
TO NIGHT
HT
HOUSES
SKY
MOON
END

TO SQUARE :N
REPEAT 4 [FD :N RT 90]
END

TO TRIANGLE :N
REPEAT 3 [FD :N RT 120]
END

TO HOUSE :N
SQUARE :N
FD :N
RT 30
TRIANGLE :N
LT 30 BK :N
DOOR
END

TO DOOR
RT 90 FD :N/2
LT 90 FD :N/2
LT 90 FD :N/4
LT 90 FD :N/2
RT 90 FD :N/4
RT 90
END

TO HOUSES
PU SETPOS [-130 -60] PD
HOUSE 40
PU RT 90 FD 60 LT 90 PD
HOUSE 35
PU RT 90 FD 52.5 LT 90 PD
HOUSE 30
PU RT 90 FD 45 LT 90 PD
HOUSE 25
PU RT 90 FD 37.5 LT 90 PD
HOUSE 20
PU RT 90 FD 30 LT 90 PD
HOUSE 15
END

TO STAR
DOT LIST (RANDOM 260) (RANDOM 115) - (RANDOM 20)
END
```

(For MIT, leave out the word LIST in the STAR procedure.)

```
TO SKY
REPEAT 100 [STAR]
END

TO MOON
PU SETPOS [100 70] PD
RT 90
REPEAT 18 [FD 2 LT 10]
LT 140
REPEAT 14 [FD 2 RT 8]
END
```



We've waited more than a year to get rid of Bill Budge from that picture at the top of this page. So, while he's off looking for more modeling gigs, let's get down to some serious fooling around.

Actually, we're not going to do that much fooling with the Apple this time because most of the stuff we're going to cover takes place inside the machine where we can't see it. We're going to have a look at how the computer counts.

Numbers are important in computing. On a typical day, a word-processing Apple might input, delete, and save tens of thousands of words in text. On the same day, it could also run financial programs that handle figures in the hundreds of thousands of dollars. That evening, the same Apple might rack up millions of points on arcade games.

Numbers are also important in computing even if you never do any *VisiCalc*ulating or general ledgering. They're important because the computer is really just a very big calculator. You've probably heard people say that the abacus was one of the earliest computers, and you might have tried to imagine someone using it for word processing or playing adventures and arcade games. Not much luck, right? Obviously, it isn't that kind of computer, but it can do complex calculations.

Perhaps the most important reason numbers are so vital to a computer is because that's all it understands. And it understands only two of them—zero and one. This crazy method of using just two numbers is called the *binary system*.

Thinking in terms of numbers is rather complicated, and fortunately we don't have to; but it's unfortunate for the computer, since that's all it knows. In typical computer stubbornness, the Apple refuses to speak our language, so we must be broadminded and speak its tongue.

Playing by the Numbers. Whether you're typing up a term paper, playing a game, or receiving information by modem over the phone lines, the computer must receive all information as numbers. When you press a key on a keyboard or turn the dial on a game paddle, you're feeding numbers into the Apple. In fact, all input, output, and internal operations happen in terms of numbers.

Even though we use these marvelous machines to do more than marvelous things (and sometimes to make marvelous mistakkes), the computer is really quite a simple piece of work. You were probably quite surprised to see how few parts there were inside the Apple the first time you removed the lid and took a look inside. If so, you'll probably be equally surprised to find out that, technically, the computer is really nothing more than a lot of switches.

These switches are in one of two states, on or off; they're just like the light switches in the dining room (unless you have one of those dimmer knobs that simulate candlelight for people too cheap to buy real candles). On or off; yes or no; live free or die. There is no in between.

In terms of numbers, the state of a switch being off or on is represented by the numbers zero and one. Okay, let's count with the Apple. Ready, go. Zero, one. . . . Now what? We've run out of numbers; what a stupid machine. Before we start condemning it to limbo, let's look at the number system that we humans use—the decimal system.

We have only ten numerals to work with, zero through nine. But as soon as we get to nine, we form the number ten by adding another column. Thus, ten is represented by 10; in our system, 10 (read as *one, zero*) represents ten, the number that comes after nine.

The binary system works exactly the same way. We run out of numerals after we get to one, so we add another column. In this case, 10 (read as *one, zero*) represents two, the number that comes after one. The next number, three, is written as 11. We're out of numerals again, so it's time to add another column; four is written as 100. Getting the hang of it?

Kid Stuff. Many adults have trouble with this concept of counting in terms of zeros and ones because they're so used to the decimal system. Kids seem to pick it up with more ease because they're not so convinced that decimal is the way the world works.

In elementary school, we were taught that the number 10 is a one in the tens column and a zero in the ones column. In other words, it's one ten and no ones. When we get to 99 (nine tens and nine ones), we're out of numerals, and we need to add another column. The next number is 100 (one hundred, no tens, no ones). For one more example, 365 is interpreted as three hundreds, six tens, and five ones.

And so it is with binary numbers. The figure 10 represents two (one two and no ones) and 11 represents three (one two and one one). We've filled both the twos and the ones columns to represent the number three, so the next column would be the fours column; the number four would be represented by 100 (one four, no twos, no ones).

So here we have a nice assortment of zeros and ones; big stinking deal. The big deal is that this is where it all ties in to computers. In the world of computers, each binary digit (zero or one) is called a bit, which comes from *bi*nary digi*t*. Remember all those switches that make up the computer? That's what bits are. Depending on how they're combined, bits are what the computer uses to represent numeric values, letters, and other little creatures.

To get a clearer idea of how this works, think of our decimal system. With three places, we can make numbers from 000 to 999. The value of the numeral depends on which numbers are in which places. You could have a three with two zeros and get 003. You could have the same numbers in different places and come up with 300. There's an obvious difference. It's the same way with bits. Depending on which are ones and which are zeros, you get different values.

Can You Are Ee Ay Dee This? Bits are the smallest pieces of information the Apple deals with, just as letters in the alphabet are the smallest things we deal with when we read and write. However, the Apple doesn't handle bits one at a time, nor do we read words one letter at a time.

When we see the word *Gumby*, we read it as Gumby (gum-bee) and conjure up an image of a lovable green clay cartoon figure who skates on one foot and walks through book covers; we don't read it as G-U-M-B-Y (gee you em bee why), visualize five letters in a sequence, and then form a mental green clay image. Likewise, picture yourself reading *Gone with the Wind* using the latter method, one letter at a time, and you'll see that it would take forever to find out if Rhett Butler gave a damn. Obviously, reading words instead of letters is much faster. (Renting the mov-

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ie for home video would be even faster, but that doesn't relate to the subject at hand.)

The Apple doesn't handle bits one at a time, either. It handles them in groups of eight; each group of eight bits is known as a *byte*. In groups of eight, we can make strange-looking numbers such as 01101100, 10011100, 00000001, and so on.

In order, those figures represent the decimal numbers 108, 156, and 1 respectively. How did we know? Here's how:

From right to left, the columns of each binary figure are 1, 2, 4, 8, 16, 32, 64, and 128. For 01101100, we find out what columns the ones are in and add those numbers together. In this case, it's

$$64 + 32 + 8 + 4 = 108$$

For 10011100, it's

$$128 + 16 + 8 + 4 = 156$$

This is fine if you happen to have lots of scratch paper and plenty of patience, but there's an easier way.

Notice that the four columns on the left (128, 64, 32, and 16) are all equal to sixteen times the four columns on the right (8, 4, 2, and 1). Here's where it becomes easier. Take the binary number 10011100 and slice it down the middle into two four-digit numbers, 1001 and 1100, which equal 9 and 12 respectively (go ahead, check the math if you want).

Next, take the left-hand half, multiply it by sixteen, and you'll get

$$9 \times 16 = 144$$

Add this to the right-hand side and we'll get the final answer:

$$144 + 12 = 156$$

It's Really Not That Hard. If this concept seems difficult, take a look at how the same thing works in decimal. We take a number like 1,984, break it in half, and we get 19 and 84. Since the two left-hand columns (thousands and hundreds) are one hundred times the two right-hand columns (tens and ones), we multiply the left-hand side by one hundred to get

$$19 \times 100 = 1{,}900$$

Next, we add that to the right-hand side for the final result of

$$1{,}900 + 84 = 1{,}984$$

the official year of the 1984 Summer Olympics.

But even with this method, numbers like 00101101 are still hard to read. To make things a little easier, the computer gods devised a system to change these eight-digit numbers into two-digit ones. They did this by changing from a binary (two-numeral) system to a *hexadecimal* (sixteen-digit) system; the more numerals we're allowed to work with, the fewer times we'll need to add columns to numbers. Having a sixteen-number system means having to add columns less frequently.

The binary system is like a set of one-cup containers. As soon as one container (column) is holding one cup of water, you have to have another one handy if you want to add more. The hexadecimal system is like a set of one-gallon containers; you can fill one with sixteen cups before you have to add another container.

Counting with the ABCs. When counting in hexadecimal, we run into a little problem. After we get to 9, we have six more numbers to go before we add another column, but we're out of numerals. The computer gods have also taken care of this by introducing the alphabet into the hexadecimal counting system. So, instead of 0 through 9, we count 0, 1, 2, 3 . . . 9, A, B, C, D, E, F. If you guessed that A through F represent numbers ten through fifteen, give youself an A for the day.

Armed with all this knowledge, we're ready to begin writing numbers like the pros do. Here are a few examples of how hexadecimal works:

Decimal	Hexadecimal
1	$1
2	$2
10	$A

Decimal	Hexadecimal
15	\$F
16	\$10
17	\$11
160	\$A0
255	\$FF

The big question buzzing through the mind ought to be, "What the heck are those dollar signs doing in there?" That's how computer people mark the difference between decimal and hexadecimal. The decimal figure for sixty is 60; in hexadecimal, 60 stands for ninety-six (six sixteens and no ones). If you're programming and you don't know whether 60 means sixty or ninety-six, your program may end up doing some things stange enough to catch the attention of Leonard Nimoy and the *In Search of . . .* team.

In short, whenever you see a number preceded by \$, it's telling you that it's in hexadecimal.

Deja Vu. Figuring out the values of hexadecimal numbers is similar to figuring out binary numbers, but it's a little easier. Start by splitting the number down the middle, just as we did with binary numbers. For example, \$D6 would be chopped into \$D and \$6. Multiply the left-hand side by sixteen to get \$D × 16 = 208 (\$D equals thirteen, right?). Then we just add that result to the right-hand half of \$D6, and voila,

208 + 6 = 214

Going the other way is just as simple. If you wanted to convert 214 to hexadecimal, you'd divide by sixteen to get 214 / 16 = 13, with a remainder of 6. In other words, it's thirteen sixteens and six ones. We know that 13 × 16 is equal to \$D0, so we just combine that with the remainder to get \$D6.

We now have a somewhat firm grip on understanding the binary and hexadecimal numbering systems, and we're all better people for it. But where all this fits in the scheme of things is still a little unclear.

Confusion for the Sake of Neatness. Remember that we said eight bits make up one byte in the computer. In other words, we can represent a byte of information as 01101100, 10011111, or any combination of zeros and ones from 00000000 to 11111111. But this way of writing numbers is confusing, and it takes up a lot of room. That's why computer people prefer to use the hexadecimal system. Decimal numbers are easier to recognize, but when it comes to dealing with computers, memory structures, and bytes, hexadecimal really is tidier.

Here's what we mean. Boot up DOS and get into the Monitor by the usual call −151. Now type *3D0.3F0L* and hit the return key. Those four-digit numbers on the left are memory locations, known as addresses. All those two-digit numbers to the right are the values currently stored at each address. For example, address \$03D0 holds 4C, \$03D1 holds BF, \$03D2 holds 9D, and so on. You don't see each address listed, just every eighth address. So far, things don't look that much tidier.

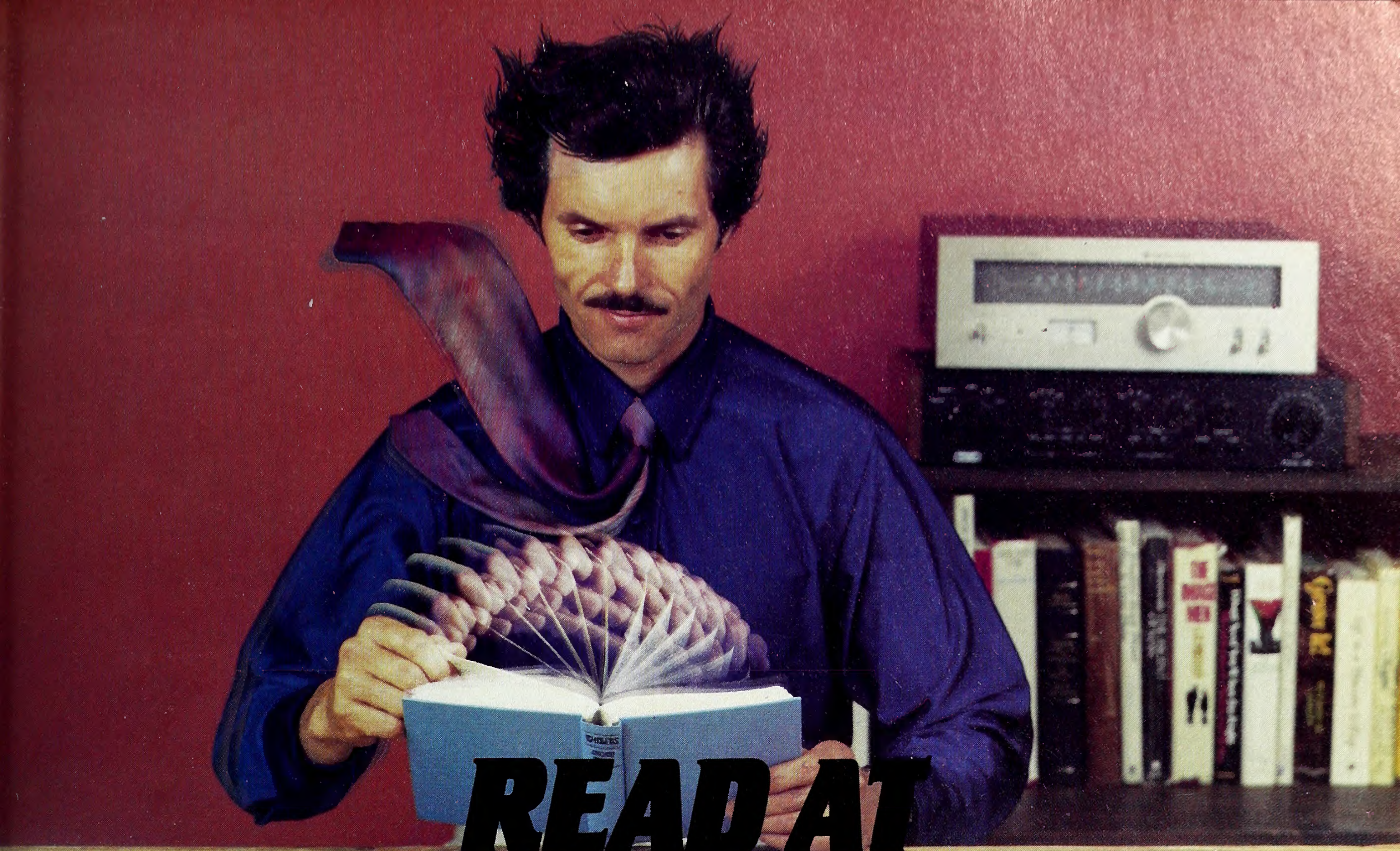
As we said earlier, bytes are represented by the binary numbers between 00000000 and 11111111. In decimal, it's between 0 and 255; in hexadecimal, it's between \$00 and \$FF. Clearly, the latter system is easier.

The Apple's memory structure works in a similar way. We could either say that the main RAM is between decimal locations 24576 and 49152 or that it's between hex locations \$6000 and \$BFFF. Take your pick; hex never felt so good.

What a Long, Strange Trip It's Been. Finally, we're at the point where all these dollar signs, numbers, and letters begin to make a little sense. Once you have a grip on the hexadecimal system, a lot of other things will be a little easier to understand. Getting used to hexadecimal is perhaps the second hardest thing there is in the Apple world. (The hardest thing is figuring out what to do with the cardboard boxes after you've unpacked everything. If you don't believe that, just check out the picture at the beginning of this column.)

But now we've brought up some new questions. If the computer understands only numbers, then how is it that it can display letters, punctuation marks, and other symbols? That will be the topic of confusion next time.

Stay tuned, true believers.



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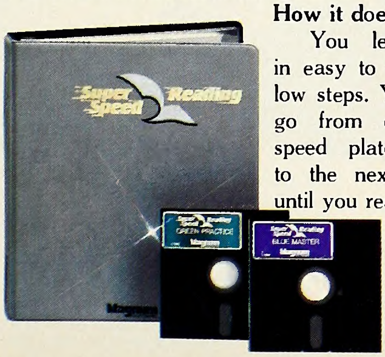

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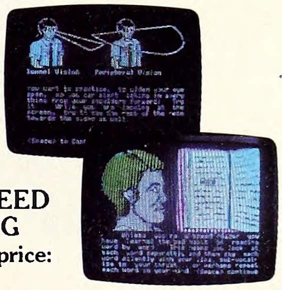

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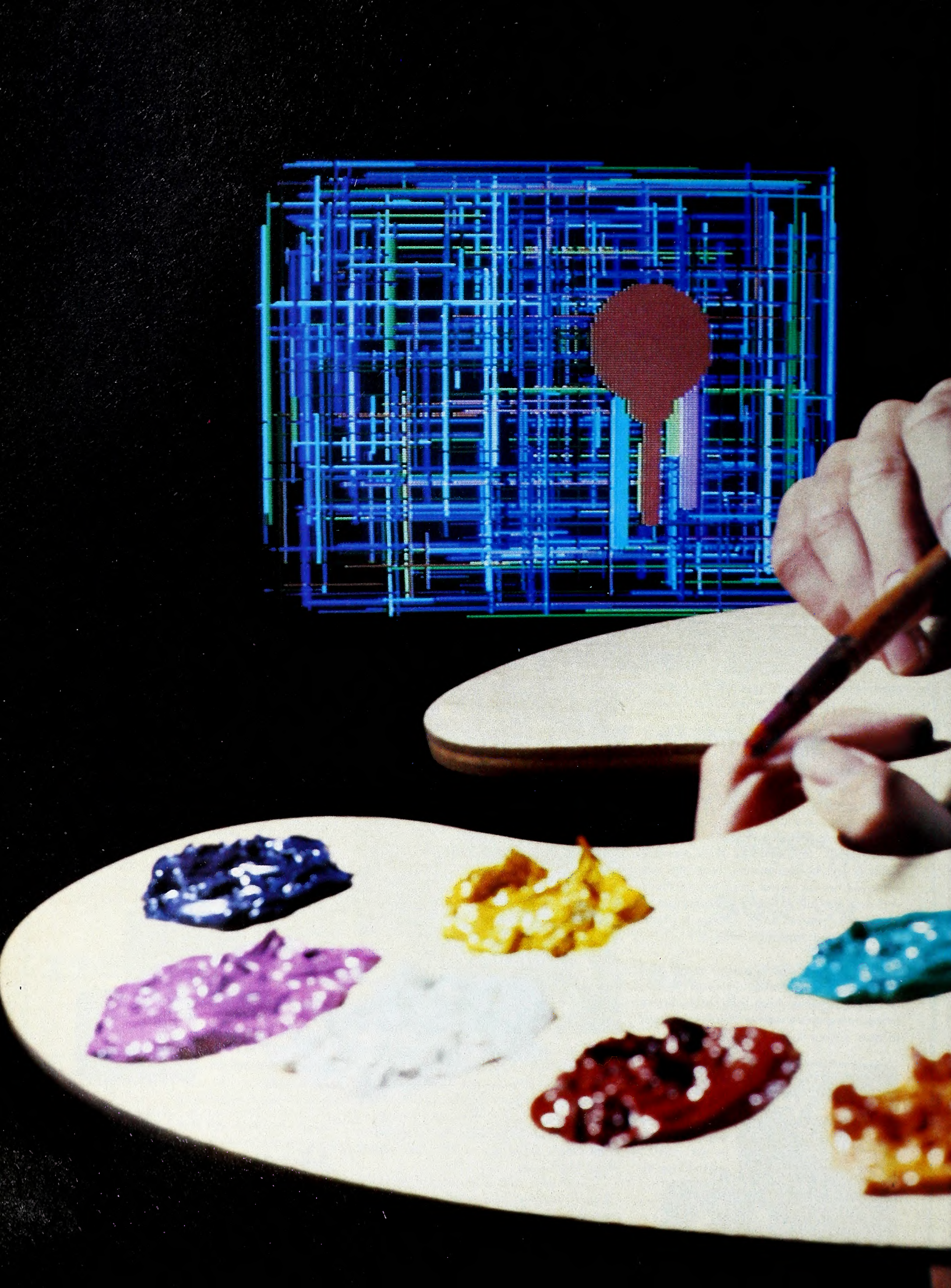
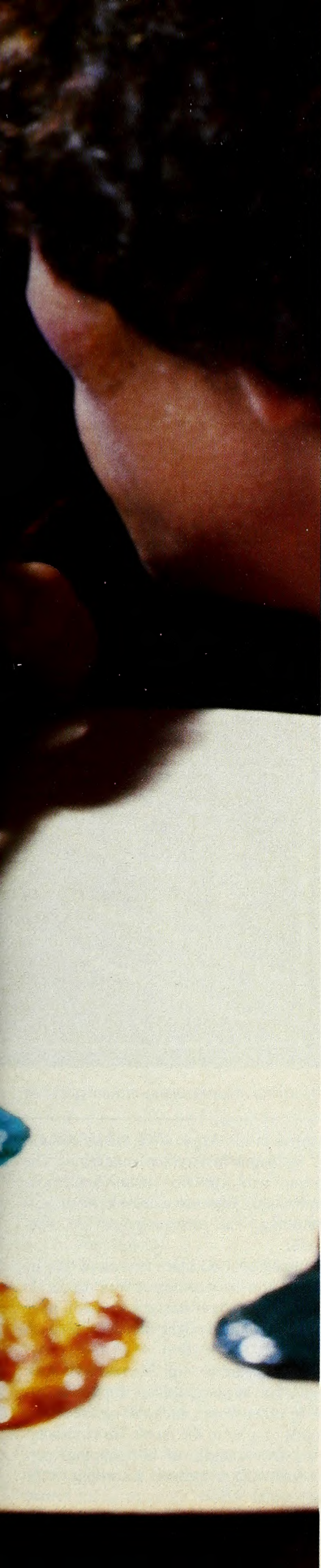
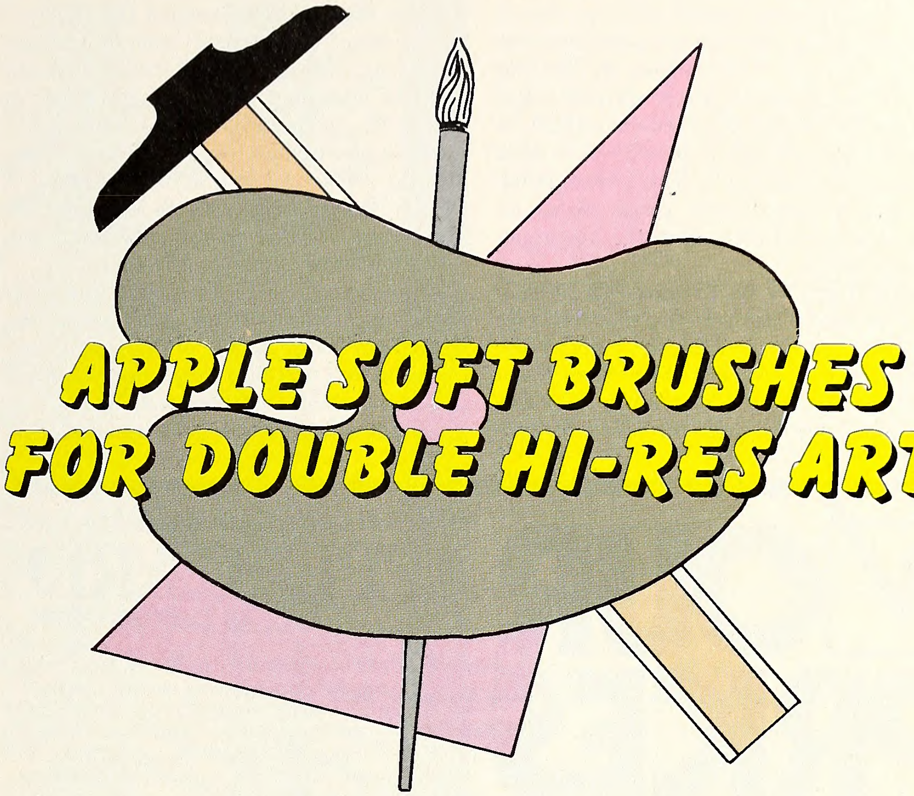






APPLESOFT BRUSHES FOR DOUBLE HI-RES ART

by Peter Baum and Larry Roddenberry

The double-high-resolution display mode available for the Apple IIe provides twice the horizontal resolution of the standard hi-res mode. On a monochrome video monitor, standard hi-res displays 280 columns and 192 rows of picture elements (pixels); the double-hi-res mode displays 560 by 192 pixels. On a color monitor, the standard-hi-res mode displays up to 140 columns of colors, each being selected from the group of six colors available, with certain color mixture limitations. Double hi-res displays 140 columns of color on which all sixteen of the colors available in lo-res can be displayed without any mixing problems.

Do You Have What It Takes? Installation of the double-hi-res mode on your Apple IIe depends on the following three conditions: presence of a revision B motherboard; installation of an extended eighty-column text card with jumper; a video monitor with a bandwidth of at least 14 MHz.

First, your Apple IIe must have a revision B motherboard. To find out whether your IIe's motherboard is revision B, check the part number, which is printed on the motherboard between the peripheral slots and the back panel of the computer. If the board is a revision B, the part number will be 820-0064-B. Double hi-res does not work on computers containing a revision A motherboard. If your IIe doesn't contain a revision B board, and if you want to obtain one, contact your local Apple dealer.

The second condition for using double hi-res on your IIe is that your IIe must have an extended eighty-column text card installed. This card must have a jumper connecting the two Molex-type pins on the board. (*Warning*: If your IIe has an A motherboard, do *not* make the jumper connection on the eighty-column card. The system will not work at all if you do. The manual that came with the card shows where the pins are and how to install the jumper.)

The last requirement for operation in double-hi-res mode is that your video monitor must have a bandwidth of at least 14 MHz. This bandwidth is necessary because a television set

When Apple redesigned the Apple II and put the little e on the case, the company used the new eighty-column video capability to boost the resolution of graphics as well as text. There was only one catch. Anyone who asked how to use the new double hi-res got the punch line from an old Vermonter's joke: You can't get there from here. In our July issue, Don Worth introduced us to the new mode with some Applesoft demo programs. He showed us how to get there all right, but like another old Vermonter, he showed us the long way. This month, Peter Baum shows us how to do it fast *with an in-depth look at how double hi-res works and a set of routines by Larry Roddenberry that do double hi-res the easy way: machine language called from Applesoft.*

requiring a modulator will not reproduce some characters or graphic elements clearly, due to the high speed at which the computer sends out dots in this mode. The examples we start out with will be clearest on a monochrome monitor—one that displays eighty columns clearly—while the color routines at the end will be more interesting in color. If you have a video monitor, color or monochrome, please use it—instead of a television set—to display the examples that follow.

Your Turn To Be Creative—Or, Volunteers, Anyone? There are no commercial programs that support double-hi-res graphics yet. Moreover, none of the standard-hi-res commands (such as hplot) work properly in double-hi-res mode. We'll provide the basic color-line-drawing commands in this article, but there is a need for shape-drawing routines, fill routines, and a body of other material before we can get full use of double hi-res. Until such routines are available, users must write their own. If you've gotten this far and want to continue, you'll probably already have used the system Monitor, and you'll need very few explanations. If you have no experience with the Monitor, refer to the *Apple IIe Reference Manual* before trying to follow the examples given here.

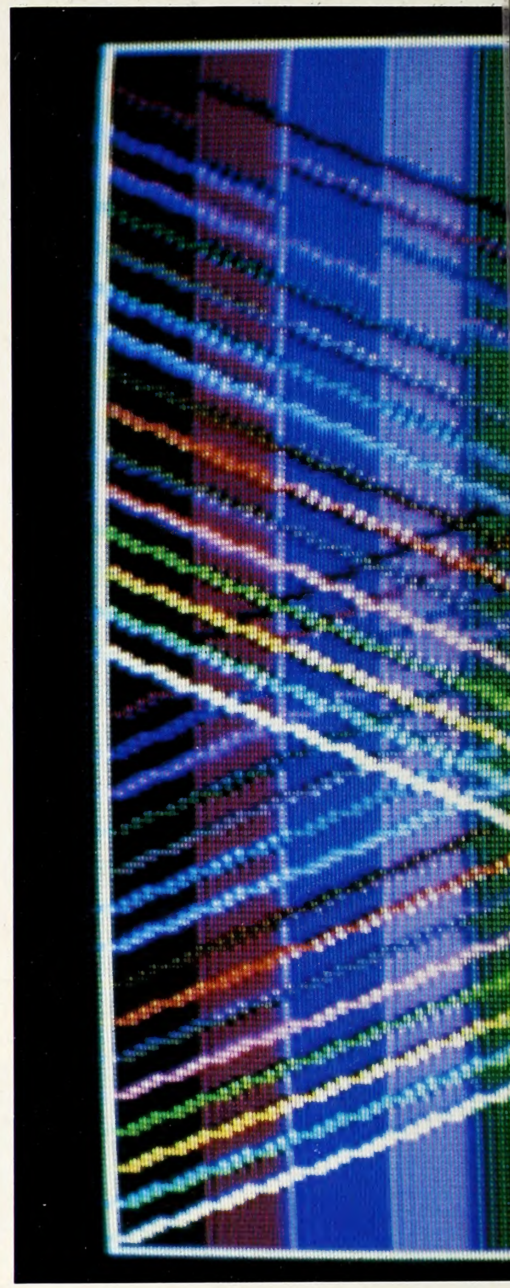
You should also be acquainted with standard-hi-res functions. If you aren't, obtain the *Apple IIe Reference Manual* or the *Apple II Reference Manual* and read the sections on high-resolution graphics before proceeding.

You can find another good explanation of these features in the Apple II Graphics column by Ken Williams in *Softline* magazine. The series began with the first issue, September 1981, and back issues are available from Softalk Publishing. The early columns are especially useful.

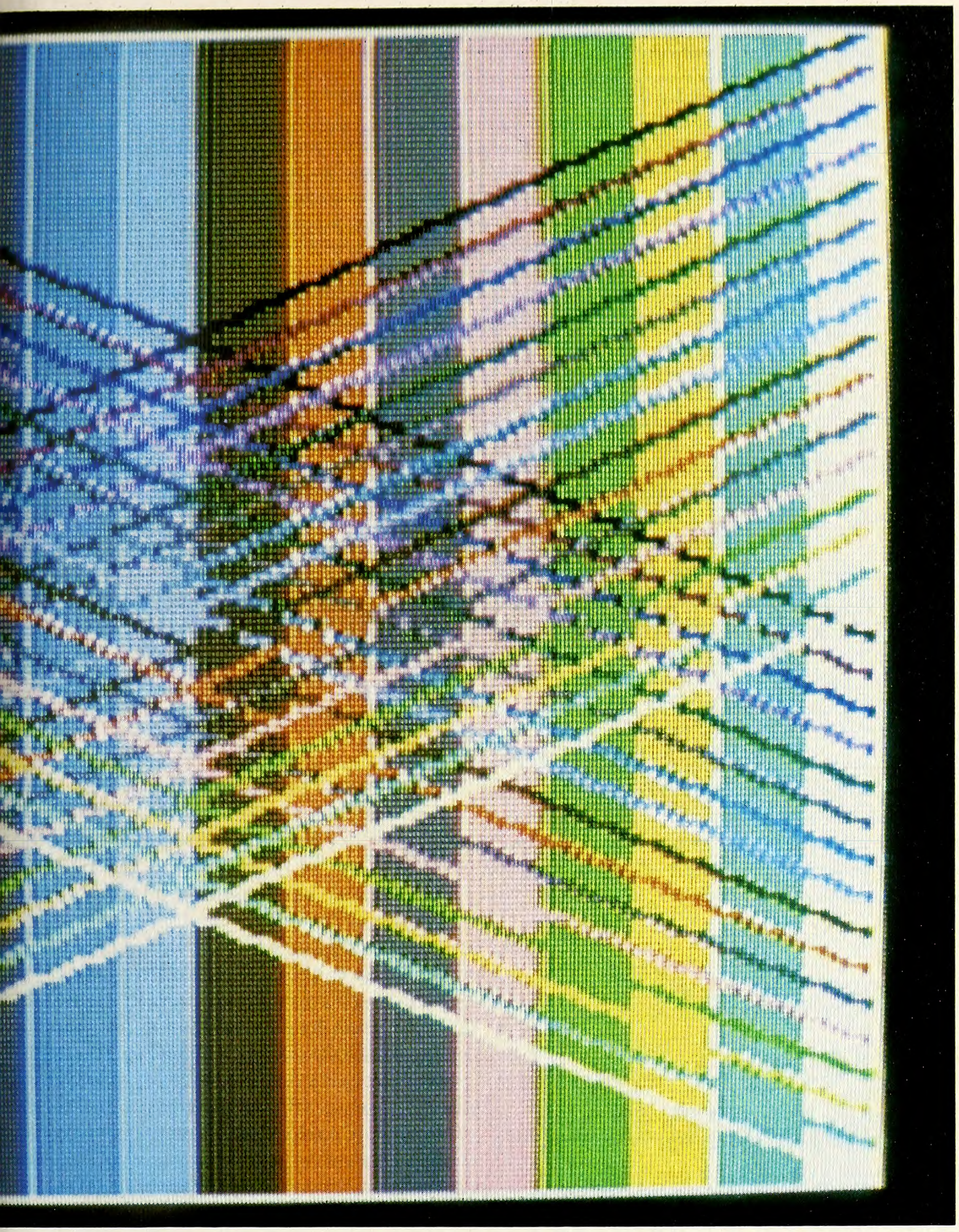
The tutorial that occupies the rest of this article assumes you are working at your Apple IIe as you read. Before you start, be sure you have a jumpered extended eighty-column card in your revision B Apple IIe.

Hands-On Practice with Standard Hi-Res. The Apple IIe hi-res graphics display is bit-mapped. In other words, each dot on the screen corresponds to a bit in the Apple IIe's memory. For a real-life example of bit-mapping, perform the following procedure, according to the instructions that follow. Be sure to hit return after typing each command.

1. Boot the system, using the DOS System



The color bleeding in normal hi-res



isn't a problem across the whole sixteen-color range of double hi-res.

Master disk.

2. When the Applesoft prompt appears, press control-reset.
3. Engage the caps-lock key, and type *hgr*. (This instruction should clear the top of the screen.)
4. Type *call −151*. (The system is now in the Monitor mode, and the prompt should appear as an asterisk.)
5. Type *2100:1*. One single dot should appear in the upper left-hand corner of the screen.

You have just plotted a hi-res pixel. (Not an astonishing feat, but you have to start somewhere. . . .)

With a black-and-white monitor, the bits in memory have a simple correspondence with the dots (pixels) on-screen. A dot of light appears if the corresponding bit is on (has a value of 1) but remains invisible if the bit is off (has a value of 0). (The dot is white on a black-and-white monitor, and green on a green-screen monitor, such as Apple's Monitor III. For simplicity, we shall refer to an invisible dot as black and a visible one as white.) Two visible dots located next to each other appear as a single wide dot, and many adjacent dots appear as a line. To obtain a display of another dot and a line, follow the steps listed below.

1. Type *2080:40*. A dot should appear above and to the right of the dot you produced in the last exercise.
2. Type *2180:7F*. A small horizontal line should appear below the first dot you produced.

From Bits and Bytes to Pixels. The seven low-order bits in each display byte control seven adjacent dots in a row. A group of forty consecutive bytes in memory controls a row of 280 dots (seven dots per byte, multiplied by forty bytes). In the screen display, the least significant bit of each byte appears as the leftmost pixel in a group of seven pixels. The second least significant bit corresponds to the pixel directly to the right of the pixel previously displayed, and so on. To watch this procedure in action, follow the steps listed below. The dots will appear in the middle of your screen.

1. Type *2028:1*.
2. Type *2828:2*.
3. Type *3028:4*.

The three bits you specified in this exercise correspond to three pixels displayed one after another, from left to right.

The most significant bit in each byte does not correspond to a pixel. Instead, this bit is used to shift the position of the other seven bits in the byte. For a demonstration of this feature, follow the steps listed below:

1. Type *2050:8*.
2. Type *2850:8*.
3. Type *3050:8*.

You'll notice that the dots align themselves vertically. Now:

4. Type *2450:88*.

The new dot (that is, the one corresponding to the bit you just specified) does not line up with the dots you displayed earlier. Instead, it appears to be shifted one "half dot" to the right.

5. To demonstrate that this dot really is a "new" dot and not just the "old" dot shifted by one dot position, type *2050:18, 2850:18*.

You'll notice that the dot mentioned in step 4 (the dot that was not aligned with the other seven dots) is straddled by the dots above and below it. (The use of magnifying lenses is permitted.)

Shifting the pixel one half dot by setting the most significant bit is most often used for color displays. When the high bit of a byte is set to generate this shifted dot (which is also called the *half-dot shift*), all the dots for that byte will be shifted one half dot. The half-dot shift does not exist in the double-hi-res mode for the Apple IIe.

Figure 1 shows the memory map for the standard hi-res graphics mode. Each block shown represents an area seven pixels wide and eight pixels high on the hi-res screen. One block is blown up and broken down to show the relative memory layout. Each row of seven boxes in the blown-up block represents one byte of memory, each box in the row representing one pixel or bit. The address of any given byte of hi-res memory is determined by adding the hexadecimal numbers (shown in the figure) of the block's column and row to the hex number corresponding to its byte within its block.

For example, the first memory address of each screen line for the first few lines is $2000, $2400, $2800, $2C00, and so on. Those are all within the first block: $2000 (the number to the left of the block's row) plus $00 (the number at the top of that column) plus $0, $400, $800, and $C00 (the numbers of the corresponding bytes in the blown-up block).

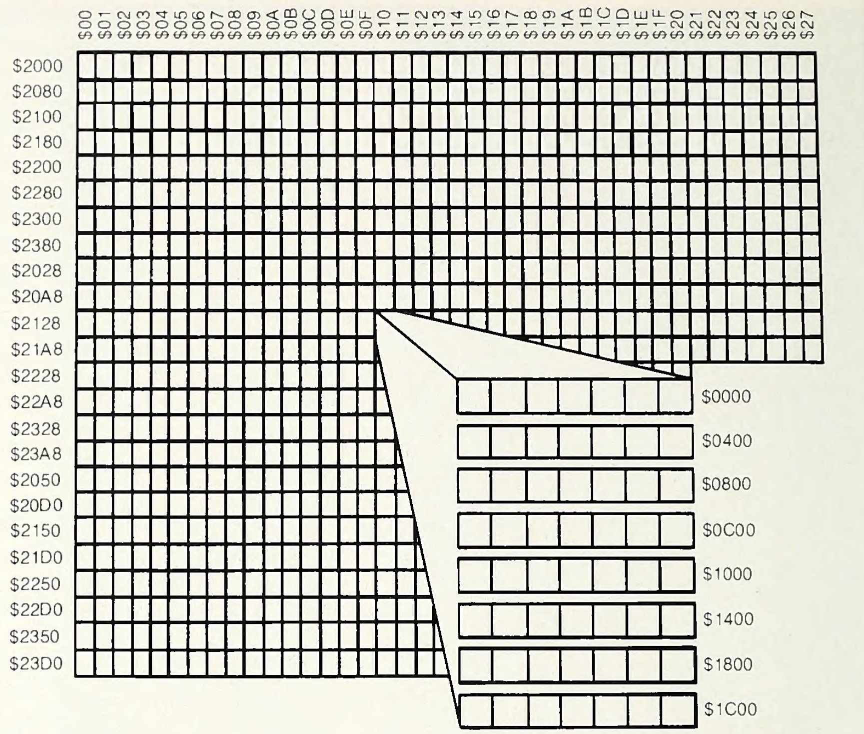


Figure 1.

The Intricacies of Double Hi-Res. Because the double-hi-res graphics mode provides twice the horizontal dot density as standard hi-res does, double hi-res requires twice as much memory as standard hi-res. If you spent many hours memorizing the standard-hi-res memory map, don't despair. Double hi-res still uses the hi-res graphics page, but only to represent half the picture, so to speak. In the double-hi-res mode, the hi-res graphics page is compressed to fit into half of the display. The other half of the display is stored in memory on the extended eighty-column card (called the *auxiliary* or *aux* memory). (This article refers to the standard-hi-res graphics page, which resides in main memory, as the *motherboard* or *MB* memory.)

The auxiliary memory uses the same addresses used by the standard-hi-res graphics page 1 ($2000 through $3FFF). The hi-res graphics page in auxiliary memory is known as *hi-res page 1X*. The graphics pages in auxiliary memory are bank-switched memory, which you can switch in by activating some of the soft switches. (Adventurous readers may want to skip ahead to the section of the article headed "Using the Auxiliary Memory.")

The memory mapping for the hi-res graphics display is analogous to the technique used for the eighty-column display. The double-hi-res display interleaves bytes from the two different memory pages (auxiliary and motherboard). Seven bits from a byte in the auxiliary memory bank are displayed first, followed by seven bits from the corresponding byte on the motherboard. The bits are arranged in the same way as in standard hi-res (least significant bit first). In double hi-res, the most significant bit of each byte is ignored; thus, no half-dot shift can occur. (This feature is important, as you'll see when we examine double-hi-res color.)

The memory layout for double hi-res is similar to that of standard hi-res. Each block, however, is broken down into eight rows of fourteen pixels each, seven pixels in each row coming from a byte of auxiliary memory and the other seven pixels coming from motherboard memory. Figure 2 shows the double-hi-res version of the blown-up block in figure 1.

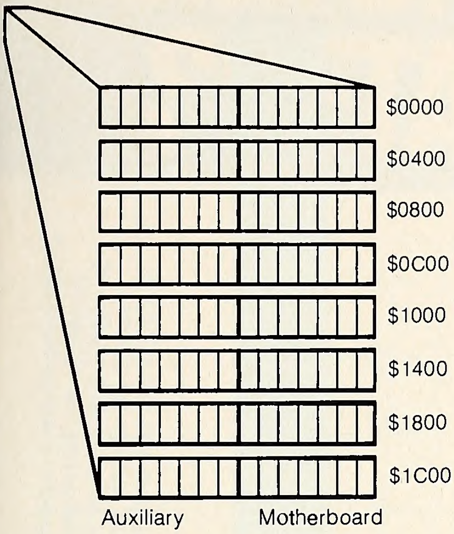


Figure 2.

Obtaining a Double-Hi-Res Display. To display the double-hi-res mode, set the following soft switches:

	In Monitor, read:	In Applesoft, peek:
HI-RES	$C057	49239
GR	$C050	49232
AN3	$C05E	49246
MIXED	$C053	49235
	write:	poke:
80COL	$C00D	49165,0

Annunciator 3 (AN3) must be turned off to get into double-hi-res mode. You turn it off by reading location 49246 ($C05E). Note that whenever you press control-reset, AN3 is turned on; therefore, each time you press control-reset, you must turn AN3 off again.

If you are using MIXED mode, then the bottom four lines on the screen will display text. If you have not turned on the eighty-column card, then every second character in the bottom four lines of text will be a random character. (The reason is that although the hardware displays eighty columns of characters, the firmware updates only the forty-column screen, which consists of the characters in the odd-numbered columns. The characters in even-numbered columns then consist of random characters taken from text page 1X in the auxiliary memory.)

To remove the even characters from the bottom four lines on the screen, type *PR#3* from Basic (type *3 control-P* from the Monitor). This activates the eighty-column firmware and clears the memory locations on page 1X.

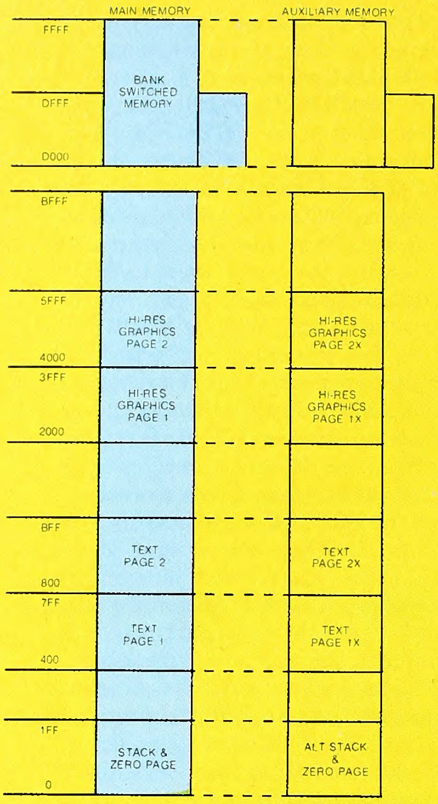
Using the Auxiliary Memory. The auxiliary memory consists of several sections, which you can select by using the soft switches in the list that follows. A pair of memory locations is dedicated to each switch. (One location turns the switch on; the other turns it off.) You activate a switch by writing to the appropriate memory location. The WRITE instruction itself is what activates the switch; therefore, it doesn't matter what data you write to the memory location. The soft switches are:

		From Monitor, write:	From Applesoft, poke:
80STORE	off:	$C000	49152,0
	on:	$C001	49153,0
RAMRD	off:	$C002	49154,0
	on:	$C003	49155,0
RAMWRT	off:	$C004	49156,0
	on:	$C005	49157,0
PAGE2	off:	$C054	49236,0
	on:	$C055	49237,0
HIRES	off:	$C056	49238,0
	on:	$C057	49239,0

A routine called AUXMOVE, located in the Monitor ROM of the Apple IIe, is also handy. AUXMOVE is located at address $C311.

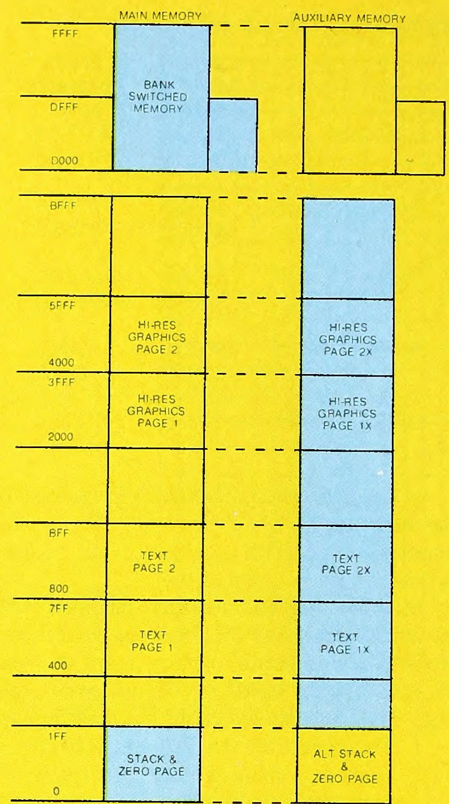
Manipulating the auxiliary memory with the soft switches has the following idiosyncrasies. Figure 3 is a set of memory maps showing the active banks based on various switch settings. The figure should clarify the descriptions.

1. To activate the PAGE2 and HIRES switches, you need only read (peek) from the corresponding memory locations (instead of writing to them, as you do for the other three switches).
2. The PAGE2 switch normally selects the display page, in either graphics or text mode, from either page 1 or page 2 of the motherboard memory. However, it does so only when the 80STORE switch is off.
3. If the 80STORE switch is on, then the function on the PAGE2 switch changes. When 80STORE is on, PAGE2 switches in the text page, locations $400–7FF, from auxiliary memory (text page 1X), instead of switching the display screen to the alternate video page (page 2 on the motherboard). When 80STORE is on, the PAGE2 switch determines which memory bank (auxiliary or motherboard) is used during any access to addresses $400 through 7FF. When the 80STORE switch is on, it has priority over all other switches.
4. If the 80STORE switch is on, then the PAGE2 switch only switches in the graphics page 1X from the auxiliary memory *if the HIRES switch is also on.* (Note that this circumstance is slightly different from that described in item 3.) When 80STORE is on, and if the HIRES switch is also on, the PAGE2 switch selects the memory bank (auxiliary or motherboard) for accesses to a memory location within the range $2000 through 3FFF. If the HIRES switch is off, any access to a memory location within the range $2000 through 3FFF uses the motherboard memory, regardless of the state



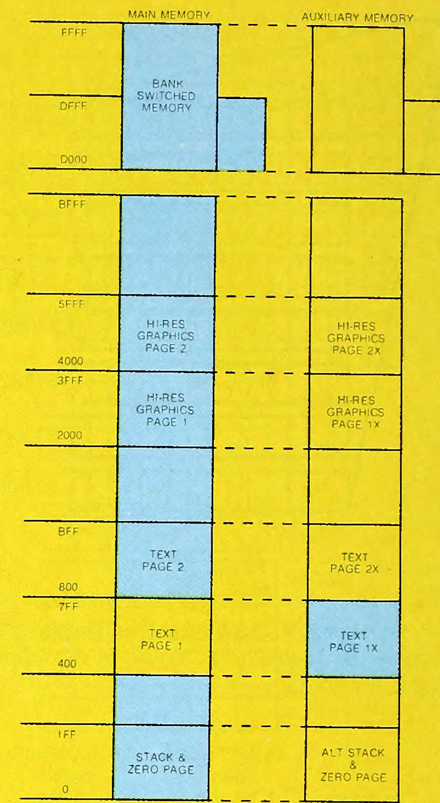
SWITCH SETTINGS (TWO POSSIBLE COMBINATIONS):

80STORE	OFF	ON	
PAGE 2	X	OFF	
HIRES	X	X	
RAMRD/RAMWRT	OFF	OFF	



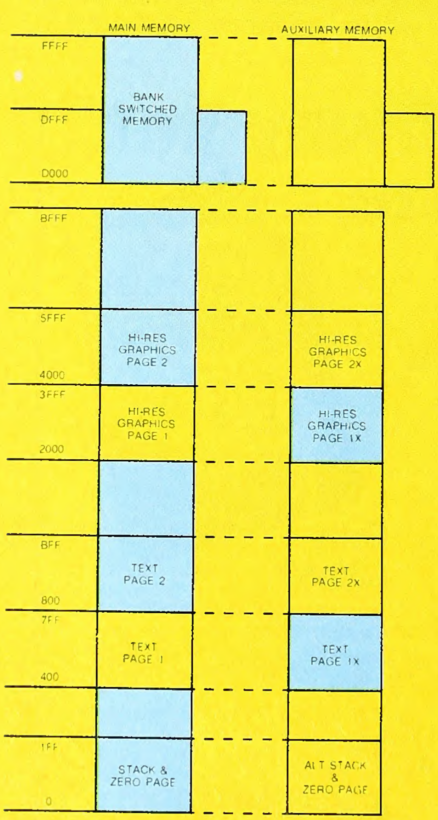
SWITCH SETTINGS (TWO POSSIBLE COMBINATIONS):

80STORE	OFF	ON	
PAGE 2	X	ON	
HIRES	X	X	
RAMRD/RAMWRT	ON	ON	



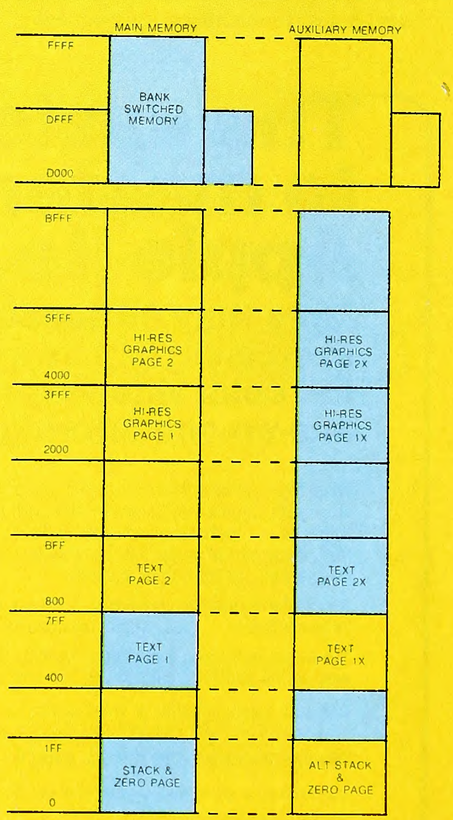
SWITCH SETTINGS:

80STORE	ON			
PAGE 2	ON			
HIRES	OFF			
RAMRD/RAMWRT	OFF			



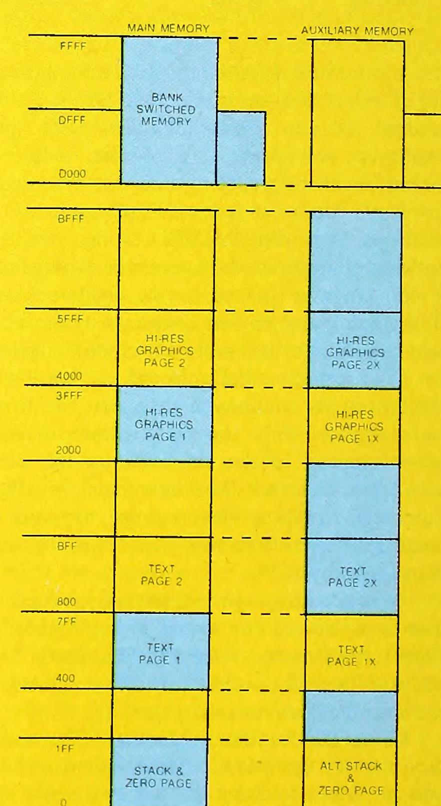
SWITCH SETTINGS

80STORE	ON		
PAGE 2	ON		
HIRES	ON		
RAMRD/RAMWRT	OFF		



SWITCH SETTINGS

80STORE	ON			
PAGE 2	OFF			
HIRES	OFF			
RAMRD/RAMWRT	ON			



SWITCH SETTINGS:

80STORE	ON			
PAGE 2	OFF			
HIRES	ON			
RAMRD/RAMWRT	ON			

Figure 3. The Apple IIe with the extended eighty-column text card carries 128K of RAM memory, but the 6502 can address only 64K at a time. These six maps show how the 80STORE, PAGE2, HIRES, RAMRD, and RAMWRT soft switches tell the Apple which 64K to address. In the tables beneath each map, *on*, *off*, and *X* refer to the necessary switch settings; an X indicates that either on or off will work.

of the PAGE2 switch.

5. If the 80STORE switch is off, and if the RAMRD and RAMWRT switches are on, then any reading or writing to address space \$200–\$BFFF gains access to the auxiliary memory. If only one of the switches—for example, RAMRD—is set, only the approriate operation, in this case a read, will be performed on the auxiliary memory, while a write operation will affect only the motherboard memory. If only RAMWRT is set, then all write operations go to the auxiliary memory. When the 80STORE switch is on, it has higher priority than the RAMRD and RAMWRT switches.

Shortcuts: Writing to Auxiliary Memory from the Keyboard. First, press control-reset. Next, type *call −151* to get into the Monitor. Then type the following hexadecimal addresses to turn on the double-hi-res mode:

```
C057    (for hi-res)
C050    (for graphics)
C053    (for mixed mode)
C05E    (turns off AN3 for double hi-res)
C00D:0  (turns on the 80COL switch)
```

This procedure usually causes the display of a random-dot pattern at the top of the screen, while the bottom four lines on the screen contain text. To clear the screen, follow these steps:

1. Type *3D0G* to return to Basic.
2. Type *HGR* to clear half of the screen. (The characters you type will probably appear in alternating columns. This is not a cause for alarm; as noted earlier, the firmware simply thinks you are working with a forty-column display.) Remember that hi-res graphics commands don't know about the half of the screen stored on page 1X in the auxiliary memory. Therefore, only page 1 (that is, the first half) of the graphics page on the motherboard is cleared. As a result, in the screen display, only alternate seven-bit columns appear cleared.

On the other hand, if all of the screen columns were cleared after the *HGR* command, then chances are good that you're not in double-hi-res mode. If your screen was cleared, you should determine which mode you're in. Type the following instructions:

```
CALL −151
2000:FF
2001<2000.2027M
```

If a solid line appears across the top of the screen, you're not in double-hi-res mode. (The line that appears should be a dashed or intermittent line.) If you're not in double hi-res, then make sure that you do have a B motherboard and that the two Molex-type pins on the extended eighty-column card are shorted together with the jumper block. Then retype the instructions listed previously.

If you're staring at a half-cleared screen, you can clear the nonblank colums by writing zeros to addresses \$2000 through \$3FFF on graphics page 1X of auxiliary memory. To do so, simply turn on the 80STORE switch, turn on the PAGE2 switch, and then write to locations \$2000, \$2001, \$2002, and so on up through \$3FFF. However, this procedure will not work if you try it from the Monitor! The reason is that each time you invoke a Monitor routine, the routine sets the PAGE2 switch back to page 1 so that it can display the most recent command you entered. When you try to write to the hi-res memory on the auxiliary card, it will write to the motherboard memory instead.

Another way to obtain the desired result is to use the Monitor's user command, which forces a jump to memory location \$3F8. You can place a JMP instruction starting at this memory location so that the program will jump to a routine that writes into hi-res page 1X. Fortunately, the Monitor already contains such a routine: AUXMOVE.

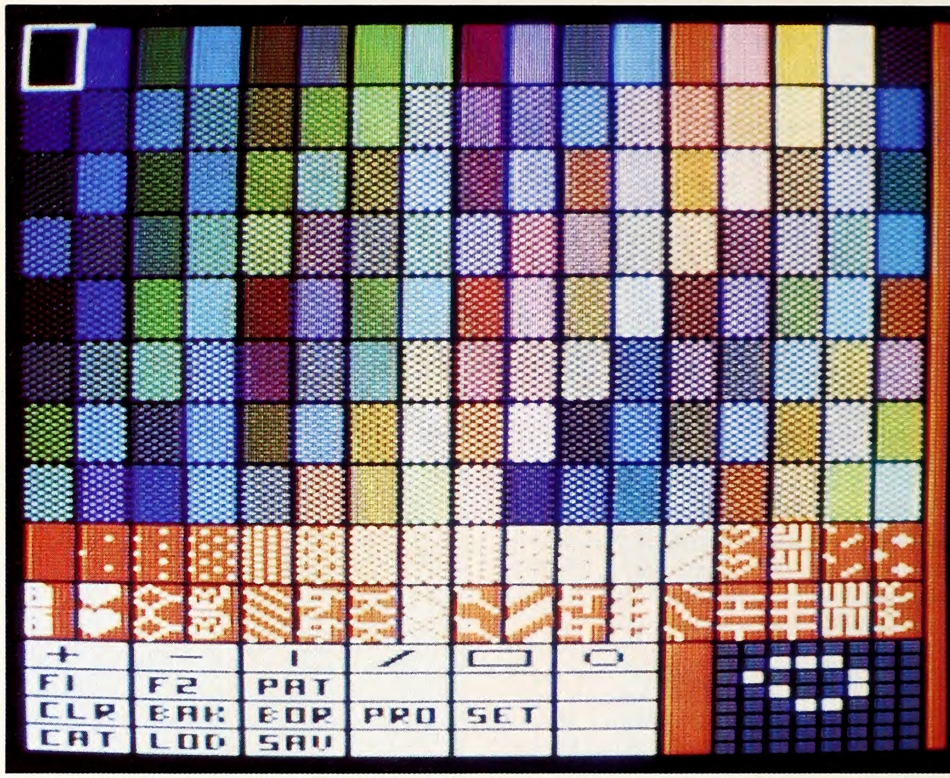
Using AUXMOVE. You use the AUXMOVE routine to move data blocks between main and auxiliary memory. But the task still remains of setting up the routine so that it knows which data to write and where to write it. To use this routine, some byte pairs in zero page must be set up with the data block addresses, and the carry bit must be fixed to indicate the direction of the move. You may not be surprised to learn that the byte pairs in zero page used by AUXMOVE are also the scratch-pad registers used by the Monitor during instruction execution. The result is that, while you type the addresses for the Monitor's move command, those addresses are being stored in the byte pairs used by AUXMOVE. Thereafter, you can call the AUXMOVE command directly, using the user (control-Y) command.

In practice, then, enter the following instructions:

C00A:0	(turns on the eighty-column ROM, which contains the AUXMOVE routine)
C000:0	
3F8: 4C 11 C3	(the jump to AUXMOVE)
2000<2000.3FFF control-Y	(control-Y activates the user command)

The syntax for this user command is AUXdest < MBstart.MBend control-Y.

The command copies the values in the range MBstart to MBend in the motherboard memory into the auxiliary memory beginning at AUXdest. This command is analogous to the move command.



Double hi-res is capable of much more subtle color mixtures than normal hi-res. This is a potential dithered color chart for a double-hi-res fill routine that—sorry—doesn't exist yet.

You can use this procedure to transfer any block of data from the motherboard memory to hi-res page 1X. Working directly from the keyboard, you can use a data block transferred this way to fill in any part of a double-hi-res screen image. The image to be stored in hi-res page 1X (that is, the image that will be displayed in the even-numbered columns of the double-hi-res picture) must first be stored in the motherboard memory. You can then use the control-Y Monitor command to transfer the image to hi-res page 1X.

The AUXMOVE routine uses the RAMRD and RAMWRT switches to transfer the data blocks. Because the 80STORE switch overrides the RAMRD and RAMWRT switches, the 80STORE switch must be turned off—otherwise, it would keep the transfer from occurring properly (hence the write to $C000 mentioned earlier).

If the 80STORE, PAGE1, and HIRES switches are on when you execute AUXMOVE, then any access to an address located within the range from $2000 to $3FFF inclusive would use the motherboard memory, regardless of how RAMRD and RAMWRT are set. Entering the command C000:0 turns off 80STORE, thus letting the RAMRD and RAMWRT switches control the memory banking.

The control-Y trick described above works only for transferring data blocks from the main (motherboard) memory to auxiliary memory (because the Monitor always enters the AUXMOVE routine with the carry bit set). To move data blocks from the auxiliary memory to the main memory, you must enter AUXMOVE with the carry bit clear. You can use the routine listed below to transfer data blocks in either direction:

301:AD 0 3	(loads the contents of address $300 into the accumulator)
304:2A	(rotates the most signif-

```
                icant bit into the carry
                flag)
305:4C 11 C3    (jump to $C311-AUX-
                MOVE)
3F8:4C 1 3      (sets the control-Y com-
                mand to jump to address
                $301)
```

Before using this routine, you must modify memory location $300, depending on the direction in which you want to transfer the data blocks. If the transfer is from the auxiliary memory to the motherboard, you must clear location $300 to zero. If the transfer is from the motherboard to the auxiliary memory, you must set location $300 to $FF.

Two Double-Hi-Res Pages. So far, we've only discussed using graphics pages 1 and 1X to display double-hi-res pictures. But—analogous to the standard-hi-res pages 1 and 2—two double-hi-res pages exist: pages 1 and 1X, at locations $2000 through $3FFF, and pages 2 and 2X, at locations $4000 through $5FFF. The only trick in displaying the second double-hi-res page is that you must turn off the 80STORE switch. If the 80STORE switch is on, then only the first page (1 and 1X) is displayed. Go ahead and try it:

```
C000:0    (to turn off the 80STORE switch)
C055      (to turn on the PAGE2 switch)
```

The screen will fill up with another display of random bits. Clear the screen using the instructions listed in the section headed "Using AUXMOVE." However, this time, use addresses $4000 through $5FFF instead. (Don't be alarmed by the fact that the figures you're typing aren't displayed on the screen. They're being "displayed" on text page 1.)

```
4000:0
4001<4000.5FFFM
4000<4000.5FFF control-Y
```

You'll be delighted to learn that you can also use this trick to display two eighty-column text screens. The only problem here is that the eighty-column firmware continually turns on the 80STORE switch, which prevents the display of the second eighty-column screen. However, if you write your own eighty-column display driver, then you can use both of the eighty-column screens.

Color Madness. It should come as no surprise that color-display techniques in double hi-res are different from color-display techniques in standard hi-res. This is because the "half-dot shift" doesn't exist in double-hi-res mode.

In the following examples, the term *color monitor* refers to either an NTSC monitor or a color television set. Both work; however, the displays will be much harder to see on the television. The generation of color in double hi-res demands sacrifices. A 560-by-192-dot display is not possible in color. Instead, the horizontal resolution decreases by a factor of four (to 140 dots across the screen). Just as with a black-and white monitor, a simple correspondence exists between memory and the pixels on the screen. The difference is that four bits are required to determine each color pixel. These four bits represent sixteen different combinations: one for each of the colors available in double hi-res. (These are the same colors that are available in lo-res.)

Let's start by exploring the pattern that must be stored in memory to draw a single colored line across the screen. Start by pressing reset; then load the program *Color Test* from the DOS 3.3 Sample Programs disk (with the old Apple DOS System Master use the program *Color Demosoft*). Use this program to adjust the colors displayed by your monitor. After you've adjusted the colors, exit from the program.

The instructions that follow are divided into groups separated by blank lines. Because it's very difficult (and, on a TV set, almost impossible) to read the characters you're typing in as they appear on-screen, face it: You will make typing errors. If the instructions appear not to work, then start again from the beginning of a group of instructions.

```
CALL -151          (to get into the
                   Monitor)
C050               (this set of instructions
                   puts the
C057               computer into double-
                   hi-res mode)
C05E
C00D:0

2000:0             (this set of instructions
2001<2000.3FFFM    clears first
3F8:4C 11 C3       one half of
2000<2000.3FFF     the screen, and
control-Y          then the other half
                   of the screen)

2100:11 4          (two red dots appear on
                   top left edge of screen)

2102<2100.2126M    (a dashed red line
                   appears across the
                   screen)

2150:8 22          (two green dots appear
                   near the bottom left
                   edge)
2152<2150.2175M    (a dashed green line
                   appears across the
                   screen)

2100<2150.2177     (fills in the red line)
control-Y
```

In contrast to conditions in standard hi-res, no half-dot shift occurs, and the most significant bit of each byte is not used.

As noted above, four bits determine a color. You can paint a single-color line across the screen simply by repeating a four-bit pattern across the screen. But it is much easier to write a whole byte rather than just change four bits at a time. Since only seven bits of each byte are displayed (as noted earlier in our discussion of black-and-white double hi-res) and the pattern is four bits wide, it repeats itself every twenty-eight bits or four bytes. Use the following instructions to draw a line of any color across the screen by repeating a four-byte pattern for the color as shown in figure 4.

2200: mb1 mb2	(colored dots appear at the left edge)
2202<2200.2226M	(a dashed, colored line appears)
2250: aux1 aux2	
2250<2250.2276M	
2200<2250.2276 control-Y	(fills in line, using the selected color)

In figure 4, aux1 indicates the first, fifth, ninth, thirteenth, . . . bytes of each line. The heading mb1 indicates the second, sixth, tenth, fourteenth, . . . bytes of each line. The aux2 and mb2 headings indicate every fourth byte, starting with the third and fourth bytes of each line respectively. Aux1 and aux2 are always stored in auxiliary memory, while mb1 and mb2 are always stored in the motherboard memory.

As may be inferred from figure 4, the absolute position of a byte also determines the color displayed. If you write an 8 into the first byte at the far left side of the screen (in the aux1 column), then a red dot is displayed. But if you write an 8 into the third byte at the left side of the screen (the aux2 column), then a dark green dot is displayed. Remember: The color monitor decides which color to display based on the relative position of the bits on each line (that is, on how far the bits are from the left edge of the screen).

So far, so good. But suppose you want to display more than one color on a single line. It's easy: Just change the four-bit pattern that is stored in memory. For example, if you want the left half of the line to be red and the right half to be purple, then store the red pattern (8,11,22, 44) in the first forty bytes of the line, and then store the purple pattern (19,33,66,4C) in the second forty bytes of the line. Figure 4 is a useful reference tool for switching from one color to another, provided you make the change on a byte boundary. In other words, you must start a new color at the same point in the pattern at which the old color ended. For example, if the old color stops after you write a byte from the mb1 column, then you should start the new color by storing the next byte in memory with a byte from the aux2 column.

Color	aux1	mb1	aux2	mb2	Repeated Binary Pattern
BLACK	00	00	00	00	0000
MAGENTA	08	11	22	44	0001
BROWN	44	08	11	22	0010
ORANGE	4C	19	33	66	0011
DARK GREEN	22	44	08	11	0100
GREY1	2A	55	2A	55	0101
GREEN	66	4C	19	33	0110
YELLOW	6E	5D	3B	77	0111
DARK BLUE	11	22	44	08	1000
VIOLET	19	33	66	4C	1001
GREY2	55	2A	55	2A	1010
PINK	5D	3B	77	6E	1011
MEDIUM BLUE	33	66	4C	19	1100
LIGHT BLUE	3B	77	6E	5D	1101
AQUA	77	6E	5D	3B	1110
WHITE	7F	7F	7F	7F	1111

Figure 4.

For instance,

```
2028:11 44 11 44 11 44 11 77 5D 77
5D 77 5D
```

creates a dashed line that is red, then yellow. Then,

```
2128: 8 22 8 22 8 22 8 22 6E 3B
6E 3B 6E
2028 < 2128.2134 control-Y
```

fills in the rest of the colors.

Switching Colors in Mid-Byte. If you want a line to change color in the middle of a byte, you'll have to recalculate the column, based on the information in figure 4. Suppose you want to divide the screen into three vertical sections, each a different color. The left-hand third of the screen ends in the middle of the twenty-seventh character from the left edge—that is, in an aux2 column of the color table. (Dividing 27 by 4 gives a remainder of 3, which indicates the third column, or aux2.) Your pattern should change from the first color to the second color after the fifth bit of the twenty-seventh byte. You can change the color in the middle of a byte by selecting the appropriate bytes from the aux2 column of figure 4 and concatenating two bits for the second color with five bits for the first color.

However, because the bits from each byte are shifted out in order from least significant to most significant, the two most significant bits (in this case bits 5 and 6, because bit 7 is unused) for the second color are concatenated with the five least significant bits for the first color. For instance, if you want the color to change from orange (the first color) to green (the second color), then you must append the two most significant bits (5 and 6) of green to the five least significant bits (0 through 4) of orange. In figure 4, the aux2 column byte for green is $19, and the two most significant bits are both clear. The aux2 column byte for orange is $33, and the five least significant bits are equal to 10011. The new byte calculated from appending green (00) to orange (10011) yields $13 (0010011). Therefore, the first twenty-six bytes of the line come from the table values for orange; the twenty-seventh byte is $13, and the next twenty-six bytes come from the table values for green.

2300: 19 66	(puts orange line on screen)
2302< 2300.2310M	
2350: 4C 33	
2352 < 2350.2360M	
2300<2350.2360 control-Y	
230D: 33 4C 33 4C 33 4C 33 4C	(puts green line next to it)
235D: 13 66 19 66 19 66 19 66	(note first byte)
230D<235D.2363 control-Y	

There you have it: a basic explanation of how double hi-res works—except for one or two anomalies. The first anomaly is that NTSC monitors have a limited display range. The second anomaly shows one of the features of double hi-res versus a limitation of standard hi-res.

An NTSC color monitor decides what color to display based on its "view" of four-bit "windows" in each line, starting from the left edge of the screen. The monitor looks at the first four bits, determines which color is called for, and then shifts one bit to the right and determines the color for this new four-bit window. But remember, the color depends not only on the pattern, but also on the position of the pattern. To compensate for relative position from the left edge of the screen, the monitor keeps track of where on each line each of these windows starts. (For those of you of the technical persuasion, this is done through the use of the color burst signal, which is a 3.58 MHz clock.)

Try this example:

```
2000:0              (clears screen)
2001< 2000.3FFFM
2000<2000.3FFF
  control-Y
2001:66             (draws orange box in
                    upper left)
2401:66
2801:66
2C01:66
3001:66
2050:33             (draws blue box below
                    and to the right of
3402<2050.2050      the orange)
  control-Y
3802<2050.2050
  control-Y
3C02<2050.2050
  control-Y
```

Notice that if the blue box was drawn at the top of the screen, next to the orange box, they would overlap. Yet, the boxes were drawn on two different columns, orange on mb2 and blue on aux1. This can be explained by the previous paragraph and the sliding windows. The monitor will detect the pattern for orange slightly after the mb2 column, while the pattern for blue shows up before column aux1.

Look at four-bit windows and you'll see that the orange pattern overlaps on both sides.

```
0000000     0110011     0000000
  aux2        mb2         aux1
```

If a pattern is repeated on a line, this overlap doesn't cause a problem, since the same color just overlaps itself. But watch what happens when a new pattern is started next to a different pattern.

```
3002< 2050.2050   (puts blue pattern next
  control-Y       to orange)
2C02<2050.2050
  control-Y
2802<2050.2050
  control-Y
```

Where the blue overlaps the orange, you'll see a white dot. This is because in one of the four-bit windows the monitor sees all 1s. If two colors are placed right next to each other, the monitor will sometimes display a third color, or fringe, right at the boundary. Fringing is especially noticeable when there are a lot of narrow columns of different colors next to each other. (Next time you run *Color Test* take a look at the boundaries between the colors.)

Note the four 1s in a row at the boundary between orange and blue.

```
            orange      blue
0000000     0110011     11001100
  aux2        mb2         aux1
```

The Double-Hi-Res Routines. The second anomaly presents a good lead-in to the last part of this series, the double-hi-res routines, which plot lines. These routines work like the standard-hi-res Applesoft commands, hgr, hcolor, and hplot, except that they use the Applesoft ampersand function. The listing for the routines is at the end of the article.

There are four ampersand functions:

&H (clears double-hi-res screen)
&C*n* (sets the double-hi-res color to *n*)
&P*x,y* (plots a point at *x,y*)
&L*x,y* (draws a line from the last point to *x,y*)
TEXT:POKE 49164,0:POKE 49247,0(returns to 40-column text mode)

The double-hi-res screen has 140 columns, numbered 0 through 139, and 192 rows, numbered 0 to 191. Just like the standard-hi-res screen, the origin is in the upper left corner, while the point 139,191 is in the bottom right corner.

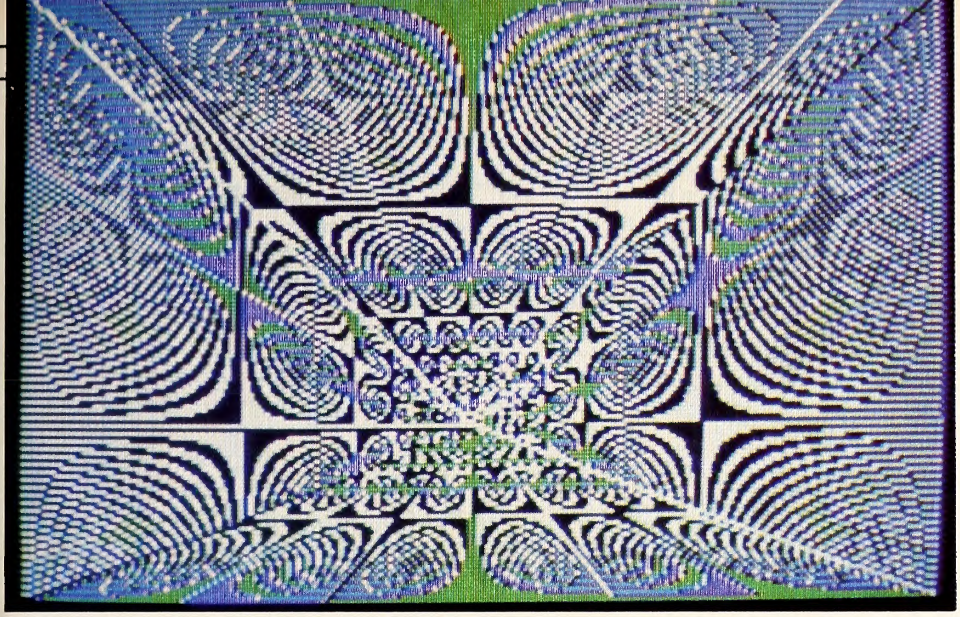
The color codes are the same as for lo-res graphics:

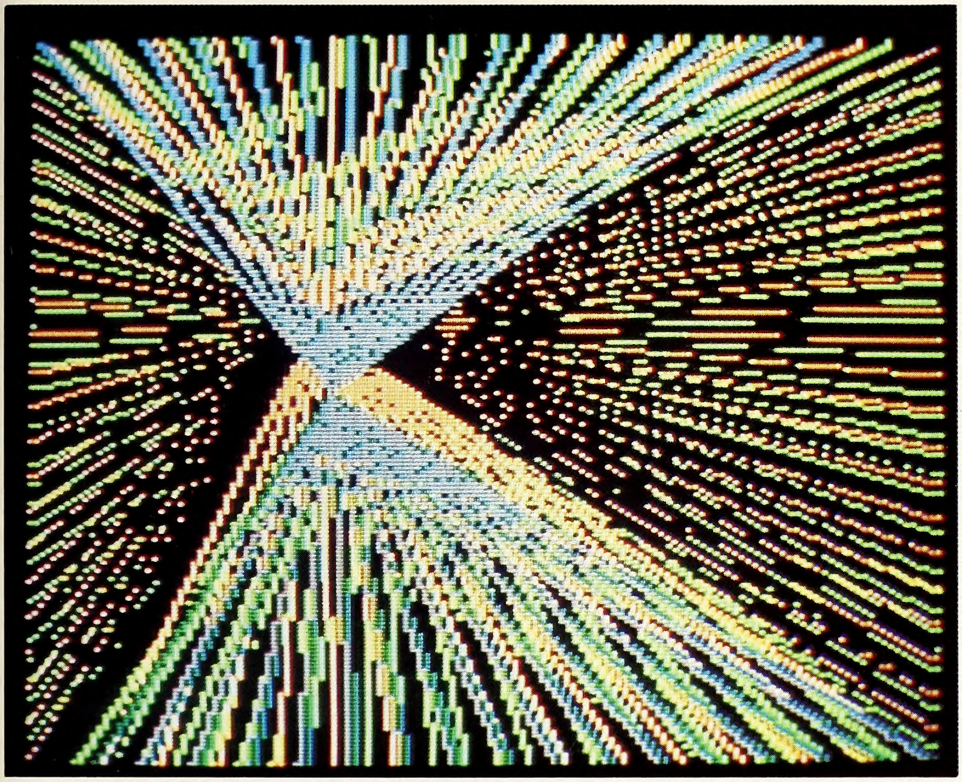
0. black	8. brown
1. magenta	9. orange
2. dark blue	10. grey2
3. violet	11. pink
4. dark green	12. green
5. grey1	13. yellow
6. medium blue	14. aqua
7. light blue	15. white

Some exercises you may want to try include painting the left half of the screen with grey1 and the right half with grey2 to see if they are different or moving a colored ball on different colored backgrounds. If you're the adventurous type, you may want to rewrite *Brickout.*

The following program shows off double hi-res (it requires that the ampersand routines be on disk with the name Color Dbl Hires). It starts with the color bar demo, except in this case the color bars can be much narrower than was possible in lo-res graphics. The next screen shows a simple picture of an orange line drawn diagonally on a green background. These two colors are also available in standard hi-res, but as you'll see in the next picture there are certain limitations.

```
5   PRINT CHR$ (4)"BRUN COLOR DBL
    HIRES"
10  PRINT CHR$ (4)"PR#3" : PRINT CHR$
    (21)
15  INPUT "INPUT COLOR BAR WIDTH
    (1-8)?";X
20  & H
25  & CI
30  FOR I = 1 TO 15
40  & CI
50  FOR N = 0 TO X - 1
60  & P8 * I + N,0
70  & L8 * I + N,140
80  NEXT N
90  NEXT I
100 POKE 49235,0
150 PRINT : PRINT : PRINT
160 INPUT "PRESS RETURN";A$
170 PRINT : PRINT : PRINT : PRINT
205 & C12
210 FOR I = 0 TO 139
220 & PI,0
230 & LI,191
240 NEXT I
250 & C9
260 & P0,0
270 & L139,191
310 POKE 49235,0
320 PRINT : PRINT " DOUBLE HI-RES"
330 PRINT : INPUT " PRESS RETURN";A$
340 POKE 49164,0
350 POKE 49247,0
360 PRINT : PRINT : PRINT : PRINT
400 HGR
410 HCOLOR= 1
420 FOR I = 0 TO 279
430 HPLOT I,0 TO I,191
440 NEXT I
450 HCOLOR= 5
460 HPLOT 0,0 TO 279,191
470 PRINT : PRINT : PRINT
480 PRINT " STANDARD HIRES"
```





Top: a picture of a screen from *Brian's Theme*, the hi-res demo program that dates back at least as far as DOS. Bottom: a new double-hi-res *Brian's Theme*, complete with multiple overlapping colors. The "new theme" was created by the program on this page, using the routines at the end of this article.

In double hi-res the most significant bit is not used, and any color can appear next to any other color, anywhere on the screen (though fringing can occur where the colors join). In standard hi-res the most significant bit of each byte limits that byte to four of the six colors. If the MSB is set, the only colors displayed by that byte are white, black, blue, and orange. When an orange line passes through the blue byte, the MSB is set, so the whole byte becomes orange and the stair step line appears.

Here's a more impressive demo, reminiscent of the venerable *Brian's Theme.*

```
10  PRINT CHR$ (4)"BRUN COLOR DBL
    HIRES"
120 TEXT : & H
125 M% = INT ( RND (2.78) * 5) + 1
130 FOR M = 1 TO M%
131 P% = RND (15) * 15
132 Q% = RND (15) * 15
135 IF (P% + Q%) > 16 THEN 131
180 I% = ( RND (1) * 8) + 2
190 X1 = 70 + INT (40 * RND (5))
195 Y1 = 75 + INT (40 * RND (6))
220 FOR X = 0 TO 130 STEP I%
240 FOR S = 0 TO 1
260 & CP% * S + Q%
300 & PX + S,0: & LX1,Y1: & L138 - X
    -S,191
320 NEXT S,X
321 FOR X = 190 TO 0 STEP - I% * 1.01
322 FOR S = 0 TO 1
323 & C - P% * S + (P% + Q%)
324 & P0,X + S: & LX1,Y1: & L138,191
    -X - S
325 NEXT S,X
330 NEXT M: GOTO 120
```

By the way, if annunciator 3 (AN3) is

turned off when a jumpered extended eighty-column card is present, the most significant bit of standard hi-res isn't used either. This means that any standard-hi-res picture will display only black, white, violet, or green. If the picture contains blue or orange, then those colors will be converted to violet or green. Go ahead and try it: Pull out a game that uses all four colors, turn the AN3 off with peek 49246, and then, without pressing reset (since that sets AN3 on), run the program.

Now you've got the tools and the rules to the double-hi-res mode. As you can see, double hi-res has more color with higher resolution than standard hi-res. You can even develop games that do fancy animation or scroll orange objects across green backgrounds. In black and white, word processing programs that use different fonts of proportional character sets can be developed. Have fun playing with this new mode.

```
                BASE     EQU  $300
                PTR      EQU  $0D0
                YQLD     EQU  $0D2
                YNEW     EQU  $0D3
                XOLD     EQU  $0D4
                XNEW     EQU  $0D5
                XTEM     EQU  00+BASE
                YTEM     EQU  01+BASE
                YDLQ     EQU  02+BASE
                YDHI     EQU  03+BASE
                YFAC     EQU  04+BASE
                YLAS     EQU  05+BASE
                XDLQ     EQU  06+BASE
                XDHI     EQU  07+BASE
                XFAC     EQU  08+BASE
                XLAS     EQU  09+BASE
                GR       EQU  $C050
                HIRES    EQU  $C057
                STORE80  EQU  $C001
                CQL80    EQU  $C00D
                AN3      EQU  $C05E
                NQMIX    EQU  $C052
                PAGE1    EQU  $C054
                PAGE2    EQU  $C055
                CHRGET   EQU  $00B1
                CHRGQT   EQU  $00B7
                EXTLQC   EQU  $03F5
                GETBYT   EQU  $E6F8
                CHKCQM   EQU  $DEBE
                         QRG  $6000
                * ********************************
                * This routine sets up Applesoft *
                * & vector to be used with the   *
                * graphics routines.             *
                * ********************************
6000: A9 4C              LDA  #$04C
6002: 8D F5 03           STA  EXTLOC
6005: A9 10              LDA  #< AMPER
6007: 8D F6 03           STA  EXTLOC+1
600A: A9 60              LDA  #>AMPER
600C: 8D F7 03           STA  EXTLOC+2
600F: 60                 RTS
                * ********************************
                * This routine is ampersand      *
                * controller. Will handle the    *
                * calls from Applesoft to        *
                * machine code.                  *
                * ********************************
6010: 20 B7 00  AMPER    JSR  CHRGOT
6013: 48                 PHA
6014: 20 B1 00           JSR  CHRGET
6017: 68                 PLA
6018: C9 48              CMP  #'H
601A: F0 40              BEQ  HGR
601C: C9 43              CMP  #'C
601E: F0 1B              BEQ  CQL
6020: C9 50              CMP  #'P
6022: F0 05              BEQ  PLQT
6024: C9 4C              CMP  #'L
6026: F0 0A              BEQ  LINE
6028: 60                 RTS
6029: 20 46 60  PLQT     JSR  GETXY
602C: 20 8B 60           JSR  HPLQT
602F: 4C 42 60           JMP  EXIT
6032: 20 46 60  LINE     JSR  GETXY
6035: 20 F1 60           JSR  HLINE
6038: 4C 42 60           JMP  EXIT
603B: 20 F8 E6  COL      JSR  GETBYT
603E: 8A                 TXA
603F: 4C D4 60           JMP  HCOLOR
6042: AD 54 C0  EXIT     LDA  PAGE1
```

```
6045: 60                 RTS
6046: 20 F8 E6  GETXY    JSR  GETBYT
6049: 8E 00 03           STX  XTEM
604C: 20 BE DE           JSR  CHKCQM
604F: 20 F8 E6           JSR  GETBYT
6052: 8E 01 03           STX  YTEM
6055: AE 00 03           LDX  XTEM
6058: AC 01 03           LDY  YTEM
605B: 60                 RTS
                * ********************************
                * HGR fills the screen with      *
                * a black background color.      *
                **********************************
                HGR
605C: AE 50 C0           LDX  GR
605F: AE 57 C0           LDX  HIRES
6062: 8E 01 C0           STX  STQRE80
6065: 8E 0D C0           STX  CQL80
6068: AE 5E C0           LDX  AN3
606B: AE 52 C0           LDX  NQMIX
606E: AE 54 C0           LDX  PAGE1
6071: 20 77 60           JSR  CLRSCR
6074: AE 55 C0           LDX  PAGE2
                CLRSCR
6077: A9 00              LDA  #$000
6079: A8                 TAY
607A: A2 20              LDX  #$020
607C: 8E 81 60  CLRSCR0  STX  CLRSCR1+2
607F: 99 00 20  CLRSCR1  STA  $2000,Y
6082: 88                 DEY
6083: D0 FA              BNE  CLRSCR1
6085: E8                 INX
6086: E0 40              CPX  #$040
6088: D0 F2              BNE  CLRSCR0
608A: 60                 RTS
                **********************************
                * HPLOT is used to plot a dot    *
                * on the screen of any color     *
                * with the X location in the     *
                * X reg and the Y location       *
                * in the Y reg. Use HCQLQR       *
                * to set the color.              *
                **********************************
                HPLQT
608B: 86 D4              STX  XQLD
608D: 84 D2              STY  YQLD
608F: 20 97 60           JSR  DQT
6092: A4 D2              LDY  YQLD
6094: A6 D4              LDX  XQLD
6096: 60                 RTS
                DQT
6097: A4 D2              LDY  YOLD
6099: B9 6A 61           LDA  LQPAG,Y
609C: 85 D0              STA  PTR
609E: B9 2A 62           LDA  HIPAG,Y
60A1: 85 D1              STA  PTR+1
60A3: A6 D4              LDX  XQLD
60A5: BD 92 63           LDA  XLQC,X
60A8: 4A                 LSR
60A9: A8                 TAY
60AA: BD EA 62           LDA  XSHIFT,X
60AD: AA                 TAX
60AE: AD 55 C0           LDA  PAGE2
60B1: 90 03              BCC  SKIP1
60B3: AD 54 C0           LDA  PAGE1
60B6: B1 D0     SKIP1    LDA  (PTR),Y
60B8: 3D 76 63           AND  MASKLQ,X
60BB: 1D 84 63           QRA  CQLQRLQ,X
60BE: 91 D0              STA  (PTR),Y
60C0: AD 54 C0           LDA  PAGE1
```

```
60C3: 90 04               BCC   SKIP2
60C5: AD 55 C0            LDA   PAGE2
60C8: C8                  INY
60C9: B1 D0      SKIP2    LDA   (PTR),Y
60CB: 3D 7D 63            AND   MASKHI,X
60CE: 1D 8B 63            ORA   COLORHI,X
60D1: 91 D0               STA   (PTR),Y
60D3: 60                  RTS
                 ********************************
                 * HCOLOR is called to set the  *
                 * color for HPLOT. The color   *
                 * is passed in the A reg.      *
                 ********************************
                 HCOLOR
60D4: 29 0F               AND   #$0F
60D6: 4A                  LSR
60D7: 90 02               BCC   COL0
60D9: 09 08               ORA   #$008
                 COL0
60DB: A2 00               LDX   #0
60DD: 48                  PHA
                 COL1
60DE: 9D 84 63            STA   COLORLO,X
60E1: 0A                  ASL
60E2: E8                  INX
60E3: E0 07               CPX   #7
60E5: D0 F7               BNE   COL1
60E7: CA                  DEX
60E8: 68                  PLA
                 COL2
60E9: 4A                  LSR
60EA: 9D 8B 63            STA   COLORHI,X
60ED: CA                  DEX
60EE: 10 F9               BPL   COL2
60F0: 60                  RTS
                 ********************************
                 * HLINE will draw a line from  *
                 * the last dot plotted to the  *
                 * point X,Y, with X being in   *
                 * the X reg and Y being in     *
                 * the Y reg. Used HCOLOR to    *
                 *set the color of the line.    *
                 ********************************
                 HLINE
60F1: 86 D5               STX   XNEW
60F3: 84 D3               STY   YNEW
60F5: A5 D4               LDA   XOLD
60F7: 8D 09 03            STA   XLAS
60FA: A5 D2               LDA   YOLD
60FC: 8D 05 03            STA   YLAS
                 ********************************
                 *SETUP DELTA'S                 *
                 *XD=(XNEW-XOLD) DIV 256        *
                 *YD=(YNEW-YOLD) DIV 256        *
                 ********************************
60FF: 38                  SEC
6100: A5 D5               LDA   XNEW
6102: E5 D4               SBC   XOLD
6104: 8D 06 03            STA   XDLO
6107: A9 00               LDA   #0
6109: E9 00               SBC   #0
610B: 8D 07 03            STA   XDHI
610E: 38                  SEC
610F: A5 D3               LDA   YNEW
6111: E5 D2               SBC   YOLD
6113: 8D 02 03            STA   YDLO
6116: A9 00               LDA   #0
6118: E9 00               SBC   #0
611A: 8D 03 03            STA   YDHI
611D: A9 00               LDA   #0
611F: 8D 08 03            STA   XFAC
6122: 8D 04 03            STA   YFAC
                 ********************************
                 *CALC. NEXT DOT POSITION       *
                 ********************************
6125: 18         LINE1    CLC
6126: AD 06 03            LDA   XDLO
6129: 6D 08 03            ADC   XFAC
612C: 8D 08 03            STA   XFAC
612F: AD 07 03            LDA   XDHI
6132: 65 D4               ADC   XOLD
6134: 85 D4               STA   XOLD
```

```
6136:  CD 09 03   224          CMP  XLAS
6139:  F0 06      225          BEO  LINE2
613B:  8D 09 03   226          STA  XLAS
613E:  20 97 60   227          JSR  DOT
                  228 LINE2
6141:  18         229          CLC
6142:  AD 02 03   230          LDA  YDLO
6145:  6D 04 03   231          ADC  YFAC
6148:  8D 04 03   232          STA  YFAC
614B:  AD 03 03   233          LDA  YDHI
614E:  65 D2      234          ADC  YOLD
6150:  85 D2      235          STA  YOLD
6152:  CD 05 03   236          CMP  YLAS
6155:  F0 06      237          BEQ  LINE3
6157:  8D 05 03   238          STA  YLAS
615A:  20 97 60   239          JSR  DOT
                  240 LINE3
                  241 ********************************
                  242 *TEST FOR LAST DOT IN LINE.    *
                  243 ********************************
615D:  A5 D5      244          LDA  XNEW
615F:  C5 D4      245          CMP  XOLD
6161:  D0 C2      246          BNE  LINE1
6163:  A5 D3      247          LDA  YNEW
6165:  C5 D2      248          CMP  YOLD
6167:  D0 BC      249          BNE  LINE1
6169:  60         250          RTS
                  251 ********************************
                  252 *TABLE USED BY PROGRAM         *
                  253 ********************************
                  254 LOPAG
                  255          LUP  4
616A:  00 00 00
616D:  00         256          HEX  00000000
616E:  00 00 00
6171:  00         257          HEX  00000000
6172:  80 80 80
6175:  80         258          HEX  80808080
6176:  80 80 80
6179:  80         259          HEX  80808080
                  260          --^
617A:  00 00 00 00
617E:  00 00 00 00
6182:  80 80 80 80
6186:  80 80 80 80
618A:  00 00 00 00
618E:  00 00 00 00
6192:  80 80 80 80
6196:  80 80 80 80
619A:  00 00 00 00
619E:  00 00 00 00
61A2:  80 80 80 80
61A6:  80 80 80 80
                  261          LUP  4
61AA:  28 28 28
61AD:  28         262          HEX  28282828
61AE:  28 28 28
61B1:  28         263          HEX  28282828
61B2:  A8 A8 A8
61B5:  A8         264          HEX  A8A8A8A8
61B6:  A8 A8 A8
61B9:  A8         265          HEX  A8A8A8A8
                  266          --^
61BA:  28 28 28 28
61BE:  28 28 28 28
61C2:  A8 A8 A8 A8
61C6:  A8 A8 A8 A8
61CA:  28 28 28 28
61CE:  28 28 28 28
61D2:  A8 A8 A8 A8
61D6:  A8 A8 A8 A8
61DA:  28 28 28 28
61DE:  28 28 28 28
61E2:  A8 A8 A8 A8
61E6:  A8 A8 A8 A8
                  267          LUP  4
61EA:  50 50 50
61ED:  50         268          HEX  50505050
61EE:  50 50 50
61F1:  50         269          HEX  50505050
61F2:  D0 D0 D0
```

```
61F5:  D0         270          HEX  D0D0D0D0
61F6:  D0 D0 D0
61F9:  D0         271          HEX  D0D0D0D0
                  272          --^
61FA:  50 50 50 50
61FE:  50 50 50 50
6202:  D0 D0 D0 D0
6206:  D0 D0 D0 D0
620A:  50 50 50 50
620E:  50 50 50 50
6212:  D0 D0 D0 D0
6216:  D0 D0 D0 D0
621A:  50 50 50 50
621E:  50 50 50 50
6222:  D0 D0 D0 D0
6226:  D0 D0 D0 D0
                  273 HIPAG
622A:  20 24 28
622D:  2C         274          HEX  2024282C
622E:  30 34 38
6231:  3C         275          HEX  3034383C
6232:  20 24 28
6235:  2C         276          HEX  2024282C
6236:  30 34 38
6239:  3C         277          HEX  3034383C
623A:  21 25 29
623D:  2D         278          HEX  2125292D
623E:  31 35 39
6241:  3D         279          HEX  3135393D
6242:  21 25 29
6245:  2D         280          HEX  2125292D
6246:  31 35 39
6249:  3D         281          HEX  3135393D
624A:  22 26 2A
624D:  2E         282          HEX  22262A2E
624E:  32 36 3A
6251:  3E         283          HEX  32363A3E
6252:  22 26 2A
6255:  2E         284          HEX  22262A2E
6256:  32 36 3A
6259:  3E         285          HEX  32363A3E
625A:  23 27 2B
625D:  2F         286          HEX  23272B2F
625E:  33 37 3B
6261:  3F         287          HEX  33373B3F
6262:  23 27 2B
6265:  2F         288          HEX  23272B2F
6266:  33 37 3B
6269:  3F         289          HEX  33373B3F
626A:  20 24 28
626D:  2C         290          HEX  2024282C
626E:  30 34 38
6271:  3C         291          HEX  3034383C
6272:  20 24 28
6275:  2C         292          HEX  2024282C
6276:  30 34 38
6279:  3C         293          HEX  3034383C
627A:  21 25 29
627D:  2D         294          HEX  2125292D
627E:  31 35 39
6281:  3D         295          HEX  3135393D
6282:  21 25 29
6285:  2D         296          HEX  2125292D
6286:  31 35 39
6289:  3D         297          HEX  3135393D
628A:  22 26 2A
628D:  2E         298          HEX  22262A2E
628E:  32 36 3A
6291:  3E         299          HEX  32363A3E
6292:  22 26 2A
6295:  2E         300          HEX  22262A2E
6296:  32 36 3A
6299:  3E         301          HEX  32363A3E
629A:  23 27 2B
629D:  2F         302          HEX  23272B2F
629E:  33 37 3B
62A1:  3F         303          HEX  33373B3F
62A2:  23 27 2B
62A5:  2F         304          HEX  23272B2F
62A6:  33 37 3B
62A9:  3F         305          HEX  33373B3F
```

```
62AA: 20 24 28
62AD: 2C         306          HEX  2024282C
62AE: 30 34 38
62B1: 3C         307          HEX  3034383C
62B2: 20 24 28
62B5: 2C         308          HEX  2024282C
62B6: 30 34 38
62B9: 3C         309          HEX  3034383C
62BA: 21 25 29
62BD: 2D         310          HEX  2125292D
62BE: 31 35 39
62C1: 3D         311          HEX  3135393D
62C2: 21 25 29
62C5: 2D         312          HEX  2125292D
62C6: 31 35 39
62C9: 3D         313          HEX  3135393D
62CA: 22 26 2A
62CD: 2E         314          HEX  22262A2E
62CE: 32 36 3A
62D1: 3E         315          HEX  32363A3E
62D2: 22 26 2A
62D5: 2E         316          HEX  22262A2E
62D6: 32 36 3A
62D9: 3E         317          HEX  32363A3E
62DA: 23 27 2B
62DD: 2F         318          HEX  23272B2F
62DE: 33 37 3B
62E1: 3F         319          HEX  33373B3F
62E2: 23 27 2B
62E5: 2F         320          HEX  23272B2F
62E6: 33 37 3B
62E9: 3F         321          HEX  33373B3F
                 322 XSHIFT
                 323          LUP  20
62EA: 00 04 01
62ED: 05 02 06
62F0: 03         324          HEX  00040105020603
                 325          --^
62F1: 00 04 01 05 02 06 03
62F8: 00 04 01 05 02 06 03
62FF: 00 04 01 05 02 06 03
6306: 00 04 01 05 02 06 03
630D: 00 04 01 05 02 06 03
6314: 00 04 01 05 02 06 03
631B: 00 04 01 05 02 06 03
6322: 00 04 01 05 02 06 03
6329: 00 04 01 05 02 06 03
6330: 00 04 01 05 02 06 03
6337: 00 04 01 05 02 06 03
633E: 00 04 01 05 02 06 03
6345: 00 04 01 05 02 06 03
634C: 00 04 01 05 02 06 03
6353: 00 04 01 05 02 06 03
635A: 00 04 01 05 02 06 03
6361: 00 04 01 05 02 06 03
6368: 00 04 01 05 02 06 03
636F: 00 04 01 05 02 06 03
                 326 MASKLO
6376: F0         327          DFB  %11110000
6377: E1         328          DFB  %11100001
6378: C3         329          DFB  %11000011
6379: 87         330          DFB  %10000111
637A: 8F         331          DFB  %10001111
637B: 9F         332          DFB  %10011111
637C: BF         333          DFB  %10111111
                 334 MASKHI
637D: FF         335          DFB  %11111111
637E: FF         336          DFB  %11111111
637F: FF         337          DFB  %11111111
6380: FF         338          DFB  %11111111
6381: FE         339          DFB  %11111110
6382: FC         340          DFB  %11111100
6383: F8         341          DFB  %11111000
                 342 COLORLO
6384: 00 00 00
6387: 00 00 00
638A: 00         343          DFB  0,0,0,0,0,0,0
                 344 COLORHI
638B: 00 00 00
638E: 00 00 00
6391: 00         345          DFB  0,0,0,0,0,0,0
                 346 XLOC
6392: 00 00      347          DFB  00,00
6394: 01 01      348          DFB  01,01
6396: 02 02      349          DFB  02,02
6398: 03         350          DFB  03
6399: 04 04      351          DFB  04,04
639B: 05 05      352          DFB  05,05
639D: 06 06      353          DFB  06,06
639F: 07         354          DFB  07
63A0: 08 08      355          DFB  08,08
63A2: 09 09      356          DFB  09,09
63A4: 0A 0A      357          DFB  10,10
63A6: 0B         358          DFB  11
63A7: 0C 0C      359          DFB  12,12
63A9: 0D 0D      360          DFB  13,13
63AB: 0E 0E      361          DFB  14,14
63AD: 0F         362          DFB  15
63AE: 10 10      363          DFB  16,16
63B0: 11 11      364          DFB  17,17
63B2: 12 12      365          DFB  18,18
63B4: 13         366          DFB  19
63B5: 14 14      367          DFB  20,20
63B7: 15 15      368          DFB  21,21
63B9: 16 16      369          DFB  22,22
63BB: 17         370          DFB  23
63BC: 18 18      371          DFB  24,24
63BE: 19 19      372          DFB  25,25
63C0: 1A 1A      373          DFB  26,26
63C2: 1B         374          DFB  27
63C3: 1C 1C      375          DFB  28,28
63C5: 1D 1D      376          DFB  29,29
63C7: 1E 1E      377          DFB  30,30
63C9: 1F         378          DFB  31
63CA: 20 20      379          DFB  32,32
63CC: 21 21      380          DFB  33,33
63CE: 22 22      381          DFB  34,34
63D0: 23         382          DFB  35
63D1: 24 24      383          DFB  36,36
63D3: 25 25      384          DFB  37,37
63D5: 26 26      385          DFB  38,38
63D7: 27         386          DFB  39
63D8: 28 28      387          DFB  40,40
63DA: 29 29      388          DFB  41,41
63DC: 2A 2A      389          DFB  42,42
63DE: 2B         390          DFB  43
63DF: 2C 2C      391          DFB  44,44
63E1: 2D 2D      392          DFB  45,45
63E3: 2E 2E      393          DFB  46,46
63E5: 2F         394          DFB  47
63E6: 30 30      395          DFB  48,48
63E8: 31 31      396          DFB  49,49
63EA: 32 32      397          DFB  50,50
63EC: 33         398          DFB  51
63ED: 34 34      399          DFB  52,52
63EF: 35 35      400          DFB  53,53
63F1: 36 36      401          DFB  54,54
63F3: 37         402          DFB  55
63F4: 38 38      403          DFB  56,56
63F6: 39 39      404          DFB  57,57
63F8: 3A 3A      405          DFB  58,58
63FA: 3B         406          DFB  59
63FB: 3C 3C      407          DFB  60,60
63FD: 3D 3D      408          DFB  61,61
63FF: 3E 3E      409          DFB  62,62
6401: 3F         410          DFB  63
6402: 40 40      411          DFB  64,64
6404: 41 41      412          DFB  65,65
6406: 42 42      413          DFB  66,66
6408: 43         414          DFB  67
6409: 44 44      415          DFB  68,68
640B: 45 45      416          DFB  69,69
640D: 46 46      417          DFB  70,70
640F: 47         418          DFB  71
6410: 48 48      419          DFB  72,72
6412: 49 49      420          DFB  73,73
6414: 4A 4A      421          DFB  74,74
6416: 4B         422          DFB  75
6417: 4C 4C      423          DFB  76,76
6419: 4D 4D      424          DFB  77,77
641B: 4E 4E      425          DFB  78,78
641D: 4F         426          DFB  79
```

The Enhancer II™ Proudly Presents

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Recognize some of these "key" characters? You've seen them all before on your Apple® II screen, but now the Enhancer II has given them all new identities!

The Enhancer II uniquely gives your Apple II user-definable keys. So you can define any key to become what you want it to be. That means phrases, paragraphs or commands that you use frequently (up to 510 characters!) can be remembered by the Enhancer II and then called up at the touch of a single key.

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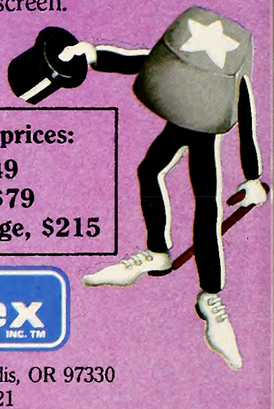
We may be prejudiced, but we think you're going to like these new "key" characters from Enhancer II. In fact, we'll bet that once you've seen them perform, they'll become the stars of your screen.



Suggested retail prices:
Enhancer II, $149
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Combined Package, $215

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VENTURES WITH VISICALC

BY JOE SHELTON

Some financial templates, such as the one we constructed two months ago to help you maintain your correct checking-account balance and analyze your tax deductions, are useful year in and year out. Other kinds of financial templates may be used less often but may be equally valuable tools for analyzing your financial position.

This month we'll create a template designed to help you truly understand the cost of borrowing money. In the course of things we'll also learn how to save money by comparing loan rates, and we'll consider the savings that may be involved in paying off a loan early.

Buying a car is the second most important investment most people will make in their lives (a home is the first). We'll use buying a car as the example in our template, although the template can apply to almost any normal loan situation. When a balloon payment structure is involved, the criteria change slightly, but the template we're going to design can handle that kind of situation with only minor modifications.

Buying a Car. Let's set the scene. You've decided you're going to buy a really good car. You go to the dealer, find the car you like, and haggle over the price. Let's say the car you decide on retails for $16,872. After a lot of haggling, the nice people at the dealership decide they like you and are willing to give you a deal! You get the car for $16,800. At this point, you can either get the dealer to determine the financing or go to a bank and arrange your own financing. Deciding to do the latter, you run to your finance person, who says that in order to get a loan you must make a 10 percent down payment on the car. That means you need $1,680 in cash. Once you've gotten that, the finance company will lend you the remainder of the money at 13 percent.

You decide to put $1,800 down. After doing some figuring, your finance person tells you that your monthly payment on $15,000 is a low $505.41 for thirty-six months. You hesitate momentarily; that is more than you wanted to pay. But you have to have the car! So you agree, withdraw the down payment from your bank account, and—et voila—the car is yours. All you have to do is be sure to put a check in the mail to the vendor once a month.

Hold it a second. Have you ever stopped to think how much money you're actually paying the finance company for the use of their money? Have you ever determined how much quicker the loan would be paid off if you paid a little more each month? Or how much less it might cost if you paid the loan off quicker? If you're like most people, you haven't given these questions a great deal of thought. Once you've completed this template, however, you'll have no excuse for not knowing how much you're paying in interest; and knowing this should help you make more informed financial decisions.

Compounding the Problem. The first thing you must understand is the compounding effect that the interest rate has on your loan. Each month's payment includes a percentage for reducing the principal; the remainder goes toward interest. In the beginning, the interest component of your monthly payment will probably exceed the component that's applied to the principal. That means that the quicker you pay off the loan, the less interest you'll have to pay. Most loans do permit early repayment, though some require an early payment penalty.

For example, borrowing $15,000 at 15 percent per annum for four years requires a monthly payment of $417.46. Multiplying the monthly payment by forty-eight months reveals that you have made total payments of $20,038.08. In other words, you've paid $5,038.08 in interest expense alone. Arranging to pay off that same loan over three years would put your monthly payments at $519.98, but the total interest expense would be only $3,719.28. That's a difference of $1,318.86 in interest expense. You can see that it might make sense to pay off the loan as quickly as possible. (Of course, it's also worthwhile to consider what effect inflation might have on this whole business.)

If you already have a loan, why not plug it into this model? All you have to do is find out the pertinent information for the current month.

Begin at the Beginning. When attempting to solve any problem, it's best to begin by considering what you want to accomplish and what components are required. In our example, the elements are an initial loan amount (called the principal) and the monthly payments that you must make for a specified period of time. In addition, the bank must consider the interest rate in order to determine how much of your monthly payment will go toward the principal and how much will be counted as interest payment. Each month the bank calculates the amount of the interest payment by taking the monthly interest rate times the remaining principal. The remainder of your payment (the principal payment) is deducted from the principal, and the balance is the principal balance for the following month.

Our simple model operates under a couple of assumptions. The first is that any regular or extra payments made on the loan must be made on the day the original payment is due. The second is that if you mail your payment late you'll be charged interest for the days past the due date. Of course, there's also a final payment date beyond which you'll incur additional financial penalties. We won't take this into account in our model, but if you currently incur this penalty on a loan, you can easily add the necessary extra column to keep track of it.

We're also assuming that occasionally you'll find that the numbers we calculate and those the bank comes up with are slightly different. There are a number of possible reasons for this; the main one is late payment. In addition, many banks calculate interest daily, whereas our model calculates it monthly. The figures obtained via the two methods can differ substantially over the long haul.

So now we're ready to get started. Boot *VisiCalc* and let's begin. In B15, enter September, the first month of our loan. In B16 through B26, enter the remaining months, October through August. Enter the column headings as shown in figure 1.

Before going any further, enter /GCM in order to make recalculations happen only when we ask for them (by pressing !). This will make entering the remainder of the model less time-consuming. Since the majority of the template will concern dollars and cents, enter /GF$ so that any values will automatically be displayed with two decimals. If there are any values you'd like displayed in some format other than this, use the format command /F to select the appropriate option.

Enter the loan amount, $15000, in C15. Next, enter $505.41, the monthly payment, in D15. In a future column we'll look at a couple of methods of determining the payment amount using *VisiCalc* and *VisiCalc Advanced Version.*

In E15, calculate the monthly amount to be applied to the interest expense. If you know the interest rate, the solution is simple. Suppose you don't? It's still simple—let's determine it.

We'll choose cell K15, in an area outside the template, as our work area. We could call this area our "variables" and/or "entry" section. In

addition to entering the interest rate here, we could enter the loan amount, number of periods, and so on in this section and then insert that information into the template automatically.

To determine the monthly interest rate we need only know the principal balance and the monthly interest amount. Dividing the interest amount by the principal gives us the interest rate. You've already entered the principal into cell C15; now enter the interest amount in E15. Then compute the monthly interest rate in cell K15 by entering +E15/C15. If you want to know the yearly rate, multiply the entry in cell K15 by 12.

If the rate you already know is the yearly rate, calculating the monthly rate is simply a matter of dividing 12 into it (for example, .1775/12 [return]) in cell K15. We'll need this value in order to calculate interest expense.

Now all we have to do is to calculate how much of the monthly payment is applied to the principal. In F15, enter +D15−E15, the payment minus the interest amount.

Let's reserve column G as a place to enter any additional payments you may make. Column H will contain a total of the payments made during the month; we'll use this total later. In H15, enter +D15+G15.

Big Deal. You may be wondering what we've accomplished. So far, you've made most of the entries manually and only a couple of computations have been made by *VisiCalc*. Now, though, we're going to complete the model in such a way that it will automatically fill in the entries in all of the columns for the remainder of your loan. The only changes that will be necessary from this month forward are those that must be made to reflect additional payment entries in column G and possible corrections to the principal amount.

Time to think about the October entries. Since we want the remaining entries to be calculated automatically, let's consider each column. The balance, calculated in column C, is easy. It should be the balance from the prior month, minus the amount of the prior month's payment applied to the principal, minus the amount of any extra payments. The formula in C16 would be +C15−F15−G15. If you allow a row for each month in your loan contract, everything will work out fine. But if you pay off the loan early—by making additional early payments, for exam-

	B	C	D	E	F	G	H
12			MONTHLY	APPLIED TO		EXTRA	TOTAL
13		BALANCE	PAYMENT	INTEREST	PRINCIPAL	PAYMENT	PAYMENTS
14							
15	SEPTEMBER						
16	OCTOBER						
17	NOVEMBER						
18	DECEMBER						
19	JANUARY						
20	FEBRUARY						
21	MARCH						
22	APRIL						
23	MAY						
24	JUNE						
25	JULY						
26	AUGUST						

Figure 1.

ple—you'll have a number of months when the values in column C will be incorrect. And, ideally, the balance in column C should show 0 once the loan is paid off.

Now we have a puzzle. How do you have the template calculate the current amount of the principal and then make it display 0 once the loan is paid off? Regular readers should have no problem with this one. The answer is the @IF function. Before reading the next paragraph, try to figure out how to set things up.

The @IF function takes the following form: If a logical statement is true, return the first value. If the statement is false, return the second value. The logical statement is nothing more than a comparison—you compare two values, cells, formulas, or combinations of these items using the logical operators greater than (>), less than (<), equal to (=), greater than or equal to (>=) less than or equal to (<=), or not equal to (<>). The comparison then returns either TRUE or FALSE, and that determines whether the first or second value is displayed.

Back to our problem. We want the value (in this case, the value of the principal of our loan) to be displayed if it is larger than 0; otherwise, we want a 0 to be displayed. That sounds simple enough. The value is +C15−F15−G15. So the formula in C16 should read:

```
@IF ((C15-F15-G15) > 0,C15-F15-G15,0)
```

Now replicate this formula down column C using relative for each cell reference. Of course, you'll want to determine the total number of payments on your own loan and replicate down the appropriate number of rows. For purposes of example, we'll stick with a single year's payments.

Now let's think about column D, the payment. One way to go would be to replicate the initial payment in D15 down the column. That would solve our problem, all right, but it wouldn't be the most elegant solution. It makes sense to have the last payment entry reflect what the real payment needs to be. It's rarely the amount of the regular payment, especially if you've incurred any additional penalties or made additional payments. Besides, it would be nice to have the payment cell display a 0 when no payment is necessary. That presents us with another puzzle. How do we make this column display the correct payment amount (which may be less than the regular payment amount)? Most of the time, the column should display the regular payment, but the amount due in the last month will probably be less than the other payments and will be 0 thereafter. Why not experiment with this one before reading the answer that follows.

Since we're going to display optional values, the @IF statement is again the obvious choice. @IF is not the only choice, however. You might try some other options, such as @LOOKUP. In this example, we'll stick with @IF.

Let's think about the solution a moment. What do we know? Well, for one thing, we know the normal payment amount. We also know that the final payment will be the balance plus the amount of interest due in the final month. We could let the @IF formula calculate the amount as defined above; if we did that, we'd also have to ensure that the payment and interest became 0 just as soon as the loan was paid off. To state our solution in English: If the balance is greater than our payment, display the payment. If it is not, display the amount of the final payment (balance plus interest). If there's no balance, then there will be no interest due and the cell will display a 0.

Rather than entering the actual payment amount in the formula, we've referenced a specific cell in the variables section (K16, for example). Setting the template up that way means that you'd only have to change the actual payment amount in that one location for any future loans you want to calculate.

The formula in cell D16 should read:

```
@IF(C15>K16,K16,C15+E15)
```

Replicate that formula into column D through row 26. With the exception of the payment amount, all cell references are relative. Because the payment amount value is in a single cell, its reference would be no change.

Calculating the interest for each month isn't hard at all. We've already determined the interest rate. Now we just multiply the monthly interest rate by the principal to determine the interest expense. The formula for E16 would be +C16*K15. Replicate using relative reference and then no change reference.

Next we must determine how much of the regular monthly payment is applied to the principal. Replicate F15 through column F using relative reference.

We've now completed the major part of the model. We can get a little better understanding of the mechanics involved by totaling some of the columns. For example, you'd probably like sums of the individual monthly payments, the interest expense, the extra payments, and the total payments. Enter the appropriate @SUM formulas (@SUM D15 . . . D27) in row 28.

From these sums we can calculate such things as the effective interest rate. Choose a cell located below the actual model (for example, H32) and enter +E28/H28. The resulting figure is the effective interest rate for your loan. No matter what the "official" rate was, this tells you what you actually paid. If you make additional loan payments each month, you'll find that your effective interest rate is less than the official rate.

Figure 2 shows the completed template.

Now that your template is complete, you can look at each loan you have and do some rather precise calculations about what each loan is actually costing you and what you can do to make it cost less. For example, you can do "what-ifs," such as adding a payment to each month to see how quickly you can pay off the loan; you can then determine how much interest expense you would save if you were to pay off the loan more rapidly.

One additional note. Making an early payment one month may cause your next month's statement to show your payment due to be lower than normal. It may be that you'll have to submit extra payments directly to the bank in order to have them applied directly to the principal rather than incorporated into the normal payment cycle.

There's another financial function worth knowing about that's included in *VisiCalc* but rarely used. It's the @NPV function, and it can tell you what a loan actually costs you in today's dollars. Net present value measures the present value (what the same money would buy in the value

	B	C	D	E	F	G	H
12			MONTHLY	APPLIED TO		EXTRA	TOTAL
13		BALANCE	PAYMENT	INTEREST	PRINCIPAL	PAYMENT	PAYMENTS
14							
15	SEPTEMBER	15000.00	505.41	162.50	342.91	....	505.41
16	OCTOBER	14657.09	505.41	158.79	346.62	....	505.41
17	NOVEMBER	14310.47	505.41	155.03	350.38	....	505.41
18	DECEMBER	13960.09	505.41	151.23	354.18	....	505.41
19	JANUARY	13605.91	505.41	147.40	358.01	....	505.41
20	FEBRUARY	13247.90	505.41	143.52	361.89	....	505.41
21	MARCH	12886.01	505.41	139.60	365.81	....	505.41
22	APRIL	12520.19	505.41	135.64	369.77	....	505.41
23	MAY	12150.42	505.41	131.63	373.78	....	505.41
24	JUNE	11776.64	505.41	127.58	377.83	....	505.41
25	JULY	11398.81	505.41	123.49	381.92	....	505.41
26	AUGUST	11016.89	505.41	119.35	386.06	....	505.41
27		----------	----------	----------	----------	----------	----------
28	TOTALS		6064.92	1695.75	4369.17	0.00	6064.92
29		==========	==========	==========	==========	==========	==========

Figure 2.

of today's dollars) of a cash flow (payments). In cell H30, enter @NPV(K18,I5...H26), where K18 is a cell in which you've entered your estimate for the rate of inflation. Then save your file and let's discuss a problem in our template.

Problems, Problems, Problems. If you clear your file and then reload it, you may find that a number of recalculations are required before the template is correct. For example, if you enter $1700 as the loan amount and .01 as the interest rate, save, and then reload the file, you'll find that approximately eighteen recalculations are required before the template is correct. This is so because the order of recalculation is by column. Recalculation by column means that *VisiCalc* recalculates column A before column B, column B before column C, and so on. Because our template references back and forth between columns, there are times when a reference won't be correct until the next recalculation allows it to "see" the correct answer in another column. The solution to this potential problem is to set the recalculation order to recalculate by rows (/GOR). Using the same information, the reloaded template will require approximately seven recalculations.

If you wish to minimize the number of recalculations, you need to lay out your template so that all references are to cells either to the left of or above the original cell. When things are set up that way, all cells will be recalculated in an order that ensures the accuracy of the previous cell. Having paid attention to how you lay out a template will make a difference not only when you're loading a file but also when you're doing "what-if" analysis. If you have a large template that requires thirty to forty seconds to recalculate and you have to recalculate it ten times in order to ensure its accuracy, you'll have to wait more than five minutes each time you change a variable.

If minimizing recalculation time is important and your report format is not one that can be set up to accomplish that, you might want to make use of a format that incorporates both a computational section and a report section. The computational section is laid out to minimize the need for recalculation, and the report section displays the results in an attractive format.

It is always important that you test each template under various conditions in order to determine how many recalculations are necessary for accuracy. It's not always sufficient to assume that just because you've seen no changes for the last couple of recalculations the template must be accurate. This is especially important to remember when you have a template in which lots of computations take place in an area larger than the display screen. Sometimes it takes a number of recalculations before the area within the display is affected.

Once you know how many recalculations are required to ensure accuracy, it would be nice to be able to count them as they take place. The Apple III uses a type-ahead buffer, which means you can press ! as many times as necessary and then wait for the results. (Pressing control-6 on the keypad to turn off the Apple III display will speed recalculation.) Folks with Apple IIs can't use that trick, so let's see if we can find another way to go.

The answer is simple, and it points out another problem you can encounter when using *VisiCalc*. The problem, which the *VisiCalc* manual recommends that you avoid, is called *circular referencing*.

Circular referencing, at its simplest, is when two cells reference one another. When true circular referencing is going on, both cells will continue to generate new values each time you recalculate. This will keep happening until the values are either too small or too large for *VisiCalc* to display.

Let's create and look at an example of circular referencing. In cell B1, enter 1+C1. In cell C1, enter +B1. Press ! a number of times and then watch what happens. The values will continue to increase until they become so large that *VisiCalc* is no longer able to display them. Fortunately, we can use this anomaly in creating a way of counting the number of recalculations that have been made in a template.

One way of arranging matters so that you'd know how many recalculations have taken place would be to enter these formulas each time before you begin recalculating and then watch the results. But remember, we'd like for this option to be reusable. We'd also like to be able to watch a value increment at each recalculation and to be able to reset the value to 0. We could just watch the value increment forever, renewing the counting with the current value when we wanted to evaluate the results. But it would be nice to have the count start at 1 each time we begin recalculating. The problem is that we must enter the formula each time we load the template; if it already exists in the template being loaded, both cells will display ERROR and nothing we can do will change that.

Before you continue, see if you can come up with a final solution.

We know the initial premise of our solution—we're going to use circular referencing. The formulas we enter in B1 and C1 incremented the values each time we pressed !, so they're a good place to start. The question is, how do we get the values to zero on demand?

Since the circular reference is, by definition, a closed loop, we're going to have to find a way to reset the loop to 0. This method should not involve an entry to either of the original cells; so we must use a third cell as a trigger. The problem might be stated thus: If there is no value in our trigger cell, then add 1 to the value in the other cell (C1); otherwise, display 0.

Sounds like an @IF solution, doesn't it? Figure 3 shows the formulas as they are in each cell.

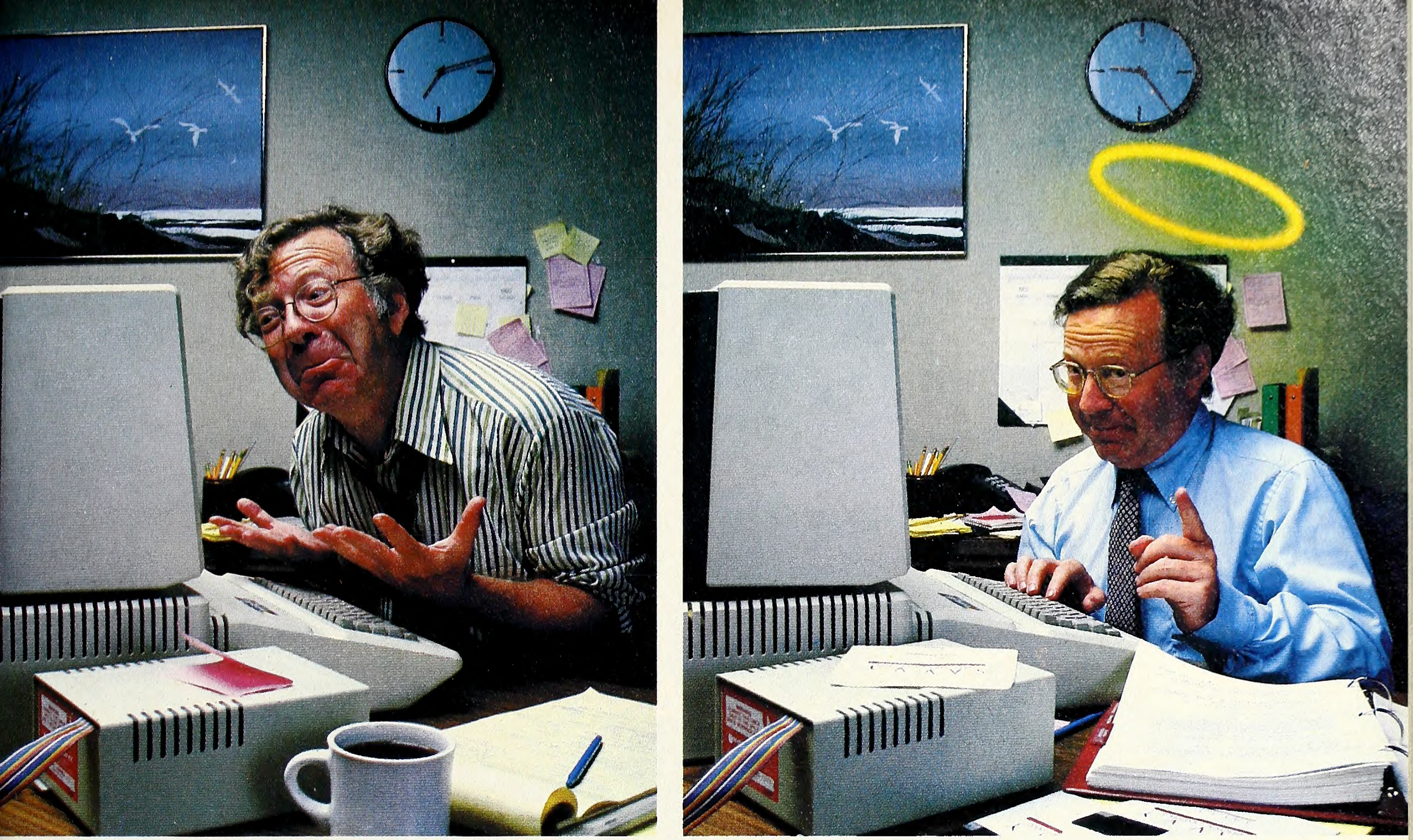
	A	B	C
1		@IF(A1=0,1+C1,0)	+B1
2			
3			

Figure 3.

Entering any value greater than 0 in cell A1 causes cell B1 to display the value 0. In this case, C1 will also display 0. Blanking cell A1 allows the formulas to begin incrementing values at each recalculation—our solution!

As you can see, the logic and search functions are part of what makes *VisiCalc* as powerful as it is. The more you experiment with them, the more useful these functions become.

Next Month. In October's installment, we'll look at some enhancements to this template and at some noteworthy features of *VisiCalc Advanced Version*.



Darth Vader himself was stalking off the cover of *Softalk* #1 three years ago this month. Included in that first, skinny, twenty-eight-page issue was an article entitled, "Dealing with DOS from Assembly Language." Since assembly language is a force that wasn't with most of us three years ago, we're about to discuss the DOS-from-assembly-language problem again.

Already the eyes of many Basic-only readers are beginning to glaze over. Wait! This column is written with you in mind. Even if you never write assembly language programs, you frequently use them. Some of the ones you use will fail to work at times.

The correct procedures for using DOS from assembly language aren't well documented. Many assembly language programs, even commercial ones, have problems using DOS under certain conditions. Users who understand the symptoms of these problems and the limitations they imply can often find a cure.

Here are a few assembly language fundamentals that will help you with this column and with other material you may encounter.

A Silicon Primer. *Machine language* is the only language your Apple's microprocessor can actually understand. Machine language consists entirely of numbers. Bare-handed humans find machine language exceedingly difficult to read or write.

Assembly language is the human version of machine language. An *assembler* is software a human can use as a tool for writing machine language programs with words instead of numbers. An assembler translates words into the numbers required by the microprocessor.

Machine language and assembly language are really two manifestations of the same thing. The human-readable manifestation of a program is often called *source code*. *Object code* is the machine-readable manifestation. The process of converting source code to object code is called *assembling* the program.

The microprocessor in the Apple is known as the *6502*. It, like all microprocessors, has its own unique machine language. Programs written for the 6502 will not run on computers with other microprocessors, such as the Z-80 (used in CP/M-compatible computers) or the 8088 (used in the IBM pc and compatibles).

There are only fifty-six things you can actually get the microprocessor in an Apple to do. Most of these are available in several different styles, however, so 6502 machine language has about one hundred fifty distinct commands.

The 6502 contains a handful of its own memory locations. These are called *registers*. One of these, known as the *accumulator*, is the only memory location in the entire computer where two numbers can be added or subtracted.

Amazingly, direct multiplication and division are beyond the capability of the 6502. Such high-level calculations as two times two are done with subroutines that repeatedly add or subtract.

Writing programs in assembly language is a slow and tedious process. Nonetheless, assembly language provides a flexibility, a level of control, and an execution speed simply unattainable in any other language. And once a programmer has built up a library of standard, tested subroutines, programming becomes easier and faster.

Assembly language programs are always closely identified with their actual location in memory. Programs are said to *reside* at such and such an *address*.

Some assembly language programs, but not many, are *relocatable*. This means they will work just fine no matter where they reside. Others, even rarer, are *self-relocating*. This means that they automatically adjust themselves for whatever location they end up in. A DOS master disk contains a self-relocating version of DOS.

A DOS slave disk, on the other hand, contains a *nonrelocatable* version of DOS. Most assembly language programs are like this. It means they don't work correctly if moved.

For example, suppose a program contains a text string. The program reads this string using the address the string was assigned to when the program was assembled. But if the program is moved, the string will be moved along with it and consequently won't be where it's supposed to be. Instead, the program will read whatever junk is at the correct address and fail. This is just one example of the kinds of problems that develop when assembly language programs are moved.

E.T. Call Home. There is an assembly language subroutine permanently nailed into the Monitor—part of the Apple's built-in software—that will clear your Apple's screen. You can run this routine from Basic by using the *call* command. A Basic call is the same thing as a gosub, except control is passed to an assembly language, rather than a Basic, subroutine.

The clear-screen subroutine starts at memory byte 64600. You can access this routine from Applesoft with the command *call 64600*. (However, it is usually written as *call −936*. The two numbers 64600 and −936 represent the same memory byte. Call −936 is easier to remember and works in Integer Basic as well as Applesoft. This explains its popularity.)

The assembly language statements for doing the equivalent call look like this:

```
HOME    EQU    64600    ;set HOME equal to 64600
        JSR    HOME     ;jump to subroutine at the
                        ;  address indicated by HOME
```

The first statement sets the word HOME to the proper address. (HOME is the standard name for this address—see the Monitor ROM source code, which is included in the Apple II reference manual.) The second statement calls the Monitor routine. The first statement would appear only once in a program. The second, of course, could appear wherever and as many times as the programmer desired.

In machine language, the equivalent call looks like this:

```
20 F8 FC
```


3M
diskettes
Box of 10 5¼ inch
SS,DD,RH
single side
double density
Memorable.


3M
diskettes
3M
diskettes

These three numbers are in hexadecimal. Hexadecimal numbers are very similar to decimal, except each digit can range from 0 to 15 instead of 0 to 9. The letters A through F are used to represent the digits for 10 through 15.

The number 64600 in hexadecimal is $FCF8 (the dollar sign indicates the number is in hexadecimal).

In our machine language instruction, 20 is the hexadecimal code for JSR, jump to subroutine. Notice that the address $FCF8 follows, only it's backward. This is standard operating procedure in 6502 machine language.

Apple DOS is written in assembly language. You might suppose that would make DOS extremely simple for other assembly language programs to use. . . .

Bone of Basic's Bone; Flesh of Basic's Flesh. Last month it was observed that Apple DOS sometimes seems to have been created from one of Basic's ribs. In that column we looked at all the DOS commands that have special features for Basic's sake.

In columns previous to last month's we saw that Apple DOS is really made up of three separate programs. RWTS, one of these three, is the program that actually turns the disk drive on, moves the arm inside it, and reads and writes on disk. Using RWTS, an assembly language programmer can gain direct and easy access to individual sectors on a disk. The techniques for this have been well documented, both in this column (in its prior incarnation: October 1982) and elsewhere (*DOS Manual*, *Beneath Apple DOS*).

Being able to handle individual sectors, however, is a far shot from being able to deal with a whole file. The program within DOS that facilitates file handling is called the file manager.

The file manager is in charge of the clerical aspects of retrieving the files a programmer asks for, stowing away the files a programmer saves, and keeping track of where everything on each disk is. The procedures for using the file manager directly from assembly language are not at all well documented anywhere but in the book *Beneath Apple DOS*, although they are very similar to the RWTS procedures.

To use either RWTS or the file manager, a programmer must fill in a table of numbers with meaningful values. The table associated with RWTS is called the *input/output control block* or *IOB*. The table associated with the file manager is called the *file manager parameter list* or, rarely, the *status area*.

For example, to use RWTS directly, you have to fill in the IOB to indicate the slot, drive, volume, track, and sector numbers of the particular sector you are interested in. Another number in the IOB indicates whether you want to read the sector or write to it. After filling in the table with these and other numbers, you simply call on RWTS.

The file manager is the primary user of the RWTS routine. Every time you do a catalog, for example, it is the file manager that tells RWTS which sectors on your disk to read. The file manager also displays the catalog on your screen.

The primary user of the file manager, on the other hand, is the third program inside DOS, the DOS command interpreter—affectionately known in this column as the Captain.

It is the Captain that is bone of Basic's bone, flesh of Basic's flesh. RWTS and the file manager are oblivious to what language is calling them. They are easy to use from assembly language (or from Basic, for that matter) once a programmer knows how to fill in the tables. The Captain, on the other hand, being a creature created as a helpmate for Basic, is more difficult to tame.

Nonetheless, beginning assembly language programmers have their hands and minds quite full of new concepts. Wouldn't it be great if they could use the DOS commands they already knew from their experience with Basic? Why burden them further by forcing them to learn new ways of dealing with disks and files at the same time they are fighting to understand indirect indexed addressing?

Tell It to the Captain. Fortunately, even the Captain has remarkable adaptability running through his veins. As discussed in previous columns, the Captain is a spylike creature who taps all the messages coming from your keyboard or going to your screen so he can see them first. This is how he intercepts commands meant for him.

Because he opens all your mail, you can give DOS commands to the Captain by simply sending them to your screen. The Captain will intercept and execute them. This technique works from any language, including assembly language. And the beauty is that the commands are the same ones we already use with Applesoft and Integer Basic.

But there are a few problems with this approach. The family relationship between DOS and Basic does get in the way. There are three areas where problems develop.

First, the Captain does some things in different ways, depending on whether Basic is running a program or is stopped. To get the Captain to work normally, an assembly language program must let him know a program is running. This requires some special tricks.

Second, the Captain normally returns program control to Basic after a disk error or a press of the reset key. Since you don't want users thrown out of your program and into Basic every time they leave a disk drive door open, a second trick is necessary.

Finally, the Captain and Basic have an agreed-upon procedure for keeping track of what memory areas inside the Apple are available for use. Assembly language programmers should honor this agreement but often don't know how.

Crossing the (Toll) Bridge. There is one price that must be paid for tricking the Captain. You have to find him. As we've seen before, DOS doesn't have a permanent home. While DOS can usually be found at the standard 48K location, some users like to move DOS into a 16K RAM card.

It's true that DOS always files a change-of-address notice when it is booted. This notice can be found in the *page three vector table*, which we discussed in June. By using the page three vector table, you can call both RWTS and the file manager without knowing where DOS resides.

The page three vector table can also be used to find the Captain. But many assembly language programs don't use it. Instead they simply assume DOS is at its normal 48K location. This causes users unnecessary problems.

As a user, you should be aware that many assembly language programs won't work correctly if DOS has been moved to the language card.

At the very least, a commercial program should check the page three vector table and refuse to run if DOS isn't at its normal 48K location. A really good program will find the Captain no matter where he is hidden.

Of course, if you are using programs you have written yourself or if you are using copy-protected commercial software, the DOS location is under control and shouldn't cause a problem.

The reason it's so important to find the Captain is that he keeps some information in his heart that we must have access to. This information is kept in two areas, the *Basic entry-point vector table* and the *active-Basic flag*. (It would have been nice if these had been made part of the page three vector table, but. . . .)

Finding Himem. The active-Basic flag tells us which version of Basic the Captain thinks is running. In normal 48K DOS, this flag is at byte 43702 ($AAB6). A zero at this location indicates Integer Basic, a 64 ($40) indicates standard Applesoft, and 128 ($80) indicates cassette Applesoft.

Once we know which Basic the Captain thinks is running, it is a very easy matter to find the extent of free memory. Nonetheless, few assembly language programs do it. Even though it is quite common for programs to be inserted between DOS and its buffers, thus decreasing the amount of free space available, many assembly language programs assume this hasn't been done.

Consequently, such programs overwrite the DOS buffers and cause users misery. At the very least, commercial programs should check himem and refuse to run if the value there is abnormal. A really good program will adapt to any himem setting.

Basic keeps the lowest available address, lomem, and the highest available address, himem, stored on page zero. The Captain updates himem whenever he rebuilds the DOS buffers. The actual zero-page locations vary according to which language is active, as shown.

	lomem	himem
Integer	74–75 ($4A–4B)	76–77 ($4C–4D)
Applesoft	103–104 ($67–68)	115–116 ($73–74)

The active-Basic flag also has some other uses, which we'll get to in a moment.

Intercepting Errors. The Basic entry-point vector table is a list of addresses DOS uses to pass control of the computer to Basic. This happens during cold starts, warm starts, when a program is run, and after a DOS error.

A DOS/Basic warm start occurs whenever the reset key is pressed, unless you intercept the reset at the soft-entry vector in the page three vector table. Rather than mess with the soft-entry vector, however, you can simply place your assembly language program's warm-start address in the Basic entry-point vector table. Then the Captain will pass control to you after a reset, rather than to Basic.

This same technique is used to get him to pass control back after a DOS error. Put the address of your error-handling routine at byte 40282 ($9D5A). Put your warm-start address at byte 40286 ($9D5E).

As part of your error-handling routine you can choose whether you want the Captain to send DOS error messages before passing control back to you. If you would like the Captain to do this for you, it is very important that you store a zero in byte 216 ($D8). This is the Applesoft onerr flag. If it contains a value greater than 128, the Captain will not send error messages. Again, many assembly language programs fail to clear this byte. If you have a favorite program that sometimes doesn't send DOS error messages, simply set byte 216 to zero before running the program.

If, on the other hand, a programmer wants to handle DOS errors within an assembly language program, two steps are necessary. Not only must byte 216 be set higher than 128, but the active-Basic flag must also indicate Applesoft is running. If the Captain thinks Integer Basic is running, he always sends error messages.

There is nothing complex about changing the active-Basic flag; just do it. Put a 64 ($40) there to indicate Applesoft. You would probably also like to know how you can determine which DOS error occurred. The Captain puts the error number in the X register just before passing control to your error-handling routine. This number will be one of the standard error numbers documented in the DOS manual.

Tell Him We're Running. The final trick an assembly language programmer has to play on the Captain is to make him think a Basic program is running. This is necessary to avoid the *not direct command* error

when handling text files. It's also necessary for intercepting DOS errors. And it even keeps keyboard input from accidentally activating DOS commands.

The keyboard input problem is an interesting one. If an assembly language program fails to tell the Captain it is running, he continues to intercept all keyboard input and look for DOS commands. If a user enters his last time in response to a program prompt, and his name is "RUNYAN", DOS will immediately try to run a Basic program called Yan. The results are a disaster.

To avoid all this, the assembly language program needs to set three flag bytes on the Apple's zero page. There are many different ways to do this. Here's how Apple's *FID* program does it:

```
0844:  A9  80  LDA  #$80  ;load accumulator with hex value $80
0846:  85  76  STA  $76   ;store contents of A ($80)
0848:  85  D9  STA  $D9   ;  at the three zero-page
084A:  85  33  STA  $33   ;  locations $76, $D9, and $33
```

Two of these locations are Applesoft flags; one, $D9, is an Integer flag. Of course, it's only necessary to set the flags for the version of Basic that DOS thinks is running, but setting all three is pretty simple.

A few of you might like to know that the routine inside DOS that actually checks whether a program is running resides at byte 42590 ($A65E–A678). If this routine returns with the carry (a flag inside the microprocessor itself) clear, the Captain will think a program is running.

Your Mother Does Not Work Here—Please Pick Up after Yourself. Any assembly language program that uses the techniques mentioned here modifies DOS. When the program is finished, it should put everything back the way it was originally. This can be done quite simply by exiting through the DOS cold-start vector in the page three table.

If you use a program that works well but leaves you and your computer in a muddle, a DOS cold start via call 979 will sometimes fix things. Unfortunately, some programs change the reference tables that the Captain transfers into the Basic entry-point table, as well as the entry-point table itself. If the reference tables have been changed, the only way to recover is to reboot.

In some situations an assembly language program is designed to work as a subroutine. Once it is finished it needs to return from whence it came rather than jumping to the DOS cold-start address.

There are some problems programmers need to be aware of in this situation. If the program is bloaded and called, simply bandaging any DOS patches the program makes is all that is required before its return (RTS in assembly language). In addition, if the program doesn't require any input and doesn't send any output, simply unmodifying any DOS modifications will be sufficient.

Brun and Back. If the program is brun, and if input/output operations are necessary (including the sending of DOS commands), the program should retrieve whatever is stored at byte 43609 ($AA59) before input/output and replace it before returning. This value is critical to your program's finding its way home again but gets changed whenever the Captain intercepts a character passing through the I/O links.

Alternatively, you could disconnect DOS from the I/O links. In this case, you should reconnect it by calling the page three vector at 1002 ($3EA) before returning. In either case, of course, you have to be sure your program exits with the stack pointer where it was on entrance.

A similar problem arises when you intercept DOS errors yourself, but then try to use the Captain's routines for sending selected error messages. If you want to do this, first disconnect DOS. Then put the error number in the accumulator and jump to 42706 ($A6D2). The Captain will send the message, then send control back to the start of your error-handling routine. You will have to meet him there or you will get an infinite cycle of error messages.

The easiest way to disconnect DOS is by using the Monitor routines Inport and Outport. Load the accumulator with the slot you want to use and call 65163 ($FE8B) for inport (equivalent to Basic's in#), or 65173 ($FE95) for outport (pr#).

Assembly language programmers who follow these procedures when using DOS will create few problems for the rest of us.

Another slick way to use DOS from assembly language, or from Basic, is to ignore the Captain entirely and send commands directly to the file manager. We'll get to that next month. See you then.

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WEREN'T THE SAME. THOUGH NOTHING HAD CHANGED, EVERYTHING WAS DIFFERENT. THE PEOPLE WERE DIFFERENT, THE STREETS WERE DIFFERENT. HE WAS DIFFERENT.

"DAD," BRIAN BEGAN, "I...I HAVE SOMETHING TO TELL YOU." HE FORCED THE WORDS FROM HIS LIPS, UNSURE OF HOW HIS FATHER WOULD REACT.

"SURE, WHAT IS IT, SON?"

"DAD, I'VE BEEN THROUGH A LOT OF CHANGES AT COLLEGE, AND WELL, I JUST THOUGHT IT BEST IF I BROUGHT THEM INTO THE OPEN. YOU SEE, I'M NOT THE SAME SON YOU SENT TO SCHOOL A FEW MONTHS AGO. I'VE CHANGED EMOTIONALLY--AND PHYSICALLY; I'M...DIFFERENT."

BRIAN PAUSED AND SWALLOWED HARD, TRYING TO KEEP THE LUMP IN HIS THROAT FROM GROWING ANY BIGGER. HE CONTINUED.

"YOU SEE, DAD, I'M...I'M...." HE COULDN'T BEAR TO BREAK THE NEWS TO HIS FATHER, BUT HE NEW IT WOULD ONLY BE HARDER LATER ON. HE COULDN'T HOLD IT BACK ANY PLEASE TURN TO TEXT PAGE 2

CONTINUED FROM TEXT PAGE 1

LONGER. NOW WAS THE TIME.

"DAD. I'M A SANDWICH."

"SAY WHAT!?" HIS FATHER EXPLODED IN DISBELIEF AS HIS JAW DROPPED TO THE FLOOR.

"THAT'S RIGHT, I'M INTO SLICED BREAD AND COLD CUTS. I'M A SANDWICH," BRIAN CONFESSED HESITANTLY, BUT PROUDLY.

"WHY, THAT'S DISGUSTING! AFTER ALL I'VE GIVEN YOU SINCE YOUR MOTHER DIED. I'VE SLAVED TO RAISE YOU AS A NORMAL HUMAN BEING, AND THIS IS HOW YOU SHOW ME YOUR GRATITUDE?"

BRIAN'S FACE TURNED PEPPERONI-RED. "IT'S GOT NOTHING TO DO WITH UP-BRINGING. I LIKE WEARING PUMPERNICKEL; I ENJOY SOCIALIZING WITH HEADCHEESE; AND THE HORSERADISH, OH,

IIND GRADE CHATS

Turning the Text Page

by Dennis Osrow

In this article, we're going to look at ways to use text page two and text pages three, four, five, and so on. You didn't know that there were more than two text pages, did you? Well, you're right, there aren't. We can, however, treat sections of memory as "phantom" text pages. We'll see how to use them to create interesting and useful effects in your programs.

The Apple comes endowed with two text screens that can be displayed on the monitor screen. These two text pages are really just segments of memory, and the thing that distinguishes them from other segments of memory is the hardware that displays the contents as text characters. Text page one has the added distinction that it can be printed on. There's no provision in Applesoft for printing on page two. What use is a text screen you can't print on? Remember, it's just a section of memory. You can't print there, but you can move printed text there from elsewhere in memory. Page one, perhaps?

This makes the second page much less flexible than the first, but it can still have its uses. For example, you can use the second text screen for a resident help screen, available for instant viewing at the touch of a key. You can use it to display codes used in the program. You're entering a payroll and have forgotten a deduction code. Help screen to the rescue.

The best part about using page two to view the help screen is that page one is left untouched. When you finish with the help screen and return to your program, you are exactly where you left off. Even if you're in the middle of data entry, you could switch to the help screen while entering a string of letters and return to the same letter you left off at. The switch between page one and page two is superquick.

The second text page resides directly above the first text page, occupying a range of memory from 2048 ($800) to 3071 ($BFF). Usually, Basic programs begin at location 2048 ($800) and use the text page two memory space. As a matter of fact, if you turn on page two (poke − 16299,0) while a program is in memory, you will see the beginning of your program through the eyes of text page two.

In order to use the second page, we'll have to move the program out of the way. Two pokes before entering or loading the program take care of this. Location 104 stores the starting address of the program. By changing this number, the program can be made to start above text page two (or anywhere in memory), allowing you to use the second text page for any display you want.

Location 104 stores the page number of the starting address. In this case we mean a memory page: an area of 256 bytes. The normal value of location 104 is eight, indicating page eight. To find the actual starting address of the Basic program, multiply the page number by 256: 8 × 256 = 2048.

To use page two, the program must begin at address 3072, which is the start of page twelve (3072/256). These commands set the pointer to the correct location.

```
POKE 104,12
POKE 3072,0
```

Location 3072, the new starting address of the program, must contain a zero or the computer gets confused.

After doing these pokes, any program loaded or typed in will reside above location 3072.

Big Caution: Don't do these pokes while a program is in memory. If you do, the program will be rendered useless. These pokes must be done before you load and run your program. The pokes won't affect the normal operation of the computer; they just reserve a little of the memory usually available to the program. Programs can be loaded, saved, and run just like normal. The loss of 1,024 bytes of memory is hardly noticeable in a 48K system.

These pokes change the index to the start of the program without moving the program to the new location. Since that will ruin the program in memory, a short "loader" program is needed to perform the pokes and then run your main program. The short program listed below does the setup.

```
10 POKE 104,12
20 POKE 3072,0
30 PRINT CHR$(4);"RUN YOUR PROGRAM"
```

To restore the normal program start address:

```
10 POKE 104,8
20 POKE 2048,0
```

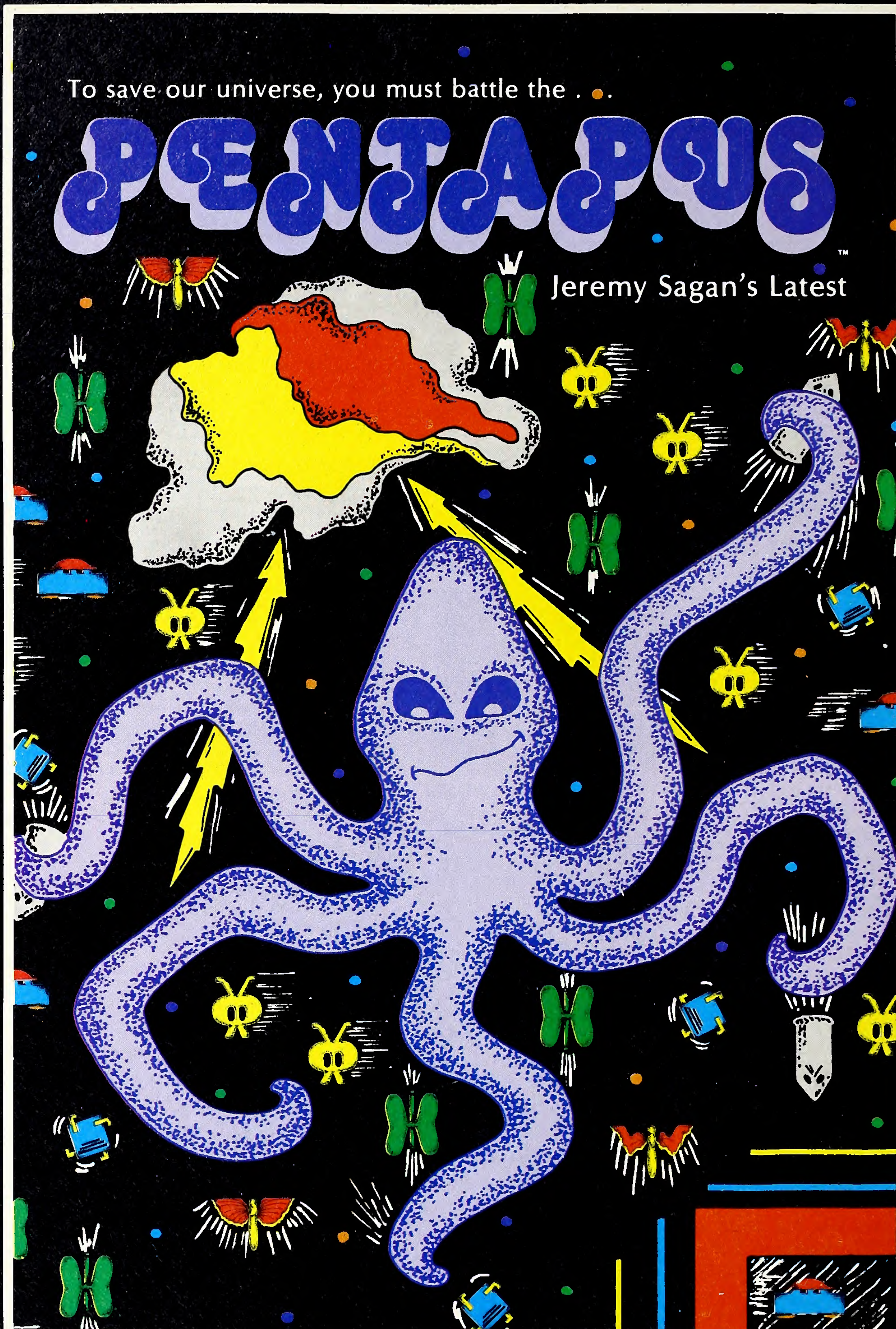
These pokes should not be done from within the main program either. The program would continue to execute until it reached a goto or gosub statement, at which point it would look in the wrong place for the start of the program and be unable to find itself.

Now that we've made page two available for use, how do we create a page two display? As mentioned earlier, there are no output commands for page two. Page one has print, vtab, inverse, and many other commands for setting up and printing a text display.

The easiest way to create a page two screen is to create it on page one and move it to page two. There are two ways to do this. The first way is to bsave the screen you create on page one and then bload it onto page two. The second way is to use a memory move routine. Fortunately, the Apple Monitor has a memory move routine that can be called from a Basic program. We'll get into this method a bit later.

This program creates a screen on page one and bsaves it.

```
10  REM EXAMPLE OF A HELP SCREEN
20  REM CREATES SCREEN ON PAGE ONE
30  REM AND BSAVES IT
40  HOME
50  HTAB 15: PRINT "HELP SCREEN"
60  VTAB 3: PRINT "OPTIONS ARE:": PRINT
70  PRINT "A = ADD NEW RECORDS": PRINT
80  PRINT "C = CHANGE RECORDS": PRINT
90  PRINT "D = DELETE RECORDS": PRINT
100 PRINT "Q = QUIT"
110 VTAB 20: PRINT "PRESS ANY KEY"
120 PRINT CHR$ (4);"BSAVE HELPSCREEN,A1024,L1024"
130 REM PAGE ONE HAS BEEN SAVED
```



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Lines 40 through 110 create the screen with the usual commands. Line 120 bsaves the screen and calls it Helpscreen. Now that we have our screen, let's write a small program that will display it. First, run this program to set up the start address above page two:

```
10  REM * RUN THIS BEFORE RUNNING
20  REM * THE FOLLOWING EXAMPLES
30  POKE 104,12
40  POKE 3072,0
```

Now you're ready to run this program:

```
 10  REM EXAMPLE OF USING HELP SCREEN
 20  REM LOAD SCREEN PREVIOUSLY CREATED
 30  REM ON PAGE ONE AND SAVED.
 40  REM LOAD HELP SCREEN INTO PAGE TWO,
 50  REM LOCATION 2048.
 60  PRINT CHR$ (4);"BLOAD HELPSCREEN,A2048"
 70  REM CREATE NORMAL DISPLAY
 80  HOME
 90  HTAB 15: PRINT "DATA ENTRY"
100  VTAB 8: PRINT "OR 'HELP' FOR HELP SCREEN"
110  VTAB 6: INPUT "COMMAND: ";COM$
120  IF COM$ = "HELP" THEN POKE - 16299,0: GET E$: POKE
     - 16300,0: GOTO 110
130  IF COM$ = "A" THEN REM GOSUB (ADD RECORDS)
140  IF COM$ = "C" THEN REM GOSUB (CHANGE RECORDS)
150  IF COM$ = "D" THEN REM GOSUB (DELETE RECORDS)
160  IF COM$ = "Q" THEN HOME : END
170  GOTO 110
```

Line 60 bloads the Helpscreen file we just created. This is loaded into the text page two area of memory, which begins at location 2048. Lines 80 through 110 create a screen and prompt for a command. If the command is *help*, line 120 switches to page two and waits for a key to be pressed. When this is done, the view is switched back to page one again.

Our examples so far have used a single, static page two screen. The help screen is loaded in and isn't changed during the program. Let's see how to create a dynamic help screen, one in which the screen can be changed during the program so that more information can be displayed.

One way to do this is to store the regular text page in the page two area and then create your help screen on page one. When you're done with the help screen, the original screen can be moved back to page one. If you want, you can create a different help screen each time the help key is pressed. Using page one for our help screen gives us the advantage of letting the program create the help screen instead of loading a previously created screen into page two.

Page one is moved into page two with the routine mentioned earlier. The routine consists of two instructions and a call to the Monitor's memory move routine. The code for it is below and is relocatable. The Monitor move routine is very quick and can move an entire page of text in a split second. This is the assembly program that sets up for and calls the move routine:

```
0300- D8        CLD
0301- A0 00     LDY   #$00
0303- 4C 2C FE  JMP   $FE2C
```

Three things must be specified before the move routine can be called. You must specify the starting address of the block of memory you want moved, the ending address of the block of memory, and the destination address to move it to. To move page one into page two, the starting address would be 1024, the ending address 2047, and the destination address 2048.

The following are two subroutines to be put into each program using a memory move to move text pages. They should be renumbered to convenient locations within the program. The first subroutine pokes the memory move assembly routine into memory at $300. The second subroutine takes care of poking the starting, ending, and destination addresses into the proper locations so that the Monitor's memory move routine can get at them.

This routine pokes in the instructions that call the memory move routine. It should be executed once as part of the program's initialization process.

```
10  REM * MEMORY MOVE POKER
20  FOR LOC = 0 TO 5
30  READ A
40  POKE 768 + LOC,A
50  NEXT
60  DATA 216,160,0,76,44,254
70  RETURN
```

This is the subroutine that pokes the starting, ending, and destination addresses into memory. Your program should use this routine whenever you want to move the contents of page one into page two.

```
 10  REM * MOVES TEXT PAGES
 20  BEG = 1024: REM * PAGE ONE
 30  FINISH = 2047
 40  DEST = 2048: REM * MOVE TO PAGE TWO
 50  REM * SET UP PARAMETERS FOR MOVE
 60  POKE 60,BEG - INT (BEG / 256) * 256: POKE 61, INT (BEG
     / 256)
 70  POKE 62,FINISH - INT (FINISH / 256) * 256: POKE 63, INT
     (FINISH / 256)
 80  POKE 66,DEST - INT (DEST / 256) * 256: POKE 67, INT (DEST /
     256)
 90  REM * CALL MEMORY MOVE ROUTINE
100  CALL 768
```

This shows how to prepare a page to be moved. The starting address of the page to be moved is poked into locations 60 and 61 by line 60. Line 70 pokes the ending address into locations 62 and 63. Finally, line 80 pokes the start address of the destination into locations 66 and 67. Line 100 calls the routine that performs the memory move.

This next program puts it all together. The program will use page one for a help screen while using page two to store the screen that was on page one. When the help screen is exited, the screen stored in page two is moved back into page one, thus restoring conditions to normal. The program works as follows: The memory move routine is poked into memory starting at location 768. The normal data-entry screen is set up and the user is prompted for input.

If *help* is entered, the memory move routine is used to move the page one screen to page two, freeing page one to be used for the help screen. The help screen is created, and a get statement is used to hold the screen until any key is pressed. At that point, the original screen is moved from page two back into page one. This happens so fast that it appears instantaneous.

```
10  REM EXAMPLE OF USING PAGE TWO TO STORE
20  REM PAGE ONE WHILE PAGE ONE IS USED FOR
30  REM THE HELP SCREEN
40  GOSUB 330: REM POKE MEMORY MOVE ROUTINE
50  HOME
60  HTAB 15: PRINT "DATA ENTRY"
70  VTAB 8: PRINT "ENTER 'HELP' FOR HELP SCREEN"
80  VTAB 6: INPUT "COMMAND: ";COM$
90  IF COM$ < > "HELP" THEN 280
100 REM MOVE PAGE ONE TO PAGE TWO
110 BEG = 1024:FINISH = 2047:DEST = 2048
120 GOSUB 380: REM MOVE SCREEN
130 REM CLEAR PAGE ONE AND CREATE HELP SCREEN
140 HOME
150 HTAB 15: PRINT "HELP SCREEN"
160 VTAB 3: PRINT "OPTIONS ARE:": PRINT
170 PRINT "A = ADD NEW RECORDS": PRINT
180 PRINT "C = CHANGE RECORDS": PRINT
190 PRINT "D = DELETE RECORDS": PRINT
200 PRINT "Q = QUIT"
210 VTAB 20: PRINT "PRESS ANY KEY"
220 GET E$
230 REM BRING BACK ORIGINAL PAGE ONE
240 REM FROM PAGE TWO
250 START = 2038:FINISH = 3071:DEST = 1024
260 GOSUB 380: REM MOVE SCREEN
270 GOTO 50
280 IF COM$ = "A" THEN REM GOSUB (ADD RECORDS)
290 IF COM$ = "C" THEN REM GOSUB (CHANGE RECORDS)
300 IF COM$ = "D" THEN REM GOSUB (DELETE RECORDS)
310 IF COM$ = "Q" THEN HOME : END
320 GOTO 50
330 REM MEMORY MOVE ROUTINE POKER
340 FOR I = 768 TO 773: READ J: POKE I,J: NEXT
350 DATA 216,160,0,76,44,254
360 RETURN
370 REM * SET UP PARAMETERS FOR MOVE
380 POKE 60,BEG - INT (BEG / 256) * 256: POKE 61, INT (BEG /
    256)
390 POKE 62,FINISH - INT (FINISH / 256) * 256: POKE 63, INT
    (FINISH / 256)
400 POKE 66,DEST - INT (DEST / 256) * 256: POKE 67, INT (DEST /
    256)
410 CALL 768: REM CALL MEMORY MOVER
420 RETURN
```

Since the help screen is created on page one with print statements, it isn't as fast as the switch back. If a cleaner look is desired, a slight modification will do the trick. After page one is moved to page two, turn on page two while the help screen is being created on page one. After the help screen is created, turn on page one to display it. To return to the regular display, turn on page two again and then move page two into page one (page two is left intact). When page two has been moved, turn on page one and you'll be back where you were. With this method, the screens flip cleanly in and out.

Now let's move into even more screen moving, using five screens. To use the phantom text pages, we have to start the program at even higher locations in memory.

The accompanying table shows how to reserve memory for as many as ten text pages. It shows you what to poke for whatever pages you want to use. If you want to use text pages one, two, three, and four, for example, you would poke 104,20 and poke 5120,0.

Page	Pokes	
1	104,8	2048,0
2	104,12	3072,0
3	104,16	4096,0
4	104,20	5120,0
5	104,24	6144,0
6	104,28	7168,0
7	104,32	8192,0
8	104,36	9216,0
9	104,40	10240,0
10	104,44	11264,0

Pokes for First Ten Text Pages

In this next example, we will create five screens and then move them into page one and page two for alternate viewing. This will illustrate how fast the page-moving routine works. The text pages will flip so quickly you'll hardly see them.

The program, called *Page Viewer*, uses seven text pages (two real ones and five phantoms), so you must reset the program starting location to the start of page eight. Run this program before the main one:

```
10  POKE 104,32
20  POKE 8192,0
30  PRINT CHR$(4);"RUN PAGE VIEWER"
```

Here's the *Page Viewer* program:

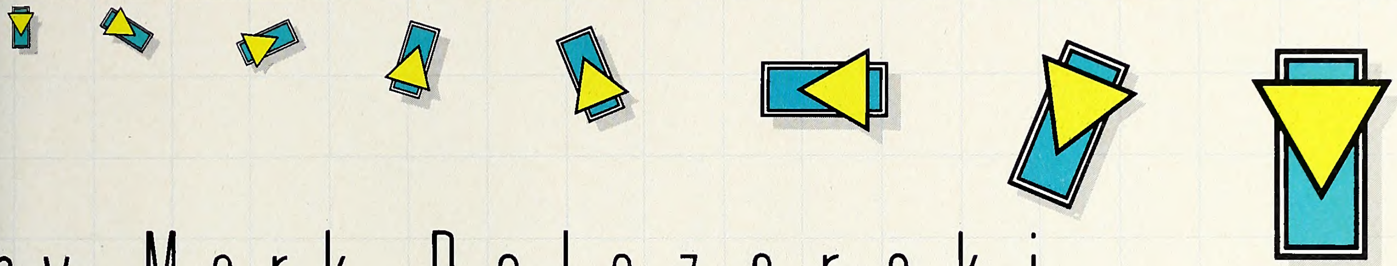
```
10  REM * PAGE VIEWER
20  GOSUB 400: REM POKE MEMORY MOVE ROUTINE
30  D$ = CHR$ (4)
40  CPG = 2: REM CURRENT PAGE SWITCH
50  MX = 7: REM NUMBER SCREENS TO DISPLAY
60  NXT = 3
70  DIM PG%(8)
80  PG%(1) = 1024
90  PG%(2) = 2048
100 PG%(3) = 3072
110 PG%(4) = 4096
120 PG%(5) = 5120
130 PG%(6) = 6144
140 PG%(7) = 7168
150 PG%(8) = 8192
160 REM * CREATE PAGES
170 HOME : PRINT "THIS CREATES A PAGE ONE SCREEN AND
    LOADS IT INTO HIGHER PAGES"
180 GET E$
190 FOR I = 3 TO 7
200 HOME
210 VTAB I: HTAB 10: PRINT "***********"
220 HTAB 10: PRINT "THIS IS PAGE ";I
230 START = 1024:FINISH = 2047:DEST = PG%(I)
240 GOSUB 430
250 NEXT
260 PRINT "THE SCREENS ARE LOADED-PRESS 'RETURN' TO
    VIEW EACH ONE"
270 REM * MOVE NXT TO CPG
280 START = PG%(NXT)
290 FINISH = PG%(NXT + 1) - 1
300 DEST = PG%(CPG)
310 GOSUB 430
320 GET E$
330 IF CPG = 2 THEN POKE - 16299,0
340 IF CPG = 1 THEN POKE - 16300,0
350 REM * MOVE NXT TO CPG
360 NXT = NXT + 1: IF NXT > MX THEN NXT = 3
370 CPG = CPG + 1 - 2 * (CPG = 2)
380 GOTO 280
390 REM * MEMORY MOVE ROUTINE
400 POKE 768,216: POKE 769,160: POKE 770,0: POKE 771,76:
    POKE 772,44: POKE 773,254
410 RETURN
420 REM * SET UP PARAMETERS FOR MOVE
430 POKE 60,START - INT (START / 256) * 256: POKE 61,
    INT (START / 256)
440 POKE 62,FINISH - INT (FINISH / 256) * 256: POKE 63, INT
    (FINISH / 256)
450 POKE 66,DEST - INT (DEST / 256) * 256: POKE 67, INT (DEST /
    256)
460 CALL 768
470 RETURN
```

First, the memory move routine is poked into memory. Then, five page one screens are created and moved into phantom pages three through seven. After the screens are loaded in memory, they are alternately moved into page one and page two for viewing. Each time you press a key, the next page is brought into view.

With a little experimenting, you will find there are many ways in which to enhance your programs with these techniques.

Internal documentation is an important part of making a program easy to use. Next month in IInd Grade Chats, David Durkee will present a program that allows you to design and create unique help screens. By creating a custom screen for each section of a program and managing them all with the techniques discussed this month, you can create software that is completely self-explanatory.

GRAPHICALLY SPEAKING



by Mark Pelczarski

"The continuing saga of Softalk *articles versus the computer has not ended," Mark Pelczarski said in his most recent letter, speaking of the printer and disk drive that went on strike as soon as they saw him getting ready to work on the book of his Graphically Speaking columns. He was referring also to the time the computer went on the blink in the middle of a late column, the time he handwrote the column while boating on vacation and the one that got away took the fragile papers with it, the time he finally got three months ahead and the hard disk failed and killed all three columns.*

Little did Pelczarski know. Even darker forces were at work.

"This is odd," said the editor during a Wizardry *break. "Pelczarski hasn't put a signoff in his last column. This is his last column, isn't it?"*

"Yes," mumbled the associate editor through her granola bar. "The new one starts in September."

But it wasn't. Just as the printers finished printing the August issue with the editor's makeshift signoff for Pelczarski, Pelczarski's final manuscript arrived at Softalk, *complete with his own signoff.*

And his signoff's a lot better than ours.

We've talked about the various Applesoft commands available for drawing on the hi-res screen, but so far we've used the commands mostly for animation and "computed" pictures. Here's a program that makes use of all the Applesoft graphics commands for freehand drawing with paddles or a joystick. It gives you two line-drawing modes, color control (using the standard six Apple colors), and a paintbrush mode using a shape table. It also lets you save and load your pictures to and from disk.

The program uses a few interesting programming tricks. A couple of them deal with refining joystick control for drawing, and one shows a quick way to poke in some hexadecimal machine-language code from Basic. It's also fairly short, so there's room for adding things like the packing and fill routines from earlier in the series.

The two line-drawing modes are called *line* and *fill.* The latter is somewhat of a misnomer—it's not like the fill routine that appeared last February—but it does allow a sort of manual fill. The regular line mode puts two round cursors on the screen. One is a start point and the other the end point for your line. The start point is stationary. The end point moves under joystick control. When you push button 0 on the joystick, a line is drawn between the start point and end point and the end point becomes the new start point. This way it is possible to draw successive lines, such as around a box, without having to move the start point manually each time. Pressing button 1 at any time moves the start point to the current end point position without drawing a line.

The fill version of line mode works the same, except the start point doesn't change when you draw a line. The result is that, until you change the start point yourself (by pressing button 1), all lines originate from the same point. By holding down button 0 as you move the joystick, you can manually fill an area with any of the six colors available, albeit slowly.

There is a shape table of three brush shapes numbered 1, 2, and 3. Number 1 is a small solid brush, number 3 is a larger solid brush, and number 2 is an "airbrush," made up of random dots in a small area. Brushes were discussed earlier when we talked about the Picdraw routine from *The Graphics Magician.* That routine used a character generator that allowed use of all the blended colors. The same technique can be used with a shape table, as in this program, except that you become limited to the standard six colors.

A help page lists all the keypress options for the program and what they do. To make the command keys easier to remember, each key is the first letter of the function name. Help, for example, is H. Line and fill modes are selected with L and F. Among other options are the get and save commands (G and S) for loading and saving pictures to disk (L, for load, was already used for line mode). The escape key toggles between full-screen graphics and mixed text and graphics. C and B control the drawing and background colors, the latter clearing the screen when it sets the new background.

Z is one of the joystick commands. It zeros in your joystick to the area immediately around the cursor. Pressing it again toggles back to full-screen control.

Another feature of the program's joystick control is that it can handle the full range of X, from 0 to 279, even though the joystick only returns values from 0 to 255. This is done by adding an offset, XS, to the joystick value each time through the loop. If you are working on the left nine-tenths of the screen, this offset is −5. This is negative, instead of zero, to compensate for joysticks that are slightly worn and don't go all the way down to zero. (Also for products such as the KoalaPad, which, although it's an interesting new graphics input device, has even less resolution than a joystick.) When you are working on the right nine-tenths of the screen, the offset 30 is added to the joystick value, giving it a maximum value of 285. All values are then put in actual range (0–279) before drawing. You shouldn't notice this change in offsets unless you move your cursor from one extreme edge to the other.

The following is a breakdown of the program sections for your reference. You should also take a look at the accompanying list of variables used in the program.

Lines 10–100 initialize everything.

Lines 105–190 display the help screen.

Lines 195–205 print the current status (mode, colors) at the bottom of the drawing screen.

Lines 210–228 read the paddle controls, zero in if in zero mode, adjust X with XS, and check the coordinates for proper range.

Lines 230 and 232 flash the cursors (the start point only if needed). Note that in line 232, the statement *if not PS* means to us "if not in paintbrush mode." To the computer, *if not PS* is equivalent to saying *if PS = 0*. *If PS* is the same as the statement *if PS <> 0*, or, "if PS is not equal to zero," or, in our case, "if PS is 1." This logic syntax is used in several places in the program, and it does save a lot of bytes in long programs.

Line 233 draws the brush if in paintbrush mode and the brush is down.

Lines 235–285 check for a keypress and process the keypress after erasing the flashing cursors.

Lines 290–330 erase the flashing cursors, check for a button press, and process any button press.

Lines 400–504 let the user input a new drawing or background color.

Line 750 is a disk error message.

Lines 850–855 turn off the paintbrush switches, if necessary, if one of the line modes is selected. Note that two shape tables are used, one for the flashing round cursor, the other for the brushes. Line 850 pokes the location of the round cursor into the shape table pointer (the second byte is zero for both tables, so it need not be changed). Line 266 has a similar poke for setting the brush shape table.

Lines 900–970 let you save or load a picture.

Lines 1000–1020 load the shape table data by setting the starting locations, L, and calling the subroutine at 1100.

Lines 1100–1150 contain a routine that will read a string of character data and interpret that string as hexadecimal numbers (by using the ASCII code of each character). Once each number is interpreted, it is poked into memory, starting at location L.

Lines 1200–1240 contain the hex data for our shape tables. Line 1200 is the cursor shape table, and lines 1210–1240 contain the three brushes. How'd we get the data? Brute force . . . sorry. It seemed the simplest way to do it in an Applesoft program without having to mess with bloading binary files. The original bloaded shapes were made with the *Shape Maker* program, but if we printed that data here it would not make for very meaningful typing.

With this issue I sign off from Graphically Speaking to let someone else start from the beginning. I do this partially to avoid getting into subject matter that might be construed as conflict of interest, and partly to let someone else pick up at the beginning again. I don't feel I should be in a position to compare graphics utilities on the market, and the direction of the column can either go that way, become more technical, or start from the beginning for all the newer readers. The fellow who's taking over should do all right (anyone who walks around the West Coast

Draw Program Variable List

A$—a general input string
BS—brush switch: tells whether the brush is up (0) or down (1)
CB—color of the background
CD—color used for drawing
D$—a control-D, for disk commands
GS—full-screen graphics switch; 0 for mixed text and graphics, 1 for full-screen graphics
I—loop counter
L—location, or address, for poking in shape table data
NS—the number shape that is being drawn
PS—paintbrush mode switch; 0 for not brush mode, 1 for brush mode
SW—line mode switch; 0 for normal line mode, 1 for "fill" line mode
X,Y—movable cursor coordinate position
X1,Y1—start point position
XS—X offset for joystick adjustment
Z—intermediate variable used in poke subroutine
ZC—zero switch; 0 for full screen cursor, 1 for zeroed-in cursor
ZX,ZY—coordinate of zeroed cursor

Computer Faire wearing a Penguin jersey can't be that bad), and, though he's never heard of Alexander Botts, he seems to know what he's talking about with graphics. At least you know that if a solution isn't readily apparent, he won't fudge it. (Can I say that?)

Anyway, it's been a pleasure, and I hope the column has been of interest and of help to some of you.

```
10   D$ = CHR$ (4)
20   GOSUB 1000
30   POKE 232,0: POKE 233,3
40   NS = 1: GS = 0:PS = 0:BS = 0:CB = 0:CD = 7:SW = 0:ZR = 10:XS
     = 0
50   HCOLOR= 7: ROT= 0: SCALE= 1
100  HGR
105  POKE - 16303,0: HOME
108  PRINT "DRAWING PAGE OPTIONS:"
109  PRINT
110  PRINT "L : LINE MODE"
120  PRINT "F : FILL MODE"
121  PRINT "1,2 OR 3 : BRUSH NUMBER/BRUSH MODE"
122  PRINT
130  PRINT "C : NEW DRAWING COLOR (0-7)"
140  PRINT "B : NEW BACKGROUND COLOR (0-7)"
141  PRINT
150  PRINT "G : GET A PREVIOUS DRAWING"
160  PRINT "S : SAVE DRAWING"
161  PRINT
162  PRINT "ESC : FULL SCREEN/TEXT SWITCH"
163  PRINT "Z : ZERO IN CURSOR SWITCH"
164  PRINT
165  PRINT "H : HELP; RETURNS TO THIS PAGE"
167  PRINT
170  PRINT "PRESS ANY KEY TO GO TO DRAWING PAGE": GET A$
190  POKE - 16304,0
195  HOME : VTAB 22: HTAB 1
196  PRINT "          TYPE 'H' FOR HELP"
199  IF PS = 0 THEN 202
200  IF BS = 0 THEN PRINT "PAINT MODE, BRUSH UP": GOTO 205
201  PRINT "PAINT MODE, BRUSH DOWN": GOTO 205
202  IF SW = 1 THEN PRINT "FILL MODE": GOTO 205
203  PRINT "LINE MODE"
205  PRINT "COLOR: ";CD;"     BACKGROUND: ";CB;
210  X = PDL (0):Y = PDL (1): IF NOT ZC THEN 220
215  X = ZX + INT (X / 128 * ZR) - ZR:Y = ZY + INT (Y / 128 * ZR) - ZR:
     GOTO 225
220  IF X > 245 THEN XS = 30
221  IF X < 10 THEN XS = - 5
222  X = X + XS:Y = INT (Y / 256 * 202) - 5
225  IF X < 0 THEN X = 0
226  IF Y < 0 THEN Y = 0
227  IF X > 279 THEN X = 279
228  IF Y > 191 THEN Y = 191
230  XDRAW NS AT X,Y
232  IF NOT PS THEN XDRAW NS AT X1,Y1
233  IF PS AND BS THEN DRAW NS AT X,Y
235  IF PEEK ( - 16384) < 128 THEN 290
240  GET A$: POKE - 16384,0
245  IF NOT PS THEN XDRAW NS AT X1,Y1
246  IF NOT PS OR NOT BS THEN XDRAW NS AT X,Y
247  IF A$ = "H" THEN 105
250  IF A$ = "C" THEN 400
260  IF A$ = "B" THEN 500
261  IF A$ = "S" THEN 950
262  IF A$ = "G" THEN 900
265  IF A$ = "Z" THEN ZX = X:ZY = Y:ZC = NOT ZC: GOTO 195
266  IF A$ = "1" OR A$ = "2" OR A$ = "3" THEN NS = VAL (A$): POKE
     233,64:BS = 0:PS = 1: GOTO 195
268  IF ASC (A$) = 27 THEN POKE - 16302 + GS,0:GS = NOT GS:
     GOTO 195
270  IF A$ = "F" THEN SW = 1: GOTO 850
280  IF A$ = "L" THEN SW = 0: GOTO 850
285  GOTO 210
290  IF NOT PS OR NOT BS THEN XDRAW NS AT X,Y
291  IF NOT PS THEN XDRAW NS AT X1,Y1
292  IF PEEK ( - 16286) < 128 THEN 310
296  IF PS THEN BS = 0: GOTO 195
300  X1 = X:Y1 = Y
310  IF PEEK ( - 16287) < 128 THEN 210
316  IF PS THEN BS = 1: GOTO 195
320  HPLOT X1,Y1 TO X,Y: IF NOT SW THEN X1 = X:Y1 = Y
330  GOTO 210
400  HOME : VTAB 22: PRINT "0-7?";
404  GET A$: IF ASC (A$) >47 AND ASC (A$) < 56 THEN CD = VAL (A$):
     HCOLOR= CD: GOTO 195
406  GOTO 504
500  HOME : VTAB 22: PRINT "0-7?";: GET A$
502  IF ASC (A$) > 47 and ASC (A$) < 56 THEN CB = VAL (A$):
     HCOLOR= CB: HPLOT 0,0: CALL 62454: HCOLOR= CD:
     GOTO 195
504  PRINT "INVALID COLOR; COMMAND CANCELED.": FOR I = 1
     TO 2000: NEXT I: GOTO 195
750  PRINT "THAT FILE ISN'T ON DISK.": FOR I = 1 TO 2000: NEXT :
     GOTO 195
850  POKE 233,3:NS = 1: IF PS THEN XDRAW 1 AT X1,Y1:PS = 0
855  GOTO 195
900  HOME : VTAB 22: INPUT "UNDER WHAT NAME IS IT
     SAVED? ";A$
905  ONERR GOTO 750
910  PRINT D$;"BLOAD ";A$
920  POKE 216,0: GOTO 195
950  HOME : VTAB 22: INPUT "UNDER WHAT NAME? ";A$
955  ONERR GOTO 750
960  PRINT D$;"BSAVE ";A$;",A8192,L8192"
970  POKE 216,0: GOTO 195
1000 L = 768: GOSUB 1100
1010 L = 16384: FOR I = 1 TO 4: GOSUB 1100: NEXT
1020 RETURN
1100 READ A$: FOR X = 1 TO LEN (A$) STEP 2
1120 Y = ASC ( MID$ (A$,X,1)) - 48: IF Y >9 THEN Y = Y - 7
1130 Z = ASC ( MID$ (A$,X + 1,1)) - 48: IF Z >9 THEN Z = Z - 7
1140 POKE L,Y * 16 + Z
1150 L = L + 1: NEXT : RETURN
1200 DATA "01000400123F20642D15361E0700"
1210 DATA "030008000B001E00"
1220 DATA "353700"
1230 DATA "0D09111B1F130909311B1B170909111B1F1300"
1240 DATA "292D153F3F372D2D353F3F372D2D353B3F1700"
```

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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.

☐ **Ventura Educational Systems** (2239 Townsgate Road, Suite 201, Westlake Village, CA 91361; 805-498-8364) has several programs available. *Geoart* is a collection of programs providing computer-assisted instruction for developing the concepts of geometry. Names of basic shapes, perimeter and area concepts, rotation, reflection, and translation are explored. $39.95. *Chemaid* teaches the names of elements in the periodic table, lists the groups they belong to, their positions in the table, and their symbols. Included are basic facts about elements, such as their atomic numbers, atomic structures, uses, and characteristics. $39.95. *Senses* uses hi-res graphics to prompt the student to identify the sensory organs. Facts about each sensory organ are presented. $39.95. In *Visifrog*, the anatomy of the amphibious creature is revealed. Topics include the function of each organ and the life cycle of the frog. $39.95. *States* is a geography study unit in which the student learns the names of the fifty states and their capitals. Included are facts about each state, such as area, population, electoral votes, state flower, and state bird. $39.95.

☐ *Menu Master* from **Borland International** (4320 Stevens Creek Boulevard, Suite 129, San Jose, CA 95129; 408-244-6291) makes CP/M easy to use by eliminating complex commands. The program consists of a set of menus that let you perform any typical operating system function. The set includes a master menu, a file menu, a word processing menu, and a menu that lets you create customized menus. The program also lets you know how much disk space you have left at all times. When you shut off the computer, *Menu Master* remembers the name of the file you were working on and brings it back when you start again. $195.

☐ *Medicine & Computer* is a monthly magazine covering the ways in which computers can be used in medical practice. Editorial content leads readers into the microcomputer world and offers suggestions on how doctors can proceed with computerization. Much space is devoted to hardware and software reviews and new product announcements. **Medicine & Computer** (470 Mamaroneck Avenue, Suite 406, White Plains, NY 10605; 914-681-0040). $35 per year.

☐ *The Software Author* is a bimonthly magazine for computer programmers. Published by **Soft Quest** (Box 44122, Tacoma, WA 98444), the magazine is a journal for professional software writers, casual freelancers, and those who wish to write software or to know about those who write software. *The Software Author* features people and personalities, not computers. Interviews with talented, well-known programmers are combined with marketing information and how-to articles for software writers. $9.95 per year.

☐ *The Practical Accountant* from **Softlink** (3255-2 Scott Boulevard, Santa Clara, CA 95051; 408-988-8011) is a single-entry accounting program that takes full advantage of the IIe's upper- and lower-case features and full-screen cursor control. The program can constantly monitor cash flow, record all financial transactions, provide a chart of accounts that's easily defined and customized, print checks with cash flow information, reconcile records and bank statements, and expand to support more than twenty-eight hundred transactions at a time. It handles accounts receivable and payable, as well as simple payroll. Included is a tutorial with exercises. $149.95.

☐ **Unik Associates** (12545 West Burleigh, Brookfield, WI 53005; 414-782-5030) has developed a program to help industrial, manufacturing, and design engineers/analysts in optimizing material selection. The program is aimed toward companies that have any kind of metal fabrication operation. The user just enters the desired size and quantity, and all available sizes for a given thickness of material, and the program makes the most economical selection resulting in the least amount of scrap material. $10 through December 1983; $95 after that.

☐ **Lorac Software** (48 Baker Road, Livingston, NJ 07039; 201-533-1828) enters the text adventure world with its release, *Mystery Island*. The object of the game is to escape from a remote tropical island upon which you have been stranded. The game has more than forty locations to explore and seventy items to investigate, and the program understands more than one hundred thirty-five words. It's listable for the curious. $24.95.

☐ The *Invoicing Application Template* is the third in a series offering screen formats, form-printing formats, and report instructions for configuring *VersaForm* to specific applications. Available from **Applied Software Technology** (170 Knowles Drive, Los Gatos, CA 95030; 408-370-2662), the template lets you use *VersaForm* to prepare invoices. It checks entered data for accuracy, automatically extends prices from quantity and unit prices, and figures sales taxes and total charges. Customer payments are automatically subtracted from invoice amounts to show current balance due. $49.95.

☐ **Axel Johnson Corporation** (666 Howard Street, San Francisco, CA 94105; 415-777-3800) has begun marketing *Autocode 1*, a program generator for the *dBase II* database management system. *Autocode 1* automatically writes a database management program based on answers to a few simple questions, and it incorporates features such as alphanumeric and numeric range checking and error trapping, calculated fields, and the ability to generate selective field reports. Requires CP/M. $195.

☐ More than three hundred twenty vendors will provide computer hobbyists with a day of bargains at the Computer Swap America show September 10 at the Santa Clara County Fairgrounds in San Jose, California. Door prizes, auctions, and craziness have made this a popular gathering on the West Coast. Hours are from 10:00 a.m. to 6:00 p.m. **Computer Swap America** (Box 52, Palo Alto, CA 94302; 800-221-7927, 415-327-7810). Admission, $5.

☐ The newest product from **Orange Micro** (1400 North Lakeview Avenue, Anaheim, CA 92807; 714-779-2772) is the Orange Interface. More than fifteen firmware commands let you dump eighty- and forty-column text screens, set page length and margins, add or delete line feeds, and more. When not in use for formatting, the Orange Interface acts as a standard parallel interface compatible with virtually all Apple software, CP/M, and Pascal. $87.

☐ Forget playing *in* the arcade; **Broderbund Software** (1938 Fourth Street, San Rafael, CA 94901; 415-456-6424) lets you *own* your own in *Spare Change*. You get down to serious playing once the last customer leaves your arcade, but the game's characters want to go home and rest. They escape and it's your job to round them back up by distracting them with jukebox music and crank phone calls. Your reward? More than a dozen video comedy routines. $34.95.

☐ **United Software Associates** (38A West Oakland Avenue, Oakland, NJ 07436; 201-337-2002) has released two products for CP/M Apples. *Sort/Merge* is a system enhancer that sorts and indexes records based on up to ten characteristics. $49.95. The *Index Card File* keeps and allows easy access to records. Applications include name and address files, time cards, inventory records, recipes, and more. It has a sixty-column-by-fourteen-line screen format and is designed to provide a free form for entering data. $49.95.

☐ The Rainbo-256 is a high-resolution analog RGB interface card designed to interface from the Apple to Electrohome, Taxan, and other similar color monitors. The card eliminates typical problems the Apple has with RGB monitors such as smearing of colors and multihue text. The Rainbo-256 is also programmable; instead of being limited to the computer's color capabilities, it can be programmed for 256 different colors. From **Microtek** (4750 Viewridge Avenue, San Diego, CA 92123; 619-569-0900). $279.

☐ New offerings from **Osborne/McGraw-Hill** (2600 Tenth Street, Berkeley, CA 94710; 415-548-2805): *Home Computer Software Guide* helps you make decisions on what kind of software to buy. Every major home software package—including personal finance, investment, education, word processing, and games—is listed, summarized, and analyzed. $11.95. For the spreadsheet worker, *54 VisiCalc Programs: Finance-Statistics-Mathematics* helps you learn to manage investments, loans, and taxes. Includes more than thirty different statistical and mathematical problems. $15.95. *The VisiCalc Program Made Easy* presents a series of hands-on lessons that introduce users to the program's format and many versatile commands. The book introduces the basic skills needed to build a worksheet, examines commands used for editing, and covers advanced uses and special tricks that extend the capabilities of the program. $12.95. *Microsoft Basic Made Easy* gives you a better understanding of programming while you learn to develop and customize programs. Commands, statements, functions, and operators are covered, and all programs have been fully tested to run on any computer using MBasic. $17.95. *The Programmer's CP/M Handbook* covers the internal structure and major components of the popular operating system. Written for the programmer, this book includes subroutine examples for each of the CP/M system calls and information on how to customize CP/M, complete with detailed source codes for all examples. $21.95. *The Guide to Your Apple III* shows how to purchase, install, and use the Apple III and teaches about the III system, files, utilities, and SOS. $17.95. *Using dBase II* is a manual for those wanting to design and customize programs with *dBase II*. It's a collection of techniques presented to help you master the package. After learning about installation, you'll be introduced to information file organization, records, and databases. Then you move on to system design, structured programming, and other advanced topics. $18.95. Osborne/McGraw-Hill's DiskGuide series includes a guide for the Apple II. In addition to summarizing all Basic and operating system statements, commands, and keywords, the guide explains exec files and peek and poke locations. $6.95.

☐ **State of the Art** (3183-A Airway Avenue, Costa Mesa, CA 92626; 714-850-0111) is marketing integrated business accounting modules for the Lisa; the modules include general ledger, accounts receivable, accounts payable, and budget and financial reporting. They can be used alone or with each other. Called the *SM Series* (SuperMicro), the new packages let the small-business owner move from a single-user to a multiuser system without losing the investment in hardware or having to reenter data. $795.

☐ Take note, educators. There are several software programs available for English teachers to use in the classroom, and they're all free. They include vocabulary building and review, poetry, spelling tutor, vowel review, and parts of speech. For information, send a self-addressed, stamped envelope to **Educational Computing Network** (12680 Hollyglen, Riverside, CA 92503).

☐ **Mannesmann Tally** (8301 South 180th Street, Kent, WA 98031; 206-251-5500) has introduced the Spirit dot-matrix printer. The printer uses a nine-by-eight dot matrix, resulting in higher print resolution. Its unique print head uses square hammers that overlap to form more fully connected horizontal and vertical lines rather than rows of dots. Print speed is eighty characters per second. $399.

☐ *Regress II*, a *VisiCalc*-compatible multiple-regression package with a powerful database, is available from **Human Systems Dynamics** (9010 Reseda Boulevard, Suite 222, Northridge, CA 91324; 213-993-8536). The package gives professionals a research database and five multiple-regression methods, including stepwise regression. You can design files and then count, search, sort, review, and edit with a set of step-by-step instructions. Transformations include moving averages and exponential smoothing. Files created with *Regress II* can be used with other of the company's programs, including *Anova II* and *Stats Plus*. $150.

☐ **WattsOut** (2020 South Oneida, Suite 201, Denver, CO 80224; 303-759-3880) helps you get rid of undesirable static problems. Its product is also called WattsOut. When WattsOut is attached to a ground, you just touch the device to rid yourself of static electricity that can cause incorrect data entry, circuit damage, or memory loss in the computer. No more need for that bottle of antistatic spray. $9.95.

☐ **Metatek** (12525 Hummingbird Street, Box 33129, Minneapolis, MN 55433; 612-571-7319) has released Metascope, a low-cost data line monitor consisting of a circuit board and software. The unit can display and store data in asynchronous, byte-oriented synchronous, or bit-oriented synchronous formats at speeds of from 110 to 19,200 bits per second. It offers full and half duplex display, display of data in ASCII, EBCDIC, and hexadecimal formats, and data capture of up to 4K with disk storage and retrieval capability. A powerful feature stops the display when a specific sequence of characters has been detected. $895.

☐ The latest from **Strobe** (897 Independence Avenue, Building 5A, Mountain View, CA 94043; 415-969-5130) is its model M260, an eight-pen plotter. The plotter offers a resolution of 500 steps per inch; it includes an RS-232C interface that has a 1K buffer, upper- and lower-case character sets, several foreign languages, and a business graphics starter software package that produces simple bar, pie, and line graphs from *VisiCalc* DIF files or from data entered at the keyboard. $995. Strobe has also reduced the prices of its other plotters. The model M100 is now $595; the model M200 is now $695. Both include an interface and the business graphics starter software.

☐ **Project Control Systems** (3317 S.W. Malcolm Court, Portland, OR 97225; 503-292-5562) has introduced *PlanFlow*, a program for cash flow and manpower planning. Specially designed for clients, engineers, and constructors of large capital projects, *PlanFlow* uses reports and graphics to portray cash flow and manpower requirements quickly and accurately. It saves hours of work for planners, estimators, and cost engineers. This menu-driven program has on-screen spreadsheets and graphic displays to show forecast results. Requires 64K, two disk drives, and a 132-character-per-line printer; an eighty-column card is recommended but not required. $495.

☐ Managers of agricultural operations can shorten budgeting and budgeting review procedures with the *AgDisk Budgeting Extension* module from **Harris Technical Systems** (624 Peach Street, Box 80837, Lincoln, NE 68501; 402-476-2811). The software permits budgeting based on the previous year's data. Percentage increases or decreases can be made across the board. Budget changes can also be entered manually. To review budget performance through the year, actual versus projected performance can be presented in a graph on-screen. Worksheets and the budget plan can be printed for permanent records. $150.

☐ From **Random House** (7307 South Yale Avenue, Suite 103, Tulsa, OK 74136; 800-331-5469) comes *Tutorial Quiz Master*, a system that lets teachers create CAI lessons using instructional content they've written themselves. No programming experience is needed. The program uses the content provided by the teacher for tutorial lessons with true/false questions, multiple-choice answers, or short answers. Other *Quiz Master* features include detailed record keeping of the number of attempts and the number of hints for each question, as well as the percentage score for the lesson. The teacher controls the parameters of the test, such as number of attempts per question, the penalty percentage for each attempt, and the penalty for each hint requested. $49.50.

☐ **Wadsworth Electronic Publishing** (20 Park Plaza, Boston, MA 02116; 800-322-2208, 617-423-0420) has entered the market with *Statpro*, a series of integrated statistics, graphics, and data management programs. The database component lets you enter, edit, manipulate, transform, store, copy, and print out data. The statistics component contains a comprehensive collection of statistical procedures grouped into five modules—descriptive, regression, analysis of variance, time series, and multivariate. The graphics component lets you display and edit data on a monitor before either saving it to disk or printing it out. It's menu-driven, allowing you to manage data with only a few keystrokes. $1,995. On the lighter side of things, Wadsworth's book, *The Survival Kit for Apple Computer Games*, is a look at more than two dozen popular games. Designed to assist the beginner with basics, the book includes advice on selection and purchase of computer games, along with a quality rating of the games. Each game entry includes a detailed description that sets the scene, recommended procedures for having fun while winning, inside tips from expert players, programmers, and game designers, and a hints and strategies section. $9.95. *Algebra Arcade* is an educational game that lets the player have fun while learning or practicing algebra. Your job is to construct an algebraic equation that will zap as many Algebroids as possible with the equation's resulting graph. After you enter an equation, the Whirlwind rushes along the path of the graph, knocking down the Algebroids and racking up points. Beginners can play with straight-line graphs, while advanced players can use the ten geometric functions to create complicated curves. For one or two players. $49.95.

☐ For producing instant color prints of images displayed on a CRT, **Eastman Kodak** (343 State Street, Rochester, NY 14650; 716-724-3169) has come up with the Instagraphic CRT Imaging Outfit. You can make instant color prints or conventional color slides and prints of a video image. The outfit includes a Kodak Instagraphic camera with close-up lens, two packages of Instagraphic color print film, an Instagraphic CRT cone, a filter, and brackets for adapting a 35mm single-lens reflex camera to the cone. $195.

☐ **Visual Horizons** (180 Metro Park, Rochester, NY 14623; 716-424-5300) turns your computer into an art-generating machine with its Computer Slide Express. With this service, you can convert computerized charts, designs, graphs, and graphics to 35mm color slides. Standard size or enlarged color or black-and-white prints and overhead transparencies are available. You just send the picture files by modem or by mail on disk. All material is delivered to you by mail. $6 per slide.

☐ *Group Insurance Policy Analysis* is a software package offered by **R.R. James and Associates** (920 Davis Road, Elgin, IL 60210; 312-742-4703) that gives the insurance broker a method for fast and easy calculation of group health insurance rates. The *GPA* system currently includes more than two dozen major insurance company rates, with more companies being added. With the package, the insurance broker can provide clients with quotations from several companies within minutes; *GPA* provides a census and can produce group insurance illustrations showing many options on customized reports. Requires CP/M. Standard system with rates for three broker-selected companies, $450; additional companies, $45 each; demonstration disk, $35. Update service includes program enhancements, $90 per quarter.

☐ **Cross Educational Software** (1802 North Trenton Street, Box 1536, Ruston, LA 71270; 318-255-8921) has three lab programs available. *Light* includes experiments for timing a pendulum, measuring the acceleration of gravity, measuring light intensity, and testing the efficiency of a light bulb. Four phototransistors are included. $60. *Heat* includes experiments in graphing temperature versus time, thermal radiation, cooling curves, and specific heat. Four thermistors are included. $60. *Sound* features experiments in sound intensity, a simulated oscilloscope, and a Fourier spectrum analyzer. A speaker, microphone, potentiometer, transistors, and a capacitor are included. $60.

☐ **Northeast Expositions** (824 Boylston Street, Chestnut Hill, MA 02167; 617-739-2000) has announced upcoming computer shows. The Second Annual Twin Cities Computer Show and Software Exposition will be held September 15–18 at the Minneapolis Auditorium. Show hours are 10:30 a.m. to 5:30 p.m. daily. Adults, $6; children, $3. The Second Annual Rocky Mountain Computer Show and Software Exposition will be held September 22–24 at the Denver Merchandise Mart. Show hours are 10:30 a.m. to 5:30 p.m. daily. More than three hundred displays will include business, home, educational, game, and hobbyist computer products. Adults, $6; children, $3. Applefest/San Francisco, the largest Apple-specific computer show in the country, will be held October 28–30 at the Moscone Center. Virtually all Apple-compatible hardware and software products will be on display and for sale in more than four hundred displays and booths. Hours are 10:30 a.m. to 5:30 p.m. each day. One-day ticket for exhibits only, $10; three-day ticket for exhibits only, $25. The Fifth Annual Northeast Computer Show and Software Exposition will take place November 17–19 at Boston's Hynes Auditorium. Hours are 10:30 a.m. to 5:30 p.m. This is the largest annual computer event in the east and features nearly five hundred displays and exhibits. Adults, $7.50.

☐ The Third Annual Sunbelt Computer Expo will be held at the Phoenix Civic Plaza September 8—11. Robots, computer art, innovations in computer music, and other electronic wonders will offer the public the opportunity to expand its computer knowledge. Hours are from 11:00 a.m. to 8:00 p.m. and Sunday from noon to 6:00 p.m. Sponsored by **Judco Computer Expos** (2629 North Scottsdale Road, Suite 201, Scottsdale, AZ 85257; 800-528-2355, 602-990-1715).

☐ **Davong Systems** (217 Humboldt Court, Sunnyvale, CA 94089; 408-734-4900) has packed a lot of information about microcomputer peripherals into an envelope-sized Fact-Pack. Individual product sheets cover Davong universal Winchester hard disk systems with drive capacities of up to thirty-two megabytes, hard disk software that supports multiple operating systems, and plug-in streaming tape backup systems. For a free Fact-Pack write or call Davong Systems.

☐ **Goci Software** (7710 Computer Avenue, Suite 115, Edina, MN 55435; 612-835-4271) has announced a completely new interactive version of its business accounting programs for the Apple III. The new SOS version is available for either floppy or hard disk systems. The source code is available for modifying bookkeeping functions. $350 to $2,800, depending on partial or complete systems.

☐ Easy-View is a compact storage system for 5¼-inch disks. It holds up to one hundred disks, with twenty-five titles visible at a glance. The storage device is constructed of wood-grained corrugated cardboard with twenty-five plastic slots that hold up to four disks each. The cover protects disks from dust and swings back to lock the unit in a vertical position. From **Rule One** (5 Lawrence Street, Bloomfield, NJ 07003; 201-748-6336). $9.95.

☐ **Micro Learning Concepts** (380 Lexington Avenue, Suite 1208, New York, NY 10017; 212-687-0066) produces a videotape learning presentation that advises and instructs the viewer in the uses of personal computers and their programs. The tape explains computer jargon and how to use spreadsheet, word processing, and database programs. *Learning Concept: Introduction to Personal Computers*, in addition to its fifty-six-minute tape, includes a reference guide that offers an in-depth discussion of programming and programs. $99.95.

☐ *Multiple Labels* lets you type often-used addresses once and then save the addresses for future use when printing out multiple labels for a mailing. At any time you can run off from one to ten thousand labels to use as you wish. The program, from **Applied Professional Software** (300 East Huntland Drive, Suite 111, Austin, TX 78752), will make labels for charts, files, and return addresses and print them in different character sizes. $24.95.

☐ *Client Manager* from **Systems Plus** (1120 San Antonio Road, Palo Alto, CA 94303; 415-969-7047) is designed to automate the paperwork for an accountant, bookkeeping firm, or small business. It contains features that accounting firms need to service their clients' requirements on an individual basis. The system allows you to perform all general ledger functions. In addition, historical data and budget data are kept, including after-the-fact payroll posting, fixed-asset accounting, and back-account reconciliation. The package generates amortization schedules and includes a report writer to allow formatting of statements. Requires CP/M. $1,500 to $1,800. Systems Plus has also released an office management module for its *Medical Manager* program. Extending beyond the system's financial and billing aspects, the module can report data on all aspects of a patient's medical history and the physician's schedule. Office management information is stored and reports are generated in categories that include hospital rounds, clinical history, procedure and diagnosis history, frequency and revenue reports, and appointments and recall management. Requires CP/M. $3,500 to $4,000.

☐ **Sybex** (2344 Sixth Street, Berkeley, CA 94710; 415-848-8233) breaks the trend of dull and technical computer programming books. *Your First Basic Program* entertains while it explains the basics of Basic. Illustrated with colorful cartoons and simple diagrams, the book guides readers of any age through the essentials of Basic. Flowcharts, variables, calculations, debugging routines, and more are explained. $9.95. *VisiCalc for Science and Engineering* shows how to use *VisiCalc* for technical applications. The book includes applications for mechanics, optics, mathematics, statistics, electronic and civil engineering, systems control and communications, and more. Included are fifty scientific and engineering programs for *VisiCalc* that are ready to key in. $13.95.

☐ **Robert J. Brady** (Route 197, Bowie, MD 20715; 301-262-6300) publishes *Apple II Computer Graphics*, a book that takes you through the most current graphics techniques, from placing dots on-screen to artificial color generation, animation, and even byte-move techniques. No assembler or machine language skills are required. The book includes complete explanations of Apple II and IIe graphics, business and technical graphics, exercises, examples of assembly language for advanced users, and a complete glossary. $19.95.

☐ *The Internist* is written for members of the medical and health professions interested in performing differential diagnoses with the aid of a computer. Based on the Merck manual, *The Internist* lets you run differential diagnoses on any combination of more than four hundred fifty symptoms for three hundred thirty-one diseases. Features include a disease reference module that can display the symptoms associated with any of the diseases covered in the program. From **N-Squared Computing** (5318 Forest Ridge Road, Silverton, OR 97381; 503-873-5906). Requires 64K. $65.

☐ Four new *Informax* systems from **Abacus Data** (1920 San Marco Boulevard, Jacksonville, FL 32207; 800-874-8555, 904-398-8547) let you select exactly the price and performance you need from the program, while providing easily upgradable expansion. *Informax 5* is an electronic file manager that offers high speeds and simple screen-driven operation for data storage, retrieval, calculation, and reporting. $395. *Informax 10* gives you extensive multifile reporting capabilities. $595. *Informax 15* adds full relational operations and a security system that prevents unauthorized access to data. $795. *Informax 20* provides the capabilities of all other packages. $995. All require CP/M.

☐ **Family Life Software** (1401 South Eleventh Avenue, Saint Cloud, MN 56301; 612-253-6032) publishes its *Natural Family Planning Personal Charting Program* for the daily charting of a woman's fertility cycles. Each cycle is displayed with physical signs plotted graphically, as well as in text. A statistical analysis of all charted cycles displays cycle length, peak day, and postovulatory phase. $39.50.

☐ *Daisy Professional* from **Rainbow Computing** (19517 Business Cen-

ter Drive, Northridge, CA 91324; 213-349-0300) is an enhanced version of the company's *Statistics with Daisy*. The new version performs more than fifty statistical functions, produces seven different screen plots and graphs, allows for missing data and cross-tabulations, and makes it possible for data to be transferred to and from *VisiCalc*, *VisiPlot*, and *DB Master*. A separate utility allows *Daisy* to transfer data to and from *Multiplan* and *General Manager* and to receive data from minicomputers and mainframes to your Apple. $199.95.

☐ **Rocking X Software** (1207 West Lee Street, Borger, TX 79007; 806-273-3894) has released the *Versa-Prof Gradebook System*, a record-keeping and grade-averaging system designed to work with *VisiCalc*. Using the electronic spreadsheet, you keep an easily updated file of grades. With the *Versa-Prof* system you get current grade standings easily. The program averages grades, prints a complete gradebook, prints progress letters to students, identifies missing and absentee grades, and prints a roll sheet for organizing input. $75.

☐ *Filter Design I* is a program that takes the complexity out of filter design. People with no knowledge of filter design can design professional-quality filters. The program is menu-driven and input frequency parameters are checked to avoid impossible situations. *Filter Design I* is useful in designing filters for equipment, designing traps for rejection in radio or television work, and serving as a demonstration and teaching aid in electronics. From **Software Specialties** (Box 329, Springboro, OH 45066). $29.95.

☐ **Telegogics** (3015 North Ocean Avenue, Suite 116, Fort Lauderdale, FL 33308; 305-563-5209) publishes *Computers in Education*, a monthly newspaper covering events in educational computing. In addition to news features, the paper offers a number of monthly columns including hardware, software, and courseware reviews, an investors column, profiles on personalities, lists of conferences, an educational entrepreneurs column, a classroom hints feature, and a classifieds section. Subscription, $10 for eleven issues.

☐ **Micromation** (1 Yorkdale Road, Suite 406, Toronto, Ontario M6A 3A1; 416-781-6675) has introduced *Gutenberg Junior*, which has several features not found in its predecessor. The latest version formats a page as it's printed; formats aren't limited to the capabilities of the screen. The same document can be printed, with no change to the text file, in several formats. *Gutenberg* prints in fully justified output using proportional-spaced type and can produce a variety of tabular displays. In addition to the full ASCII character set, the word processor makes available up to one hundred fifteen of your own characters. Requires 64K. $85.

☐ **Justified Computing** (19 Oxbow Lane, Woodbridge, CT 06525; 203-397-0051) is marketing a product-costing package designed for chemical, paint, and adhesive manufacturers, compounders, and packagers. *Chem-Cost* provides complete formula, batch, and packaging cost information as well as finished goods pricing. Menus simplify operation and you can adapt the program to meet your own special requirements. Built-in communication capabilities allow prompt remote technical service. $395.

☐ **CMA Micro Computer** (55722 Santa Fe Trail, Yucca Valley, CA 92284; 619-365-9718) has released a medical applications software package for *VisiCalc* users. *Medicard* is designed for the small medical practice and lets you produce professional-looking private patient bills and print the universal AMA claim form. You can enter transactions into patient files at any time during the month, and transactions may be posted at any time for preparing AMA claim forms. Requires 64K and *VisiCalc*. $249.95.

☐ Northern New Jersey Comexpo '83 will be held October 9–10 at the Temple Emanuel, Overlook Road, Woodcliff Lake, New Jersey. More than sixty exhibitors and manufacturer representatives will be showing their wares each day from 9:00 a.m. to 5:00 p.m. For information, contact Dennis Paul at (201) 279-6154. Adults, $5; children, $3.

☐ **Suprex International Marketing** (151 Ludlow Street, Yonkers, NY 10705; 914-965-1469) now produces advanced business software. Its first two products, *The Pharmacist's Assistant* and *The Retailer*, are programs dedicated to the running of a pharmacy and a retail store respectively. Each handles customer receipts, mailing lists, and total inventory management. *The Pharmacist's Assistant* requires a five-megabyte hard disk and sells for $2,000. *The Retailer*, $300.

☐ *Navette* is a handweaver's pattern design tool from **Opcode Software** (1901½ Vine Street, Berkeley, CA 94709; 415-525-6697). *Navette* lets you create warp and weft drawdowns that can be stored on disk and combined to produce new and unusual block patterns. Hi-res graphics create sixteen harness patterns with warp repeats to sixty-six threads and weft repeats to forty-eight picks. The program can print full-pattern drawdowns that simulate tight or open weave effects. Requires 64K. $39.95.

☐ **Microperipherals** (2565 152nd Avenue N.E., Redmond, WA 98052; 206-881-7544) has unveiled a receive-only modem designed to receive computer data from commercial radio stations. The modem is compatible with Bell 103 signals and operates at speeds up to 9600 baud. $70.

☐ If you're using both sides of the disk to record information, you might be interested in the Load Button Kit from **Cyber-Tech** (Box 924, Chatsworth, CA 91311). The load button is a pressure pad that presses the disk against the disk drive's read/write head and might need replacing when it gets dirty. The kit includes a replacement pressure pad and instruction manual. $5.95.

☐ *Software Reports* is an updated reference manual that reviews educational software programs. From **Allenbach Industries** (2101 Las Palmas Drive, Carlsbad, CA 92008; 800-854-1515, 619-438-2258), the manual evaluates programs in twenty subject areas for students in preschool through college. Educational software for adults, school administrators, and special education students is also reviewed. Regular updates review about one hundred programs. Programs are awarded overall letter grades based on ratings for educational usefulness, ease of use, instructional techniques, content, and documentation. $39.95.

☐ **Black Box** (Mayview Road at Park Drive, Box 12800, Pittsburgh, PA 15241; 412-746-2910) has added the Sam+ Centronics to its line of status activity monitors. Now users of Centronics-compatible parallel equipment can reconfigure, patch, monitor, and test all active interface leads. Permanently monitored leads are data strobe, bits one through eight, acknowledge, busy, paper empty, select, input prime, and fault. Leads that aren't permanently monitored may be tested for ground presence and pulse by patching into the four spare LEDs. $225.

☐ The Operator, by **Timecor** (4 Longfellow Place, Box 8928, Boston, MA 02114; 617-720-4090), is a low-priced modem with rotary and Touch-Tone capabilities. It has conventional features—110 or 300 baud, full and half duplex, auto-answer and auto-disconnect—and plugs directly into a telephone wall jack. Compatible with almost all popular software terminal programs. $159.95.

☐ The *Entrepreneur Software Series* business templates create expense and sales forecasts, advertising and product cost analyses, and cash flow and monthly/annual pro forma projections. From **Rich Peternel** (77 Riches Road, Box 1314, Battle Creek, MI 49016; 616-968-3670). $129.95 each.

☐ **Fantasy Plaza** (Box 6055, Burbank, CA 91510; voice, 800-824-7888; modem, 213-244-1100) is a shopping center accessible by modem. When you log on, you can take an elevator to any of six floors. A text character map lets you know where you are on each floor. Separate boutiques carry everything from Apple software and hardware to vitamins and general merchandise. You can even strike up conversations with others who are logged on to the shopping center at the same time. Select what you want and pay the cashier as you log off.

☐ **Dynamic Solutions** (61 South Lake Avenue, Suite 309, Pasadena, CA 91101; 213-577-2643) has available a full line of chemistry software that's supported on Cyborg Corporation's Isaac data acquisition hardware for the Apple II. The *Appligration* is designed for testing and research laboratories using quantitative techniques in analytical chemistry. Specific supported applications include chromatography, spectroscopy, colorimetry, thermal analysis, electrochemistry, and flow totalization. This turnkey operation gives immediate and organized access to a flexible library of data acquisition, display, analysis, reporting, and calibration routines. A complete list of calibration procedures, examples of graphics and text reports from current *Appligration* users, and a descriptive brochure are available from Dynamic Solutions. Application packages: *Flow Totalization*, $880; *Chromatography*, $1,480; *Spectroscopy*, $1,780; *Colorimetry*, $1,980. Software modules that comprise each package are available separately and range in price from $295 to $595.

☐ Omni-Lock is a security shelf system that provides total lock-down of keyboards, dual disk drives, and monitors through a single lock-on-the-shelf spindle. Omni-Lock shelves will individually swivel 360 degrees to give you complete access to internal cards or components of the computer and disk drives. Shelves are designed to blend in with the computer elements in order to save space and allow full ventilation. One key unlocks the entire assembly. Available for both Apple II and III from **Micro-Metrics** (Box 1812, 908 South Claremont Street, San Mateo, CA 94401; 415-342-8466). $339.

☐ **Howard W. Sams** (4300 West Sixty-second Street, Indianapolis, IN 46268; 317-298-5400) offers beginning and experienced programmers a guide to writing programs for business and personal applications. *Polishing Your Apple* uses a self-instructional format to guide the reader from elementary to advanced programs. A number of programming concepts and applications are presented in simple terms. The guide covers writing, disk filing, printing, and using different printers. Sample programs with utility give readers a base on which to create their own programs. $4.95.

☐ The Cheetah from **Zolman International** (600 Montgomery Street, Forty-fifth Floor, San Francisco, CA 94111; 415-421-5340) is a nonabrasive dry process read/write head cleaner. It's made with nonwoven polyester wet-laid web with factory inbred dry-cleaning and polishing agents. It cleans and polishes disk drive heads in just twenty seconds. Each Cheetah is good for at least forty cleanings per two-disk kit. $28.95.

☐ **Reston Publishing** (11480 Sunset Hills Road, Reston, VA 22090; 703-437-8900) publishes *Computers for Profit*, a nontechnical guide to understanding and effectively using modern computers. The book lets the noncomputer expert communicate with and understand the computer experts. It teaches how to identify and properly use computer advisers, salespeople, sales organizations, and products. Paperback, $14.95; cloth, $24.95.

☐ **Intellectual Software** (798 North Avenue, Bridgeport, CT 06606; 203-335-0906) has developed a line of educational software that covers reading, grammar, spelling, vocabulary, writing skills, math, health, and test preparation. More than sixty programs average less than $40 each.

☐ **Insoft** (Box 19208, Portland, OR 97219; 503-244-4181) has announced new low prices for its Apple arcade game series. The suggested retail price of *Grapple*, *Spider Raid*, and *Zargs* is now only $19.95 each.

☐ **Institutional Management Consultants** (Suite 2, 3624 Second Street N.W., Calgary, Alberta T2K 0Y2; 403-277-9136) is hosting a convention titled Institute on High Technology for Women. The convention will be held October 28–30 at the Calgary Westin Hotel. Featured will be the Hero I robot and twenty-four workshops on microcomputers, plus nine trainers from business, industry, and education for high-technology sessions. Men interested in the focus of this institute are also invited to participate.

☐ *Dollars & Sense* is a personal financial management program from **Tronix Publishing** (8295 South La Cienega Boulevard, Inglewood, CA 90301; 213-215-0529) designed for home use. It helps the average consumer who doesn't know accounting to balance checkbooks, keep tabs on expenses, and plan and follow budgets. The program displays financial information in easily readable color charts and graphs. *Dollars & Sense* tracks growth in assets and liabilities and keeps tabs on information needed to prepare income taxes. $100.

☐ Take care of disk problems before they start taking care of your data. **Verbatim** (323 Soquel Way, Sunnyvale, CA 94086; 408-245-4400) has produced a diagnostic tool for getting to the core of common disk drive problems. In less than three minutes, *Disk Drive Analyzer* runs four tests that cover head alignment, disk clamping, read/write accuracy, and disk speed. It then displays evaluations and pass/fail ratings that let you know whether the tested areas need adjustment or repair. $69.95.

☐ **Micro Programs Designs** (5440 Crestline Road, Wilmington, DE 19808; 302-738-3798) has expanded its *Stock Watch* software into a two-disk package that includes *Portfolio Watch*, a program that lets you keep a database of buy, sell, and dividend activities. $59.50.

☐ A new monochrome video display monitor has popped out of **Apple Computer** (20525 Mariani Avenue, Cupertino, CA 95014; 408-996-1010). Its features include superior resolution for eighty-column text and graphics display, an antireflective, high-contrast screen, and a tilt mechanism for adjusting the screen's angle without having to tilt the entire monitor. The monitor's twelve-inch screen displays in green phosphor. $229.

☐ No more flipping coins. **Simple Software** (2 Pinewood, Irvine, CA 92714; 714-857-9179) has released *Confidence Factor*, a program designed to help upper and middle managers make business decisions. Decisions are based on risk simulation and decision tree modeling; qualitative choices are evaluated using the program's decision matrix. For planning and scheduling, the linear programming model and critical path method are given. *Confidence Factor* pays attention to the use of these functions and their results in presenting ideas to others. Output is organized neatly to capture and package key elements in the decision-making process. $189.

☐ *Charts Unlimited* is a graphics program that offers CAD (computer-aided-design) capabilities. The program starts with thirty-six predefined objects and thirty-six predefined symbols. You can create up to twenty-six of your own alternative objects in one file, and there's no limit to the number of files. Applications for the program include drawing flow charts, floor plans, organization charts, engineering drawings, electrical schematics, and almost any type of chart. Drawings are created on a worksheet grid of 123 columns by 90 rows. From **Business Information Systems** (5084 Mosiman Road, Middletown, OH 45042; 513-424-6733). $195.

☐ **Flexible Software** (Box 5841, Charlottesville, VA 22905; 800-334-0854) gives you a chance to handle $10 million in *Portfolio*, a creative simulation of the investment world. The game simulates virtually every factor on Wall Street, letting you find out what it's like to be a big-time investor. One to four players can play. Features include a computer opponent, the ability to store games in progress, and a portfolio board. $64.95.

☐ A new line of modems is available from **Universal Data Systems** (5000 Bradford Drive, Huntsville, AL 35805; 205-837-8100). The modems are powered entirely by the telephone line, eliminating the need for power supplies or plug-in-modules. The UDS 103-O/A-LP offers 0- to 300-baud communication and conforms to the widely used Bell 103/113 protocol. $145. Model UDS 202-LP uses the faster Bell 202 protocol and operates at 1200 baud. $195. The UDS 202S-LP is the same but adds the auto-answer function. $245. Last in line is the UDS 212-LP, a 1200-baud model that uses the Bell 212 protocol. $445.

☐ The Cincy Computer Convention will be held October 15 at Cincinnati Technical College. Programmers and representatives of computer hardware and peripherals companies will be present. Presentations, demonstrations, lectures, and displays will be open from 8:00 a.m. to 4:00 p.m. Sponsored by **Apple Siders of Cincinnati Computer Club** (1074 Brooke Avenue, Cincinnati, OH 45230; 513-659-4309). Admission, $3.

☐ **Micromedia Software** (276 Oakland Street, Wellesley, MA 02181; 617-237-5630) has announced an educational game for parents and teachers concerned with spelling. *Watchwords*, a climb-the-pyramid game, lets students progress through nine levels of word lists by selecting or typing the correct spelling of new vocabulary or terms in subjects such as geography, social studies, and foreign languages. A utility program, *Wordisk Maker*, lets you create word lists, storing up to nine hundred words per disk to be used with this game as well as other Micromedia word games. *Watchwords*, $59.95. *Wordisk Maker*, $29.95. Discounts for schools.

☐ **Concourse** (2626 East Eighty-second Street, Suite 215, Minneapolis, MN 55420; 612-854-8848) offers a computer-based training program designed for managers, supervisors, and team leaders. Objectives of the program are to provide participants with the skills they need to build a participative work environment, communicate effectively with team members, improve employee job satisfaction, increase service/product quality, and create a teamwork environment. *Participative Management Skills* consists of an instructional text and software. $195.

☐ *Titan Empire* is the latest from **Muse** (347 North Charles Street, Baltimore, MD 21201; 301-659-7212). The game is a space battle that teaches about the solar system while you defend the planets. Evil titans have already captured three planets and several moons and have set them up as enemy bases. Your mission is to conquer the titans before they can gain complete control. Realistic maps, planetary information, radar, and a space window are available to help you plan your strategy. Once you've beaten the titans and restored peace, you can enter your name into the Empire Hall of Fame. In playing *Titan Empire*, you'll learn the names of planets, their characteristics, and relative positions in space. $34.95.

☐ **Applied Software Technology** (170 Knowles Drive, Los Gatos, CA 95030; 408-370-2662) has announced an updated version of its *VersaForm*. *Release 2* updates and expands the capabilities of *VersaForm*, including modifications designed to improve the program's efficiency and increase the number of its applications. One feature lets you transfer data from one form to another in which field names are the same, providing the ability to redesign a form after data has been entered. Other features include an option that lets you change report selection criteria at run time and another option that allows grouped or subtotaled data to be printed on separate pages. *Release 2* disks and documentation are available to *VersaForm* owners for $29.95 (include registration numbers from the original disk).

☐ It's all relative. **Einstein Corporation** (11340 West Olympic Boulevard, Los Angeles, CA 90064; 213-477-6733) is dropping the *Ghost* prefix from its series of word processing software. From now on, the products will be known as *EinsteinMailer*, *EinsteinLetters*, *EinsteinSpeller*, and *EinsteinWriter*.

☐ **Single Source Solution** (2637 Pleasant Hill Road, Pleasant Hill, CA 94523; 415-680-0202) publishes *HVAC Design Load Calculation*, a program that calculates cooling and heating loads for commercial and industrial buildings. The only input required is numbers from the ASHRAE Manual for shadow length for selected latitude, month, hours, and exposure. *HVAC* can provide calculations for an entire building or up to thirty rooms on a room-by-room basis. $179.95.

☐ Would you like to win $1,000? Solving *Masquerade*, from **Phoenix** (64 Lake Zurich Drive, Lake Zurich, IL 60047; 312-438-4850), could do it for you. It's a detective adventure. Everyone's hush-hush; no clues. Just as you're about to give up, something breaks! If you solve this case, send in your final score to Phoenix Software. From correct entries, one will be drawn to win $1,000 in cash. $34.95. Three blind mice are trapped in Zacks Sixth Avenue and need your help if they're to survive. In *Mad Rat*, the mad merchandiser is teasing the little rodents, and you're their only hope. $24.95. Your employment with the Swat & Squash Exterminators is the center of *Bats in the Belfry*. Your first job takes you to an old schoolhouse infested with bats, some of which are of the vampire variety. Job description dictates that you must catch and dispose of the furry little animals before they reach the belfry. After that, who knows what could happen? Do well and you could even make the exclusive club of Bat Masters. $29.95. Developed by behavioral psychologists, *Communicate and Win* provides you with techniques for dealing with people. The program enables you to build a profile of yourself and others and helps you learn how to handle certain issues with individuals. $250. The fate of the universe rests on your shoulders. In *Gemini*, an evil space lord has masterminded a scheme to take over the galaxy. You're left alone to defend against a legion of fighting robots. Go get 'em. $19.95.

☐ It's not too early for holiday shopping. Gift ideas from the Apple Collection include beer mugs, oven mitts, sailboards, sportswear, fine Italian leather goods, and much more, all with the Apple emblem. Free catalogs are available from **Apple Gift Catalog** (10275 North DeAnza Boulevard, Mail Stop 9H, Cupertino, CA 95014; 800-632-7979, 800-227-6703).

☐ **Software Publishing** (2674 North First Street, Suite 210, San Jose, CA 95134; 408-946-1400) has begun publishing its own newsletter, *PFS: News*, which will be sent to members of the PFS User Group quarterly. The newsletter will include new product information, product enhancements, tips on how to best use *PFS* software, and special product discount offers on the *PFS* family of software. Purchasers of *PFS* software who complete and return the user group enrollment card will automatically be enrolled in the PFS User Group.

☐ *Teacher's Apple* is a grade-tracking program for teachers, and it's available from **Simple Software Systems** (Box 41069, San Jose, CA 95160). The program lets a teacher track up to fifty students with up to two hundred assignments per student. Fields include assignment name, its number, possible number of points, points received, and the date of assignment. *Teacher's Apple* will print assignments in various formats. Included is an editor to change data that's been entered incorrectly. $34.95.

☐ **Felicity Systems** (Box 113, Westminster, CA 92683; 714-891-4238) has released two educational programs covering subjects that have previously been overlooked. The first two in Felicity's *How You Do It* series include *Visual Signaling* and *Talking Hands*. *Visual Signaling* introduces you to semaphore positions and international Morse code. With the help of some hi-res sailors, you can find out what all that flag-waving and light-flashing at sea means. $19.95. *Talking Hands* teaches the Ameslan alphabet. Just typing in the letter or number you want to see brings a hi-res hand on the screen to show you how to form the character. $19.95.

☐ For the Lisa, **BPI Systems** (3423 Guadalupe, Austin, TX 78705; 512-454-2801) has come out with the only single-user accounting software system authorized by Apple Computer. The system consists of *General Accounting*, *Accounts Receivable*, and *Accounts Payable* modules. They include a help screen, BPI's *Disk Document Manager*, and a background printing feature. $595 each.

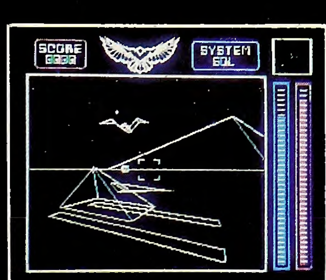
☐ *The Parent's Guide* is for parents who want to know what sort of computer education their children should experience and how parents can help. The booklet explains why children should learn about and use computers, describes what's being done, and recommends what still needs to be done to educate youngsters about computers. There are sections on the present uses of computers and suggestions for obtaining hands-on experience for parents and children. From **International Council for Computers in Education** (135 Education, University of Oregon, 1787 Agate Street, Eugene, OR 97403; 503-686-4414). $3.50.

☐ Some peripherals from **Panasonic** (One Panasonic Way, Secaucus, NJ 07094; 201-348-7183) are now available. The first is the Model CT-160, a ten-inch display color monitor. It features a front panel switch that changes the display from full color for color graphics or video games to a sharp black and white for business use. The model accepts a composite video input signal and incorporates a built-in audio system for use with games or speech synthesizers. $400. The Model TR-120M1P is a twelve-inch monochrome display that features a direct-etched faceplate to minimize glare and an extra-high-resolution display. The screen reproduces clearly eighty-column text displays or graphics through green P31 phosphors. Included is an integral audio system. $220. Model TR-120MPDA is a twelve-inch monochrome amber monitor that features the same low-glare faceplate and high resolution as the TR-120M1P. $240. For the Apple III, Panasonic makes the model DT-D1300D, a thirteen-inch RGB composite display. It has a direct-etched, nonglare, dark-faced screen and

STELLAR 7

by Damon Slye ™

RAVEN, an experimental Agrav Unit, is Earth's only defense against the Imperial Arcturan Armada. Commanding RAVEN, you will face Arcturan laser tanks, pulsars, sandsleds, assault batteries, prowlers, skimmers, seekers, guise mines, and the rest of the rampaging Arcturan assault. Your wits and RAVEN's biphasal thunder cannon are all that stand between a helpless Earth and the wrath of the Arcturan Armada.



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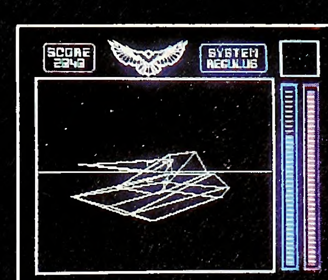

Stalker Agrav Unit

can generate sixteen colors. In RGB mode it displays up to two thousand characters in eighty columns; in composite mode it displays one thousand characters in forty columns. Included is a built-in audio system. $540. Also for the III is the DT-D1000G, a ten-inch RGB monitor with the same display specifications as the DT-D1300D. It includes a built-in audio system and a universal power supply capable of operating from several power sources. $450.

For making hard copies, Panasonic has three new pieces of hardware. The first is the VP-6802P, a flexible digital color plotter that features high-speed writing and silent movement. A variety of functions make it easy to generate engineering drawings or business graphics including italics, rotation, circles, and grids. The plotter writes at a speed of sixteen inches per second and uses either eight-fiber, plastic, or ball-point pens (in water format) or eight-fiber pens (in oil format) to write in a plotting area fourteen inches wide by ten inches high. $3,000. The VP-6801P uses six-fiber, ball-point, or plastic-tip pens to write over an area ten inches wide by seven inches high. It also writes at a speed of sixteen inches per second and accepts an ASCII eight-bit parallel interface. $1,995. In printers, Panasonic's KX-P1160 prints up to one hundred sixty-five characters per second (pica) and one hundred ninety-six characters per second (elite). Its nine-by-thirteen-dot matrix creates ninety-six ASCII characters with descenders, and a sprocket pin feed handles paper from four inches up to fifteen inches wide. It also prints single sheets. $1,750. The KX-P1090 prints eighty characters per second (pica) and ninety-six characters per second (elite). It accommodates paper from four to ten inches wide. Its dot matrix is nine by nine, which creates the full ninety-six-character ASCII set as well as three international character sets. $449.

☐ All sorts of programs related to education are available from **Total Information Educational Systems** (1925 West County Road B2, Saint Paul, MN 55113; 612-633-9110, 612-638-2348). TIES courseware packages include simulation, drill and practice exercises, tutorials, and teachers' aids. Courseware prices, $49.95 to $374.95.

☐ **Raging Bear Productions** (21 Tamal Vista Drive, Suite 175, Corte Madera, CA 94925; 415-924-1194) has announced three upcoming shows. National Software Show West will be held October 19–21 at the Trade Show Center in San Francisco, California. More than five hundred exhibits will include software producers and franchises, magnetic media suppliers, and producers of software supplies. International Software Update is a conference for microcomputer software industry executives, featuring speakers from around the world. The conference will be held January 8–14 at the InterContinental Hotel in Maui, Hawaii. National Software Show East will take place February 3–5 at the Convention Center in Miami Beach, Florida.

☐ *QualityAlert*, a statistical quality control program, has been introduced by **Penton Software** (420 Lexington Avenue, Suite 2846, New York, NY 10017; 212-878-9643). This menu-driven program lets you analyze process capability, construct eight different types of control charts, and determine when quality deviations occur. The system displays output in the form of numerical data, statistics, and graphics on the monitor or as hard copy from a graphics printer. $795.

☐ **ATC Software** (Route 2, Box 448, Estill Springs, TN 37330; 205-837-4718) publishes a report that tells ambitious programmers how to sell their programs. The report tells how to obtain free directory listings, be included in national databases of programmers, receive media coverage, write manuals, and operate a mail-order service. $20.

☐ **CBS Software** (One Fawcett Place, Greenwich, CT 06836; 203-622-2503) has released four programs in its *Success with Math* series: *Addition/Subtraction* offers practice in fundamental operations of these two skills, including carrying and borrowing. Problems may have up to nine rows and nine columns. *Multiplication/Division* lets students practice on randomly generated problems with up to three digits in the divisors or multipliers. Errors are identified and explained before the student moves on. *Linear Equations*, for students in seventh through tenth grades, gives practice on equations using single variables with integers. The program asks students to choose the proper steps to solve the problems and explains errors in progress. *Quadratic Equations*, for students in eighth through eleventh grades, gives practice on advanced math problems. All *Success in Math* programs are $24.95 each on disk and $19.95 on cassette. *Mastering the SAT* helps students prepare to take the Scholastic Aptitude Test. It's a comprehensive program that provides practice in all skill areas tested in the college entrance exam: math, verbal skills, and standard written English. This multidisk program first tests the student to identify specific areas for further study; the student may then practice at his own pace on problems in the selected subject areas. A ninety-six-page workbook that contains practice exams is included. $150. *Mastering the College Board Achievement Tests: English Composition* is designed as a means to prepare high school students for entrance into selected colleges and to qualify them for advanced placement in college English courses. The five-disk program has more than one thousand problems that offer practice in rewriting sentences, phrasing, identification of grammar errors, and pointers on sentence structure. It's self-paced, and it provides error analyses and an approximate score to indicate areas for further study. $175. *Mystery Master: Murder by the Dozen*, a logic and deduction game that can be played by up to four persons at once (either cooperatively or competitively), challenges the player to investigate and unravel twelve cases of murder. The sleuth is provided with a dossier on the crime, a map of the city, and a clue book containing hundreds of numbered clues. Red herrings, wild goose chases, and deductive reasoning are all part of it. $34.95. *Match-Wits* is a find-the-matching-boxes game for one to four players. Categories include words, sports, famous people, multiplication, cities, and animals; the game also lets players program in additional files of their own. Each matching pair uncovers part of a rebus; the first one to solve the puzzle wins the game. $29.95.

☐ *Charles Goren: Learning Bridge Made Easy* is being published by CBS Software and **Goren International** (110 East Forty-second Street, New York, NY 10017; 212-661-1918). The program teaches bidding, covering such topics as hand evaluation, opening bids, responses, and rebids. More than one hundred specially selected hands are given for practice in play. The computer gives players the opportunity to make the correct bid before it reveals and explains the best answer. Included is a 144-page book that teaches bidding and the playing of hands. $79.95.

☐ *The Computer Glossary, It's Not Just a Glossary!* is an unusual combination of glossary and textbook combined into one volume. More than eleven hundred computer and vendor terms are defined in the book for quick reference; explanations are easy to understand and are cross-referenced with other explanations in the book. Available in bookstores and from **The Computer Language Company** (140 West Thirtieth Street, New York, NY 10001; 212-736-8364). $6.95.

☐ The DX-1 Sound Processing System is a hardware/software package that uses the Apple for recording, processing, and playing back sound. One of six menus allows a collection of prerecorded drum sounds to be played in real time on the Apple keyboard. Another menu provides random reproduction of various sounds. Other menus let you record and reproduce any sound and include the ability to program variations in pitch, volume, and sequence. Sounds can be played forward or backward and can be saved on disk. The interface card connects to any medium- to low-level signal source such as a microphone; output goes through a speaker either directly or through an amplifier. From **Decillionix** (Box 70985, Sunnyvale, CA 94086; 408-732-7758). $239.

☐ **Elcomp Publishing** (53 Redrock Lane, Pomona, CA 91766; 714-623-8314) publishes *The Apple in Your Hand*. The book includes an introduction to 6502 machine language, Forth, and software applications in machine language, Forth, and Basic. $12.95.

☐ **Gessler Educational Software** (900 Broadway, New York, NY 10003; 212-673-3113) enters the educational market with the release of two titles. *Poker Pari* is an all-text card game in French. Players are dealt seven cards, each card reviewing one of fourteen topics on French culture, grammar, and vocabulary. There are hundreds of hard and easy questions. *Poker Pari* can be played by individuals, small groups, or an entire class for cooperation or competition. $39.95. *Anagramas Hispanoamericanos* is a geography lesson in Spanish. Its hi-res depictions of South and Central America, Mexico, and the Caribbean aid in the teaching process. As the names of countries or capitals appear as anagrams, a map of the entire region appears, with the area to be identified shown directly above the scrambled letters. Players take turns trying to unscramble the name of each area. $37.95. ■

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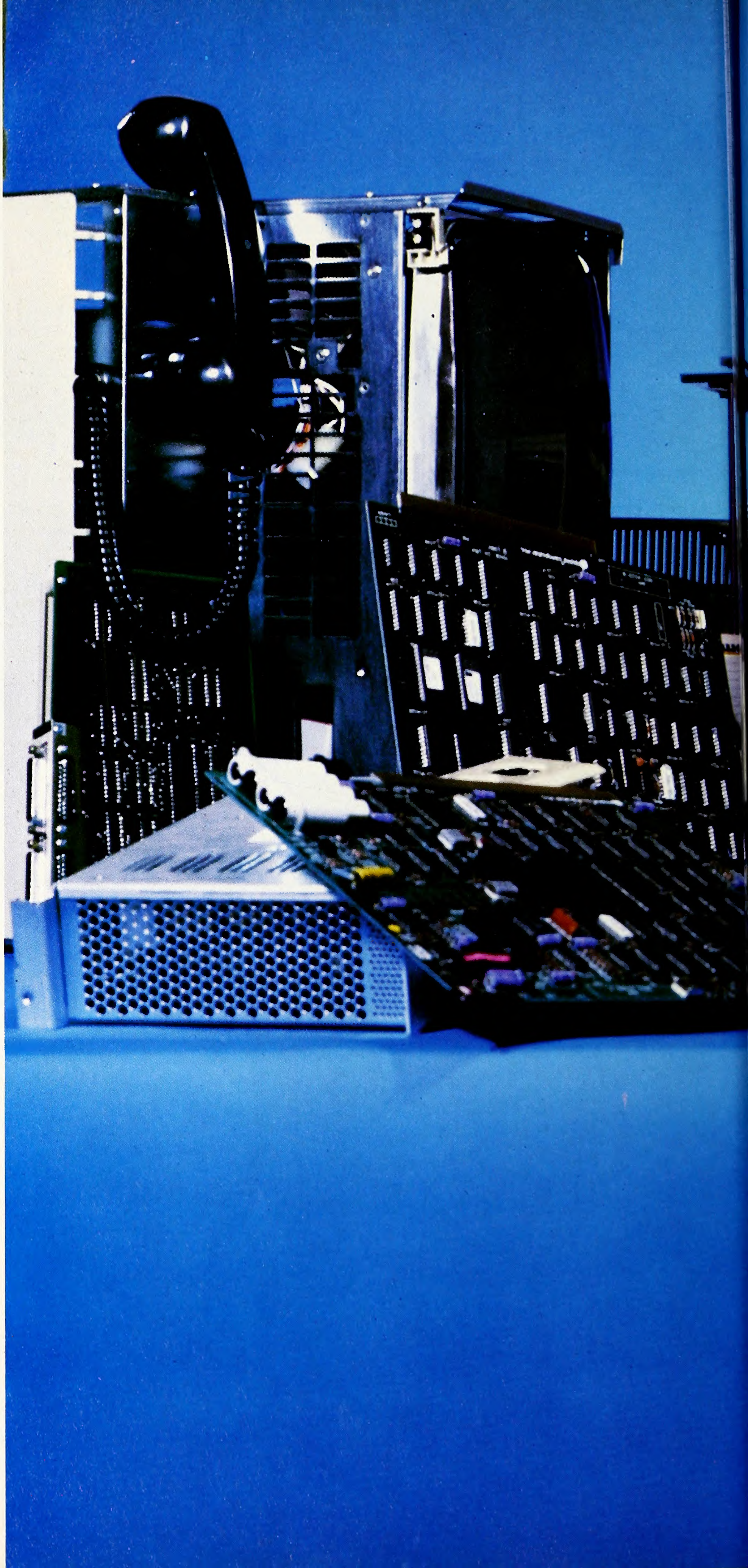
LISA-Close Up And Personal

by Roger Wagner and Joe Holt



Once upon a time, three blind men were led to an elephant so that they might experience the nature of the beast. One man held the trunk in his hands and said, "The elephant is like a giant snake." Another man stood by one of the elephant's legs and, wrapping his arms around the leg, said, "Oh no; the elephant is strong and tall like a tree." The third man put his hands on the elephant's side and said, "No, this beast is like a great wall."

Although you no doubt see the folly of their observations, we are all intellectually blind to greater and lesser degrees regarding the many things and subjects to be found in the world. On the nature of simple objects, like a table or a chair, we can pretty much agree; although those of greater experience, like a carpenter or cabinetmaker, may have perceptions far more detailed than those of the average person.

The more complex the subject, the more our views of its nature are likely to differ from other people's and the more our own personal experience (or lack thereof) is apt to produce a view unique to ourselves—most likely a view blind to certain aspects of the thing in question.

The Lisa computer, released last June by Apple Computer, definitely qualifies as a complex subject, and therefore it is unlikely that many people will fully appreciate or even understand all about its nature and capabilities. This observation has a lot to do with the answer to one of the more often posed questions, "Is the Lisa worth the price?" After an introduction to the machine, we'll explore the possible answers to that question, as well as to the question of how this new computer could impact upon the current state of computer usage.

The "blind-man effect," as we'll call the analysis problem, also means that no one author is likely to perceive all the aspects of the Lisa, nor can one article answer all the questions that the readers are likely to have. In this article, we'll try to present two views of the Lisa, one centering on the more applications-minded person who is mainly interested in the immediate uses of the machine, and another that con-

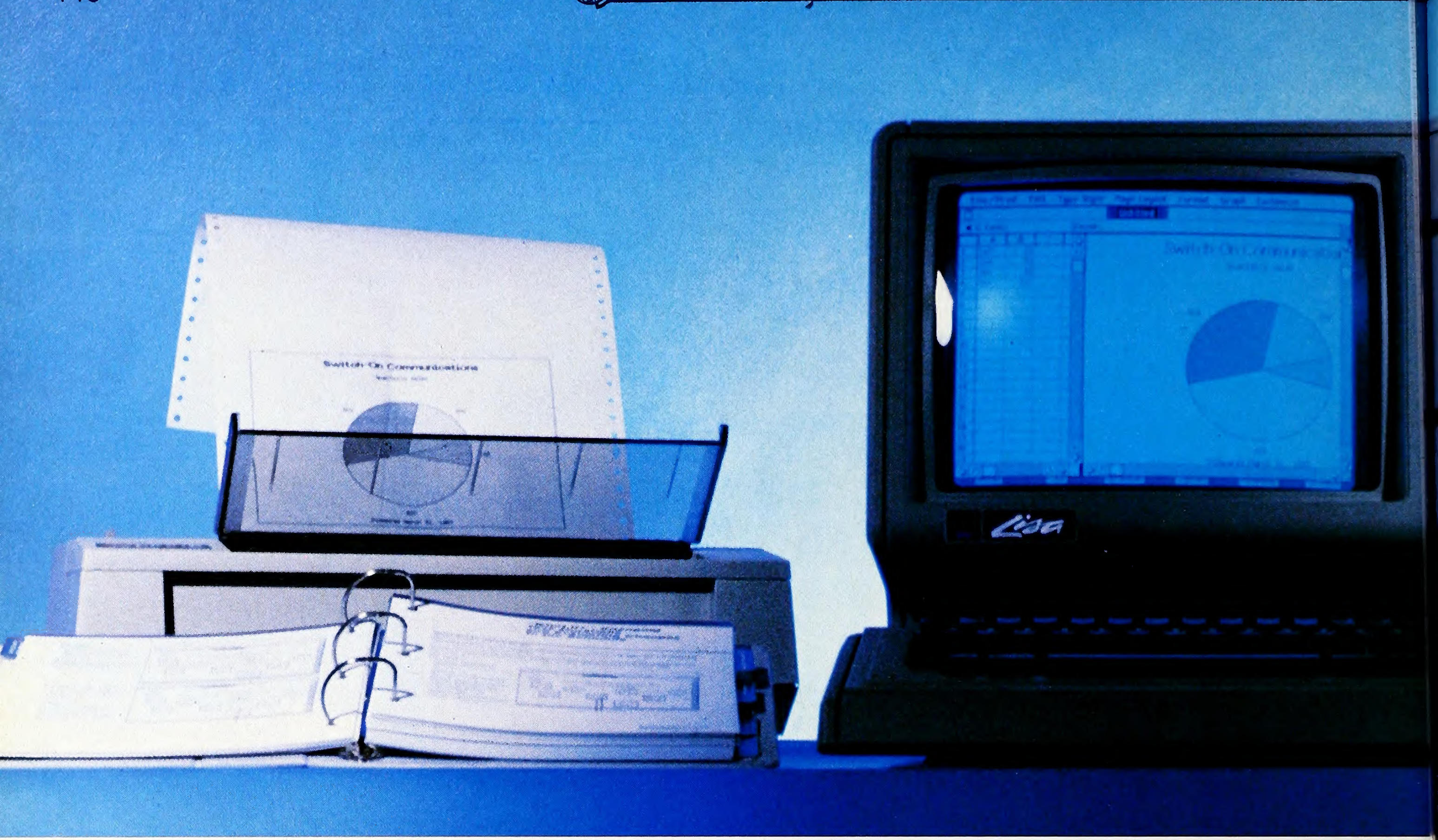


Figure 1.

ware and software details of the machine for those interested in the technical aspects.

The First Date with Lisa. Unpacking a Lisa and the boxes of its various components is a little like a blind date with someone whom you've heard is better than perfect. Expectations can be a little overdemanding, and nervousness and excitement abound.

With all the media talk of the Lisa being so easy to use, you half expect it to jump out of the boxes and set itself up. Well, needless to say, it isn't quite that easy.

Although the Lisa manuals are very good, it's not always obvious which of the many chapters one should be reading. Besides, the notion of reading a manual when your brand-new Lisa is inches away is rather like the thought of taking along an etiquette book on that blind date.

Well, eventually everything is in its place and the Lisa is brought to life. Figure 1 shows how everything looks when set up (this is how you keep your computer set up, isn't it?), and figure 2 shows what the usual office system screen setup looks like with the basic icons present.

The office system is the environment in which the various tools (Lisa's applications programs) are used. The tools, stored on the ProFile, are *LisaWrite*, *LisaCalc*, *LisaDraw*, *LisaGraph*, *LisaProject*, and *LisaList*. The screen depicts an executive desktop where all of our electronic paper-pushing is about to occur. Icons are the graphic symbols used to represent the various tools, documents, and devices available to you. A document is any file that you can open up and write information in by using one of the tools.

The mouse is sort of an upside-down track ball that can be rolled around on your own (real) desktop to control a pointer on Lisa's (electronic) desktop that selects the icon you wish to manipulate. Besides just moving things around, clicking the button on the mouse with the pointer on a menu choice selects that choice. For example, in figure 2, clicking the mouse with the menu bar highlighted as shown "opens" up most icons so that you can view their contents.

On first exposure, it's easy to spend some time (certainly more than fifteen minutes, but it doesn't seem like it) just experimenting before you run any actual program. It's fun just to move the mouse around and poke all the screen icons to see what happens.

Of course, one can never resist the temptation to do things like put the ProFile icon in the trash-can icon to see what happens. Lisa is very forgiving of such youthful mischief; the ProFile icon merely scurries back to its original spot on the desktop when you try such antics.

When you choose an icon, the display is dramatic. A box outline pops out of the icon and swiftly expands from tiny icon size into a large window. Closing the document the window displays does the same thing in reverse. Figure 3 shows the desktop with three windows opened. These experiments usually draw a crowd (if there's anyone around) and each icon's opening and closing elicits the oohs and aahs usually associated with a fireworks display. The ultimate cheap thrill is opening as

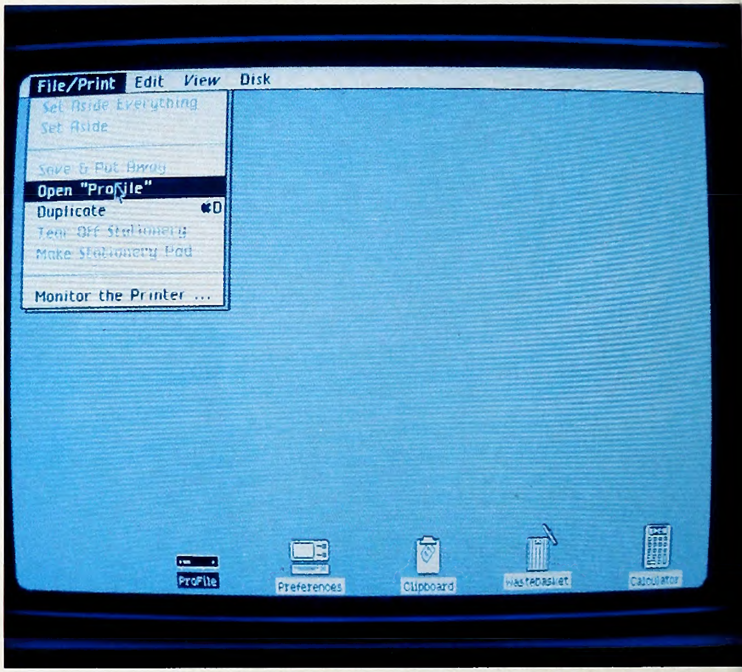
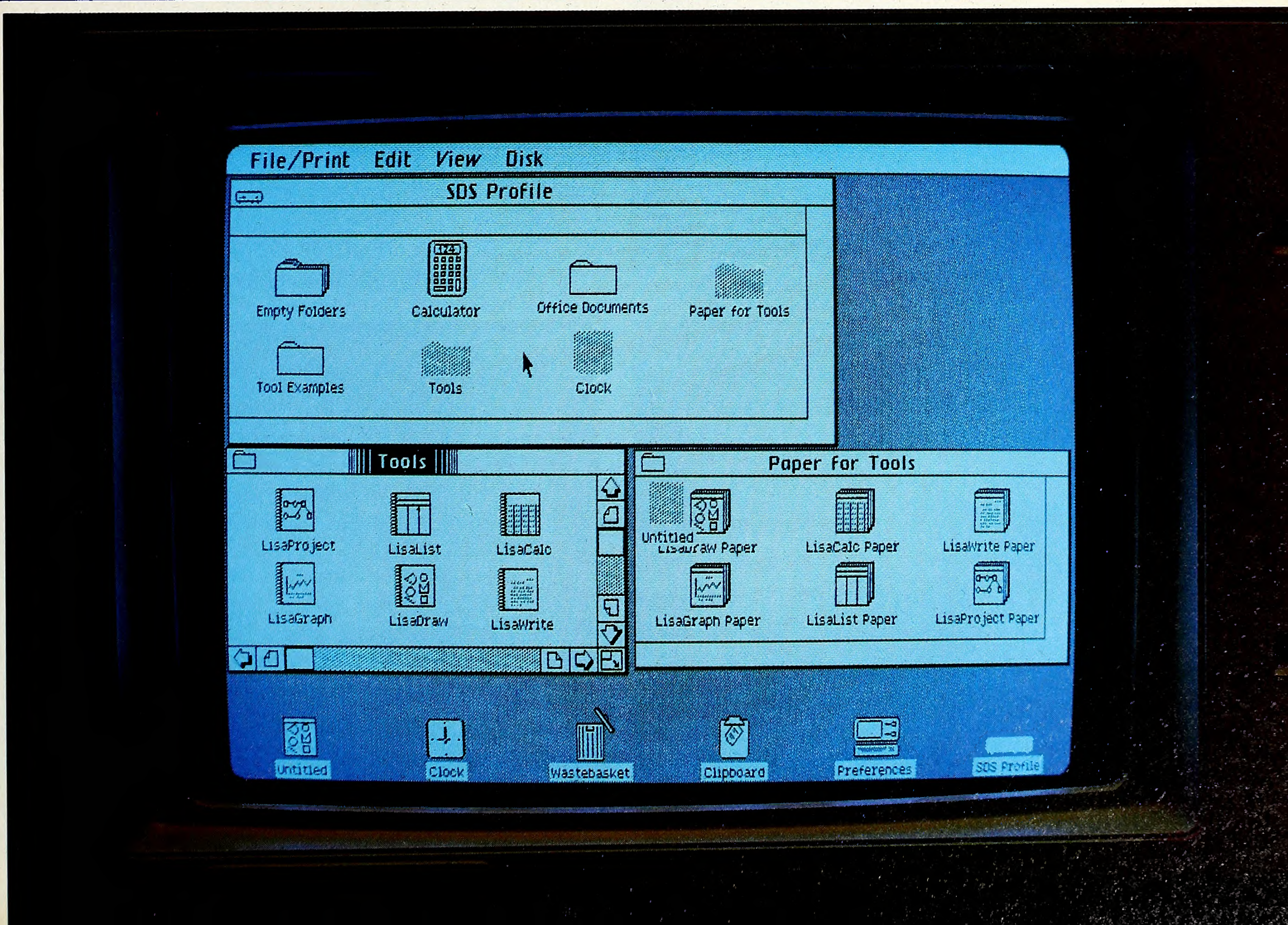


Figure 2 above. Figure 3 facing page.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LisaWrite
Paper for Tools
Untitled
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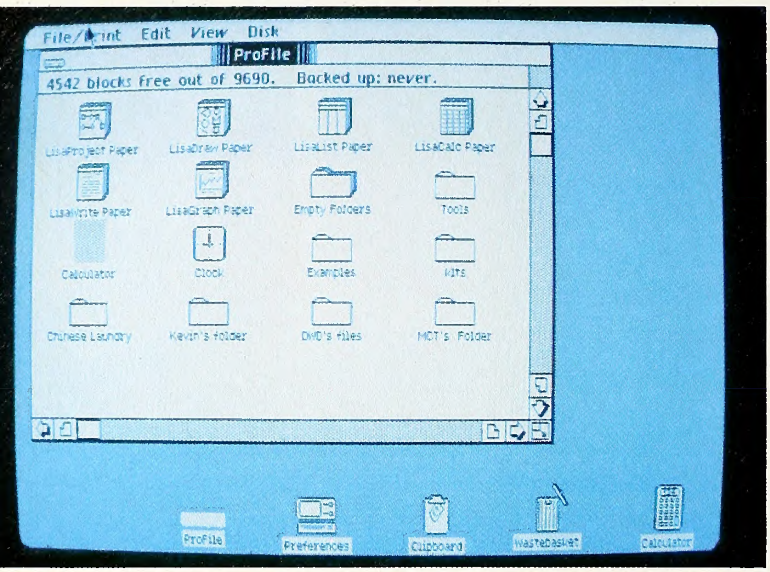
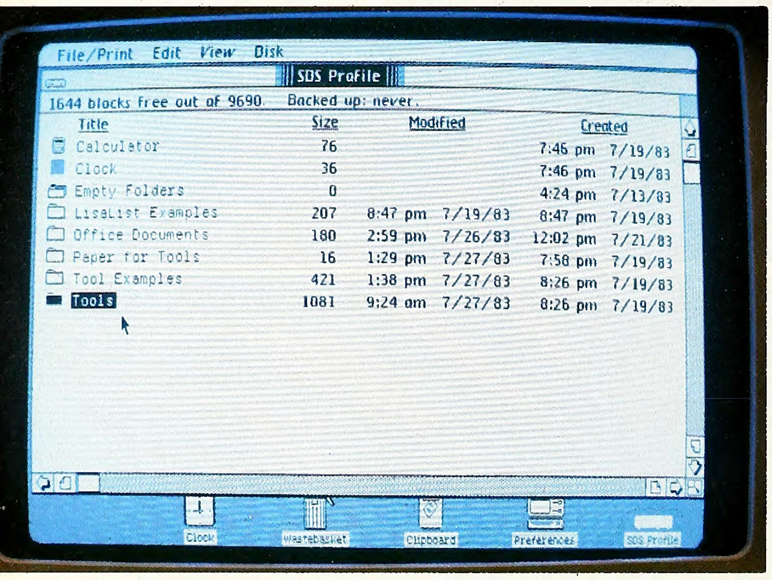




Figures 4 and 5 above. Figures 6 and 7 below left and below right.

many icons as possible on the screen and then telling Lisa to close them all at once. (As you can tell by now, this article was researched in only the most professional of manners.)

Well, on with the story. You'll notice that there are four basic icons on the screen desktop. There is a ProFile, which represents the five-megabyte hard disk that comes with the Lisa. There is also the wastebasket, which is used to dispose of unwanted items. The clipboard is a temporary storage spot whose primary use is in editing documents and in copying all or part of one document to another. For example, one could take part of a spreadsheet generated in *LisaCalc* and copy it to a letter being written in *LisaWrite* simply by copying the desired text to the clipboard, moving from *LisaCalc* to *LisaWrite*, and then retrieving the data from the clipboard to put in the letter.

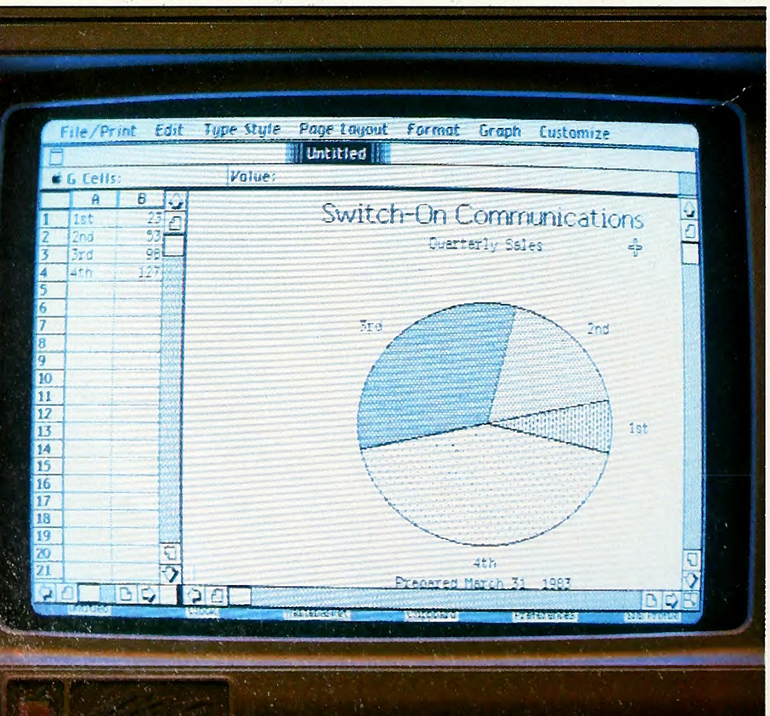
Learning the Ropes. One of the big advantages of the Lisa is that the principles you learn in one portion of the system usually apply to every other section as well. This means that, once you have learned how to use one tool, you can learn the others very quickly. These general principles of operation are even extended to the Workshop, an optional (meaning you buy it separately) developers' package that is essentially the programming level of the Lisa. In addition, the manuals for all the tools share a common format, and the bulk of each manual is a good tutorial on the features of that tool.

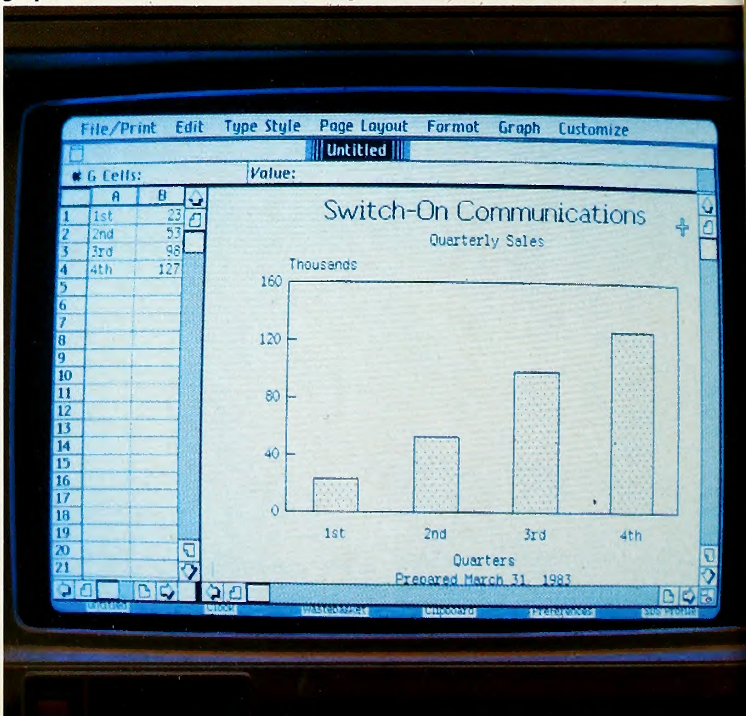
You can probably tell already that one of the nicest things about the Lisa is that you can do almost everything on a very intuitive level. The old Apple directory format of catalogs and file types does not exist. Instead, files are arranged in treelike structures and, for the user, it's even simpler than that sounds.

For example, when the ProFile is opened, you find a number of items stored there. Remember that on the Lisa opening a file is a very fundamental concept. It's more like opening up the drawer of a filing cabinet than it is like opening a computer file. You can choose to look at the contents in a variety of ways. For example, figure 4 shows the contents of the ProFile arranged by icon. Figure 5 shows the contents arranged chronologically, with the size of each file, date of origin, and other information written out in a way that's a little more like a disk catalog.

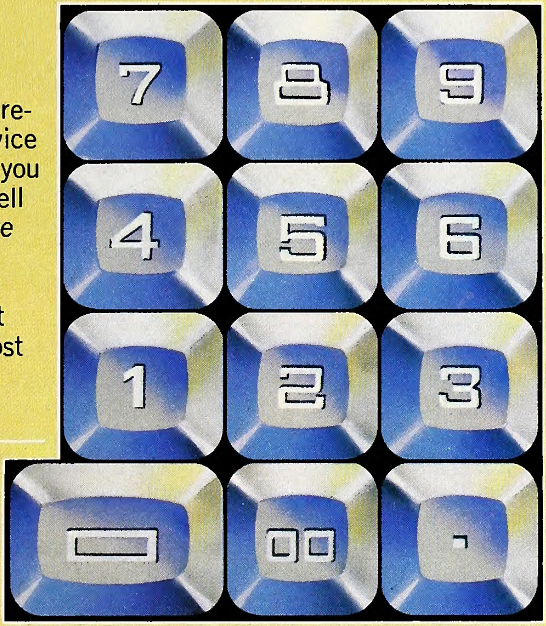
If you wanted, for example, to create a chart, the first step would be to find on the ProFile the icon labeled *LisaGraph Paper.* This is analogous to finding a tablet of graph paper in your office when you want to create a chart. When the *LisaGraph Paper* icon is located, selecting it performs an operation known as "tearing off a sheet" of *LisaGraph* paper. This creates the single sheet of paper (the data file) on which our graph will be made.

Figures 6 and 7 illustrate what the screen might look like after a graph has been created. On the left portion of the screen is part of a sim-





KEYS TO SUCCESS



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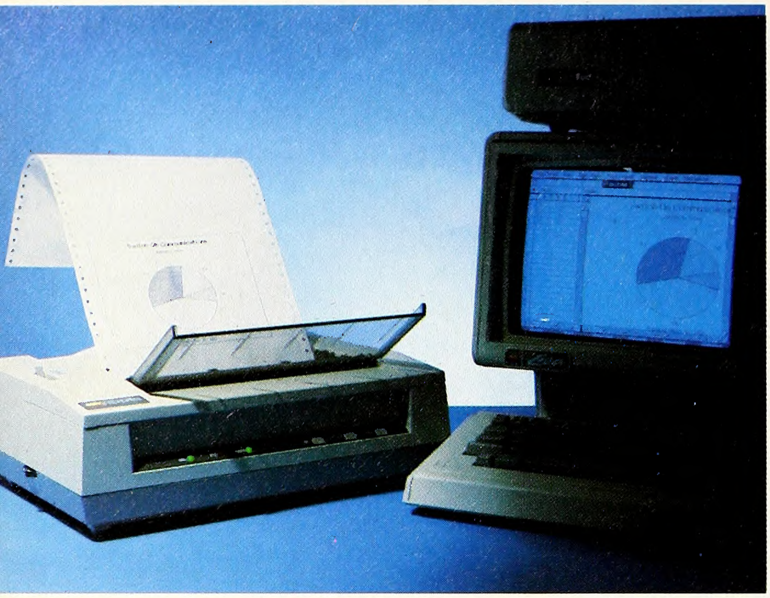

Figure 8.

Figure 10.

plified spreadsheet on which the basic data for the graph has been recorded. On the right in each photo is the graph created from the data. It should be noted that all scaling, labeling, and even shading is performed automatically by the software, with the user being responsible only for entering the data correctly.

The different graphs were created by pulling down the chart-type menu at the top of the screen and selecting either pie chart or bar chart with the mouse pointer. A chart of one type can be regraphed as another type nearly instantaneously.

Printing the chart is also easily done by selecting the print option from within the file/edit menu. The Apple Dot Matrix Printer has about average abilities when driven by an Apple II, but with the Lisa software telling it what to do it can create unusually good reproductions of the document as shown on the screen using the page layouts (full page, half page, vertical, or horizontal orientation, and so on) selected by the user. (See figure 8.)

Files can be stored directly back to the ProFile by closing the window of the document (and thus the document itself) and then using the mouse pointer to pick up the document and move it onto the ProFile window or directly over the icon for the ProFile.

A better way, though, is to take advantage of another file concept called the *folder*. This is also an icon; it's used to represent a group of documents. You could, for example, create a folder titled My Charts and put the two charts into the folder. Folders can also be nested. That is, you could have a folder entitled My Charts, in which are stored three other folders, one titled Test Charts, in which you keep any number of experimental charts and graphs.

What You Get with Lisa. So, just what do you get when you buy a Lisa? For the time being, the Lisa cannot be purchased without the software or the ProFile, so the list looks something like this:

* Lisa main unit with one megabyte of RAM, monitor, and two floppy drives (0.8 megabyte each) built in.
* ProFile hard disk, five-megabyte capacity.
* Keyboard with number pad, detachable.
* Mouse control unit (one button).
* Lisa owner's manual with *LisaGuide* tutorial software.
* *LisaWrite*, a word processor.
* *LisaCalc*, spreadsheet software.
* *LisaGraph*, graphing/plotting software.
* *LisaDraw*, freestyle graphics software.
* *LisaList*, database software for simple lists.
* *LisaProject*, project management software.

The Lisa unit itself has three interface slots in the back, each of which accommodates two devices. These can be printers, modems, even more ProFiles. There are three built-in ports along the back, two serial and one parallel. (See figure 9.) The ProFile is usually connected to the built-in parallel port. There's even a reset button back there, but its use is recommended only in the most drastic of circumstances, namely a complete system lock-up, since any files currently open when reset is pressed would be lost. You can't use the power button to recover from a lock-up because it isn't actually connected to the power line; it's more accurately thought of as a "power-down-request" button.

Apple had maintenance in mind when they designed the Lisa. All major parts with exception of the video tube and related parts can be removed by the user by hand, with no special tools (not even a screwdriver!) required. Figure 10, for example, shows the front panel removed

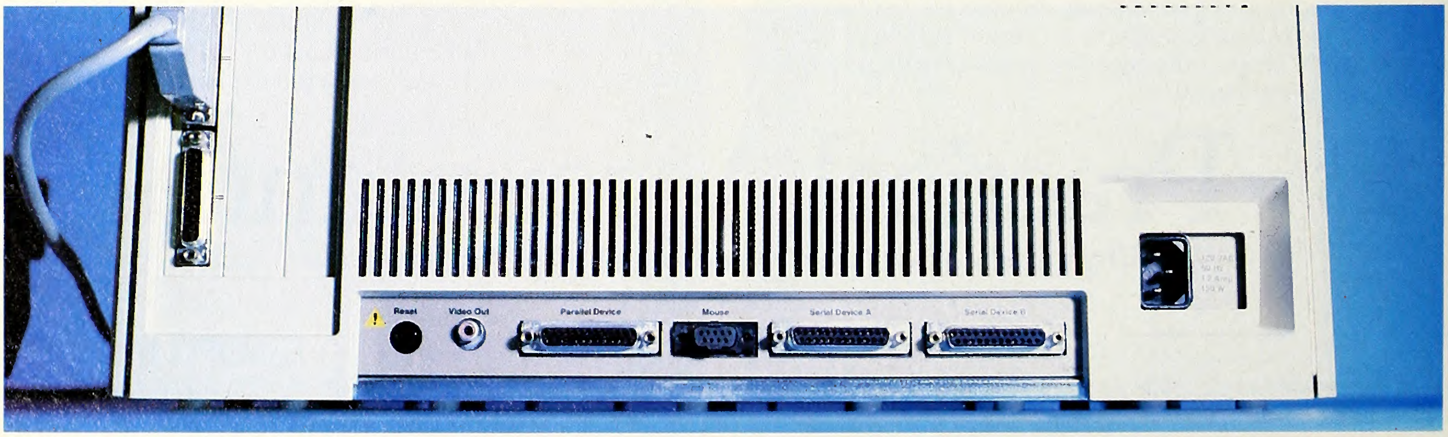

Figure 9.

Figure 12.

and the disk drive unit slid halfway out. Presumably the notion is that you just take the part that needs to be replaced in to your dealer and get a new one that works.

Figure 11 shows the back panel removed. You can see the three interface slots and some of the circuitry of the Lisa. The yellow handles at the end of each slot open the slot up like a Venus's-flytrap to allow insertion or removal of the interface cards without having to push them in from above. The cards are very tall (exactly the height of the available space, to be exact), so this approach is necessary. The self-cleaning effect of taking cards in and out on the Apple II is probably nonexistent here, but maybe Lisas don't oxidize either!

The power supply is on the far right of the Lisa in figure 11 and is a separate, removable unit. The center portion of the Lisa also slides out and holds four circuit boards, one with the cpu, one with the I/O circuitry, and two with a half megabyte of RAM each for a total of one megabyte.

Figure 11.

The keyboard is a nice one, as shown in figure 12. There is a numeric keypad, and special functions are provided by the option and apple keys in the lower left and right corners of the keyboard. The keyboard hardware is designed so that the keys are all individually identifiable by software, which allows for a great deal of flexibility.

The software included is enough to accomplish some of the more obvious functions of an office computer. Realistically, the bundled programs are probably Apple's attempt to make sure that the most important classes of software are immediately available (not to mention providing revenues for the company).

LisaProject is perhaps the most fascinating of the software packages included with the Lisa, and some example screen displays are shown in figure 13. This software allows a person to break down a major project

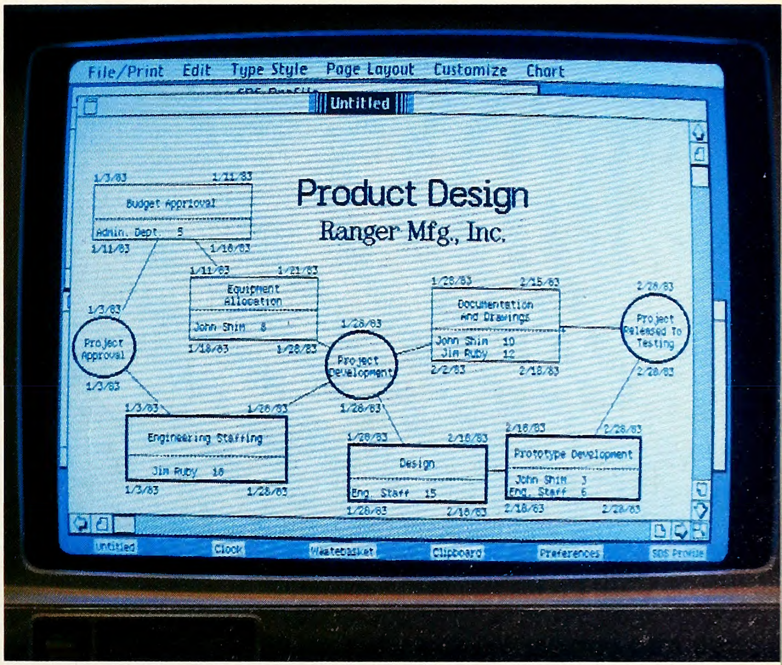

Figure 13.

into a network of interdependent events or tasks to be done by various persons. The user estimates how much time is required to complete each task. *LisaProject* then adds the various amounts of time together to determine the earliest and latest possible completion dates and also highlights the tasks that are most critical timewise to the project's completion. This process is usually called critical path analysis, and it's quite time-consuming without the aid of a computer.

LisaProject also redisplays the project diagram information in bar-chart form, with the bars representing the time taken for each project by each person in the project (figure 14).

Most of the software is somewhat similar to products available for the Apple II; the big difference lies in the degree of integration between the packages, the sophistication of the screen displays, and the general processing power available.

Many of the packages can exchange data among themselves where appropriate. You tell Lisa to transfer data simply by copying the parts desired to the clipboard and then going to the next tool.

The displays for the Lisa tools all follow a common theme, so going from one tool to another is quite simple. The screen is a high-resolution display (720-by-364) so text is easy to read and graphics are sharp. All the programs have error messages that are for the most part clear in their meaning, and various error messages are accompanied by unique sound patterns (earcons, perhaps?).

The real secret to the Lisa software is the sophistication of the hardware system that runs it. The amount of computing power in the Lisa is staggering; it amounts to nothing less than having a mainframe/minicomputer-level computer sitting on your desk. Although the technical section to follow will go further into the specifics, it can be said that the real excitement in the Lisa lies more in the software that the future will bring than in any of the software that exists now.

It's interesting to note, however, that things never change; only the form they take does. For example, there's a comparison between some familiar functions of the Apple II and the Lisa in figure 15.

We've already discussed many of the file-related aspects of the Lisa, but we should also make a brief mention here of some of the differences in disk and memory storage of data, and how I/O devices are handled.

You'll notice that there are no slot, drive, or volume parameters associated with the disk system on the Lisa. A ProFile or floppy disk is treated as a continuous block of storage media so that all of the storage devices may be used at any time. The numbers 1 and 2 on the built-in disk drive units are for the most part arbitrary. Whenever a disk is inserted, it's captured by the drive (and not given back until Lisa feels like releasing it!) and a disk icon appears on the desktop. The disk eject buttons on the

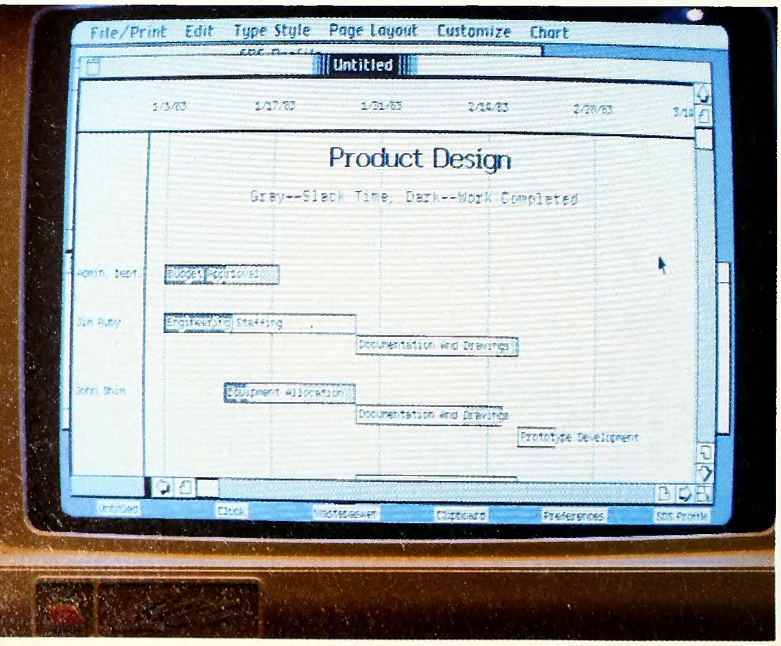

Figure 14.

Apple II	Lisa
Catalog	Open ProFile, disk, or folder (File names can be nested)
Programs	Tools
Files	Documents
Run	Open paper with tool available
Open	Select with mouse and click twice
Close	Set aside
Save	Put away
Delete	Move object to wastebasket
Lock, unlock	(No equivalent)
Volume, slot, and drive	(No equivalent; continuous storage throughout disk)
Memory map	Transparent use of 16Mb logical memory with 1Mb actually in machine
PR#, IN#	Select devices graphically
Menu selections	Mouse and pull-down menus
Reset	Back of machine, but powers down Lisa

Figure 15.

drives are similar to the power button; they are actually eject request buttons and don't immediately release the disk when pressed. Only after all associated files are automatically put away is the disk ejected.

For the programmer, memory maps are no longer a concern because, even at the program level, virtually (so to speak) all of memory is automatically managed by internal hardware. That is to say, even though there is actually one megabyte of RAM in the computer, the memory management unit (MMU) makes any program in memory (and there can be several at a time) think it's operating in a sixteen-megabyte environment (although it can't store that much data at one time, of course).

This brings us to the inner workings of the Lisa and the technical aspects of its operation. If you're the applications sort of person who's just waiting for the final opinion on Lisa, skip ahead to the conclusion. Otherwise, hang in here and we'll get into the bits and bytes of things.

Getting inside the Lisa. Glad to see you're here! Now it's time to get really dirty. Any readers with weak stomachs or uncertain alignments may not survive this odyssey through Dante's Inferno. So grab your schematics, logic diagrams, and memory maps and come along!

Speaking of memory maps, let's jump into what is probably the most difficult aspect of Lisa to understand (no one said this was going to be easy). Everyone by now knows that the Lisa comes standard with one megabyte of memory. With the Apple II's 64K memory map etched in all of our heads, it may be somewhat unnerving to learn that nothing in Lisa's memory is where it thinks it is.

What? Well, the Lisa uses a technique called *virtual memory*, which fools the computer into thinking it has more memory than it actually does (a college education can have the same effect on people). The RAM memory in Lisa is actually a collection of windows, called segments, which look into a much larger apparent address space. When the microprocessor looks at an address that isn't contained within one of the segments, the command is halted while the memory management unit loads from disk the needed block, which is then fooled into thinking it is where it's supposed to be. Operation then continues, as if nothing had ever happened.

Did you get that? Let's try an example. But before we do, there are two terms you should become acquainted with: *logical address* and *physical address*. Logical address is where the program or data block thinks it is, and physical address is where in the RAM memory it actually is. An example: A program is running along and off-handedly references a memory location or subroutine or whatnot that's not currently in any segment. In such a case, hardware control is given to the memory management unit. The MMU loads in from disk the block of memory containing the whatnot referenced and places it within a free segment.

Now here's the important part: The MMU then *fools* the micro-

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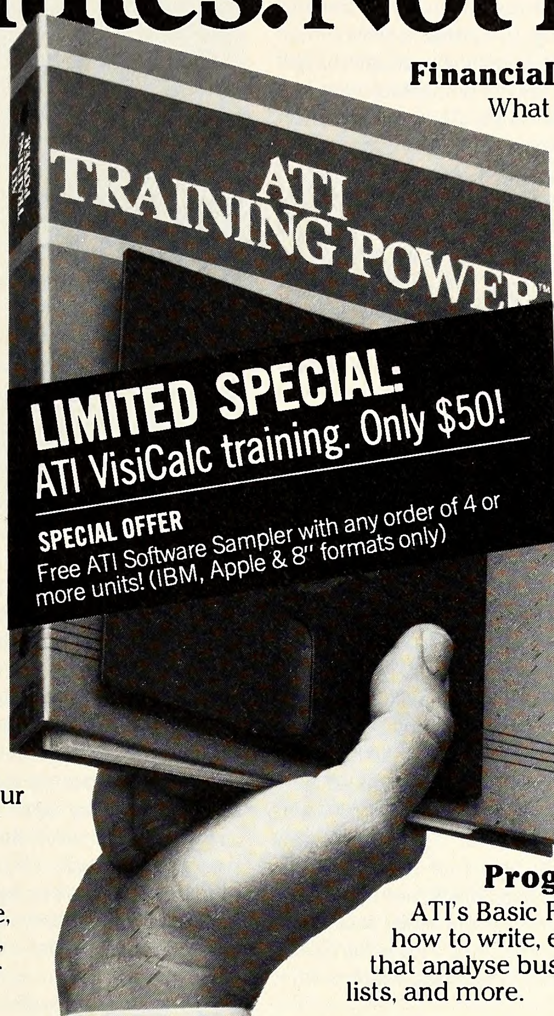

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processor into thinking the segment where the block was loaded is its true location when execution continues. All this happens without the microprocessor having the slightest inkling that it has. This is where logical address and physical address come into play. The logical address in our example was whatever memory location was referenced, but its physical address was wherever the MMU placed it in actual memory. To the program and for all intents and purposes, the logical address is where it actually is, but this is only because the MMU is pulling a couple of fast ones and causing the addresses to pretend they're someplace else.

If you're still here, then you've passed through the hardware Inferno's first ring and are ready for a bit of refinement. First off, that explanation of virtual memory is sufficient only to get us through the rest of this article. The actual workings of virtual memory are much more complex, and deserve an article of their own (for example, when and how does the MMU decide that a segment no longer needs to reside in memory? What happens when all the segments are full and another is needed? Ah, well . . .). It isn't necessary to understand virtual memory to write a program on the Lisa. What *is* important is to realize that, with virtual memory, each program isn't restricted to addressing a measly megabyte, but has a workspace of a gigantic *sixteen* megabytes.

So far, there has been no mention of what microprocessor is in the Lisa. That is because there are actually five microprocessors working in unison to produce all the dazzling effects and unheard-of reliability associated with Lisa. Before all you multiprocessor nuts drag out your programming sheets, note that only one processor is accessible to the assembly language programmer. But what a processor it is!

This microprocessor is the Motorola 68000. The heart of all the tricks seen on the Lisa, this chip has *power*. Anyone who's dabbled in 6502 assembly can appreciate the improvement of the 68000 with its sixteen thirty-two-bit registers and more addressing modes than you could ever use in one program. It's interesting to note that, although the 68000 can reference memory addresses up to thirty-two bits wide (that's four gigabytes, or sixty-five thousand times as much memory as the die-hard Apple II), only twenty-four of these bits are brought out of the 68000. The reason for this is a restriction of the physical construction of the 68000 integrated circuit. If you've ever lifted the lid on your Apple, you know what an IC looks like. Well, the 68000 with sixty-four pins (most ICs have sixteen or twenty-four) recalls images of huge black monoliths from a Kubrick film. There just wasn't enough room on the 68000 package to put eight more pins to bring out those eight other bits. This is the reason Lisa's virtual memory can only address sixteen megabytes, which is what twenty-four bits gives you.

As a small example of the 68000's power, realize that the Lisa's screen is always in the graphics mode, and that all text displayed is generated by software (somewhat like Apple's hi-res character generator). This is the key to Lisa's great flexibility when dealing with the screen, and it accounts for Lisa's twelve different type styles (not to mention boldface, italics, underline, shadow, hollow, super and subscripting . . .) and addictive interactive nature. Scrolling is likewise done in software, yet it's accomplished without the nauseating wavy motion you would expect with hi-res scrolling. More on the screen later.

Under the 68000's command are four other processors, each serving a specific function and each having its own limited memory and operating on the firmware supplied for it.

First there's the Z8 microprocessor within the ProFile. Although the ProFile is not really a part of Lisa proper, it is standard with the Lisa and is an integral part of the Lisa system. Without the ProFile and its intelligent Z8 controller, the Lisa's virtual memory scheme (so important, yet so transparent) would be impossible. Instead of having to dedicate its entire attention to such mundane tasks as disk I/O, Lisa is able to specify what data on the disk to read from or write to, and the ProFile takes over. On a down note, it is discouraging that the ProFile has only a five-megabyte capacity, whereas other hard disk systems of comparable price contain as much as twenty megabytes.

The other mass-storage related chip is the 6504, which controls Lisa's two built-in floppies, or *twiggies*, as Apple calls them. The 6504 is a limited 6502, with less addressing space (8K) and fewer control functions (such as no nonmaskable interrupt). The 6504, teamed with the twiggies' sophisticated hardware, increases the drives' capacity to 860K as well as improving the reliability.

The stepper motor that moves the disk head over the twiggy disk is capable of microstepping, which translates to reliability beyond comprehension and sophisticated error recovery. If the 6504 can't find a track where it thinks it is, it can move in and out in small fractions of a track until it finds it. Also, the motor that spins the disk is capable of varying its speed, slowing down on the outer tracks and thus keeping a constant 10,000 bits per linear inch over the entire disk, giving the outer tracks, which have greater circumferences, more to store. This advanced system requires a special variety of disk, shown in figure 16.

As a note, the error rate of a twiggy drive is so low that Apple couldn't measure it, but they estimate it at something like one error for every trillion operations, which should get you through this century without problems. All disk drives revolve, but only twiggies are revolutionary.

Speaking of getting through this century, Lisa for some reason can only keep accurate time and date through 1995. The time and date are controlled by a National Semiconductor COPS microprocessor, one of two within the Lisa. The second COPS is responsible for decoding the keyboard and transmitting the keycodes to the other COPS via the keyboard's twisted cable. Together, the two of them handle all the low level I/O and functions within the Lisa. The time and date COPS stays active even when Lisa is off. It updates the time and date while waiting for someone to come along and press the power button (figure 17). If Lisa is unplugged while in the off state, internal batteries power the time and date COPS for up to twenty hours.

So much for the Inferno's second ring. Now things are starting to get a bit easier. On to the fun ones!

The first thing that breaks even the seasoned programmers' cool facade is Lisa's graphics. Even the coolest among them lose their staid dispositions and join the chorus of "oohs" and "ahhs" when they see Lisa at work. The hardware behind all this is amazingly simple. A bit-mapped graphics screen very similar to the Apple's but consisting of 720 pixels by 364 lines provides the resolution that makes Lisa's desktop metaphor so believable. Every byte within the 32K of screen memory is directly mapped to the video display (with the exception of the eight bytes left over). Back to our virtual memory, the screen memory is located just about anywhere a contiguous segment of 32K is sitting on a 32K boundary. What this means is that the screen memory is nowhere in particular, but almost everywhere at one time or another.

Although the current screen is black and white, the screen software supports up to thirty-two bit planes (which means that up to four trillion colors are possible), and the technical manuals hint left and right at a col-

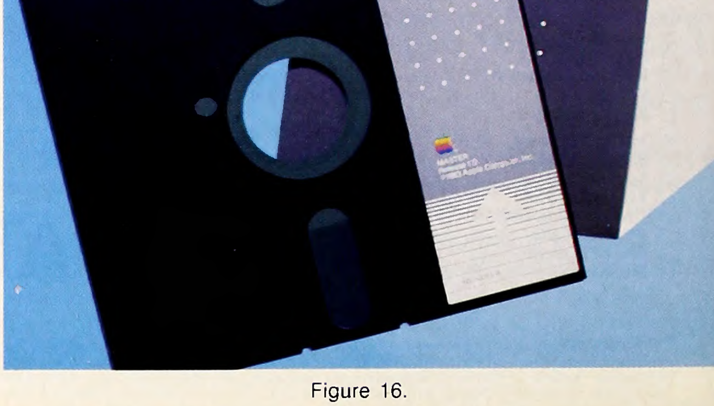

Figure 16.

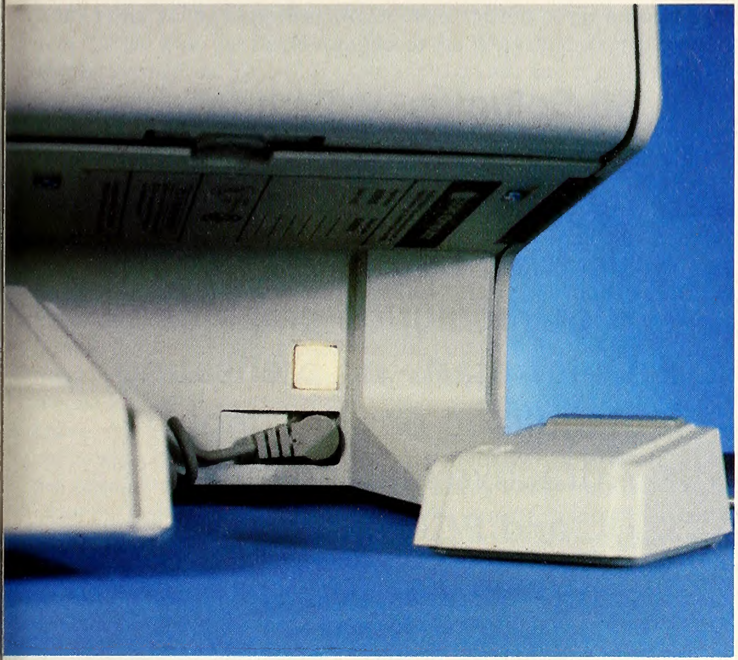

Figure 17.

or board that should be out soon. A retrace interrupt is provided which can be used to synchronize screen access with the retrace timing so that flickerless graphics can be attained. Also, since the screen's contrast is software controlled, a program can produce any sort of eye-killing effects. On the more practical side, software-controlled brightness allows Lisa to dim the screen to a specified level after a specified period of inactivity to save video screen phosphor. Nice.

What is that little thing with such a long tail sitting next to Lisa? Why, that's a mouse, one of the most innovative peripherals yet. Mice have been around for some time, but only now are they making such a noise in the marketplace. It has been estimated that the average mouse will travel almost twenty miles in a year's usage, and Apple's mouse is not one to be caught without its track shoes. It's rumored that the plotter used to put Lisa's mouse through its paces died before the mouse even began to sweat.

For no apparent reason (except perhaps novelty), Lisa's mouse comes complete with a software odometer that is reset to zero on each power-up. Real cute. Essential to successful mousing is the cursor, a 16-by-16-bit image necessary to translate the mouse's movement from the physical desktop to the metaphysical one. The feel of actually moving the cursor on the screen is phenomenal, and it'll take anyone with an arm no time at all to accept the mouse as standard. In fact, on Lisa's desktop, 90 percent of the interaction is done with the mouse. What a joy to use!

The biology of a mouse is such (for those who want the gory details): A hard rubber ball (which doesn't bounce too well) rests under the mouse and just touches whatever surface the mouse is sitting on. As the mouse is shoved from one location to another (as only mice will tolerate), the ball within likewise revolves, turning two small flywheels. Each flywheel is responsible for recognizing its particular axis of motion. As each flywheel turns, a small Benham-like disk turns also, causing a light beam to be interrupted and a movement of one unit to be recognized. Motion in any direction is recorded as a series of these small movements, and internally they are translated to screen coordinates. Basically, a mouse's life is uneventful (with a few exceptions), but what it does, it does well.

What Turns Lisa On? One of the hardest things to accept for someone who's always flipped a toggle switch is that Lisa never really turns off. When a power-off request is made (by pressing the on/off button), Lisa calmly closes any open files and powers down with the sophistication expected from a computer of such background. When "off," Lisa is actually in a low-power mode, updating the time and date and patiently waiting for someone to come along and press her button. When this happens, the COPS which senses the power-on request energizes a relay that turns Lisa on. Control is then passed to a very specialized boot ROM which contains 16K of 68000 diagnostics and power-on sequences.

After the Lisa examines itself for any anomalies and passes all tests, the boot ROM reads a block of boot code from the predefined default boot device (either ProFile or twiggy) unless the default is overridden at power-on. The selection of the boot device is made from the preferences window of the desktop and maintained in low-power RAM. After the boot code is loaded, it is executed. What happens next depends on the boot code, but in a standard Lisa configuration (using Lisa's own operating system), System.OS and a host of friends (System.LLD, System.LOG, and others) are loaded in and System.OS is executed.

Let's digress for a moment and explain what System.OS is. Probably the best analogy is to the Apple II's own DOS. System.OS is like DOS's file manager, consisting of hundreds of routines used to control every aspect of the operating system and its environment. These include calls to the file system, process handling, memory management, exception and event handling, and system configuration. Like the file manager, System.OS (to be called "the operating system" from here on) needs some controlling program to provide the user interface. DOS's equivalent would be what we all mistakingly call DOS, but what is really just the command interpreter to supply the necessary man-machine interface.

Lisa's operating system, once in memory, loads and executes System.Shell, which is Lisa's command interpreter. In the desktop environment that we usually see Lisa displaying, this shell is the Environments window (see figure 18), which is normally transparent on bootup and is responsible for bringing up the desktop software. If, however, the default shell to use on power-on is the Workshop, for example, then Environments will load and execute the Workshop shell. Basically, System.OS loads and runs System.Shell, which is the interface between user and operating system.

What is the Workshop? The Workshop is a shell that provides a UCSD Pascal-like environment for writing and debugging programs. Complete with the Workshop are an editor, Pascal and Cobol compilers, a Basic interpreter, a 68000 assembler and debugger, and an ample supply of support programs. These languages and utilities make up the Lisa development package, which doesn't come with Lisa but may be purchased separately. All the operating system calls can be made from Pascal and assembly. In fact, most of the operating system was written in Pascal (some 900,000 lines worth!), with only a few speed-critical routines, such as the graphics software, written in 68000 assembly (only 40,000 lines).

It was this Workshop that Apple developers used to write all of the software for Lisa. Sound like a chicken and egg situation? Well, the original Pascal compiler from the Apple II language system was strapped

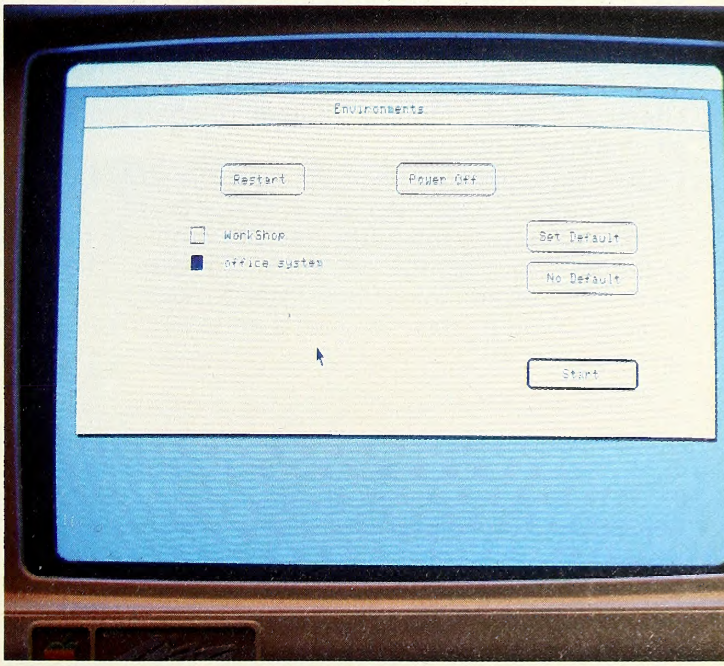

Figure 18.

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onto a very young Lisa, then used to write the rest of the operating system. By the way, the Pascal compiler in the Workshop translates source to an intermediate file, which is enhanced p-code and is good for nothing except the Workshop generator, which produces 68000 machine code. All in all, anything is possible in the Workshop.

Where were we? Oh yes, Lisa's power-up sequence. . . . Well, in some sort of roundabout manner, we've just explained it.

Don't let anyone tell you otherwise: The Lisa is anything but a micro. With multitasking (which we haven't discussed, but which essentially means that many processes can run concurrently) and virtual memory (giving *each* process sixteen megabytes of program and data space), the Lisa easily competes against many of the "all-powerful" mainframes. In fact, the only apparent reason that it's not considered a mainframe is that it doesn't fill a specially air-conditioned room and doesn't require a flock of smocked technicians to operate. Outside the desktop, Lisa is still a completely integrated system, with an extremely powerful operating system running very powerful state-of-the-art hardware. There will certainly be a large quantity of very happy Lisa owners still around when the real-time clock peaks out in 1995. Apple Computer had better be prepared to supply a firmware patch for all these people to carry them through the rest of the century.

Conclusion(s). After all of two weeks with Lisa, what do we think of it? Granted that the honeymoon's not over, we still have some general impressions.

When you first see a demonstration of the machine, you're apt to have a feeling about it rather like the one you probably had when you got your first Apple. Many of us came to computers knowing little about them or about what could be done with one, but they seemed intrinsically fascinating. Even if you now know at least a little more about computers, you'll probably have much the same feeling about the Lisa.

Any single word is too weak to accurately describe the sense of the incredible the machine can elicit. The potential housed in that simple case is truly staggering. The most expert, most veteran Apple II users have yet to explore even a fraction of the potential of their machines. The internal power and level of integration of the Lisa seems like going from a bicycle to a starship.

Your reactions to the machine might well vary, though. When you first start using the machine, you're mainly aware only of the appearance of the applications software, the tools. Initially very impressed, you might then begin feeling like the $10,000 price tag is, for the average person, a lot to pay for the convenience of smooth graphics and easy data transfer between programs. For the stereotypical business executive, the usability of the Lisa is probably worth the expense, but the cost factor is certainly high.

In all fairness, even with this view, the price difference is not as high as you might think. An Apple II with all the equivalent hardware and software could still cost more than half the cost of a Lisa. With that in mind, the convenience factor is not costing as much as you would originally suppose.

If then you learn more about the inner nature of the machine and begin to realize its tremendous potential, a different picture emerges.

The first conclusion is that cost is a very relative thing. Think for a moment about your reaction to the possibility of paying $10,000 for a television, a car, or a house.

Ten thousand dollars for a television is certainly expensive. For a car, it is at least within current price ranges, and for a house it would be a bargain. *Expensive* then is not an absolute value, but rather a ratio between actual cost and perceived value. In addition, even large amounts of money do not present as big a barrier to purchase as many people seem to think. Most likely, many of the people you know own things like houses and cars in spite of their high cost. In addition, think of the number of people who own motorhomes that cost far in excess of $10,000 and at that only use them once a year.

Clearly, the real question is not, "Is it expensive?" but rather, "Is it worth the price?"

The ultimate answer will depend on a number of things. For someone in a business environment, the likelihood of a Lisa being worth it is admittedly much greater. Along with doing the research on the Lisa for the purposes of this article, we've put it to use in our office, and there are already at least a half a dozen people using the Lisa for official functions. Even those who never quite got around to learning to use the Apple IIs seemed to be attracted immediately to using the Lisa.

The graphics and printer output on *LisaWrite*, *LisaDraw* and *LisaGraph* alone give one the equivalent of an in-house graphics studio. The cost savings in this area alone help justify a major portion of the machine's cost. In addition, the graphics capabilities will make possible professional-looking documents, forms, diagrams, and charts for those projects that wouldn't ordinarily justify the expense of a graphics department. For the home user, it's probably still a matter of waiting a little longer for more software. You might look at it this way: Would you buy a motorhome before a Lisa?

You can bet that time will very quickly change all the factors in both business and home. It should be clear by now that the power of the machine is scarcely even hinted at by the existing software. If you think back for a moment about what has been done in software for the Apple II, considering the comparatively limited capabilities of the machine, the potential of the Lisa seems almost limitless.

The second conclusion is how the Lisa and computers like it are going to affect us all. There is more than enough written about how computers are going to change our lifestyles. This will probably happen, and there are some changes that we should see very soon.

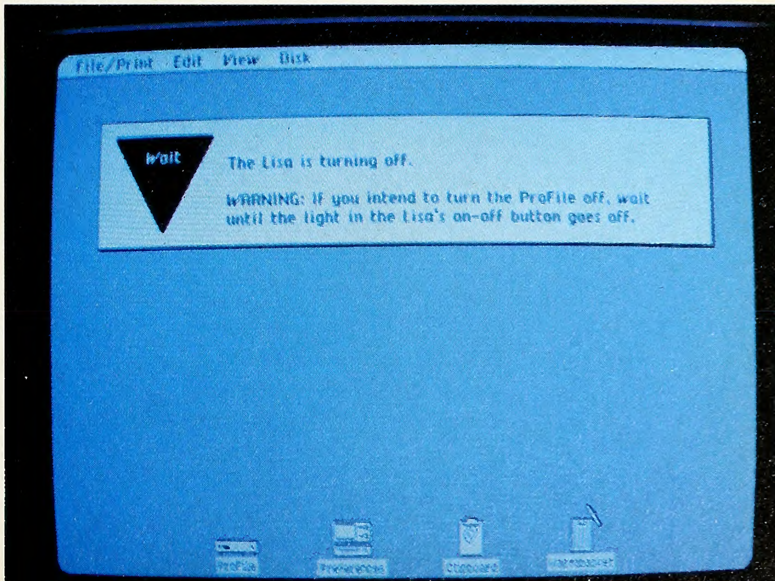
An example at hand is the dot-matrix printer. There's still a tendency to think that people really need letter-quality printers to generate business correspondence on their computers. The assumption seems to be that either dot-matrix print is totally unreadable or that people will be offended to receive any letter that was done on a computer rather than on a typewriter.

Ignoring for a moment that dot-matrix printers are improving to the point where they are less and less distinguishable from a daisy-wheel printer (read "typewriter"), the real point is, dot-matrix printers do the job better than typewriters. For someone to criticize a dot-matrix letter because it doesn't look like a typewriter is like criticizing a car because it doesn't look like a horse.

The Lisa printer graphics are like this. You might look at an invoice form (and I mean the pretty lines and logos, not the numbers) generated by a Lisa and say, "But it doesn't look like it was done by hand." That is precisely the point. Would you deride a neighbor's new wallpaper because it wasn't hand-painted? Of course not, and neither should anyone get too picky about being able to tell that a form or a letter was done by a computer.

The point is that a computer is a far more efficient way of accomplishing a given task, and that the person *not* using one is to be pitied for not yet having caught on to the revolution already surrounding us.

My prediction? No predictions at all. Look today for the Lisa-generated letters, project charts, financial reports, and invoice forms. The people generating those are the people who know where the future lies. ❏■



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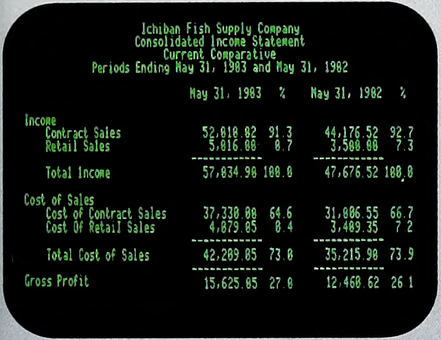
And just how well your cash flow is flowing.
And where to give credit where credit is due (a customer inquiry



Ichiban Fish Supply Company Consolidated Income Statement Current Comparative Periods Ending May 31, 1983 and May 31, 1982	May 31, 1983	%	May 31, 1982	%
Income				
Contract Sales	52,818.82	91.3	44,176.52	92.7
Retail Sales	5,816.88	8.7	3,500.00	7.3
	------------		------------	
Total Income	57,834.98	100.0	47,676.52	100.0
Cost of Sales				
Cost of Contract Sales	37,330.00	64.6	31,806.55	66.7
Cost Of Retail Sales	4,879.85	8.4	3,409.35	7.2
	------------		------------	
Total Cost of Sales	42,209.85	73.0	35,215.90	73.9
	------------		------------	
Gross Profit	15,625.85	27.0	12,460.62	26.1

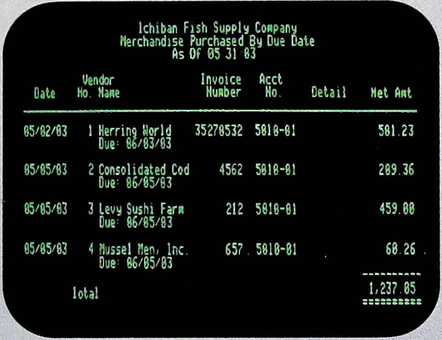
Your Apple can generate instant income statements (with expense ratios) or balance sheets, and let you compare them to last month's or year's, then print them out to suit your banker.

feature allows you to make credit decisions based on the most current information).
You can also list your purchases by discount dates. And take advantage of them in no uncertain net terms. You can even keep payroll records without paying more, because it's part of the same package.

Profit from history.

In business as in life, experience is the best teacher. And the Apple/BPI system can provide you with instant comparisons of this-month-this-year vs. this-month-last-year, or this-year-to-date vs. last-year-to-date.
So you can quickly spot changing expense ratios and make decisions with 20/20 foresight.

The BPI General Accounting Package also lets your income statements be coded by location, department or product line. So you know where your money's coming from.
And where it's not.



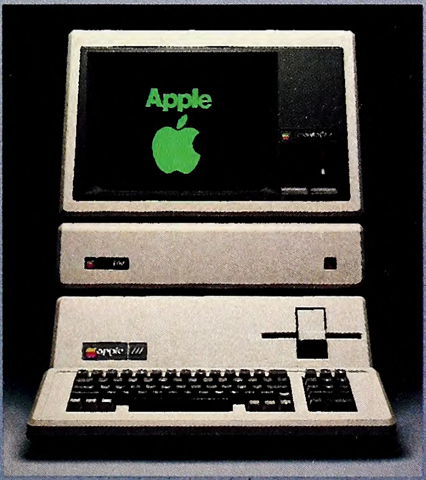
Ichiban Fish Supply Company
Merchandise Purchased By Due Date
As Of 05 31 83

Date	Vendor No. Name	Invoice Number	Acct No.	Detail	Net Amt
05/02/03	1 Herring World Due: 06/03/03	35270532	5010-01		501.23
05/05/03	2 Consolidated Cod Due: 06/05/03	4562	5010-01		209.36
05/05/03	3 Levy Sushi Farm Due: 06/05/03	212	5010-01		459.00
05/05/03	4 Mussel Men, Inc. Due: 06/05/03	657	5010-01		68.26
	Total				1,237.85

It can also allow you to take full advantage of merchandise discounts. So you'll know whom to pay, when to pay, how much to pay—and save a lot of clams in the process.

Make a timely statement.

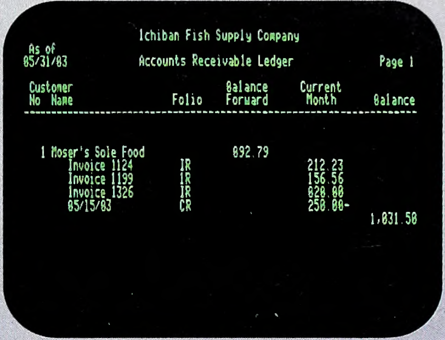
Add an Apple Dot Matrix or Daisywheel printer to your Apple III, and you can print out your entire balance sheet in minutes.
Or any number of reports, from cash receipts to payroll ledger to income. You can even print checks and customer statements.
The impressively professional



results will make an important statement to everyone you deal with—including your banker.

More ways Apples pay.

There are more people in more places doing more things with



Ichiban Fish Supply Company
As of 05/31/83 — Accounts Receivable Ledger — Page 1

Customer No Name	Folio	Balance Forward	Current Month	Balance
1 Moser's Sole Food		892.79		
Invoice 1124	IR		212.23	
Invoice 1199	IR		156.56	
Invoice 1326	IR		020.00	
05/15/03	CR		250.00-	
				1,031.58

To avoid fishy transactions, you can instantly display customer's payments, charges and current balance. In this case, a few more cans of tuna would put Mr. Moser over his $2,000 limit.

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HOW Apple Presents Lisa

by David Durkee

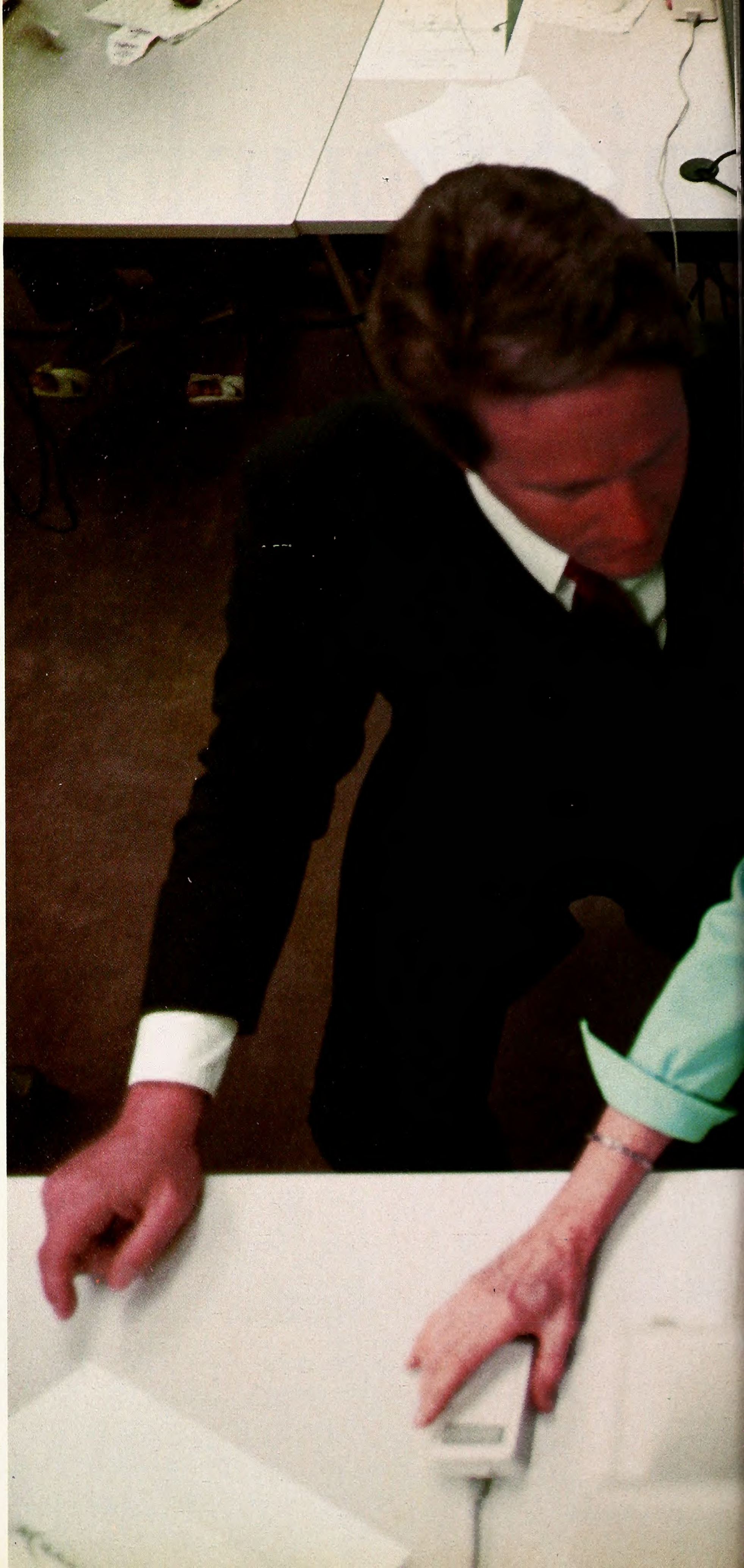
Assume that an executive has no time to learn about computers but has ten thousand dollars to spend on a computer that takes no time to learn. Well, almost no time. Where does said executive go to learn about this computer? After all, it isn't as easy as saying, "Hey, Lisa, plan my budget for fiscal 1984 and watch for cost overruns in production." To be sure, Lisa talks to the user in a way that should be nonthreatening even to the most practiced technophobe, saying things like, "Excuse me, you asked me to monitor the printer, but there is no printing going on now," instead of, "Illegal quantity error—break in 320." The hurdle is generally not in learning to understand Lisa but in learning to talk to her.

Apple is prepared to help its corporate customers over this hurdle with a small, informal training session. The general target audience is comprised of the top 1,300 corporations in the country, although it isn't limited strictly to this group. The one-day session is available free to Apple's national accounts: Corporations that are purchasing several Lisas for their top managers can send those managers to Lisa school. Apple has established twelve offices across the country, located in areas expected to have the highest volume of sales, with conference rooms dedicated to Lisa training.

In a typical class, there might be seven "students," usually all from the same company, each sitting at a Lisa. Apple's "teachers" know the Lisa inside and out and are good at helping people who don't. No question is too simple and very few are too complicated. And they have a good assistant teacher in the Lisa itself.

With coffee and doughnuts in hand, the students sit down to a short videotape of an executive using a Lisa in his work and explaining how each of the Lisa programs can help him with his everyday tasks. The tape is more demonstrative than instructive; it serves as an overview of Lisa for those who have never seen her in action and as a refresher for those who have.

It's not long before students get to try things out for themselves. *LisaGuide*, one of the programs that come with Lisa, is running on all the machines when the session begins. The tutorial is a gentle introduction to the basics of talking

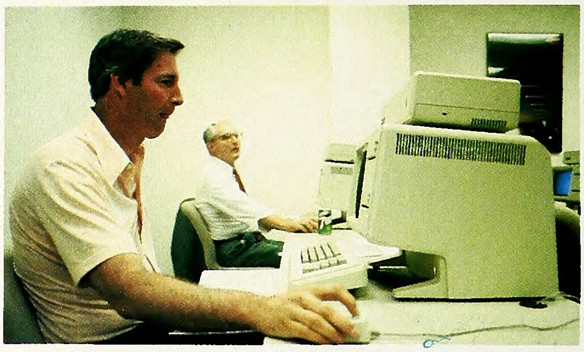


to Lisa. The first concepts are the mouse and the cursor. *LisaGuide* teaches how to move the mouse and how that movement controls the cursor, which is displayed as a black arrow on the screen. With the mice tamed, *LisaGuide* shows how certain symbols on the screen can act as buttons and how you can push those buttons by pointing at them with the arrow and pushing the mouse button.

An important concept for the Lisa beginner to grasp—one designed to make it easier to understand the system as a whole—is that the Lisa screen, sometimes called the desktop environment, is really an extended metaphor for an executive's desk and other elements of a typical office. There's the filing cabinet, the file folder, the wastebasket, the clipboard, the clock, the calendar, and the calculator; one wonders why they didn't actually create scissors and glue pot icons for cut-and-paste operations. Most of Lisa's tools are used in ways that are analogous to the ways you would accomplish the same goals without a computer. Once people understand the Lisa metaphor, they know as much about Lisa as they might have learned about the Apple II in the first week or two.

With that hurdle cleared, the rest of *LisaGuide* covers most of the elements of Lisa that are common to all the bundled programs. All the files that Lisa can manipulate are displayed in windows, and windows act like pieces of paper on the desktop. You can have one paper on your desk at a time, or you can have a pile of papers from completely different projects and work on the one on top.

Employees of Hughes Aircraft learn about Lisa at Apple's district office in Culver City, California. The instructors are sales training specialists Sarah Schwartz and national account executive Wayne Norberg, who represents the Hughes account.



LisaGuide shows how to change the size of a window, move it, put one on top of another, and select which one you're working with. Just as on your real desk, you can have several different things going on at once. While you're working, how organized your desk is depends mostly on your preferences and your own inherent talent for organization. When you quit for the day, however, you can tell Lisa to put everything away for you. This is one of Lisa's big advantages: She can conform to your habits.

Since *LisaGuide* comes bundled with the computer, you may well wonder what advantage there is to running it in Apple's classroom rather than your own office. Studies have shown that the average executive is interrupted once every seven minutes; the session at Apple reserves a block of uninterrupted time just for that reason.

A more important advantage is that people are there to help Lisa be your guide. The reason most computers prefer jargon to English is that jargon, if you know it, is a more precise language. For instance, at one point, *LisaGuide* instructs you to put the cursor over a certain word on the screen. The computer means to superimpose the cursor on top of the word, but someone could just as easily interpret it as saying to move the cursor to the line above the word. Having someone handy who knows the right meaning can avert some frustrating moments.

The nice thing about computer-aided instruction is that learners can go at their own

pace. Some finish *LisaGuide* in forty-five minutes and are ready for more; others take all day. And anyone can ask questions without getting ahead of the rest of the group or slowing them down.

Once people finish the tutorial, the teachers help them get started with any of the main Lisa programs: *LisaCalc*, *LisaWrite*, *LisaProject*, *LisaList*, *LisaGraph*, or *LisaDraw*. Which to look at first is up to the individual. All the programs are on the ProFile, of course, and the manuals include tutorials that start where *LisaGuide* leaves off. As before, there's the security of being able to follow the prescribed path at a comfortable rate, but there's also greater freedom. The more adventurous tend to make up data from their actual work experience instead of strictly following the examples in the tutorials.

At the end of the session, the Apple people demonstrate some applications that are more advanced than those that most people will get to on the first exposure to the computer. Finally—perhaps this is the most astounding event of the day for anyone who thinks the case of a ten-thousand-dollar computer is inviolate—they take a Lisa apart. Twist a few thumb screws; off comes the back. Flip a catch; there goes the front panel. The disk drives slide easily out through the front; the circuit boards come out the back. As casually as the magician sawing the assistant in half, they break Lisa up into a pile of parts.

For the uninitiated, this can go a long way toward demystifying the computer. A more knowledgeable user may experience an even greater surprise. Lisa, the computer made for people who are least likely to want to pull a computer apart, is designed to be completely modular—far more so than any Apple to come before it, in fact. When a Lisa goes down, the owner's going to want it back up again fast. Most of the time, Lisa can tell you where it hurts. With parts that are easily removable, what can't be quickly repaired can be quickly replaced.

Plenty of people who buy Lisas won't have the opportunity to go to one of these training sessions. And plenty of people won't need to anyway. But nobody who buys a Lisa will be without a source of help. More is required of Lisa dealers than is currently required of Apple II and III vendors. Lisa dealers must meet requirements for minimum size and have a large enough staff that some sales can be done in the field. Their salesmen must be suitably trained to support the product after the sale, and the stores are obligated to provide that support. They know Lisa, so they're prepared to answer questions. They come to you to help with the installation, and in some cases they even make house calls after the sale.

For the most part, Lisa users should be able to get by without extra help, because Lisa helps more than you'd imagine any computer can. What people that already use a computer know, people about to get started on Lisa will quickly discover: It's just a matter of getting their feet wet.

THE VERDICT IS IN

"Odesta has set the standard against which everyone else in this industry will be measured..."

Ian Chadwick, InfoAge 6/83

Checkers 2.1 by David Slate

"It's a textbook tutorial on a disk... a primer on artificial intelligence."
Softalk 3/83

"...a gold-plated edition of a classic."
Apple Dayton Journal 3/83

Chess 7.0 by Larry Atkin

"Chess 7.0 is the definitive chess game available on the Apple and Atari computers... It is certainly the best chess program that I have seen for any microcomputer."
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Odin by Larry Atkin & Peter Frey

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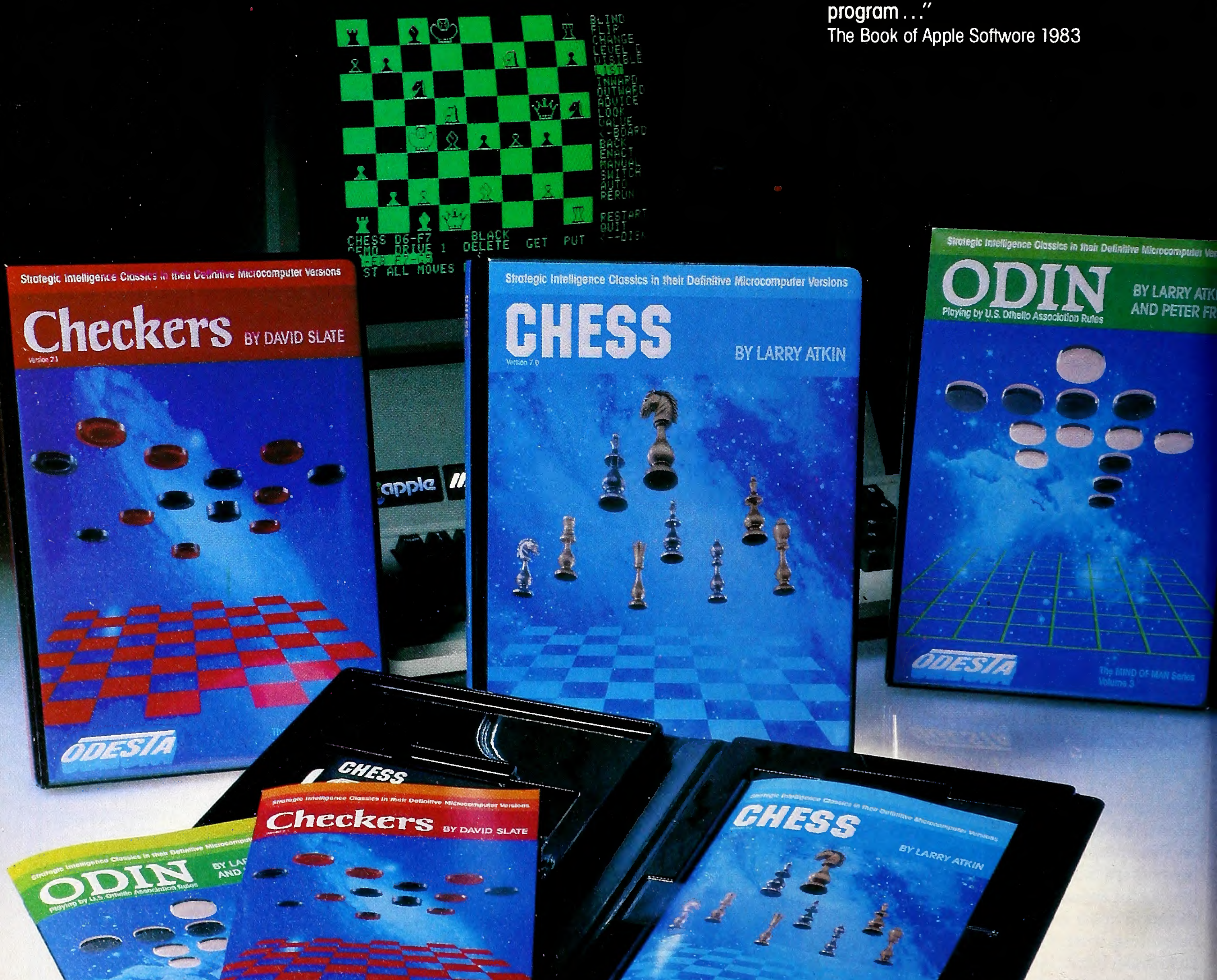

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For:
Apple II, II+, IIe 48K disk
Apple III emulation mode
Atari 400/800/1200 48K disk

MARKETALK Reviews

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.

Enchanter. By Marc Blank and Dave Lebling.

John John Morrison Morrison
Weatherbee George Dupree
Took good care of his mother
though he was only three. . . .
John John said to his mother,
"Mother," he said, said he,
"You must never make friends with a fire-breathing dragon
without consulting me."

Where is Zork? Alive and well in magic school. The result? *Enchanter*, the beginning of a trilogy sequel to the *Zorks*.

No longer is Zork condemned to subterranea. *Enchanter* takes place in a natural—if fanciful—world, a sunlit world. Well, at first it's a sunlit world. But the powers of darkness would have it otherwise. As the apprentice enchanter pursues his quest, the days grow alarmingly shorter. Soon the sun is rising at noon and setting at 2:00 p.m. Only the young apprentice's quick study and apt use of powerful magic can prevent the world from perpetual night.

Can magic be logical? Darn tootin'. Determining when and where and how to use which spells provides puzzles as clever and logical as those in any *Zork*. Without clear, innovative thinking, the enchanter's magic is useless. Or sometimes when it's useful it's misguided. Several spells can be cast only once; exactly the same number of puzzles can be solved only one way—with those spells. But the spells work in plenty of other places and even solve other puzzles that seem to be insoluble otherwise.

In line with Infocom's new mysteries and recent science-fiction adventures, *Enchanter* expands interaction with other characters beyond that of earlier Infocom games and of most other games. Even animals become confidants—or informers—when you have the right magic.

Enchanter is not chock-full of breakthroughs. It is simply a delightful adventure that takes advantage of the niceties and expertise Infocom has been nurturing at such a fast clip.

Zork's world isn't forgotten. The period is the same, or very close to it, and, although these people live above ground, they remember Zork even if you don't. Check the portraits in the castle gallery; see yourself azorking in the hall of mirrors.

And don't make friends with dragons. MCT

Enchanter, by Marc Blank and Dave Lebling, Infocom (55 Wheeler Street, Cambridge, MA 02138; 617-492-1031). $49.95.

Ultraterm. When the first eighty-column dual-case display boards appeared from Videx and its competitors a few years back, Apple owners were led Moses-like from the morass of a nonindustry standard forty-column upper-case-only display. Suddenly a new world opened up to users of word processing, Pascal, and CP/M. With the advent of the Apple IIe came Apple's own eighty-column display card, at a very competitive price. This seemed to signal the demise of the independent visual boards.

Never underestimate the spirit of microcomputer industry pioneers.

Instead of giving up, or even of producing a me-too copy of Apple's board, Videx has struck out into new territory; the result is the Ultraterm video display board. The Ultraterm provides for seven—that's right, seven—separate display modes. And the hardware works with the Apple II Plus, the Apple IIe, and the Apple III. It's fully compatible with the principal Apple operating systems—Apple DOS, Apple Pascal, Softech's Pascal, and CP/M. Full cursor movement through either escape or control sequences is provided for, as is the capability to change video display modes at will.

The Ultraterm's display capability is terrific. Besides the default standard 24-line-by-80-column display with seven-by-nine-dot character font, you can select 24 lines by 96 columns, 32 lines by 128 columns, 24 lines by 132 columns, or 48 lines by 80 columns. If that isn't enough, there's a special high-density display that produces a clean, solid character set. Inverse video is standard with the Ultraterm, as is a "soft switch" to sense automatically whether a forty- or eighty-column display is required and respond accordingly. The competition may have to turn to three-dimensional holograms to top this.

Despite its many convolutions of capability, the Ultraterm is remarkably simple to operate. It's slot-independent in newer Apples (requires slot 0 in older Apples) and installs in only a few minutes. To get it up and running, you simply PR# to its slot or call it from software, then choose the video format you want with a simple control sequence from DOS or CP/M. The Ultraterm defaults to a Videx Videoterm emulation mode, so most software that works with the Videoterm should work with the new Ultraterm.

The Ultraterm performs its magic in several ways. The amount of video information transmitted to the monitor is approximately 1.6 times that normally conveyed. In display modes of thirty-two or forty-eight lines a technique called interlacing—updating the screen characters at half the conventional scan rate—is employed. Because of the reduced scan rate, monitors with low-persistence phosphors may tend to flicker or shimmer. Videx recommends using monitors with a minimum bandwidth of fifteen megahertz such as the Apple Monitor III, NEC models JB-902M and JB-1201M, and Sanyo models VM4509 and VM4512.

The Ultraterm shines brightest in use with spreadsheets and word processors. Videx provides preboot software for using the Ultraterm with *VisiCalc* and will soon offer the same thing for *Apple Writer II*. Patches to configure *WordStar* for a 48-line-by-80-column display are given in the manual. Other compatibilities are expected to come from software publishers; Hayden has announced that *PIE Writer* will soon support a 24-line-by-128-column display with Ultraterm.

In this unique industry, you can't count a company out just because its main product has been made obsolete. With the true pioneer spirit, this industry's companies are more likely to develop whole new generations of applications. That's what Videx has done. WHH

Ultraterm, Videx (897 N.W. Grant Avenue, Corvallis, OR 97330; 503-758-0521). $379.

Zaxxon. By John Garcia. Here's a game that debuted in *Softalk*'s Top Thirty last month at number two. The game is popular, that much is certain. But how good is it?

Questions like this must always be taken in the proper context. Datasoft's *Zaxxon* is the official Apple version of the coin-operated game that hit the arcades about a year and a half ago. When *Zaxxon* walked in, we all fell to the floor in awe. Quarters lined up as former *Pac-Man* devotees stood tiptoe to see over the tall kids in front and catch a glimpse of this graphics wonder.

In those days, a lot of our Apples were still grabbing the gusto of *Beer Run* and munching down on *Taxman*. How far we've come.

Now *Zaxxon* is walking into our computer stores, and we're all falling to the floor in awe again. But for all the wrong reasons.

One of the reasons we buy computer games is to simulate arcade entertainment without having to wait in endless lines and plunk down a quarter for each play. But if you've taken a look at the arcades recently, the lines for *Zaxxon* have all but disappeared, with all the footprints leading to the newer blood.

But it doesn't matter. *Finally*, we have an official version of a coin-op game that really looks like the original. Jaded, but still the original.

For the benefit of those who have been out of the country, in pursuit of spiritual fulfillment, or otherwise out of touch with arcade reality, *Zaxxon* is the basic shoot-them-before-they-shoot-you game, but with a delicious look. The key to the game's success is its perspective. You see your space craft in a combined perspective from above, the side, and behind. Lay a book on a table a foot to your left and a foot in front of you and you'll have the *Zaxxon* perspective.

The scenery moves from the upper right-hand corner to the lower left-hand corner of your screen, and it moves toward you. You're shooting at planes, gun turrets, missiles, fuel tanks, and radars before you go off and do space battle with other ships. The only control you have of your space craft is vertical and horizontal. No speeding up, no slowing down.

Broken down to its basic elements, *Zaxxon* is very much like the meteor shower in *Sneakers*, *Autobahn* with guns, or even plain old *Space Invaders*. In other words, there are things coming at you; shoot them or die. Oh, there is somewhat of a point to all this: Eventually destroy a robot for no apparent reason other than because it wants to destroy you for no apparent reason.

On the lighter side of things, Datasoft's John Garcia deserves a hearty round of applause for a superb piece of programming. The graphics are an outstanding reproduction of the original's, simulating diagonal scrolling while many games are still trying to hurdle vertical and horizontal movement. The sound effects are used conservatively—agitating where they should be, but not obnoxiously so. If this game is any indication of talent, Garcia is a programmer to keep an eye on.

Zaxxon is a playable game once you get used to the perspective (although many times you'll make it well past a wall or missile, but your ship's exploding will indicate otherwise). It's selling like crazy and probably will continue to do so because it looks "cool," because the original was a tremendous success in its heyday, and because of its name. MTV

Zaxxon, by John Garcia, Datasoft (16606 Schoenborn Street, Sepulveda, CA 91348; 213-701-5161). $39.95.

Money Street. By Donald Hill and Robert Payne. About a year ago, Nevada ski enthusiast and businessman Robert Payne decided he needed a home financial program to balance his checking account and collect financial data in the process. He went through about six of the best known and gave up. He deemed programs rigid and unfriendly; and he didn't need the hassle. Payne took the matter in hand and collaborated with a professional programmer, Don Hill, to design a program that could be learned easily and set up quickly and that would "run friendly." He wanted a program that could work as well for small businesses as for households. And he wanted it to have standard commands and codes so that it could be used by different operators—a husband and wife, a boss and secretary—for an unlimited number of checking accounts.

The result is *Money Street*. It's a checkbook designed for everyone, from computer buffs itching to start and scared-stiff computerphobes to novices with their first checking accounts or CPAs. Aspects of home or personal money management that are handled include checks, charge cards, cash control, automated teller transactions, "checkless" bill-paying, and budgeting. You can split checks into two or more categories (such as to keep track of interest and principal for house payments).

A complete set of reports can be printed out in hard copy or reviewed on-screen. And you can print the contents of the screen at any time.

Money Street can print running totals of tax deductions, income, or tax credit items. With these, you can quickly estimate next year's taxes and take necessary action. A small business benefits by *Money Street*'s capacity to print year-to-date (and monthly) totals of sales, department expenses, and salaries.

All categories of entries are open to user definition, so you can choose which items to track. *Money Street* uses a program disk and a separate data disk for each checking acount and for each new year. You do need an optional, extra-cost utility disk to make copies of data disks; the extra disk also makes two backup copies of the program disk, among other abilities.

Setting up is simple and well prompted. For each data disk, you input the name of the checking account and the beginning balance. And you create a code dictionary comprised of up to one hundred number codes for credits and debits. The menu-driven program disk then shifts you to a facsimile of your checkbook. *Money Street* displays seventeen items per screen and can scroll for more; a running balance is always shown.

Perhaps the most distinctive feature of *Money Street* is the code dictionary, a screen-behind-the-screen data bank that appears instantly on command. Scrolling through the dictionary, you can see year-to-date totals of all entries: deposits, house interest payments, salaries, gasoline expenses, entertainment, and groceries, for example. Through the dictionary, you can set up subtotal groups of categories, keeping areas such as income in one section, tax-deductible debits in another, and nondeductibles in yet another.

Money Street makes use of whatever features your printer can handle. It can print reports in condensed, emphasized, double-width, italic, and bold typefaces. You can insert a top-of-the-form command at the end of each report, set line spacing, set carriage returns, and skip or observe perforations. Once entered, the setup holds until you choose to change it.

Money Street has some special features for real estate ownership. The program tracks rents, tallies repair costs, and helps establish cost bases for capital-gain tax treatment. It's also set up for trust accounting, small retail stores, and home budgeting.

For home users, professional offices, and small businesses, *Money Street* makes life simpler; isn't that what you bought your computer for? DC

Money Street, by Donald Hill and Robert Payne, Computer Tax Service (Box 7915, Incline Village, NV 89450; 702-832-1001). $99.95; optional utility disk, $25.

Jenny of the Prairie. By Elizabeth Stott and Lucy Ewell. *Jenny of the Prairie* is the first release in the series of Rhiannon Computer Games for Girls. Nearly ready to follow *Jenny* are *Chelsea of the South Seas*, *Cave Girl Clair*, and *Lauren of the Twenty-fifth Century*. The series is a totally new concept in software—games specifically designed with little girls in mind.

According to Rhiannon, almost all families purchasing a home computer have at least one daughter or granddaughter. Yet more boys play video games, go to computer camps, and learn Basic than girls. Rhiannon believes that computer hardware and software are subtly marketed toward males. (After all, didn't *Time* magazine name the computer the *man* of the year?)

The Rhiannon company is worried about the future of little girls if they don't get involved with computers like little boys—and about the future of a country that will need computer expertise from both sexes. Not surprisingly, Rhiannon was founded by two women, Elizabeth Stott, a counseling psychologist, and Lucy Ewell, a computer programmer. Ewell has two daughters and Stott has three sons. The friends noticed that the girls were not interested in the computer games the boys played. So Rhiannon decided to bridge the gap between girls and computers.

Jenny is the story of a plucky pioneer girl who gets separated from her wagon train family and must spend the winter by herself. She must avoid immediate dangers like rattlesnakes and packs of coyotes. She must also take care of her daily needs. After chopping down wood, Jenny takes a mirror out of her pocket and reflects the sun onto the logs. The flame on the fire dwindles when the fire needs tending. She finds tools on the trail: the hatchet to chop the wood and a fishing spear and slingshot for hunting.

Survival is a crucial theme in the game; Rhiannon wanted to present real-life situations. The player has to figure out logically how to survive with the limited resources at hand.

In that problem-solving capabilities are required through a group of interwoven tasks, *Jenny* is an adventure. But the game also requires the hand and eye coordination of an arcade—when Jenny aims her slingshot at the rabbits who hop about very fast or her spear at the fish who swim busily up the stream.

When Jenny lost the wagon train, she was wearing only a summer dress, so she must improvise some winter protection for survival. Probably the easiest way is to hunt the rabbits, but for players who cannot bear to make a coat out of the furry little creatures, Jenny instead can survive by chopping a great deal more firewood.

The game sometimes seems to move along very slowly, but Rhiannon reports that extensive field research, including field tests on a Brownie troop and several elementary classrooms (with both boys and girls), has shown that children like the time to explore the computer and the game.

Playing *Jenny* instills some basic computer skills, such as entering program commands and referring to documentation. There are no right answers to this game. Jenny explores apple orchards, fishing streams, berry patches, wheat fields, and a meadow in her quest for survival. Rhiannon has also programmed surprise extras into its games to reward experimentation and logical thinking about computers and the real world.

The graphics are purposely simple to encourage children to fill in the rest with imagination. Ever notice how a little girl can take a doll and play with it for hours? Girls can take Jenny, a sort of computer-age doll, into the simple landscape for their own imaginative adventures.

Rhiannon made the character of Jenny self-sufficient without making her a supergirl stereotype. She cannot defend herself against all the dangers (how many young children could?), so she has to run away from some of them. Jenny is smart—it's up to the computer user to get her away fast. If she doesn't get away fast enough . . . well, the game is over. This is supposed to be like real life.

And Jenny is very much a real child. If she forgets to pick up the fish after she catches it, she doesn't get the fish. A nice touch is the artist's rendition of Jenny on the package material: Her hair is messed up—just a little. Any little girl, having to run away from rattlesnakes and coyotes and chop logs and build fires and fight blizzards, is going to get her hair a bit messed up. Jenny is like a real girl.

Jenny has time for a few extra pleasures. If she's careful and approaches it very slowly, she can make friends with a wild fox. And, at the end of the game, when Jenny has all her provisions stored for the brutal

winter ahead and all the survival tasks completed, she can pick some flowers to decorate her shelter. There's a surprise for Jenny if she picks and carries twenty flowers back to her shelter.

The game was designed for girls ages seven through twelve. Younger players might need help reading the text, so family participation is encouraged. Older girls who have already played more advanced adventure games might find this one slightly tedious; but, as an introduction to computers and computer games, *Jenny of the Prairie* is super, and it's bound to be a catalyst for some female computer geniuses.

Three levels of play provide a variety of playing strategies and more intricacies to keep players interested while they become more computer-sophisticated. As they grow, so does their friend Jenny.

Jenny has a lot of choices. Thanks to Rhiannon, now little girls do too. MM

Jenny of the Prairie, by Elizabeth Stott and Lucy Ewell, Rhiannon Computer Games for Girls (3717 Titan Drive, Richmond, VA 23225). $34.95.

Super Speed Reading. By Art Carpet. Experiments in using the computer to increase reading speed have generated some good tricks, but the fact is that increasing your overall reading speed significantly and making it stick requires books. Not computer screens, but old-fashioned oak and pine pulp.

Super Speed Reading incorporates the best of the computer's capabilities to guide you and time you and help you read books fast—and magazines and newspapers and business reports and other paper products.

The program is based on methods developed by J. Carson Kovar during more than twenty-five years of teaching speed reading.

The method centers on using a device to help you move your eyes quickly down each page with as few stops as possible—at best none. Super super-speed readers merely flick their index fingers at the top corner of each page. But the first step is to quit reading word for word, to quit saying each word to yourself as you read. So this method first has you train your eye to stop only three times, then only two, per line and get your lips and throat to quit working.

Super Speed Reading takes good advantage of the computer to encourage you. First, the program presents the theories and methodology in an interesting and attractive way, full of interaction. Then it provides you with tools for keeping track of your progress and for timing yourself while you're working.

The best tool, though, might simply be the computer itself—and its nonjudgmental insistence that you continue reading. When the computer presents *Tom Sawyer* with a pacer to keep you reading, the pacer, a thin horizontal strip of paper drawn vertically down the page, won't wait for you to catch up. You set your pace and it relentlessly holds you to it.

The program suggests you warm up each day with five minutes of the computer text (yes, *Tom Sawyer*) and the computer pacer or pencil moving you along. Then it insists that you practice on real books of your choice. You can do that anywhere, reporting the results to the program, or you can let the computer time you. The program figures out your speed based on its own timing and your page reports.

Using the computer as a timer works beautifully. You enter the number of the page you begin on, set the timer, and read. The program is considerately designed to give you plenty of flexibility. Do you like to push yourself and get fast feedback? Set the program to buzz you every five minutes (or every minute) for input, and try to beat each five-minute time with another five-minute read. Would you rather read a good hunk in peace and quiet? Set the timer for an hour or more. You can opt for the metronome to tick as you read—you tell it the pace you expect to read at and it ticks at what should be two-line intervals. Or you can tell it to get lost.

When time's up, the program asks if you read for the entire time, so that if you've been interrupted and actually read for only ten of the fifteen minutes it was set for, you haven't lost the entire session. Then it asks how many pages and how many lines beyond that you've read. Immediately upon receiving your answers, it responds with your reading speed in words per minute for that sesssion.

The idea is to save the results of that and other sessions so that you can see a record of your improvement. You can see it in bar chart form if you like, just for the asking, or in a simple record.

When you become fast enough and proficient enough, you can go back to the teaching disk to learn even more esoteric means of superspeeding. It's possible, they say, to read and comprehend a novel in the time it takes to turn the pages.

Super Speed Reading comes in a high-quality suedelike binder, with a manual that appears, from the first few pages, to be excellent. But who wants to read manuals? (Maybe after you finish the course. . . .) Besides, you don't need to. You can boot up this program and delve into your study and practice; the disks are self-prompting and their content is exquisitely clear and logically organized.

For most of us, learning to speed-read is something we'd like to have done but never quite have the time to do. *Super Speed Reading* brings the professional process home; and, because it's so well done, it behaves a lot like a spoonful of sugar. MCT

Super Speed Reading, by Art Carpet, Magnum (21115 Devonshire Street, Suite 337, Chatsworth, CA 91311; 213-700-0510). $149.

I.Q. Baseball. By M. Carasik. Baseball trivia games have been marketed before, but none has been lavished with as much detail as *I.Q. Baseball*. The game begins with a hi-res flag waving while the national anthem plays. If that doesn't get you into the baseball mood, wait till you hear the crowd noise and the sounds of vendors hawking hot dogs and popcorn.

The game can be played as competition between two people or against the computer. When it's your team's turn at bat, the pitcher pitches the ball, then the game freezes while a multiple-choice question appears. If you answer correctly, the batter runs the bases. Easy questions earn singles; harder questions rate doubles and triples. Answering a really tough question scores a home run—with much fanfare. When the batter rounds home plate, a teammate runs out from the dugout and gives you a "high five" congratulation. Missing a question is an automatic out.

When the computer's at bat, your pitches bring questions to you. If you can answer them, the computer strikes out; otherwise, the computer gets a hit. The computer's line-up is a lot tougher than yours, with stronger hitters. When a computer batter hits, he often scores a triple or home run. Beating the computer can be quite a challenge.

The play of the game follows normal baseball rules, but Davka has added some clever realistic touches. Occasionally, an apparent base hit is caught by a figure who runs into the infield and snags it, while the computer says, "I wuz robbed!" If you get really hot in an inning, organ music pipes up to cheer your drive on. Get too many runs and the computer pulls its pitcher and sends in relief! Randomly, the game may even be called for rain, which pours down on the field.

While all these touches make the game delightful, it's the trivia questions that give it its great playability. These questions are tough! Fortunately, there are two skill levels—designated minor and major leagues—but all questions deal with regular season baseball in the National and American leagues, spanning the entire history of baseball.

I.Q. Baseball doesn't end with the baseball season, and enjoying it doesn't have to end when you become too familiar with its large selection of questions. Davka plans twenty-seven disks of supplemental questions, each to be devoted to trivia questions about a specific team. And it plans a special comprehensive World Series disk of even more challenging questions. *I.Q. Baseball* will do much to lessen those winter withdrawal symptoms till spring training. RRA

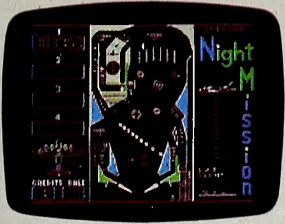
I.Q. Baseball, by M. Carasik, Davka Corporation (845 North Michigan Avenue, Chicago, IL 60611; 800-621-8227). $24.95; supplemental disks, $14.95 each.

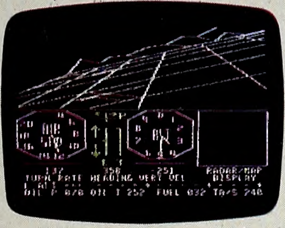
French Hangman, Latin Hangman, Spanish Hangman. By George Earl. *Softalk* has been remiss in not making you aware of George Earl's educational hangmen before. French and Spanish have been available for some time.

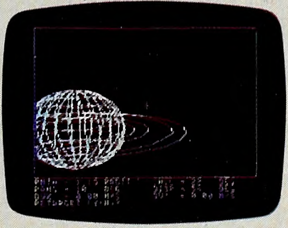
Latin Hangman is a brand-new, and, for anyone fortunate enough to live in a community that still recognizes the classical languages and smart enough to take advantage of it, it's a marvelous tool. No better than the romantic hangmen—only much more unexpected.

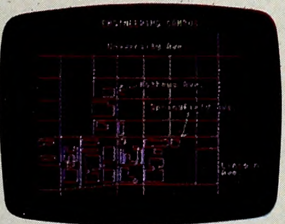
George Earl's hangmen play the traditional game, except that they tell you right out what's to go in the blanks—in another language. *C'est une bagatelle mais je vous l'offre avec amour* is what you're to put in __ __ __ _______ ___ _ ____ __ __ ___ ____ ____.

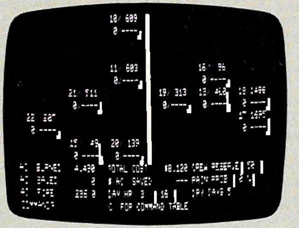
How about filling in ________ __ __ ___________

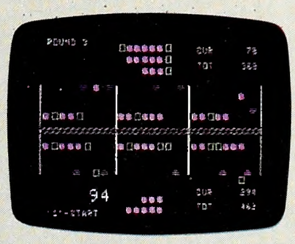












"NIGHT MISSION" PINBALL by Bruce Artwick

"...a classic—*the* arcade pinball game. It's the new state of the art against which all the others must be measured." *Electronic Fun*, April '83; "...an exceptionally impressive simulation..." *Creative Computing*, August '82; "fantastic..." *Softalk*, May '82; "...a programmer's tour de force, asserting Artwick's claim as a master code manipulator." *Softline*, May '82. Best Computer Audio/Visual Effects, *Electronic Games*, 1983 Arcade Awards, Jan. '83. Available for the Apple II ($34.95 disk), Atari 400/800 ($29.95 disk or cassette), and IBM PC ($39.95 disk).

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This program has received widespread critical acclaim for its educationally sound approach to the development of improved spelling skills. **Whole Brain Spelling** uses the graphic color capabilities of the Apple II to provide positive user feedback and to emphasize visual aspects of the learning process. Available in six categories: **General** (ages 8-adult), **A Child's Garden of Words** (preschool-8), **Fairy Tale**, **Medical**, **Scientific**, and **Secretarial**. For the Apple II ($34.95 disk).

FOREST FIRE DISPATCHER

A realistic simulation that places you in charge of a forest district in southeastern Kentucky. Your objective is to save the maximum possible acreage from fire at the least possible cost. Many variables make for a complex, thoroughly enjoyable strategy game. For the TRS-80 Model I and Model III ($24.95 cassette, $29.95 on disk).

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An economic-defense simulation for strategy game enthusiasts. You have been given absolute ruling power over one country on the continent of Zendar for a period of ten years. You must allocate aid and resources, annex other countries, make trade agreements, and defend your borders from enemy attack. Many variables make for an infinite variety of strategic possibilities. For the Apple II and Atari 400/800 ($29.95 disk).

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An arcade-strategy original with fast action hi-res graphics. You, as county sheriff, dispatch your patrol cars to surround and capture a fleeing bank robber. Since his getaway car is faster than your pursuit vehicles, you'll have to think ahead and develop an envelopment strategy if you want to keep your job (and improve your score). For the Apple II ($29.95 disk).

FRONTLINE

A fast-paced battle of wits and strategy for one or two players. Enemy forces are trying to break through one of your frontline sectors; defend them with the troops, tanks, and planes at your command. Then press your attack and attempt to penetrate the enemy line. **Frontline** requires quick offensive and defensive tactical maneuvering. For the Apple II ($29.95 disk).

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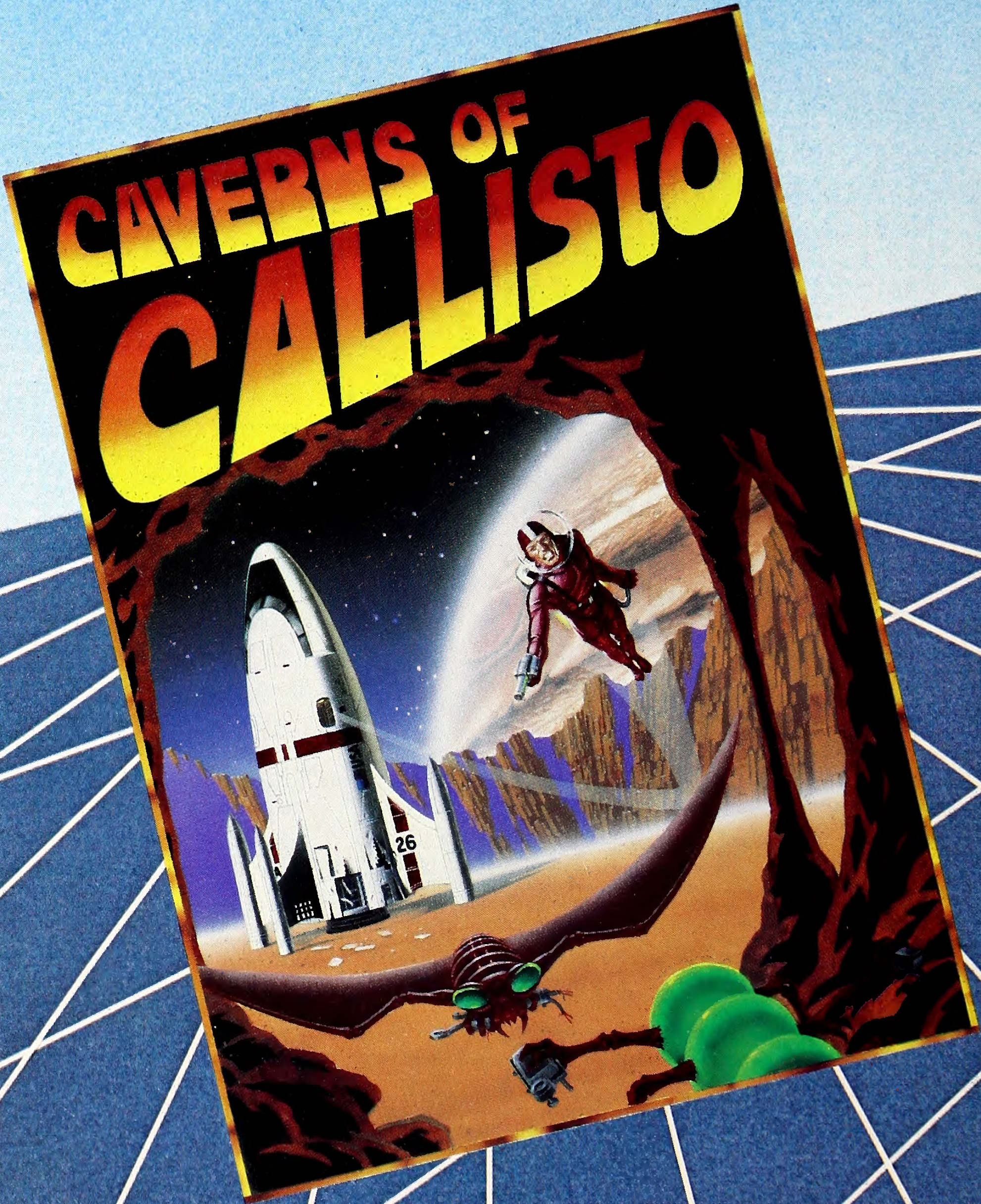
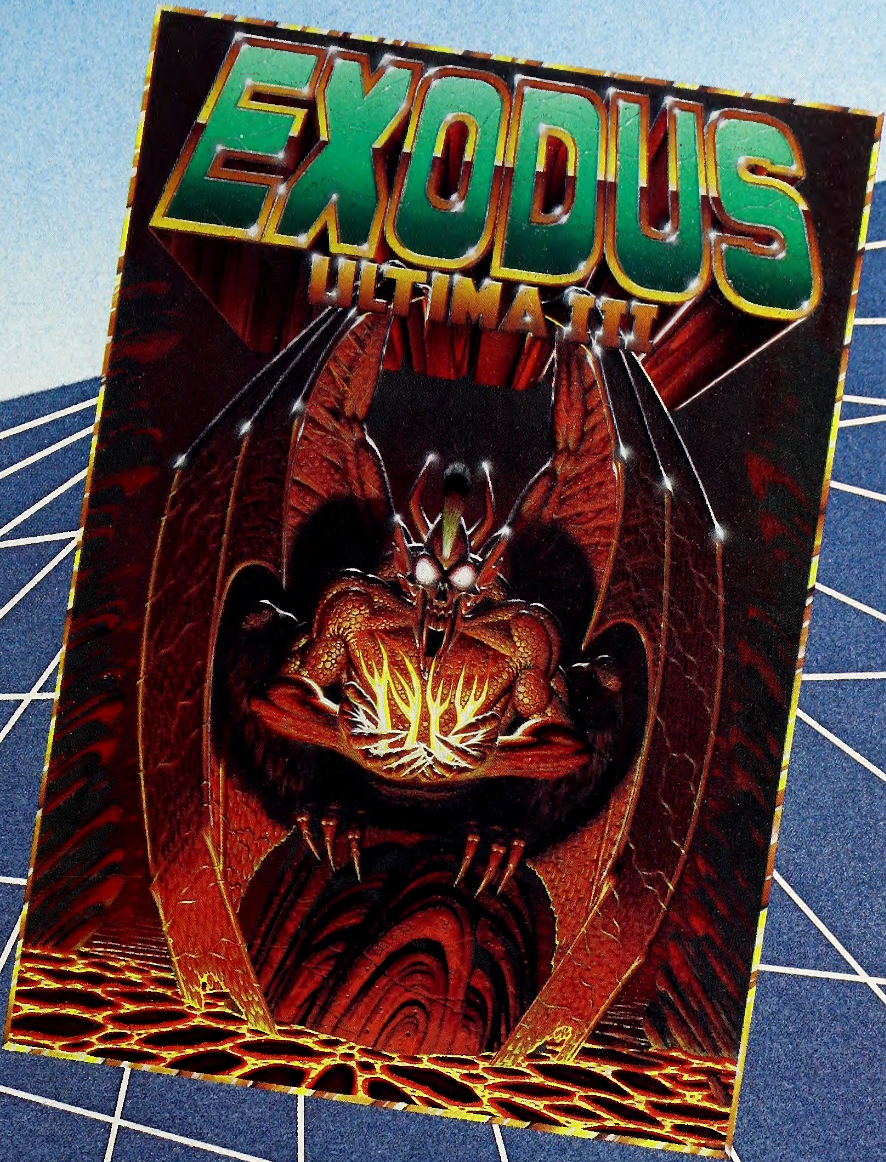


The first fast-action arcade adventure, CAVERNS OF CALLISTO allows you to assault the treacherous depths of an alien moon while evading a menagerie of menacing monsters. Created and programmed by Chuckles , author of LafPak, Lunar Leepers, and Jawbreaker, CAVERNS OF CALLISTO brings a new thrill to arcade gaming.

CAVERNS OF CALLISTO $34.95


EXODUS
ULTIMA III

__ _____ with *Calamitas virtutis occasio est.* Hmmm.

Come back, all you French and Latin students of five or fifty years ago. Well, did you solve those two? Don't feel bad. George Earl's hangmen are terrific for students, but there's a whole league of closet users who just think they're a ton of fun. See, the programs work just like hangman. You guess letters. So, when *jeune fille* is so familiar but just beyond that little twist in memory, put a couple of letters in and you've got it! Such a memory. If you become a closet addict too, don't tell anyone, just enjoy.

The fact is, you can learn or relearn a lot about languages from these packages. There are sections to study the vocabulary and syntax before you play the game. (Closet addicts never look at these first. They take their memory trials straight.) They're well done, and using the computer to learn them really is the spoonful of sugar that makes the medicine of learning go down.

But the games are the neat part. You can choose from among several configurations, or do them one after another: vocabulary (individual words), English to other language, other language to English; sentences (the whole ball game!), English to other language, other language to English. There are also several levels of configuration.

Incredibly, the sentences and words are interesting. There's little of "The pen of my aunt is on the table" (in French, please?) or "The boy is a soldier from Gaul" (Latin scholars, groan in unison). Instead, try these:

La solitude est a l'esprit ce que la diete est au corps.
Es feo, por otro lado, es rico.
Non semper facilem habet felicitas aurem.
J'ai mal a la tete. Ou sont les cachets d'aspirines?
Me hace dano la comida picante.
In cavea minus bene canit luscinia.
Regardez-vous la television pendant que vous etudiez?
Tiene su blusa puesta al reves.
In vino, in ira, in puero semper est veritas.

In the French and Latin games, the words to be translated and the letters you type in are in big, bold, pleasing hi-res type, complete with appropriate accent marks. All the games keep an on-screen record of your percentage of accuracy for that round. (Closet players: ignore it.)

The wonderful thing is that when you get done with the disk, you've learned a whole lot of another language. Child or adult, it's the same. Combining these very well done programs with a language class would seem an unbeatable move. MCT

French Hangman, Spanish Hangman, Latin Hangman, by George Earl (1302 South General McMullan, San Antonio, TX 78237; 512-434-3681). $29.95 each.

Space Station Zulu. By Dennis Shields. Avalon Hill's latest is a good example of a perfectly acceptable game being overshadowed by a superior predecessor. That's not unusual—except that in this case both games are recent releases from the same company.

Like its forerunner, *Space Station Zulu* is a tactical combat game in which players defend their home against carnivorous aliens. The protagonists are a peace-loving race called Yargs and live in an orbiting space station. There, life is cozy for the eleven active crew members and the thirty-two in a cryogenic sleep, until the day an alarm sounds. Investigation leads to awful discovery. Apparently, an exploring party brought back a stowaway alien life form that slips out and begins infesting the ship. That's bad news, but worse yet, the stowaway likes the taste of Yargs! You are the station commander and must organize your sleepy crew to become a tough fighting force before the aliens eat you for dinner.

If the scenario of *Space Station Zulu* sounds vaguely familiar it comes as no surprise. There was once a vaguely similar movie. In addition, Avalon Hill's own recently released *The Alien* bears more than a passing likeness. Unfortunately for *Zulu*, the comparison is not a favorable one. In *The Alien*, the characters all had their own unique personalities and capabilities, but in *Zulu* they are a bland, homogenous bunch. Only one new character type is introduced, Mr. T-like robots who are more than a match for adult aliens.

The aliens have reproduction on their side, however. In youth, they appear as spores, which can be stamped out by stomping on them; in adolescence, they appear as larvae and become harder to kill; and as adults, they become semi-intelligent and more dangerous yet. When not eating crew members, the adults occupy themselves by spreading spores.

Game play consists of strategically positioning your robots and Yarg crew members where they can best combat the aliens. The player may move, retreat, search a room, defend himself, or attack using his choice of weapons and battle strategy. Of course the optimum strategy is to catch the invaders as weak spores and prevent their adulthood.

Successful weapon deployment is also crucial to winning. Weapons are scattered about the ship and each has a different effect on the monsters. Some weapons do damage, some do nothing, and a few actually cause the monsters to grow! Because weapon effectiveness is randomly determined at the start of each game, players never know the effect of a particular weapon until they use it. One weapon, however, always works. Robots set to self-destruct will destroy everything in the same room, but their loss may hinder future play.

In *Zulu*, there are three levels of play: normal, difficult, and little hope. Unlike the movie, no escape pod exists for when things get rough. Victory is determined solely by the elimination of one species.

Although not a bad game, *Zulu* suffers because it isn't as exciting or playable as its older sibling, *The Alien.* In addition, the game's well-meant comic elements never seem completely appropriate. *Space Station Zulu* would serve best as a training ground for people trying their first computer simulation. Students of strategy could learn techniques and enjoy themselves simultaneously. It's just too bad, though, that Avalon Hill had to sabotage this decent entry with too many variations on the same theme. WHH

Space Station Zulu, by Dennis Shields, Avalon Hill (4517 Harford Road, Baltimore, MD 21214; 301-254-5300). $25.

Prime Plotter. By Eli Argon. *Prime Plotter* is serious about creating fine graphs, charts, and graphic demonstrations. Not only can it draw line, bar, and pie charts, but it can combine these with text and drawings to present slide-show-like ongoing displays, and it can intermix text, drawings, and graphs on one page for display via screen, printer, or color plotter.

There's a menu-driven system of modules for almost every conceivable need. Just in case your need is inconceivable, a module can be written for a specific task and added to the system. Flexibility is the hall-

mark of this package: Just about every parameter is user-definable. Quite a variety of effects can be achieved merely by selecting different modules or altering various parameters.

Once you've entered data to be plotted, more sets of data can be created through mathematical and statistical formulas or from subsets of other sets. Then, when you've selected modules and set parameters to establish the kind of graph you want, you can place labels and any other information, even pictures, on or around the graph. Another graph can be drawn on a fresh screen, superimposed on the old graph, or even drawn in a corner of the screen.

If anything turns out wrong, you can change it. Everything is flexible.

At the core of the system is a program that keeps track of (and saves) all your selections; you can review what you've done and remove from, add to, or change it. With this feature, you can create records of several graphs and have the computer replay the instructions within a demonstration program—also provided—that re-creates and displays screen after screen. You could work up a demonstration with text, drawings, and graphs to depict Northeast sales, for example, and run it at a board meeting or as a perpetual promotional display.

Prime Plotter doubles as a general graphics tool. There are modules for drawing with lines or with Applesoft shape tables. In the package are several character sets and shape tables of figures and even of electrical components. Of course, you can add other shape tables—flexibility, right?—or create new character sets. Still other modules interface with DIF files, graphic printer cards, and plotters.

Often, only the author and a dedicated few can run packages of this scope. But *Prime Plotter*'s menus are fairly easy to grasp and impossible to crash, and help is available within the program. The extensive manual is well written, describing quite clearly every phase of the program.

However, *Prime Plotter* is definitely a tool and not a toy. You can fiddle around with graphs and pictures after only fifteen minutes, but familiarity comes only with significant use. *Prime Plotter* is a carefully conceived, well-executed package for business or scientific applications that can benefit from its great power. AEDC

Prime Plotter, by Eli Argon, PrimeSoft Corporation (Box 40, Cabin John, MD 20818; 301-229-4229). $240. Plotter interfaces, $60 to $75.

Apple Cider Spider. By Ivan Strand. Has anyone noticed that a new category of computer games has lately sprung up? Yes, the industrial arcade game has become the wave of the future. Lately, these labor-intensive little wonders have been dragging us around mines, construction sites, and the like. Now it's time for the grand tour of the most unsanitary bottling facility in existence.

You, in the role of the title arachnid, are not the least part of this dubious distinction. As you wend your way up to the cider factory attic, you must dodge random frogs, thrushes, and hang-gliding wasps. While apples are plunking down chutes, getting cored, pared, diced, juiced, and bottled, you are hopping nimbly amongst the conveyor belts, making use of convenient prehung webs dangling from strategic places to make your way to the top of each screen.

The mechanical layout of each stage of cider production is satisfyingly arcane. The trick is in the precision of your jumping and familiarity with the layout of each screen. Sometimes you can just come close to a web and the program will patiently jerk you back and firmly place you on it before you can sail off into oblivion; other times you can be called out for so much as grazing your antennas on the ceiling.

The beginning titles and end sequences open up new horizons of Cute in computer gaming.

Nevertheless, it will be tough for *Apple Cider* to compete with its hard-hatted, '49-mining, lode-running competition for two reasons. To begin with, it has three (3) screens. This is no sin. A game with three really good, challenging game screens with a wealth of strategic possibilities beats a game with several dozen mediocre ones. Unfortunately, the path through the industrial maze of each of the *Cider* scenarios is preset. In each case, there is only one way to go. Try a different path and you will suddenly start overshooting your jumps for no apparent reason, and seemingly solid footing will become inexplicably intangible. And while getting there is much easier seen than done, there's not much point in doing it twice.

So what we have here is a nonviolent (save for observance of the laws of nature and gravity), conscientiously charming, well-programmed little game, designed in such a way as to limit its potential for repeat play as much as possible. AC

Apple Cider Spider, by Ivan Strand, Sierra On-Line (Sierra On-Line Building, Coarsegold, CA 93614; 209-683-6858). $33.33.

VIS\Bridge/SORT. One of *VisiCalc*'s major weaknesses is its inability to sort data. *VIS\Bridge/SORT* is a utility that allows you to sort either rows or columns of a *VisiCalc* template. Your template must be complete; then you must set it up to be sorted. This involves entering special codes that allow *VIS\Bridge/SORT* to determine which columns or rows to sort. You can even set up a secondary sort priority. You then save a DIF version of the file, quit *VisiCalc*, and run *VIS\Bridge/SORT*. The program uses a simple menu from which you determine the file that's to be sorted and whether it's to be sorted by row or by column. *VIS\Bridge/SORT* is a useful addition to a *VisiCalc* library. JS

VIS\Bridge/SORT, Solutions (Box 989, Montpelier, VT 05602). $89.

Death in the Caribbean. By Philip and Bob Hess.

Fifteen men on a dead man's chest
Yo-ho-ho and a bottle of rum!
Drink and the Devil had done for the rest
Yo-ho-ho and a bottle of rum!
—Robert Louis Stevenson

Ahoy mates! There's pirate treasure, death, and danger aplenty in Micro Fun's latest—a challenging graphic quest so well drawn you can practically feel the dense heat.

Setting out in the tropical morning with a yellowed map, the adventurer can accumulate clues and objects with ease—the solution seems within a baby's reach. However, as the day wears on, the barometer soars and the challenges increase. First you realize that some of your easily won possessions are being spirited away by a light-fingered ghost. Discovering the location of his cache is just one in a series of puzzles that make this adventure worthwhile.

Next, the adventurer must reason his way past man-eating ants, quicksand, a zombie, fog, and enough red herrings for a public fish fry. And then there's the Maze. That's maze with a capital M. With the maze containing more than twenty-five turns, only a careful mapper will be able to find the exit.

With maze navigated, the pressure is on. The three crucial maneuvers of the game take imagination, a punster's mind, and a feel for the offbeat. This may leave strict disciples of logic feeling disappointed or even angered by the solution—and others may be frustrated by the two-word parser that can leave users playing word games. However, the adventure conceived by the brothers Hess is a good one and the graphics by Barbara P. Lawrence are lush and lovely, a gourmet's delight.

So, mop your brow, ye brave adventurer, and take a voyage into the heat. You'll find it dangerous, frustrating, and fun. But ye wouldn't be leaving old Blind Pew behind, would ye, boys? Not old Pew! No!! Come back, boys! Come ba— CP

Death in the Caribbean, by Philip and Bob Hess, Micro Fun, Micro Lab (2699 Skokie Valley Road, Highland Park, IL 60035; 312-433-7550). $35.

Compuquote. *Compuquote* is a program that is less interesting for what it does than for how it does it. But since it isn't going to sell on the merits of its input system alone, we can't ignore its purpose entirely. So let's get on with it.

Compuquote is a cost estimation system for retail operations that provide materials and services. Meaning simply that when you go to get your car repaired and ask how much it's going to set you back, they say, "Let's see. You're gonna need a new alternator, new calibrator, new double interlocking framistan jobber, total parts $245 (plus 10 percent for markup), take about three hours to put all that stuff in, about $60, and towing from the corner was $25 (you're lucky we didn't have to tow you from the other side of town), so that'll be about $330, plus 5 percent for the governor."

Compuquote does that on the computer. It keeps a list of all the parts on hand and their prices, plus hourly rates for any kinds of services you might have available. So to produce a stunningly accurate, fast, and neat price quote that the customer will look at and say, "Oh my god," all you have to do is go in, select a few items, estimate a few hours of service, tell it to print, and there it is, fully itemized, complete with a dotted line to sign on. The sample data files on the disk are written for a fictitious computer store, but the play's the same no matter who the actors are: "Let's see. You're gonna need a new disk controller, some new RAM chips, and a new double interlocking framistan jobber IIe. . . ."

Several additional options enhance the package. An item can have as many as five different per-unit prices. This is useful, perhaps even necessary, for wholesale operations. The quote can have a message stating how long it applies printed at the top and a comment of your choice printed at the bottom. Sales taxes and shipping charges are provided for too, of course. There are even options for arbitrary markups or discounts for least and most favorite customers.

By now the suspense is killing you, isn't it? Just what is so special about how *Compuquote* works? It comes with a light pen. Not an ultrasensitive, highly expensive light pen like you'd use for graphics, but a fairly cheap, lightweight, easy to install light pen. Just enough for the job at hand.

The job at hand is selecting almost everything in *Compuquote*: items, markups, taxes, services, printing, saving, the works. Each item will have a white, cursor-shaped block next to it. When the pen detects that it is pointed at a block, all the blocks on the screen blink in sequence, fairly quickly. When the pen sees a light blink, it knows which cursor it's pointed at. The only things that need to be typed are the original price lists, file names, quantities, percentages, and that sort of thing.

This method, when it works, can be as easy to use as Lisa's mouse. It's not without its drawbacks, however. Long persistence monitors, like Apple's Monitor III, tend to confuse light pens because the screen doesn't blink properly. *Compuquote* provides for this with a slower flashing rate, but the Monitor III still has trouble unless the brightness is turned uncomfortably high. If the light pen doesn't work right, there is no keyboard backup for any of its functions.

Overall, *Compuquote* is well conceived. Its creators seem to have covered most of the necessities of cost estimation. It seems a shame that the program doesn't also do actual invoices; the procedures would seem to differ only a little. The light pen approach provides much of the advantage of a touch-sensitive screen at a fraction of the expense. DD

Compuquote, Peripheral Visions (5285 N.E. Elam Young Parkway, Suite B500, Hillsboro, OR 97123; 503-640-1317). $275.

North Atlantic '86. By Gary Grigsby. It's 1986, and the war in Europe is over. Russia has won.

That bleak scenario is the opening for this operational level simulation depicting a Soviet versus NATO air, land, and naval battle. The prize is the North Atlantic and the significance is that this campaign is virtually the West's last hope.

Like Gary Grigsby's previous games, *Guadalcanal* and *Bomb Alley*, this gigantic scenario is not based upon a war past, but one that we hope will never occur: World War III.

The Soviet Union's attack floored the allies because it was carried out under the cover of Warsaw Pact maneuvers. Overnight, Germany was overrun, France declared neutrality, and the British and American armies were forced to evacuate to Great Britain. Meanwhile, operating from their newly acquired bases in Germany and Norway, the Soviet Union is preparing to strike again. NATO must struggle to run convoys through the Soviet air and naval blockade before Britain is starved into submission. In addition, the strategic Faeroe Islands and Iceland must be defended. If they fall, NATO must retake them at all costs.

In *North Atlantic '86*, naval task forces are formed and deployed to project military power. Task forces may engage in combat patrol, sea line interdiction, and land bombardment. They can also supply and transport troops and can evacuate troops if the situation becomes hopeless.

So detailed is *North Atlantic '86* that every contemporary weapons system—ship, plane, and infantry company—available to the Soviet Union and NATO is included. Planes include the F15 Eagle, Harrier jump jet, C141 Starlifter, MIG 23 Backfire bomber, and CUB transport. Naval vessels range from the large American nuclear carriers *Nimitz* and *Kennedy*, battleships *Iowa* and *New Jersey*, to the new American and Soviet nuclear guided missile cruisers *California* and *Kirov*. In addition, a full complement of destroyers, submarines, and cargo ships rounds out the roster. The attention to detail is amazing, with actual real-life ships included by name and rated for combat capability, range, and firepower. These powerful forces are all armed with the latest in smart weaponry, including antiaircraft and air-to-air missiles such as the American Sidewinder and Soviet Atol. Even the deadly ship-killers first seen in the Falklands war—the *American Harpoon*, *Soviet Styx*, and the *Exocet*—are present. *North Atlantic '86* is a chilling, plausible simulation of war in the all-too-near future.

The gaming system includes two full campaign games and two mini games for those not prepared to make a career of *North Atlantic '86*. After all, the main campaign takes more than one hundred hours to complete. Needless to say, each game turn players may save a game in progress.

During play, each game turn represents twelve hours, during which the player may build task forces, launch missiles and air squadrons, attack targets, and, at last, resolve combat. For all its incredible complexity and detail, Grigsby's game system is remarkably easy to learn and play.

Graphics are similar to S.S.I.'s previous *Guadalcanal* and *Bomb Alley* and include a low-res color display of the North Atlantic basin and a large grid depicting Great Britain, Norway, Western Europe, the Faeroe Islands, and Iceland.

Play may be carried out on four difficulty levels and with either one or two players. In solitaire mode, the human always commands NATO, but rest assured, comrade, the computer opponent is plenty tough.

The documentation is full, clear, and complete. One can only admire the level of research that went into this simulation.

North Atlanic '86 is a superb simulation of a future NATO/Soviet conflict with a unique setting and background. The described Soviet vic-

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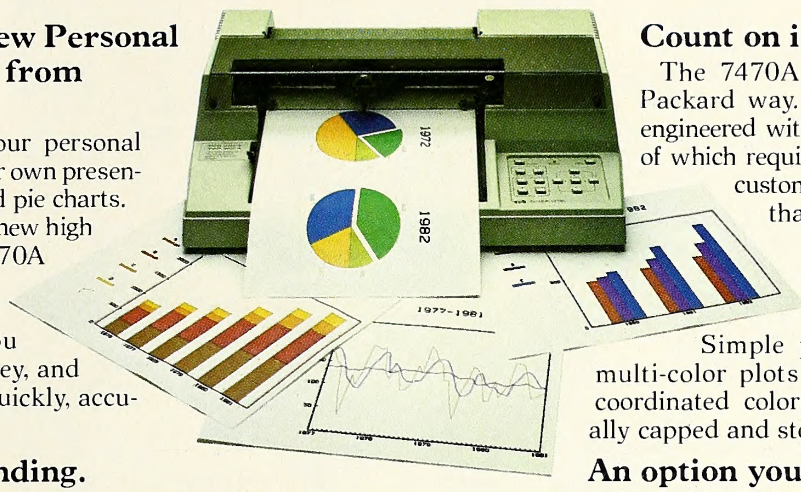

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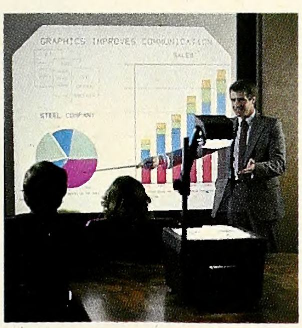

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tory in Europe and the ongoing conventional war of attrition actually mirror some contemporary strategic thinking. What this highly detailed yet playable game offers is a rare insight into the strategic implications of modern warfare as shaped by the new high-tech weaponry. WHH

North Atlantic '86, by Gary Grigsby, Strategic Simulations (883 Stierlin Road, Suite A-200, Mountain View, CA 94043; 800-227-1617). $59.95.

Speed Reader II. By Janice G. Davidson and Richard K. Eckert, Jr. From the people who gave you *Math Blaster* and *Word Attack*, two excellent game-style teaching programs for children, comes a program for adults—or, more precisely, for readers of any age. This program is very different from the earlier ones, but it has two characteristics in common with them: elegant simplicity and teaching power.

Speed Reader II is based on the fact that most people use the wrong set of habits to read with. Back when we were first learning to read, we had to examine each new word in a sentence, one at a time; so we got into the habit of reading that way and never changed it. This program consists of a set of exercises designed to help us change those habits.

The problem (in simplified terms) is this: Your eyes have to be locked on to something—the technical term is *fixated*—before they can send detailed information to your brain. Thus the normal operating pattern of the eyes is to fixate on something, send a picture to the brain, and then move to fixate on something else.

This cycle of eye activities—stop on a target, sharpen the focus, send a picture to the brain, move to the next target—takes time. The more often you have to repeat the cycle in reading a sentence, the more time it will take you to read that sentence; thus, the slower your reading speed will be.

The answer is obvious: If you can train your eyes (and your brain) to take in more words on each stop, you won't have to make so many stops in reading the sentence. That means you spend less time on each sentence; in other words, you read faster.

And there is (sometimes) a rather surprising side effect: improved comprehension. You might think that reading faster means reading less carefully and that understanding suffers; but, in fact, the reverse is true. When this program was being tested, it produced speed increases to at least double the student's previous speed, with no loss in comprehension; and sometimes comprehension improved along with speed.

The program has three types of exercises to change your eye-movement habits. You start by improving your peripheral vision, learning to take in more at a glance. The program shows you larger and larger groups of letters (later, of words) for shorter and shorter periods of time, until you can take in four words widely separated across the screen in a fraction of a second.

Next, you learn to read in groups of words, instead of single words. This is done with a narrow vertical column of text, two or three words wide: The task is to train your eyes to take in each line in a single glance (technically, with a single fixation). You've mastered this when you can read the column by moving your eyes straight down the screen, without going from side to side at all.

Finally, there is an exercise that teaches you to read normal text in groups of words, rather than word by word. You learn to swing your eyes back and forth across the page, making two stops on each line.

In addition to the exercises, the program includes a number of practice passages of normal text with variable scan rate and other features to help you reshape your eye-movement habits and several reading speed and comprehension tests, which you can use to measure your progress.

The process is not effortless, of course. It always takes effort to change your own habits, and the older they are the harder it is. But this program focuses that effort very sharply (that's where the "elegant simplicity" comes in; no wasted motions). It will show you distinct improvements after very little work. Of course, you have to keep practicing or the old habits will reassert themselves.

The package includes extensive support material. On the pedagogical side, there is a complete lesson plan, student record sheets, and a detailed explanation of the principles on which the program is based. On the programming side, there's a software editor (with an excellent tutorial) to enable you to add text material of your own choosing (new lessons, quizzes, and so on) to the program.

In short, this program is a well-designed tool for a specific purpose. It is friendly to both student and teacher and it teaches effectively; you can watch yourself getting better, which is a great motivation to keep practicing. If you need to improve someone's reading speed, or if you're looking for a game to play against yourself, with useful side effects, check this one out. JR

Speed Reader II, by Janice G. Davidson and Richard K. Eckert, Jr., Davidson & Associates (6069 Groveoak Place, Suite 12, Rancho Palos Verdes, CA 90274). $69.95.

The Assembler and **MacroSoft.** By Alan Floeter and Valerie Floeter. Have you ever wished for a machine language assembler that could understand Basic? Have you ever wished that there were a halfway step between Basic's slow but familiar operation and the high-speed gibberish of assembly language programming?

The folks at MicroSparc have two items directed at just those needs: *The Assembler* and *MacroSoft*. The two packages complement one another. *MacroSoft* is a library of routines that, when used with *The Assembler*, allow you to generate machine language code from familiar Basic-like commands.

The Assembler is a reasonably good assembly language tool in its own right. It includes a flexible, line-based editor, complete with commands to move or copy code from one place to another, search for and replace strings, and edit lines. The line-editing command allows you to clean up almost any mistake without having to retype the whole line. You can even control the speed of the screen's scrolling with paddle 0, a handy capability if you find yourself unable to read as fast as the Apple can print.

The editing features of *The Assembler* aside, its main strength is its ability to handle macros. Macros are prewritten routines that are inserted into the object code at assembly time in place of macro labels. Macros allow you to place assembly language routines in assembly language programs as single commands followed by their parameters. The macro definition tells the assembler what parameters to expect and what to do with them. A library of macro routines can reside on disk and automatically read into memory at assembly time. You could have a library of string-handling commands, a library of mathematical functions, and a library of graphics routines that you could then use

Currently there are four software packages in the family: PFS:WRITE, PFS:FILE, PFS:REPORT and PFS: GRAPH, with more on the way. Here's a little more about each of them.

PFS:WRITE. The simplest way to get your message across.

PFS:WRITE is ideal for people who want to make their writing time more productive. It displays what you write on your computer screen so you can make revisions as you compose.

With WRITE, you can correct misspellings or substitute one portion of text for another, with just a few keystrokes.

And when you're through revising, WRITE shows you "on-screen" just how your document will look when it's printed. So there are no surprises afterwards.

WRITE also works with most popular software programs, including the PFS Family of Software.

This feature allows you to add names and addresses from mailing lists to generate form letters. Or combine columns of numbers or graphs with your text.

PFS:FILE. The simplest way to get organized.

FILE is basically a paper filing system without the paper. So you can record, file, retrieve and review information in a fraction of the time it takes with a conventional filing system.

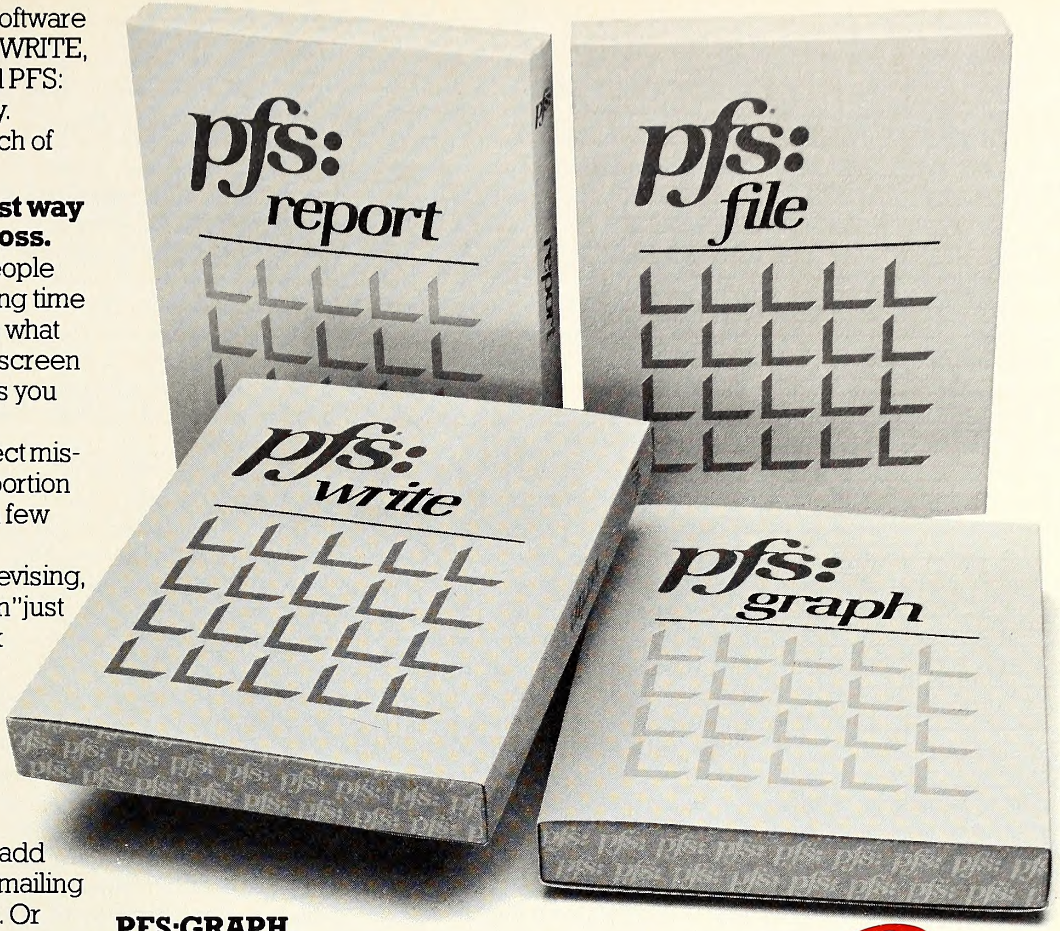
With FILE, you arrange your information on a "form" you design yourself. And when you need to track something down, FILE sorts through your records electronically. It lets you retrieve information in a variety of ways so you can be as selective as you want.

PFS:REPORT. The simplest way to sum it all up.

REPORT is a powerful analysis tool that works with FILE.

REPORT sorts through your files and retrieves the information you're looking for. Then assembles it all into one report, so you can analyze, plan and make better-informed decisions.

REPORT is also good at math. It quickly sorts through columns of numbers and performs calculations, so you won't have to.



PFS:GRAPH. The simplest way to spot trends.

GRAPH is ideally suited for professionals who need charts or graphs in a hurry.

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GRAPH transforms columns of facts and figures into pie, line and bar charts so you can spot trends quickly and make better-informed decisions.

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in your assembly language programs.

You could even have a library of Applesoft commands, which is exactly what *MacroSoft* is. Many assemblers handle macros, and a few come with libraries of macro routines, but the combination of *MacroSoft* and *The Assembler* is the first system designed to act as a complete high-level language. And it is executed and documented well enough to pull it off. Almost all the Applesoft commands are mimicked by the *MacroSoft* library. Most of the macros are in effect no more than subroutine calls to the correct locations in Applesoft ROM. This allows you to write with familiar functions and commands and, after assembly, have ready-to-run machine code. More or less preinterrupted Applesoft.

Of course, this is not the end of your search for the perfect programming tool. And it's not a tool for beginners. Though the manual does start from ground zero, a good understanding of programming concepts is essential in order to use these tools properly.

Although the code is significantly faster than good old Applesoft, there's a fair amount of inefficiency inherent in the generality of the routines. The object code generated is longer than an equivalent Applesoft program. An experienced assembly language programmer could write better code, but certainly not as quickly. Besides, how many of us think with a vocabulary of three-letter words and digits 0 through F? *MacroSoft* makes a nice way station between Basic and assembly-level progamming, and *The Assembler* is powerful enough to get the most out of it. AEDC

The Assembler and *MacroSoft*, by Alan Floeter and Valerie Floeter, MicroSparc (Box 325, Lincoln, MA 01773; 617-259-9710). *The Assembler*, $69.95; *MacroSoft*, $49.95; both, $99.95.

The Quest. By Dallas Snell, Joe Toler, and Joel Ellis Rea. A wonderful romp through a medieval fantasy world, this hi-res adventure amuses players with one hand while picking their pockets with the other. Settle back and enjoy the story as it unfolds.

Once upon a time there was a lovely kingdom named Balema. It was ruled by a wise and kind king, Galt the First. One day Lady Diane, a beautiful noblewoman from a distant southwestern province, burst into the king's throne room. She pleaded for aid from the king and begged forgiveness for not being able to pay the taxes then due. Lady Diane told a horrible tale of destruction and killing. It seems that a vicious dragon was laying waste to the whole countryside; many towns and villages had been destroyed. The king immediately ordered his champion, Gorn, to track the beast down and slay it.

Bet you thought you were going to be Gorn, the mighty slayer of dragons, huh? Nope. Instead, with a tip of the hat to *A Connecticut Yankee in King Arthur's Court*, you're the king's newest, very green adviser. The king decrees that you shall aid and assist Gorn in this valiant quest. Gorn is not excited. The king instructs Gorn to follow all your advice, but a look at the hot-tempered champion makes the prospects of his obedience dubious. And so the two of you start off.

The first stop is at the castle provisioner for supplies. A sign offers standard fare plus a few exotic items, but don't stop there. Not everything available is posted on the sign—and there's no returning to the provisioner. It pays to be well read.

Leaving the castle opens up a colorful world. There are glens, waterfalls, swamps, lakes, and labyrinthine caves. The vast kingdom (it's an extensive map) is well populated; there are bandits, skeletons, snakes, goblins, seers, and traders. There's even a transplanted Sphinx that will bar your way unless you can solve one of its famous riddles (no, the answer is not Man). And, of course, there's the small problem of the dragon, which, after all, is the object of the quest.

Water is crucial. Avoiding dying of thirst is a constant problem, but water sources are many and well spread out. Finding them and keeping easy access to them through careful mapping tames this issue to a more reasonable perspective.

Be careful not to take everything at face value. Things that seem harmless may not be, and people may steer you in the wrong direction.

Geared for intermediate adventurers, *The Quest* has several innovative features to encourage and make the game fun for beginners. Most of the puzzles and roadblocks have more than one solution. Consequently, there's none of the frustration, especially prevalent for beginners, of trying to figure out, "What on Earth does this *?#!!* machine want for an answer?" So cleverly is the use of multiple solutions carried out that it's seldom apparent whether there's an optimum solution to a particular puzzle. If it works, it's probably just fine.

And *The Quest* works. RRA

The Quest, by Dallas Snell, Joe Toler, and Joel Ellis Rea, Penguin Software (frnk, frnk) (830 Fourth Avenue, Geneva, IL 60134; 312-232-1984). $19.95.

Troeger Math Placement Guide. By Martin Troeger. The *Troeger Math Placement Guide* enables teachers to administer math placement tests and evaluate the results for many students without the burden of paperwork. The subjects enter their names at computers and answer a series of multiple-choice questions. When students finish, the program instructs them to notify the teacher, who can gain access to their scores by typing a special control code.

Seven levels of testing are provided; two pretests determine the best starting level for each student. When a number of the one hundred forty or so questions on a level are answered correctly, the program advances to the next level automatically, eliminating a lot of work on the teacher's part. However, a bright student could be at the computer a long time.

Any of the questions may be modified or added to according to individual teachers' preferences. Also, short of students' pressing reset, excellent error trapping prevents them from accidentally messing up a test in progress. EW

Troeger Math Placement Guide, by Martin Troeger, Merit Audio Visual (Box 392, New York, NY 10024; 212-787-4766). $59.

Stellar 7. By Damon Slye. It's been a long time since there was this kind of game on the market.

The last time anything like *Stellar 7* sprung up, it was called *Horizon V*. *Stellar 7* is what *Horizon V* could have been, with a little help.

It's a tank game with you in the driver's seat of an experimental armored tank, the Raven. Though a complex story line accompanies the game, you don't really need it to have fun. Gir Draxon, Supreme Overlord of the Arcturan Empire, Stalker Agrav Units, biphasal thunder cannons, Warplink, gravitic scope, protonic shields. . . . These are all just big words to add a feeling of heroism to your task—destroying the enemy Arcturans and saving a defenseless Earth.

Hmm. Sounds like every other space game. But it's not.

Each level requires you to destroy a certain number of the enemy before moving to the next level via Warplink (best described as a thing that transports you to the next star system when you run into it). Finding enemy vehicles isn't necessary; they'll find you. Luckily, the Raven is equipped with a radar that lets you know where all your opponents and other obstacles lie. In fact, you'll find it easier to navigate by your radar scope than by the view window, since it gives you 360-degree vision.

The Raven is almost everything you need to blast your way to level 9. In addition to cannons and shields, it comes with Inviso Cloak, which makes the Raven invisible to the enemy, often confusing them as to your location. A zoom lens gives you a telescopic view of the terrain (the better to aim your cannons with), while a special scope makes shells and lasers visible on your radar scope.

As for graphics, they're done quite well. When you look at some of the more recent games around, it's hard to imagine someone even thinking of writing one with black-and-white vector graphics (line drawings). When tanks rotate, they really look like they're rotating (don't miss the awesome mission briefing sequence) with a fine 3-D look. Movement of objects from side to side, from near to far, and vice versa is smooth.

Most of today's popular worlds-at-war games are keen-looking simulations of things flying through the air, but how often do you actually control a vehicle from the outside, as these games have you doing? *Stellar 7* is a crisp version of those popular tank games that let you control a vehicle from the inside.

If you've never heard of Software Entertainment Company, don't let that fool you. It ranks right up there with this game. MTV

Stellar 7, by Damon Slye, Software Entertainment (537 Willamette, Eugene, OR 97401; 503-342-3495). $34.95.

Financial Planning for VisiCalc and the Apple II and **Financial Planning for Multiplan and the Apple II.** By Expert Systems. Many people have purchased an electronic spreadsheet to help them solve problems, only to discover that they don't know how to go about solving some complex problems. Others have purchased their spreadsheets to solve one problem and then realized that they could use it to solve other problems, as well. In both cases, the users may not understand the prob-

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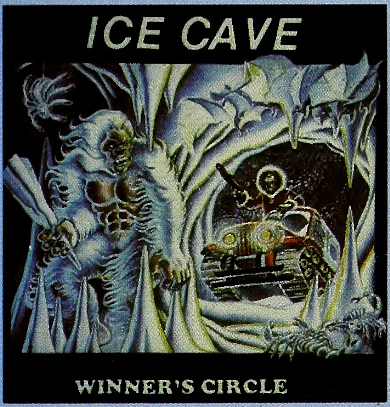

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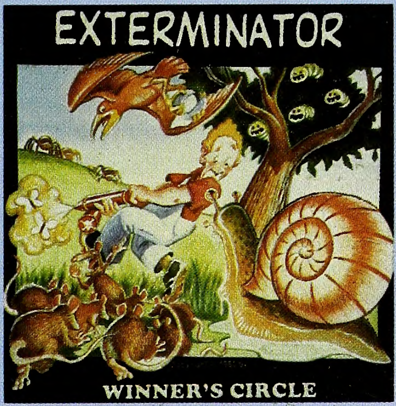

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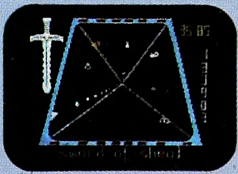

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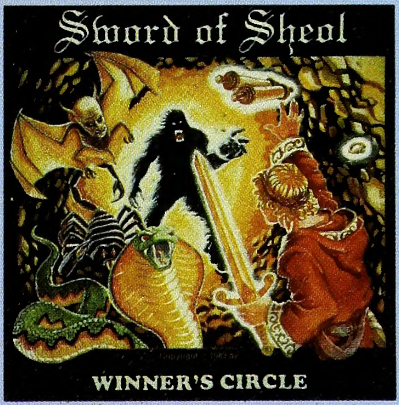

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lem areas well enough to develop good templates to deal with them.

The no-template standstill seems to occur more often in financial planning than in other areas. Very few people understand financial planning well enough to solve complex financial problems. The Financial Planning series from Howard Sams, which includes versions for both *VisiCalc* and *Multiplan* on the Apple II, provides the solutions to a number of specific financial questions. These products contain eighteen templates to help you solve everything from real estate wraparound mortgage calculation to internal rate of return calculation to linear regression calculation. If that sounds too esoteric, there are also break-even analysis, compound growth, and depreciation calculation templates. The series is a nice collection of financial templates that take off your shoulders a whole lot of the work of using *VisiCalc* or *Multiplan.* JS

Financial Planning for VisiCalc and the Apple II and *Financial Planning for Multiplan and the Apple II*, by Expert Systems, Howard W. Sams & Company (4300 West Sixty-second Street, Indianapolis, IN 46206; 800-428-3696, 317-298-5566). $79.95 each.

Secret Agent: Mission One. Patrick McGoohan never had it this tough!

You are the secret agent in this spy adventure, and at every turn someone is trying to shoot you, poison you, or blow you up. The plane you're on goes into a tailspin before you're ten moves into the game. A haberdasher dashes out to shoot you because you copped a bow tie from his shop. And suddenly you realize that *Secret Agent* is the ultimate in what might be called the "Ha ha, you're dead" genre of adventure.

Once again a megalomaniac is terrorizing the world. Hidden away on a remote island off the even remoter coast of Batangali, one Ruppert Melton, certified loony, plots to rule the world by Friday or else blow it up. His home-brewed superweapon, the Energy Synchronizer, can do the job. The weapon, a bit too large to hide in a Cracker Jack box, is protected against encrosion on itself or its surroundings by an automatic firing device. Any attack on the island fortress will set off the Energy Synchronizer and devastate the world.

Your mission is to find Batangali, locate the island fortress, sneak ashore, overcome the guards and electronic traps, and deactivate the firing device—all within a few hours. Even Our Man Flint would have had trouble making the deadline. Assuming you survive the plane incident, only ten or eleven other attempts on your life stand between you and the familiar sight of a Hilton hotel. Haven? Maybe. Now to just figure out a way to reach the formidable island fortress of Dr. No (whoops, wrong movie!) and save the world.

The hi-res graphics in *Secret Agent* are line outlines; no color fills are used. While this does allow crisper outlines, the pictures lack depth.

The adventure itself has many very good moments; escaping some of the situations calls for plenty of ingenuity. *Secret Agent* is the first of a series of spy adventures; if the stories maintain the quality of this one, it would behoove the creators to bring the graphics up to par.

Secret Agent: Mission One is a good first effort from a new company. RRA

Secret Agent: Mission One, Jor-And (Box 9180, Glendale, CA 91206; 213-247-6658). $32.95.

Ramdisk IIe. By Richard Kraemer. A DOS is a DOS is a DOS. No? Well, not always. Sometimes a DOS is written to operate more than just disk drives. There are lots of different sized RAM cards around, and it seems that whenever you have a chunk of RAM that can't be used normally by Basic, someone is tempted to fool DOS into thinking it's another disk drive. There have been pseudo-DOSs for RAM segments as small as 16K (the language card) and as large as 320K (the Axlon Ramdisk 320, perhaps the height of the pseudodisk art).

Such an area of memory is the 64K resident on the Apple IIe Extended 80-Column Text Card, and such a program is *Ramdisk IIe*, a 64K pseudodisk program for DOS 3.3 and Apple Pascal. Normally, you can't use that 64K from Basic without using some new and highly esoteric firmware calls; so it's a natural for pseudodisk use. Only a handful of new programs and new versions of old programs use the extra memory, and most of those are copy-protected anyway (meaning they probably have their own modified DOS, which will deactivate any pseudo-DOS when you boot them). In short, nearly anything you can run with the *Ramdisk IIe* program active will not contend for any of that memory space.

There are exceptions. For instance, the eighty-column card uses 1K of the auxiliary bank. *Ramdisk IIe* thoughtfully does not use the text page—no conflict there. Double hi-res graphics requires 8K of auxiliary memory. Problems there? Yes, but not big ones. The default configuration tells *Ramdisk IIe* to use that 8K—after all, that's too big a section to waste on the off chance that someone might want double hi-res—but the instructions (which come on the disk with a provision for printing them out) tell how you can use a single poke to protect that 8K. They also include pokes for changing the slot to be emulated, disallowing eighty-column use, and so on.

The advantages and disadvantages of a RAM-based pseudodisk are, in summary: It's a convenient and fast place to store programs and other files temporarily. For instance, when you're working on one program and need to run another program briefly, you can store one in the *Ramdisk IIe* and load the other. It's easy to use from a Basic program; you just have to make sure that there's a slot parameter available for all disk commands. It's very useful for multiple program systems; *Apple Writer I*, for example, will fit neatly into the available space complete with all its supporting files.

The only real disadvantage is that it isn't permanent storage the way a real disk is. It can serve as a data file backup for circumstances in which you might want to revert to an old version of a file, but as backup in the sense of saving a file in case of a system crash or power failure, saving a file on the *Ramdisk IIe* is no more useful than attempting to memorize it

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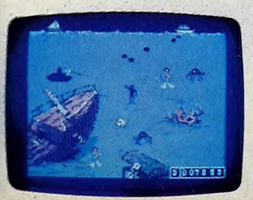

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yourself. For a pseudodisk with its own power backup—Axlon's Ramdisk comes to mind—you can expect to pay a considerable amount of money.

Nevertheless, if you have that chunk of memory, *Ramdisk IIe* can be a useful thing to have. There is a satisfaction to be had in having to wait less time for any disk access that is necessary but less than urgent. And as a value—that is, the amount of storage weighed against the price asked—*Ramdisk IIe* beats the others hands down. DD

Ramdisk IIe, by Richard Kraemer, Precision Software (6514 North Fresno Street, Milwaukee, WI 53224; 414-353-1666). $19.95.

Square Pairs. By Glenn M. Kleiman and Steve Minsuk. You don't need a computer or software to play this game. Kids often make do with a pack of playing cards. But Scholastic's version takes the concepts a few steps further.

Square Pairs is a flexible learning tool in the guise of a conventional match-the-boxes game. The computer screen shows the player a grid of numbered boxes. On each turn, you uncover two boxes; the goal is to find boxes that match. Matches can be direct matches (two identical things), opposites (floor, ceiling) or even two things that simply go together (computer, disk drive).

The game accommodates one or two players; there's even an option for one player to play alone or against the computer.

Perhaps the most valuable feature of *Square Pairs* is its Gamemaker utility. This is where toy becomes teacher. Children can use this utility to create their own pairs, using words or phrases they know, or parents can create games that teach general knowledge of relationships. For example, you can teach state capitals by creating such pairs as Albany/New York, Juneau/Alaska, and so on.

Square Pairs may be one of the first educational games that involve child and parent equally. As a game, it's challenging and stimulating; as a teaching tool, it lets the parent take an active role in the teaching process instead of just supervising the child as the game is played.

The flexibility of the Gamemaker makes it possible to teach almost any subject short of quantum mechanics. And that's not an exaggeration. Creating new games is a completely open process; the information and the criteria for matching pairs is entirely up to you. Because of this, *Square Pairs* opens itself up to being more than an educational game just for kids.

One nice feature is that the program assumes you know nothing. A brief manual takes you by the hand in setting up the game, selecting its options, and making suggestions for other possible games.

It's nice to see an educational game that generates parental participation without requiring someone looking over the child's shoulder every step of the way (remember how nervous that made you when you were trying to finish your arithmetic homework?). MTV

Square Pairs, by Glenn M. Kleiman and Steve Minsuk, Scholastic (Box 2010, Englewood Cliffs, NJ 07632; 201-567-7900). $39.95.

Ultra Rom Board. By Paul Johnson. Programming involves a lot of little tasks. The more you know about the computer, the more little, highly specialized tricks you know and need to know. Like converting number bases between decimal, binary, and hexadecimal. Like finding the address and length of a binary file. Like determining how much space is left on a disk. And so on. You don't have to work at programming for long to develop a library of programs for these tasks.

In most cases, however, it's a pain to use these routines when you need them most. At best, you have to find your utility disk and run the right program, which is a lot of trouble to go through to find out that $C8 equals 200. At worst, if the program you're working on and the utility are both in Applesoft, you have to save your work, load and run the utility, and reload your program. More often than not, you'll end up making the calculations by hand. Which is still kind of silly when there's a computer sitting in front of you.

Hollywood Hardware has developed an elegant solution to this problem: the Ultra Rom Board. This board has two ROM chips and six extra sockets for expansion. The two chips that come with the board contain Neil Konzen's *GPLE*—a widely used editor for Applesoft that augments the computer's built-in editor without replacing it and making you learn a whole new set of conventions right away—and a set of ampersand routines that do a lot of those necessary little tasks you've done by hand until now.

The board really gives you two different kinds of ampersand commands. Some are the kind you would use while you are programming, and others are the kind you would use in your programs. They call them runtime and immediate commands. The immediate commands include the tasks just discussed as well as a quick ASCII conversion, several different memory searches (search memory for ASCII string, search memory for hex string, search program for parsed string, search program for raw string, and so on), find himem or lomem, restore a program deleted with new or FP, and a few others.

The runtime commands include print using and if-then-else. The print using is useful but not complete: It won't add commas to a number, for instance, but it will align numbers by decimal point position and round properly, probably the two most needed features of print using. The other runtime commands substitute for a few of the more useful of the items in the peeks, pokes, and calls chapter of the Applesoft manual: turning on either hi-res screen without clearing it and clearing a text screen from the cursor to the end of the line or the page.

GPLE has been reviewed in *Softalk* before, but released in this new form, some of what was said bears repeating. *GPLE* makes editing an Applesoft program all that it should have been in the first place, and then some. It allows you to insert to or delete from the middle of a line, jump from the beginning to the end, jump to the first occurrence of a particular character in a line, and so on. Or you can search an entire program for lines containing a certain string. All the regular Applesoft and DOS commands, list, run, load, and save, for instance, operate as usual.

The "and then some" is the keyboard macro capability that *GPLE* gives you. Escape can be used with any other key to substitute for any string you would want to use frequently. The built-in macro table with the Ultra Rom Board includes some improvements over the original one from Synergistic. For instance, most of the DOS commands can be executed by moving the cursor up the catalog to the file desired and hitting two or three keys. The macros even take care of moving the cursor over the file name for you.

The advantage of having all these things in ROM should be obvious. All you have to do is activate the slot that the card is in and all those capabilities become available. No messing with disks, and activating the card doesn't even damage the program in memory. In fact, it doesn't even use any RAM at all unless you choose to create your own macros. Everything on the board is bank switched within the range of addresses accorded to that slot's I/O space.

The six open ROM sockets on the board are there for future expansion, and Hollywood Hardware has plans for ROMs to fill these slots. Presumably, the programs on the new ROMs will be as well thought out as the ones already extant, but it's always advisable to buy—or not to buy—based on what's available now, not what's coming next week. Fortunately, in the case of the Ultra Rom Board, what's available now is worth it. DD

Ultra Rom Board, by Paul Johnson, Hollywood Hardware (6842 Valjean Avenue, Van Nuys, CA 91406; 213-989-1204). $190.

Cosmic Balance II. By Paul Murray. *Wanted: Galactic ruler, no previous experience necessary. Long hours, imagination, and an Apple II required.*

If this description appeals to you, *Cosmic Balance II* may be the challenge you've been seeking. A simulation of strategic operations in an interstellar culture, *Cosmic Balance II* takes up where *Cosmic Balance I* left off. There's even an option to resolve combat ship to ship using the *Cosmic Balance I* game disk.

The object of this sequel is to discover, colonize, and develop new worlds in the galaxy while defending yourself against hostile human or alien empires. To accomplish this, you must manage a sophisticated galactic economy, govern the people, maintain defense, discover new worlds, organize commerce, and conduct scientific research. In the event of war, whole fleets of spaceships may have to be designed and built. Flash Gordon, eat your heart out!

Containing five scenarios with unique settings and requirements for victory, *Cosmic Balance II* is not some simple space version of the classic city-state game of Hammurabi. In this richly detailed simulation, up to four planet types exist, including industrial, mining, farming, and terran worlds. In addition, each world has its own economic status ranging from newly discovered to fully active. Provision has even been made for ecolapse, an economic disaster that would plunge an entire world back to

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Softerm file transfer utilizes an easy to use *command language* which allows simple definition of even complex multiple-file transfers with handshaking. Twenty-three high-level commands include *DIAL, CATALOG, SEND, RECEIVE, ONERR, HANGUP, MONITOR* and others which may be executed in immediate command mode interactively or from a file transfer macro command file which has been previously entered and saved on disk.

Built-in utilities

Softerm disk utilities allow DOS commands such as CATALOG, INIT, RENAME, and DELETE to be executed allowing convenient file maintenance. Local file transfers allow files to be displayed, printed, or even copied to another file without exiting the Softerm program. Numerous editing options such as tab expansion and space compression are provided to allow easy reformatting of data to accommodate the variations in data formats used by host computers. Softerm supports automatic dialing in both terminal and file transfer modes. Dial utilities allow a *phone book* of frequently used numbers to be defined which are accessed by a user-assigned name and specify the serial interface parameters to be used.

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The Softronics Online Update Service is provided as an additional support service at no additional cost to Softerm users. Its purpose is to allow fast turnaround of Softerm program fixes for user-reported problems using the *automatic patch facility* included in Softerm as well as a convenient distribution method for additional terminal emulations and I/O drivers which become available. *User correspondence* can be electronically mailed to Softronics, and *user-contributed* keyboard macros, file transfer macros, and host adaptations of the Softrans FORTRAN 77 program are available on-line.

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6626 Prince Edward, Memphis, TN 38119, 901-755-5006 development status. To further complicate matters, you must constantly acquire starships that range from simple one-man fighters to huge dreadnoughts and colony transport ships. Each vessel is separately rated for size, range, cargo, and combat values. This extensive level of detail supplies a sophisticated backdrop for the action to follow.

The player must use his planets' resources to build additional starships while maintaining established worlds. Then, as new planets are discovered and colonized, you must create commerce nets to link interdependent industrial, mining, and farming planets together. To safeguard the newly discovered worlds, and provide an escort for the merchant fleets, war ships must be constructed and deployed. War is incredibly wasteful, so consider carefully before launching an attack on a neighbor. The cost of war could bankrupt your fledgling empire!

Graphics displays in *Cosmic Balance II* are reserved solely for the colorful hi-res maps available to players. Text displays are used during game play to demonstrate the ongoing status of ships, planets, and current deployment. With more than four hundred star systems and forty habitable planets in the sixteen sectors of your small corner of the galaxy, the player needs constant updates. Battle sequences undertaken without *Cosmic Balance I* are resolved by the computer and consist of a nongraphic running commentary with notification of contact and battle results.

Cosmic Balance II brings strategic gaming to a new and vast arena. As you discover untrodden worlds, colonize them, and use their resources to expand, remember that to win at this game you've got to be shrewd and daring—a leader in peace as well as in war. For as the saying goes, "The meek shall inherit the earth, the rest of us will go to the stars!" WHH

Cosmic Balance II, by Paul Murray, Strategic Simulations (883 Stierlin Road, Suite A-200, Mountain View, CA 94043; 400-227-1617). $39.95.

Jeepers Creatures. By Spencer Orelove, George Hoffman, and Joseph Prieboy. *Jeepers Creatures* is not a game exactly, nor does it masquerade as dry educational software. You don't win, lose, or solve puzzles. However, it does amuse the little ones, and that is the express purpose of *Jeepers Creatures*. If anything, it's frivolous, and that isn't bad at all.

Thirty colorful critters appear in three bands across the screen. When you tap a key, a new animal part is drawn in the band corresponding to the keyboard row you tapped. If you tap a key in the top row of alphabetic keys, the beastie on the screen gets a new head. If you choose a key in the middle row, then a new torso appears. Guess what happens if a key on the bottom row gets mauled?

Now remember, the rest of the creature does not change, just the corresponding one-third. It doesn't take long to get some pretty weird-looking animals on the screen. For instance, a neat creature is the pencatroo, a hybrid of penguins, cats, and those pogo-sticking marsupials for which the newcoming publisher of *Jeepers Creatures* is named.

Jeepers Creatures is nicely crafted. The animal parts always line up without overhangs or mismatched parts that make the animals into poorly carved totem poles. The names always fall together nicely at the bottom of the screen, using the most appropriate syllables of the animals' names. The sound, while not complex, is not all that bad either—no mean feat for those who dislike the Apple's limited (when unaided) vocal abilities. Each time you make a complete and normal animal the program rewards you with a series of notes.

This program is usable (and enjoyable) at any age, although it's geared toward the very young. In many senses, playing with *Jeepers Creatures* is like watching television, except that watchers get to change the stories anytime they want to by just tapping the keyboard. The program's quite imaginative and silly, and it doesn't take itself too seriously. It might well be the computer program most usable by the youngest people; it's quite easy to picture a toddler gleefully seated in front of the computer, amused for hours upon hours. DA

Jeepers Creatures, by Spencer Orelove, George Hoffman, and Joseph Prieboy, Kangaroo (332 South Michigan Avenue, Suite 700, Chicago, IL 60604; 312-987-9050). $34.95.

Round About. By Ray Giarratana, a.k.a. Gumby Bitworks. Playing *Round About* is a little like playing *Threshold* while rotating the television monitor. The object of the game is the typical arcade golden rule: Blast the enemy ships off the face of the universe (clear the screen) before they do likewise unto you. However, unlike many of the typical home-arcade games sprouting up like so many mushrooms, this one has some interesting angles.

Your ship, the starship *Roundabout*, isn't confined to the top, bottom, or middle of the screen but moves along all four sides, firing its photon torpedoes toward the center of the screen. Each torpedo has a range limited to roughly half the screen distance.

Traveling in squadrons made up of identical ships, the enemies materialize on-screen and fly about in high-speed zigzagging formations. Each of twenty-four levels introduces a more challenging swarm of attacking foes than the one before.

The alien attackers, who appear as highly animated and colorful shapes, don't fire; they're satisfied with ramming your starship. Their unpredictable formations and high-speed flight paths make evasion and attack most difficult tasks.

To further confound and challenge the arcade enthusiast, your adversaries periodically bring along two buddies that attack independently. The first, a happy-faced killer that stalks your ship with unrelenting persistence, materializes and dematerializes randomly. The second, a whirling dervish type that appears only after level six, bounces around the screen at such high speeds that avoiding it seems nearly impossible.

Besides the three ships with which you start each game and an endless supply of torpedoes, bonus ships are awarded at levels four, ten, and eighteen.

The sound effects are quick, blend in well with the action, and are put to good use in maintaining the fast pace of the game.

Another nice touch offered in *Round About* is a series of cartoonlike graphic interludes offered at intervals after level six.

Gumby Bitworks may be an unconventional name for a game programmer, but *Round About* proves once again that in gaming "the play's the thing." HAS

Round About, by Gumby Bitworks, Datamost (8943 Fullbright Avenue, Chatsworth, CA 91311; 213-709-1202). $29.95.

Vindicator. By Jimmy Huey. Tired of all those nonviolent arcade games? Frustrated with long, involved directions that you have to read before you can play the game? Poor thing. H.A.L. Labs understands. It's provided, for your joystick's pleasure, a whole disk full of very solid, very handsome, wall-to-wall, robot-busting action.

Keep moving, keep shooting, watch your energy level, and keep an open mind about bonus points. You move your good little robot through a field of eggs while blasting materializing squads of bad little robots before they can blast unto you. Though the eggs are impervious, they are sought after by nasty pterodactyl-types that attempt to put the snatch on them while you are otherwise engaged. If you don't nail one in flight, it will release your purloined egg at the top of the screen, from whence it must surely plummet to a horrible omelet.

But wait! From across the screen you dispense with an encroaching pack of attackers with a mighty burst of multidirectional disruptor fire, race the length of the screen, and catch your falling egg without a moment to spare, for a big 500 bonus points.

As the levels—yea, measureless to man—mount ever higher, one encounters the full complement of malevolent arcade types. It starts to look like an automaton convention and they seem to be materializing everywhere you're not. There is also an indestructible little red delivery truck that barrels in and purposefully mows you down if it thinks you've stayed in one place too long. But be warned: Unless you're already very good at this sort of thing, you will likely never witness the full variety of the local fauna in anything but demo mode—for you, it'll be three levels and out, tops. Those of you who are already this good (or are starting to think about your Christmas shopping for people you know who are) will not be underexerted or disappointed.

This isn't exactly a ground-breaking game, any more than *Octopussy* is *Cries and Whispers*. It draws on the old reliables of arcade show biz and satiates your left-brain's need for vivid color and movement. It does its job like a pro and it knows when to get off.

In computer games, the sheer craftsmanship of programs such as this will always ensure them a place as software salt of the earth; eternal and unbending; the solid rock upon which the eye-hand coordination of a generation is founded. AC

Vindicator, by Jimmy Huey, H.A.L. Labs (4074 Midland Road, Riverside, CA 92505; 714-359-8480). $24.

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Applesoft as a First Language

Learning your first computer language is like learning your first human language. The first language you speak affects your view of the world; your first computer language shapes the way you think about programming. The study of Applesoft programming is really two things: the study of Applesoft and the study of programming. This is not just a glib truism designed to get you to read further—though it is that too—but an important distinction.

Some things you'll learn in this column will only be relevant to Applesoft. However, you'll also learn concepts that will help you when you're learning to program in other languages. It's useful to be conscious of whether things apply to Applesoft or to programming when you learn them so that you won't have to duplicate a lot of effort later on.

Apple's Native Tongue. Learning Applesoft is akin to learning vocabulary and grammar. Now don't say that you hated studying vocabulary and grammar in school, because you didn't learn them in school. Without being aware of it you learned most of that stuff long before you went to school. You learned it because everyone around you was talking all the time and you didn't want to be left out. You were rewarded in the way that meant the most to you at the time; you were given attention. Like many things, languages are easy to learn if you have the motivation.

There are many reasons to learn a programming language. You can get a lot more out of your computer if you know how to tell it what to do in a way it understands. Say you have a task that is perfect for the computer to do—any information work that is repetitive, time-consuming, dull, or all of the above. Unfortunately, many such tasks are so specialized that no commercial program exists to perform them. If you can write your own program, you'll find that a few hours spent now can save ten times as many hours in the long run.

Now sometimes, when you've written such a program, you'll find out that maybe the task wasn't as specialized as you thought. All your friends say they need the very same thing. And maybe a publisher will realize that, and you'll be able to sell that program (to the publisher; you would give it to your friends, of course). This doesn't happen every day, but it does happen.

Burning the Midnight RAM. There's another good reason to learn programming that is actually much more immediate than doing work or making money. Programming is fun. Once you get into it, you'll probably find yourself spending hours writing programs that have no practical value at all, just for the fun of it. A lot of people who see computers merely as useful tools are bewildered by programmers who work on into the night, oblivious to the needs for sleep and food. And a lot of programmers are equally bewildered by normally frugal executives who pay them good money to do something they enjoy.

So even if you can't think of a practical reason to learn Applesoft just now, don't worry; it'll come to you.

Vocabulary and grammar in human languages correspond to *commands* and *syntax* in computer languages. You may wonder why programmers feel the need to use jargon like this. Why can't they use the words *vocabulary* and *grammar*? The primary reason is that *commands* and *syntax* have more exact definitions when applied to this field. Keep in mind that the words *baste* and *saute* were probably considered jargon at one time by people who didn't know how to cook.

In Search of Unlimited Verbosity. So you've learned at least one thing already: Commands are the vocabulary of Applesoft. Actually, they're the verbs. Consider a verb in English. It can take numerous forms, and each form says a subtly different thing. It can describe actions to be taken, actions that should be taken, actions that have been taken, actions that are being taken, and actions that would have been taken, to name only a few. The subject of the verb can be the speaker (I am), the listener (you are), or a person in the next room (she is). Notice how the verb changes in each case. You know English so well that you don't think about these complexities even though you use them every day. Applesoft is simple in comparison. It has no variation in verb form and the subject is always understood to be the computer. It only understands imperatives: Do this; if this is true, do that; understand this as meaning that. That's about as complicated as it gets.

The fact that the only verbs the computer understands are commands is a revealing point: The computer is designed to do only what it is told. By learning Applesoft, which is much easier than the human language you already know, you can tell your machine to do things that no commercial program will do.

If the commands of Applesoft are its verbs, then the syntax is the set of rules that describe how those verbs are put together with adverbs, direct objects, indirect objects, and prepositional phrases to make *statements*. Statements are the sentences of Applesoft. The other "parts of speech" have functional equivalents in Applesoft but no individual names. They are sometimes collectively referred to as *parameters*. More precise definitions of these terms can wait until we can give some examples.

The study of Applesoft can be thought of as the study of how commands are put together with the required and optional parameters using the correct syntax to make statements. Statements are put together to make programs.

What, then, is programming? How is learning to program distinguished from learning Applesoft? If Applesoft is the vocabulary and grammar of the computer's language, then programming is composition.

Any complex composition can be summarized in some kind of shorthand. One form of shorthand you're probably familiar with, even if you're not usually inclined to use it, is the outline. An outline of this article, for instance, would be another way of expressing the concepts in the

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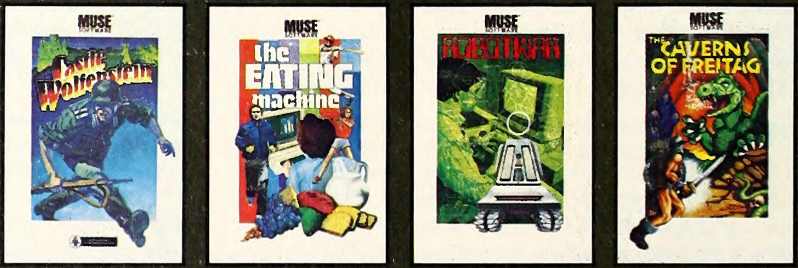

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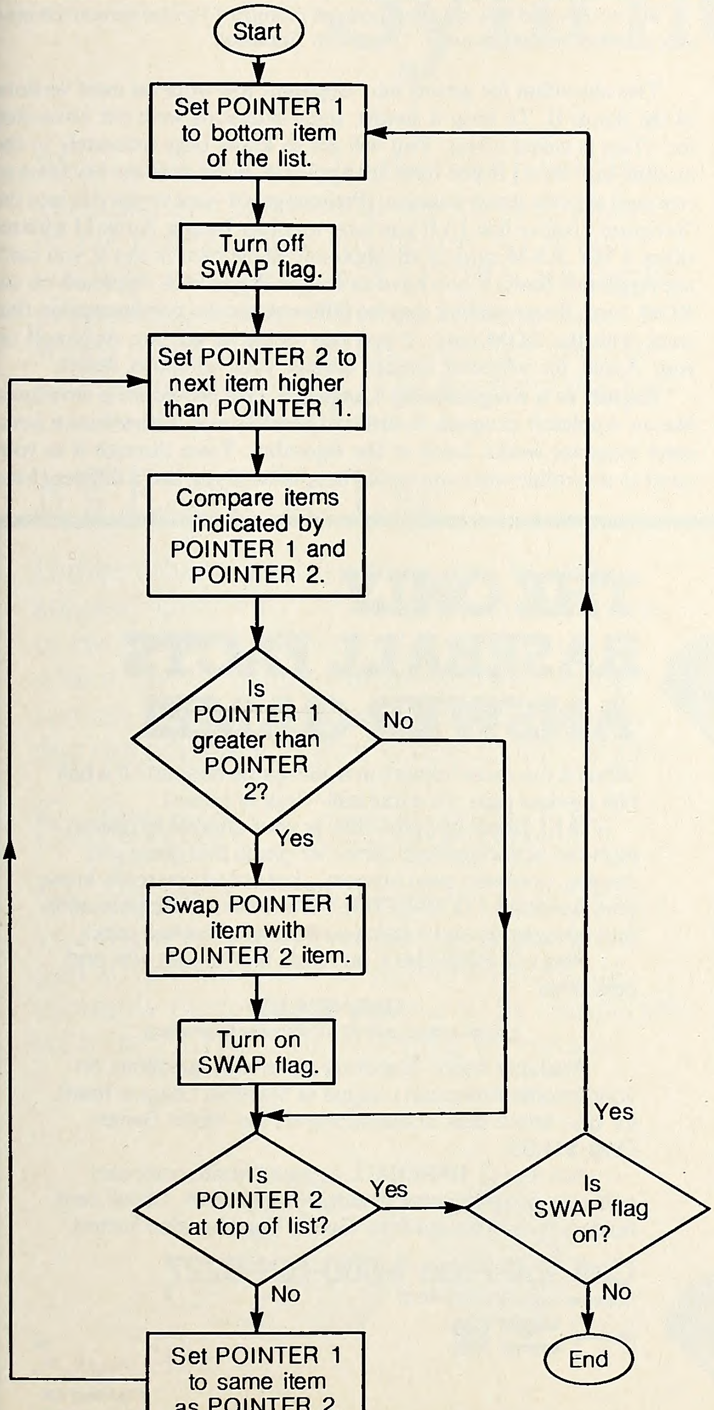
article. It doesn't take the place of the article—it doesn't include all the necessary details—but it does indicate the overall structure at a glance. Such an outline might look like this:

I. Introduction
II. Learning Applesoft programming
  A. Reasons for learning Applesoft
    1. saving time
    2. making money
    3. having fun
  B. Learning Applesoft
    1. commands
      a. verbs
      b. other parts of speech
    2. syntax
  C. Learning programming

and so on.

Structure is an important concept in programming, so naturally there's a device similar to an outline that can be used to show the structure of a program or routine. This device is called a *flow chart.* A typical flow chart is shown in the accompanying figure. You don't have to understand the chart at this point; all you have to know is that it represents the structure of a moderately complicated program. Think of it as an outline of a set of tasks and decisions.



Bubble Sort Flow Chart

All Good Metaphors Must Come To Pass. The differences between the flow chart and the outline demonstrate an important difference between the structures used in writing articles and those used in writing programs. An article flows from beginning to end without diversion or interruption. Digression maybe. The indentations of the various items in the outline show the relative importance of and relationships between the topics.

A program, interacting with the changing states of its own data and the information it receives from the outside world, flows quite differently, repeating some tasks, skipping others completely. The flow chart reflects these interactions by means of rectangular task boxes, diamond-shaped condition boxes, and arrows indicating that in some situations the program must skip a section or return to an earlier section in order to operate properly. The whole shebang is more like human behavior than it is like a written language; a program responds.

The metaphor linking computer languages to human languages begins to break down here. In a way this is good because you shouldn't feel that your ability to program is dependent on your ability to write. It's not.

Algorithm, Who Could Ask for Anything More? The flow chart in this article can be described in linguistic terms. It shows an *algorithm,* a systematic method for solving a specific problem. There is a more specific mathematical definition for the word, but this has become its popular usage in computerdom. This flow chart illustrates the algorithm for a bubble sort, which is used for putting a list in sequence. You might describe the algorithm in English like this:

> You're looking at each item in the list and rearranging the list so that the items at the top will have the greatest values and the

items at the bottom will have the least. Start at the bottom of the list. Compare the bottommost item with the next item up. If the one in the lower position is greater than the one in the higher position, switch their positions. Now, whether you had to switch those items or not, look at the second item from the bottom of the list and compare it with the next higher one up. Again, if the lower item is greater than the higher item, switch their positions. Move up the list, continuing to compare and swap items until the top of the list is reached. Then, if any swaps were required in that pass through the list, go to the bottom of the list and do the whole thing over. If no swaps were performed, the list is in the correct order.

The flow chart, once you understand it, is a more effective summary of the algorithm than the description was. The flow chart can use arrows to indicate where to go back to instead of the less precise description of "go to the bottom of the list and do the whole thing over."

In Applesoft, we make it clear to the computer where we want to go back to or forward to within the program by using *line numbers*. A line number is a number identifying a line by giving it a unique name and indicating its position within the program. For now, we will define a *line* as a statement or a set of statements with a line number. (Yes, that is a circular definition of a line. Please try to conceal your mirth.)

Get Down and Boot Up. Much of the material in this column from now on will be easier for you to understand if you have the computer at hand and try things as we discuss them. First you have to get into Applesoft. If you have an Apple II Plus or an Apple IIe with at least one disk drive, the most common Apple system, here's what you want to do:

1 Insert the disk labeled DOS 3.3 System Master in your disk drive.
2 Close the disk drive door.
3 Turn on the computer and the monitor.
4 Wait until the disk stops spinning and you have a right bracket ( ]) on your screen followed by a flashing square.

The "program" for getting Applesoft is shown as a four-step process. But what about people who have no disk drives? What about people who have older models of the Apple II without the Autostart ROM? They must follow different procedures. Let's look at a "program" for getting Applesoft that will work on a number of different systems:

1 If you don't have a disk drive, go to step 4.
2 Insert the disk marked DOS 3.3 System Master in the disk drive.
3 Close the drive door.
4 Turn on the computer and the monitor.
5 If you don't have a disk drive, go to step 9.
6 If you have an Apple II without the Autostart ROM, you will get the Monitor prompt (*). Type 6 followed by control-P (that is, hold down the control key while you hit the P key) and the return key.
7 The light indicating that the disk drive's in use should come on and the drive will make some noise. Wait until it stops.
8 If you have an Integer Basic prompt (>) on the screen, type FP followed by return.
9 You should now see the Applesoft prompt ( ]) on the screen followed by a flashing square. You are in Applesoft.

This algorithm for getting into Applesoft will work on most versions of the Apple II. To keep it simple, some situations were not accounted for. (This is called a bug. You will get to know bugs intimately in the months to follow.) If you have an Apple IIe, make sure the key marked *caps lock* is in the down position. (Perhaps you'd want to put this into the "program" before line 1.) If you have an older Integer Apple II without either a 16K RAM card or an Applesoft ROM card in slot 0, you can't use Applesoft Basic. If you have an Integer Apple with Applesoft on the ROM card, the procedure may be different; see the documentation that came with the ROM card. If you can't seem to get into Applesoft on your Apple, for whatever reason, consult your computer dealer.

English as a Programming Language. This procedure is structured like an Applesoft program in order to demonstrate further how a computer program works. Look at the algorithm. Trace through it in your mind to determine what you would have to do if you had a different kind

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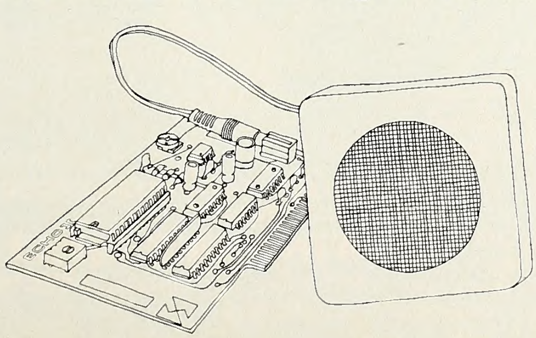

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of system. In some cases, some lines of the "program" will never be executed.

Look at lines 1 through 3 of the original version. In the new version, lines 2 through 4 contain the same statements. Often when you are writing an Applesoft program you will have to insert a line prior to one you have already typed, as we did with the new line 1 here. If the lines are numbered as we showed them, counting by ones, inserting a new line is a real pain. For that reason, it's a good idea to start with line 10 and increment by tens: lines 10, 20, 30, and so on. That way, if you need to insert a new line between lines 20 and 30, all you'll have to do is call it line 25.

Let's try some of these ideas out with some real commands. Get into Applesoft. When you see the] and the flashing square, called a *cursor*, type:

```
NEW
```

The Soul of a New Command. Be sure it is all in capital letters. Even if you have an Apple IIe, Applesoft understands only those commands typed in upper case. When you have typed the word *new*, hit the return key. In Applesoft, hitting the return key tells the computer that you have finished typing a command.

New is a verb in Applesoft. The *new* command tells the computer that any program in memory should be erased because the programmer wants to enter a new one. Depending on how you started up Applesoft, there probably was a program in memory. We don't want it there.

You entered the new command without a line number. As such, it was not added to an existing program but executed as soon as you hit return. This is called entering the command in the *immediate mode*, and new is most often used in this mode. If you had preceded the command with a line number, Applesoft would not have acted on it but would have inserted the line into whatever program was in memory at the time. This is almost never done with new because that would tell the computer to erase the program while it was running. Not good.

You're now ready to do some simple programming. Type:

```
10  PRINT "HELLO"
```

Remember, whenever you type something, hitting return tells the computer to do something about it. There is now a program in memory, albeit a small one. To see it, type:

```
LIST
```

And there it is. Like the new command, *list* is most often used in immediate mode. It tells the computer to display the program in memory on the screen.

You can probably guess what our program does. The *print* command tells the computer to put something on the screen. Anything that follows print is printed on the screen, in one form or another. If what follows print is in quotes, it is printed as it appears in the program line. Something that is not in quotes will be interpreted in some way before being printed.

The distinction is like the difference between saying to someone, "Tell me 'The sky is blue,' " and saying, "Tell me what day it is." In the first case, the likely response will be, "The sky is blue." In the second, however, the person may think about your request for a second and then say, "Tuesday." The request "Tell me" is the same both times, but the content of the rest of the sentence tells the listener whether you want a verbatim response or you are looking for information. So it is with the print command.

Now you can run the program. This is done by typing:

```
RUN
```

Exciting, isn't it? Now try typing this:

```
20  PRINT "I AM AN APPLE II"
LIST
RUN
```

The first item you typed was a program line. The other two were immediate mode commands. When you finished typing the program line, Applesoft added it to the program. When you typed the first command, Applesoft listed what was now in the program: lines 10 and 20. When you typed the second command, the computer ran the program, print-

ing the messages. Let's try one more thing before we call it a month. Type:

```
5 HOME
```

Where do you think the line will go? List the program. Were you right? Whenever you enter a new line into an Applesoft program, Applesoft puts it between the lines with the next higher and next lower line numbers. In this case, it put it at the beginning because there was no line with a line number lower than 5. If you use a line number that has already been used, the old line will be erased when the new one is inserted. If you just want to erase a line without entering a new one, just type the line number and hit return. Now you know the basics of entering and editing an Applesoft program.

Home Is Where the Cursor Is. Home is so simple a command that you can find out what it does for yourself. And *don't* look it up in a book: There'll be plenty of opportunity for that later. For now, experiment. Run the program. Add new lines. Nothing you can type will be able to damage the computer in any way, unless you type it really hard. It is sometimes possible to damage programs that are on the disk in the disk drive, so you might want to remove the disk if you plan to get more adventurous. The commands we've talked about this time are guaranteed 100 percent harmless.

Next month you'll get more stuff to play with. We've covered a lot of important conceptual ground that will help you understand things as we move along. As a review, you might want to look over the accompanying glossary, which lists the terms and commands covered this month.

Try this little exercise. Write out an algorithm for some common task like setting the dinner table or sorting the mail for different members of the family. If you feel comfortable with the form, draw a flow chart of the task. If flow charts still look like Egyptian hieroglyphics to you, don't worry. We'll look more carefully at how to "think" a flow chart next month.

Programming is more than just commands and syntax. If you learn the way of thinking—it's not hard, just different—learning to program becomes easy. ❑

GLOSSARY

Algorithm: A systematic method for solving a specific problem.
Command: A verb in the Applesoft language.
Flow chart: A graphic outline of an algorithm or program that uses rectangular boxes to represent tasks, diamond-shaped boxes to represent decisions, and arrows to indicate flow of control.
HOME: Command to clear the screen. Next character printed will be in the upper left corner.
Immediate mode: The state of a command entered in Applesoft without a line number. Such a command is executed immediately rather than being inserted in an existing program.
Line (program line): A statement or set of statements with a line number.
Line number: A number that serves to identify a line of an Applesoft program by giving it a unique name and indicating its position relative to other lines.
LIST: Command to show the program on-screen. Usually used in immediate mode.
NEW: Command to erase the Applesoft program in memory. Usually used in the immediate mode.
Parameter: The necessary and optional information that goes together with a command to make up a statement. Parameters correspond loosely to parts of speech, such as direct and indirect objects, adverbs, and prepositional phrases in English.
PRINT: Command to put information on-screen. Anything in quotes is printed verbatim. Data that is not in quotes is evaluated and its value printed.
Statement: An Applesoft command combined with the required and optional parameters to tell Applesoft a specific thing to do.
RUN: Command that executes the Applesoft program in memory. Usually immediate mode.
Syntax: The rules governing the use of Applesoft commands.

THE MASTERMIND BEHIND MASTERTYPE

by Andrew Christie

What is the measure of a piece of educational software?

It's whether it can teach the programmer who programmed it what he programmed it to teach.

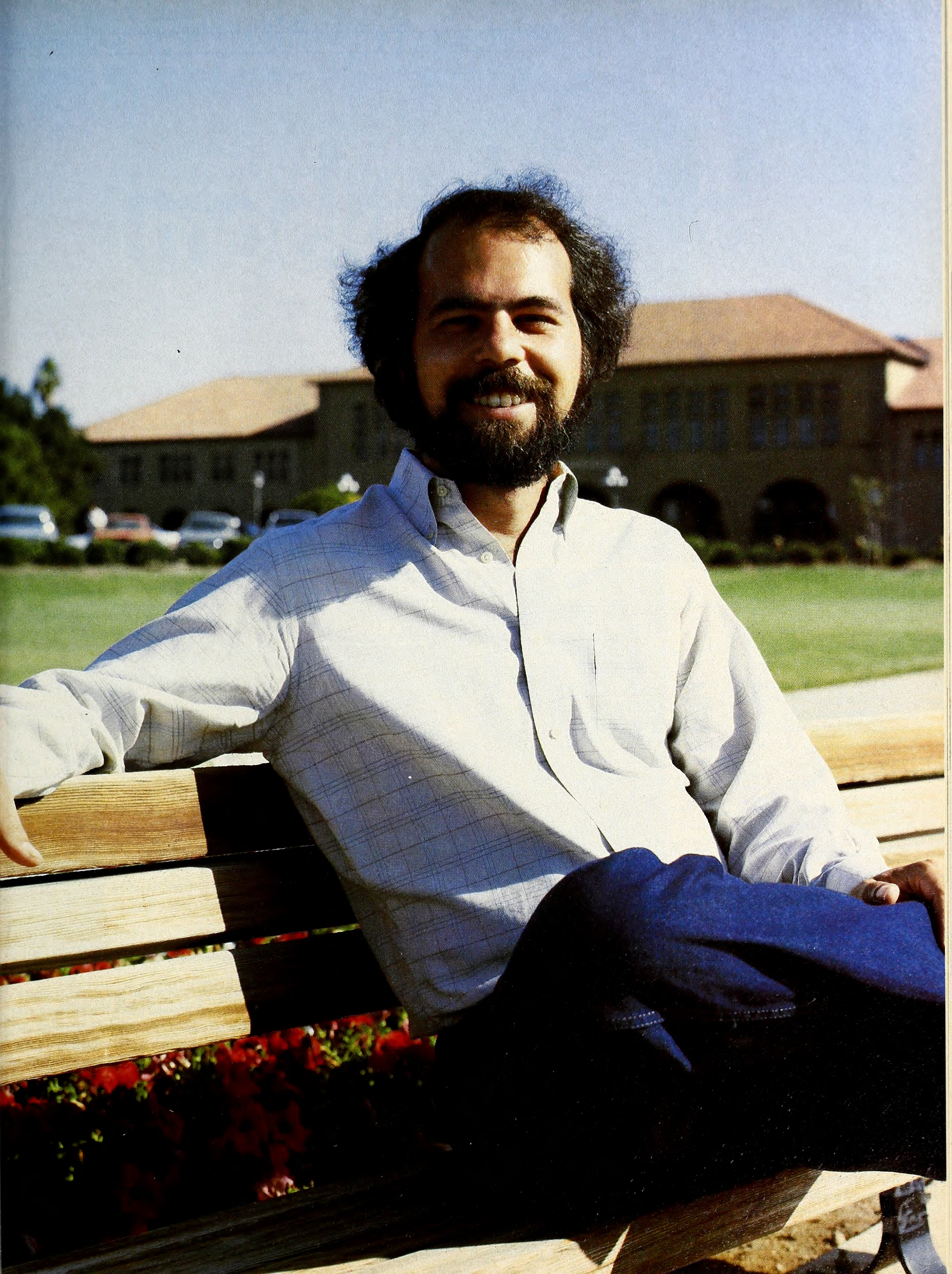
Bruce Zweig downplays his educational career, but it has not been undistinguished. He spent his undergraduate days at MIT in the field of operational research—constructing mathematical models of business and social situations. After getting his degree, he spent a year as a substitute teacher in the Boston inner-city schools. After that, with the idea in mind that he wanted to work in education but with computers as well, he returned to his home town of Washington, D.C., intending possibly to work as a programmer for some governmental education agency.

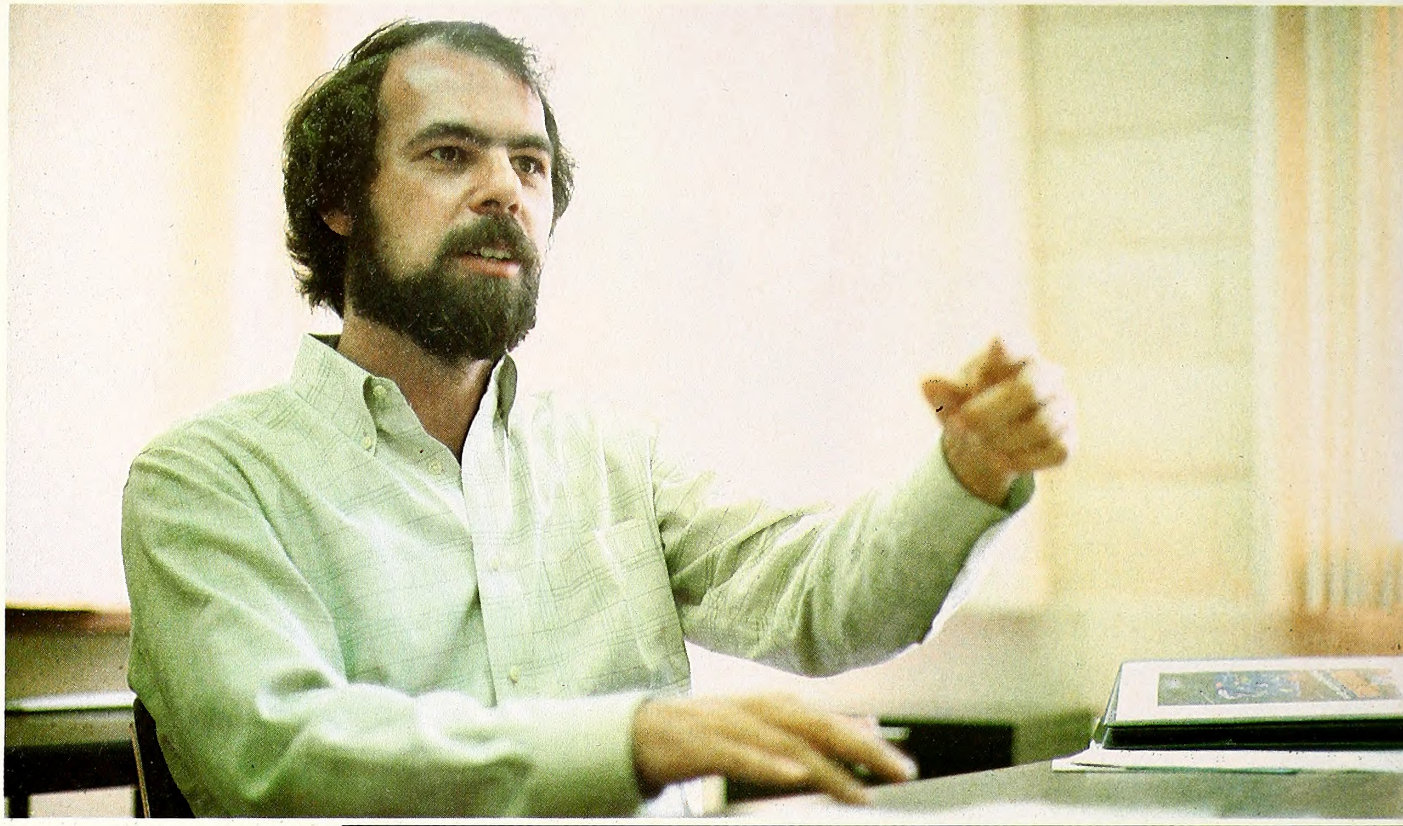
"There was at that time [the early seventies] a major move to improve the quality of education in socially disadvantaged or economically deprived areas," Zweig recalls. Securing a position with a small consulting firm, he helped to program the model used by Congress to determine which schools had the greatest number of poor students and should get the most money.

"Whenever a new bill would come up relating to education, Congress would say, 'Well, suppose we use this poverty cutoff and give $10 per kid to every school that has more than 20 percent disadvantaged kids. What'll happen if we approve this legislation?' " From 1975 to 1980, every proposed federal-aid-to-education bill would go

SPOTLIGHT ON

Bruce Zweig





Can one man with an urge to type create a hi-res drill and practice game and make it into one of the best-selling Apple programs ever? Could be.

through Zweig's model.

Not bad for a kid just out of college. And yet he continued to harbor a secret shame.

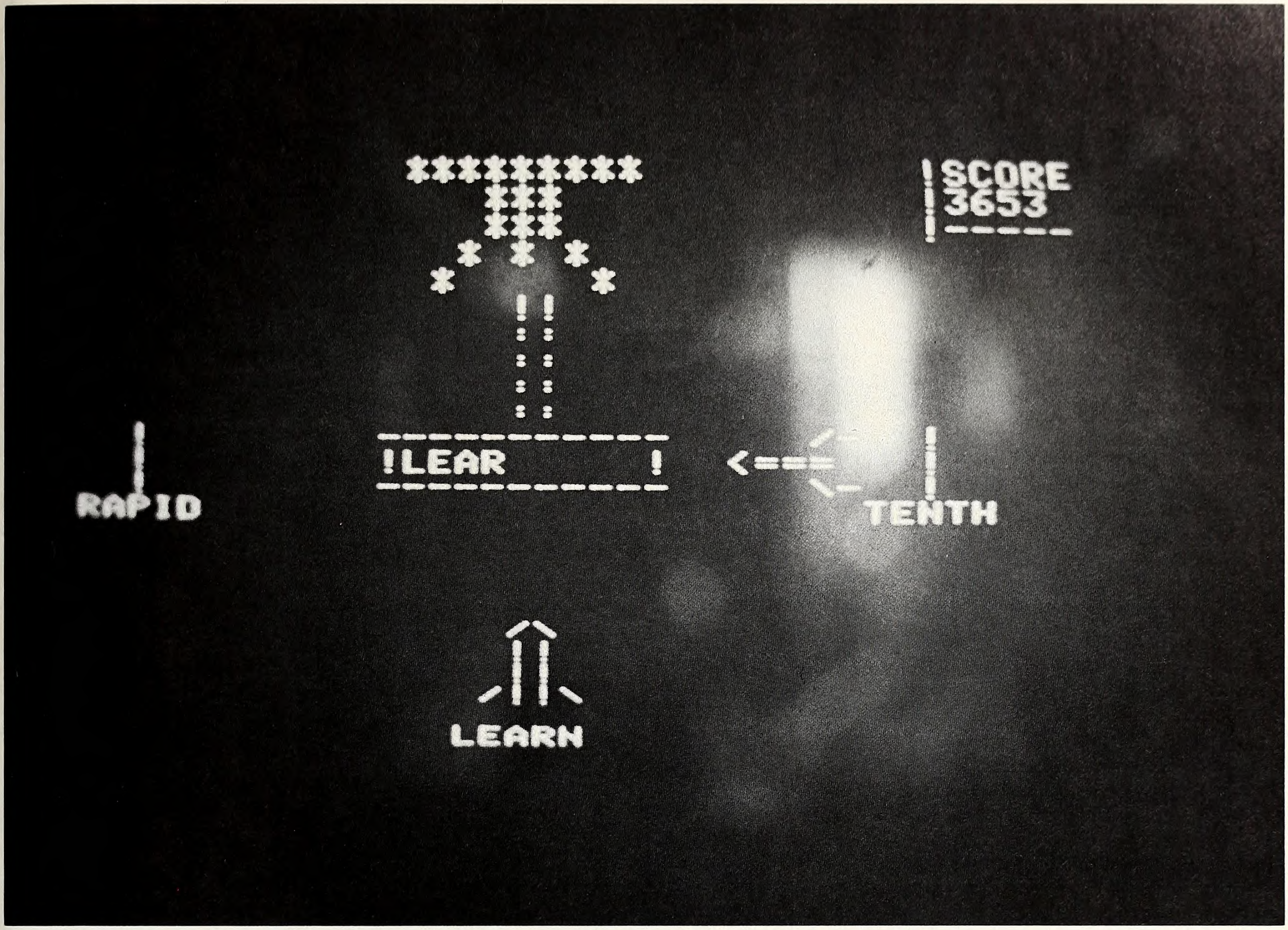
"I couldn't type. I was a programmer; I had to type in my programs . . . but I had to look at the keys. I had never learned how not to."

The obvious solution for a man who wanted to keep his educational and computer interests close together was to write a computer program that would teach him how to type. In those dark, pre-micro days, this was not a likely proposition. It would be a second or two before you found out how you did on a typing drill using a mainframe, and Zweig wanted instant feedback.

Meanwhile, the entrepreneurial itch that would result in the founding of Lightning Software was beginning its nascent stirrings. Zweig, like many others before and after him, was discovering that he wanted more creative freedom than one is generally allowed when programming for large companies. He left Washington in 1976, going to Stanford for his MBA, then signing up in the business school's Ph.D. program in marketing.

Still, he yearned to type. And with the arrival on the scene of microcomputers—machines that knew you had pressed a key the moment you pressed it—his dream seemed closer to reality. He started sketching out his program. A friend bought an Apple, and he started spending a great deal of time at his friend's house. Then another friend, Trip Hawkins, a Stanford business school classmate and then director of marketing at Apple Computer, steered him into getting his own Apple. Then Zweig started putting some graphics into his basic typing tutorial, which now gauged how long it took him to type the keys and let him practice the ones he had trouble with. Just as he was thinking this might be a marketable idea, Microsoft's *Typing Tutor* hit the market. Well, that was that. He'd have to come up with a new approach. Something different.

Getting up to Speed. At Stanford, he had occasion to hang out with Tom Malone, a psychology student who was then doing research for his book *What Makes Things Fun To Learn?*, a study of intrinsically motivating computer games. While hanging out with Malone, he also hung



MasterType 1.0 was entirely ASCII, fired only one missile at a time, and didn't tell you your speed. Those were the days.

out in the Stanford computer center. These two activities were to prove significant.

"One day I was playing *Robots* on a DEC minicomputer, using a numeric keypad to move the robots around. I found that I was getting pretty adept with the keypad, and pretty soon I wasn't looking down to see where the numbers were. I figured, 'Hey, these robots could teach you how to type!' "

And voila: *MasterType*. That's all there was to it. Practically.

Just as Michelangelo created his statues by cutting away everything that didn't look like a statue, the basic design of the game just seemed to Zweig to be the way it should be designed. It has remained essentially unchanged. Four words appear in the four corners of the screen. When you select one word to type, each letter appears (or doesn't appear, in advanced modes) in a box at center screen. As you type, missiles begin to converge on your center position from the four corners. One word successfully typed results in the destruction of that word's missile, and you immediately proceed to deal with the others in like manner, defending your position by typing as fast and accurately as possible.

Back Straight; Fingers Arched; Feet on the Floor. . . . That was the basic conception. The first thing he decided to do was add learning reinforcement. The best way, perhaps, was to give a reward, a congratulatory message or words of encouragement, at the end of every correctly typed line. No, that would be too long to wait. Maybe at the end of every word . . . but when you're first learning, even that could mean long stretches of nothing. Then he thought of video games and how the second you zap the guy you get a colorful explosion and sound . . . and so it was decided that *MasterType* would have a beginner mode where at every single keystroke—kazoom, pow—you'd get reinforcement for doing it right.

Zweig wrote the first version in Basic, using just characters for the graphics. It kept dropping keystrokes. He learned assembly language so he could get the keystroke response fast enough to keep up with the user. In September 1980 he made up his first ad and showed it to friends, asking if they thought anybody would buy the thing. They said "maybe" and told him a lot of ads never get any results at all. He put the ad in a magazine in January 1981, selling through mail order only, and got about ten orders, enough to pay for the ad, all he had really been looking to do.

March 1981 marked *MasterType*'s public debut at the West Coast Computer Faire in San Francisco. That show and subsequent shows proved invaluable for field testing. When Zweig realized that everyone who came up to the booth was asking the same question, to which he was always giving the same answer—"Type the words in the corners before the ships crash into you"—he put the answer in the program, making it one of the first things that come up on the screen, and there it remains to this day.

There were other means of testing. He gave a copy to a friend, who gave it to his daughter. While he was over at their house for dinner sometime later, *MasterType* came up in conversation, though the daughter didn't make the connection between daddy's dinner guest and the author of her computer game.

"It stinks," she said cheerfully. "It's really ugly."

"That," Zweig remembers, "is when I knew I had to do a hi-res version."

Now Is the Time. Zweig was still a student at Stanford and still making updates for the Library of Congress to his mathematical model of disadvantaged schools. His studies were suffering. Publishers were contacting him. It was time to decide whether he wanted to be in software full-time or finish his Ph.D. He decided to start a company, and he knew he couldn't do so alone.

"I had to write a full hi-res version of the program; that, plus distribution and advertising, was going to be a lot of work." At that time, Stu Berman, now with Broderbund, was trying to start his own company out of his living room. As Zweig was trying to start a company out of *his* living room, and Berman was spending a lot of time in Zweig's living room anyway (playing *Space Invaders*), they decided to join forces. They officially formed Lightning Software in August 1981. They worked until December just to get the operation running, setting up production and distribution. Zweig took each successive version of the new *MasterType* to George Johnson, product manager at Apple, who offered encouragement and criticism and suggested changes.

"In those days you had to write all your utilities yourself," says Zweig. "I wrote a sound editor and all my own hi-res routines. I went to see Bill Budge, who was just starting his own company then. He said I needed to have preshifted bit maps. So I used preshifted bit maps. If I'd let someone else publish it, they probably would have given me all the utilities, but I was committed to starting my own company. That meant the programming was definitely more of a challenge."

It was a challenge well met. The current product (officially, *MasterType 1.7*) is an intentionally nonpedagogical, self-paced, student-friendly program. "The main thing, I think," says its creator, "is that you get to choose which word you're going to type rather than having to go through a fixed rote order—though most people go clockwise anyway. You can use shields if it's too tough for you and just practice the words that are hard for you without having to start the whole sequence over."

Every Good Boy Deserves Favor. Product testing has become more official lately with the addition to the staff of a testing consultant. Twenty copies of the program were donated to a Santa Barbara, California, school for a summer program for gifted minority children. Zweig appreciated the opportunity to get some idea of what constituted a reasonable rate of progress depending on age (all the students were sixth-graders), with an eye to including overall difficulty levels in later versions. He thinks testing will make future Lightning products more effective, although, to date, "nobody's ever complained. We've done minor touch-ups all along; people will write to us and say, 'Why don't you put this in?' and we will."

Currently, Lightning Software is engaging in considerable market expansion. Its single product is now on the Apple, Atari, IBM pc, Commodore 64, and VIC-20. Future products will use the tried and true *MasterType* format for teaching other subjects. ("This is a fun way to learn typing; using it to learn subjects that are actually interesting should be even more fun," Zweig predicts.) The company has long since moved from Zweig's living room. Its two-month-old Palo Alto headquarters houses shipping and receiving, a marketing division, and a staff of in-house programmers, as well as the company president and his five-dollar office chair, the first official business furniture he purchased when he started the company.

Jump over the Lazy Dog. Having arrived at this point, the young president of the young company has come to ponder the issue that all those who have gone before him have had to face. "I wasn't sure I wanted to stop programming and start hiring authors, which seems to be the path you have to take when you start a software company," muses Zweig. "It was kind of depressing. But running a company is a full-time job and it takes all your concentration. I have a lot of ideas for programs and it bothers me that I haven't been able to execute any of them. It'll take me at least six months to do something new and different. Right now I have an idea for a program that would just be too hard to use and I'm trying to think of a way around that.

"But mostly I work with the programmers on the conversions, or, if I want to put in some tricky little thing, I do it myself. I figure I've got a few good years of creativity left."

All success has its price, but Bruce Zweig has definitely succeeded in what he set out to do.

He doesn't have to look at the keys anymore.

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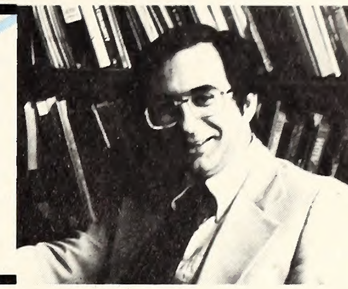
Mind Your Business

BY PETER OLIVIERI



Summer is rapidly fading away and the fall season is upon us. It's a time of changing weather, football games, reading, and new business opportunities. Perhaps it's also a time for thinking about your current computer system and applications and for considering new possibilities. Why not take a few minutes to consider the following questions; your responses may help you decide what next steps are right for you.

1. Have your needs outgrown your computer system? Could it be time to expand your system or to get an entirely new one?

2. Are you using a lot of floppy disks for data storage? Does it take your system a long time to search through (or sort) your data? Might it be time to expand to a hard disk system?

3. Have new versions of the programs you've been using been released? Is it time to get the latest editions so you can take advantage of all those little extras that weren't included in the originals?

4. Are there applications you haven't attempted yet? Is it time to purchase a project-scheduling program, a database management system, or a graphics package?

If you find yourself nodding "yes" to some of these questions, it may be time for a change. Move carefully, though. Making a change to a new system or upgrading your present one is as serious a decision as it was to buy that first system. So do your homework. You may discover that the system you have can be expanded to accommodate all of your new requirements. Or you may find out that you'd be better off with an entirely new setup.

The Business System—What Is It? Business users tend to fall into one of three categories. There are the experienced "computer people" who are comfortable around computers and actually write some of their own software, there are people who are less computer-literate from a technical standpoint who are nonetheless quite comfortable using canned software, and there are new system owners who are perhaps still getting their feet wet in the computer arena. There's probably a fourth category to consider, consisting of those who don't own or use a computer themselves but who are around others who do.

A variety of Apple computers out there could be called business systems. In fact, most computer users would agree that the applications a computer system is used for dictate whether or not it is a business system.

There's much to be said for a system that's been designed for a particular market. A standalone word processing machine, such as a DisplayWriter, a DECmate, or a Wangwriter, is a good deal easier to use than a microcomputer-based word processing system. In the same way, systems intended for the business environment include hard disks, integrated software, and design features that take advantage of the terminology and methods used in the day-to-day operations of the business.

In most adequate business computer systems, you could expect to find the following hardware:

1. A microcomputer with at least 48K of primary memory. (The minimum needed will soon be 64K.)

2. A high-resolution color monitor capable of displaying eighty columns.

3. A hard disk drive with at least five thousand megabytes of secondary storage. (This translates to about five thousand megabytes of additional capacity—even this is not really enough.) The ability to back up to a removable cartridge is also necessary.

4. A letter-quality printer with graphics capability (and probably a printer buffer so that the computer can be used for other tasks while printing is taking place).

5. A keyboard that facilitates business applications—that is, one that has several programmable keys, a numeric keypad, word processing keys, upper- and lower-case capability, and so on.

6. A modem to use in communicating with other computers.

In a business computer system, you could also expect to find software designed to facilitate the backup of important files, a spreadsheet program, a database management package, a business graphics package, a word processing package, and a telecommunications package. Depending on the specific situation, a business user might also need or wish to have a general ledger package, a "slide show" package for displaying graphics, the CP/M operating system to enhance software options, or a statistical analysis package.

Users who are taking advantage of a business computer system are likely to have an account with an information utility, such as the Source or CompuServe, subscriptions to various computer publications, and membership in a local user group.

It's reasonable to suspect that a majority of Business User Group members meet most of the criteria just outlined. How the various busi-

ness computer systems are implemented might differ considerably, but most of the applications probably fall into the listed categories. By the way, many B.U.G. members are interested in new software applications; perhaps some of you who are using software you particularly like will describe to the rest of us any business applications programs that you've found especially useful.

It would also be interesting to hear from experienced B.U.G.s who plan to upgrade their systems. Finding out what "bells and whistles" some of you old-timers plan to add or have already added to your original systems will help new business users develop some perspective on the possibilities. So take a moment soon to jot down on a postcard or in a letter what you have now and what you plan to add.

Microcomputers in the Office. Computers in the workplace are becoming more and more common. In fact, the workplace is under attack by micros.

The way it usually starts is that someone in a company has a microcomputer at home or has seen one demonstrated. The next thing that happens is that management somehow gets the idea that it would be worthwhile for key members of the staff to become more computer-literate. This idea is often implemented by inviting someone to come into the workplace and describe the potential applications of microcomputers in the office.

The application described most often is *VisiCalc*, and the typical training event is a one- or two-day seminar at which a dozen or so individuals get hands-on experience with microcomputers and *VisiCalc* or some other spreadsheet program. Such sessions often go very well. Their success is dependent on two key ingredients: First, the instructor must be good—not merely knowledgeable about computers or about *VisiCalc*, but also very good at actually teaching others about how they work; and second, lab sessions must have plenty of helpers available to help first-time users over the stumbling blocks they often encounter.

As mentioned, most such introductory instruction geared to business users involves spreadsheets. At present, there are far fewer opportunities to learn about using database management systems, graphics, and word processing. For most managers, learning to use a spreadsheet program is not especially difficult. There are only a few dozen spreadsheet commands and there is far less involved in learning to operate the computer. Where people begin to have difficulty is in the development of the spreadsheet model itself. Managers learning to use a database management system often experience similar problems—learning the basics of *operating* a database management system is not all that hard to do, but learning to use it and to think in terms of how the records and fields in a database should be designed is a more difficult proposition.

What all this points to is the fact that there seem to be two types of applications-program users. When it comes to spreadsheet users, for example, there are those who will learn to build, use, and refine their own models and those who wouldn't build models but who could (and would) use models built by others. Thus, it would seem that an organization that wishes to integrate the microcomputer into its facility would do well to do the following:

1. Provide managers with an overview of what the microcomputer can do (that is, of the major applications mentioned earlier).
2. Identify those who would best be characterized as users and those who have or could acquire the skills that model-building requires.
3. Provide model builders with two phases of instruction—the first should introduce all the aspects of the particular spreadsheet to be used, and the second should focus on the skills that the building of effective and correct spreadsheet models requires.
4. Identify those areas and people in the organization that might benefit from using a spreadsheet model. Send in a knowledgeable, well-prepared instruction team to spend some time with the people you've identified and help them build a model for their use. In this way, areas within an organization that lack model-building skills can still benefit from this new tool.

Many organizations are simply providing wholesale exposure of all their people to a hands-on spreadsheet seminar. It might really be better to take the time to identify what applications are likely to be designed using a spreadsheet, where these applications will be located, who will be using them from day to day, and who might be able to design the models that drive the applications.

Ouch! Learning to use a computer can keep a person rather busy. Add in that magic word "statistics" and the prospect is enough to make a lot of folks shudder. After all, few of us had an easy time with statistics in school.

Numbers are a major component of business decisions. Forecasts, budgets, and market shares are all based on numbers. And think for a moment how much we all depend on statistics. We're always asking questions like, "What percentage of the people who own Apples are over forty?" or "Can you show me a table that will display the educational level (high school, college, graduate school) achieved by all Apple owners, broken down according to the person's sex?"

SoftCorp International's *SpeedSTAT* just may be your answer. Volume 1 (the current program is the first package in a planned series) handles frequencies and crosstabs.

Those of you who have some experience using statistical packages on a large mainframe computer are already familiar with frequency and crosstab options. The program is *SPSS*-like in its implementation of these features. There are, of course, limitations on the amount of data that may be analyzed, but *SpeedSTAT* performs many of the same analyses as *SPSS*.

"Frequencies" is a procedure that produces frequency distributions. Suppose that you want to analyze the results of a questionnaire that was given to two hundred people and that one of the questions has four possible answers numbered 1, 2, 3, and 4. The frequencies program would print out the number of people who chose number 1, number 2, number 3, and number 4. The answers given would tell how many people responded a particular way and what percentage of the whole a particular group of respondents represents. In addition, the frequencies program can display a variety of statistical calculations, including mean, median, mode, minimum, maximum, range, skewness, kurtosis, sample standard deviation, sample variance, estimate of the population variance, standard error, number of missing values, and number of valid cases.

The crosstabs program produces tables, often called two-way tables, that show how one variable compares to another. In our example, we might want to know how many males and females responded to the question (how many males chose number 1, how many females chose number 1, and so on). The program would print out just such a table. The rows in our example table would list the sex of the respondents and the columns would list the numbers of the answers. Each cell of the table would contain a count of how many of the two hundred respondents met the specified criteria (for example, *female* and *chose number 3*).

In addition, this program produces such statistics as the row, column, and total percents for each category, chi-square, Cramer's V lambda, gamma, Kendall's tau C, Somer's D, contingency coefficient C, Spearman's *rho*, Pearson correlation, the number of missing values, and the number of valid cases. (By the way, you don't have to understand every one of the statistical measures in order to benefit from frequency distributions and crosstabs, so don't worry if, like most of us, you have no idea what a Somer's D might be. Certainly, one must be careful in making generalizations about data without a knowledge of the statistics. Many times the statistical measure tells the researcher that, although the data looks great, it occurred by chance and should not be relied upon.)

Using *SpeedSTAT* requires a 48K Apple, two disk drives, a monitor or television set, and a supply of disks. A printer is not required but would certainly be useful in preserving hard copy of the reports.

There are basically six parts to the package: data in, data out, edit, statistics, reports, and setup.

Data in is used to get the data into the system. Data may be entered from the keyboard or from a data disk. This section is also used to identify the design of the data. Essentially, a data set is made up of cases, such as a person's set of responses to a questionnaire. The cases are made up of variables, namely each question that a person was asked. The variables have answers. These answers have labels (words that describe each answer) and values (the answers themselves). In addition, *SpeedSTAT* can access data stored in DIF files so that it is compatible with a variety of other products.

Data out is used to store the current data set on a data disk. Also, the entire data set must fit into main memory. This can be a limitation when it comes to some types of processing.

Edit is one of the more powerful options available. It allows you to display any case, modify any case, add new cases, identify which cases should be included in a subsequent analysis, edit names given to variables, enter or edit labels given to values, recode values (that is, to specify code numbers to signify a particular range of values), and to search through the cases using a variety of search criteria.

Statistics is used to select and execute a variety of statistical measures. You can even do some sampling of the data before processing it fully.

Report possibilities include a raw data report (all data is included), a raw data summary, frequency distributions of your choice with accompanying statistics, and two frequency tables (crosstabs) with accompanying statistics.

The *setup* section creates work disks and allows you to set the appropriate printer parameters.

One of the most impressive parts of this package is the documentation. It is unusually readable, contains loads of actual screen illustrations, and is well organized. It covers using the computer, using a software package, and using statistics, so this is no small accomplishment. The manual was written by a user who wasn't a computer professional; perhaps that says it all.

Since many people who are interested in statistics are accustomed to using large mainframe computers with very large main memories, how much data a program can process is a pertinent concern. The amount of data *SpeedSTAT* allows you to work with is a function of how many variables there are in each case. More specifically:

Number of Variables In Each Case	Number of Cases Allowed
5	2048
10	1248
15	806
20	585
25	452
50	187
75	98

As you can see, the package can accommodate data sets of reasonable size. It's important, of course, to have a good sense of your application before choosing a statistical analysis package.

Statistical analysis can add a new dimension to your decision-making aids. If you are already a statistics user and you've been looking for a microcomputer-oriented package, this one should meet your needs. It will not teach you all about statistics; it does make it easier to work with them, however. You, as always, must do your homework ahead of time in order to determine what measures are important. *SpeedSTAT* provides many capabilities that both the professional statistician and the novice will find useful.

B.U.G. Advice. One of our Business User Group members wrote in to ask whether it would be okay to use both sides of a floppy disk. It seems she saw a device at a computer show that would cut a notch in the backside of a disk so it would no longer be write-protected, and she was hopeful that this procedure would double a disk's capacity.

Before you decide to use both sides of a disk, consider these facts:

1. When you use the opposite side of a disk, the disk itself rotates the opposite way. Since the purpose of the "dust jacket" is to wipe the disk surface, this opposite rotation may cause any collected particles to come loose and scratch the surface of the original side.

2. Disk manufacturers test both sides of a disk for any defects. If a defect is found on one side, that side is often used as the underneath side when the disk is packaged and sold.

3. Using both sides of a disk decreases the life of the disk.

For these reasons, using both sides of a disk is certainly not recommended when you have valuable data to be stored. Forewarned is forearmed; you make the final decision.

And so we come to the end of another month's ramblings. Thanks for tagging along.

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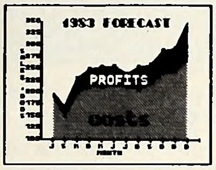

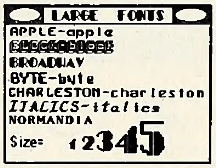

The GRAPHICS DEPARTMENT is a new graphics system that combines five major graphics tools into one friendly, easy-to-learn HI-RES graphics package. All visuals produced are HI-RES pictures suitable for printing or turning into slides.

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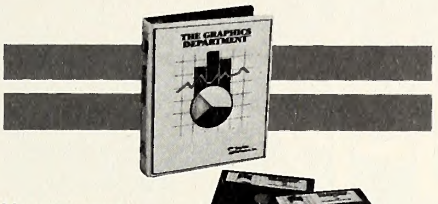


You can even overlay multiple images.

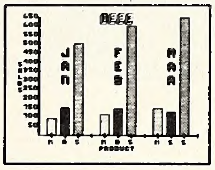
2. The **lettering kit** includes 20 character fonts...from Old English to Bold Modern, from headlines and shadow effects to tiny text. You may letter anywhere on a HI-RES picture with complete control over character size, color and direction.

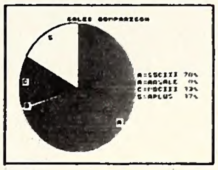
3. The **graphics tools** module lets you "cut and paste," overlay, merge, flip, shrink, invert, mask, change colors, or add patterns. You can use these graphic tools to edit and combine charts, or even to create pictures from scratch.

4. The **slide projector** combines your graphics into a professional-looking presentation. You can move "slides" forward or backward with the game paddle or even automatically display them at preset intervals. It's a great way to beat "rush" presentation deadlines!

5. **Editors** are available in both the charting kit and the slide projector to simplify your data entry.

All these features are now combined into a single package for the first time. Now you can do your entire presentation with just one graphics program. All you need is the GRAPHICS DEPARTMENT program, an





Apple computer (II, *//e*, or *///*), 48K, and Applesoft.

GRAPHICS DEPARTMENT is available for only $124.95 at your local computer store. Or directly by mail (please add $1.25 for shipping). Visa, Mastercard, COD, and checks welcome. For more information or to order:

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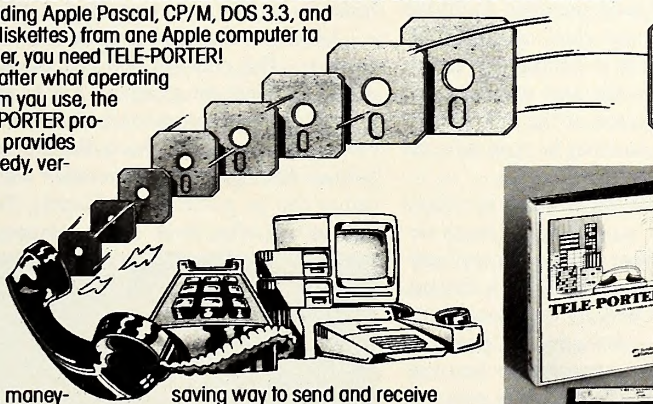

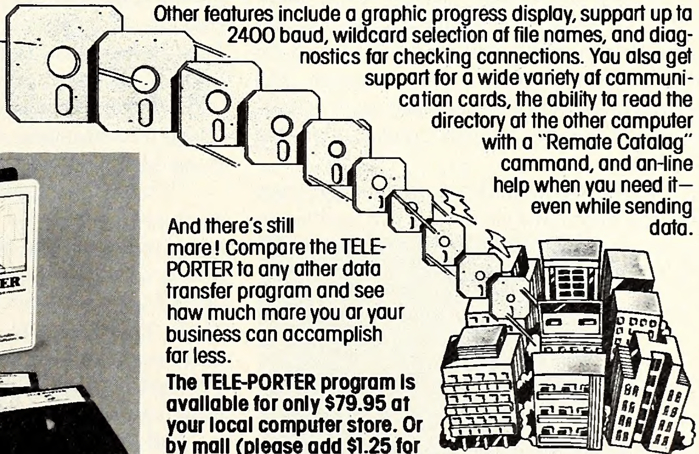

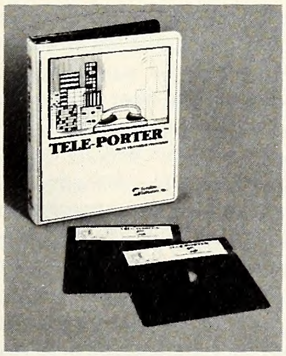

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Requirements: Apple II,™ //e or /// (in emulation mode) computer with 48K and one or more disk drives.
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BY TOMMY GEAR

What separates a successful business from a blockbuster? VisiCorp, nee Personal Software, presents an example of the latter. Its superstar product, *VisiCalc*, became such a hit that management decided to change the name of the company to reflect the product's name. Was this success all due only to the merits of a software concept whose moment had come, or was the foresight and willingness of the management to take risks—from the word go—also a crucial ingredient?

Softalk first introduced its readers to the VisiCorp people and their forward-thinking approach back in October 1980. The company was still doing business as Personal Software then. Here was a firm whose growth became the archetype of the Silicon Valley success story.

VisiCorp's Dan Fylstra and his wife operated a software mail order operation out of their apartment in Cambridge, Massachusetts. That was in 1978, and their product line contained many games one might consider collectible today, some by nature of their obscurity, others by nature of the huge popularity they've enjoyed since they were originally released.

One such collectible hit program was developed by Canadian Peter Jennings, the cofounder with Fylstra of Personal Software, toward the end of 1978. This popular chess program, *Microchess*, along with the marketing savvy of Fylstra, made possible all that would follow for Personal.

With the success of this program under their belts, Jennings and Fylstra were in a position to begin parlaying the company, which started with an initial investment of $500, into one whose worth is now appraised to run somewhere in the area of $125 million. Armed with an understanding of the necessity to take risks, they felt compelled in late 1978 to embark on a course of action that could make or break the company.

They decided to go for broke, funding MIT grads Dan Bricklin and Bob Frankston with $100,000 worth of the profits from *Microchess* to develop what was envisioned to be a business forecasting tool or spreadsheet. The gamble paid off: *VisiCalc* became a long-running top seller, setting a standard that all competitors addressing the business software market would have to acknowledge.

By 1980 Personal Software had received $500,000 in private placement funds from a venture capital arm of the Rockefeller family, as well as all the management expertise that went along with the association. A few months before the Exec feature *Softalk* presented on the company in the latter part of 1980, Terry Opdendyk, formerly of Intel and, before that, of Hewlett-Packard, had been recruited to fill the position of president and chief operating officer. Jennings had begun to concentrate his efforts in advanced research and development, and Fylstra, now chairman of the board, continued to concentrate on what he then referred to as "doing an Apple."

"We looked around the industry and liked what we saw at Apple, so we applied those elements of success that were germane to our business and made them our own," says Fylstra. One of these elements was, by traditional standards, the premature installation in executive positions of people that appeared to be overqualified, thus allowing the company room to grow into the capabilities of its management.

And grow the company did. With its change of name to VisiCorp and of residence to Silicon Valley, all the entertainment software that was part of its line early on was eschewed in favor of a complete line of business packages. Every one was called VisiSomething and was supported by a full-time staff of more than three hundred employees.

In the spring of 1981, it became obvious that if hardware trends continued evolving as rapidly as they were, certain things would be inevitable in the area of software marketing. Fylstra says, "One of our maxims is that user expectations always rise to a point just beyond what can currently be delivered."

Plans were laid to develop a series of integrated multipurpose software packages that would complement *VisiCalc* and take advantage of the more powerful computer systems that consumers would be buying.

Now, two years later, VisiCorp is about to unveil *VisiOn*. Though analogous in many ways to the approach taken by Apple with the Lisa, *VisiOn* is distinctively software-based, allowing it to run on various machines, above the level of the operating system.

VisiOn and Lisa share a distinctive window approach to interacting with various data structures and a mouse that makes control keys and complex command codes a thing of the past. The *VisiOn* programs opt for a more verbal approach to menu selection, instead of the graphic icons that Lisa provides to represent various tasks.

VisiOn is scheduled to be in users' hands by October. The package will run on sixteen-bit machines (eight-bit machines not being powerful enough to accommodate it) and will use expanded memory and hard-disk-storage capabilities. The approach is modular: Each application can be purchased separately. The initial release will offer three core programs, *VisiOn*

Left, chairman Dan Fylstra, and right, president Terry Opdendyk, VisiCorp's visionary helmsmen.

Calc, *VisiOn Word*, and *VisiOn Graph*, each integrating substantial improvements over other similar applications already offered in VisiCorp's product line.

In such a period of rapid technological growth as the present, when the nature of the workplace is being redefined by burgeoning technology, the nature of the relationship between labor and management must also be redefined. The awareness of this essential connection is reflected at VisiCorp in the share-the-wealth attitude toward employees that's concretely implemented in the company's profit-sharing and stock-option policies. The majority of VisiCorp stock is held by its employees in spite of successive rounds with outside venture capital investors—a little more than nine million dollars' worth—that the company has enjoyed to date. Management at VisiCorp stands committed to this approach that views worker participation as an essential ingredient for increased productivity and continued success.

Another solid commitment at VisiCorp, continued from the early days when Personal Software was just beginning in Boston, is the employ of the handicapped for product assembly. Last year VisiCorp was selected Handicapped Employer of the Year for the San Francisco Bay Area. The company currently employs hundreds of handicapped people from various organizations, including a disabled veterans' group.

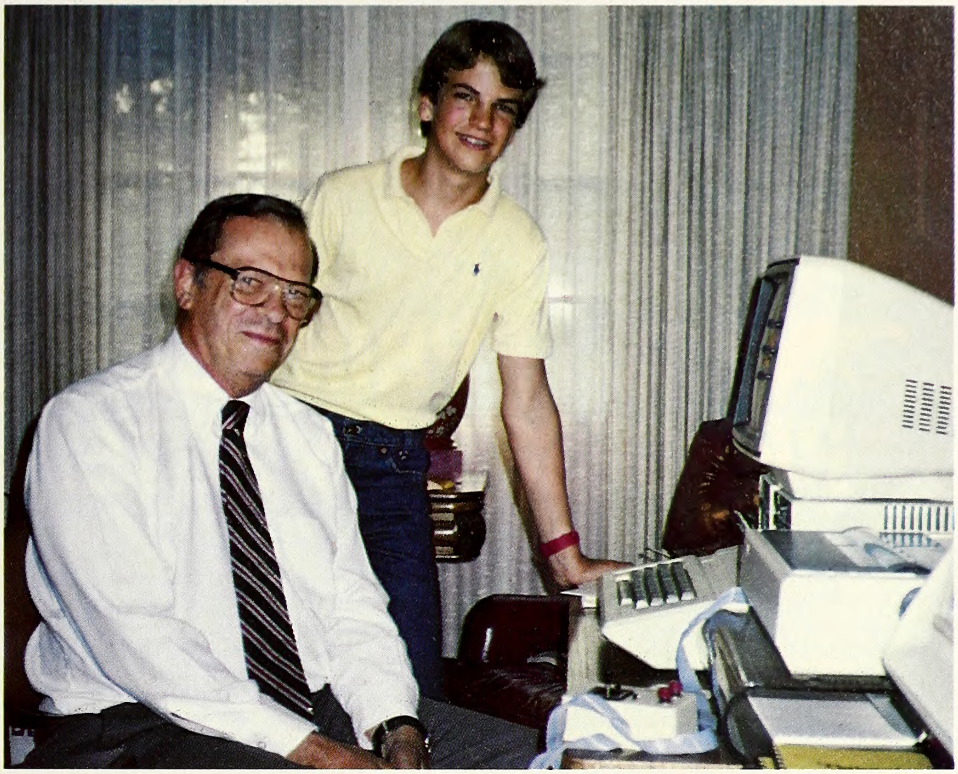
Looking always toward the future, Opdendyk sees the next frontier for VisiCorp to be in the area of communications and networking; he predicts a proliferation of local-area networks over the next few years. In consideration of this, all of the *VisiOn* line has the ability to communicate with mainframes and other micros.

The meteoric success of *VisiOn*, made possible by the powerhouse team of Fylstra, Opdendyk, and Jennings and backed by the support of those in their employ, bears witness to the viability of risk-taking in the area of marketing as well as in the area of organizational structure and policy. Most companies that endure and become giants in their fields achieve success because the motivating people who make the decisions are risk-takers.

But the nature of risks is that, sometimes, they don't pay off.

Taking Chances. A man like Howard Hughes predicated his life on taking risks, in business and personally. Plenty didn't pay off for him, but most of the crucial ones did. Besides that eccentric and monumental souvenir, the Spruce Goose (flown only once, and only for moments, with Hughes himself in the cockpit), the giant and now diversified Hughes Aircraft Corporation remains a living monument to this innovator's risk-taking prowess. At the helm today is Dr. Allen E. Puckett, chairman of the board and chief executive officer. He bought himself an Apple in 1979 as a tool to help him understand better the implications of increased computing power on the flow of information at Hughes. *Softalk* told his story in September 1981.

At that time, Puckett had taught himself programming from the manual that came with his Apple and had devised some programs for his personal use to keep track of tax records and stock transactions. An enthusiastic yachtsman, Puckett wrote a program used in the Mazatlan Regatta to keep an up-to-the-minute account of each yacht in the race. The information that the program tracked, on each vessel's position and current standing, during the race kept the participants and the media who were covering the event well abreast of each yacht's progress.



Above, Dr. Allen E. Puckett, Hughes Aircraft chairman, and his son Jimmy enjoy spending time at their computer workstation at home.

In his position at Hughes, Puckett was preoccupied with a different kind of progress, that of adjusting company personnel to the electronic revolution. The chief executive officer had come to understand the coming computer age as an electronic triangle: data processing, data storage, and communication. "Group all three and you have a totally new capability in excess of human capability," he said.

Convinced at the time that computers would never replace the necessity of human interaction—such as the team effort he saw as fundamental at Hughes—Puckett believed that decentralizing the job site through the use of personal computers at home would probably not be conducive to his company's progress.

But nowadays, things are changing. Based on his experience of having the Apple at home, Puckett decided to risk an experiment. At the end of last year he picked the top fifty executives at Hughes, most of whom had no computer experience whatsoever, and provided them with micros for their own use at home. Puckett hoped to enable those in management to gain a better understanding of, and communicate more intelligently with, the computer professionals who are shaping the information revolution.

The chairman now predicts that more and more home computers may become extended workstations, operating as terminals networked into company mainframes. At Hughes, this would be especially apt in the area of software design, which absorbs an increasing amount of development time on complex engineering projects, such as the engineering and design of a satellite.

On the home front, Puckett now has an IBM pc sitting adjacent to his tried-and-true Apple. And this new acquisition was good news to his fourteen-year-old son, Jimmy, who's been writing his own Basic programs for some time—having another computer around gives Jimmy more uninterrupted time on the Apple for programming and for playing *Axis Assassin*, his current favorite. The elder Puckett worries about the preoccupation with game playing by Jimmy and his schoolmates, many of whom have Apples at home, too. Reassuringly, Jimmy praises *WordStar* for the ease with which he has applied it to school projects requiring word processing.

Whether you're chairman of the board or merely a fledgling hacker, the Apple you spend your time with can be an essential partner in your personal formula for success. It sure helps to have something you can rely on when venturing into uncharted territory—always a risky business.

One of the greatest thinkers of our time, R. Buckminster Fuller, passed away on July 1, 1983. Softalk *was privileged to have visited with him for our January 1982 cover story. Fuller's enthusiasm for microcomputers will not be forgotten; the implementation of his World Game concept on an Apple continues at full pace.*

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The ONLY BUFFER that let's your Apple II™ & IIe™

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PRINT SERIAL!

ALL FOR $125

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EXPANDABLE TO 64K

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In the dual printing mode, data to be printed parallel and serial are stored separately in the buffer memory. The memory is divided between them by intelligent firmware, proportional to the storage requirements of each. The memory is expandable to 64K maximum in increments of 16K with plug-in RAM modules available from your dealer.

P/S Buffer Card has both a parallel output port and an RS-232C standard serial output port. When you need to change from parallel to serial, serial to parallel, or output both simultaneously, you don't have to physically change cards. The intelligent firmware lets you do it by either software command or (optional) hardware switch.

P/S Buffer Card interfaces with most popular parallel printer cards including Apple,™ Epson,™ Grappler,™ Graphitti,™ PRT-1,™ and Tymac.™ If you don't already have a parallel card, order the P/S Buffer "Stand-Alone" Card. It includes a built-in parallel interface. An optional graphitti plug-in ROM allows you to dump the Apple hi-res graphic screens with a few simple keyboard commands.

Many applications programs and ope[rating systems] such as CP/M™ and App[le] Pascal™ require that the parallel interfac[e] be in a specific slot. So, leave it there. Whe[n] you wish to print parallel, or serial, or both [at] the same time, just "tell" P/S Buffer Ca[rd] what to do. It's that easy.

See your local dealer for details.

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P/S 16K BUFFER CARD. For use with existing parallel interface card ..... **$125.**

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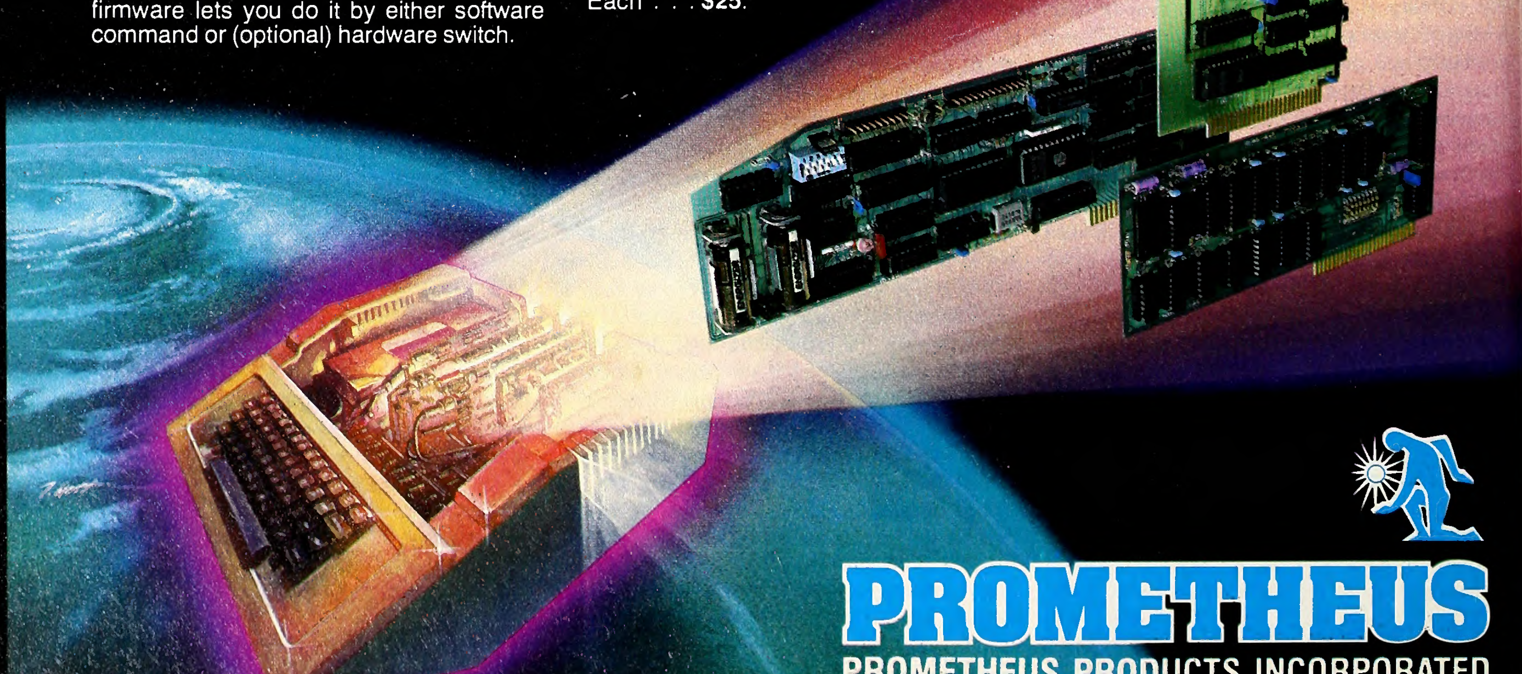
16K RAM MEMORY EXPANSION Plug-In MODULES (64K Total Maximum) Each . . . **$25.**

Hardware "SWITCH" Option . . **$25.**



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HARD TALK

BY JEFFREY MAZUR

This month we'll look at a few more new products for the Apple that should be of some interest.

Print Buffers. The Consolink Corporation (formerly Compulink) offers two standalone print buffers. The first is SooperSpooler, a full-featured, parallel/serial unit with up to 62K of memory. The SooperSpooler is completely self-contained, with its own power supply, cabinet, and internal microprocessor. In addition to the power switch, the front panel sports a two-digit LED display, a reset button, and two sets of push button/LED indicators. The buttons control the space compression and pagination features of the SooperSpooler. The back of the unit provides input/output connectors, a "hard" reset button, and access to several DIP switches used to select the default configuration.

The basic model of this print buffer includes 16K of RAM, a parallel input port, and a parallel output port. A memory expansion module is also available, as is a pair of serial ports. Besides functioning in its normal fashion as an on-line buffer, the SooperSpooler can convert serial input to parallel output or vice versa.

Connecting the SooperSpooler is as simple as removing the cable from your printer and plugging it into the spooler. Another cable connects the spooler to your printer. Several DIP switches for configuring the SooperSpooler to your system are accessible from the rear of the unit. Two of these set up the "line-feed-on-carriage-return" control parameters for both the computer and the printer. Another switch controls the type of form feed used to advance the printer to the start of a new page.

If the form-feed feature is enabled, the SooperSpooler automatically keeps track of the number of lines printed on each page. When the form-feed command is encountered on the input stream from the computer (or generated internally by the SooperSpooler's pagination feature), the unit translates this command into the proper number of line-feed characters to bring the printer to the start of the next page.

If the serial port option is installed, another bank of switches selects baud rates (both incoming and outgoing), character length, stop bits, and parity. Since the baud rates can be adjusted separately, input is normally set to the highest rate common to the SooperSpooler and the computer. If the printer supports some form of handshaking, the output rate will usually be set to the highest rate available on the printer. If the printer does not support handshaking, the rate must be lowered until the printer operates reliably without dropping characters. SooperSpooler supports both XON/XOFF and ETX/ACK software handshaking, as well as the hardware RDY/BUSY control.

The two-digit LED readout on the front panel continuously displays the amount of internal memory being used. Thus when a SooperSpooler with extra memory installed has become full, the readout displays the number 62.

Pressing the space compression button toggles the space compression mode on or off. The status of this mode is indicated by an LED above the push button. When this mode is active, the SooperSpooler attempts to conserve memory by compressing any number of consecutive spaces from 1 to 127 into one byte. This can make the buffer appear to be much larger, especially if the file contains large blocks of tabular data. To achieve this, the SooperSpooler examines each character that comes from the computer. If the character is not a space, it is placed into the input stream of the FIFO buffer. When the computer receives a space character, the spooler temporarily stops filling the buffer and begins counting characters. If the next character coming in is another space, the counter is incremented by one. Each consecutive space character received is counted until a nonspace character is received. At that point, the Spooler puts a special character into the buffer, followed, of course, by the current nonspace character that just came in. This special character consists of the number of spaces that were counted with the high-order bit set. Normal characters do not have the high-order bit set.

When data is being read out for transmission to the printer, the procedure is reversed. All characters emerging from the buffer with their high bits not set are sent to the printer as expected. But whenever a character comes out with its high bit set, the Spooler automatically converts it into the number of space characters indicated by the lower seven bits of the code. Since this scheme for space compression uses the high-order bit as a flag, it cannot compress data that uses codes above 127; this means that this mode cannot be used when graphics, an alternate character set, or other eight-bit data are being printed.

The page button toggles the SooperSpooler's automatic pagination mode. An LED above the switch confirms the present status of this feature. When activated, the Spooler prints a predetermined number of lines on each page and then advances to the start of the next page. Most often, this feature is used to prevent printing on or near the perforations between sheets of fan-fold paper. For this reason, this function is also referred to as "skip-over-perf."

The page button also performs a second function. If it is pushed while the Spooler is still outputting to the printer, printing halts temporarily at the end of the current line unless the printer has its own internal buffer. When the page button is reactivated, printing resumes.

The soft reset button on the front panel affects only the buffer condition of the SooperSpooler. A brief press of this button causes the buffer to clear and the status display to return to 00. The soft reset button is useful when you want to terminate a printout. It does not affect any of the other software or hardware parameters that have been set up.

Several other features of the SooperSpooler are controlled by pressing combinations of the above buttons. For example, pressing the soft reset and page buttons simultaneously turns on the single-sheet mode. This function makes the SooperSpooler easier to use with single-sheet, friction-feed printers.

In some cases, the intelligent features of the SooperSpooler may need to be disabled so the unit can be used simply as a straight-through print buffer. This is easily done by pressing the soft reset and space-compression buttons on the front panel. In this mode, incoming data is simply stored in memory and passed along to the printer; software commands are not checked for.

Pressing the space compression and page buttons together initiates a self-test mode. In this mode, a software check of both ROM and RAM is performed and the results are displayed on the printer.

The hard reset button on the rear of the unit performs a complete cold start (similar to turning the SooperSpooler off and then on again). This clears the buffer and returns all software-controlled features to their default values.

Besides buffering data to the printer, the SooperSpooler offers a wealth of intelligent capabilities to enhance your hard copy, most of which can be accessed by means of software commands to the SooperSpooler. Each command is simply a string of characters, starting with a special "lead-in" character that is sent out by the computer. When the Spooler sees this special character, it stops filling the buffer and instead interprets the next character or characters as a control sequence. The default lead-in character used by the SooperSpooler is the ASCII code 28, but it can be changed to any control character.

A number of useful commands can be sent to the SooperSpooler. Through them, you can accomplish pagination, line formatting, redefinition of the form-feed character, and redefinition of the lead-in character. You can also disable the SooperSpooler's intelligent features so that all data is passed directly to the printer, embed a command to stop printer output, and turn space compression on or off. Each of the commands can be initiated directly from the keyboard (immediate mode) or from within a program (deferred mode).

MicroSpooler. The MicroSpooler is SooperSpooler's little brother. For starters, the basic unit is about one-third the size of its full-featured sibling and contains only one input and one output port. Several models of the MicroSpooler are available, covering all the possible combinations of parallel/serial input/output. Like SooperSpooler, MicroSpooler displays memory status by means of a digital readout.

MicroSpooler has two push buttons, copy/pause and reset. Depending on when it is pressed, pushing the first button activates one of several functions. If the Spooler is currently outputting data to the printer, then pressing this button halts, or pauses, printing. This button can also be used in creating multiple copies of the data sent by the computer. You can do this as an afterthought ("one more copy") or by preprogramming the unit to produce from one to ninety-nine copies. The former function is activated by pressing the copy button anytime after a printout has been passed through the MicroSpooler.

After the complete document has been transmitted to the MicroSpooler (note, of course, that the entire document must fit within the buffer), the Spooler automatically takes care of producing the exact number of copies requested. A pause between copies to allow for inserting new paper for each copy can also be activated. When multiple copies are being produced, the digital readout changes to display the number of copies remaining. Pressing both buttons together causes the MicroSpooler to perform a self-test.

Bufferboard. Provided that you still have an empty slot in your computer, you might find the Bufferboard from Orange Micro a useful addition. This device, which connects to most printer interface cards via a short "docking cable," provides up to 64K of buffered printing. Its connecting cable plugs onto the double-row header pins used by most printer cards, and the printer cable can then be attached to the Bufferboard.

The standard Bufferboard comes with 16K of RAM using the popular 64K (bit) dynamic RAM ICs. These chips are usually organized as 64K by 1 bit and require a minimum of eight chips to store "bytes" of data. By contrast, the microprocessor on the Bufferboard is programmed to operate with as few as two RAM ICs—making the 64K-by-2 memory array appear like 16K by 8. Simply adding the extra memory chips will increase the buffer size to 32K or 64K.

The Bufferboard uses the Apple's reset key to perform two functions. If the reset key is held down while the computer is turned on, the Bufferboard will perform a self-test of its RAM memory. After less than a minute, the results of the test will be displayed on the printer, and each of the eight possible RAM ICs will be identified as being good, bad, or missing.

The reset key can also be used to clear the buffer; however, this function will be performed only if the reset key is held down for more than two seconds. Briefly pressing this key resets the computer but does not disturb the Bufferboard's operation.

If you already have an interface board you're satisfied with, the Bufferboard is an economical way to obtain printer buffering. Its major disadvantage is that it takes up another peripheral slot, something you may be running short of. If you've just bought a printer and are looking for an interface board, Orange Micro's Buffered Grappler is a better choice. This board combines the Grappler interface and Bufferboard functions onto one board.

Okidata Microline 92 Printer. For the past few years, the low-cost dot-matrix printer market has been dominated by three Japanese manufacturers: Epson, TEC (Tokyo Electric Corporation, which makes the NEC 8023, C. Itoh 8510 or Prowriter, and the Apple Dot Matrix

Printer), and Okidata. This year, we've seen all three of these companies bring out their next generation of printers. The good news about these printers is that they offer faster speed, multimode operation, and additional features. For Okidata, this trend is represented by the Microline 92.

The Microline 92 has two basic modes of operation: the data processing mode and the correspondence-quality mode. In data processing mode, the printer works like any other dot-matrix printer. Using bidirectional printing with short-line logic-seeking, the printer attains speeds up to 160 cps (characters per second). In this mode, it uses a nine-by-nine character matrix to obtain draft-quality characters with descenders. In the correspondence, or near-letter-quality (NLQ), mode, the printer uses a nine-by-seventeen matrix and prints at 40 cps. The drastic cut in speed results from the fact that the printhead must make two passes on each line, both in the same direction. That is, the printhead prints a complete line, backs up, and then prints the entire line again. On the second pass, the paper advances slightly so that the printhead places dots in between the existing dots from the first pass. Note, however, that the dots printed on the second pass are not necessarily the same as those printed the first time—each character truly has a nine-by-seventeen dot pattern. The NLQ mode still uses logic-seeking to determine the best direction for printing each line, however.

The Microline 92 has three major font sizes: 10 cpi, 12 cpi, and 17 cpi (characters per inch). These correspond to pica, elite, and compressed character pitches. All of these fonts can be printed in double width, giving three more sizes of 5, 6, and 8.5 cpi. Two forms of special printing are also supported. Emphasized printing causes each dot to be printed twice, one right next to the other. This gives the print a darker appearance and makes horizontal lines more continuous. Enhanced printing, whereby the paper is advanced by a one-half-dot width in between the two passes, is also available. This gives the print an even darker and thicker look, at the expense of a little clarity. There's a difference between enhanced mode and the NLQ mode. In enhanced mode, the very same dots are printed during both passes. The NLQ mode also allows proportional spacing between characters. Proportional spacing must be done through software, however, by constantly supplying a new "space between characters" value. This is different from the NEC, C. Itoh, and Apple printers, all of which can proportionally space automatically.

The Microline 92 is also capable of printing slightly above or below the normal printing line. This makes it possible to print superscripts or subscripts for such things as chemical formulas or mathematical notations. A continuous underlining feature allows the printing and underlining of text in one pass.

Line spacing can also be set to either six or eight lines per inch. Actually, any line height between 1/144-inch and 127/144-inch can be specified from software. Also selectable from software are page length, top of form, and right and left margins. Horizontal tabs and a vertical format unit complete the repertoire of the Microline 92's page formatting. Two other features of this printer are worth mentioning: downloadable characters and graphics printing.

Each ASCII character has three dot patterns stored in the Microline 92: one for the draft-quality mode (nine by nine), another for the NLQ mode (nine by seventeen), and the third for patterns the user defines. Characters are defined within a seven-by-eleven-dot field, and pattern information is sent to the printer using a special sequence of characters. Once the "start loading" command has been sent, the code for the character being defined is sent, followed by the bit map for the character. It takes eleven more bytes to specify this map—each byte represents the dots to be printed in one vertical column of the character. Within each byte, a one signifies printing of a dot in the corresponding row, while a zero means no dot. Of course, when the printer is turned off, any downloaded character definitions are lost.

For dumping pictures of the Apple's hi-res screens, the Microline 92 supports Okigraph dot-addressable graphics. This means that with the appropriate software, hi-res dumps can be accomplished with ease. Up to seventy-two dots per inch can be printed either vertically or horizontally. For the ultimate convenience, a printer interface card with onboard graphics dump routines should be used; just make sure your card has the appropriate firmware to work with the Microline 92.

The Microline 92 appears to be sturdy and well built. It weighs almost twenty pounds. Most similar printers are lighter (an Epson MX-80, for example, weighs about twelve pounds).

A small lever on the right side of the unit is used to select either friction feed or pin/tractor feed. The standard printer is equipped with pin feed rollers for nine-inch paper. A tractor assembly, available separately, can be attached on top of the printer for full four-point tractor feed. This unit is adjustable on both sides down to a minimum spacing of three inches. A roll-paper holder is also available.

Paper is usually fed into this printer from the top or back. When the tractors are used, however, paper can also be fed in through a slot in the bottom of the printer. This is a feature usually found only on higher-priced machines; of course, it requires that the printer be placed on a special printer stand that has a similar slot for bottom feed.

On the front of the printer is a small control panel with five switches and three indicator LEDs. The switches perform line feeds and form feeds, select/deselect the printer, and set top-of-form. The last switch works in conjunction with a ten-position rotary switch that selects the form length. These controls make it easy to set up for the printing of continuous-feed invoices, checks, or envelopes. The three LEDs indicate when the power is on, when the printer is selected (enabled), and when the printer has run out of paper. Also on this panel (behind the front cover) is a row of DIP switches that select various default parameters such as line feed on carriage return and foreign language character sets.

Update. The Galfo Systems *Integer Basic Compiler* is now available exclusively from Synergistic Software, 830 North Riverside Drive, Suite 210, Renton, WA 98055; (206) 226-3216. ◼

Consolink Corporation, 1840 Industrial Circle, Longmont, CO 80501; (303) 651-2014. Okidata Corporation, 111 Gaither Drive, Mount Laurel, NJ 08054; (609) 235-2600. Orange Micro, 1400 North Lakeview Avenue, Anaheim, CA 92807; (714) 779-2772.

With this issue, Jeff Mazur retires from Hardtalk. Mazur will continue to contribute articles to *Softalk* and to advise on the subject he knows best.

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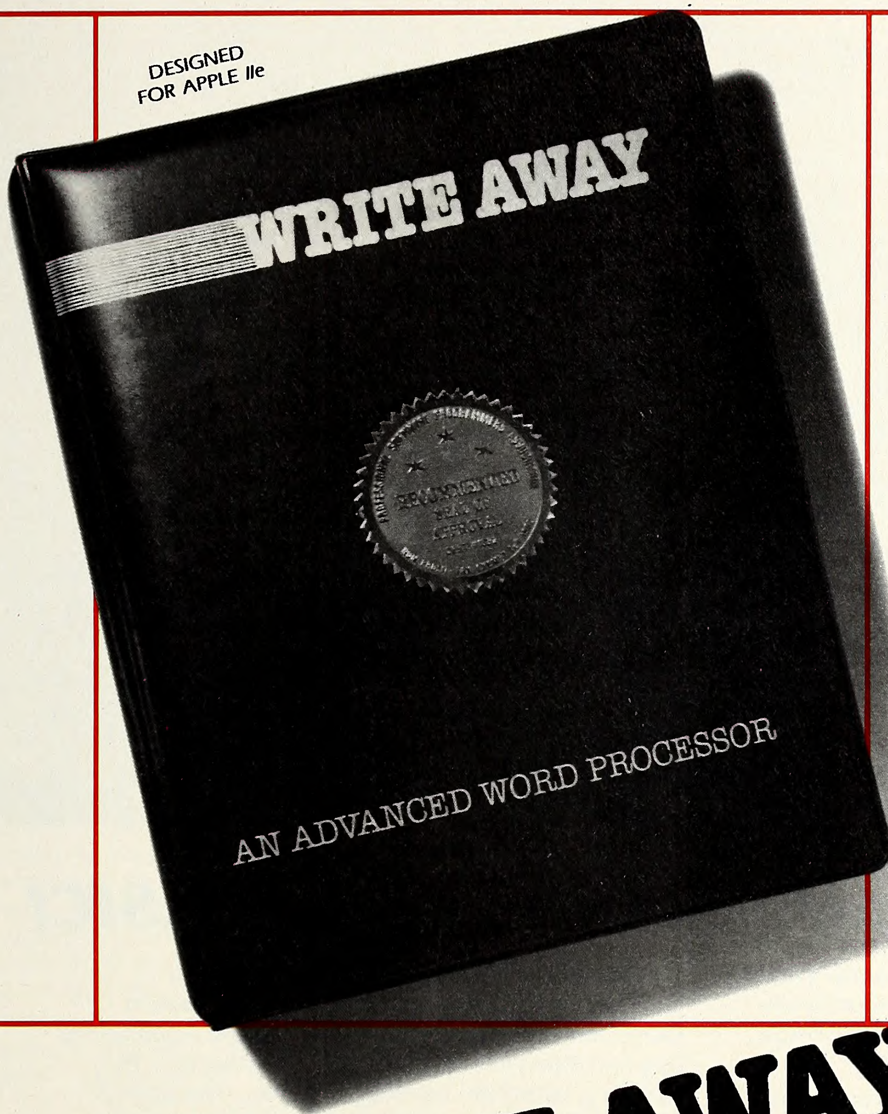

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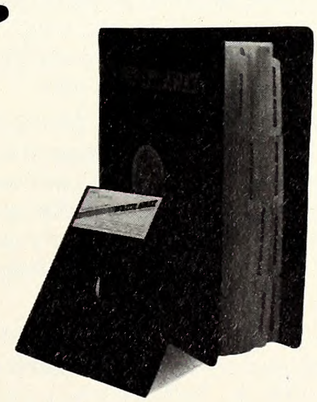

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THE BASIC Solution

By Wm. V. R. Smith

This month's Basic Solution presents a very fast circle-drawing subroutine. The subroutine requires that the hi-res screen be turned on and a color be set for line drawing.

This subroutine was written and developed by Bill Depew. The logic of the circle algorithm requires a knowledge of advanced calculus and will not be discussed in this article.

A circle is defined by the location of its center and the size of its radius. The subroutine requires you to specify the radius of the circle in the variable R and the screen coordinates of the center of the circle in X and Y.

Another subroutine checks the radius and coordinates to make sure that the entire circle can be drawn on the screen. In the event the circle cannot be drawn, the variable ER is set to one, indicating an error. This means that the circle goes off the screen and you should not attempt to draw the circle with the current parameters.

A sample program is provided that draws various-size circles randomly on the screen to show how the routines are used in a program. Looking over the sample control program should give you an understanding of how to use the circle-drawing subroutine and the parameter testing routine.

After you have entered the subroutines and the control program and are satisfied that it runs correctly, you can edit the circle subroutine. You can change the way the circle is drawn in line 320. The current line 320 will draw a filled-in circle. Enter the following line 320 to draw a circle outline.

```
320 HPLOT CX+X,CY+Y
```

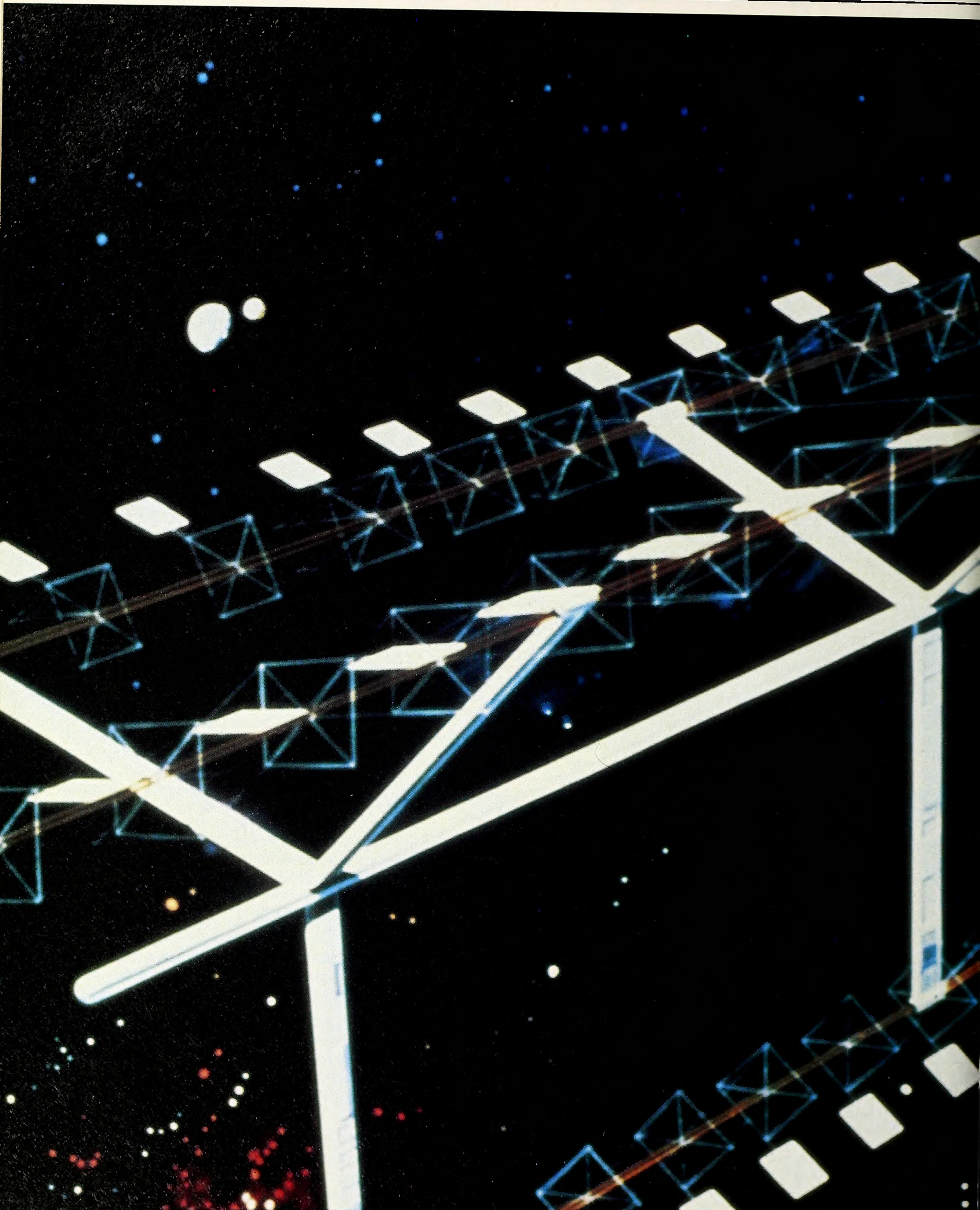
Here is an example of a different way to fill in a circle.

```
320 HPLOT CX,CY+Y TO CX+X,CY+Y
```

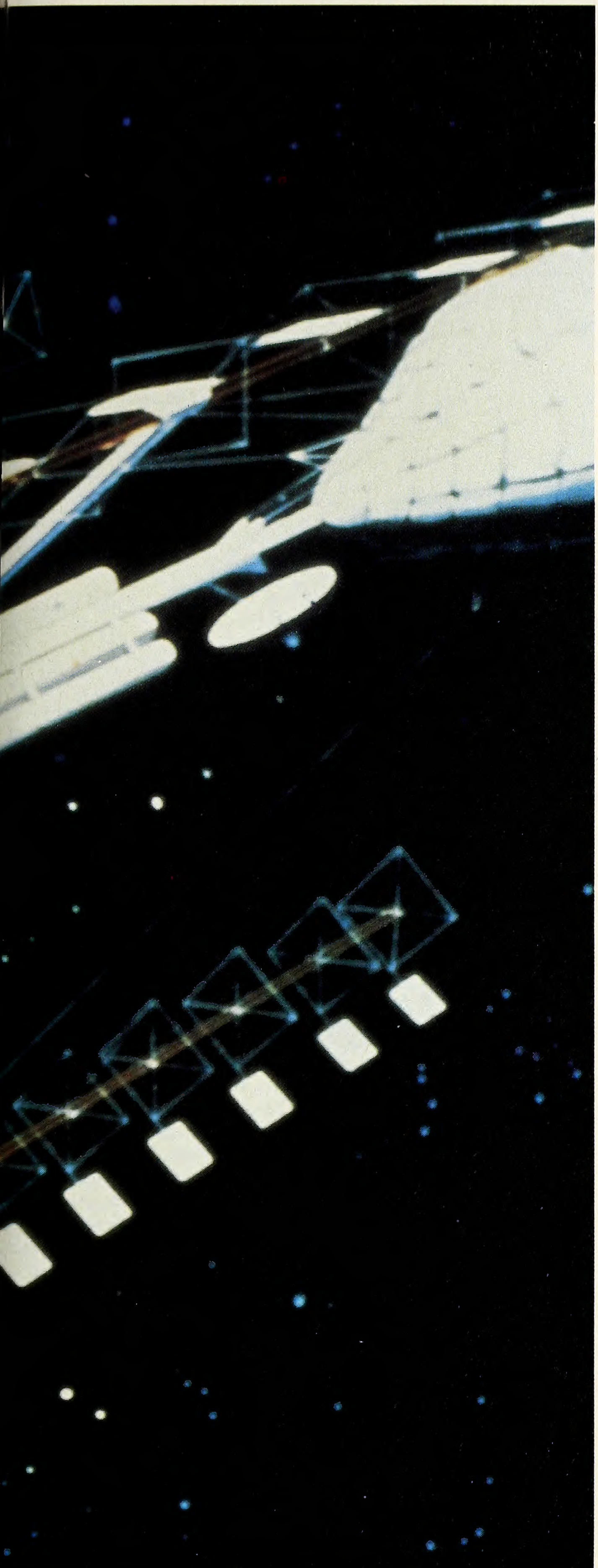
By changing this line you can even create cones.

We will be using this subroutine in future Basic Solution articles so save it on disk for later use. Good luck with your programming.

```
1 REM ***************
2 REM * CIRCLES
3 REM *  CIRCLES
4 REM *    CIRCLES
5 REM ***************
10 HGR
20 HCOLOR= 7
50 R = INT ( RND (1) * 30) + 1
55 CX = INT ( RND (1) * 250) - R
60 CY = INT ( RND (1) * 300) - R
70 GOSUB 100
75 IF ER = 1 THEN 50
80 GOSUB 200
90 GOTO 50
100 REM *******************
110 REM * CHECK CIRCLE
120 REM * SIZE / SCREEN
130 REM *******************
135 ER = 1
140 IF CX - R < 1 THEN 190
150 IF CX + R > 269 THEN 190
160 IF CY - R < 1 THEN 190
170 IF CY + R > 155 THEN 190
175 ER = 0
190 RETURN
200 REM ******************
210 REM * CIRCLE ROUTINE
240 REM ******************
250 N = 0
260 N = N + 1
270 IF (2 ^ (N - 1) > R) OR (R > =
    2 ^ N) THEN 260
280 RD = 2 ^ ( - N)
290 CS = COS (RD):SN = SIN (RD)
300 X = .5:Y = R + .5
310 FOR N = RD TO 6.3 STEP RD
320 HPLOT CX,CY TO CX + X,CY + Y
330 X2 = X * CS + Y * SN
340 Y = Y * CS - X * SN
350 X = X2
360 NEXT
370 RETURN
```



An artist's rendering of the "mass catcher," a large device in orbit that receives lunar material accelerated



into space by the Mass-Driver.

APPLES AND THE HIGH FRONTIER

BY DAVID HUNTER

Civilization on Earth has been allowed to develop. Therefore, we can be quite sure that no civilization hostile to other life is in command of the galaxy. Either there has never been such a killer life form, or any that developed were contained by earlier civilizations with peaceful intentions, or we are, in fact, alone in the galaxy. All three alternatives lead to a single, profound, and positive conclusion.

Our galaxy is friendly, and it is waiting for us.

—from *2081: A Hopeful View of the Human Future*

Dr. Gerard K. O'Neill is optimistic about the future of the human race. Author, professor of physics, researcher, Apple owner, programmer, president of both a high-tech startup company and a nonprofit foundation, pilot, and father, O'Neill is a man with a message: space.

In his two-year-old treatise on the future, *2081* (Simon and Schuster), O'Neill proposes that when a civilization reaches the level of technology we have today, there are only three paths its future history may take: self-destruction, stagnation, and the colonization of space.

Making a Path under Surges That Threaten To Engulf Us. It's no secret that there are enough nuclear warheads in the arsenals of the world to bomb the human race back to the Stone Age, if not right out of existence. And by stagnation, O'Neill means that the civilization might never grow beyond its own solar system. "A civilization could freeze its technical progress at a modest level and could devote the rest of time to the arts, to philosophy, or to contemplation."

O'Neill refers to the first two paths as "dead ends," though he does acknowledge that stagnation "could be perfectly satisfactory. After all, the oyster fills its ecological niche so well that it hasn't changed for a million years." But it's the third path, colonizing space, that he feels is the best one for our civilization.

The idea of building human colonies in space is an old one. As far back as the writings of Cicero and Lucian it's possible to find fanciful speculations about space. The acknowledged modern-day father of space colonies is Konstantin Tsiolkowski, a Russian schoolteacher who proposed that a space colony requires only an air-enclosing shell and could make use of solar power and raw materials found in space. Tsiolkowski first developed his ideas in the early years of this century; he was way ahead of his time.

Several decades later the idea of colonies in space—as opposed to colonies on the moon and planets, which have always been popular notions—was revived by individuals like Robert Goddard, John Stroud, J.D. Bernal, and Dandridge Cole. O'Neill is the latest champion of the cause of breaking through what he calls our "myopia, our inborn automatic assumption that all human beings, even centuries from now, will be born and live out their lives on planets, even if they venture briefly into space to travel from one planet to another."

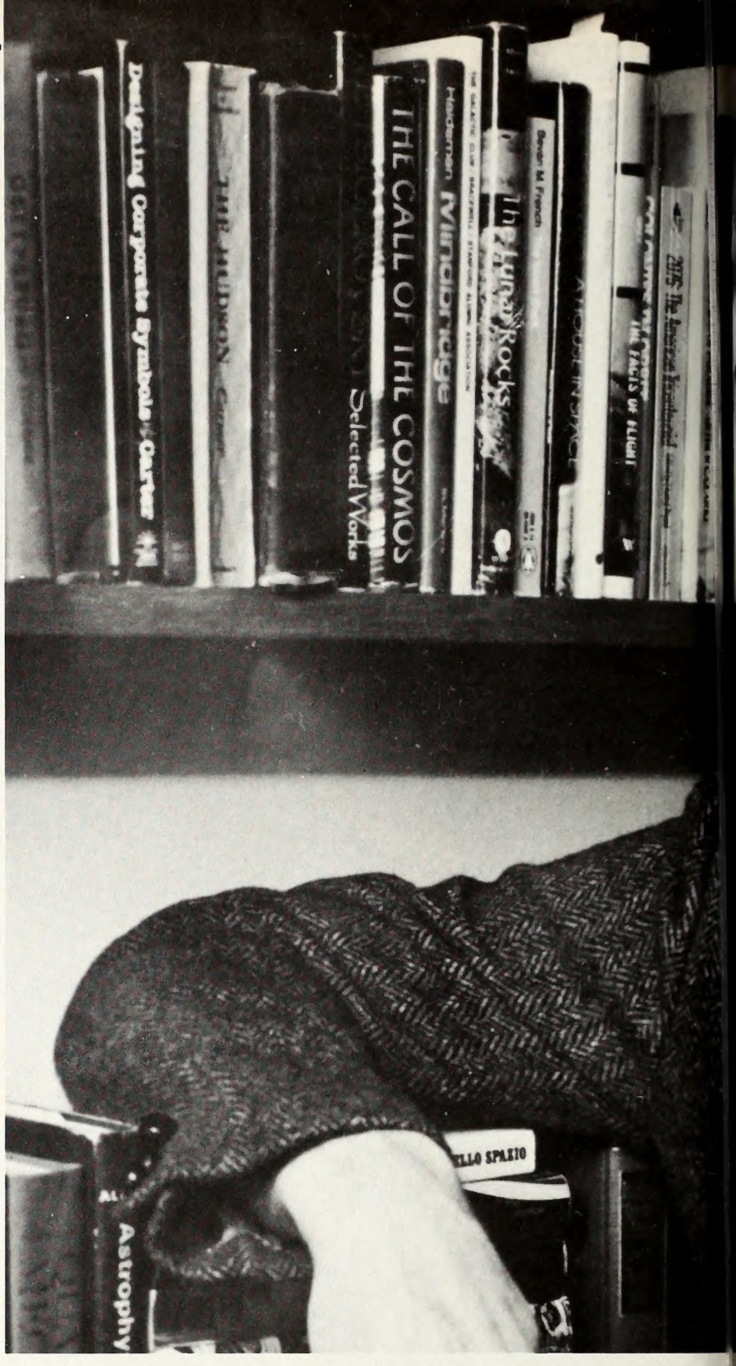
In *2081*, Gerard K. O'Neill takes us on a whirlwind journey through a world of ideas, a future that some of us may be around to see. Right now, he's heavily involved with the down-to-earth process of developing some of these technologies, including a curious piece of hardware called a "Mass-Driver." One of his hardworking colleagues, helping with the research and design of the Mass-Driver and numerous other tasks, is an Apple II Plus.

New Jersey, the Final Frontier. O'Neill is currently a professor of physics at Princeton University and president of the Space Studies Institute and Geostar Corporation. A native of New York state, raised in Connecticut and upstate New York, O'Neill received a B.A. from Swarthmore College in 1950 and a Ph.D. in physics from Cornell University in 1954. Since 1954 he has been a faculty member at Princeton, teaching both graduate and undergraduate courses.

O'Neill has conducted numerous research projects, especially in elementary particle physics. In 1979, he published a graduate textbook on that subject with one of his graduate students. O'Neill is perhaps best known in particle physics circles for the concept of colliding-beam storage rings and for implementing this concept in the first high-energy colliding-beam experiment.

In 1969, O'Neill took an idea that had been around in various forms for decades—colonies in space—and promoted it as a realistic plan within the limits of existing technology. The early seventies were a frustrating but exciting time, says O'Neill. It was difficult to gain support in the scientific community for his ideas, because they were so "threatening to 'establishment' thinking." He had to resist the temptation to give up and turn his work into science fiction.

By the mid-seventies, O'Neill had stirred up more than passing interest among the scientific community and the aerospace industry with his conclusions "that we could build space colonies relatively soon, within



Dr. Gerard K. O'Neill, president of the Space Studies Institute and Geostar,

the limits of known engineering practice, out of ordinary materials; that the colonies could be large, as much as a hundred square miles in land area; and that they could be, if we so desired, very 'Earthlike.'"

In 1977, O'Neill wrote *The High Frontier* in which he worked out his version of a consistent, practical plan for building space colonies. He attempted to do what must be done with any new technical construct, forging a chain of many links so that every link is correctly identified and proven feasible. One possible space colony design O'Neill wrote about in *The High Frontier* is what he calls a "Bernal Sphere"—named after J.D. Bernal, who wrote about the human habitation of space more than fifty years ago.

The Bernal Sphere actually contains two spheres, one inside the other. The outermost sphere is stationary and made of lunar soil to shield the interior sphere from cosmic rays. The inner sphere has an atmosphere and slowly rotates, simulating the Earth's gravity near its equator. Solar energy provides power and light, with greenhouses providing food. The interior could be lush with vegetation, while the area near the "Earth-normal" equator would be a good place to enjoy such sports as swimming and tennis. More esoteric athletic activities, such as zero-gravity soccer and human-powered flight, would be possible near the sphere's axis of rotation.

In 1977, O'Neill directed a second study (the first was in 1976) on space manufacturing at NASA's Ames Research Center. That study re-

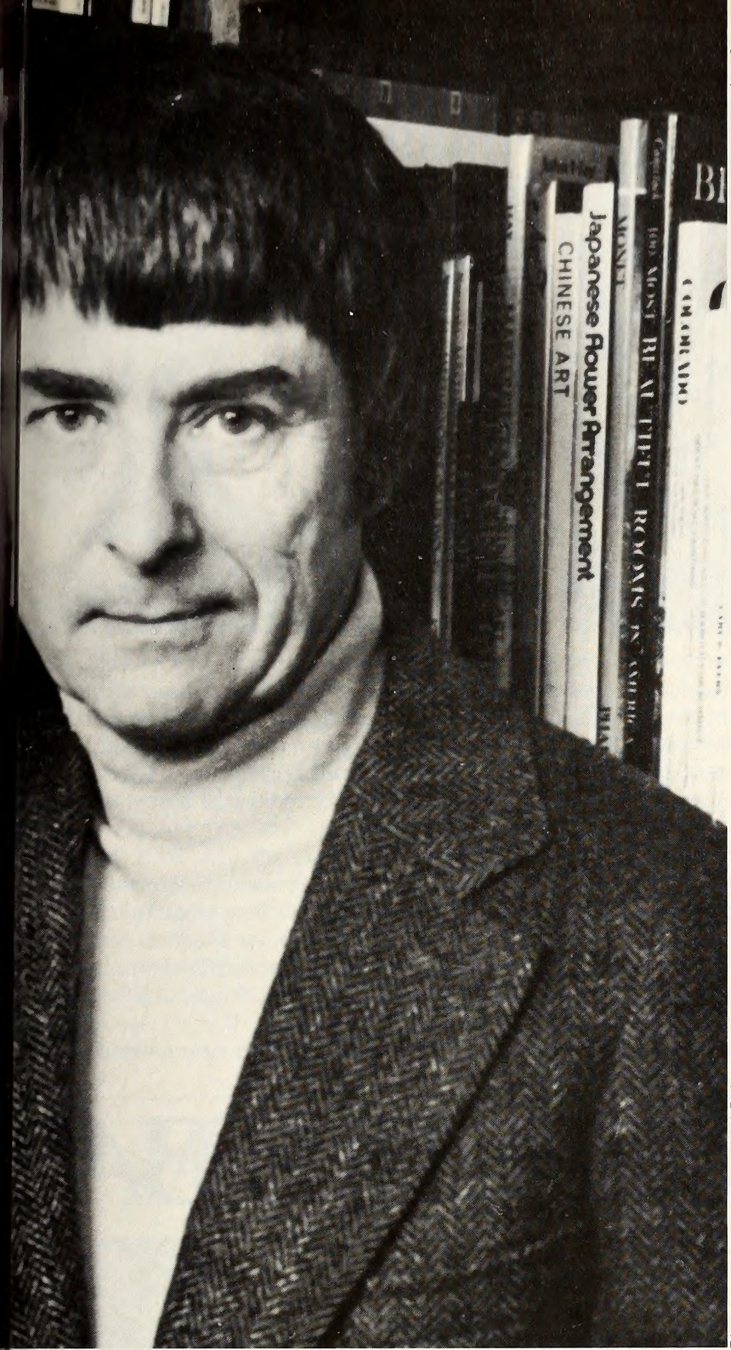


Photo courtesy of Simon and Schuster

professor of physics at Princeton, author, pilot, and Apple owner.

sulted in a collection of technical papers dubbed *Space Resources and Space Settlements* (NASA SP-428), and it narrows down the problems of space manufacturing and building self-contained space colonies to five main areas: research needs for regenerative life-support systems, habitat design, dynamics and design of electromagnetic Mass-Drivers, asteroids as resources for space manufacturing, and processing of nonterrestrial materials.

After completing the NASA study, O'Neill founded the Space Studies Institute (SSI), a nonprofit organization dedicated to funding research through popular subscription. He also got funding from NASA to begin work on a prototype Mass-Driver.

What's a Mass-Driver?

A Mass-Driver is an electrical device used to accelerate payloads of any material to a high velocity. This is accomplished by accelerating a small receptacle, known as a "bucket," containing superconducting coils through pulsed magnetic fields. The bucket is guided by induced magnetic fields set up in a surrounding guideway.

Lunar Rocks on the Rise. Imagine a one-hundred-sixty-meter-long tubular machine on the surface of the moon. Mined materials are put in an open-ended container at one end of the machine. A fraction of a second later the container races to the other side of the tubular machine and ejects the material into the thin atmosphere of the moon at a greater speed than the moon's escape velocity. Sixty or so hours later, the material has escaped from the moon's gravitational well and is picked up by a "catcher" in high orbit.

The rationale behind a device like the Mass-Driver is dictated by economics. In order to build structures in space, material is needed. The power—and its cost—required to lift materials from the earth to high orbit (outside the earth's gravitational well) is enormous.

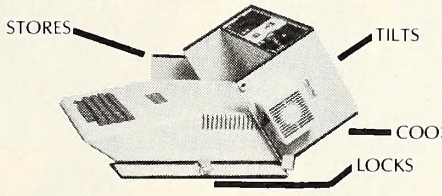
Launching materials into high orbit from the earth requires about eighty tons of fuel to transport one ton of payload. O'Neill claims that for each ton of the weight of a Mass-Driver you'll get eighty tons of lunar material a year.

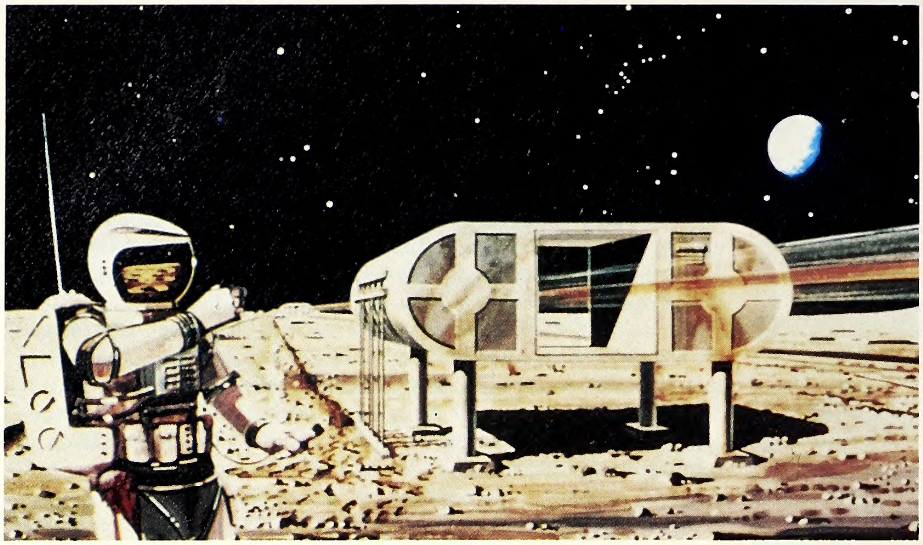
O'Neill and others have argued convincingly that large- or small-scale colonizing of space could be accomplished faster and cheaper with space materials. The solar system is well-stocked with raw materials—chiefly asteroids and the moon, in our general vicinity. Devices like the Mass-Driver would provide an efficient way to transport these materials to an orbiting manufacturing site. As such, the Mass-Driver agrees with another underlying concept in an economical approach to space colonization—automation.

It was much cheaper and safer to send an automated craft to Mars than it was to send a manned exploratory flight. The same kind of thinking, according to O'Neill and his colleagues, will govern our future efforts in space. There will be many situations in which having automated devices like the Mass-Driver will be cheaper and more efficient than having human beings doing the work.

O'Neill was the first to write about the concept of Mass-Drivers in a technical article—"The Colonization of Space"—published in *Physics Today* (September 1974). For the NASA study—*Space Resources and Space Settlements*—O'Neill worked with nine other researchers on three papers covering the electrical design, structural dynamics, and engineering of Mass-Drivers.

Primitive Drivers. Through the late seventies, O'Neill and his colleagues at Princeton developed a working model of a Mass-Driver. The research, which was made possible through NASA funding, resulted in two scaled-down prototypes, MDI and MDII.





The basic driver design of a tunnel of electromagnetic coils, fired in sequence to accelerate a bucket likewise equipped with magnetic coils, has not changed from MDI and MDII to the most current Mass-Driver prototype, MDIII.

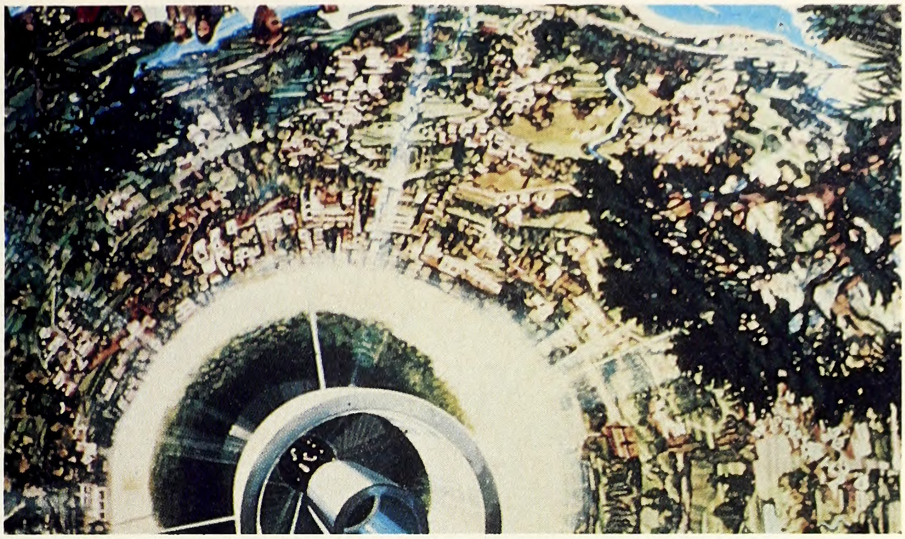
What has changed is the speed to which the bucket can be accelerated. MDI achieved a speed of 35 gravities and MDII reached a speed of 500 gravities. The hoped-for speed of 1,800 gravities (around two hundred fifty miles an hour) is possible with the MDIII.

After the MDII project was completed, O'Neill realized that one minor change in the design of the Mass-Driver would significantly simplify the device and at the same time provide improved performance. This involved the change from a "push-pull" operation to a "pull-only" design.

MDI and MDII, with their push-pull design, employed magnetic strips for dynamic guidance of the bucket through the driver coils. Those strips reduced the amount of the space available for the bucket. Using the pull-only design makes the driver self-guiding, or self-centering. Also, by increasing the diameter of the drive coils, the ratio of bucket coil diameter to drive coil diameter could be made quite large. It's that ratio that mostly determines the strength of the electromagnetic interaction between the coils and the magnitude of acceleration the Mass-Driver can achieve.

While O'Neill worked on the design, his colleague, Dr. Les Snively, received a postdoctoral appointment in Princeton's Physics Department to work on the construction of MDIII under a grant from SSI. Before coming to Princeton, Snively did research at Montana State University on low-dimensional magnetic interactions. MDIII was unveiled this spring and has gone through numerous test-firings, with full power tests planned for this fall.

MDIII is a test section—the first twenty coils of a full-scale lunar



Left to right: Optical flying-spot scanners measure the position and velocity of lunar material as it passes through correctors downrange of the Mass-Driver before launch into space; the lunar material is collected about 63,000 kilometers above the moon by this combination mass catcher and Mass-Driver and then transferred to a space-manufacturing plant in high Earth orbit; interior view of a space colony, with its own atmosphere, vegetation, and Earthlike habitations.

Mass-Driver. The diameter of the drive coils is forty centimeters and the diameter of the bucket coil is thirty-eight centimeters—the nominal diameters of the proposed lunar model. The only part of the prototype that is not to lunar scale is the mass of the bucket. Due to a limited amount of energy-storage capability, MDIII's bucket mass is only one-tenth (40 grams) that of a lunar bucket-payload mass.

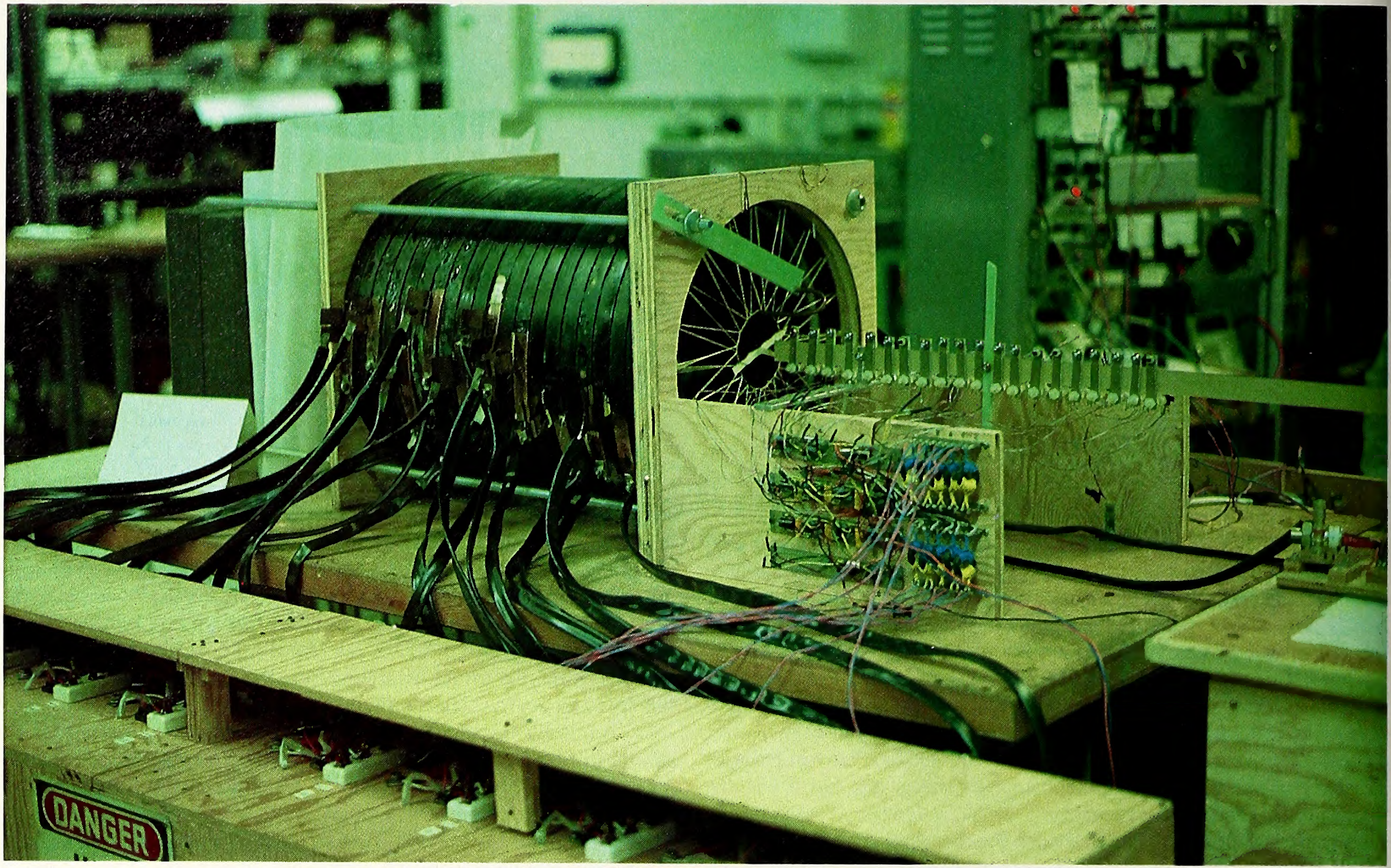
Apple Driver. Over the course of a year, O'Neill wrote a program in Applesoft to calculate the whole operation of MDIII—all twenty drive coils and their interactions with the bucket coil. O'Neill has worked with all sizes and varieties of computers since the fifties and has found the Apple very useful in his research.

Simulating the interactions between the changing currents and fields of the bucket coil with the other coils required twenty-one simulated differential equations in O'Neill's program. The final Applesoft program was rather large and ran very slowly, says O'Neill, due to the number of iterations the program had to go through.

Using the *TASC* compiler, O'Neill compiled the Applesoft program into machine language and the simulation ran five to six times as fast. Still, tracking the movement of the bucket from rest to full speed in the scaled-down, nineteen-inch MDIII requires about fourteen hours. By contrast, when the actual MDIII is fired, the bucket moves from rest to full speed in seven-thousandths of a second.

O'Neill calls the simulated program he wrote on the Apple *M31* and says it will be run on a bigger, faster computer soon. *M31* helped immensely in the construction of MDIII. When the performance of the actual model and the computer model are compared, they agree closely, says O'Neill, differing at the most by only 2 percent.

Snively and crew arranged several low-power test firings of MDIII this May at the Sixth Princeton/SSI Conference on Space Manufacturing. The demonstrations were very fast—starting and finishing faster



MDIII—the latest prototype Mass-Driver constructed in a Princeton lab through funding from the Space Studies Institute. MDIII is built to the nominal specifications for a lunar Mass-Driver, but it comprises only the first nineteen inches of the proposed one-hundred-sixty-meter-long device. The spoke-wheel-like bucket (center) is ready to be accelerated through the circular magnetic coils.

than you can blink. The spoke-wheel-like bucket would be standing still one moment and then, suddenly, it would be at the other end of the twenty-inch drive chamber. The bucket travels so fast that its movement is virtually undetectable.

In *2081*, O'Neill talks about another application utilizing the electromagnetic technology found in the Mass-Driver. He predicts that high-speed, wingless "floaters"—which ride a cushion of magnetic fields—could be the most desirable form of short-distance ground travel in the next century. These devices would operate underground in airless tubes lined with magnetic coils that would accelerate thin, cylindrical passenger compartments to speeds as high as eight hundred miles an hour.

A "floater" ride from New York City to Washington, D.C., would take about eight minutes. O'Neill sees this kind of ground transportation replacing the current short intercity runs by commercial airlines, which are traditionally more economical for longer flights. Several decades from now, you or your children may be the "mass" in a kind of Mass-Driver system.

Twenty-first Century Drivers. O'Neill identifies what he calls the five "drivers of change" early on in *2081*. Computers, automation, space colonies, energy, and communications are the five developments that O'Neill believes will determine, alone and in combination, the course of the next hundred years.

"As with any technology," O'Neill writes, "that of computers can be used either for good or evil, and, unfortunately, some of its applications will certainly be evil." Despite this unsettling conclusion, O'Neill does not see all dark things for computers in the future. He believes that computers will become integral to the home and will be much smarter and more communicative.

O'Neill has had nothing but good experiences with the Apple. He first became familiar with the machine in the autumn of 1980, when one was purchased by the institute for use in keeping track of SSI's members and their contributions. O'Neill wrote a program in Applesoft for keeping track of the foundation's senior associates, those individuals who donate between one hundred dollars and five hundred dollars a

year to SSI for five years.

SSI used O'Neill's program for about eighteen months before one of SSI's senior associates donated a commercial program for the task—Stoneware's *DB Master*. That senior associate was, by no mere coincidence, Barney Stone, one of the coauthors of *DB Master*.

O'Neill says the Apple is also used at SSI for general record keeping and accounting (via *VisiCalc*) and word processing (with *PIE Writer*). After trying many different word processing programs, O'Neill settled on *PIE Writer* and has been using it for years. He has just finished another book for Simon and Schuster, written entirely on his Apple at home. The book, as yet untitled, concerns competition among high-technology companies and the future of the U.S. economy. It's due out later this year.

Phoney Apples. The Apple also facilitates telecommunications between O'Neill and SSI and his other company, Geostar. O'Neill lives both in Palo Alto, California (about 25 percent of the time), and Princeton. Recently, he took a fourteen-month sabbatical from teaching at Princeton to work with a high-energy physics group at Stanford. He took his Apple along to fulfill his responsibilities of running SSI, using *Micro/Courier* to communicate with the institute's office in Princeton.

Geostar is another ambitious project that O'Neill is the driving force behind. In late March, Geostar filed an application with the FCC to construct, launch, and operate a "position location system" based on satellites in geostationary orbit.

The Geostar satellite system is based on three satellites orbiting 22,300 miles above the equator, supercomputers at a single ground location, and inexpensive calculator-size transceivers, one for each user. The three satellites provide the ability to pinpoint accurately within a few meters the location of someone carrying a transceiver. The supercomputers accomplish this by comparing the slightly different times at which transceiver signals are received by each of the satellites.

Geostar has already raised \$1.8 million for the building of the three satellites by making a private stock offering, and O'Neill says RCA's Astro Electronics division has given the thumbs up on Geostar's design after a recent study. The FCC has also awarded the company a frequency for microwave transmissions. O'Neill sees Geostar being especially useful to the trucking industry, airlines, railroads, and public safety agencies. The system could also allow transference of data between users with portable computers.

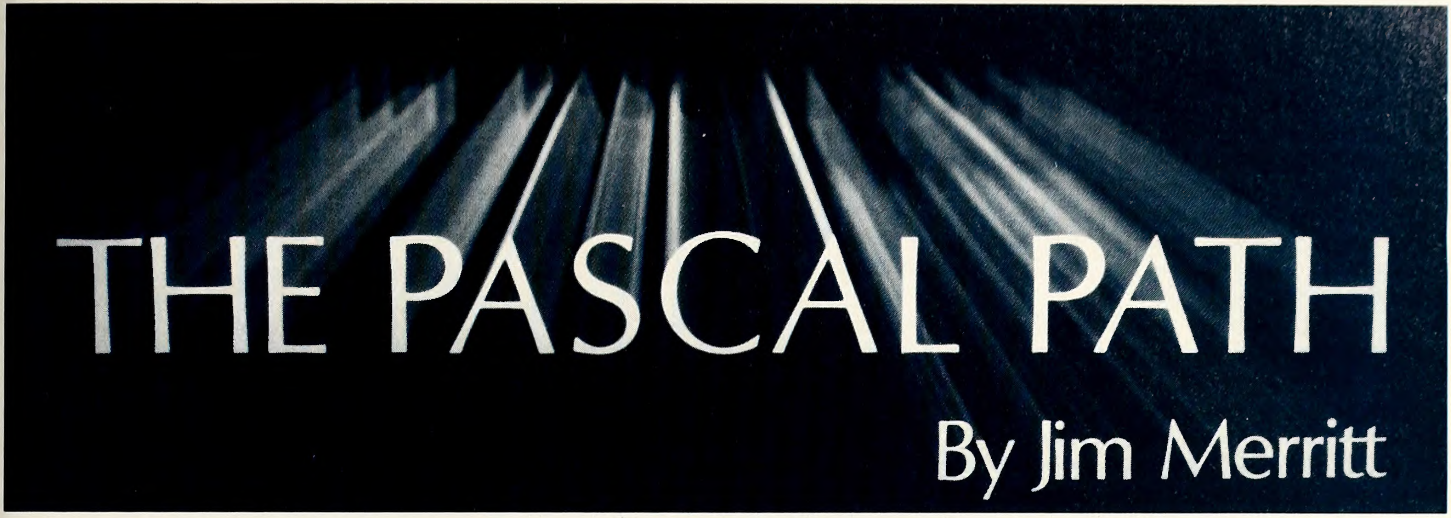
The earliest that we could expect to see the Geostar system in operation would be 1987. O'Neill says the time required to build one of the satellites is thirty-nine months, once there is enough money.

The Time Machine. *2081: A Hopeful View of the Human Future* is a fascinating trip through one man's projection of what life in the year 2081 will be like.

After going through his point-by-point treatise of future life, O'Neill reserves a section of his book for "wild cards"—potential developments currently on the fringes of known science (psionic powers, time travel, contact with extraterrestrials, the harnessing of antimatter, and other goodies usually relegated to the realm of science-fiction literature).

While O'Neill makes passing mention of these potential breakthroughs, he spends the majority of his time discussing existing technologies—the five drivers of change—and the most likely improvements we'll see in these technologies in the next one hundred years.

Trying to predict how we'll travel, and work, and play, and where we'll live a hundred years from now is an ambitious task. It's an exercise in manipulating ideas, made more palatable by the efforts of O'Neill and his colleagues to realize today some of the wonders described in *2081*. ∎



Jungle Fever, Part 7

Primary memory—usually in the form of RAM (random access memory)—is arguably the most critical resource in your computer system. The Apple Pascal p-machine can access only that program code and data that occupy primary memory. Until copied into primary memory, material stored on disk or any other form of *secondary memory* remains invisible to the p-machine.

A computer that contains a large amount of primary memory can accommodate larger programs and can manipulate more data at high speed than can a less generously endowed machine. In the Apple II computer equipped with a language card, around 36K of primary memory is free to hold your Pascal programs and data. The memory that remains is occupied by the p-machine simulator program and the Apple Pascal operating system.

To get a more precise estimate of the amount of primary memory available to you (whether you are using an Apple II, IIe, or III), compile and execute the following one-line program:

```
PROGRAM Free; BEGIN WriteLn(MemAvail) END.
```

As we have seen in previous months, MemAvail is a built-in function that returns a reasonably accurate approximation of the number of memory *words* (half the number of *bytes*) that remain unused at the time of the function call. (Why MemAvail can never be exact is properly the concern of a course in the design and implementation of computer operating systems; we are not yet ready to consider such matters.)

No Apple computer that runs unabridged Apple Pascal offers less than about 36K of primary memory for your programs and data. Unfortunately, while this may sound like an impressive amount of memory at first blush, it can be filled rather quickly by even a modest program, especially one that employs a good-sized ARRAY OF RECORD.

At some point, then, you will certainly write a program that needs more primary memory than you have. Most often, you'll become aware of this situation when your program causes a "stack overflow," which is Apple Pascal's unfortunate (and rude) way of saying, "Enough is enough!" Sometimes, the system indicates a "stack overflow" condition by putting a special error message on-screen. At other times, the computer simply has what appears to be a spontaneous seizure, characterized by an automatic reset of the equipment.

If your program and its data together consume more memory space than your computer provides, don't despair; Apple Pascal supports two techniques you may use to squeeze your program into the available space. These techniques are data segmentation and program segmentation.

In *data segmentation*, you leave all the program code in primary memory but process only a small amount of data at a time. The inactive portion of the data is stored until needed in a FILE that is maintained on a secondary memory device, such as a floppy disk. A program that uses data segmentation must shuffle data between primary and secondary memory as often as is necessary to expedite processing. In some computer environments, data shuffling is handled by the operating system through a so-called "virtual memory" scheme, whereby a secondary memory file is used to simulate a larger primary memory. In Apple Pascal, however, your program must handle data segmentation through explicit data structures and FILE access.

Program segmentation permits you to maintain large amounts of data in primary memory by reducing the amount of memory needed for program code. With this method, you divide the *program* into smaller, semi-independent subprograms, called *code segments*. Apple Pascal automatically ensures that each code segment occupies primary memory only while it is being executed. When one segment finishes its work, it is replaced in primary memory by another. Thus, a segmented program tends to occupy much less memory at execution time than an unsegmented program of similar size and complexity. This leaves more room for data.

Data and program segmentation techniques enable your Apple to accommodate larger programs and greater amounts of data than would normally fit into its primary memory. There's a price to be paid, however. Programs that use secondary memory generally run much more slowly than programs that do not. Secondary memory is more sluggish than primary memory, usually because primary memory is completely electronic and involves no moving parts (other than electrons, which move at almost the speed of light), while secondary memory—a disk drive, for example—often incorporates mechanical devices that are relatively slow. For instance, the Apple's p-machine can acquire a piece of data from its primary memory in a few thousandths of a second. Getting the same data from a dormant floppy disk drive may take a second or so, especially when drive start-up time is taken into consideration. As you can well imagine, the more a program must rely on segmentation techniques and secondary memory, the slower it will be.

While some programs use either data or program segmentation exclusively, most serious programs involve a combination of the two techniques. Therefore, we will examine them both over the next few months. We'll start with a look at Apple Pascal's facilities for program segmentation, progressing in later months to data segmentation and advanced FILE access.

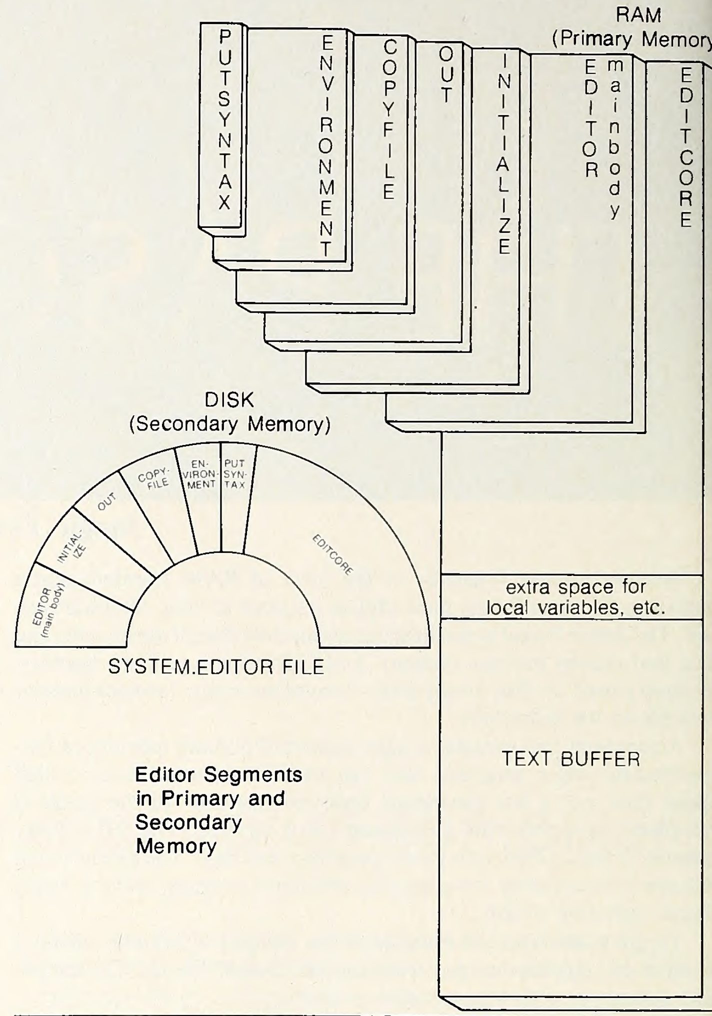
Program Segmentation. From previous discussions, you know that Pascal programs are kept on disks or other secondary storage media in the form of p-code files until you choose to execute them. At your command, the Pascal system retrieves an executable program from the code file in which it resides and then copies the p-codes into primary memory. Usually, an entire program is copied into memory at once, but you may elect to divide your programs into two or more code segments if you prefer.

The Pascal system loads a code segment into primary memory only when it is needed. So long as a segment resides in primary memory, it is said to be "swapped in." Idle segments remain on disk until they are summoned during execution, in the process replacing one or more segments that are no longer in use. A discarded segment is said to be "swapped out," even though the copy of it in primary memory actually goes nowhere. Instead, that code is simply destroyed—overwritten by incoming segments, perhaps. After all, an inactive segment may always be reloaded from disk whenever it is needed again.

In Apple Pascal, the keyword SEGMENT may precede a PROCEDURE or FUNCTION heading, and it designates the following subroutine as a code segment. The p-code for this subroutine remains on disk until the subroutine is called. The code for any procedure or function declared within a segment subroutine is also part of that segment. Thus, a code segment may include a bundle of related subroutines. The entire aggregate stays in secondary memory until the segment's primary (outermost) subroutine is called.

An Example of Segmentation: The Screen Editor. The Apple Pascal screen editor is divided into seven segments, as shown in the accompanying figure. The designers of Apple Pascal knew that quick, convenient text editing would be possible on a microprocessor-based system only if all the text being edited could be stored and manipulated in primary memory at once. Thus, the editor had to provide for an extensive text buffer (on the order of several thousand characters at least). The larger the buffer, the larger the text file that could be created and modified using the editor. On the other hand, a large text buffer left little primary memory for the editor program itself! In the end, a balance had to be struck. The most convenient, commonly used editor functions were grouped together in one large code segment, so that switching between them would not involve any time-consuming disk accesses that would degrade the editor's performance. This crucial segment was named the EDITCORE.

In addition to EDITCORE, other segments were established to handle less frequently used aspects of the editor. For instance, when you elect to Set the Environment (as described in Chapter 4 of the *Apple Pascal Operating System Reference Manual*), the EDITCORE segment is swapped out and the ENVIRONMENT segment is swapped in. When you regain the editor main prompt line, you reverse this process. When you Quit the editor, the EDITCORE segment is again swapped out, and the segment named OUT is swapped in. Whenever you see the editor prompt line or are using any of the common editing commands, such as



Editor Segments in Primary and Secondary Memory

Insert, Delete, or eXchange, the EDITCORE segment is executing in primary memory and the other segments are swapped out, awaiting their turn to be loaded in and executed. The editor's huge text buffer, however, remains in primary memory at all times and is always available to the code segment that happens to be swapped in at any particular moment.

EDITCORE is much larger than any of the editor's other code segments, primarily because the complement of functions deemed essential by the system designers could be realized only by using hundreds of lines of Pascal code. The size of EDITCORE has always set an uncomfortably confining upper bound on the amount of text you can manipulate with the editor at one sitting. On the other hand, the text buffer would be only about half its current size if it had to share primary memory with *all* of the editor's code segments simultaneously.

Program Segmentation and Execution Speed. The following program executes very slowly, because of its unwise use of segmentation:

```
 1 1 1:D  1 PROGRAM
 2 1 1:D  3   Sluggish;
 3 1 1:D  3 (* Demonstration of inefficient use of
 4 1 1:D  3   code segments in Apple Pascal.
 5 1 1:D  3 *)
 6 1 1:D  3
 7 1 1:D  3   VAR
 8 1 1:D  3     I
 9 1 1:D  3         :Integer;
10 1 1:D  4
11 7 1:D  4   SEGMENT PROCEDURE
12 7 1:D  1     P;
13 7 1:0  0   BEGIN (* P *)
14 7 1:0  0     (* Empty body—no use slowing things
15 7 1:0  0        down even further with excess
16 7 1:0  0        computation!
17 7 1:0  0     *)
18 7 1:0  0   END   (* P *);
19 7 1:0 12
```

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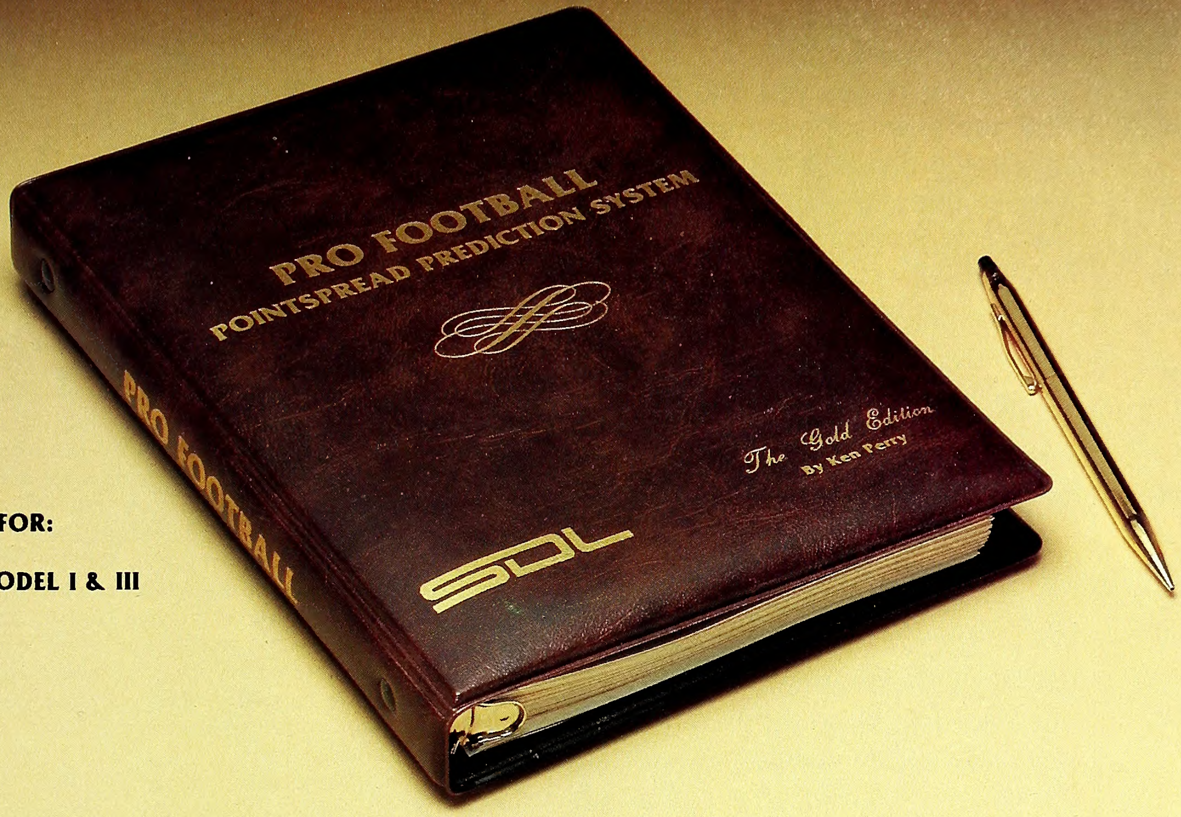

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```
20 8 1:0 12      SEGMENT FUNCTION
21 8 1:D  3        F
22 8 1:D  3          :Integer;
23 8 1:0  0      BEGIN (* F *)
24 8 1:1  0        F := 0; (* Dummy function value is constant!
25 8 1:1  3                  Again, no unnecessary computation!
26 8 1:1  3                *)
27 8 1:0  3      END   (* F *);
28 8 1:0 16
29 1 1:0  0    BEGIN (* Sluggish *)
30 1 1:0  0      (* Now, suppose that the following loop
31 1 1:0  0         was part of a frequently made calculation
32 1 1:0  0         in a "REAL-WORLD" program!
33 1 1:0  0      *)
34 1 1:1 0       WriteLn(Output, 'Beginning test...');
35 1 1:1 39      FOR I := 1 TO 500 DO
36 1 1:2 52        IF (F = 0)
37 1 1:2 59          THEN
38 1 1:3 61            P;
39 1 1:1 71      WriteLn(Output, 'End of test.');
40 1 1:0 103 END  (* Sluggish *).
```

Experiment with two versions of this program: one that includes the SEGMENT keywords as shown here, and one that does not. Time the two programs to see how crippling arbitrary segmentation can be. Obviously, it is generally a bad idea to initiate frequent segment swaps during periods of heavy computation! Instead, you should organize your code so that segment swaps occur infrequently and at times when a slight pause is psychologically acceptable to the human beings that use your programs. In the screen editor, for example, segment swaps occur whenever you want to Set the Environment or Quit the editor, but not while you are using the common text-manipulation commands. There is a kind of "mental pause" implied by someone's decision to change the editor's internal settings, or to quit editing altogether. In such situations, the user may very well notice the delay in program response that is engendered by a segment swap, but she will probably find it easy to ignore the brief interruption. On the other hand, she is likely to be acutely conscious of uncomfortable delays in the editing process if segment swaps occur while she tries to use the most common text-manipulation commands, such as Insert, Delete, and eXchange.

FORWARD Declarations. According to the rules of Apple Pascal, no "regular" subroutine may be defined at any given level of procedure nesting within a program until any and all segment subroutines at that same level have been defined. This means, for instance, that the following skeleton describes an *illegal* program:

```
PROGRAM
BadOrder;
(* Utility function—used almost everywhere *)
FUNCTION
 Capital(Ch: Char)
   :Char;
BEGIN (* Capital *)
 IF (Ch IN ['a' . . 'z'])
   THEN
     Capital :=Chr(Ord(Ch)-Ord('a')+Ord('A'))
   ELSE
       Capital := Ch;
END (* Capital *);
SEGMENT PROCEDURE (* Compiler will complain at this line *)
 ActiveIngredient;
BEGIN (* ActiveIngredient *)
 (* Some useful code goes here—presumably, it uses Capital. *)
END (* ActiveIngredient *);
 (* Perhaps some other regular subroutines and maybe
     even some more SEGMENT routines, as well . . . *)
 BEGIN (* BadOrder *)
 (* Some useful code goes here—presumably,
     it uses Capital, too! *)
 END (* BadOrder *).
```

Attempts to compile programs modeled after BadOrder will fail. The compiler will refuse to generate a code file, complaining of error condition 399 ("implementation restriction").

We could solve the problem by moving Capital below ActiveIngredient in the source text. However, ActiveIngredient could not then use

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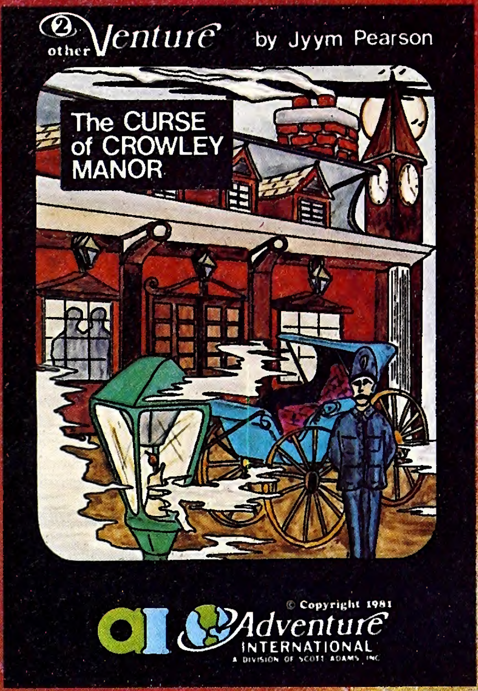

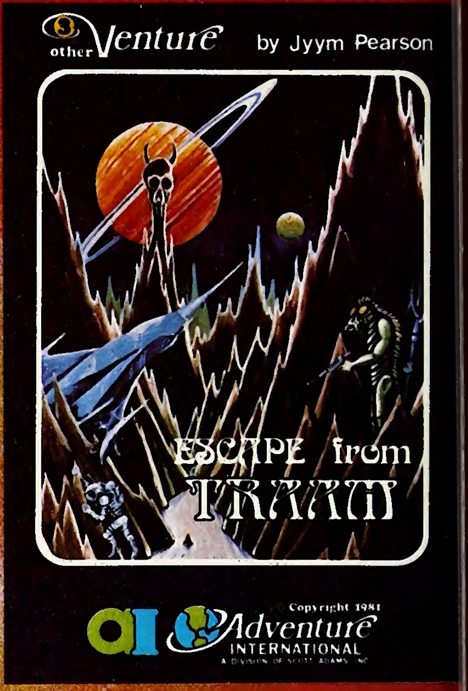

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Capital, unless it included its own redundant copy of that routine within its local declaration area. This would be a sloppy and wasteful way of resolving our difficulty, since an unnecessary duplicate of Capital would occupy precious primary memory at execution time whenever ActiveIngredient was swapped in.

Nothing keeps a segment subroutine from calling and using a regular subroutine such as Capital except the rule that segment subroutines must be defined before regular ones.

Fortunately, Apple Pascal draws an important distinction between the *declaration* of a subroutine and its *definition.* Usually, declaration and definition happen simultaneously. The heading of a PROCEDURE or FUNCTION *declares* your intention to define and use a particular subroutine and is customarily followed by the (optional) declaration section and by a main body. These last two items constitute the *definition* of a subroutine.

The Pascal keyword FORWARD enables you to separate subroutine declaration from definition. To declare a subroutine using this method, you specify its PROCEDURE or FUNCTION heading, including any parameter list and FUNCTION result type, just as you would normally. Instead of following this heading with a declaration section and a body of code, however, you write the keyword FORWARD and follow that with a semicolon.

To *define* a subroutine that has already been declared FORWARD, you issue an *abbreviated* heading that consists only of one of the keywords, PROCEDURE or FUNCTION (whichever is appropriate), followed by the identifier that names the subroutine and then by a semicolon. After this comes the postponed declaration section (if any) and, of course, the complete subroutine body. Note that if you fail to provide a definition that matches a FORWARD declaration, the compiler will complain of error condition 117 ("unsatisfied forward reference").

Now, we can place the *declaration* of Capital before ActiveIngredient and the *definition* afterward:

```
PROGRAM
  GoodOrder;
  (* Utility function—used almost everywhere *)
FUNCTION
  Capital(Ch: Char)
    :Char;
FORWARD;(* Notice that the full subroutine heading, including
           parameter list and function result type, are used
           in the DECLARATION.*)
SEGMENT PROCEDURE
  ActiveIngredient;
BEGIN (* ActiveIngredient *)
  (*Some useful code goes here—presumably, it uses Capital. *)
END (* ActiveIngredient *);
(* Any other SEGMENT routines go here . . . *)
FUNCTION
  Capital; (* Notice the abbreviated form of subroutine heading
              that is used in the DEFINITION. *)
BEGIN (* Capital *)
  IF (Ch IN ['a' . . 'z'])
     THEN
       Capital :=Chr(Ord(Ch)-Ord('a')+Ord('A'))
     ELSE
       Capital := Ch;
END (* Capital *);
(* Any other regular routines that may need to use Capital go
   here . . . *)
BEGIN (* GoodOrder *)
  (* Some useful code goes here—presumably, it uses Capital, too! *)
END (* GoodOrder*).
```

By using the FORWARD declaration, we manage to obey the rule requiring that "segment definitions come first," while at the same time we permit Capital to be global to the entire program, including segment subroutines.

A Digression: Mutual Recursion. Not only does the FORWARD declaration allow you to establish regular subroutines that can be called by segment subroutines without violating the "segments come first" rule, it also enables you to write *mutually recursive* subroutines. That is, using the FORWARD declaration, you can write a subroutine A, which calls a subroutine B, which calls a subroutine A, which calls a subroutine B, and so on.

Consider, for example, the task of recognizing a statement in a computer programming language like Pascal. Perhaps a general routine that validates a "statement" does its work by calling specialized routines that recognize different types of statements. One such subroutine would recognize an IF statement, another would recognize an assignment statement, while still another would handle a compound statement, and so on. Yet in Pascal-like languages, IF statements and compound statements can usually themselves *contain* statements. Consequently, the subroutines that handled such specialized constructs would have to call the general statement-recognition routine. Computer scientists would say that the generalized subroutine and its specialized subordinate routines are mutually recursive.

You could not write mutually recursive subroutines in Apple Pascal were it not for the FORWARD-declaration facility. At any point during the compilation process, the compiler prevents your program from calling any subroutine that has not already been declared. In such situations, you'll be notified of error condition 104 ("undeclared identifier"). Given this restriction, it is clearly impossible to *define* the bodies of two routines that call each other without first *declaring* at least one of them. If you could not postpone the *definition* of one of the routines, you could not define its partner.

Segment Nesting. Segment subroutines may be declared and defined within the declaration sections of other segment subroutines. Of course, segment procedures and functions must be the first subroutines defined in any declaration area, in keeping with the "segments first" rule we have already discussed.

Suppose, though, that SEGMENT PROCEDURE B is nested within SEGMENT PROCEDURE A. In other words, suppose that the definition for B is contained within A's declaration section. This does *not* imply that the code for B is also loaded into primary memory when A is called. Instead, B is treated as the independent code segment that it is. B's code is left on disk until such time as B is called by A (or by one of the subroutines that are local to A and global to B).

Segment Number Assignments. We have long acknowledged that the Apple speaks a language of numbers that is almost wholly divorced from more commonly understood languages such as English. So, it should come as no surprise that the compiler automatically assigns a unique number to each code segment, for purposes of identification at the level of the p-machine. The main program body and all regular subroutines associated with it are collected in segment 1. This segment is always resident in primary memory. Other segments are assigned numbers on a "first-come, first-served basis," in ascending order beginning at 7 and ending at 31. (Segment numbers 2 through 6 are reserved for system components.) Although this implies that your programs may be divided into twenty-six separate code segments, limitations of Apple Pascal system design restrict the number of explicit segment subroutines in any one program to sixteen. Thus, the numbers assigned to code segments in your programs will normally range from 7 to 21. (This numbering scheme is upset if you use any UNITs, but we won't discuss this aspect of the system for some time.) You can see graphic evidence of the compiler's segment-numbering policy by looking back to the compiler-generated listing for Sluggish. Notice that the main program body is associated with segment number 1, SEGMENT PROCEDURE P with the number 7, and SEGMENT FUNCTION F with the number 8.

A "New" Compiler Directive. The $R compiler directive instruction, which has up to now been used with a "switch" argument (+ or −) to control the automatic generation of range-checking code, may also be given an arbitrary character string as an argument. The compiler interprets this string as the name of a SEGMENT PROCEDURE or SEGMENT FUNCTION. The $R instruction must occur at the beginning of a body of code, immediately following the keyword BEGIN and ahead of any Pascal statements that the compiler would translate into p-code. $R forces the Pascal system to load the specified code segment into primary memory and to leave it there until the subroutine containing the $R instruction completes its execution. In other words, the $R instruction temporarily "freezes" a code segment in primary memory, defeating the Pascal system's automatic segment-swapping behavior. Thus, this compiler directive instruction enables a particular subroutine to call a segment subroutine as often as necessary without incurring segment-swapping delays.

Earlier, we examined the inefficient use of segmentation in the program Sluggish. Here is another version of that program, which executes almost as quickly as the unsegmented one by virtue of including a strategically placed $R compiler directive instruction:

```
PROGRAM
 NSluggish;
(* Demonstration of how the $R (code-Resident) compiler directive
   instruction can compensate for segment-swapping inefficiencies. *)
  VAR
   I
    :Integer;
  SEGMENT PROCEDURE
   P;
  BEGIN (* P *)
   (* Empty body—no use slowing things down even further with excess
      computation! *)
  END (* P *);
  SEGMENT FUNCTION
   F
    :Integer;
  BEGIN (* F *)
   F := 0; (* Dummy function value is constant! Again, no unnecessary
              computation! *)
  END (* F *);
 BEGIN (* NSluggish *)
  (*$R P*)
  (*$R F*) (* P and F are now resident in primary memory throughout the
              execution of Sluggish, which could easily have been a
              subroutine, instead of the main program. *)
  WriteLn(Output, 'Beginning test . . . ');
  FOR I := 1 TO 500 DO
   IF (F = 0)
     THEN
       P;
  WriteLn(Output, 'End of test.');
 END (* NSluggish *).
```

In NSluggish, two separate compiler directives were used to control the "residency" of the code segments P and F. The addendum to the *Apple Pascal Language Reference Manual* implies that the two directives could have been combined into the single directive "(*$R P,F*)", and this is certainly the case in Apple II Pascal, where one $R instruction may be used to control the swapping behavior of any number of code segments. The argument to $R in Apple II Pascal may be either a single name or a list of names such that each item is separated from its successor by a comma. However, the Pascal compiler for the Apple III permits only *one* name to follow the $R instruction. Thus, the "(*$R P,F*)" directive is perceived by the Apple III compiler as containing *two separate instructions*, $R and $F. The latter instruction is undocumented in the Apple III Pascal manuals and forces the Apple III compiler to generate code for a p-machine that runs on a different computer system. Quite understandably, Apple III Pascal would refuse to execute the alien product of such a compilation. Use of two separate compiler directives renders the source text compatible with both the Apple II and Apple III Pascal compilers.

The $R instruction allows you to optimize both memory usage and execution speed. You may declare procedures and functions as code segments, then rely on the automatic mechanisms of Apple Pascal to swap these segments in and out of primary memory as appropriate during program execution, thus conserving primary memory at the cost of execution speed. However, at points where memory is not so crowded and quicker execution is desirable, $R can disable segment swaps, thereby providing marked improvement in a program's performance.

Note that you need not issue the $R compiler directive instruction in a recursive segment subroutine—that is, in a segment subroutine that calls itself, either directly or indirectly (through mutual recursion). A code segment remains in primary memory until the original call to it is resolved. It does not need to be reloaded for subsequent recursive calls; instead, the *original copy* of the subroutine code is used (as is always the case with recursive execution, whether or not program segmentation is involved).

Programmed Control of Segment Swapping. It may not be immediately obvious, but the $R instruction may also be used to enable or disable code segment swapping under program control. Here is yet another version of the Sluggish program that demonstrates the proper technique:

```
PROGRAM
  DSluggish;
(* Demonstration of code segment swapping under program
   control in Apple Pascal. *)
 VAR
  Answer
   :Char;
 (* Remember, segments must come before unsegmented global
    procedures. *)
 SEGMENT PROCEDURE
  P;
 BEGIN (* P *)
  (* Empty body—no use slowing things down even further
     with excess computation! *)
 END (* P *);
SEGMENT FUNCTION
  F
   :Integer;
BEGIN (* F *)
  F := 0; (* Dummy function value is constant! Again, no unnecessary
             computation! *)
END (* F *);
 PROCEDURE
  Compute;
 (* If this procedure is called by itself, P and F will be swapped
    according to Apple Pascal's usual segment-swapping behavior. If
    called from within NoSwapCompute, no swapping will occur. *)

  VAR
   I
    :Integer;
 BEGIN (* Compute *)
  WriteLn(Output, 'Beginning test . . . ');
  FOR I := 1 TO 500 DO
   IF (F =0)
    THEN
     P;
  WriteLn(Output, 'End of test.');
 END (* Compute *);
 PROCEDURE
  NoSwapCompute;
 BEGIN (* NoSwapCompute *)
  (*$R P*)
```

```
(*$R F*)(* P and F are now resident in primary memory throughout the
         execution of NoSwapCompute, and by extension throughout the
         execution of any subroutines that are called by it, including
         Compute! *)
    Compute;
  END (* NoSwapCompute *);
BEGIN (* DSluggish *)
  Write(Output, 'Swap (Y or N)? ');
  REPEAT
  Read(Keyboard, Answer); (* No echo *)
  CASE Answer Of
    'Y', 'y':
      BEGIN
        WriteLn(Output);
        WriteLn(Output, 'Swapping ON');
        Compute;
      END;
    'N', 'n':
      BEGIN
        WriteLn(Output);
        WriteLn(Output, 'Swapping OFF');
        NoSwapCompute;
      END;
    END (* CASE Answer *);
    (* If Answer does not contain capital or lower-case 'Y' or 'N', neither
       CASE alternative is executed, and control passes immediately to
       UNTIL. *)
  UNTIL (Answer IN ['Y', 'y', 'N', 'n']);
END (* DSluggish *).
```

Remember, $R forces the specified code segment(s) to reside in primary memory until the subroutine in which the $R instruction occurs finishes its execution. The procedure NoSwapCompute includes an $R instruction that fixes P and F in primary memory. It then calls Compute to do the program's real work. If the user selects nonswapping operation, Compute is called *through* NoSwapCompute. Otherwise, Compute is called directly. A more complex version of this scheme was used in writing the Pascal compiler, permitting you to control the compiler's code-swapping behavior by means of the $S compiler directive instruction. As far as your own work is concerned, you may even couple the "dynamic swapping" technique with a check of MemAvail to produce programs that can decide to conserve memory through segment swapping when running on 64K Apple II Plus and IIe systems but to eschew swapping in favor of more rapid execution on a 128K IIe or a 256K Apple III.

Control of Segment Number Assignment. With the $NS instruction, you may direct the compiler to assign a particular number to a code segment. One of the compiler's global variables is a counter that determines the number to be given to the *next* code segment constructed during the compilation process. As soon as the compiler is invoked, the counter is set to 1. That number is assigned to the main program segment, and immediately the counter's value is increased to 7. Normally, the segment counter is then automatically incremented by one as the compiler encounters each new code segment. The compiler directive "(*$NS n*)", where *n* is an Integer from 1 to 30, tells the compiler to change the segment counter's value to *n*. This does not change the number of the segment that is currently under construction. In particular, since the main program segment is considered as "under construction" at the instant that the compiler is invoked (and before any compiler directive instructions can be recognized), you cannot use $NS to change the value of the main program's segment number, which must always be 1. Furthermore, the argument to $NS must always be greater than the current number in the segment counter, or the $NS instruction will be ignored (in Apple II Pascal version 1.1, that is; error condition 274 will be reported by Apple III Pascal in the same situation). Since the segment counter is increased to 7 as soon as the number 1 is assigned to the main segment, $NS may not be used to produce segments numbered 2 through 6.

The $NS instruction is obviously of limited utility, even to experienced programmers. It is presented here merely for completeness. Only programmers responsible for certain components of the Apple Pascal operating system are customarily concerned with segment number assignments anyway. The rest of us usually don't (and shouldn't) care about such details; the compiler's automatic behavior should never attract our attention unless and until it somehow prevents us from achieving our programming goals.

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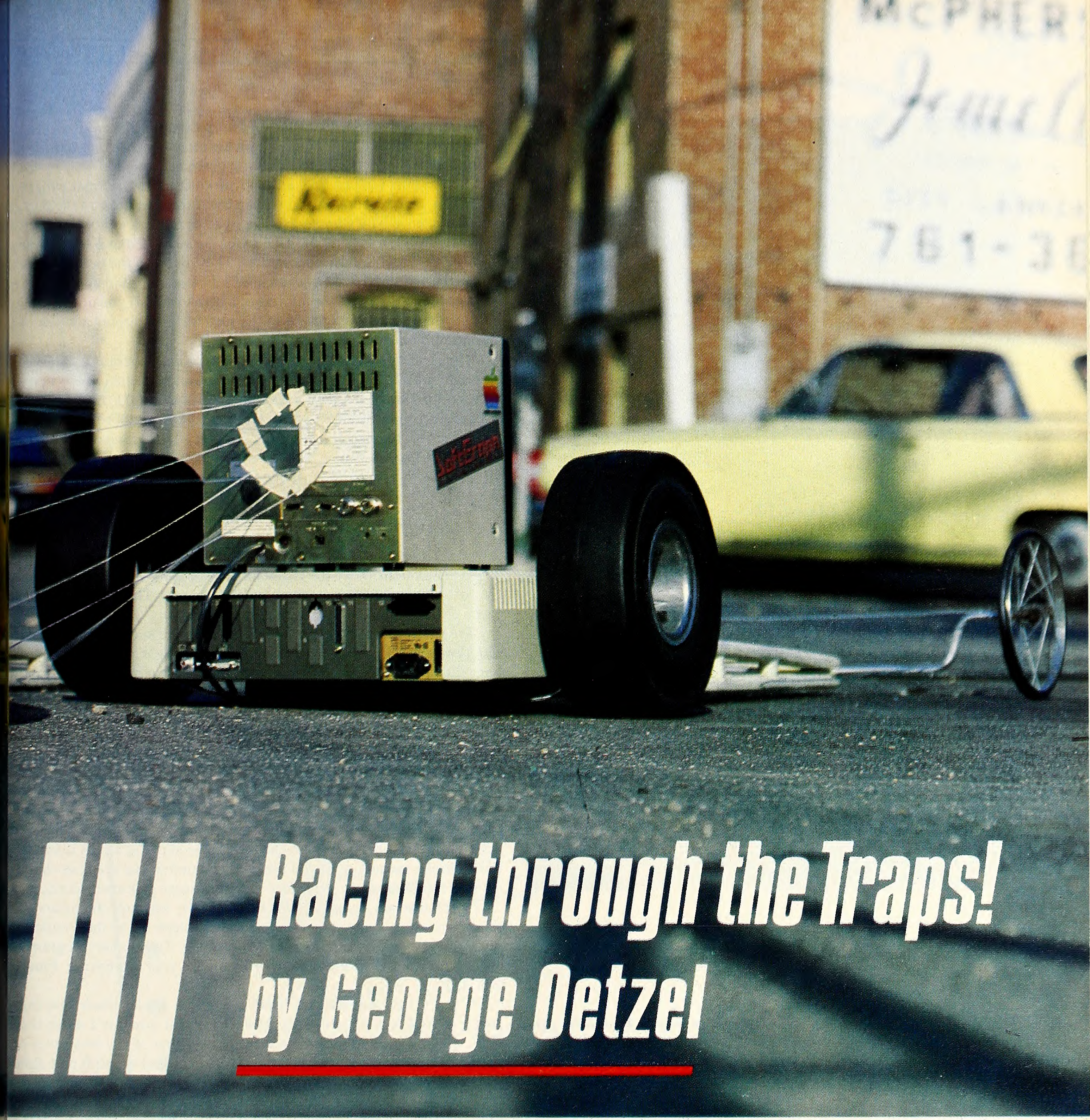
HOT ROD

The two previous articles in this series have described differences between the Apple II and Apple III hardware that affect the Emulation mode, the organization of the Basic and Monitor images on the Emulation disk, and changes in the Monitor and games programs that make it possible to play many Apple II games on the Apple III. Now we'll delve more deeply into the Emulation program itself to discover further variations of the Emulation Apple. The first, with lower-case character display and keyboard entry, permits the use of programs that use lower-case display. This includes programs for the Apple IIe that don't require the eighty-column card. More exotic configurations include 60K of RAM and the use of Apple II software in an Apple III hardware environment, with delightful and novel results.

When the Emulation program boots, the first twelve disk blocks are loaded in sequence to install the program into the address range $A000 through $B677. (Block 0 occupies $A000 through $A1FF; block 1 fills $A200 through $A3FF, and so forth.) The program is an interesting application of the "memory is cheap, but code is expensive" approach. Code segments are in $A000 through $A3C4 and $A4C7 through $A67D. The rest consists mostly of the two text screen images, complete with all the spaces.

First, let's install a new character set and keyboard handler so we can use programs written for an Apple with lower-case display, including some new programs written for the Apple IIe.

Installation and use of a character set with lower case involves three types of changes to the Emulation mode. The first is the installation of the character set, which is a modification of the Emulation program. The second is the modification of the KEYIN routine in the Apple II Monitor so that it will read and interpret both bytes from the Apple III keyboard. The third is the treatment of inverse and flashing modes in a consistent way. This involves some decisions about what type of consistency



Racing through the Traps!

by George Oetzel

you want and how much work you are willing to do to achieve it.

The problem with inverse and flashing characters arises because there are only 256 character codes recognized by the character generator. The Apple II normally displays sixty-four characters, which are translated into sixty-four character codes for inverse, sixty-four for flashing, and two normal sets. Adding lower case expands the character set to ninety-six characters. You can't have full sets of inverse, flashing, and normal characters, because there are too few character codes. Something has to give. You can settle for inverse or flashing display of the wrong character part of the time, but the most satisfactory solution is to eliminate the flashing mode entirely.

A simple program will display the entire character set on the screen. It is written in Integer Basic, as are the other Basic programs in these articles. Integer Basic is useful for applications that involve modifications of binary files, because it includes the Miniassembler and can include other utilities in the $D800 through $DFFF address space.

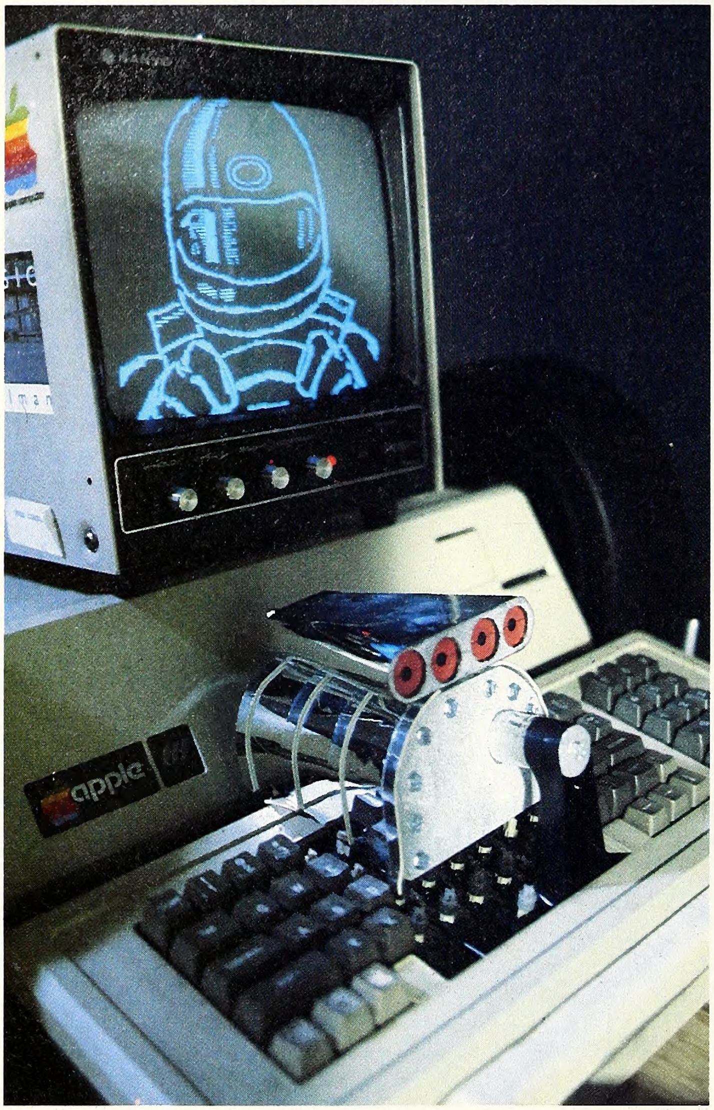
First, clear the screen:

```
100 CALL -936
```

Next, set up a loop to poke eight rows, each containing thirty-two character codes, directly to the screen memory locations.

```
120 FOR R=0 TO 7
140 I=R+1+R/2
160 FOR X=0 TO 31
180 C=32*R+X
```

The variable C is the character code. The character displayed does not have to be the one suggested by the corresponding ASCII value, as is clear from the absence of lower-case letters in the Apple II character set. Next, calculate the screen addresses and poke in the characters.




```
200 J=(I-1) MOD 8
220 K=(I-1)/8
240 POKE 1024+128*J+40*K+X,C
260 NEXT X
280 NEXT R
```

Finally, move the cursor down so the Integer prompt doesn't write over the display.

```
300 VTAB 12 : PRINT
320 END
```

The Apple III character generator uses 128 character images to generate the 256 displayed characters. Each character image does double duty, once in the normal character set, with its character code larger than 128, and again in the inverse set, with the character code 128 less than the corresponding normal code. On the distributed Emulation disk, the images in one sixty-four-character set have the most significant bit of every byte set, so that the characters will flash in the inverse mode. (See the *Standard Device Drivers Manual*, page 166.) When the lower-case letters are added, they must appear in either inverse or flashing format for character codes 97 through 127 and in normal display for character codes 225 through 255. The character ROM in the Apple II has 256 characters, giving more freedom in character-set design.

The easiest way to make a new character set is to start with one that is already nearly what you want. Several commercial graphics packages for the Apple include full character sets in the proper format. Two examples are the Apple *DOS Tool Kit* and the Penguin *Complete Graphics System*.

You can use the character-editing program, *Charedit*, shown in listing 1, to examine and modify character sets. The program has an initial menu that allows you to select the character-set editor or hex-decimal conversion utilities that are a byproduct of the normal program operation. Select option 1, and type in the starting address of the part of the character set you want to examine. The characters will begin to scroll by, with an address label for each byte. To make changes, press a key. Two keys, C and S, have special uses. They give you the option to clear or set the flashing bit over a range of addresses. Hitting any other key yields a request to enter the address of a byte to edit. If you don't want to edit anything, enter 0 to return to the request for a display address. A 0 response to this request ends the program.

The Apple II character set in the Emulation program is in \$AA86 through \$AE85. Use the *Trackmover* program, presented in the first article, to load track 0 from an Emulation disk at \$4000. Each character occupies an eight-byte cell, one byte for each horizontal row of dots. As furnished, the characters sit in the bottom seven rows of the display space, and the top row is blank. To provide for lower-case descenders, the characters have to be moved to the top of their display windows. The Monitor provides a quick fix:

```
5000<4A87.4E85M
53FF:0
```

These instructions move the character set to \$5000 for editing, removing the first byte and adding a blank byte at the end. The effect is to move every character to the top of its display window.

The *Charedit* program can be used to examine and edit the character set. The first \$1FF bytes have the flashing bit clear, and the next \$200 have the flashing bit set. Providing for descenders moved the tops of the upper-case characters to hex addresses that end in 0 or 8 and displaced the alignment of the flashing bits from the character cells by one byte. Use the C option to clear the flashing bits in \$51FF through \$53FF. The character cell that will become the letter "a" begins at \$5308, corresponding with ASCII code 97.

The *DOS Tool Kit* character set has ninety-six characters. If you load it at \$3000, the "a" is at \$3208. Use the Monitor move command, 5308<3208.32FFM, to add it to the new character set. The Penguin character set has 128 characters, so the lower case starts at \$3308 if you follow a similar procedure. If you use another commercial graphics character set, use *Charedit* to determine the lower-case character location.

Check the new characters for flashing bits, edit any characters you think should be changed, and return the character set to the Emulation program with 4A86 < 5000.53FFM. Use the *Trackmover* program to restore the modified Emulation program to your lower-case Emulation disk.

With the new character set installed, you can display lower-case characters in programs that already have them, but you can't enter them from the keyboard. The Monitor reads only one of the two bytes required to decode the keyboard. It doesn't know that the shift and alpha lock keys exist.

A revised Monitor KEYIN subroutine and a few minor patches in the character handling elsewhere will remedy the problem. The KEYIN3 subroutine is shown in listing 2. To install it, load track 5 from your lower-case Emulation disk at address \$5000 and track 9 at address \$4000. Bload KEYIN3,A\$59FE (\$FEFE when the Monitor is loaded in its proper location). Four small changes will complete the Monitor modifications.

The RDKEY subroutine, at \$FD0C, normally converts characters to flashing mode when the cursor backs over them. If it is unchanged, the flashing versions of the lower-case characters become a confusing assortment of inverse numbers and punctuation marks, and the numbers become inverse lower-case letters. All characters will be converted to proper inverses if three bytes are altered:

	Original		Modified	
FD11:	29 3F	AND #\$3F	29 7F	AND #\$7F
FD13:	09 40	ORA #\$40	EA	NOP
			EA	NOP

Modify the track 5 memory image from the Monitor with 5812:7F EA EA.

In the Monitor KEYIN routine, replace the instruction to read the keyboard with a jump to the new KEYIN3 routine. The Monitor command 5828:4C FE FE will replace the LDA $C000 (AD 00 C0) with JMP $FEFE. All character input to the Monitor is converted to upper case by an AND #$DF (29 DF) instruction at $FD82. The Monitor won't interpret lower case, and it isn't likely that this part of the Monitor is used by other programs. The conversion can be eliminated with 5882:EA EA if you want to be able to enter lower case in the Monitor anyway.

A routine to store $3F in the inverse flag location at $32 should be changed to store $7F instead. Enter 5982:7F to modify the track 5 image. This completes the modification of the Monitor image used with Integer Basic. Copy the modified Monitor to the Applesoft version with 4300 < 5800.5AFFM. Then write the modified tracks 5 (from $5000) and 9 (from $4000) back on the Emulation disk.

With the character set installed in the Emulation program and the Monitor patched for lower-case entry, one further change is needed on the Emulation disk. The Applesoft inverse and flash commands should also be made to produce readable output. The *Pattern Location* program, presented in the second article as a tool for locating paddle routines in games, serves equally well to analyze the inverse and flash commands in Applesoft. Since we know that the inverse flag is stored in $32, one of three commands must put the value there: STY $32 (84 32), STA $32 (85 32), or STX $32 (86 32). Without much difficulty, we can locate the following code:

```
F273-   A9 FF    LDA #$FF
F275-   D0 02    BNE F279
F277-   A9 3F    LDA #$3F
F279-   A2 00    LDX #$00
F27B-   85 32    STA $32
F27D-   86 F3    STX $F3
F27F-   60       RTS
F280-   A9 7F    LDA #$7F
F282-   A2 40    LDX #$40
F284-   D0 F5    BNE $F27B
```

It looks like everything needed is right here. Changing $F278 from $3F to $7F should fix the inverse problem. Further, it appears that address $F3 must be used for the flashing mode. We could store a zero in $F3 all the time, but this would waste a valuable page 0 location. A better solution is to eliminate its use in the output routine. Looking for ORA $F3 (05 F3) quickly shows the route:

```
DB62-   05 F3      ORA $F3
DB64-   20 ED FD   JSR $FDED
```

Replace the ORA instruction with a pair of NOP instructions and the flashing mode disappears. The flashing and inverse modes both yield inverses of the desired characters.

These changes to Applesoft must be made on two different disk tracks. Load tracks 7 and 8 in addresses $4000 through $5FFF. Go to the Monitor and type 5878:7F and then 587D:EA EA to make the first change. Type 4162:EA EA to eliminate the ORA instruction, and write both tracks back on the Emulation disk. With these changes, the Applesoft inverse and flash commands both produce the inverse of the desired character. Since Integer Basic doesn't have these commands, no more changes are required. The lower-case Emulation disk is complete.

With these changes, the control-character codes, 0 through 31 and 128 through 159, have no role in normal character displays. You can create your own special characters to go with these codes. You can use the inverse flag, *poke 50,31*, to print the inverse control characters, but you will need your own routine to place the normal ones on the screen.

Many Apple II editors, both for Basic (such as *PLE* or *GPLE*) and in editor/assembler packages, generate the flashing cursor internally and will show inverse lower case when the cursor goes over numbers. If you use one frequently, you will probably want to change the cursor routine to match the changes made on the Emulation disk. It is usually easy to find the responsible routine. Just search for the ORA #$40 (09 40) command that sets the flashing mode in the normal character set. Most of these programs use the Monitor KEYIN subroutine to read the keyboard, so they will automatically accept lower-case characters after you have modified the Emulation disk.

Exotic Emulation. Let's look at the hardware setup that accompanies the Emulation mode and see what changes might produce useful results. Here is the instruction sequence that turns on the Emulation mode:

```
         ;$FFD0 is the zero-page control register.
A56F-    A9 00       LDA #$00       ;Select zero page = 0.
A571-    8D D0 FF    STA $FFD0

         ;$FFDF is the environment control register.

A574-    A9 FC       LDA #$FC       ;Select environment—
A576-    8D DF FF    STA $FFDF      ;discussed below.

         ;$FFEF selects memory bank and I/O status.

A579-    AD EF FF    LDA $FFEF      ;Retain same
A57C-    8D EF FF    STA $FFEF      ;memory bank.

         ;$FFE3 is the data direction register for the
         ;A port of the E VIA. Set the
         ;Emulation bit to output status, so the
         ;STA $FFEF will turn on Emulation.

A57F-    AD E3 FF    LDA $FFE3      ;Set the Emulation mode
A582-    09 40       ORA #$40       ;bit in data direction
A584-    8D E3 FF    STA $FFE3      ;control register.
A587-    AD EF FF    LDA $FFEF      ;Reselect memory
A58A-    29 B0       AND #$B0       ;bank 0, and turn on
A58C-    8D EF FF    STA $FFEF      ;Emulation mode.
```

Table 1 describes the uses of the bits in the environment register ($FFDF). It originally appeared in "III Bits: John Jeppson's Guided Tour of Highway III" (May 1983 *Softalk*). That article is an excellent reference concerning the Apple III hardware features.

Value	Bit	Function	Bit=0	Bit=1
01	0	$F000–$FFFF	RAM	ROM
02	1	ROM#	ROM#2	ROM#1
04	2	stack	alternate	normal
08	3	$C000–$FFFF	read/write	read only
10	4	RESET key	disabled	enabled
20	5	video	disabled	enabled
40	6	$C000–$CFFF	RAM	I/O
80	7	clock speed	2 MHz	1 MHz

Table 1. Environment register ($FFDF) description.

When the environment is set to $FC, the clock speed is 1 MHz; the I/O, video, and reset key are all enabled; the memory in $C000 through $FFFF is write-protected to behave as if it were ROM; the true ($0100) stack is used, and the ROM is deselected. Two changes look tempting immediately. One is to install RAM in the $C000 through $FFFF memory space, and the other is to run the "Apple II" at 2 MHz. Both are feasible, with the important limitation that most Apple III I/O requires the 1 MHz clock, so we can't set the Emulation mode clock permanently at 2 MHz.

The installation of RAM in high memory allows the use of a limited selection of language-card software. There are two restrictions:

1. There is no bank selection in the $D000 through $DFFF memory range, so programs that use the extra memory bank can't be used.
2. Programs that switch back and forth between the language card and ROM memories won't work. This includes the language-card DOS, for example.

To use the all-RAM Emulation mode, you must disable a nasty function in DOS 3.3. During the boot process, DOS stores a zero in $E000. The zero is supposed to be in the language card, but the language-card control instructions don't do anything in the Apple III. In normal Emulation mode, the memory is write-protected, so the store instruction has no effect.

A disk that already contains DOS can be fixed with the aid of the *Trackmover* program. Read track 0 into memory at address $5000. The Monitor command 56D3:EA EA EA replaces the unwanted instruction with three NOPs. Rewrite track 0 on any DOS 3.3 disk that you want to use with RAM in high memory. Disks initialized by the modified DOS will have the same DOS changes. Since the language-card initialization is useless in Emulation mode, it can be eliminated from any disk you expect to use exclusively on the Apple III.

After you have a disk that will boot DOS without destroying Basic, a one-byte change of the Emulation program will select Emulation mode without write-protecting the high memory. Read track 0 of the Emulation disk into memory at $4000. Use the Monitor command 4575:F4 to change the value in the environment register from $FC to $F4 and rewrite track 0 on the disk. The change eliminates the high-memory write protection without changing any other part of the Emulation setup.

As a finale, we consider a Hybrid mode, in which Apple II software has full control of the Apple III environment. Advantages include number crunching, access to the 6502 and system clocks, experimentation with Apple III hardware, and some novelty features. Applesoft at 2 MHz is faster than Business Basic, because there is no memory management overhead. The system clock normally cannot be read in Emulation mode, because the zero-page register switches the output bytes. Experimentation with routines to control Apple III hardware is easier in the simpler Apple II software environment than under SOS. The color text display mode is a delightful novelty. It would be welcome on the real Apple II.

There are some important limitations to the Hybrid mode, too. It's not an environment for big software projects or for most commercial programs. DOS 3.3 won't select drive 2 in the Hybrid mode, and only three of the Apple III video modes are usable with Apple II software.

A two-byte change in the Emulation program eliminates the Apple II switch to begin the production of a Hybrid Emulation disk. Use an Emulation disk already configured for lower case, because we will use base page address $F3 for color text utilities. Read track 0 into memory at $4000. The Monitor command 4582:EA EA replaces the ORA #$40 instruction with two NOP instructions. Restore the modified track 0 to the Emulation disk. If you boot an Apple II disk at this stage, the screen fills with a checkerboard of miscellaneous colors (or shades of gray). The Monitor doesn't work at all. We have to chase down some problems to build a working computer.

The checkerboard screen display occurs because the Apple II Monitor INIT routine ($FB2F) sets the display switches for the Apple III color text mode. In this mode, each character in text page one ($400 through $7FF) is affected by the contents of the corresponding address in text page two ($800 through $BFF). The most significant nibble determines the character color, and the least significant nibble determines the background color. On a monochrome monitor, $F0 produces the normal light-on-dark display, and $0F yields an inverse display. On a color monitor, the colors are those listed on page 41 of the *Standard Device Drivers Manual.*

The Monitor program doesn't work because it expects to find data tables in $FFD0 through $FFEF, where there are Apple III control registers. We will move the data tables into parts of the Monitor that can't be used in the Hybrid mode. Listing 3 illustrates subroutines that make the color text mode a usable addition to Applesoft programs, read the system clock, and control the 6502 clock and video output. All are shown on memory page three, but they could be installed permanently in portions of Applesoft and the Monitor used by the cassette load and save commands and the lo-res graphics commands.

Initializing the color text mode requires filling text page two with $F0 bytes to give a normal display. This usually destroys the first $400 bytes of an Applesoft program, so the initializing routine beginning at $300 relocates the start of Basic programs to $C00 and calls the Applesoft new program instruction. Because of this, the color-text initialization, call 768, must be the last instruction in any Basic program in which it is used.

To restore the screen to a normal display without destroying Basic programs, call 787. The color-text routines use the base page address that we eliminated from the Applesoft flashing mode ($F3) to store the value used to fill text page two. Using C for the character color and B for the background, each with a range 0 to 15, VAL = B + 16*C. Then poke 243,VAL : call 791 to color the screen and characters to your liking. To fill just one line poke 243,VAL: poke 64,line : call 807. This feature has real utility. If VAL = 0, the line disappears from view, but the characters are still in screen memory. Set VAL=240 and the characters reappear in normal display. For inverse, use VAL=15. The Emulation program uses this technique to change menu fields from normal to inverse and to erase and restore lines of text.

Only three of the Apple III display modes can be used easily with Apple II software. Turn on full-screen, hi-res, black-and-white graphics with LDA $C057 or peek(49239). Return to text mode with LDA $C056 or peek(49238). The forty-column color-text switch is LDA $C051 or peek(49233). Return to normal text mode and normal use of the $800 through $BFF address range with LDA $C050 or peek(49232). John Jeppson described the soft switches for all of the Apple III display modes in the article mentioned earlier.

Here are the steps needed to complete the Hybrid Emulation disk after track 0 has been modified as described:

1. Using *Trackmover* and an Emulation disk already configured for lower case, load track 5 at $5000 and tracks 8 and 9 at $6000.
2. Use the Monitor to install the subroutine table in its new location with 59CE < FFE3.FFFFM and 74CE < FFE3.FFFFM. Move the character table with 5319 < FFCC.FFE2M and 6E19 < FFCC.FFE2M.
3. References to the Monitor data tables will be corrected with the following entries:

```
5048: 19 F8
5A7E: 19 F8
757E: 19 F8
```

```
5AC2:CE FE
75C2:CE FE
```

4. Disable the Applesoft lo-res-graphics commands gr, hlin, and vlin with

```
683E:60 EA EA
6990:60 EA EA
684C:60 EA EA
```

5. The disk will boot in forty-column, black-and-white text mode with two additional changes: 563A:50 and 313A:50.
6. Restore the three tracks to their proper locations on the Emulation disk.

Perhaps the most intriguing aspect of the Hybrid mode is the use of the 2-MHz processor speed with Applesoft programs. The 6502 clock can be set to 2 MHz for numerical processing but should be returned to 1 MHz for I/O operations. Since there is no SOS in this mode, you have the responsibility of taking care of it. Using the utilities shown in listing 3, call 842 to set the clock to 2 MHz and call 851 to return to 1 MHz. For even faster computations, you can turn off the video screen with call 860 and turn it back on with call 869.

As an example of the gains possible with this novel variation of Emulation, let's compare the performance of Applesoft at 2 MHz with that of the Basics tested on Jerry Pournelle's 20-by-20 matrix multiplication benchmark program described in the October 1982 issue of *Byte* magazine ("User's Column"). Table 2 shows the results obtained with several versions of Basic.

Business Basic, Video on	3:16
MBASIC (Softcard III)	3:13
Applesoft, 1 MHz (normal)	3:09
Business Basic, Video off	2:35
Applesoft, 2 MHz, video on	2:10
Applesoft, 2 MHz, video off	1:41

Table 2. Execution times for the 20-by-20 matrix multiplication benchmark program.

The results in the normal operating modes were surprising, because Business Basic is usually a little faster than Applesoft in numerical benchmarks. Business Basic has a definite advantage if there is much I/O. The Applesoft advantage at 2 MHz was expected, because it has none of the software overhead needed to manage the full Apple III memory.

All of the benchmark programs used the Apple III system clock as a stopwatch. Listing 3 includes a clock routine that can be used with Applesoft programs in the Hybrid mode. It reads all eight clock bytes into a buffer and then prints the hour, minute, and second on-screen without a carriage return. Each byte is encoded as two BCD nibbles, so the printed hex value appears to be the correct decimal number. For other uses, the BCD should be decoded to binary or ASCII.

The Hybrid mode provides full access to all of the Apple III hardware features, including memory bank switching, extended indirect addressing, and read/write RAM in $C000 through $FFFF, including the area normally used for I/O. SOS was designed to free the user from memory management details, but an imaginative hobbyist could create a 192K RAM-based pseudodisk for the Emulation Apple.

The extensions of the Emulation mode discussed in these three articles arose from a variety of intended applications. A solution to the games problem was required to please the younger members of the author's family when the Apple III replaced an Apple II. Lower-case character display and entry were needed for compatibility with Apple II software already on hand. The development of the Hybrid mode was spurred by a data-taking application that demanded use of the clock, fast computations, and usable software in just a few days. Taken together, these projects emphasize that the Emulation mode offers much more than a partial imitation of the Apple II. For those who care to explore it, the Emulation program provides a route to the very heart of the Apple III.

Listing 1. The character-set editing program, *Charedit*, in Integer Basic.

```
100  GOTO 5000
120  PRINT "START(HEX): ";: INPUT A$: GOSUB 2040
140  IF A=0 THEN END
160  L=A+1024
180  FOR I=A TO L
200  P= PEEK (I)
220  FOR J=1 TO 8
240  TAB J+1: IF P MOD 2 THEN PRINT "+";
260  P=P/2
280  NEXT J
300  GOSUB 1560: TAB 20: PRINT R$
320  X= PEEK (V)
340  IF X>128 THEN 440
360  A=0
380  NEXT I
400  A=0
420  GOTO 120
440  POKE Q,0
460  IF X=195 THEN 1000      (195 = "C")
480  IF X=211 THEN 1280      (211 = "S")
500  PRINT "EDIT WHAT ADDRESS?  ";: INPUT A$
520  GOSUB 2040
540  IF A=0 THEN 120
560  PRINT "INPUT AN 8-CHARACTER STRING"
580  PRINT "SPACE FOR BLANK"
600  PRINT "ANY OTHER CHARACTER FOR SET"
620  P= PEEK (A)
640  PRINT "OLD BYTE - > ";
660  FOR J=1 TO 8
680  TAB 11+J: IF P MOD 2 THEN PRINT "X";
700  P=P/2
720  NEXT J
740  TAB 20: PRINT "<-"
760  PRINT "NEW BYTE ->";: INPUT S$
780  M=0
800  FOR K=8 TO 1 STEP -1
820  P=(S$(K,K)#" ")
840  M=2*M+P
860  NEXT K
880  I1=M: GOSUB 1580
900  PRINT "M = ";R$
920  I1=A: GOSUB 1580
940  PRINT "A = ";R$
960  POKE A,M
980  GOTO 120
1000  PRINT "CLEAR FLASHING BIT"
1020  PRINT "START ADDRESS: ";: INPUT A$
1040  GOSUB 2040
1060  IF A=0 THEN 120
1080  S=A
1100  PRINT "LAST ADDRESS: ";: INPUT A$
1120  GOSUB 2040
1140  IF S>A THEN 120
1160  FOR I=S TO A
1180  X= PEEK (I)
1200  IF X>=128 THEN X=X-128
1220  POKE I,X
1240  NEXT I
1260  GOTO 120
1280  PRINT "SET FLASHING BIT"
1300  PRINT "START ADDRESS: ";: INPUT A$
1320  GOSUB 2040
1340  IF A=0 THEN 120
1360  S=A
1380  PRINT "LAST ADDRESS:  ";: INPUT A$
1400  GOSUB 2040
1420  IF S>A THEN 120
1440  FOR I=S TO A
1460  X= PEEK (I)
1480  IF X<128 THEN X=X+128
1500  POKE I,X
1520  NEXT I
1540  GOTO 120
1560  I1=I
1580  R$=""
1600  F=0: IF I1>0 THEN 1660
1620  Z=NN*(I1< NN)
1640  I1= ABS ( ABS (I1-Z)-Z+MM):F=1
1660  FOR K=1 TO 4
1680  Z=I1/B:R=I1 MOD B
1700  N=R+1
1720  A$=H$(N,N)
1740  A$(2)=R$
```

```
1760  R$=A$
1780  IF Z=0 THEN K=4
1800  I1=Z
1820  NEXT K
1840  IF F=0 THEN RETURN
1860  M=4- LEN(R$):A$="0000"
1880  IF M=0 THEN 1960
1900  A$=A$(1, M)
1920  A$(M+1)=R$
1940  R$=A$
1960  A$=R$(1,1):R$=R$(2)
1980  C= ASC(A$)-167
2000  A$=H$(C,C):A$(2)=R$:R$=A$
2020  RETURN
2040  A=0
2060  FOR J=1 TO LEN(A$)
2080  C= ASC(A$(J,J))-176
2100  IF C>9 THEN C=C-7
2120  IF C<0 THEN 2240
2140  IF C>15 THEN 2240
2160  IF A>2047 THEN A=A-4096
2180  A=A+C+15*A
2200  NEXT J
2220  RETURN
2240  PRINT "HEX ENTRY ERROR"
2260  A=0: RETURN
3000  CALL -936
3020  PRINT "HEX TO DECIMAL CONVERSION"
3040  PRINT "ENTER 0 TO END"
3060  INPUT "HEX VALUE: ",A$
3080  GOSUB 2040
3100  IF A=0 THEN END
3120  PRINT "DECIMAL IS ",A
3140  PRINT : GOTO 3060
4000  CALL -936
4100  PRINT "DECIMAL TO HEX CONVERSION"
4120  PRINT "ENTER 0 TO END"
4140  INPUT "DECIMAL VALUE",I1
4160  IF I1=0 THEN END
4180  GOSUB 1580
4200  PRINT R$
4220  PRINT : GOTO 4140
5000  DIM A$(4),R$(4),H$(16),S$(16)
5020  B=16:H$="0123456789ABCDEF":NN=-16384:
      MM=NN+NN
5040  V=-16384:O=-16368
5060  CALL -936
5080  VTAB 5
5100  PRINT "1 - CHARACTER SET EDITOR"
5120  PRINT "2 - HEX TO DECIMAL CONVERSION"
5140  PRINT "3 - DECIMAL TO HEX CONVERSION"
5160  PRINT "4 - QUIT"
5180  PRINT : PRINT : INPUT "CHOOSE A NUMBER",C
5200  IF C>3 OR C<1 THEN END
5220  IF C=3 THEN 4000
5240  IF C=2 THEN 3000
5260  CALL -936
5280  PRINT "      CHARACTER SET EDITOR"
5300  PRINT : PRINT
5320  PRINT "AT THE PROMPT 'START(HEX)' --": PRINT
5340  PRINT "ENTER THE HEX ADDRESS OF CHARACTERS"
5360  PRINT "      YOU WANT TO SEE DISPLAYED."
5380  PRINT "      CHARACTER BYTES AND ADDRESS"
5400  PRINT "      LABELS WILL SCROLL PAST."
5420  PRINT "ENTER 0 TO EXIT PROGRAM"
5440  PRINT : PRINT
5460  PRINT "DURING SCROLLING DISPLAY --": PRINT
5480  PRINT "HIT 'C' TO CLEAR FLASHING MODE"
5500  PRINT "           IN AN ADDRESS RANGE"
5520  PRINT "HIT 'S' TO SET FLASHING MODE"
5540  PRINT "ANY OTHER KEY TO REQUEST BYTE EDIT"
5560  PRINT
5580  PRINT "IF EDIT ADDRESS = 0, RETURN TO 'START'"
5600  PRINT : PRINT : PRINT
5620  INPUT "PRESS RETURN",A$
5640  GOTO 120
```

Listing 2. KEYIN3, an Emulation Monitor patch that allows full keyboard input in Emulation mode.

```
                   ****************************************
                   *
                   *     KEYIN3: Lower-case
                   *     keyboard input routine
                   *     for Apple II Emulation
                   *     mode on the Apple III.
                   *
                   *
                   *
                   *
                   ****************************************
                   *
                   KBDA     EQU  $C000    ;KEYBOARD "A" REGISTER
                   KBDB     EQU  $C008    ;KEYBOARD "B" REGISTER
                   KBDSTRB  EQU  $C010    ;KEYBOARD RESET ADDRESS
                   A4L      EQU  $42      ;MONITOR SCRATCH LOCATION
                   A4H      EQU  $43      ;SCRATCH, HIGH BYTE
                   *
                            ORG  $FEFE
FEFE: 84 43        KEYIN3   STY  A4H      ;SAVE Y
FF00: 86 42                 STX  A4L      ;SAVE X
FF02: AD 00 C0              LDA  KBDA     ;CHECK KEYBOARD "A"
                                             REGISTER
FF05: A8                    TAY           ;STORE DATA IN Y
                                             REGISTER
FF06: AD 08 C0              LDA  KBDB     ;READ KEYBOARD "B"
                                             REGISTER
FF09: AA                    TAX           ;STORE IN X
FF0A: 2C 10 C0              BIT  KBDSTRB  ;RESET KEYBOARD
FF0D: 29 08                 AND  #$08     ;WAS THE ALPHA LOCK
                                             KEY SET?
FF0F: D0 06                 BNE  FILTER   ;NOT = MEANS NO
FF11: 98                    TYA           ;IF ALPHA LOCK, JUST
                                             TRANSFER DATA
FF12: A6 42        RTS1     LDX  A4L      ;RESTORE X
FF14: A4 43                 LDY  A4H      ;RESTORE Y
FF16: 60                    RTS
FF17: 98           FILTER   TYA           ;CHARACTERS BELOW "A"
                                             ARE OKAY
FF18: C9 C1                 CMP  #$C1     ;SO JUST RETURN
FF1A: 30 F6                 BMI  RTS1
FF1C: C9 DB                 CMP  #$DB     ;CHARACTER ABOVE Z?
FF1E: 10 F2                 BPL  RTS1     ;YES, NO CHANGE
FF20: 8A                    TXA           ;THE REST TESTS THE
                                             SHIFT KEY
FF21: 29 02                 AND  #$02     ;HERE'S THE SHIFT BIT
FF23: AA                    TAX           ;SAVE THE RESULTS
FF24: 98                    TYA           ;NOW GET DATA
FF25: E0 00                 CPX  #$00     ;X=0 IF SHIFT
FF27: D0 E9                 BNE  RTS1     ;ELSE NO CHANGES
FF29: 18                    CLC           ;DON'T CHANGE
                                             CHARACTER BY ACCIDENT
FF2A: 69 20                 ADC  #$20     ;DO THE SHIFT
FF2C: D0 E4                 BNE  RTS1     ;BRANCH TO RETURN
                                             (NEVER ZERO)
FF2E: 00                    BRK
```

Listing 3. Utility routines for use in the Hybrid Emulation mode.

```
                   ****************************************
                   *
                   *     APPLE III HYBRID
                   *      EMULATION MODE
                   *     Color-text control
                   *     1 MHz/2 MHz control
                   *     Video on/off switch
                   *
                   *
                   *
                   *
                   ****************************************
                   *
                   ENVIRON  EQU  $FFDF    ;ENVIRONMENT REGISTER
                   NEW      EQU  $D64B    ;APPLESOFT "NEW"
                   COLOR    EQU  $C051    ;COLOR SWITCH
                   INMASK   EQU  $F3      ;INTENSITY MASK
                   LINE     EQU  $40      ;LINE TO MASK
                   BASL     EQU  $42      ;LINE BASE ADDRESS
                   BASH     EQU  $43      ;HIGH BYTE
                   BASIC    EQU  $C00     ;START OF BASIC PROGS
                   ASLO     EQU  $67      ;PROGRAM START POINTER
                   ASHI     EQU  $68      ;HIGH BYTE
                   CLOCK    EQU  $C070    ;CLOCK CHIP ADDRESS
                   PRBYTE   EQU  $FDDA    ;PRINT BYTE SUBROUTINE
                   COUT     EQU  $FDED    ;CHARACTER OUTPUT
                   ZPAGE    EQU  $FFD0    ;ZERO-PAGE REGISTER
                   BUFFER   EQU  $278     ;=760 DECIMAL
                   COLON    EQU  $BA      ;ASCII COLON
                   *
                            ORG  $0300
                   * Set Applesoft pointers so programs
                   * will start at $C00, rather than
                   * the usual $800
0300: A9 00                 LDA  #$00
0302: 8D 00 0C              STA  BASIC
0305: A9 01                 LDA  #$01
0307: 85 67                 STA  ASLO
0309: A9 0C                 LDA  #$0C
030B: 85 68                 STA  ASHI
030D: 20 4B D6              JSR  NEW      ;CALL APPLESOFT NEW
                                             ROUTINE
0310: AD 51 C0              LDA  COLOR    ;TURN ON COLOR MODE
                   * Set intensity for normal screen
                   * and set to line 0.
0313: A9 F0                 LDA  #$F0     ;CHAR ON, BACKGND OFF
0315: 85 F3                 STA  INMASK
0317: A9 00        DOSCRN   LDA  #$00     ;DO WHOLE SCREEN
0319: 85 40                 STA  LINE
031B: 20 27 03     DOLINES  JSR  CLINE    ;FROM LINE TO BOTTOM
031E: E6 40                 INC  LINE
0320: A9 17                 LDA  #$17
0322: C5 40                 CMP  LINE
0324: B0 F5                 BCS  DOLINES
0326: 60                    RTS
                   * Routine to calculate base address
                   * of line and set its intensity mask.
                   *  The routine is almost identical
                   *  with the BASCALC routine in the
                   *  Apple II Monitor, at $FBC1.
0327: A5 40        CLINE    LDA  LINE
0329: 4A                    LSR
032A: 29 03                 AND  #$03
032C: 09 08                 ORA  #$08     ;SELECT TEXT PAGE 2!
032E: 85 43                 STA  BASH     ;ADDRESS HIGH BYTE
0330: A5 40                 LDA  LINE     ;NOW DO LOW BYTE
0332: 29 18                 AND  #$18
0334: 90 02                 BCC  BSCLC
0336: 69 7F                 ADC  #$7F
0338: 85 42        BSCLC    STA  BASL
033A: 0A                    ASL
033B: 0A                    ASL
033C: 05 42                 ORA  BASL
033E: 85 42                 STA  BASL
                   * Now put the value in INMASK into
                   * each position in the line.
0340: A0 27                 LDY  #$27     ;CHARACTERS 0-39
0342: A5 F3                 LDA  INMASK   ;VALUE TO STORE
0344: 91 42        STO      STA  (BASL),Y
0346: 88                    DEY
0347: 10 FB                 BPL  STO
0349: 60                    RTS
                   *
                   * Set clock to 2 MHz
                   *
034A: AD DF FF     FAST     LDA  ENVIRON
034D: 29 7C                 AND  #$7C
034F: 8D DF FF              STA  ENVIRON
0352: 60                    RTS
                   *
                   * Set clock to 1 MHz
                   *
0353: AD DF FF     SLOW     LDA  ENVIRON
0356: 09 80                 ORA  #$80
0358: 8D DF FF              STA  ENVIRON
035B: 60                    RTS
                   *
                   * Turn off video screen
                   *
035C: AD DF FF     VIDOFF   LDA  ENVIRON
035F: 29 DC                 AND  #$DC
0361: 8D DF FF              STA  ENVIRON
0364: 60                    RTS
                   *
                   * Turn on video screen
                   *
0365: AD DF FF     VIDON    LDA  ENVIRON
0368: 09 20                 ORA  #$20
036A: 8D DF FF              STA  ENVIRON
036D: 60                    RTS
                   *
                   * Subroutine to read Apple III
                   * system clock with Apple II
                   * software in Hybrid Emulation
                   *
036E: A2 07        RCLOCK   LDX  #$7      ;THERE ARE 8 BYTES
0370: 8E D0 FF     LOOP     STX  ZPAGE    ;SET CHIP REGISTER
0373: AD 70 C0              LDA  CLOCK    ;READ CLOCK
0376: 9D 78 02              STA  BUFFER,X ;STORE DATA
0379: CA                    DEX
037A: 10 F4                 BPL  LOOP     ;>=0, ANOTHER VALUE
037C: AD 7C 02              LDA  BUFFER+4 ;PRINT HOUR
037F: 20 DA FD              JSR  PRBYTE
0382: A9 BA                 LDA  #COLON
0384: 20 ED FD              JSR  COUT
0387: AD 7B 02              LDA  BUFFER+3 ;MINUTE
038A: 20 DA FD              JSR  PRBYTE
038D: A9 BA                 LDA  #COLON
038F: 20 ED FD              JSR  COUT
0392: AD 7A 02              LDA  BUFFER+2 ;SECOND
0395: 20 DA FD              JSR  PRBYTE
0398: 60                    RTS           ;RETURN TO CALLER
0399: 00                    BRK
```

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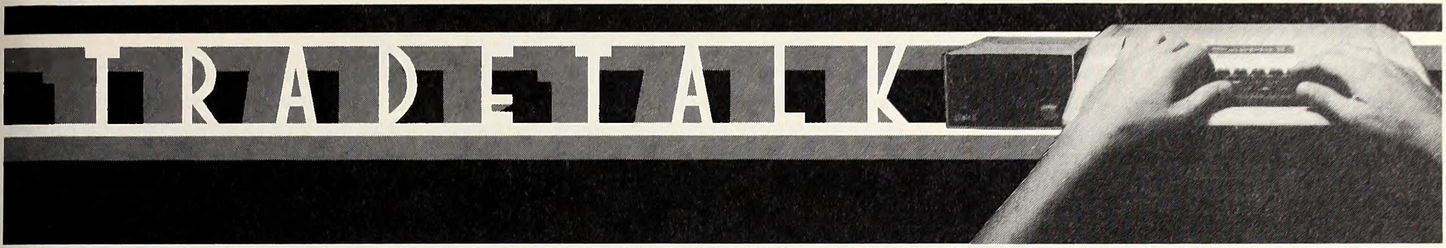

☐ **Apple Computer** (Cupertino, CA) and **General Electric Credit** (Stamford, CT) have introduced a manufacturer-sponsored credit card for buyers of Apple computers and compatible hardware and software. The Apple card will allow qualifying customers to charge up to 90 percent of a computer's purchase price and will serve as an alternative to other cards with lower credit limits. To qualify, a customer must purchase an Apple and finance a minimum of $825. After purchase of the computer, a customer can use the credit card to buy software and accessories, provided the purchases have a minimum value of $100. Credit card applications are available at participating authorized Apple dealers.

☐ **Katharine Graham**, chairman of the *Washington Post*, and **Rand Araskog**, chairman and chief executive officer of International Telephone and Telegraph, are using the **Source** (McLean, VA) in their roles as members of the U.S. Council for World Communications Year '83. The council chose the Source as its executive communication service and is using the network to promote electronic communications. Council newsletters, announcements, and a calendar of activities are among the items the council transmits through the Source.

William Ellinghaus (left), president of AT&T, and George Grune, chief executive officer of Source Telecomputing, have established the Source as the executive communications service for World Communications Year.

☐ **Management Science America** (Atlanta, GA) has purchased **Edu-Ware Services** (Agoura, CA) for $1.5 million in MSA stock, plus a deferred cash percentage of future profits, announced **Steven Pederson**, Edu-Ware's president. "We're very, very happy about the acquisition because we like the people at MSA so much. Working with them will do a lot for us personally, professionally, and economically," Pederson said. Edu-Ware, which is now an MSA subsidiary, will be hiring many programmers in a push to expand new product development but will not otherwise change its personnel or operating structure. Future company plans may include a cooperative effort with MSA's Peachtree Software division, as well as a more competitive marketing approach. "Essentially we now have the backing of the world's largest independent software manufacturer. We are going to play to win in the educational market," Pederson said.

☐ Following the resignation of **Richard Sunderland**, executive vice president and chief operating officer of **Sierra On-Line** (Coarsegold, CA), the company's owners, **Ken** and **Roberta Williams**, have become copresidents of Sierra On-Line. In addition, **Bruce McDonnell**, formerly vice president of marketing at United Vintners, has accepted the post of vice president of marketing, and **John Williams**, formerly vice president of marketing, has become entertainment product manager. Sierra On-Line is not actively seeking a new chief operating officer, John Williams said.

☐ **Synergistic Software** (Renton, WA) is gradually reducing its publishing operations in order to concentrate on software development said co-owner **Ann Clardy**. As part of the transition, *Global Program Line Editor* will be picked up by **Beagle Bros** and *Crisis Mountain* will be published by **Micro Lab**. Synergistic is currently negotiating with other publishers regarding licensing of its other programs, Clardy said. **Will Clardy**, formerly Synergistic's marketing manager, is now sales manager at Sierra On-Line, and **David Kampschafer**, product service manager at Synergistic, has accepted a position with Human Engineered Software. Synergistic will now concentrate on new software development and software conversions for other companies including Atari, according to **Bob Clardy**, Synergistic's president. "The purpose of the change was to free up our time and resources to concentrate on producing quality software," Clardy said.

☐ **Information Unlimited Software** (Sausalito, CA), a publisher of business programs, has announced that it has been purchased by **Computer Associates** (Jericho, NY), a developer of mainframe and minicomputer software. Former IUS president **Jim Baker** has transferred to IUS's new-product-development department, and **Stefan Bothe**, senior vice president of marketing at Computer Associates, has become IUS's new president, in addition to retaining his Computer Associates position. IUS, now a division of Computer Associates, has split its sales and marketing departments and has named **Mark Farnell** as its new vice president of marketing. The position of vice president of sales has been vacant since the resignation of William Lohse.

☐ **Microsoft** (Bellevue, WA) has announced the resignation of its president, **Jim Towne**, and the election of **Jon Shirley** as the new president and chief operating officer. "Microsoft will benefit from Jon Shirley's broad understanding of the personal computer business. We've known and worked with him for a number of years, and we are certain Shirley's experience and vision will be a strong complement to our software development expertise," said **William H. Gates**, Microsoft's chairman. Shirley came to Microsoft from Tandy Corporation, where he was vice president of computer merchandising. Towne resigned to become president of Metheus (Portland, OR), a manufacturer of hardware for specialized graphics systems.

☐ **Softsel Computer Products** (Inglewood, CA) will present awards to publishers who have displayed excellence in personal computer software at a black-tie-optional ceremony during COMDEX/Fall, to be held in Las Vegas this November. The awards, based on Softsel's *Hot List*, will honor software publishers for outstanding achievements in sales, packaging, performance, and innovation, said **Robert S. Leff**, president of Softsel. Invitations to the affair will be sent to software publishers, the media, Softsel dealers, and other members of the software industry. "We felt that it was time for the software publishers—a most vital force in the computer industry—to receive recognition for their creativity," Leff said.

☐ **Leland Strange**, president of **Intelligent Systems** (Norcross, GA) and vice president of **Quadram** (Norcross, GA), has been named one of Georgia's five best entrepreneurs by the *Atlanta Business Chronicle*. According to *Chronicle* writer Jan Weiner, Strange was chosen as one of the year's top five because he was able to start his own company (Quadram), sell it, and then become president of the acquiring company while retaining the vice presidency of his previous firm.

☐ **The Software Store** has moved. Its new address is 16582-Q Gothard Street, Huntington Beach, CA 92647. The phone number remains unchanged.

☐ **Reston Publishing** (Reston, VA) has formed the **Reston Computer Group** to consolidate all book and software lines developed and marketed by the company. In addition to its established computer book line, the group will publish four lines of software: Creative Pastimes, learning games and family activities for use on the Apple and other computers; two software lines for the IBM pc; and one for the Timex/Sinclair computer. Future Reston Computer Group releases will include *Moviemaker*, a computer animation program for the Apple.

☐ **Startech Marketing** (Woodland Hills, CA) has announced its birth as a national software distributor that will handle only Muse and Sirtech products. Startech has appointed **Patricia Teetor** as vice president of sales and customer support services.

☐ **Micro Lab** has moved. Its new address is The Micro Lab Center, 2699 Skokie Valley Road, Highland Park, IL 60035. The phone number remains unchanged.

☐ **ComputerLand** (Hayward, CA) has opened its first ComputerLand Learning Center in Indianapolis. The company will provide each store in the projected chain of learning centers with course outlines and training packages for business, educational, and home use. All ComputerLand stores will have access to the packaged training programs, but only specially designated stores will become learning centers. "We feel that all the stores provide superior postsale training to customers, but central support will help to standardize and strengthen training programs throughout the network," said **Mike Shabazian**, senior vice president of ComputerLand.

☐ **Carolyn J. Kuhn**, a former Control Data executive, has formed a firm that will serve as an agent between software developers and publishers. According to Kuhn, **Software Mart** (Austin, TX) will match products to needs by helping programmers find appropriate publishers for their products and by helping publishers reduce the risk of "missing the market" because they didn't have a program when the time was right. "The growing competition in the microcomputer software business makes this 'up-front marketing' more critical than ever," Kuhn said.

☐ When looking for the end of the rainbow, it helps to know the address. **Rainbow Computing** has moved its warehouse and marketing facilities to 8811 Amigo Avenue, Northridge, CA 91324. The phone number remains unchanged.

☐ **Computer Scholar** has moved. Its new headquarters are located at 820 California Street, Oceanside, CA 92054. The new phone number is (619) 721-3133. The company has also opened three new computer learning centers in Michigan and southern California. The centers use Apple computers to tutor students in beginning programming, business-related computer skills, and basic math and language skills. Computer Scholar franchises are now available to interested educators, said the company's president, **Jo Ann Harvey**. ∎

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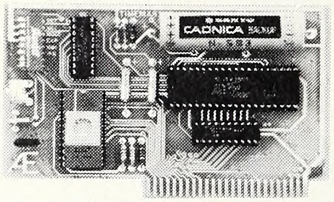
Finally a clock that does it ALL!



- Designed in 1983 using I.C. technologies that simply did not exist when most other Apple clocks were designed.
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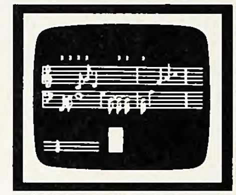
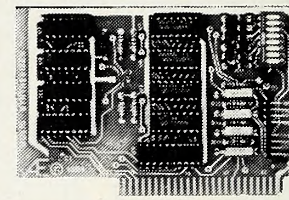
Super Music Synthesizer





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- Now with new improved software for the easiest and fastest music input system available anywhere.
- We give you lots of software. In addition to Compose and Play programs, 2 disks are filled with over 30 songs ready to play.
- Easy to program in Basic to generate complex sound effects. Now your games can have explosions, phaser zaps, train whistles, death cries. You name it, this card can do it.
- Four white noise generators which are great for sound effects.
- Plays music in true stereo as well as true discrete quadraphonic.
- Full control of attack, volume, decay, sustain and release.
- Will play songs written for ALF synthesizer (ALF software will not take advantage of all the features of this board. Their software sounds the same in our synthesizer.)
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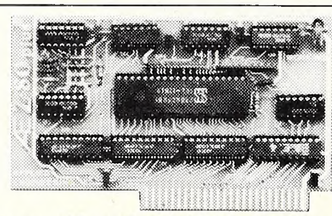

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- Fully compatible with microsoft disks (no pre-boot required).
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There used to be about a dozen 80 column cards for the Apple, now there's only ONE.

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- 80 characters by 24 lines, with a sharp 7x9 dot matrix
- On-board 40/80 soft video switch with manual 40 column override
- Fully compatible with ALL Apple languages and software — there are NO exceptions
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- All new 1983 design (using a new Microprocessor based C.R.T. controller)

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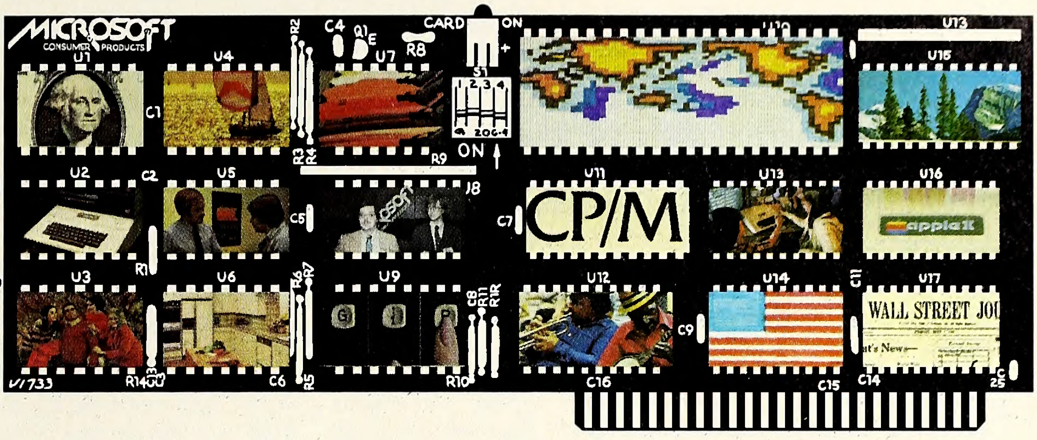
by Greg Tibbetts



Welcome to the September installment of SoftCard Symposium. This month we'll examine the BIOS disk I/O routines and, where necessary, contrast them with the equivalent routines in the more "standard" versions of CP/M.

Referring back for a moment to the BIOS jump vector table (shown on this page), we can see that eight of the seventeen entries in the table allow access to the disk driver portions of the BIOS. These disk I/O routines vary from those that perform complex operations, such as the READ/WRITE routines, to very simple ones, such as SETTRK and SETSEC. Before examining the BIOS disk I/O routines, let's briefly consider what advice Digital Research offers the BIOS implementer.

In its *CP/M 2.0 Alteration Guide*, Digital Research specifies that "disk I/O is always performed through a sequence of calls on the various access subroutines that set up the disk number to access, the track and sector on a particular disk, and the direct memory access (DMA) address involved in the I/O operation. After all these parameters have been set up, a call is made to the READ or WRITE function to perform the actual I/O operation."

It's obvious from this statement that the primary actions accomplished by means of disk drives are reads and writes and that all other routines merely support these activities. In practice, most support routines in the various BIOS implementations do very little besides save information about the track, sector, and DMA address supplied by BDOS. In these cases, the saved information is used later during the actual read or write call.

BIOS Jump Vector Table (Disk Entries Highlighted)

No.	Relative Address	Contents		I/O Type	Purpose
01	BIOS+00	JP	BOOT	INIT	Cold start initialization
02	BIOS+03	JP	WBOOT	INIT	Warm start initialization
03	BIOS+06	JP	CONST	CHAR	Console device status check
04	BIOS+09	JP	CONIN	CHAR	Console device input
05	BIOS+12	JP	CONOUT	CHAR	Console device output
06	BIOS+15	JP	LIST	CHAR	List device output
07	BIOS+18	JP	PUNCH	CHAR	Punch device output
08	BIOS+21	JP	READER	CHAR	Reader device input
09	BIOS+24	JP	HOME	DISK	Seek track 00 on disk
10	BIOS+27	JP	SELDSK	DISK	Select a specific disk drive
11	BIOS+30	JP	SETTRK	DISK	Seek a specific track
12	BIOS+33	JP	SETSEC	DISK	Seek a specific sector
13	BIOS+36	JP	SETDMA	DISK	Set DMA for next read/write
14	BIOS+39	JP	READ	DISK	Read a specific sector
15	BIOS+42	JP	WRITE	DISK	Write a specific sector
16	BIOS+45	JP	LISTST	CHAR	List device status check
17	BIOS+48	JP	SECTRAN	DISK	Map logical to physical sector

The efficiency of making five BIOS calls, three of which simply store information for later, is somewhat open to question, especially when you consider that BDOS has already done the work of storing the information somewhere within itself. It might have been better if BDOS had been designed in such a way that for disk accesses it constructed a table containing the disk number, track, sector, DMA, type of operation, and so on, and then simply passed the location of this table to a single BIOS read/write routine. This idea is meant not as a hindsight criticism of CP/M's designers but rather simply to point out that Digital Research's method is not the only viable approach, nor even the most efficient. The point is rather moot, however, since the existing version of BDOS is designed to operate with many BIOS calls, and if compatibility is to be maintained, this design must be perpetuated.

In our discussions so far, we have seen that CP/M's designers attempted to set it up in such a way that the BIOS would be totally under the control of BDOS, rather than being accessible in any way by the user's programs—never mind that this is not strictly followed in the real world. When we focused more specifically on character I/O, we further saw that the BDOS system calls accessed by user programs (also called *BDOS functions*) are generally comparable to the BIOS character I/O entry points. In other words, if we wished to output a character to the screen, for example, we could do so by calling BDOS function 2 (console output) or by calling the fifth entry point in the BIOS jump table (JP CONOUT). The two would be more or less functionally equivalent; the primary difference between them is whether BDOS is able to keep track of the cursor position on-screen.

This ability to access BIOS routines selectively and individually by making BDOS system calls is not available with BIOS disk subroutines. For example, there are no BDOS functions for setting the track number, setting the sector number, and so on. With the exception of BDOS functions 14 (disk select) and 26 (set DMA address), all BDOS system calls relate to files rather than to the raw information (tracks and sectors) the BIOS works with. This has made the creation of low-level disk utilities somewhat tricky, since the BIOS must be accessed directly for nearly everything. In normal operation and programming, however, BIOS is ignored and BDOS is allowed to control totally the calling and sequencing of the BIOS disk routines. As a result of that, and without the one-to-one comparability between BDOS disk functions and BIOS disk I/O entry points, the BIOS disk subroutines have become something of a "black box" for most users. The rest of this article is an attempt to dispel some of the mystery that surrounds these subroutines.

BIOS function number: 10 Jump location: BIOS+27
Routine name: SELDSK Routine type: Disk
Routine purpose: Select a specific disk drive
Entry parameters: Disk to select in register [C]
Exit parameters: DPH address in [HL] (00=error)

According to Digital Research, SELDSK must select the drive whose number is provided in register [C] (A:=0,B:=1...P:=15) and return to BDOS (in the [HL] register pair) the address of the disk parameter header (DPH) for that drive. If there is no drive associated with the number in register [C], SELDSK must return a zero in the register pair to inform BDOS of that fact. The term *select* has a very loose meaning here; basically, it comes from the terminology used with disk controllers.

Since there are few occasions when drives must be used simultaneously, it is inefficient to duplicate the entire disk controller for each drive. For this reason, several drives are usually connected to the same controller (two drives with Apple's Disk II system, for example), and special "select" circuitry is provided to switch the controller between drives. The action taken by the software is to send the drive "select" signal to the controller's "select circuitry"—hence the term *drive select.*

SELDSK is the starting point of any new disk access by BDOS, and from our discussion of the disk data structures these last months, it should be apparent why SELDSK is called first. Without the information contained in the DPH and the other data structures pointed to by the DPH, BDOS can know nothing about the drive and the format of the media in it. The lack of this knowledge prevents BDOS from being able to locate the disk's directory, much less calculate the location of file records. What BDOS needs most from SELDSK, then, is the DPH address. As soon as it has that address, BDOS can initialize its own internal tables and structures as well as those in the BIOS, such as the ALV and CKS areas.

Once these data locations and areas are initialized, BDOS can simply keep updating them as it continues to access the drive. For this reason, following a call to SELDSK, any number of calls to the remaining BIOS disk routines may be made in order to read and write sectors of data on whichever specific disk was selected. Only when a new disk must be accessed will BDOS again call SELDSK. BDOS will then read or write any number of sectors to that disk, and so on. Although it will call SELDSK each time a disk other than the current one is accessed, BDOS will not reinitialize the data structures each time. Only when it has been notified of a media change in the drive, either by a warm boot from the user or by an altered directory checksum value during its disk access, will BDOS re-create the data structures. BDOS keeps an internal table of which disks have been accessed (which have had their data structures initialized) and which have not.

The other functions that SELDSK performs (such as hardware initialization) are relatively unimportant to BDOS so long as any that must be done are performed sometime prior to the read or write. In most BIOS implementations, in addition to passing the DPH address to BDOS, SELDSK sets up floppy drives for action, performing the select function just mentioned, testing whether the drive is ready (plugged in, turned on, and so forth), and determining density of the disk format in use in multidensity environments. SELDSK's duties with hard drives, which need no density tests, are usually much simpler.

In the SoftCard BIOS, SELDSK performs no actual hardware control or drive select function; rather that action is delayed until the actual read or write. The reason for this is that, depending on what operation BDOS is currently performing (or on some particular whim of the user's program), BDOS may call SELDSK to select a drive without actually going on to access that drive for a read or write. In such a case there is little to be gained from turning the drive motor on, especially since doing so would cause most controllers to turn the motors off automatically on any other drives serviced by them. Switching back and forth to no good purpose would cause severe slowdowns in disk access response. With eight-inch drives, which may load the heads when selected, doing this would cause unnecessary wear on moving parts and disk surfaces; and in the Apple, there's the potential for minor but undue strain on the power supply and drives. SoftCard's SELDSK, therefore, does little besides return the DPH address to BDOS.

Located at 0DD6DH in 56K, SELDSK first checks the number in register [C] against the number of active drives found in the system during the boot sequence. As you'll remember from our discussion of the BOOT routine, the disk controller cards are counted and multiplied by two to get the maximum number of drives possible in the system, and the value that results is placed in a variable called NDISKS. It is this value minus one that is checked against the disk number BDOS is trying to select. A number that is not in the range of 0 to NDISKS−1 causes a branch to SELERR at 0DD84H. SELERR loads 00 in the [HL] pair and returns to BDOS. A valid disk number, on the other hand, causes SELDSK to load the base address of the DPH tables into [HL] and jump to a routine called AX16 at 0DD64H. This routine multiplies the disk number (0−15) by sixteen (the number of bytes in a DPH). The result of this calculation is added to [HL], leaving [HL] containing the address of that drive's DPH. Control returns directly to BDOS from the AX16 subroutine.

That's not all SELDSK does, however. If it were, there would be no way for READ or WRITE to know that a new disk had been selected, and so the next call to either of them would access the old disk. Therefore, after checking for the validity of the disk being selected and before obtaining the DPH address, SELDSK handles this potential problem by taking the number of the disk to be selected from register [C] and putting it into a variable called SEKDSK, located at 0DEADH in 56K. SEKDSK is the variable that READ and WRITE will access later to do the actual hardware control that switching to this drive requires.

In addition to setting up the SEKDSK variable, SoftCard's SELDSK routine does something else. While this process is not mentioned in the Digital Research documentation or included in the company's sample BIOS (nor in most other implementations we're familiar with), it does have a useful purpose.

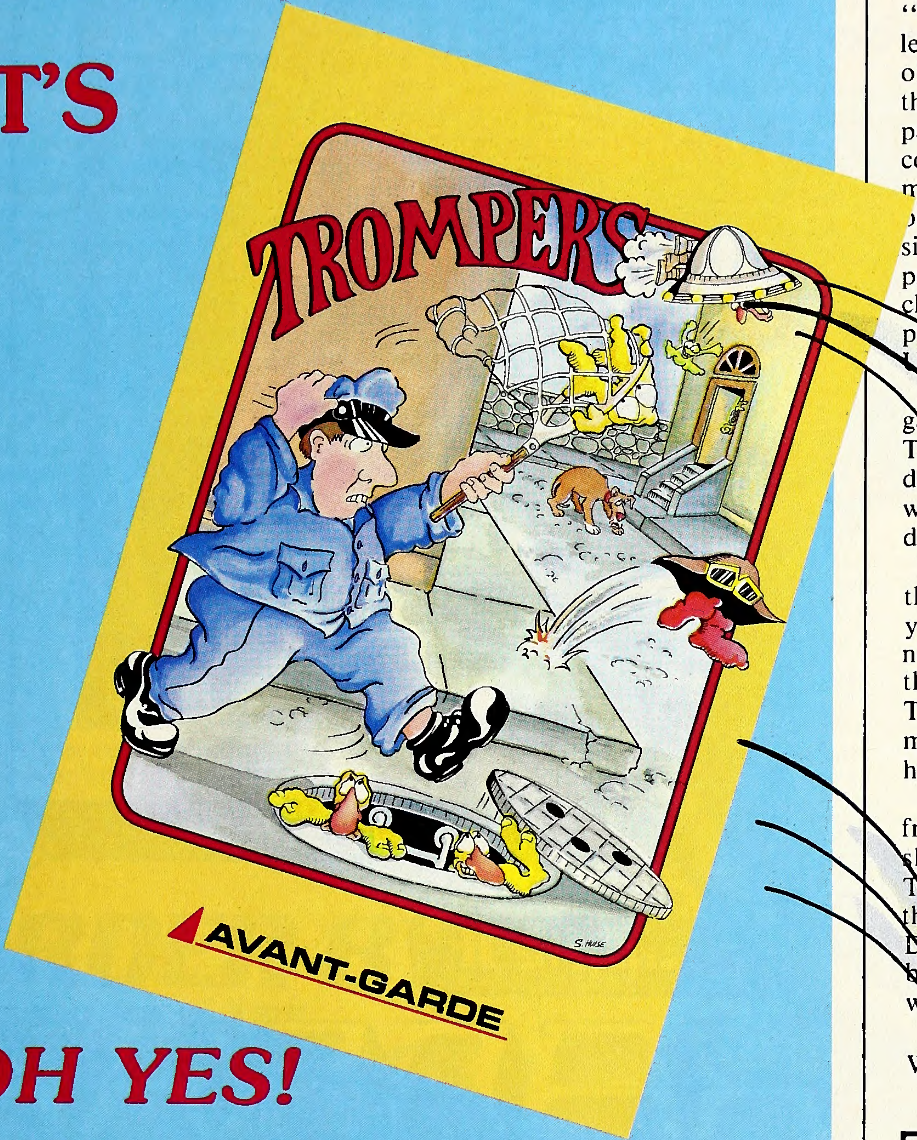
When a nonexistent drive is selected in a certain way, standard CP/M systems will hang. This usually happens when an attempt is made to log on to such a drive from the keyboard (for example, by typing C: at the A > prompt when there is no drive C:). A person who makes this mistake gets the message "BDOS error on C:SELECT." Typing a control-C at this point causes a warm boot and activates drive A: to reload the CCP; and then, since drive C: was selected by the user before, the CCP once again attempts to log it in. And so on, and so on. Only a complete reboot will get CP/M going again. The reason all this occurs is that the system keeps track of the currently selected disk in a variable called CDISK, found at 0004H in the system data page. When the CCP is told to log in a new drive, CDISK is altered to this new value even before SELDSK is called to find out if the drive is valid!

As we saw from our discussion some months ago, the last action of the warm boot code is to jump to the beginning of the CCP with the currently logged disk value in register [C]. Where does it get this value? You guessed it, from CDISK. Consequently, when attempting to log in nonexistent drive C:, CDISK is immediately changed to 02H and then SELDSK is called. When the disk select fails, SELDSK reports this back to BDOS, which prints the error message and awaits a keystroke before requesting a warm boot. When the keystroke is typed, the warm boot is performed, a 02H is loaded into register [C], and control is passed to the CCP, which immediately tries to log in drive C: (02H). In the SoftCard SELDSK, however, this does not happen.

When SELDSK is called, its first activity is the check for the validity of the disk selected. If the new disk is found to be valid, SELDSK loads the value from CDISK (which is now known to be a valid disk). It saves

OH NO!

IT'S



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this value in a variable called OLDISK, located at 0DEACH. Each successful select, then, saves the value of the new valid disk in OLDISK. Following this, if an attempted select on a nonvalid drive is made, the SELERR routine loads the value from OLDISK and writes it into the CDISK location before returning to BDOS with the error. When BDOS requests the warm boot, then, the value passed by the warm boot code to the CCP is not that of the nonvalid disk, but rather that of the last valid one. This extra code has no effect on any errors other than SELECT errors. Attempting to log in a drive with no disk, or a drive where there is a controller but no drive (that is, drive D: in a three-drive system), produces a "bad sector" error message and the system still hangs.

BIOS function number:	9	Jump location:	BIOS + 24
Routine name:	HOME	Routine type:	Disk
Routine purpose:	Seek track 00 on selected disk		
Entry parameters:	None		
Exit parameters:	None		

The HOME routine is provided more as an aid to BIOS designers than anything else. It is functionally equivalent to calling SETTRK with a parameter of 00. The HOME routine was provided separately, however, because with certain disk controllers it was easier to move the disk's read/write head to track 00 than it was to find a specific track. The HOME routine always seeks track 00, and making it a separate routine speeds things up slightly. HOME is called after each successful disk select to place the read/write head in a known position for BDOS, which keeps track of it. With more modern disk controllers that are capable of seeking from any track to any track with a single command, most BIOS designers simply let HOME load the [BC] register pair with 00 and jump or "fall through" to the SETTRK routine.

Another factor to take into account in constructing a HOME routine is whether the BIOS is performing blocking and deblocking of large sectors. As we've discussed (and will cover in more detail later), BIOS block/deblock often defers the writing of 256-byte disk sectors until it is sure that the other half (the second 128-byte CP/M sector) will not be modified. It is common, therefore, for the BIOS to get a read or write request while it still has valid unwritten data in its buffer from the last write request. This data must be written before the requested operation can be performed. Had BDOS issued a HOME command in between operations, and had HOME actually moved the read/write head to track 00, the BIOS would have to move it back where it was, do the leftover write, and then home it again. This would result in considerable loss of efficiency. Allowing HOME to defer the actual seek until the READ/WRITE routines avoids this potential problem.

SoftCard's HOME routine, located at 0DD4BH, in fact performs as we have described. Since the Apple Disk II drives have only thirty-five tracks, only the [C] register of the [BC] pair is used and all track storage locations are single-byte variables. In addition to falling through SETTRK with a 0 parameter, HOME also clears the flag indicating that the block/deblock buffer is active (if there is no sign that there is an unwritten sector contained in the buffer). Both of these last duties involve the block/deblock algorithm itself, which we'll save until we discuss READ and WRITE.

BIOS function number:	11	Jump location:	BIOS+30
Routine name:	SETTRK	Routine type:	Disk
Routine purpose:	Seek a specific track on selected disk		
Entry parameters:	Track number to seek in [BC]		
Exit parameters:	None		

Although SETTRK's purpose is to move the read/write head of the disk to the track specified in [BC] (SoftCard uses just [C], remember), this action is usually deferred until just before the actual read or write is performed; the reasons for this are the same as the ones we spoke of when discussing the HOME routine. In the SoftCard BIOS, SETTRK is located at 0DD56H, immediately following HOME. It loads the value of the track to seek from register [C] to register [A] and then loads that value into a variable called SEKTRK (at 0DEA8H); it then returns to BDOS. It is this variable that READ and WRITE will access for the current track to seek when they are called.

BIOS function number:	17	Jump location:	BIOS+48
Routine name:	SECTRAN	Routine type:	Disk
Routine purpose:	Map logical to physical sector numbers		
Entry parameters:	Logical sector number to map in [BC] XLT table address in [DE]		
Exit parameters:	Physical sector number in [HL]		

As we've mentioned in the past, the SECTRAN routine is responsible for handling software interleave translation. Its main purpose is to allow the BIOS designer the utmost flexibility in coming up with his own method of interleaving. BDOS calculates sector numbers based on there being no interleave (that is, sectors are numbered 0,1,2,3,4 . . . 15), and simply asks the BIOS for the necessary translation. In the SoftCard BIOS, interleaving is a two-part affair. The first takes place in the READ/WRITE routines, where the translation from a three-sector interleave to a two-sector one is accomplished, and the second occurs in the RWTS routines where the two-sector interleave is translated. Given this arrangement, there is no need to do anything outside of READ/WRITE. For this reason, the entry for SECTRAN in the BIOS jump table is not actually a jump, but rather two load instructions and a RET as shown below:

```
LD      H,B
LD      L,C
RET
```

This entry occupies the same three bytes as a jump instruction and its address but has the effect of returning in [HL] exactly what was supplied in [BC] without having taken up space for a routine to perform this function. Even though there are zeros in the XLT field of the DPH for a particular drive, BDOS still calls SECTRAN in order to give BIOS designers an opportunity to implement any necessary translation functions of their own.

BIOS function number:	12	Jump location:	BIOS+33
Routine name:	SETSEC	Routine type:	Disk
Routine purpose:	Seek a specific sector on selected disk		
Entry parameters:	Sector number to seek in [BC]		
Exit parameters:	None		

The SETSEC routine, like SETTRK, is simply used by BDOS to pass the sector number to the BIOS. The SoftCard BIOS again uses only the [C] register, since there are only thirty-two CP/M sectors per track. SETSEC (again like SETTRK) defers the actual passing of the sector number to the controller (RWTS in this case) when called. Instead, the value in register [C] is placed in a variable called CPMSEC, located at 0DEA9H. Control is then passed immediately back to BDOS. In the SoftCard BIOS, SETSEC is located at 0DD89H, immediately following SELDSK.

BIOS function number:	13	Jump location:	BIOS+36
Routine name:	SETDMA	Routine type:	Disk
Routine purpose:	Set DMA for next read/write		
Entry parameters:	DMA address in [BC], B=Hi C=Lo		
Exit parameters:	None		

SETDMA's only purpose is to inform the BIOS of the 128-byte area that BDOS wishes the next disk sector(s) read from or written to. The BIOS must not assume that a call to SETDMA will occur before each read or write, since there are occasions when several sectors may be loaded into the same space and processed one at a time. The initial default DMA address is 0080H in the last half of the system data page. Most data transfers are performed from and to here, although, as we've seen, BDOS will use other DMA addresses as necessary.

In the SoftCard BIOS, SETDMA is located immediately after SETSEC at 0DD8EH. When called, it loads the contents of [BC] into a variable called DMAADR at 0DEB8H and returns to BDOS. During reads and writes, the READ/WRITE routines use the contents of this variable as the start address needed for moving 128-byte records to and from the deblocking buffer.

We have now finished the easy ones. The only two routines left are READ and WRITE, which take up most of the space in the BIOS disk access routines. We'll devote the next column and possibly the one after that to discussing them. As you can see from what we've discussed so far, in a blocking/deblocking BIOS like the SoftCard, READ and WRITE do most of the work. Until next month. . . .

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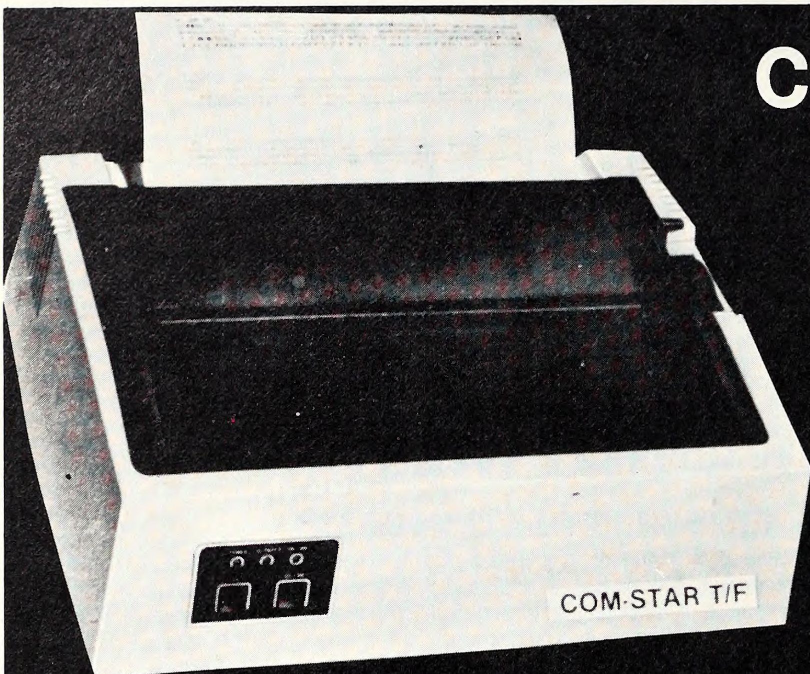

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Buttonwood Apples

BY KEN LANDIS

In the time since Buttonwood Apples began two years ago this month, we've considered numerous investment programs that run on the Apple—and times have changed. Two years ago, most people who used the Apple for investing were techies, folks who willfully lost sleep to figure out just how these beige boxes worked. Sprinkled among us were investment professionals who recognized early on what a difference having a personal computer could make in investing.

Some of the men and women who used their Apples in investing two years ago are today's software authors and publishers. Others got rich in the market, and still others got poor. But the fascination that was so addicting then still holds us now: the ability to direct and use the power of the Apple to help us make money. Nothing holds an investor's attention like the prospect of a big long-term capital gain.

Many of today's Apple users are neither techies nor market professionals. They're people who bought a computer because they knew it would change the way they live and work, parents who want to prepare their children for the future, computer hobbyists, and, of course, computer game connoisseurs. Perhaps you fit one of these descriptions. If so, it may be that the only reason you don't use your Apple as an aid in your investment decisions is that you don't know how to. This is not to say that you couldn't go to your local computer store and buy any investment program you wanted. Rather, the stumbling block is that you don't understand the basics of investing—the difference between a common stock and a preferred stock, why buying a security on margin is tricky (and what *is* margin anyway?). If you understand the basics, you just might put a little money at risk in the market. Maybe you'd make some money, maybe you'd lose some. The point is—you'll never know unless you give it a shot.

In this month's column, we'll look at why you might want to use an Apple to help you invest in the first place. Starting next time, Buttonwood Apples is going to be a two-part column. The first half of it will be a tutorial on investing—the basics you need in order to get started. The second half will be what you're used to—reviews of major pieces of investment software. The premise is simple: If you want to invest but don't know how, part one of this column will help you learn; and if you already know what to do, look to part two for programs you should consider.

The hope is that you'll find the information contained here useful and profitable. To help improve the odds that it will be both, write in with your questions, whether they concern particular pieces of software or investing in general. If we can't answer a question, we'll try to find someone who can.

Why should you even consider using an Apple to help you analyze investments? Because doing so can save you a great deal of time and money, that's why.

Investing, like medicine, is considered an art. It appears to be a mixture of exact science, emotion, luck, and folklore. Different investors subscribe to different theories.

The two major schools of thought are technical analysis and fundamental analysis. Technical analysis concentrates on the history of a security—how it has performed over time. The key indicators here are the security's price and volume. Technicians look for trends. It doesn't matter if a trend is up or down—as long as you can identify that trend, you can make money.

Fundamental analysis concentrates on how a company is doing. How are its earnings? What are its future prospects? What price is its stock trading at? If the organization itself is doing well, the theory goes, its stock will too.

These two major schools of analysis can be used to evaluate any type of security; they are used primarily, however, with equity-based investments such as stocks, options, and warrants. Bonds are a little different. The price of a bond is determined by the going market interest rate, the *coupon* (or face interest rate) of the bond, any special conditions placed on the bond (indentures), and the ability of the borrower (the issuer) to pay the principal (the money borrowed) and the interest on the bond.

Software designed to run on the Apple has been written to perform both technical analysis and fundamental analysis. Why? Let's consider technical analysis first.

The heart of technical analysis is charting numbers. These numbers might be the actual price or volume statistics of a given security, or they might be a charting of the results of a calculation designed to identify trends (or, as many technicians call them, opportunities).

What does it take to do a technical analysis chart? Well, it takes a pencil, paper, a bunch of raw data, a file cabinet, a calculator, a huge worksheet, a lot of patience, and a great deal of time. If we put the power of the Apple to work, we can direct it to collect our data, store it, manipulate it, crunch it, and then chart it. It can do all this in about one-hundredth of the time it would take to do it manually, with what approaches 100 percent accuracy. In other words, enlisting the Apple's aid allows us to do one hundred times the analysis we could do by hand. This improves our chances—our odds, if you will—of making a profitable investment decision.

Now let's consider fundamental analysis. To look at the entire universe of investments available to us would be almost impossible. There are thousands of stocks listed on the New York and American stock exchanges alone. Add to that the stocks traded over the counter and those on the regional exchanges and the task of covering them all becomes even greater. Yet if we don't want to limit our potential profit opportunities, we'll need to analyze every stock on every exchange.

Instead, why not let the Apple do the work for us? Using a fundamental analysis package, such as the *Dow Jones Market Microscope*, would enable us to get and analyze the financial statistics on almost any company and then print out a report showing which stocks warranted further evaluation. We're not replacing ourselves with the Apple in the investment process; we're simply using it to augment our own abilities.

That's a key point. In any form of Apple-assisted investment activity, we shouldn't be replacing our own judgment with the computer's. Rather, we should use the Apple as an assistant, adding its incredible computational power to our incredible (we hope) analytical or decision-making ability. There's a tradeoff, though. Using the Apple in investment analysis can get expensive. It may be that the cost of software, hardware, and connect charges for your database exceeds the value you place on your own time or your ability to recoup the money you've spent on equipment. Should I or shouldn't I use my Apple in investing is a question only you can answer.

If you do decide to use your Apple in investing, how do you shop for investment packages? Sad to say, your average computer store salesperson knows as much about investing as he does about the mating habits of the African fruit fly. When you ask to see an investment program, you'll probably hear something like, "We don't stock them but we can order them. Which one do you want?" Would you buy a car that way? Of course not. Then don't purchase a piece of software in that manner either.

Unfortunately, you can't ask your local computer dealer to order every piece of software you're considering so that you can evaluate it, keep it if it's good, and return it if it's not. So what can you do?

Well, to begin with, you can gather information by reading reviews, write-ups, and advertisements in various computer publications. Doing this will begin to give you a feel for what's out there. In addition, user groups often have SIGs (special interest groups) in investing. These groups consist of individuals like you who want to learn more about using the computer as an investment tool. Some of them may be quite experienced, others may be novices. In any event, the purpose of a SIG is to help its members learn. Through an investment SIG, you'll meet people who use investment software, and you'll have the opportunity to get their opinions about the worth of particular programs.

Some SIGs establish a special-purchase fund for buying new pieces of investment software. All members of the SIG chip in to buy a new, interesting package; then someone is assigned to review it. Once the package has been reviewed, each member uses the package for a while. If it's decided that the package is worth buying, one member buys the existing package from the group, and the other members purchase copies for themselves. If a package is worthless, each member is out only a fraction

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of what it would have cost to buy the software on his or her own. (If you want to find out quickly which programs to avoid, all you have to do is find out which programs a good SIG still has on the shelf.)

Another option is the new rental software stores and services that are popping up. They allow you to rent the package you're interested in and try it for a while. If you like it, you can buy it; if you don't, you can return it.

So now that you've found the package you want, where do you go to buy it? You could go back to your local retailer, order by mail from a discount house, or order direct from the publisher. Which is best?

Remember the African fruit fly? If your local retailer knows nothing about the package you're interested in, why should you buy it from him? There are a couple of good reasons. The first is that if you buy the package locally you'll have some leverage if it doesn't work properly. After all, a dealer who refuses to accept your return of unsatisfactory or defective merchandise knows that he'll probably lose you as a future customer. Should you pay the full list price for the package? That's up to you, of course, but you might be surprised how flexible some retailers are on software prices. Everybody is in business to make a profit, of course, and you shouldn't begrudge your local computer store that opportunity, but exactly what that profit ought to be is not cast in stone.

Buying a piece of software via mail order may save you some money, but you don't get the kind of leverage you'd have if you'd made the purchase locally. If you do go the mail-order route, be sure to use your credit card to pay for the purchase. As you may already know, if something you buy costs more than fifty dollars and the vendor is more than fifty miles from your home, you can complain to the credit card company if there's any problem. By the way, this works. If the company agrees with you and thinks there's been an injustice, you'll get your money back.

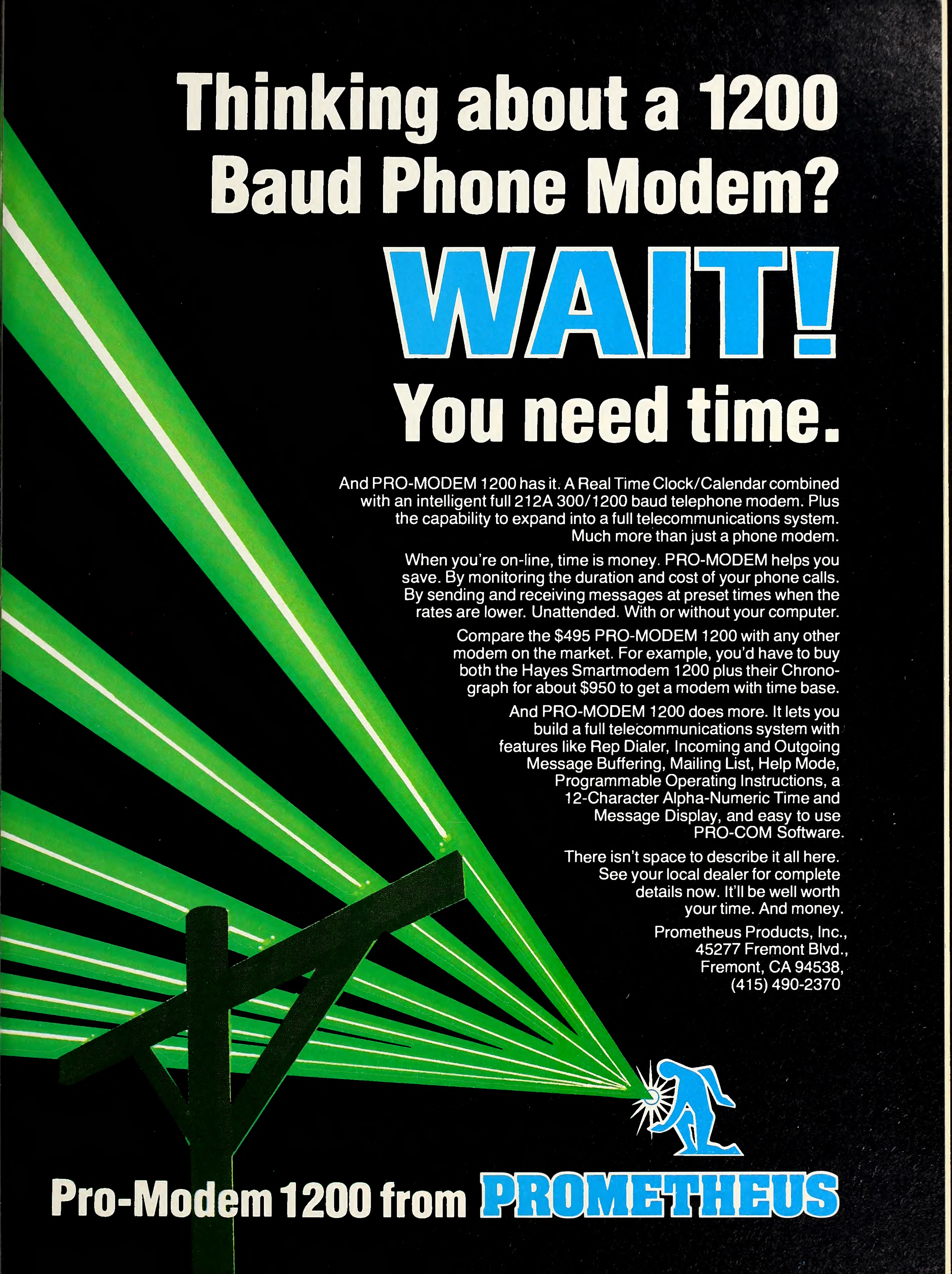
The final alternative is to buy the package directly from the publisher. In most cases, this isn't necessary and you're better off going through your local retailer in order to have that leverage we spoke of earlier. The publisher is going to give you the same amount of support whether you bought the package direct or through a retail outlet, so that's not an issue.

By the way, if a retailer tells you that "we support this package," don't take the remark too seriously. Normally, all this means is that the store will call the publisher and ask questions for you, something you'd be better off doing yourself. Frankly, unless your retailers are registered investment advisers with the Securities and Exchange Commission, they can't really support investment software. Why not? Well, selling training services on how to use a piece of software that employs a particular investment technique is, in effect, endorsing that technique and giving investment advice.

The bottom line on support is, when you buy your package, it's you, your telephone, and the publisher. If you're lucky enough to find someone locally who knows that package, be it a retailer or another investor, you're that much ahead of the game.

What about the Hardware You Need To Run the Software? The best advice anyone can give you on this score is, "Don't go hog wild!" If you're looking at a piece of software that requires you to buy an additional $1,000 worth of hardware, make absolutely sure that the software is what you want. As anyone who invests knows, the goal of investing is to minimize risk while maximizing rewards. The same principle applies here, but for some reason some people still go out and spend a lot of money on hardware only to find out they never needed it in the first place (buying a letter-quality printer to produce charts when the charts can already be seen on-screen or printed on a dot-matrix printer is an example of this). Sometimes people just find out, after having bought a lot of hardware, that the software itself doesn't do what they want. The best strategy is to be as cautious with your purchases as you are with the money you invest.

How Do I Find Out What All These Investment Techniques Are and How They Work? Just keep reading. See you next month. ■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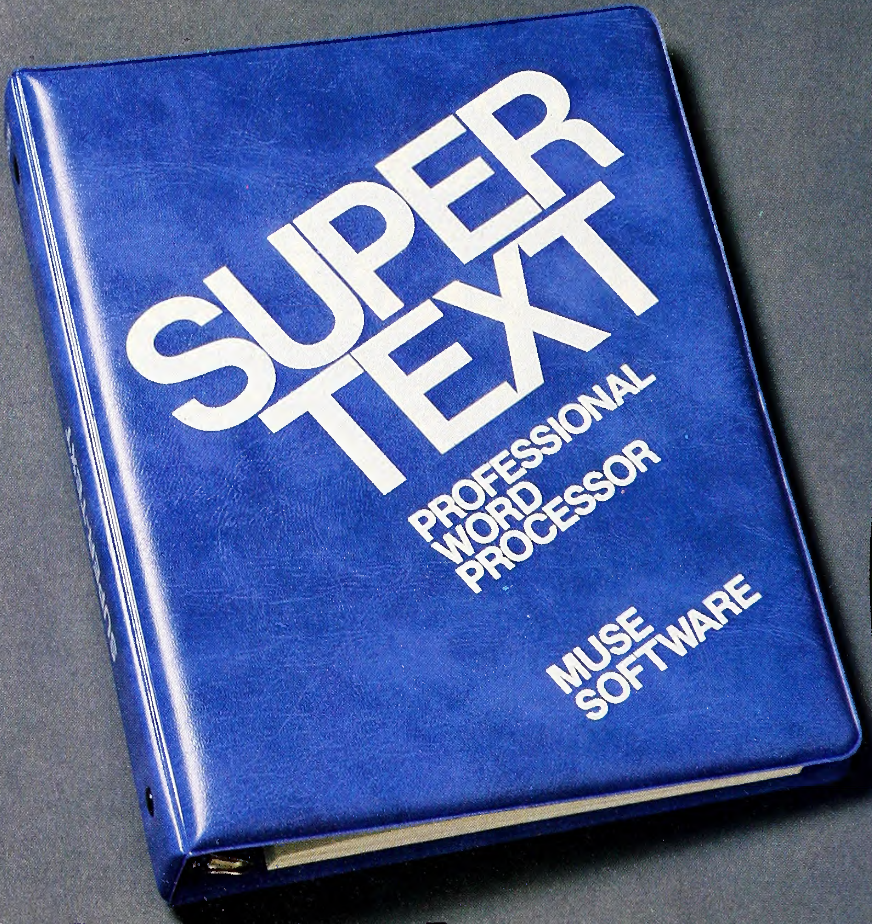

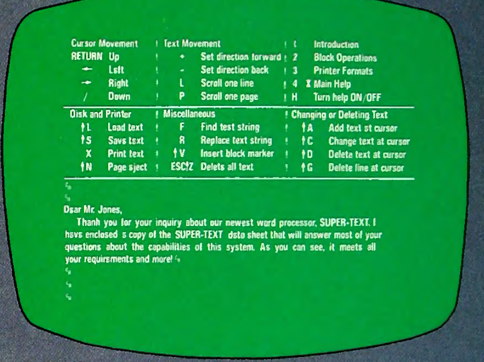

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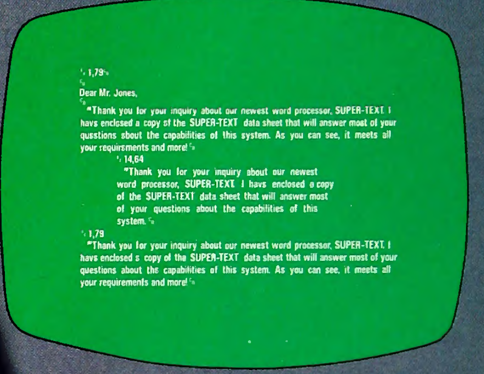

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EVERYONE'S GUIDE TO ASSEMBLY LANGUAGE

BY JOCK ROOT

Part 3: Strings

Unlike Basic, assembly language doesn't understand strings—an assembly language command can operate on only one character at a time.

Does that mean that assembly language can't deal with strings? Of course not—assembly language can deal with almost anything! But the "understanding"—that is, the step-by-step instructions—must be provided by the programmer. Your program has to tell the system, "This string begins *here*, and ends *here*."

There are several ways to do this. Last month, for example, we did it by counting, and we got a program that would print a string. This month, we'll do it a different way, and we'll get a program that can print any one of several strings.

Address and Length. Here are two ways to print a string, one in Basic and one in assembly language.

Basic		Assembly Language		
10	X=0		LDX	#0
20	READ A$	LOOP	LDA	STRING,X
30	PRINT A$;		JSR	COUT
40	X = X+1		INX	
50	IF X<11 THEN 20		CPX	#11
			BCC	LOOP
60	DATA H,E,L,L,O," ",B,O,S,S,!	STRING	ASC	"HELLO BOSS!"

Note that the logical structure is the same in both listings, line by line—even though the symbols are different, and sometimes different techniques are used. For example, line 10 in the Basic version means, "Let the variable called X equal zero," while the assembly language version means "Load the register called X with zero"; but they both amount to the same thing, which is "set the loop counter to zero."

Similarly, line 20 of each version means "Get the next character of the string," and line 30 means "Output that character." The techniques used in the two versions are different, but the result is the same.

Line 40 is the actual counting instruction. INX, in the assembly language listing, is short for increment X.

Line 50 is in two parts: first the loop exit test, "Have we done enough yet?" then the branch instruction, "If not, go back and do it again." BCC means branch if carry is clear: It's a way of testing the result of the compare X operation, CPX. When the number of passes through the loop, as counted by the X register (or by variable X), matches the number of characters in the string, the loop ends. The complete string has been printed, one character on each pass.

In this case, the string was identified by two numbers: its starting address in memory (represented by the label STRING in the listing) and its length, or number of characters. Thus the program loads the first character from the specified address and outputs it, then adds 1 to the address and repeats the process, and continues repeating until the counter equals the length of the string.

This is a useful way to identify strings; in fact, this is how Applesoft usually does it internally; but the method has one slight disadvantage: It requires *two* numbers, address and length. There is another way to identify a string, using only one number: the starting address. Instead of a length, you use a *terminating character*.

From Here to CR. That means, of course, that you have to commit that character to that one use and no other: If you tell it to do so, the program will always interpret that character as the end of a string, whenever it finds it. But that's no loss to us; we can use the carriage return character, ASCII 13. We're already used to using that as an end-of-statement mark in Basic.

Here is the assembly language program, rewritten to work with a terminating character instead of a length specification:

```
1            LDX #0
2    LOOP    LDA STRING,X
3            CMP #13
4            BEQ EXIT
5            JSR COUT
6            INX
7            JMP LOOP
8    EXIT    RTS
9    STRING  ASC "HELLO BOSS!"
10           DFB 13
```

There are several changes. First, the exit test (lines 3 and 4 in this version) has been moved up ahead of the output step (JSR COUT, line 5). This enables us to test the character in the accumulator before the COUT routine scrambles it. It also means that the terminating character itself will not be printed—if that character is found, the routine exits before printing it—so that the terminator will not appear as part of your string.

Note that the compare operation has been changed from CPX (compare X register) to CMP (compare accumulator). That's because the earlier version was testing for a character count—actually, a count of passes through the loop—and that value is found in the X register; this version is looking for a particular character, which will be found in the accumulator.

And finally, the exit arrangement is different. The first version used the branch part of the test and branch operation—CPX #11, BCC LOOP—to close the loop (that is, to repeat the cycle if needed). We can't do that here because we're doing the test-and-branch before the output step: We can't close the loop with that branch, because there's still something to do—JSR COUT—before we go around again. Instead, we use a jump command—similar to the goto command in Basic—to close the loop.

When the complete string has been output, line 3 will find the terminating character; line 4 will then branch to the exit line (BEQ is short for branch if equal); and line 8, the exit line, will return to the calling program (RTS is the assembly language form of the Basic return command).

Last but not least, line 10 provides the terminating character itself—DFB is short for define a byte, and means that the following byte (or bytes) should be inserted into the program code. Warning: When you use this technique, be sure you remember to put in the terminating character. Think about what will happen if you leave it out. . . .

Many Messages. "But what is the use," you may be wondering, "of all these changes? The program is now several bytes longer than before, and it still does the same thing." Ah, but it doesn't do quite the same thing: Now it can find the end of a string, all by itself! Before, it had to be told where the end was (address *and* length, remember)—now, you only have to tell it where the string begins.

What good is that? Why, this: If we simply poke a different address for the beginning of the string—change the value of STRING in line 2—we can have the program output a different string on each call! Thus the program could be used to handle a whole set of strings: error messages, perhaps, or a help file. All you have to do is poke the address of the desired message before each call.

In fact, there's an even easier way to do it. We can add a short section, called a "header," in front of the main program. This section modifies the message starting address and then jumps to the main program. We will need a separate header for each string, but the extra convenience will be worth it. It works like this: In order to output a particular string, your Basic program must call the header for that string (use the call command and the starting address of the header you want). The header will load the correct number and then jump to the main routine, which will output the selected string.

In effect, this gives the routine several different entry points: By selecting the proper entry point, you can choose which string will be printed.

Offsets. We have been talking about changing the message starting address as a way of selecting a string. That would work, of course, but it turns out that there's another way: less obvious but actually simpler. Take another look at what the X register is doing. . . .

In line 2 of the assembly language listing, we have the command, LDA STRING,X, an example of *indexed* addressing. STRING is a label, a name that represents a particular address in memory. Each time the processor comes to this step, it does two processes: It adds the current value of the X register to the address STRING, giving a new address; then it reads the value stored at that new address and puts that value into the accumulator.

In other words, the Apple interprets STRING,X as STRING + X. For this reason, the value of the X register is sometimes called an *offset* since it offsets the STRING address by a specified amount.

As you may remember from algebra, there are two ways to change the value of A+B: You can change the value of A, or you can change the value of B. So if we want to change the value of STRING,X we can either change STRING, as previously mentioned, or we can change X by the same amount. The effect on STRING,X will be the same.

Here's an example. Suppose we had stored three messages, "one," "two," and "three," in memory, starting at address 800 (decimal). The section of memory from 800 on would look like this:

```
O N E CR T W O CR T H R E E CR . . .
↑        ↑        ↑
800      804      808
```

CR, of course, stands for the terminating carriage return character. The numbers underneath are the memory addresses of the starting byte of each string.

The beginning of the first message is at STRING,X if STRING=800 and X=0. That's obvious enough. To get to the second message, we could use STRING=804 and X=0 or we could use STRING=800 and X=4. In the same way, the third message begins at STRING,X if STRING=808 and X=0 or if STRING=800 and X=8. Thus we have a choice: We can select a particular string by using the same value of X and different values of STRING or by keeping STRING constant and changing X.

Changing X turns out to be easier—it gives us a header for each string that is only five bytes long (if we had to change STRING instead, the header would take eight bytes—a problem we'll consider later). Thus we'll keep STRING constant at 800 and select different strings by changing X: X=0 gives us the beginning of the string "one," X=4 gives us

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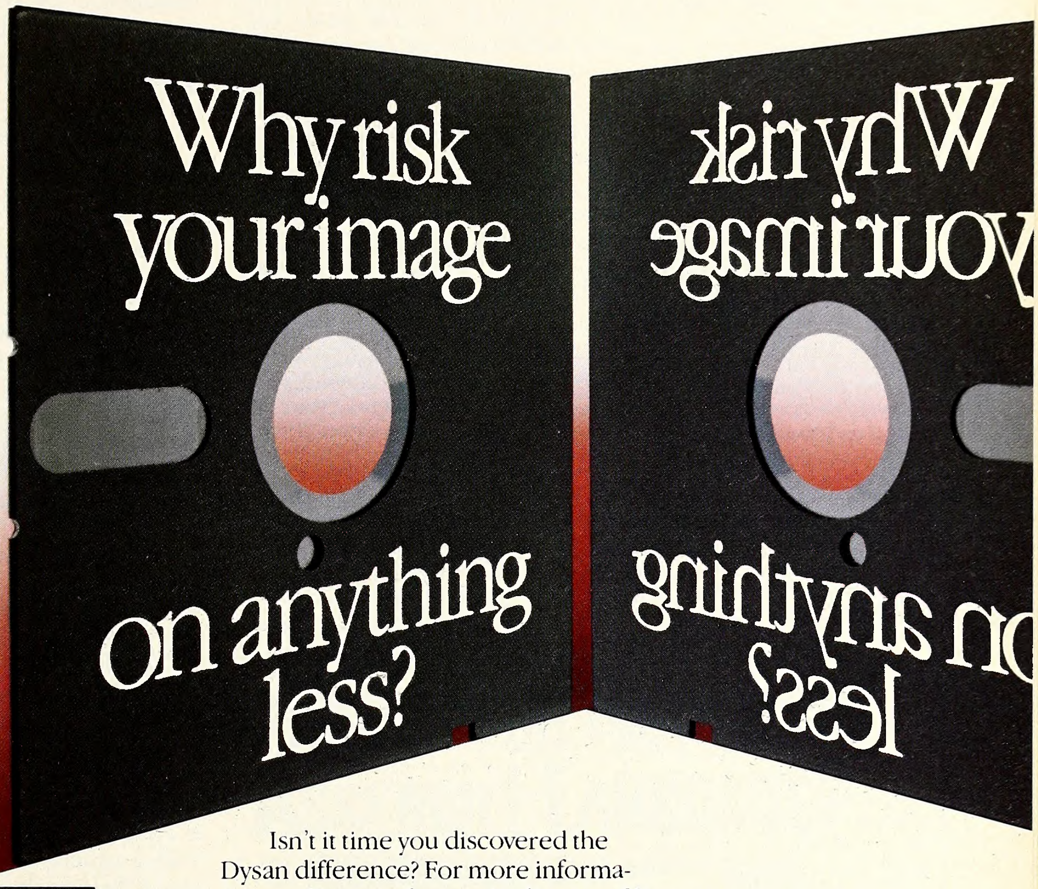

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"two," and X=8 gives us "three."

The headers are very simple. For example, for the message "two" the header is LDX #4: JMP LOOP—in which LOOP is the starting address of the main print-a-string routine, JMP is the assembly language jump command, and the # symbol in front of 4 means "Use the value 4, not the value that is stored at memory address 4."

The Complete Program. Here is the complete program. Of course this is only a model; you probably don't need a program that outputs the words "one," "two," and "three." (With a little extra effort, you can change the strings to anything you might find useful. Just translate your message into ASCII codes—use the chart on page 7 of the *Apple II Reference Manual*—and replace the strings in this example. Don't forget to include a terminating character for each one. Note: You can also use the chart on page 16 of the *Apple IIe Reference Manual*; but you must use the hex values in the chart and add $80 to each value. If your strings are of different lengths than the ones given here, you will have to recalculate the X values given in the headers, but that shouldn't be difficult. You can use more than three strings, of course, but you must include a separate header for each.)

Note that the total number of bytes, counting the routine itself, the headers, and the characters in the strings, must be less than 200 bytes. Otherwise you will overwrite part of memory that is being used by other Apple programs (DOS, for one), which will cause problems.

Using the program is simple enough. After you have entered it or bloaded it it from disk, you can output a string in the middle of a Basic program by inserting the command call *x*, in which *x* represents the starting address of the header for the desired string. In the model, the starting addresses are 770 (decimal) for "one," 775 for "two," and 780 for "three." Since the headers are five bytes long, the call addresses will be five bytes apart, which makes them easier to remember.

Note that the last header in the group—number three, in this case—is not five bytes long. It does not need a jump command, since the program simply falls through to the main loop, without having to jump anywhere. This saves the three bytes necessary for the jump instruction.

Setting It Up. There are several ways of entering an assembly language program into the Apple's memory. The simplest way, of course, is to bload it from disk, but to do that you have to have the program on disk. How do you get it there? Why, first you have to type it in, and then you can bsave it. So what's the easiest way to type it in?

Use an assembler program, if you have one. An assembler program is a kind of editing program, with special features designed to help in writing assembly language programs. With a good assembler, writing assembly language is almost as easy as writing Basic.

You don't have to have an assembler in order to use this program. You can enter the program through the Apple Monitor. This is a program built into the Apple (usually in read-only memory, or ROM), which is designed to aid you in entering and debugging machine language programs. We'll have a whole article on the Monitor one of these days, but in the meantime, here's a brief introduction. You can find more information in the Apple reference manuals starting on page 39 of the Apple II manual or page 87 of the Apple IIe manual.

Using the Monitor, you can enter bytes of machine code in hexadecimal directly into the Apple's memory. The accompanying listing (which was prepared with the *Merlin* assembler program) gives you the machine code; so all you have to do is type it in.

On the left-hand side of the listing, you will find a bunch of funny numbers—actually letters and numbers intermixed, using the numbers 0 through 9 and the letters A through F. These are hexadecimal numbers. The letters are single-digit versions of the numbers ten through fifteen respectively, but that's a story for another day. For now, you don't have to understand them, you just have to copy them accurately.

The first column consists of four-digit numbers: These are memory addresses. After each address, there are two (or maybe three, or sometimes only one) bytes of machine code, shown as two-digit hexadecimal numbers. The first byte after each address is to be stored at that address, with the other bytes (if any) following it in successive memory locations.

Note that the fifth column, which is taller, is not in hexadecimal. Do *not* enter these numbers as part of the code. They're line numbers for the assembler; the Monitor wouldn't know what to do with them.

```
                     1   *********************
                     2   *                   *
                     3   *      STRING       *
                     4   *                   *
                     5   *      OUTPUT       *
                     6   *                   *
                     7   *********************
                     8
                     9           ORG     770
                    10
                    11   COUT    =       $FDED
                    12
0302: A2  00        13   ONE     LDX     #0        ;CALL 770
0304: 4C  0E  03    14           JMP     LOOP
0307: A2  04        15   TWO     LDX     #4        ;CALL 775
0309: 4C  0E  03    16           JMP     LOOP
030C: A2  08        17   THREE   LDX     #8        ;CALL 780
                    18
030E: BD  1D  03    19   LOOP    LDA     STRING
0311: C9  0D        20           CMP     #13
0313: F0  07        21           BEQ     EXIT
0315: 20  ED  FD    22           JSR     COUT
0318: E8            23           INX
0319: 4C  0E  03    24           JMP     LOOP
                    25
031C: 60            26   EXIT    RTS
                    27
031D: CF  CE  C5    28   STRING  ASC     "ONE"
0320: 0D            29           DFB     13
0321: D4  D7  CF    30           ASC     "TWO"
0324: 0D            31           DFB     13
0325: D4  C8  D2
0328: C5  C5        32           ASC     "THREE"
032A: 0D            33           DFB     13
                    34
```

String output routine. The code to the left of the 1 through 34 column is what you type directly into the Apple Monitor if you don't have an assembler. To the right are the same commands as you would type them into an assembler.

In order to enter the code, you must first call up the Monitor program. Type *call −151*. The normal Applesoft prompt will be replaced by an asterisk (*), which is the Monitor prompt. That tells you that the Monitor is now up and running.

Type in the first address shown in the listing, 302 (you needn't type the leading zero), and a colon to tell the Monitor that you want to start entering code at that address. Then type in the bytes of machine code, separated by spaces. After you enter the two bytes on the first line, continue with the second line. Skip the address this time (the Apple already knows where you are) and just type the three bytes of code. Then go to the third line and continue until you have typed in all the bytes. Then press return and the program will be entered.

Your typing should look like this:

```
302:A2 00 4C 0E 03 A2 04 . . . C5 C5 0D
```

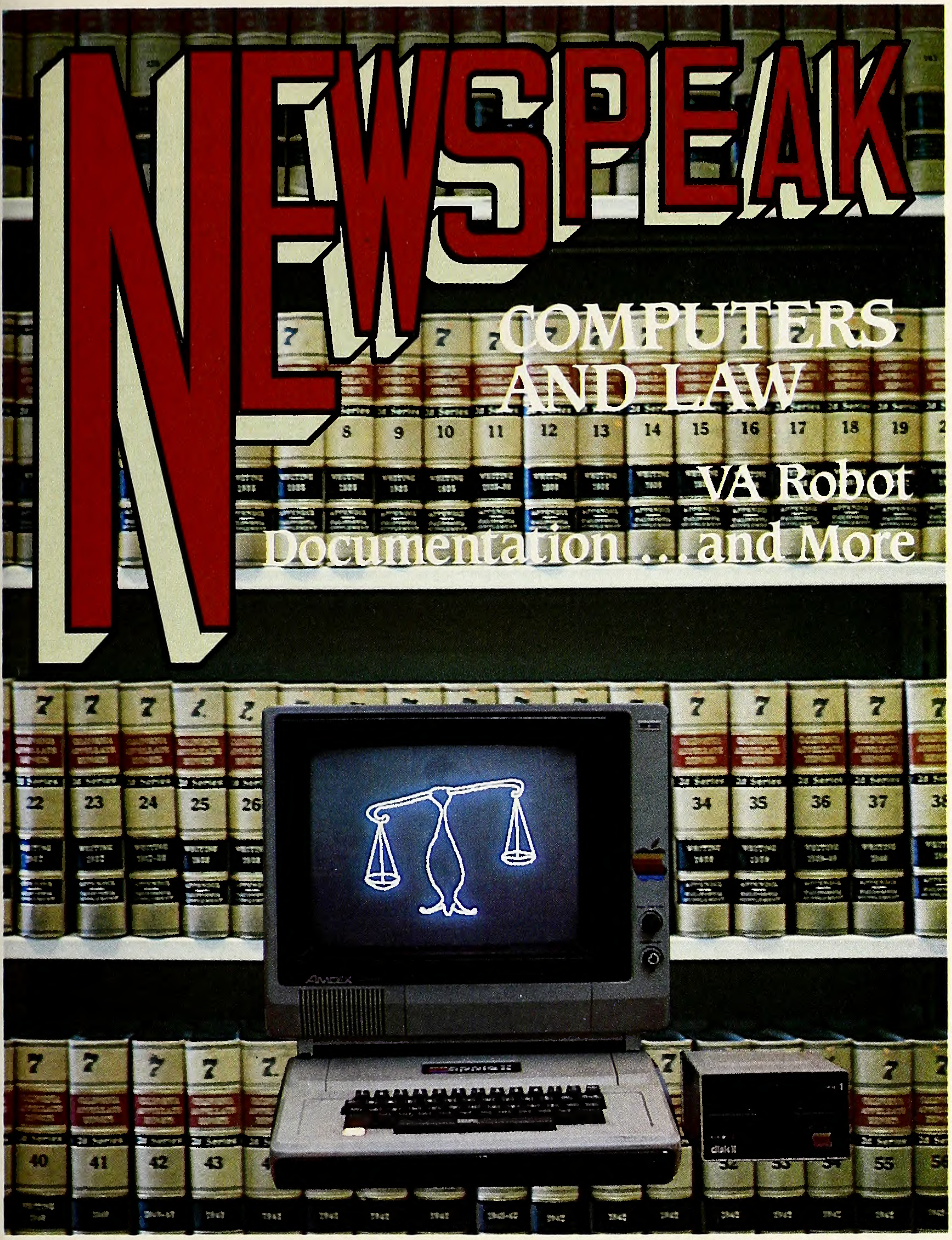
If you need to break off in the middle, type return; when you start up again, begin with a colon (no address is required, if you haven't entered anything else since you broke off) and continue entering bytes as before.

When you have entered the complete program (and typed return after it), you can check your work by typing *302L*. The Monitor will list the program you entered (in a form somewhat simpler than the magazine listing) and you can check its accuracy by comparing the codes.

And that's it. The program is now in the Apple's memory, and you can use it by typing *call 770* from Applesoft to see the first string.

In order to save the program, you will need to know its length. You can either count the bytes, or (if you know how to subtract hexadecimal numbers) use the difference between the address you started at and the address you ended up at (plus one). Or you can simply assume a length of $C8 (hexadecimal for 200). It won't hurt if you save a longer section of memory than you actually used. Then you save the program with *bsave string output, A$302,L$C8*. When you bload it again, it will automatically be put back into the same place in memory.

And that's all there is to it. Now your Apple has yet another way to talk back to you! ⊐■



COMPUTER/LAW CENTER FOCUSES ON MACHINES AND MAGISTRATES

Even more difficult than trying to keep up with the flood of new computer products and technology is trying to make sense of the legal aspects of the Information Age.

One has only to read the daily newspaper to realize how important the law is to the computer industry. Hardly a day passes where there isn't a story about software or hardware copyright infringements, contractual hassles, or good old theft of corporate secrets.

The big question is, what is the law? If a law hasn't been written to handle a specific situation, then what does an individual or company do?

"The law usually trails industry by a generation," says Michael Scott, editor of *The Scott Report* and founder of the Center for Computer/Law in Manhattan Beach, California. "Currently, the courts are totally at sea and the only remedy is to go to Congress and make them clarify what the law is."

As confusing and distressing as the current situation is, some people are working to make it better. Scott is one of these, a sharp individual tackling one of the most challenging and volatile fields in the world today—computers and the law.

The Center for Computer/Law was founded in 1977 by Scott and a number of attorneys and law professors. It's a nonprofit institution focusing on the legal problems of the computer and telecommunications industries, a focal point for research and articles on computer law.

"When we started, six years ago, a lot of the material being published about the subject was dead wrong, even shoddy," says

GOTO page 292, column 2

RETURN OF THE CHIP INDUSTRY

The demand for computer chips has been rising sharply since early this spring, so much so that most chip manufacturers are having trouble meeting the increased demand. The delays in delivering chips to computer manufacturers have been getting longer and longer, and many chip makers are saying that they may have to restrict the amounts their customers can order.

The situation is great for the semiconductor industry—which struggled through two years of recession, closing down production lines and laying off many employees—but not so good for some computer manufacturers. In July, Intel Corporation reported that its second-quarter net income had nearly tripled from a year earlier. Previously struggling National Semiconductor reported that its net income for the fourth quarter ending May 31 was more than double that of last year's fourth quarter.

The rise in demand and the shortage of product is giving the buyers of chips corporate migraines. Already some computer manufacturers are being forced to buy chips at inflated prices, and industry executives expect the situation to get worse before it gets better sometime next year. Industry scuttlebutt has it that Atari is hard put to meet its October 1 release date of the low-priced Atari 600XL because it can't get enough chips for the new machine.

The pressure caused by the chip shortage will be greatest on young computer companies lacking established relationships with chip makers. The shortage will surely muck up some computer manufacturers' holiday season plans.

Semiconductor industry executives say that computer makers alone aren't increasing the demand. The military establishment and the telecommunications, office automation, and automotive industries are also responsible for the increased demand. In the past six months, the market has changed, causing both chip makers and buyers to scramble to solve the problem.

In January of this year, buyers could expect delivery of many chips in a matter of days. Zilog, manufacturer of the Z-80 cpu chip, turned orders around in about fifteen working days. Now the company is warning buyers to expect to wait nine to fourteen weeks for delivery of chips.

Many chips makers are warning their customers to plan ahead, particularly since the practice of allocating chips among buyers may become necessary. All indications point to this happening in the near future. National Semiconductor has already begun allocating cer-

GOTO page 292, column 3

Veterans Administration Customizes an Industrial Robot for the Handicapped

In the last decade, computers have lent their special talents to the handicapped and disabled. Today, robots are beginning to expand those talents even farther.

Some of the most promising work in the field of robotics for the handicapped is being done by the Veterans Administration with the help of scientists and doctoral students at Stanford University.

"In identifying vocational task development needs, we went to C-4 quadriplegics [paralyzed below shoulder level] working in the community and asked them what they most needed to be able to do that they could not," recalls K.G. Englehardt, project evaluation supervisor and clinical director at the V.A. hospital in Palo Alto, California.

"The response was, 'Put a disk in a disk drive' and 'Open a file cabinet drawer, take out a file, and open it.' That was a surprise; those aren't the obvious things that you might suppose a severely disabled person would most need to do."

With those responses in mind, Stanford developed a voice-activated system that utilizes a modified Puma 250 industrial robot arm connected to a Zilog 80 computer, a Votrax voice synthesizer, and a Voterm voice-recognition device. Stanford associate professor of mechanical engineering Larry Leiffer, who worked on the design of the system, calls it a departure from the usual approach to high-tech aid for the handicapped in that the robot is not a replacement of a body part but a companion to the user, operated at a distance.

Currently, the robot arm can perform multiple tasks that are part of daily living, but the engineers still have to work on getting the robot to put a disk in a disk drive.

"At this stage, it's still not a turnkey system," says Englehardt, "though we're working to make it as accessible as possible, so that, ideally, a quadriplegic could just wheel up to it and get started right away."

After a year of intense interdisciplinary work, the research team has been able to reduce to about forty-five minutes the user training time necessary to instruct the robot in a simple action, such as getting a glass of water. Cooking (putting a prepackaged meal in an oven) and certain vocational tasks are currently within the robot's abilities, as are various recreations: The robot can wield a paintbrush and play board games, executing moves at the user's command. But the more complex tasks still take up to ten hours of training.

Operating the robot is more analogous to flying a spaceship than to driving a car, explains Englehardt. "You have forward, back, up, down, left, right, roll, pitch, and yaw. The manual is currently 190 pages in length."

Englehardt says the robot can now recognize fifty-eight spoken words, and the accuracy of the recognition has improved from 84 or 85 percent at the time the project started to about 95 percent.

Currently in a home with four quadriplegics, the robot arm will next go to a long-term-care facility for "task design," in which quadriplegics and attendants will identify applications and help design tasks for the robot to perform.

In the future, the Stanford team plans to add other senses besides hearing to the robot. A mobile base is under development, though it cannot be voice-controlled as yet and has not been a part of the V.A. clinical evaluation.

And when will the current system or one like it be generally available to institutions and individuals?

"It depends entirely on how much money the Veterans Administration is willing to put into it," says Englehardt. "We have spent $72,000 on the system. Interestingly, some of the parts can be purchased now for less than they cost us originally.

"The technology is here. We estimate that in five to ten years a system of this sort could be sold for the price of a medium-sized automobile—again, depending on the level of funding."

AC

NTT Announces Creation of Advanced Chip

Nippon Telegraph & Telephone Corporation (NTT)—Japan's AT&T—opened its fourth major laboratory less than two months ago. A week after the lab opened, NTT coincidentally announced that it had succeeded in making a 1,000-bit memory chip on which 10,000 Josephson Junctions are integrated.

The race between U.S. and Japanese computer firms to build a fifth-generation computer is in full swing, and NTT's announcement came as a mild surprise. No other company had announced the integration of Josephson Junctions onto memory chips at that time.

Essentially, a Josephson Junction is a bridge between two superconductors that allows current to pass from one superconductor to the other even when there is no voltage difference between the two.

Superconductors are certain metals that have virtually no electrical resistance when kept at an extremely cold temperature (never higher than minus 422 degrees) and can sustain an electrical current indefinitely. At room temperature, an electrical current flows only when there is a voltage difference, just as water flows through a garden hose connecting two pools only if one pool is higher than the other.

Josephson Junctions use a magnetic field to control the flow of current across the bridge connecting the superconductors. The current can be switched on or off in one hundred billionths of a second. A computer made with Josephson Junctions could be twenty times faster than one made with today's best semiconductor technology.

Josephson Junctions also require considerably less power and generate much less heat than semiconductors. Because of the latter attribute, computer components could be packed closer together without risking damage to the machine's reliability. A machine based on Josephson Junctions with the same power as an IBM mainframe might fit into a cube measuring six inches on a side.

NTT's new $99.1-million laboratory, located in the Tokyo suburb of Atsugi, was built to accelerate NTT's research into VLSIs—

GOTO page 291, column 1

Making pinball games used to be hard work. Now it's fun.

Shape obstacles in your game using the video tools.

Build it.

With Bill Budge's Pinball Construction Set you can easily build video pinball games of your own design. Using the set of video tools provided, put bumpers, flippers, and other pinball pieces wherever you like. You can execute all your ideas easily and instantly—Pinball Construction Set has a user-interface which until recently has been available only in expensive systems like Apple's LISA®. When you use Pinball Construction Set, you'll feel like you're building with your own hands.

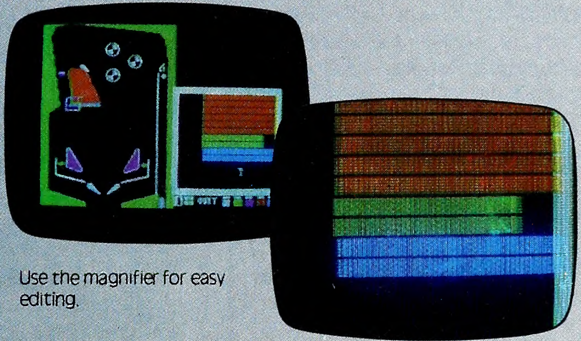
Play it.

Play as you build. You don't have to wait until it's finished. Start playing your game at any stage of construction.

Perfect it.

After you've tested your game, make any changes quickly and easily. Add all the finishing touches.

With the magnifier, create hi-res designs in color. Use the wiring kit to establish the scoring rules and sound effects. You can even tailor the physical characteristics of your game by increasing or decreasing the effects of gravity, bounce and elasticity on the play of the ball.



Use the magnifier for easy editing.

When you've built the game to end all games, save it on a disk. Give it to your friends or join the ranks of those who are actually selling games they made using Pinball Construction Set. One thing's for sure—you're in for countless hours of fun building with Pinball Construction Set by Bill Budge. Available for the Apple II® at your local software retailer. Suggested retail price: $39.95

The video pinball program that plays like a construction set.

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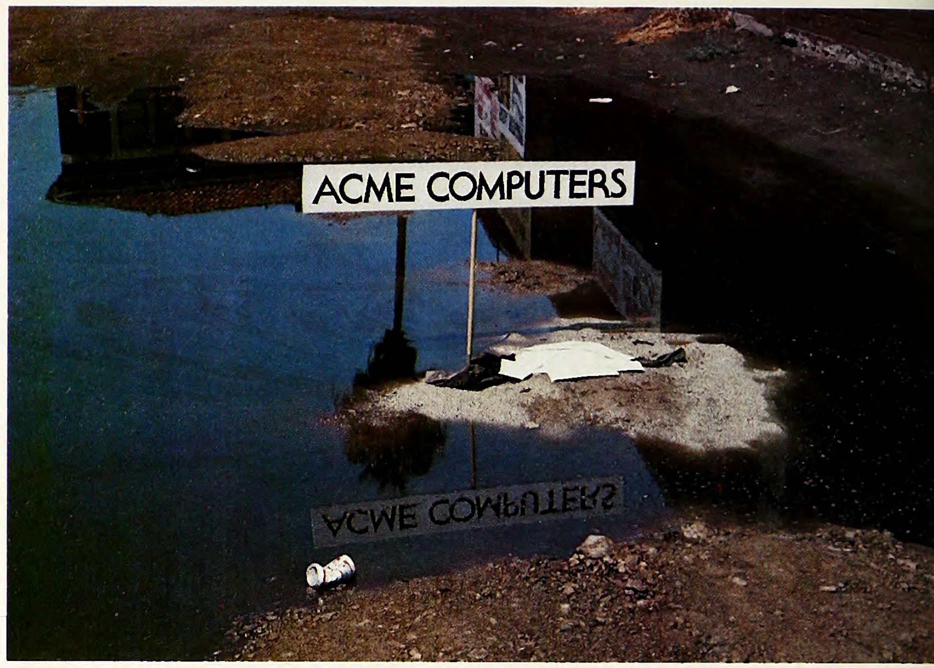


Computer Profile Puts a Halt To Fictitious-Employer Scam

Criminals, by nature, are an inventive breed. And, in order to combat all the various forms of criminal activity, law enforcers must also be inventive.

A few years ago in California, a certain kind of white-collar crime went virtually undetected until the damage had been done and, in some cases, the criminal had fled the coop. The crime involves setting up a phony business, hiring fictitious employees, paying unemployment-insurance taxes for the nonexistent employees, laying off the fictitious employees, and then collecting the bogus employees' jobless-benefit payments.

Known as the "fictitious-employer scheme," this kind of white-collar scam can be very lucrative—one New York man created twenty-eight phony corporations with 168 fictitious employees and hauled in $600,000 before he was apprehended.

Nowadays, with the help of a fictitious-employer profile and a special computer program, investigators at California's Employment Development Department are not only detecting every case of the fictitious-employer scheme but are detecting such schemes faster, before the phony employer has stolen more than a few thousand dollars.

Former LAPD detective Robert Keel, now chief investigator for California's EDD, developed the fictitious-employer profile in 1978. When Keel started at the EDD in 1976, he says there was only a "hand tally" system for keeping track of employers and the payment of unemployment-insurance benefits, and no one knew how much the state was being ripped off.

The fictitious-employer profile and its attendant computer program were developed through funds provided by the Department of Labor, which requires that states have some form of detection for this kind of fraud. Basically, the system compares wage data submitted by employers and unemployment-insurance claims data with a profile constructed from data of all the different ways people have perpetrated this kind of white-collar fraud.

Keel and his staff use terminals to tap into the state's Health and Welfare Data Center, which has all the current employer and employee data. They examine the employer entities that apply for unemployment-insurance benefits and determine if the companies are valid, even to the point of occasional field checking. "We'll check out the address," says Keel, "and make sure it isn't a vacant lot."

California's EDD has had such success with the system that about thirty other states are setting up similar programs. "We've proven that we've saved a lot of money," says Keel. "There are not a horrendous amount of fictitious-employer frauds, four or five cases a year, but each one has the potential for costing the state a hell of a lot of money."

An ironic twist to the whole story, says Keel, is what happens now after a fraud case is detected and the criminal apprehended. Detecting a phony business is one thing, but the state will not prosecute until the fictitious employer has actually collected the phony-employee benefits.

"In the old days," says Keel, "when these kinds of criminals were making off with amounts like $80,000, the state prosecutor would jump all over the case. Now, when we catch them after only a few thousand dollars has been stolen, the cases are low on the prosecutor's list of priorities." DH

Documentation Etc.

Washington State Firm Aims To Improve Documentation Writing

For years now, it's been fashionable to complain about the poor quality of user manuals, in-house training materials, and other technical documentation. This past January, Science Information Associates, a three-year-old firm based in Federal Way, Washington, began to address the issue with a more constructive attitude. The six-person company initiated publication of *Documentation Etc.*, a bimonthly newsletter directed toward high-tech professionals with an interest in improving the quality and efficacy of their written communications.

The Science Information Associates staff includes technical writers, a technical consultant, a copywriter, an art director, and a graphics artist. In addition to publishing *Documentation Etc.*, the group conducts seminars and does consulting, writing, editing, and production work for high-tech firms.

Before forming Science Information Associates in July 1980, company founder Nichole Vick worked as a technical writer, public information specialist, and publications manager for various scientific publications. Fascinated by technology, Vick is convinced that it is possible—and essential—for people to communicate clearly about hardware, software, and other computer-related matters. The firm's vice president is Vick's husband, Ray Styles, whose previous experience involved the programming and design of computer applications software and operating systems.

In the course of their professional lives, both Vick and Styles have read volumes upon volumes of technical material, the majority of it disappointing. At first, says Vick, the idea of doing documentation writing was exciting to her, but after reading much of it she had the impression that "people must not really want it to be good; their work violated all the principles of good technical writing."

After thinking things over, she came to the conclusion that the poor quality of the materials they'd read had more to do with the fact that the people involved really didn't know how to create good documentation. She also realized that most organizations give documentation very low priority. Budget constraints, tight schedules, and historical precedent all contribute to the notion that documentation is less than essential, "frosting on the cake." As Ray Styles puts it, "When you're fighting fires, you want to get the program running; you'll worry about explaining it later."

Vick and Styles see this attitude as shortsighted. Companies that don't create useful, easily understood documentation for their in-house systems and their end-user products cost themselves time and money down the road because they are constantly getting questions from users who can't find the answer in the manual. In addition, companies forfeit the advantages that clear, organized thinking and communicating would give them in their daily work.

Documentation Etc. is one significant way Science Information Associates is attempting to change people's attitudes about the importance of good documentation. Each issue of the newsletter focuses on a specific documentation or marketing-related concern. The January/February topic was user manual design, and readers received a useful, thoughtfully illustrated introduction to the principles of graphic design. March/April's installment explored the idea of using documentation as a project management tool. In May/June, the subject was user manuals once again, but this time the emphasis was on content—what makes a good manual and how do you go about creating one? The July/August edition focused on the development of internal documentation standards. Each issue also features a question-and-answer section.

Communicating about communicating isn't easy. The people at Science Information Associates just make it look that way. JV

NTT

continued from page 288

especially those employing Josephson Junctions and gallium arsenide. Using two IBM 3081-K mainframes and a Fujitsu mainframe, the lab is testimony to NTT's commitment to keep up with, if not outpace, American research. Prior to 1981, when a U.S.-Japan government procurement agreement went into effect, NTT had never used a large foreign-made computer in its research.

On this side of the Pacific, American firms are not worried much by NTT's announcement of the Josephson Junction integrated chip. It's well known around the industry that IBM is probably the world leader in Josephson Junction research; it's also well known that IBM doesn't talk much about its ongoing research. Even NTT concedes that IBM has more accumulated knowledge of the advanced technology, though no one outside of Big Blue knows how far that company has progressed.

Another NTT competitor, AT&T, is also working on Josephson Junctions through its research arm, Bell Laboratories. DH

Computer/Law

continued from page 287

Scott.

The main publication of the center is the *Computer/Law Journal*, a quarterly that addresses subjects like contracting, software protection, and international law. The center also does consulting for corporations and government entities, producing papers on particular legal aspects of the computer industry, as well as publishing a series of monographs and books, such as the *Computer Law Bibliography*. The Center for Computer/Law draws upon the expertise of a network of lawyers, law professors, and other individuals for its consulting and publishing activities.

Scott says that the *Computer/Law Journal* is meant to give the center's members a "snapshot of what's going on out there. Rather than just reacting to problems as they come up, companies are trying to forestall the problems, basing their actions on legal precedents."

Members of the center use what Scott says is "the largest collection of published materials on computer law, outside of the Library of Congress." In the last three years, the center has collected close to twelve hundred volumes of books and publications from all over the world. One of its all-volunteer staff members spends a third of his time tracking down material for the library.

The center is currently working on several special projects. The first is an information sourcebook, which will be a watershed of information for those working in the areas of computer and communication law. It will include a bibliography of periodicals, a listing of organizations, a listing of all relevant state and federal agencies, legislative committees and other government organizations, and a biographical listing of important persons in these fields from around the world.

The center is also working on a legislative compendium—a compilation of all state and federal laws and regulations in the areas of computers, communications, and information regulation—as well as an on-line database of all books, monographs, and articles written in the areas of computer and communication law.

Individuals or institutions can become members of the center for a reasonable fee that includes a year's worth of the *Computer/Law Journal* and a 20 percent discount on all books and monographs published by the center.

Sharing the same building with the Center for Computer/Law is the Law & Technology Press, a commercial company that Scott also founded. Currently, the Press publishes two monthly journals/newsletters, *The Scott Report* and *Software Protection.*

Both *The Scott Report* and *Software Protection* are more timely than the *Computer/Law Journal.* Both journals offer in-depth analysis of new cases and can be very up to date, reporting on cases only weeks old.

Scott sees interesting developments in the future regarding contracting and piracy, but these are minutia compared to some of the potential legal developments as computers become a major force in our lives. He sees a possible clash forming between those who have knowledge and access to computers and those who do not.

"There could be a class distinction between those who are computer-literate and those who are computer-illiterate, with the latter demanding equal access to the technology. For instance, suppose an American bank does an economic analysis of a South American country and then refuses to let the country see the results? The country is going to demand equal access to information on themselves."

Scott sees inequality arising from those who have the power of the computer denying it to those who do not. "Those who do not have the technology will realize they are at a disadvantage and will start demanding their computer rights, like people now demand their civil rights."

The growing trend toward personal computers could be the "battleground" where some of these concerns are resolved, according to Scott.

One scenario would have the computer industry coming under government regulation so that those who can afford the technology would subsidize those who can't.

"In the long run, the computer industry could be made into a public utility. Take the phone company. There might be a backlash once people realize what deregulation means. They may want the government to step in again.

"The concept of computers as a utility is not new. An interesting book was written on the subject in the early seventies. It's an argument that's coming back into vogue, to regulate the industry for the best public interest. Maybe we're smarter than that now." DH

Chip Industry

continued from page 287

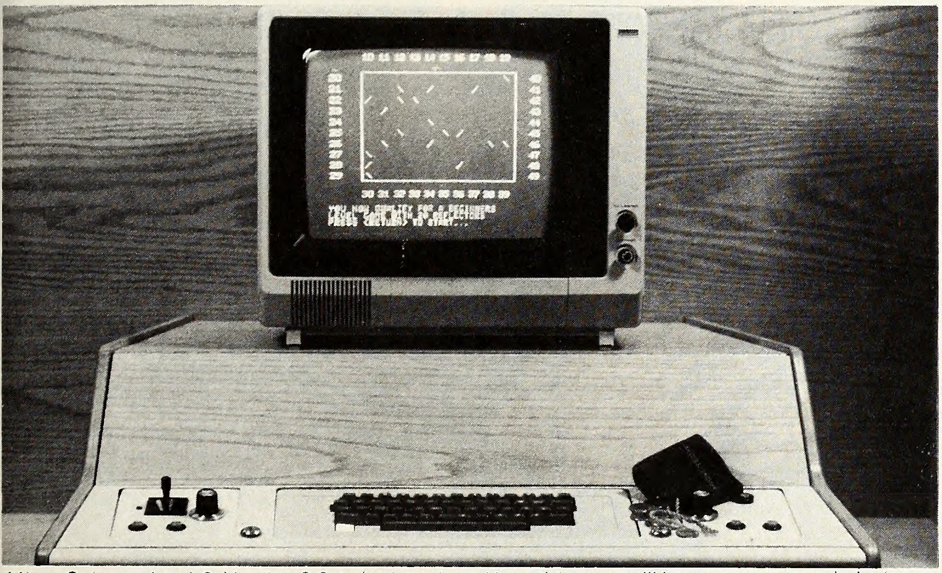
tain chips to distributors and may soon begin rationing those products it sells directly to manufacturers.

Chip distributors who hold supplies of particular products are benefiting from the shortage, and some profiteering distributors are raising the prices of chips as high as the market will bear.

As semiconductor companies return to full operation, most industry experts are predicting the current shortage of chips to continue into next year. DH

NEWSBITS

☐ **Coin-Hungry Apples.** High-Tech Entertainment (Muncie, Indiana) has created a coin-operated network called Micro Coin for entertainment, educational, and business uses. Several Apples are tied together via a custom network and allow users to access hundreds of programs stored on a hard disk. Users come into a Micro Coin facility and buy time through a standard coin slot. Different applications run at different rates and the company offers discount rates for different times of the day or days of the week. High-Tech Entertainment is currently redesigning some aspects of the system and plans to begin marketing the system to amusement operators by the end of this year. Within eighteen months, the firm will make the system available to schools, public libraries, and software merchandisers, according to High-Tech Entertainment's president Samuel M. Roberts.



Micro Coin version 1.0. Version 2.0, to be introduced later this year, will have a new network design, a new cabinet design, and will offer more computing power.

☐ **Attention, Controllers.** The Ninth Annual Advanced Control Conference will be held September 19–21 at Purdue University in West Lafayette, Indiana. This year's conference is entitled "Learning Systems and Pattern Recognition in Industrial Control." Conference subjects include speech recognition, intelligent vision systems, robotics, and artificial intelligence.

☐ **Heroic Accessories.** Perbotics (Huntington Beach, California) has announced several accessories for Heath's Hero-I robot. A 44K programmable memory board expands Hero-I's on-board memory to 48K and includes an RS-232C port. Also available are an 8K memory board and a cassette tape providing load and dump routines that work through the RS-232C port.

☐ **Computers and Psychology.** Joseph D. Matarazzo, in an editorial published in the July 22 issue of *Science*, addressed the growing use of computers for psychological testing, warning that there is "a danger that wholesale use of automated tests by people without a knowledge of their limitations will be a disservice to the public." Matarazzo stresses that the results of computerized psychological tests still must be scientifically appraised. Even when carried out by experts, the interpretation of such tests is not an objective activity. He concludes, rather gloomily, "My experience as an expert witness leaves me in no doubt that a flood of litigation involving unqualified users of the products of this new technology is just around the corner."

☐ **To Service Computers.** Computer manufacturers frequently spend a lot of money sending overqualified personnel on service assignments when the problem with a customer's machine may be only that it needs a simple part replaced. Air Couriers International, a Phoenix-based air courier service, has inaugurated a nontechnical field support service designed to save both computer manufacturers and customers time and money. When a computer breaks down and the manufacturer can diagnose the problem by phone, Air Courier picks up the needed part and sends it on the next available plane to the customer. When the part arrives at its destination, another Air Courier employee delivers the part to the customer, along with an enclosed diagram showing how to remove the defective part and replace it with a new one. The old part is then shipped back to the manufacturer.

NEWSPEAK STAFF

Editor David Hunter
Contributors Andrew Christie and Jean Varven

DRAGON, DRAGON, BURNING BRIGHT

by Lisa Michaels Jones

His favorite computer magazine was waiting for him in his mail when Dave arrived home (late again) that Tuesday. *Thank God*, he thought to himself. *At least I can salvage something from this day*. But he didn't allow himself the luxury of reading it from cover to cover yet. He walked into the kitchen area, plopping the mail in a heap on the breakfast bar, and opened the refrigerator, not really hoping for much. There was some fresh corn, bought from the old man who had a small orchard down the street, half a gallon of milk, three beers, and some celery that had seen better days. Not much to go on. He sighed and decided he wasn't hungry. Tiglath—who had followed him in—was, so he opened a can of Furry Friends Feline Food for him.

"So where's Jenny?" he asked Tiglath. "Asleep again?" Tiglath, his mouth full, didn't answer. Dave shrugged. She probably was. Jenny, a delicately boned black-and-white cat, was a refugee from the pound; Tiglath was a legacy from John, a friend who had taken a job in Britain and didn't want to subject his cat to long quarantines and a generally unpleasant lifestyle. Tiglath was orange—John had always said he imagined the Assyrian kings of that name to be fond of orange. But John was a little strange anyway. Dave took a beer and went to savor his magazine.

A half hour later he had made it to the classifieds and had been captivated. An ad promised "a new computer adventure game that will make others seem lifeless by comparison," and the company, The Happy Dragon, was just over the hill in Santa Ilusivo. The game was only twenty dollars; so, even if it didn't live up to its promise, at least he wouldn't have lost much. A drive to Santa Ilusivo would be a welcome break. His BMW hadn't had much exercise lately besides driving to and from work. He called the store, only to reach an answering machine stating hours. They closed early on weekdays, so he wouldn't be able to go until the weekend.

"Damn," Dave swore quietly. Lately life had not been working for him, and to have to wait until the weekend for even this small promise of escape seemed too much. He was young; he had the job he'd always wanted and was paid well for it; he even owned his own house. But he felt flat, empty. What had gone from his life? He didn't know, and, too tired to think about it, he went to bed.

The rest of the week dragged. Work, which had once been exciting, was now a burden. An added frustration was that Dave didn't like to wait for anything once he'd made up his mind. With his salary, he usually didn't have to, either. He'd bought his house on Union Avenue the day he'd first seen it—and he'd never regretted the decision. It was an older home, one well cared for, on a relatively untraveled street within walking distance of a fancy shopping center, and not a bad commute to Cordova either. Even during the worst of rush-hour traffic he could be at work within twenty minutes. It used to take him almost an hour from San Ardo. Bonita Springs would have been closer, but he hadn't liked any of the houses for sale there. Besides, it pleased him to live near one of the last remaining orchards in the entire valley—even the farms and orchards of Morgan were becoming subdivisions and condos. Granted, it was a small orchard, but Bob, the man who owned it, had character. Bob always slipped extra ears of corn or a few more apples or cherries into the bags of his favorite customers, and he always had something funny to say about the neighborhood events. Goings-on, he called them.

Saturday Dave set off a little later than he had planned, but the day was overcast and so the beach traffic was light. He made it to Santa Ilusivo in good time, arriving as the sun was beginning to burn off the clouds. He followed the familiar route—down Ocean, right on Water, then over the bridge and left into the Cooper House area. He found The Happy Dragon between a potter's shop and a health food store. In the window was a display of fantasy gaming miniatures, all splendidly painted. They were arranged in a tableau with an intricately wrought golden dragon, about eighteen inches long, as the central piece. Dave caught his breath at the workmanship that had gone into the dragon's making. Its eyes were especially striking—the wicked, knowing look in them made Dave laugh. They seemed to be tiny chips of some gem—garnet? Ruby? Dave couldn't tell, but they went perfectly with the glowing gold of the dragon's skin. The dragon was so detailed that Dave could make out individual scales and see where the claws joined the toes; he could even see a faint tracery of what must have been veins in the leathery spines on its back. Such a work couldn't be for sale, but Dave would at least ask. He pushed open the dark-glassed door and entered the store.

Inside, though it was dim, he could see the more usual fantasy gaming paraphernalia—unpainted miniatures, books, magazines devoted to the subject, posters, games. A small glass counter guarded oak wall cupboards and a door to the back. No one was in sight. He walked to the counter. A grubby guest book with a hand-lettered cover ("Sign-ups for Games—See Evdna First"), a handbell with the crude representation of a bull's head, and another sign ("Ring for Service—At Your Own Risk!") were the only things there. Not even a cash register, just an abacus. He smiled, not very amused, at the bull, picked it up, and rang it—hard. Immediately the back door opened and a slender redheaded woman came out, shutting the door quickly behind her. But Dave would have sworn he had heard the sounds of a full-blown party come out with her. No door could be so thick as to block out completely the sounds of a party that big.

"How may I help you?" the redhead asked. She eyed him speculatively. "You're new here. Do you belong to the Society?"

"Not really. I live over the hill, in Winchester. But yes, this is my first time in this shop. What society?"

She lost interest immediately. "Oh, just a small gaming group we have. What do you need?"

"I'd like to buy the computer adventure game you advertised."

"Oh. Yes. We have it available in several levels of experience. Do you ever play fantasy games?"

"Yes, about twice a month."

"How many years have you been playing?"

"Since I was twelve—ten years. I used to play more when I was a kid."

She thought a moment, then nodded. "You're probably a third level—there are seven in all." She unlocked the back of the counter and pulled out a plastic envelope with one disk in it. "It can be backed up once. If you try to make more, the original will destroy itself." She flicked the beads on the abacus. "That'll be twenty-one twenty, with tax."

"Wait," Dave said. "I was wondering about the dragon in your window. Is it for sale?"

The redhead's interest sharpened. "What color was it?"

Dave was always courteous and willing to allow for possibilities he might be unaware of. There was only one dragon in the window, but maybe someone had recently changed the display and she didn't know that. "Gold, with red eyes."

"Gold?" she demanded. "Are you sure it was gold? Not orange?"

Dave replied patiently, certain he was dealing with a burn-out. "Yes, gold. Very gold. Beautifully gold."

His forbearance was showing. She gave him a sharp look, then said, "No, it isn't for sale, as you might guess by the workmanship. But would you excuse me a moment?"

He could only nod and say, "Sure." She vanished into the back room, and this time he knew he heard loud male voices chanting an ear-burningly baudy song. But as soon as the door closed behind her all was silence again. It didn't take her long. She returned with a man robed in deep royal blue, as though for a role as wizard, and Dave began to want very intensely to see the other side of that door.

"So, young man, you like the gold dragon," he said. He whispered, not quite low enough, to the redhead, "You did say he saw *gold*, didn't you, dear?"

"Yes, Evdna," she answered directly.

Dave's courtesy held, much as he disliked his word being questioned. "Yes. I think it's beautiful. Who made it? Is it definitely not for sale? I can make a good offer."

The older man, who seemed quite comfortable in his magician's robes, nodded. "Yes, yes, that dragon is a work of art. But it is definitely not for sale. However, we have some work by the same artist. It isn't as large, but I feel it may appeal to you as much." He fished around in a seemingly bottomless pocket awhile, finally pulling out a small key, then he turned and unlocked one of the oak cabinets on the wall. Inside, gold, silver, and glass figures gleamed briefly. Evdna pulled out a small brown velvet box. In it nestled a ring, a copy of the golden dragon—or so Dave thought until he examined it more closely. This one was also golden, with red eyes, but seemed to have an entirely different expression on its face. It was—*friendly* was the best word for it. Dave smiled to himself at the thought of a friendly dragon. The workmanship was as impressive as that of the larger dragon—or even more so, considering the much smaller size. Dave knew he had to have it.

"How much?"

Evdna smiled at his eagerness. "Twenty-five dollars. And yes, it's real gold—twenty-four-karat. We have an inexpensive source," he added, as if knowing Dave's next question. "And," he continued, smoothly taking the packaged disk out of Dave's hand, "I think you might be happier with our level-seven game. It is much better suited to you. There is no extra charge."

Dave was astounded at the low price. As he wrote a check for the ring and the disk, Evdna turned to leave. Apparently as an afterthought, he turned back.

"Oh, by the bye. Do you have any pets?"

"Yes. Two cats," Dave said, looking up from his checkbook.

"Good. Take them with you when you adventure in our game." He smiled enigmatically and left. This time no bar noises could be heard when the door opened, but cool air, smelling of the night, drifted out, carrying with it the chirping of crickets.

"What did he mean?" Dave asked the redhead, handing her the check.

"You'll see when you read the instructions for creating characters," she said. This seemed all she was going to say, but then she added, "If anything—unusual—happens in the game, please come see us. We'll be glad to discuss any—difficulties—in the office in the back." She waved her hand in the general direction of the back door. "And we'll make amends if you so desire." She smiled. "But I don't think you'll have any problems." She stressed the last word oddly. Her smile was promising, too—quite a turnaround from the bored reception he had first been given.

"Thank you," Dave said, determined to make up a problem just to get behind that door. "I'll be sure to let you know." She nodded, and he left.

Once in his car, he carefully pulled away the tissue paper the redhead had wrapped around the ring. In the sun the dragon sparkled, almost alive in its sinuous beauty. Dave smiled at it. "Friendly dragon, you're mine." The sun gleamed off the tiny eyes. On impulse, Dave slipped the ring on his finger, then frowned. He hadn't actually thought of size yet, after a trace of initial looseness, the dragon seemed almost to snuggle around his finger, and a warmth, so faint he wasn't sure it was there, spread from the ring. It gave him a feeling of security, like that of having a trusted friend. He started the car, grinning.

Crossing the bridge again, Dave noticed that the road seemed to shimmer as though a thousand thousand tiny diamonds had been scattered over the surface. He blinked, and the impression was gone. Maybe it was a new kind of bridge surface, he thought, that he just hadn't noticed before. After all, it had been overcast when he'd driven in. His eyes traced the delicate shape of the dragon on his hand, and he smiled. Then again, maybe not. He was no fool, and he was certainly open-minded. He could hardly wait to play the game.

When he arrived home both Jenny and Tiglath greeted him at the door with interest in their eyes and stropped against his legs, making small sounds of welcome. He laughed; then, anxious, he sat down at the computer and tore open the plastic surrounding his new game. Both cats jumped into his lap, purring, and he absent-mindedly stroked them as he skimmed the first part of the instructions. How to boot the disk, how to make a backup—standard stuff. The "How To Play" section was of more interest.

> *Character Creation: The First Step.* The first character you should create is one with your own name. This is extremely important to proper functioning of the game.

Dave snorted. How would the game know?

> You will be asked to input data that you feel best characterizes your personal and physical traits.
>
> At the right time, if you have any animal friends, you will be asked to enter them. This is also extremely important, but only if your animals like you. If you have a dog, for example, who is not fond of you, do not enter it in the game. We cannot emphasize how vital this is to your well-being. This is an extraordinarily realistic game, and you'll need all the friends you can take. Any talismans you own should be taken with you also.
>
> The game is arranged in levels of difficulty. The first level's object is to simply make it to the Inn—what Inn, and where it is, are questions you must answer while playing the game. After you have achieved this first objective, you will be informed concerning the objectives of the next levels. If you never finish the first level, well, too bad, and better luck in your next life.
>
> Actually, you will have many opportunities to try to reach the Inn—this is an equal-opportunity game and does not discriminate against dimwits.
>
> We must warn you again of the realism of this game. The graphics are of a quality never before seen on a computer screen. You may actually feel you are *in* the game itself. Don't panic. Should you decide you have had enough play for one day, the appropriate ending procedure will be apparent. Should you die, you will automatically leave the game. In this event, we recommend you rest awhile before playing again.
>
> *A Word about Commands:* Any English word or sentence will be understood, and knowledge of other languages won't hurt.
>
> Now boot up and enjoy your adventure.

Dave pulled out the disk, somewhat crestfallen. He had expected to be able to create an alter ego, another him, capable of some things that he wasn't. But then, many of the finest text adventures were basically just the interaction between the player's native wits and those of the programmers of the game. He answered the prompts on the screen as best he could, adding Tiglath and Jenny when the time came. He almost answered the question "Talismans?" with a negative, until he remembered the golden dragon around his finger. He listed it.

Finally he was ready to play. The screen came up with a forest, all in green (someday he'd get around to buying a color monitor), with text below. Dave experienced a sharp sense of disappointment. The graphics were only so-so; certainly nothing he hadn't seen before. The text wasn't even very original. "You are among many trees. Before and behind you is a path. With you are two cats. You are wearing a golden dragon. You see nothing special." Nothing special—that was for sure! Resignedly he typed in, "Walk south."

The graphics shifted and Dave's interest renewed. He had never seen such smooth animation. It was as though he were walking down the path, with the perspective changing exactly as he'd expect. He even thought he heard a faint rustling, as of leaves, and a crunching of feet on gravel. Maybe this game had promise after all. But wait. Shouldn't the motion end? "Stop," he typed in experimentally. The picture halted, and the same text came up again, adding, "You hear a small stream." Which he did. Also, there was a definite wind blowing; it sounded so realistic that he imagined he felt it in his hair.

"Find stream," he typed.

The trees shifted, then pulled apart to reveal a broad, quiet-running stream. He could see one branch in front of him—the graphics were so good he bet he could identify genus and species. It looked like a cherry tree. Now what? he wondered. He decided to test the claim that the game would accept any English word or sentence.

"Now what?"

"What is your objective?" came up on the screen.

"To find the Inn. Where is it?"

"That's for you to find out. Hint: It's over the hill."

A sudden suspicion came into Dave's mind. Over the hill? A cherry orchard? Could a game do that?

"Turn around," he typed.

The picture on the screen swerved, and he was facing back the way he'd come. What he saw made his heart thump once very hard. It was an orchard, a small one, in full bloom. In the distance beyond the trees he could see a man bent over what had to be tomato plants. What stunned Dave was that the picture was in full color. He could even see Jenny in miniature, intent on a clump of grass. For several minutes all he could do was stare. Then his brain started to function again. There was no rational way his green monitor could suddenly become a full-color one, and especially not one so beautifully true to life. Therefore he must be dealing with the irrational. Long years of adventure gaming braced him. He took a deep breath, then typed, "Say hello to Bob."

The figure straightened, then started to walk toward him. When it arrived, it spoke. "Hello, Dave. See you've begun to explore the gaps of the rational world." It was Bob, and his voice was very clear. "Anything I can do to help? Don't bother typing your answer—just say it."

The hair on the back of Dave's neck lifted slightly, but he spoke aloud. "Yes, I—um—I guess I'm looking for the Inn."

Bob nodded. "Thought so. Well, I guess you've figured out where you are. There are a few changes. The road here is a stream, for example. I arranged that—good for the trees. But the main thing right now is for you to get rid of the monitor and come all the way over. You can only go so far with it before you have to leg it the rest of the way. But you'll find ways to avoid the walk once you're here—you'll find plenty of ways." He seemed to find that amusing. "I can't help you with that—it's something you have to do on your own. Kind of the first test, y'see. Good luck. And eat that corn before it gets old." At that, Bob walked off, becoming smaller again, and bent over his tomatoes.

Dave watched Bob's retreating back, an old excitement returning. A magical new world had become available, just when life seemed most ordinary. But was it legitimate? Or would he be found, days after, a mindless idiot or dead in front of his computer? Did it matter? Dave smiled. No.

So how was he to get into—or over to, or whatever preposition was applicable—this game world? Probably only took some thinking. Dave leaned back and thought, reaching out to stroke the cats. But, wait—they were gone.

"Jenny?" he called. "Tiglath?" He heard Jenny's answering chirp, but couldn't see her—until he looked at the screen. Sure enough, there she was, giving him a questioning look. Tiglath wasn't in sight. Dave stifled the sudden crazy impulse to go outside and run down the street to see if they were both at the orchard. He suspected they wouldn't be. But then . . . how did Bob manage to be in the game without others missing him? Could someone actually inhabit two worlds at once and operate in them simultaneously? He recalled something a psychic had written once, about how one's reality was all a matter of focus, and how there were thousands of other worlds available. One just needed to tune in to them, like tuning into a different radio station. But how did one do it? Dave closed his eyes again. The cats had done it somehow, and so had Bob; so, apparently, had many others. And so, he determined, would he. He concentrated, trying to guess what it would feel like to tune into a magical world. Imagine, he told himself. A warm glow around his finger began, and he put his other hand to the dragon ring. "Other worlds exist," he whispered, "and you're proof, dragon. Help me!"

It wasn't anything like he'd imagined. Suddenly the world just quietly shifted, and he opened his eyes. His house had changed in subtle ways, but not much. It felt *right*, though. He walked outside, and in place of the road flowed a small stream. He wanted to shout, to laugh, but he felt as though any loud noise would jar him back to a chair in front of a green-screened monitor. He was soon at the orchard. "Hey, Bob," he called.

Bob came over, grinning, and shook his hand. "Did it faster than I thought you would. World must be getting more open-minded. Want your cats? They're over in the pile of hay I keep around for them. Attracts mice." At Dave's look, he laughed. "Oh yes, they come visiting all the time. Cats are good at it. Come on. They're over here."

Dave followed Bob around the house. Tiglath and Jenny were there and looked up alertly—in anticipation, Dave thought—at the two men's arrival. Dave grinned at them.

"How much do they know?" he asked Bob.

"Oh, a lot. Don't underestimate them. Cats are good in a pinch, too. Know all sorts of ways out of a tight corner, and have a lot of friends you might not expect. Good thing you take care of them, or it wouldn't have done you any good at all to bring them along. Might have done you harm, in fact. But I imagine you were warned. They've started to warn people since that incident happened. Remember the guy who got torn up by his pit bull? Never thought anyone would be foolish enough to mistreat an animal, then take it along." Bob shook his head. "Got what he was looking for, that's for sure. Though I can't say even he deserved it. Anyway, you'd best be going." Bob shook Dave's hand again. "Sure glad you made it." He walked off. Dave stared after him a few moments. That unsettled, walking tightrope feeling had vanished while Bob talked, and he felt confident he wouldn't lose focus. Maybe that's why Bob had talked with him. Dave grinned, pleased with himself and the world. He was going to like this "game." He looked down at the cats.

"Come on Jenny, Tiglath. We have an Inn to find." ■

To be continued, if. . . .

Contest Winners

continued from page 6

best limerick didn't receive as many votes as the winning one. It did, however, receive votes from a wider variety of people than those who stuffed the ballot box with friends' and relatives' votes. Whereas limericks four, six, and eleven received the most votes, number ten was clearly the readers' choice.

Limerick ten, by Brian Gaines (Colorado Springs, CO), was the one with all the Infocom references (troll, *in foe com*bat, mark, *Blank*ly, axe). It drew more votes from more varied sources than any other limerick; unfortunately, Gaines isn't as skilled in the art of ballot-box stuffing as were Kantor, Nancy Docken (limerick six), or John Henrick (limerick eleven). Which brings us to our next point—sour grapes.

The voting had barely begun before we received a scathing letter from Henrick, who wanted to complain about the way the contest was being run. Henrick sent in twelve limericks and said later that the one we chose as a finalist wasn't his best. In fact, Henrick felt that at least six of his other entries were better than any of the finalists.

If Henrick's other limericks were really better than the ones we printed in June, that's his opinion, and he's entitled to it. We just hope those limericks didn't include the ones in which Henrick tried to rhyme *quark* with *lark* or *luster* with *Dog Star*.

Henrick also felt that if he had won the contest it wouldn't have been any big deal because of the lack of competition. But that didn't stop him from urging almost everyone in the Seattle and Vancouver areas to send in votes for him. There was even Angela Henrick of Seattle who voted twice! Tsk, tsk.

If this contest proved anything, it proved that voting never proves anything. No more democracy in this section. We don't deserve it.

It really is too bad that a select few have to ruin a good thing for the whole group.

Oh well.

Here are the answers to the final exam.

1. The author of *Super Invader* is M. Hata.

2. According to the program listing, the idea for the *Animals* program comes from: "Who Knows?"

3. Six hundred fifty points is the minimum score required on *Brick Out* to get a rating of "Nearly perfect."

4. a. *Master Create*
   b. *Fid*
   c. *Color Demo* or *Color Demosoft*
   d. *Renumber*
   e. *Exec Demo*
   f. *Little Brick Out* or *Brick Out*.

5a. Christopher Espinosa wrote the *Apple II Reference Manual*.

5b. Allen Watson wrote the *Apple IIe Reference Manual*.

6a. Caryl Richardson wrote the *Applesoft Tutorial*.

6b. Meg Beeler wrote the *Applesoft Tutorial* for the Apple IIe.

7a. Richard Shacklock's 1565 poem found on the inside cover of the *Applesoft Reference Manual*:

If many faultes in this book you fynde,
Yet think not the correctors blynde;
If Argos heere hymselfe had beene
He should perchance not all have seene.

7b. Joe Meyers wrote the *Apple IIe Owner's Manual*.

8. The first Apple was made available to the public on May 10, 1977.

9. a. DOS 3 was introduced on June 29, 1978.
   b. DOS 3.1 was introduced on July 20, 1978.
   c. DOS 3.2 was introduced on February 16, 1979.
   d. DOS 3.2.1 was introduced on July 31, 1979.
   e. DOS 3.3 was introduced on August 25, 1980.

10. *Phone List* was copyrighted April 1, 1979 (program listing).

11. Apple Computer, 770 Welch Road, Palo Alto, CA 94304 (Apple I user guide). Later, the company moved to 20863 Stevens Creek Boulevard, Cupertino, CA 95014. Both answers are correct.

12. Jobs sold his Volkswagen bus. Woz sold his Hewlett-Packard calculator.

13. Homebrew Computer Club is where the Apple was introduced.

14. Regis McKenna and Atari's Nolan Bushnell directed Jobs to Don Valentine, who mentioned Apple to Mike Markkula, who offered \$250,000 of his own money to help finance the company.

15. The three code names for the IIe were Annie, Alice, and Diana.

16. Rocky Clark is the name Steve Wozniak used while finishing his bachelor's degree at the University of California, Berkeley. Rocky is the name of his Siberian Husky; Clark is his wife Candi's maiden name.

17. John Scully, Apple's president, used to be the head man at PepsiCo.

18. Woz and Jobs claimed to be Henry Kissinger when they telephoned and asked to speak to the pope.

19. "A locked door. A dead man. And twelve hours to solve the murder." (Infocom's *Deadline*.)

20. "There are more people doing more things in more places with Apples than with any other computer in the world." (Apple ad.)

21. Dan Bunten, Matthew Alexander, and Bill Budge are all software artists for Electronic Arts.

22. 1,750,000 nanoseconds.

23. 1.70141183 E +38.

24a. 21.5 or 20 inches, depending on your brand of RAM chips.

24b. X8 doesn't belong. It's the only one that's not on the motherboard above where the keyboard plugs in.

25a. F8, F0, E8, E0, D8, D0. This is the order, from left to right, of the Apple's ROMs.

25b. Don't dial these numbers; the people at the other end get mad. On the motherboard, 344-0010 and 344-0020 correspond to the MMU and IOU chips respectively.

26. "Under no circumstances is this case to be opened." On a case of beer? No, you'll find this printed on the Apple's power supply case.

27. Good ol' Amy Doaks is the person who created the sample slave disk in the *DOS Manual* (see chapter on initializing disks).

28. The banana, eagle, goose, hat, and icicle are all sample words used in the *DOS Manual* under the section about creating text files.

29a. The blue horse has orange feet. (*DOS Manual*, graphics section.)

29b. The video monitor doesn't belong. It's the only object that isn't on the cover of the *Apple IIe Owner's Manual*.

30a. *Brian's Theme* was named after the program's author, Brian Howard.

30b. Sue Espinosa wrote the program, *Bargle*, found on the Apple Presents . . . Apple disk. *Bargle*, when run, prints the words, "Bargle, bargle, bargle."

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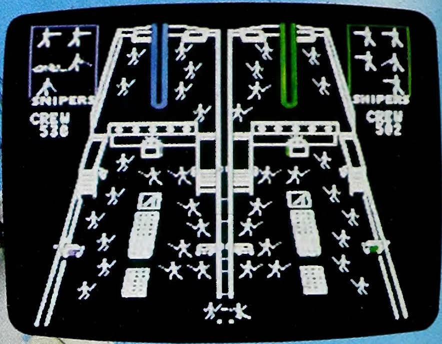

The semi-animated boarding phase.

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Softalk Presents The Bestsellers

It's pretty clear to observant pundits that Bert Kersey is in his dotage.

There are areas where the experts can't agree. Which brother is Bert? Was the picture taken in his prime? Does he really have a disk drive in his ear? Does Bert just get his inspiration from Sophie the beagle, or does Sophie call the shots?

There is even a school of thought that claims that Bert Kersey is a *nom de plume* of Barney Stone, who's always wanted to be tall. That line of pursuit is usually scoffed at, in that it would then follow that Stan Crane was Sophie, and nobody's noticed a propensity on the part of Stanley to step on his ears.

Even with all these controversies raging, there's a general agreement that Kersey—whoever he might be— has been slacking off. Look at the July Bestseller results and you'll get the tale of the sales. All Bert did was capture seven of the slots in the Hobby 10. He had only five entries in the Top Thirty.

The evidence seems clear that Bert's turning senile. So it goes with genius. Babe Ruth was barrel-shaped. Joe Louis was gentle. And Bert has taken to resting on the seventh day. Everybody has an Achilles' heel.

Among Kersey's other failings is that he's brought fun to the arcane art of writing software. Generally, program authoring is conducted under circumstances that make the British stiff upper lip appear emotional by comparison. In those circles, mild amusement is considered untoward raucousness. But Kersey has fun. In fact, he has so much fun that he can't seem to contain it. It seeps into his programs, scrambles into his advertising, and positively floods into his manuals.

There is no course in reputable computer science curricula centering on the concept of fun in programming. It's neither efficient nor profitable. Got that, Bert (Sophie)? But Beagle Bros seems to be surviving despite Kersey's lassitude on the Sabbath and his frivolous ways.

Put in other contexts, seven out of ten ain't all that bad. Try to imagine a .700 hitter in baseball. Fans go gaga at the thought of a .400 hitter. Politicians would love to be on the long side of those odds. They call 56 percent a landslide. What term would they conjure to describe 70 percent?

Five in the Top Thirty is fairly respectable also. No author has five books among the top-selling book charts. While George Lucas and Steven Spielberg are working on each having five of the top thirty movies of all time, they will have achieved that without having them released concurrently. Most things, including the creative urges, tend to be more successful when conducted in serial fashion rather than in parallel.

Just think what would happen if Kersey could shake off the onslaught of old age.

With Kersey strutting his stuff, there wasn't much room in the Hobby 10, but one new program cropped up. *Copy II Plus*, which has been hovering on the outskirts of the Hobby 10 for some time, finally scored. *Apple Pascal* retained a second non-Kersey slot. The team of Jochumson, Lubar, and Pelczarski—can you imagine those names stenciled in gold on the door of a law office—got the bottom rung with *Graphics Magician*.

Apple III

This Month	Last Month	
1.	1.	**Apple Writer III**, Paul Lutus, Apple Computer
2.	2.	**VisiCalc:Advanced Version**, Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
3.	7.	**PFS:File**, John Page and D. D. Roberts, Software Publishing Corporation
4.	8.	**PFS:Report**, John Page, Software Publishing Corporation
5.	—	**General Ledger**, Great Plains Software
6.	3.	**Quick File III**, Rupert Lissner, Apple Computer
7.	—	**Apple III Business Basic**, Apple Computer
8.	—	**The Catalyst**, Tim Gill, Quark Engineering
9.	10.	**General Ledger**, George Shackelford, State of the Art
10.	5.	**Word Juggler**, Tim Gill, Quark Engineering

Arcade 10

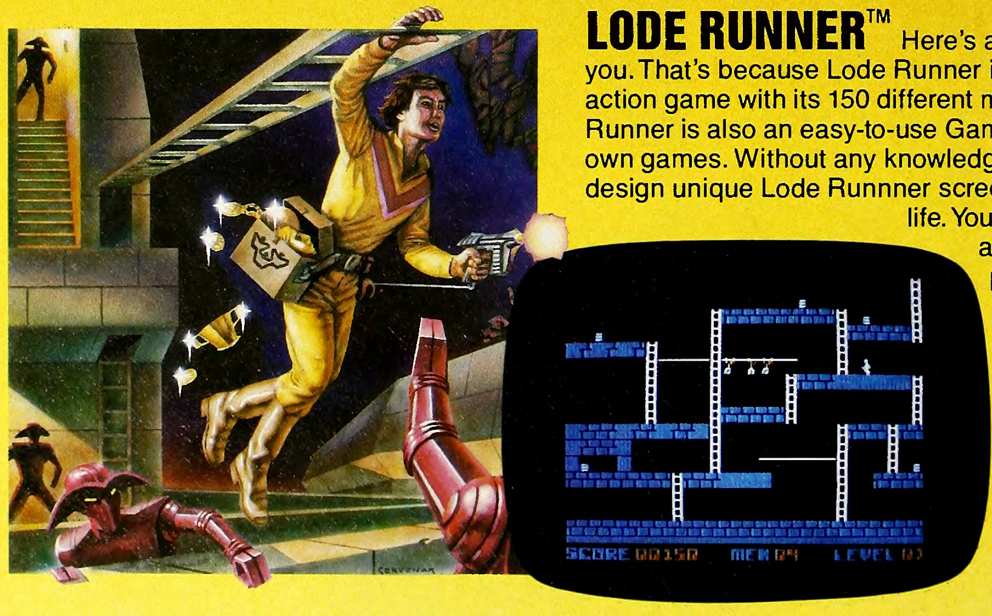
This Month	Last Month	
1.	1.	**Zaxxon**, John Garcia, Datasoft
2.	10.	**Lode Runner**, Doug Smith, Broderbund Software
3.	2.	**Miner 2049er**, Mike Livesay and Bill Hogue, Micro Fun
4.	5.	**Hard Hat Mack,** Michael Abbott and Matthew Alexander, Electronic Arts
5.	3.	**Choplifter**, Dan Gorlin, Broderbund Software
6.	4.	**Frogger**, Olaf Lubeck, Sierra On-Line
	—	**Stellar 7**, Damon Slye, Software Entertainment Company
8.	8.	**Axis Assassin**, John Field, Electronic Arts
9.	—	**Sammy Lightfoot**, Warren Schwader, Sierra On-Line
10.	7.	**Aztec,** Paul Stephenson, Datamost

A million laughs

SPARE CHANGE™ You are the game-happy owner of the Spare Change Arcade. Two fun-loving, but overworked Zerks—the main characters in your most popular game—have broken loose and are trying to retire from the business. You try madly to stop them. If you can get a coin into the juke box, the Zerks get so caught up in the music, they drop everything and start dancing. You also try popping popcorn and making a pay phone ring—which immediately makes the Zerks stop, answer and start a wild conversation. If you "win" the game, there are rib tickling cartoons by the Zerks to reward your efforts. It's a game full of sight gags, surprises and comedy. From the best. Brøderbund! **For the Apple® II, II+ and IIe. Coming soon for the Atari® home computers in disk format.**

and an endless challenge

LODE RUNNER™ Here's a game that will never stop challenging you. That's because Lode Runner is more than a spellbinding, fast-action game with its 150 different mind-boggling game screens. Lode Runner is also an easy-to-use Game Generator that lets you create your own games. Without any knowledge of programming, you can easily design unique Lode Runnner screens, then bring them to action-packed life. You will maneuver through scene after scene, running, jumping, drilling passages and outfoxing enemy guards in a secret underground hideaway as you pick up chests of gold stolen from citizens of the Bungeling Empire. There's no end to the thrills, chills and challenge. Of course, it's from Brøderbund! **For the Apple II, II+ and IIe. Coming soon for the: Atari home computers (disk and cartridge); Atari 5200™ Super System; Commodore 64™; VIC-20™; IBM® PC.**



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Overall, business remained more solid than usual for midsummer and there were few noticeable deviations from recent trends.

Apple Writer IIe continues to dominate the market and the Top Thirty. *VisiCalc* seems to be regaining strength and pulled slightly away from *Multiplan* while recapturing the second position. *PFS:File* remains strong in third. *Zaxxon* is clearly the entertainment choice of the summer, as it led the games for the second straight month, but a challenge is looming.

Broderbund's 150-level *Lode Runner* moved strongly in its initial month and may be another in that company's series of long-runners. Also gaining strength is *Hard Hat Mack* from Electronic Arts.

Generally, the shakeup of the Top Thirty was of significantly less than momentous proportions. *Computer SAT* from Harcourt Brace Jovanovich hit the Top Thirty for the first time. Another old-timer scoring well was *Knight of Diamonds*, perhaps representing the mounting frustration level as *Wizardry*'s third scenario failed to ship.

Home Accountant continued to dominate the Home 10 list. *ASCII Express:The Professional* seems to have become the latest semipermanent bridesmaid. *Micro Cookbook* from Virtual Combinatics showed strength, jumping to fourth and breaking the virtual lock that communications packages have had on all but the top spot in this category.

VisiCalc regained its accustomed spot atop the Business 10. *The Incredible Jack* inched slightly higher and the new version of *DB Master* has resuscitated its fortunes.

Multiplan stayed within striking distance of *VisiCalc*, but the pioneer showed it'll be tough for anyone to overcome its strong position in the Apple market.

Word Processors 10

This Month	Last Month	
1.	1.	**Apple Writer IIe**, Paul Lutus, Apple Computer
2.	2.	**Bank Street Writer**, Gene Kuzmiak and the Bank Street College of Education, Broderbund Software
3.	3.	**WordStar**, MicroPro
4.	4.	**Sensible Speller**, Charles Hartley, Sensible Software
5.	8.	**Magic Window II**, Bill Depew, Artsci
6.	7.	**Format-II**, G. K. Beckmann and M. A. R. Hardwick, Kensington Microware
7.	6.	**Screen Writer II**, David Kidwell, Sierra On-Line
8.	—	**MegaWriter**, Megahaus
9.	5.	**Super-Text Pro**, Ed Zaron, Muse
10.	—	**Word Juggler IIe**, Tim Gill, Quark Engineering

Home Education 10

This Month	Last Month	
1.	1.	**MasterType**, Bruce Zweig, Lightning Software
2.	—	**Computer SAT**, Harcourt Brace Jovanovich
3.	3.	**Apple Logo**, Logo Computer Systems, Apple Computer
4.	—	**Early Games for Young Children**, John Paulson, Counterpoint Software
5.	2.	**Typing Tutor**, Image Producers, Microsoft
6.	—	**In Search of the Most Amazing Thing**, Tom Snyder, Spinnaker Software
7.	—	**Story Machine**, DesignWare, Spinnaker Software
8.	8.	**Snooper Troops I**, Tom Snyder, Spinnaker Software
9.	—	**Facemaker**, DesignWare, Spinnaker Software
10.	—	**Delta Drawing**, Computer Access Corporation, Spinnaker Software

Knight of Diamonds jumped past *Ultima II* into second behind *Wizardry* in the Fantasy 5 category. *Missing Ring* nabbed fourth and *Ultima* staggered home fifth.

Castle Wolfenstein continued leading the Strategy 5, with *Flight Simulator* and *Sargon II* trailing. Strategic Simulations nabbed the other two positions. *Cosmic Balance II* remained on the list, while *North Atlantic '86* debuted on the chart.

Zork I topped the Adventure 5 list. The biggest change was the presence of *Death in the Caribbean* from Micro Fun, a company that's beginning to flex its muscles now that it has a certified hit like *Miner 2049er* under its belt.

The Home Education 10 area remains a bulwark of sales strength. This was perhaps the only area that slowed down in July, but there was no drought at Spinnaker, whose *In Search of the Most Amazing Thing* made its first appearance on the list. *MasterType* continues as the dominant entry, but Spinnaker captured the bottom five places and the next two spots were also carried by their products.

Word processing seems to be the most popular application. As more word processors enter the fray, they seem to broaden the market, rather than taking sales from other products. *Apple Writer IIe* remains the undisputed leader, with *Bank Street Writer* a clear second.

WordStar is coming on strong with their new promotion that bundles a CP/M card with the program. And two absolutely new programs muscled their way onto the list. *MegaWriter* grabbed eighth and *Word Juggler IIe* scored tenth.

Adventure 5

This Month	Last Month	
1.	1.	**Zork I**, Infocom
2.	3.	**Suspended**, Infocom
3.	—	**Death in the Caribbean**, Philip and Bob Hess, Micro Fun
4.	5.	**The Mask of the Sun**, Chris Anson, Alan Clark, Larry Franks, and Margaret Anson, Ultrasoft
5.	2.	**Zork II**, Infocom

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.	—	**North Atlantic '86**, Gary Grigsby, Strategic Simulations
5.	4.	**Cosmic Balance II**, Paul Murray, Strategic Simulations

Fantasy 5

This Month	Last Month	
1.	1.	**Wizardry**, Andrew Greenberg and Robert Woodhead, Sir-tech
2.	3.	**Knight of Diamonds**, Andrew Greenberg and Robert Woodhead, Sir-tech
3.	2.	**Ultima II**, Lord British, Sierra On-Line
4.	—	**The Missing Ring**, Terry Romine, Datamost
5.	—	**Ultima**, Lord British, California Pacific

In addition to *Lode Runner*, there were some other bright spots on the Arcade 10. *Stellar 7* made a big impression in its first month in distribution and tied *Frogger* for sixth. *Axis Assassin* held strong. And the long-awaited *Sammy Lightfoot* finally arrived from Sierra On-Line to early applause.

But *Zaxxon* is still the pacesetter by a wide margin. *Miner 2049er* dropped to third with the arrival of *Lode Runner*. *Choplifter* and *Frogger* continue selling well.

Business 10

This Month	Last Month	
1.	2.	**VisiCalc**, Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
2.	1.	**PFS:File**, John Page and D. D. Roberts, Software Publishing Corporation
3.	5.	**Quick File IIe**, Rupert Lissner, Apple Computer
4.	3.	**Multiplan**, Microsoft
5.	4.	**PFS:Report**, John Page, Software Publishing Corporation
6.	6.	**PFS:Graph**, Bessie Chin and Stephen Hill, Software Publishing Corporation
	9.	**The Incredible Jack**, Business Solutions
8.	7.	**BPI General Ledger**, John Moss and Ken Debower, Apple Computer
	—	**DB Master**, DB Master Associates, Stoneware
10.	10.	**Apple II Business Graphics**, Apple Computer

Hobby 10

This Month	Last Month	
1.	1.	**Double-Take**, Mark Simonsen, Beagle Bros
	2.	**DOS Boss**, Bert Kersey and Jack Cassidy, Beagle Bros
3.	2.	**Apple Mechanic**, Bert Kersey, Beagle Bros
4.	10.	**Apple Mechanic Typefaces**, Bert Kersey, Beagle Bros
	8.	**Pronto DOS**, Tom Weishaar, Beagle Bros
	—	**Copy II Plus**, Central Point Software
7.	—	**Tip Disk 1**, Bert Kersey, Beagle Bros
8.	5.	**Apple Pascal**, Apple Computer
9.	4.	**Utility City**, Bert Kersey, Beagle Bros
10.	7.	**Graphics Magician**, Chris Jochumson, David Lubar, and Mark Pelczarski, Penguin Software

Home 10

This Month	Last Month	
1.	1.	**Home Accountant,** Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software
2.	2.	**ASCII Express: The Professional**, Bill Blue and Mark Robbins, Southwestern Data Systems
3.	9.	**Transend 2**, Tim Dygert and Bob Kniskern, SSM
4.	—	**Micro Cookbook**, Brian E. Skiba, Virtual Combinatics
5.	9.	**Hayes Terminal Program**, Hayes Microcomputer Products
6.	—	**Cdex Training for the Apple IIe**, Cdex Corporation
7.	—	**Micro/Terminal,** Microcom
8.	7.	**Transend 1**, Tim Dygert and Bob Kniskern, SSM
9.	6.	**Micro/Courier,** Microcom
10.	4.	**Data Capture 4.0**, George McClellan and David Hughes, Southeastern Software

Softalk Presents The Bestsellers

Apple Writer III topped Apple III sales for the second month, leading to the spectacle of Apple, a company as notorious for its mediocre software as Kersey is for his fun software, being the leading software publisher in both its markets. Of course, *Apple Writer* is the brainchild of independent Paul Lutus, rather than of a committee process. Perhaps its success will serve as a model for hardware companies with software aspirations.

VisiCorp's *VisiCalc:Advanced Version* remains second, with *PFS:File* and *Report* next.

The fact that *Apple Writer* and *VisiCalc* run one-two on both Apple machines supports the contention that Apple owners are turning to more serious matters.

On the other hand, the Beagle Bros success story supports the idea that you can be serious and fun at the same time. What a delightful combination! Thank you, Sophie... and you, too, Bert, whatever you are.

Apple-franchised retail stores representing approximately 6.7 percent of all sales of Apple and Apple-related products volunteered to participate in the poll.

Respondents were contacted early in August to ascertain their sales for the month of July.

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 preferences of the individual respondents were not considered.

Respondents in August 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 to 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 3.36 percent, which translates roughly into the theoretical possibility of a change of 3.71 points, plus or minus, in any index number.

The Top Thirty

This Month	Last Month	Index	
1.	1.	191.47	**Apple Writer IIe**, Paul Lutus, Apple Computer
2.	4.	97.72	**VisiCalc**, Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
3.	3.	91.90	**PFS:File**, John Page and D. D. Roberts, Software Publishing Corporation
4.	2.	89.45	**Zaxxon**, John Garcia, Datasoft
5.	12.	85.78	**Quick File IIe**, Rupert Lissner, Apple Computer
6.	6.	59.74	**Multiplan**, Microsoft
7.	7.	59.43	**Home Accountant**, Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software
8.	10.	58.82	**Bank Street Writer**, Gene Kuzmiak and the Bank Street College of Education, Broderbund Software
9.	5.	56.98	**MasterType**, Bruce Zweig, Lightning Software
10.	—	56.06	**Lode Runner**, Doug Smith, Broderbund Software
11.	9.	41.35	**PFS:Report**, John Page, Software Publishing Corporation
12.	13.	39.21	**Wizardry**, Andrew Greenberg and Robert Woodhead, Sir-tech
13.	8.	35.53	**Miner 2049er**, Mike Livesay and Bill Hogue, Micro Fun
14.	18.	31.24	**Hard Hat Mack**, Mike Abbott and Matthew Alexander, Electronic Arts
15.	11.	26.95	**Choplifter**, Dan Gorlin, Broderbund Software
16.	26.	24.20	**DOS Boss**, Bert Kersey, Beagle Bros
	21.	24.20	**Double-Take**, Mark Simonsen, Beagle Bros
18.	26.	23.89	**Apple Mechanic**, Bert Kersey, Beagle Bros
19.	—	23.58	**Computer SAT**, Harcourt Brace Jovanovich
20.	15.	23.28	**Apple Logo**, Logo Computer Systems, Apple Computer
21.	16.	21.75	**WordStar**, MicroPro
22.	—	19.91	**Early Games for Young Children**, John Paulson, Counterpoint Software
23.	—	18.99	**Sensible Speller**, Sensible Software
24.	22.	18.38	**ASCII Express:The Professional**, Bill Blue and Mark Robbins, Southwestern Data Systems
	23.	18.38	**Zork I**, Infocom
26.	25.	18.07	**Castle Wolfenstein**, Silas Warner, Muse
27.	14.	17.76	**Typing Tutor**, Image Producers, Microsoft
28.	—	15.62	**In Search of the Most Amazing Thing**, Tom Snyder, Spinnaker Software
29.	—	14.70	**Knight of Diamonds**, Andrew Greenberg and Robert Woodhead, Sir-tech
30.	—	13.17	**Apple Mechanic Typefaces**, Bert Kersey, Beagle Bros
		13.17	**Pronto DOS**, Tom Weishaar, Beagle Bros
		13.17	**Copy II Plus**, Central Point Software

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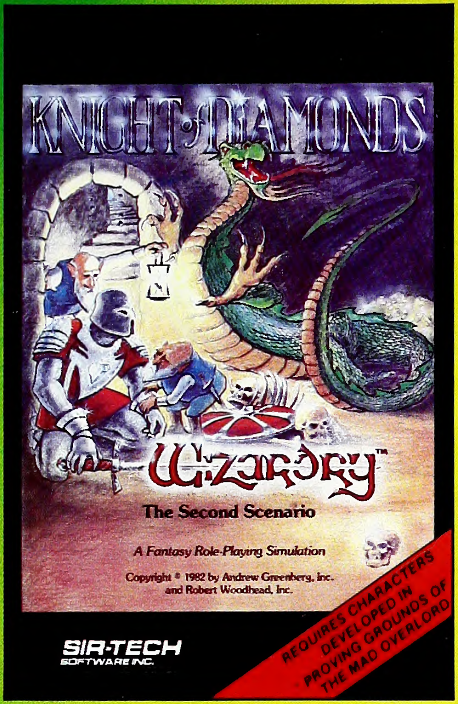

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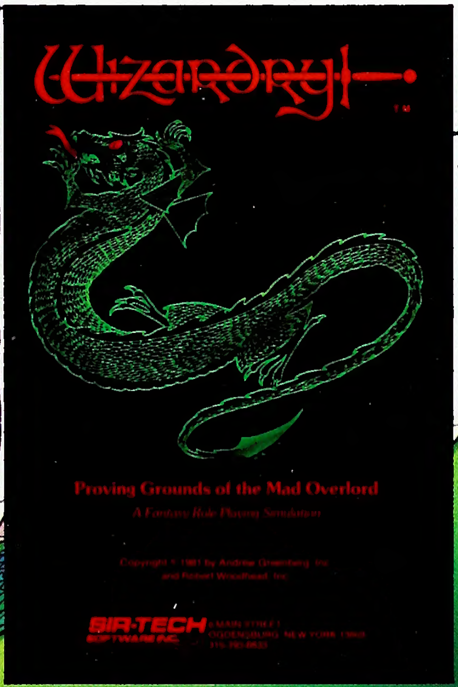

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