SOFTALK

VOLUME 4 FEBRUARY 1984 $3.00




Exec Human Systems Dynamics • All-Time Softalk Reviews Index




# *If you* can learn to use this word processor in 90 seconds, can it really be any good?




CUT & PASTE™ *displays its commands on a single line at the bottom of the screen. This makes working with it easier and also gives you more usable space on the screen.*

Of all word processors on the market today, Cut & Paste may well be the easiest to use. In fact, by the time you finish reading this section of the ad, you'll know how to work with Cut & Paste. So read on.

**START TYPING.** Working with Cut & Paste is like working with a typewriter. If you know how to use a typewriter, you already know how to type in your draft with Cut & Paste. The only real difference is, with Cut & Paste it's easier to correct typos.

**MAKING CHANGES.** Let's say you've decided to make a cut in your rough draft. To do this you put the cursor (the bright block) at the start of the text you want to delete, and stretch it through to the end of your cut. Then you send the cursor down to the "CUT" command on the bottom of the screen. Done.

If, on the other hand, you want to keep that line, but put it in a different part of your draft, you use the "PASTE" command. You mark the point of insert with the cursor. Then you put the cursor over "PASTE." That's all there is to it.

**PRINTING IT OUT.** When you like the way your work looks, you print it. Put the cursor on the "PRINT" command. Then set your margins, in inches. That's it.

You now know how to use Cut & Paste.

**OKAY, IT'S SIMPLE. BUT HOW GOOD IS IT?** Cut & Paste has all the features you'll ever need to use at home. Here are a few of them:

1. Scrolling dynamic menus
2. Automatic word wrap
3. Simple cut & paste editing
4. Block indenting
5. Set margins and paper size in inches
6. Tabs
7. Automatic page numbering
8. Controllable page breaks
9. Headings
10. Scrolling text windows
11. Automatic widow and orphan control
12. Clear and concise manual

In other words, Cut & Paste will do just about everything other word processors do. But Cut & Paste will do it more easily. Without complex commands and modes.

If you think about a word processor in terms of what it replaces (typewriters, pens and paper, files), Cut & Paste begins to look very good indeed.

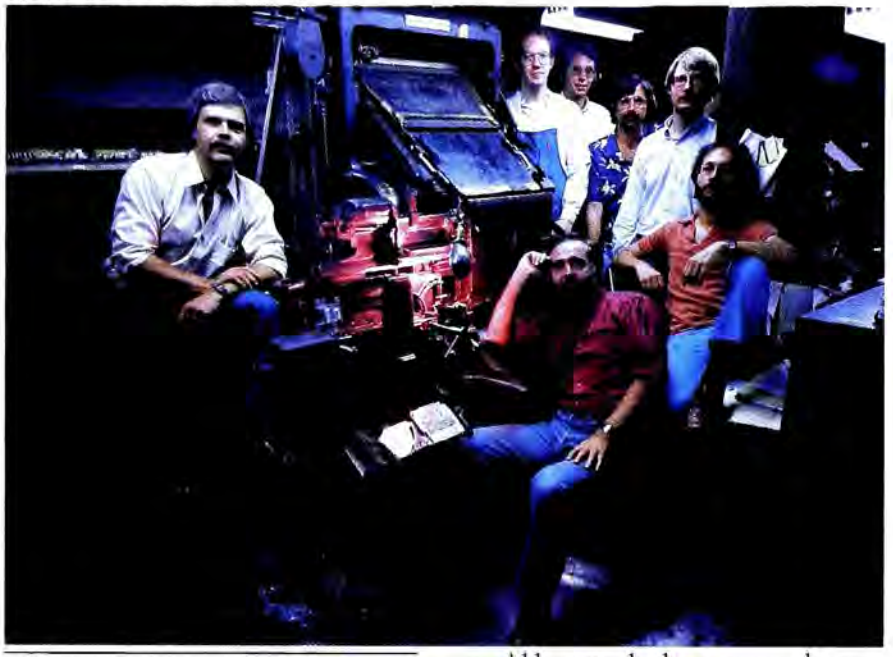
And when you consider that *all this power can be had for approximately* $50, we think you'll see why we believe Cut & Paste is something of an achievement.

**A PHILOSOPHY OF DESIGN.** The people who designed, developed and programmed Cut & Paste have some fairly heavy credentials.

They are people who worked on the internationally-famous user interface designs that led to the Xerox Star® and Apple's Lisa.® They are also



THE CHANGING OF THE GUARD. *Until quite recently we used pens and paper and typewriters to write with, mostly because we knew how to use them. They have been good tools, but limited. You tend to make messes when you work with them, and getting rid of those messes makes extra work. Cut & Paste is an inexpensive and practical alternative. Because it is as easy to use as a typewriter, you really will use it. Which may make it the first sensible word processor for the home. Thus an alleged labor-saving device has come to a position where it really can save a significant amount of labor, i.e., yours.*



THE MEN WHO MADE CUT & PASTE. *The Linotype machine pictured here was the 19th century's most important contribution to word processing technology. It let typesetters compose and rearrange text in the form of metal castings. The importance of Cut & Paste, of course, must await the judgment of history. Nevertheless, the seven men who developed it look confident here. Standing left to right, they are: Norm Lane, Steve Shaw, David Maynard, Dan Silva, Steve Hayes and Jerry Morrison. Seated at the console is Tim Mott, whose idea this was in the first place.*

people who have in common a very lucid philosophy of design.

Computers and the programs they run are tools, they believe. Tools are never noticed unless they are bad tools. When they're good, they become, in effect, invisible. And if you want to make a good tool—an invisible tool—you'd best study the way people use the tools they already have.

As a result of this thinking, Cut & Paste was designed to work much in the same way that you already work with a typewriter or with pen and paper. The most complex and powerful parts of the program are hidden from view. The work they do takes place deep in the machine. All you get to see are the results.

But beyond that, there is something almost indefinable about a good design. Things about it just seem to work crisply. Little touches and features that you notice make you want to smile. If it's really good, it *feels* good.

Cut & Paste feels good.

ELECTRONIC ARTS™

THE PRODUCTS *of Electronic Arts can be found in your favorite computer stores, software centers, and in leading department stores throughout the country. Both Cut & Paste and Financial Cookbook™ are now available at a suggested retail price of $50 for the Apple IIe and the Commodore 64 and will soon be available for the IBM-PC and Atari.*

## OUR COMMITMENT TO HOME MANAGEMENT.

Cut & Paste is just one of a growing number of products we're publishing within the category of "home management software." These products are all built around the same program architecture, making them all equally "friendly," as well as remarkably straightforward and practical. We believe that designs like these will soon make home computers as functional and efficient as today's basic appliances.

Our next product in this line is called *Financial Cookbook*. It's a realistic alternative to the complex, pre-programmed financial calculators we all wish we knew how to use. With a few, simple keystrokes, *Financial Cookbook* lets you make more than 30 key time-value-of-money computations—just about all the ones you'd ever use for personal finances—like calculating mortgages with changing interest rates, compounding the interest on IRA and savings accounts, and buy-versus-lease comparisons for automobile purchases.




To find out more about these home management products and about what we have planned for the future, call or write: Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403 (415) 571-7171.

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SOFTALK
FEBRUARY 1984

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*Virginia Lawrence and her firm are important parts of a great happening. Computers are changing the way we work, play, learn, think, and perform statistical analysis.*

DAVID HUNTER . . . . . 56

Hey, Mac! Apple's New Computer is a Winner

*Introducing Macintosh, Apple's thirty-two bit personal computer for everyone—plus a look at Mac's Lisa technology from inside Apple.*

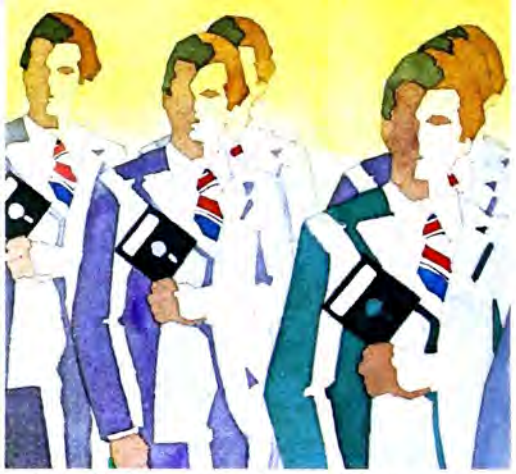
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*Lotus's Climb to the Top Louise Rude has a new career as an advocate for sensory impaired persons. Lotus's Mitch Kapor went nuts over IBM's pc. Now he's keen on Macintosh.*

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*The amazing, wonderful, complete, oppressively long, all-time, Softalk product reviews index. Well, part of it, anyway.*

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*Double and triplethinking about the computer revolution: cracking down on criminal computing, whimsical robots, mining mainframes and more.*

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**On Our Cover:** Apple Computer expects its small easy-to-use Macintoshes to sweep the nation. So Apple built a *large* easy-to-assemble factory to make them. Read all about it beginning on page 130. Photo by Kurt A. Wahlner.


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**Moving?** Send new address and a label from a recent *Softalk* to Softalk Circulation, Box 7039, North Hollywood, CA 91605; telephone (818) 980-5074. Please allow six to eight weeks for processing.


# STRAIGHTALK

At the Winter Consumer Electronics Show in Las Vegas in January, several companies introduced new computers—and they were all old computers. Coleco's Adam, Commodore's 264, even the portable goodies from Casio are merely new names and clothing on old architecture.

It's not a new trick. IBM used it to no one's surprise with the PC *Jr* just as it did two years ago with the PC itself.

Only Apple dares to look ahead and act on what it sees. Only Apple dares to stake its future on our future—toward the best possible future the most creative thinkers at Apple can envision.

While IBM purchases great fanfare to introduce a computer whose microprocessor is obsolete before it's manufactured, while Commodore and Coleco and Tandy make big to-dos over rehashed graybeards, Apple blazes the trail to a better world, tentatively with Lisa and now boldly, confidently, with Macintosh.

There are plenty of us, Apple II and III owners and loving it, who resent the new baby. How come Apple's bringing out these new machines that don't pretend to be compatible with our Apples? Is Apple pulling a Commodore and indulging in planned obsolescence with no thought for us, our feelings, our pocketbooks?

No. Apple's changes embody progress, not cosmetics; that such changes can leave its older machines eating dust is a major concern for Apple.

Trains are lovely and romantic and their distant whistles in the night conjure all sorts of wonderful fantasies. But what a disservice to the world it would be if the development of air travel had been curtailed for fear of making trains obsolete. How dreadful really the notion of Peter Pan to deny the adult because the child's so cute.

The microcomputer industry is an infant. Apple IIs and TRS-80s and Pets and Ataris and IBM PCs are the fruits of its first crop, and of them Apple II is the blue ribbon winner. But the child is bursting its seams; it's ready to produce faster, more facile machines that grasp more and remember more and do a whole lot that couldn't be done before. While others play with the toddler and change its clothes, Apple encourages the adolescent to bloom. Memories of childhood may be wistful, but growing up is exciting, mind-stretching, life-giving.

To wish that Apple would stick to compatible computers, that it would not be the kind of company who dares to put out the 68000 machines that fly in the face of much more powerful competitors, is to wish that Woz weren't the kind of person who would have invented the Apple in the first place.

Apple hasn't and won't forget us. No computer yet approaches the Apple II in breadth and depth of software; new capabilities of the II are being discovered constantly; its limits still haven't been sighted. Nor will Apple stop updating its old machines. After all, it must continue to compete with Big Blue and its ilk. So Apple is expected also to be bringing out a new-old machine—though it won't be touted as "new"—come May: a compatible, compact, lightweight, high-powered, lower-priced version of the IIe that will, by rights, blow the PC *Jr.* away.

But the Macs are the future, and we Apple II and III people, imbued with the pioneer spirit as most of us are to have bought our Apples when we did, mustn't about-face and deny the frontier.

Besides, Mac is cute and cuddly and just itching to be taken home, if we can only find a way to justify a second computer.

Mac is a great computer and a great tool. It's terrific for the hordes of people who want a computer to do tasks for them. But, without a lot of effort, Mac won't let us do anything on our own. It boots up with a message welcoming us to its world—not with a cursor opening up a whole new world to our imaginations. It lets us choose from a set of tasks it's willing to do, and it does them beautifully; but it won't easily do just whatever we want it to do. We can't add to it and customize it and expand its capabilities.

Someday millions of people will have Macs or similar computers in their homes and offices. We'll be lucky enough to have our old, versatile, commandable, and commendable Apple IIs as well. In our homes, "Welcome to Macintosh" will rise frequently and proudly on-screen. But the computer welcome we choose to hear most often is still likely to be "Beep."

MCT

# Castle Wolfenstein™

by MUSE™




## THE MOST INTERACTIVE GAME EVER!

The wildest, most addictive adventure game to date–a genuine merger of fantasy and real-time arcade elements.

"A virtuoso feat of programming..."–*New York Magazine.*

For the Apple II or II Plus, 48K. $29.95.
By Silas Warner.

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Call or write for information and the name of your nearest MUSE dealer. Apple is a TM of Apple Computer Corp.

WALDREP



# CONTEST:

## Dialing for... ...the Fun of It.

The following conversation took place. Somewhere.

"Hello, operator, I'd like the number of SofTech Microsystems."

"Yes, that's 763-8324."

"How did you find it so fast?"

"Oh, I didn't look it up. You see, SofTech is one of those companies whose phone number is determined by the letters in its name. The letters in SofTech correspond to 763-8324 on the telephone dial."

"I see. Well, do you have a listing for Robert Cook?"

"Yes, just dial GUMBALL."

"Beg your pardon?"

"Dial GUMBALL, or 486-2255. Robert Cook is the coauthor of Broderbund's arcade game, *Gumball.*"

"Good-bye, operator."

Click.

For the contest we've listed eleven telephone numbers of people and companies in the Apple world. Can you figure out who they belong to? It's not hard. All you have to do is look at the three letters that correspond to each number on the telephone dial. Then take one letter for each number to spell out a person's or company's name.

Let's solve one together. The phone number is 745-4266. First we find the corresponding letters: 7=PRS, 4=GHI, 5=JKL, 4=GHI, 2=ABC, 6=MNO, and 6=MNO. Take one letter from each group of three, and we get the word *silicon*. Aha! This must be the phone number for Silicon Valley Systems. See how simple it is?

Write the letters A through K down the left-hand side of your entry. Next to each letter write the name that the telephone number refers to. That's all there is to it for part one.

Those who like to do things backward might delight in part two. After all the phone numbers listed on the next page, you'll see a list of people and companies. Can you figure out what their phone numbers should be? For example, if you wanted to telephone Olaf Lubeck, you would dial FROGGER, or 376-4437 (Lubeck wrote the Apple version of the popular game, *Frogger*).

For part two of the contest, number your entry from one to ten on the right-hand side. Next to each number, write the person's or company's phone number and the word that the phone number spells. For Olaf Lubeck, you'd write "376-4437 (Frogger)."

Like many of our contests, the answer will be pretty obvious when you find it. If your answer requires a lot of thinking and explaining to make the connection, then you've missed it. Try again.

Whoever submits the most complete entry will collect $200 worth of Apple accessories made by our advertisers, and we'll pay for them.

All entries must be on an 8 1/2-by-11-inch piece of paper. Nothing larger, nothing smaller. The postmark deadline is March 15, 1984. That date'll creep up fast, so get your entry in soon.

Your name, address, phone number, and prize selection must be written on each page of your contest entry. If for some strange reason your entry is more than one page long, please staple the pages together.

No easier way to win some keen prizes can be found in any other computer magazine, so go for it! Send in your entry by March 15, 1984, to Softalk Phonies, Box 7039, North Hollywood, CA 91605. At the sound of the tone, you may begin the contest. Beeeeep!

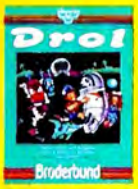
Who will you reach if you dial the following phone numbers?

A. 796-3849
B. 274-8474
C. 532-5464
D. 736-4846
E. 747-8324
F. 728-5539
G. 746-3649
H. 468-7638
I. 463-6266
J. 227-7439
K. 278-9425

And what would you dial to reach the following people?

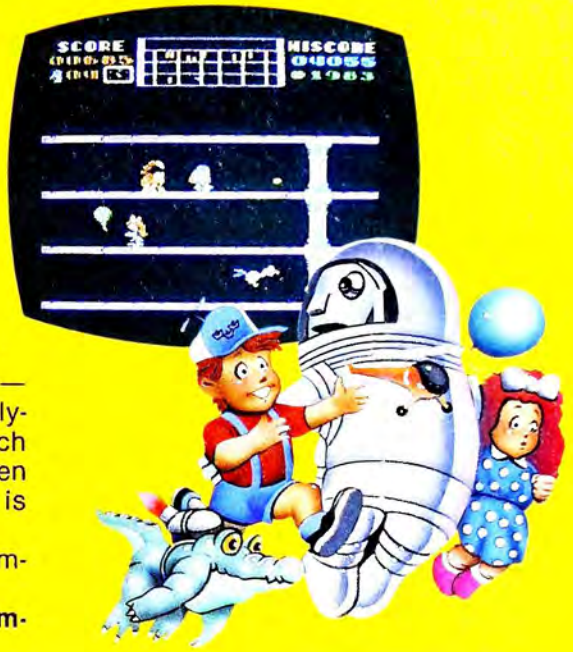
1. Bill Budge
2. Einstein
3. T.G. Products
4. Synoptic Software
5. Software Publishing
6. Data Transforms
7. John Besnard (hint: it's not BESNARD, or 237-6273).
8. Bert Kersey
9. Michael Berlyn
10. Operator

# Betcha Can't Play Just One!




## Drol™






You will soon come to expect the unexpected in the hilarious and challenging underground dream world of Drol. A little red-headed girl and her propeller-beanied brother have been lured by a witch doctor's curse into the multi-leveled ruins of a lost civilization. It's your task — as a hero equipped with a rocket backpack and full-screen radar scope — to dodge hopping scorpions, monsters and snakes, flying turkeys, swords, daggers, arrows, magnets, witch doctors, and vacuum cleaners(!) in your attempts to rescue the children and reunite them with their mother. Each new level of game play is full of surprises.

Drol's wry sense of humor and amazingly detailed cartoon imagery, make this game a charmer!

**For the Apple II/II + /IIe, Atari, and Commodore 64 home computers in disk format.**




## Gumball™






Hours of fun await you at the Sticky Sole Gumball Factory — where you'll be working against the clock to sort a tasty collection of colorful gumballs.

Your job may seem sweet at first, but after you've discovered the explosive-laced gumballs (placed by over-zealous dental assistants) or met your irritating supervisor (who is eager to undo your best efforts), you may feel that you have bitten off more than you can chew.

If, against all odds, you meet your day's quota, you'll be promptly rewarded with a promotion (to a more challenging position) and an amusing cartoon showing your higher standard of living.

Gumball — a new fast action game filled with colorful and delicious surprises.

**For the Apple II/II + /IIe.**

# Irresistible Fun From Brøderbund!

**Ask your Brøderbund dealer for Sneak Previews.**

## Brøderbund Software™

**Discover the Difference**

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# IF YOU'RE LIKE MOST BUY A SINGLE



## YOU'LL BUY LOTS OF SPINNAKER GAMES.

And not just because they're educational, but also because they happen to be a lot of fun to play.

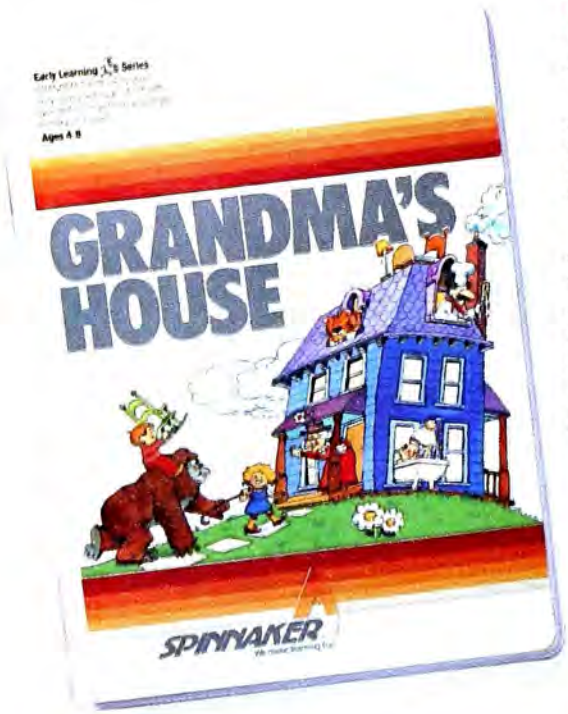
In fact, they're so much fun, parents have been known to sneak in a few hours of play when the kids are asleep.

After all, if your kids are actually enjoying a learning game, there must be something to it. And there is: Fun, excitement and real educational value. That's what sets Spinnaker games apart from all the rest. And what brings parents back for more.

We offer a wide range of learning games for a wide range of age groups: 3 to 14. One look at these two pages will show you how we carefully designed our line of learning games to grow right along with your child.

So if you're looking for a line of learning games that are as much fun to play as they are to buy, consider Spinnaker Games. They're compatible with **Apple, Atari, IBM, Commodore 64, Coleco Adam** and parents who don't mind their kids having fun while they learn.




**It's new! GRANDMA'S HOUSE™ is a magical playhouse. Ages 4 to 8.**

GRANDMA'S HOUSE is a very special place for your kids, because they can furnish it with lots of wonderful and unusual things from the magical places they'll visit.

GRANDMA'S HOUSE provides children with an imaginative way to exercise their creativity as they design their own perfect playhouse. You'll love watching your kids have fun with GRANDMA'S HOUSE—you can even join in and play it with them!



**It's new! KIDWRITER™ lets kids make their own storybook. Ages 6 to 10.**

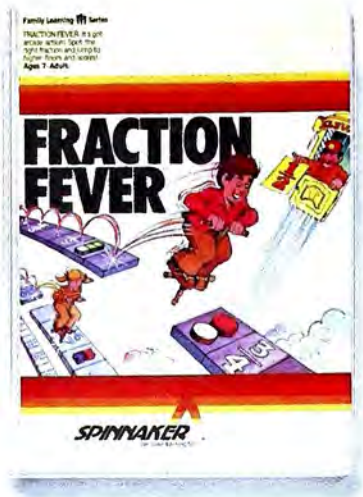
KIDWRITER gives children a unique new format for creating their own stories. With KIDWRITER, kids make colorful scenes, then add their own story lines. It's as versatile and exciting as your child's imagination!

Best of all, while it encourages children to create word and picture stories, it also introduces them to the fundamentals of word processing. KIDWRITER will bring out the storyteller in your children—and in you!



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# PARENTS, YOU WON'T SPINNAKER GAME.




**FRACTION FEVER™ brings fractions into play.**
**Ages 7 to Adult.**

FRACTION FEVER is a fast-paced arcade game that challenges a child's understanding of fractions. As kids race across the screen in search of the assigned fraction, they're actually learning what a fraction is and about relationships between fractions.

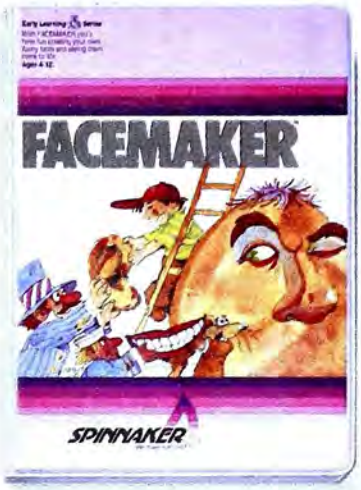
All in all, FRACTION FEVER encourages kids to learn as much as they can about fractions—just for the fun of it!




**KINDERCOMP.™ Numbers, shapes, letters, words and drawings make fun.**
**Ages 3 to 8.**

KINDERCOMP allows very young children to start learning on the computer. It lets your children match shapes and letters, write their names, draw pictures and fill in missing numbers. KINDERCOMP delights kids with colorful rewards—the screen comes to life when correct answers are given.

As a parent, you can enjoy the fact that your children are having fun while improving their reading readiness and counting skills.




**FACEMAKER™ makes faces fun.**
**Ages 3 to 8.**

FACEMAKER lets children create their own funny faces on the screen, then make them do all kinds of neat things: wink, smile, wiggle their ears, and more.

Plus, FACEMAKER helps familiarize children with such computer fundamentals as menus, cursors, simple programs, and graphics.FACEMAKER won't make parents frown because their children will have fun making friends with the computer.








SPINNAKER™
We make learning fun.

**Disks for:** Apple, Atari, IBM, Commodore 64, Coleco Adam.
**Cartridges for:** Atari, Commodore 64, Coleco Adam.

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This is why our Elite One got the #1 rating from Softalk Magazine. And our Atari* compatible Rana 1000 Slimline has turned a game computer into a sophisticated business tool. And soon we'll have a new Winchester drive and a new series of very high density minifloppies, for both IBM and Apple.

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# CONTEST WINNERS: Turkeys; Ronnie & Yuri

Attention Darren Vengroff (Lubbock, TX) and Dave Loomis (Shorewood, WI): We'd like a few words with you two in a bit. But first, the big news.

November's Turkey Trot was by far the most popular contest ever. If it seems like we keep saying that, it's because each contest seems to draw more entries than the last. But there's no way any contest drew near as many as the Turkey Trot.

Digging through the thousands of entries was a daily task, which resulted in the loss of several contest staffers (paper cuts were too much to bear). Separating the correct entries from incorrect was slow and laborious, and when each entry was in its respective pile, the random number generator (RNG) crashed through the door to pick a winner.

For the first time in the history of the universe, two rounds of random number generating were required. This was because the RNG handles only numbers that can be pronounced in one breath. The slugfest began. Punches were thrown, blows delivered. After round two, the only ones able to answer the bell were Ken Steele and Duane Wiens (Boulder, CO), who worked as a team on the contest.

The Boulder Boys solved the contest when they should have been studying for their final exams, but the smell of $200 worth of Apple goods was too good to pass up. What was their game plan?

"We put off studying so we could write programs to solve this," Steele said. "However, we found that the Apple's clock speed was a bit slow, meaning we would have to wait for days for a result. Unfortunately, my VAX (computer) account had been killed. So, we wrote six different versions of the program—in Pascal, of course. None of them ever reached completion, but we did come up with the answer."

Like many other contestants, Steele and Wiens made the problem much harder than it actually was. Nonetheless, they did arrive at the correct answer and survived the RNG, which makes them the winners of the Trot.

In case you're still wondering, the fewest number of moves was fourteen, and only one combination of fourteen moves was possible.

Briefly put, here's the strategy that most contestants used. The fewest possible moves to get the person to square 40 was thirteen moves of 3. But doing so threw Tammy the Turkey off the page. So, the next possible solution was twelve moves of 3, and one move each of 2 and 1. All that remained was to find where the 2 and 1 moves should have gone.

The winning solution looks like this:

| I move: | Tammy moves: |
|---|---|
| 3 to square 4 | 3, +6 to square 12 |
| 3 to square 7 | 3, −2 to square 13 |
| 3 to square 10 | 3, +1 to square 17 |
| 3 to square 13 | 3, −1 to square 19 |
| 3 to square 16 | 3, +1 to square 23 |
| 3 to square 19 | 3, +1 to square 27 |
| 3 to square 22 | 3, +1 to square 31 |
| 1 to square 23 | 1, −3 to square 29 |
| 3 to square 26 | 3, −3 to square 29 |
| 3 to square 29 | 3, −3 to square 29 |
| 3 to square 32 | 3, −3 to square 29 |
| 3 to square 35 | 3, −3 to square 29 |
| 2 to square 37 | 2, −1 to square 30 |
| 3 to square 40 | 3, +7 to square 40 |

**Some of the People Some of the Time.** Again, "too easy" was the way many contestants described the contest. At the same time, "Finally, a contest even I can enter" was another popular comment. Thanks for all the letters and suggestions. We read every entry that comes in; that's how we decide what to run as a contest. We'll try to make them more challenging in the future, but simple enough that most people will have a chance.

And now, the news.

First spankings go to Darren Vengroff and Dave Loomis, whom we mentioned at the beginning of this column. Vengroff listed seven reasons why he thought he should win, one of which was "I know where your children live." Please tell us, Darren, because we *don't* know where they live.

Unfortunately, Vengroff's entry was postmarked nine days late, which throws all his pleas out the window.

Loomis receives extra spanks. His entry, in addition to having the wrong solution, was postmarked twelve days late and arrived postage due (he used an airmail sticker instead of a postage stamp). For Pete's sake, Dave, it's only 20 cents.

The second set of punishments go to everyone who sent in entries with fewer than fourteen moves. Rule 2 said you begin on square one, and rule 3 said you're allowed to move one, two, or three squares at a time. Those who started on a nonexistent square zero, and those who moved more than three squares at a time (you know who you are), please stand in a circle and slap each other on the wrists.

Workhorse of the Month Awards go to Dan Peterka (San Diego, CA), who sent in 100 different fifteen-move solutions, and Richard Jordan (Memphis, TN), whose 751-move solution measured more than fifteen feet long. Appropriately, Jordan requested some printer ribbons, printer paper, and stamps as his prizes.

Speaking of prizes, some people are never satisfied. Janice Robbins (Salt Lake City, UT) told us how she felt about possibly winning $200 of computer stuff: "This is a puny prize for all the work." It's so easy to tell that Robbins was in the true holiday spirit as she worked on the contest.

Speaking of spirits, three cheers to Carl Bowden and Jim Remlinger (Hebbronville, TX), who "figured out the puzzle while sipping beer here at the Caithless Mining plant after work." Remember, Bowden and Remlinger are professional miners. Don't try sipping beer in a mine without adult supervision.

Speaking of adult supervision, Dan Veditz (Malibu, CA) had this to say on his entry: "My dad wants a Videx Videoterm board, but I want to get either *Screen Writer II* or the Gutenberg word processor. Actually, he's saying now that he doesn't want any part of this. I guess it's because he and I could solve this puzzle only by going outside and jumping around a small track in turkey suits."

**Contest Salutes.** Many kudos go to graduate engineer Mitchell Pate and the rest of the contestants from the Hines Veterans' Administration Nursing Care Unit (Hines, VA) for all of their correct entries. Wrote educational therapist Bobbie Kafka, "We have just started a computer-literacy program here at the Spinal Cord Injury Service and have high hopes that it can enrich and stimulate the one muscle not paralyzed in our patients: their brains!" Way to go, gang.

Many pities go to Dave Timm (Largo, FL), who probably can't even see his name here. "I dropped my glasses and broke them after I counted my turkey moves. Do any of your advertisers fix eyeglasses? Do any of your advertisers sell cash?"

Timm may have broken his glasses, but Larry Hanson (Sherman Oaks, CA) is the one who really needs them. Hanson, who lives not five miles from us, sent his entry along the circuitous route—via Reading, Pennsylvania. That's because he wrote our zip code on the envelope as 19603. An honest mistake, since it should have been 91603 (it's now 91605). But how does Hanson explain the way he wrote the zip code on his contest entry: 109603?

Special thanks go to Noel Marie Lavallee (Cumberland, RI), who included a nice portrait of herself and Tammy having dinner together. "To eat my opponent hardly seemed fair. So with much Thanksgiving we sat down to dine on pizza with everything, Fritos, and bottles of wine." Lavallee's picture is now on display in the Softalk Museum (admission: $1.27).

**Timeless Contest.** Whoops! It seemed like a good idea at the time, but it turned out to be another example of what happens when we try to give away too many prizes.

The first part of the Oracle '84 contest required contestants to predict who or what would be named *Time*'s Man of the Year. However, we forgot that *Time* announces it's Man of the Year during the final week in December, and the entry deadline wasn't until December 31, 1983. So, because so many contestants waited until *Time* made its announcement before sending in their entries, the Man of the Year portion of the Oracle contest has been thrown out.

Man of the Year was shared this year by President Ronald Reagan and Soviet President Yuri Andropov. Quite a number of contestants who mailed their entries before *Time* hit the stands predicted Reagan, and a handful named Andropov. But it wasn't until after *Time*'s announcement that we started receiving entries that named both. Hmm. . . .

Other popular predictions reflected *Time*'s readers' choices: United States Marines, Sally Ride, Lech Walesa, and Federal Reserve Board Chairman Paul A. Volcker. Other Oracle contestants predicted Andy Kaufman, the Cabbage Patch Dolls, and Apple's Lisa.

On that note, let's now turn our attention to part two of the Oracle contest—the Winter Olympics. Stay tuned, faithful ones. ◨

# The Penguin Page

## Why A ~~Duck~~ Penguin?

One of the most frequent questions we get asked is "Why Penguin"? Well, it comes loosely from Monty Python's Flying Circus, with their "penguin on the telly", and their scientific proof that penguins are more intelligent than humans. Actually, it's from a late Friday afternoon denial by Mark Pelczarski that the initials MP were his (neither did they belong to **Magic Paintbrush** or Monty Python). They actually stood for some "Magnificient Penguin", he said. Unfortunately this denial was in print in a computer magazine, and "penguin" or "Magic Penguin" accidentally stuck. Many People thought that this was actually some Mystical Pseudonym, which it wasn't, but you know how things go. The final blow was struck when the first Major Publication review of the original **Complete Graphics System** (before "Penguin Software") was entitled "Penguin Graphics" by the reviewer, who thought he'd give away the "inside secret". Such is fate. And now there are More Penguins.

## Author Profiles*




### Robert Hardy - A Man with a Mission

Bob Hardy is one of over 20 authors writing for Penguin Software. Soon to be known as Bob MacHardy, he has worked on such projects as **Spy's Demise** and **Pensate,** and is co-designer and programmer of **The Spy Strikes Back.** Seen here outside his high-tech office plaza in California, Bob and his wife Linda are trying to train their Apple, Atari, and Commodore computers to cook, brew beer, walk the dog, and feed the horse. Alternately, they are trying to train the dog and horse to sit-up and jump, respectively. The dog and horse are winning.

## Adventure Ad Preempts Second Penguin Page!

See for yourself ------>

This crass commercialism has the editors in an uproar. It seems to be due to **The Quest** appearing as the #1 adventure of **Softalk**'s bestseller list, **Transylvania** receiving one of the 1983 Arcade Awards from **Electronic Games** magazine for "Outstanding Graphics in a Computer Game", and the great initial reaction to the newest Penguin adventure, **The Coveted Mirror.** Soon they'll want this page for **Minit Man, The Spy Strikes Back, Bouncing Kamungas, Expedition Amazon...**




## New Complete Graphics System Finally Available!

We thought we could do it months ago, but there was always more! The new **Complete Graphics System** is the culmination of over a year of work revising what were already the two most-popular graphics drawing and design programs: the original **Complete Graphics System** and **Special Effects.** This new incarnation, which contains all the features of the originals and more, is modernized to include many of the new developments in computer software from the past three years. It's simple enough to use without a manual, with graphic icons for drawing selections, and numerous "help" screens. Nevertheless, a thorough tutorial manual guides you effortlessly through computer drawing, painting, addition of text, 3-D design, and all kinds of computer graphics tricks. It took a long time, but it's worth it.

**The Complete Graphics System** now comes boxed, works with most input devices, and retails for $79.95. Trade-ins are available for owners of the original **Complete Graphics System** and **Special Effects.**

## (800) 323-0884

If you can't find one of our products at your dealer, call us at our toll-free order number and we'll find the name of the Penguin dealer nearest you. Or if there are none you can order with VISA or MasterCard. Dealers: if you carry our products and purchase through a distributor, give us a quick call so that we can put you on this information list and send customers your way.

**For product information, adventure hints, or from Illinois, Alaska, and Hawaii, please call (312) 232-1984.**

## The Official Availability List (as predicted two months ago when this ad was written)

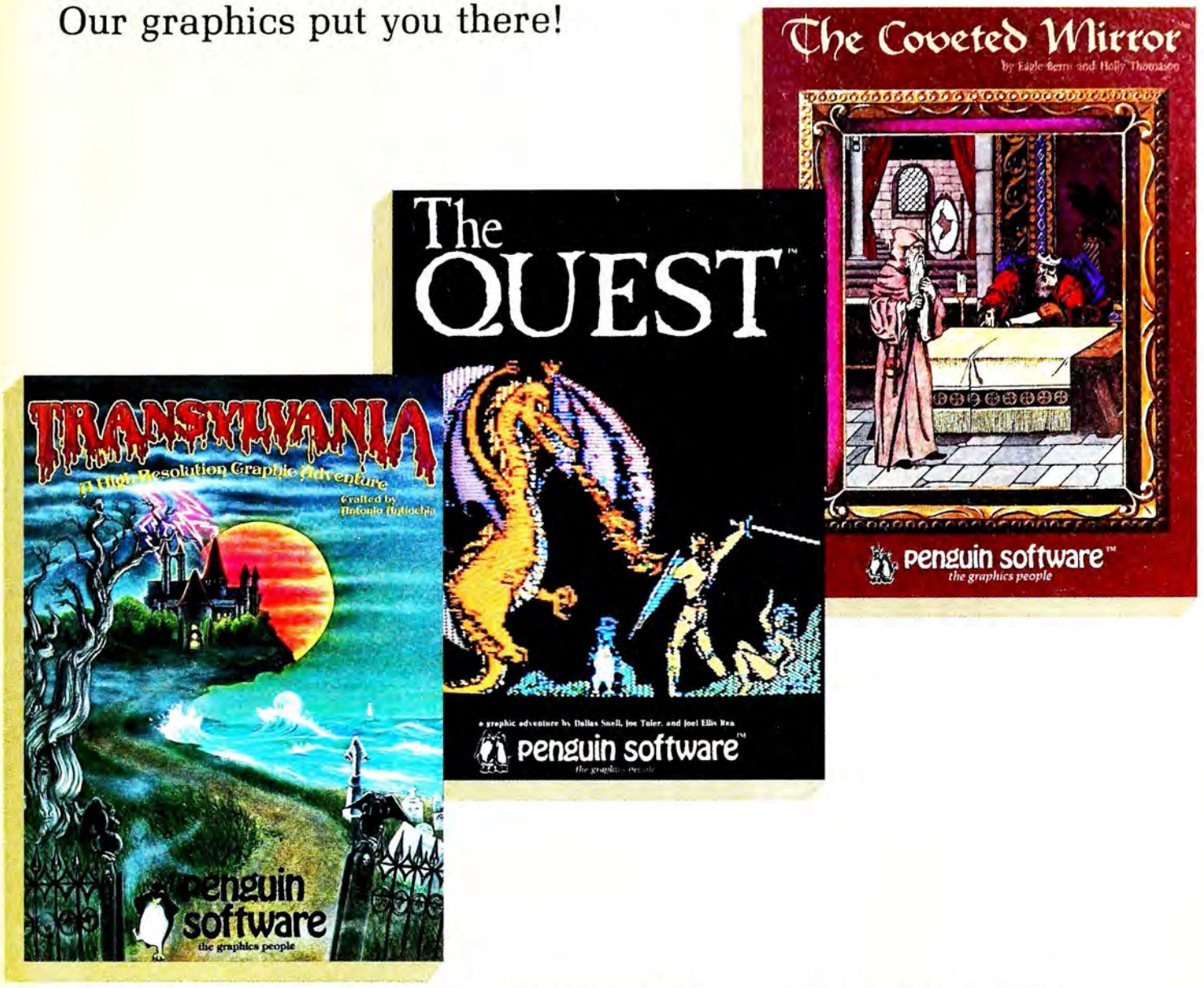
**Applications: Graphics** The Complete Graphics System - drawing and 3D designing for non-programmers AP, The Graphics Magician - animation and picture creation for programmers AP/AT, Paper Graphics - print graphics to your printer AP, Transitions - high-tech slide show AP, Additional Typesets - for Complete Graphics System AP, Map Pack - graphic map screens AP **Utilities** ShortCuts - input and sorting routines AP, DISK arRANGER - organizes your disks AP **Home Applications** coming soon **All Recreational Software is $19.95 each: Adventures** Transylvania - beautifully detailed graphics AP, The Quest - search for a dragon in a vast kingdom AP, The Coveted Mirror - animated graphics in a 2-sided disk AP **Fantasy Role-Playing** Expedition Amazon - find the lost city of Ka AP **Strategy** Pensate out-think the computer AP/AT/C64 **Arcade** Spy's Demise - quick reactions and addicting AP/AT/C64, The Spy Strikes Back - avoid being seen while searching a huge building AP/AT/C64, Minit Man - repair a bridge and get to the computer: 2 games at once AP, Crime Wave - cops and robbers chase AP, Thunderbombs - 2-way shoot-em-up AP/AT/C64 **Children's Arcade** Pie Man - rush to make pies AP/AT, Bouncing Kamungas - grow melons while avoiding kamungas AP/C64 **Educational** coming soon

AP = Apple AT = Atari C64 = Commodore 64 IBM = IBM (soon)

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# ADVENTURE

Our graphics put you there!




Thoughtful prose and stunningly detailed graphics by some of the best computer artists bring life to the Penguin Software adventure series. Whether in the beautiful detail of Transylvania, the expanse of The Quest, or the animation throughout The Coveted Mirror, our graphics make you feel like you're there, experiencing the adventure as you play.

The Penguin adventures are or will be available on disk for the Apple II series, Atari home computers, Commodore 64, IBM PC, and Apple Macintosh. And since they're from Penguin, price in 5¼" disk format is only $19.95 each. Other formats may be higher. Graphics created with The Graphics Magician.

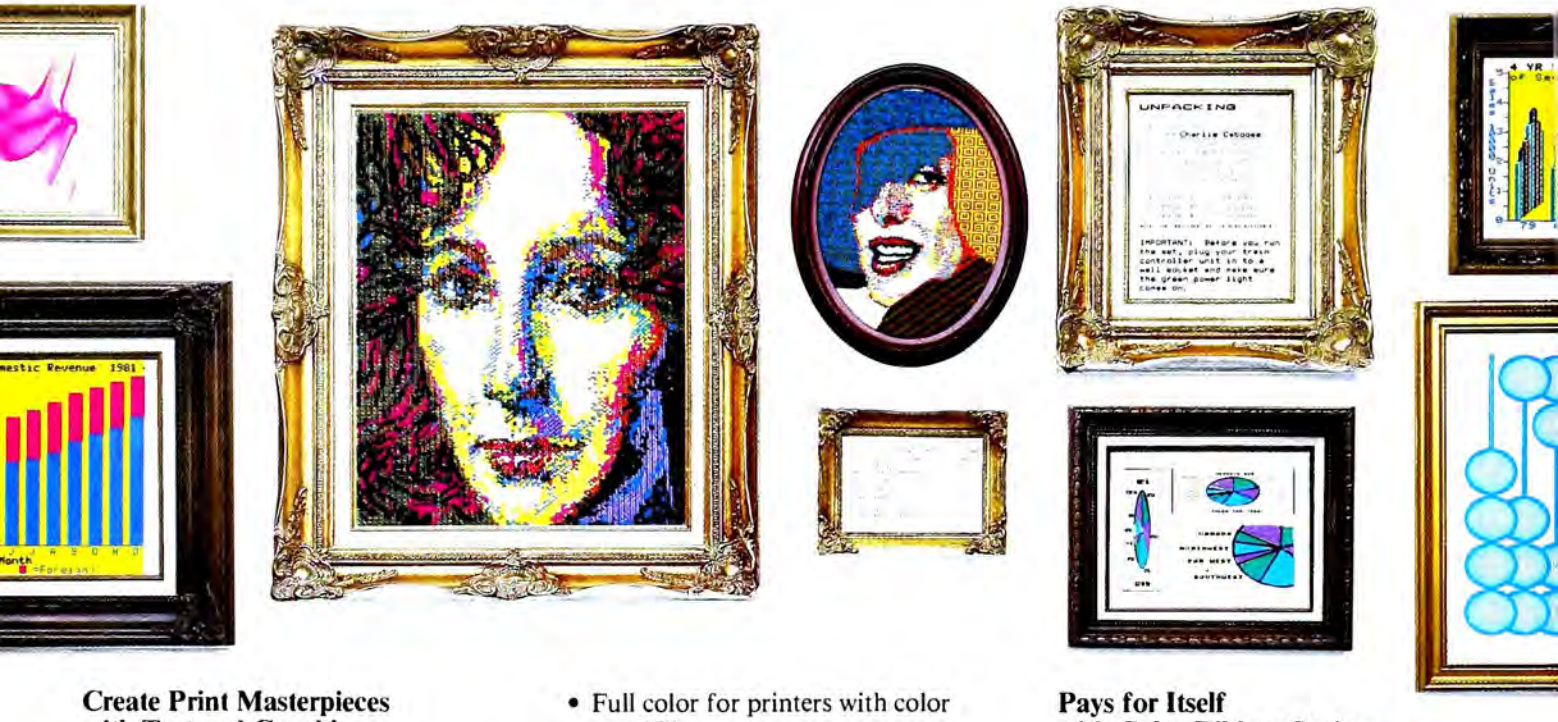
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Gain every state-of-the-art printing capability, including exclusive features not offered by any other interface:

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- Print the graphics screen *any* size — from inches to feet — another PKASO/U exclusive.
- Instantaneous, single-command Lo Resolution Screen Snapshots, only from PKASO/U.
- Super Resolution — higher resolution graphics from your dot matrix printer than possible on the screen, only from PKASO/U.
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- Full color for printers with color capability.
- 16-level gray scale for black and white photographic images, only from PKASO/U.
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Link the Apple computer with any and all major parallel printers of today or tomorrow. Unlike other printing interfaces which are limited by ROMs or DIP switches with pre-set configurations, PKASO/U is completely configurable for either present or yet-to-come Centronics parallel-interfaced printers. Another only-from-PKASO/U feature.

**Add ShuffleBuffer for a Complete Upgrade.**

The new Buffer with a Brain, ShuffleBuffer, does the printer-feeding work of the Apple so the computer is free to perform other tasks. It's the only buffer that can rearrange stored data, mix and merge, repeat and reprint. Ask your dealer for a demonstration.

**Pays for Itself with Color Ribbon Savings.**

Exclusive Mosaic Mode suspends color dot overprinting operation, uses color dots printed next to each other (not on top of each other) to achieve the desired shade. And since fewer dots are printed, less ink is used, ribbon life is doubled and the PKASO/U pays for itself in ribbons saved.

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A fully-documented Demonstration Diskette and detailed User Manual make it easy; just plug in the cables (included) and start producing masterpieces. Explore the amazing capabilities of PKASO/U by visiting a nearby computer peripherals dealer. Or call us directly at (215) 667-1713 and we'll send you the details. Unframed.



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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.

**The Coveted Mirror.** Berns, Thomason. Nicely drawn characters, arcade subgames, and fun, logical puzzles enliven nonviolent medieval adventure. Humorous and animated. Penguin, Box 311, Geneva, IL 60134. $19.95. *11/83.*

• **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, Hess. Challenging quest for pirate treasure features a mischievous ghost, huge maze, lush graphics. Well worth it. Micro Lab, 2699 Skokie Valley Rd., Highland Park, IL 60035. $35. *9/83.*

**Enchanter.** Blank, Lebling. First of trilogy sequel to *Zorks* expands interaction with other characters, goes above ground, increases use of logical magic. No big breakthroughs, but simply delightful. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95. *9/83.*

• **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, 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.*

**Infidel.** Berlyn. Excellent puzzles and a surprising bad guy hero in well-written treasure hunt. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95. *11/83.*

**Masquerade.** Johnson. Hard, logical, diabolically clever riddles in puzzle solver's *piece de resistance*. Great illustrations. Phoenix Software, 64 Lake Zurich Dr., Lake Zurich, IL 60047. $34.95. *11/83.*

**Philistine Ploy.** Aaron, Rosenbaum. Good Biblical graphic adventure based on the Book of Judges features more than 80 screens, some animation. Knowledge of the Bible not necessary to solve. Davka, 845 N. Michigan Ave., #843, Chicago, IL 60611. $34.95. *12/83.*

**Planetfall.** Meretzky. A lovable robot steals the show in this science-fiction text adventure. Includes many outstanding puzzles, rich, colorful, intelligent text. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95. *8/83.*

• **Prisoner 2.** Mullich, Edu-Ware. 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. Peachtree Software, 3445 Peachtree Rd. N.E., #830, Atlanta, GA 30326. $32.95. *The Prisoner, 3/81*; *Prisoner 2, 10/82.*

**The Quest.** Snell, Toler, Rea. As the king's newest advisor, you must accompany a champion on a dragon-slaying mission. Champion, parser accept advice in full and multiple sentences. Penguin, Box 311, Geneva, IL 60134. $19.95. *9/83.*

• **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.*

**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.*

**Witness.** Galley. Interactive mystery adventure set in 1938 reflects the style of pulp detective fiction popular then. Fun packaging and fun to play, although less complex than Deadline. A good step forward for an infant genre. 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 General Accounting.** Performs like General Ledger. Print checks, permits greater flexibility in handling accounts, produces 40 reports. 80 columns. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $395.

**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.

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

**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.*

**List Handler.** Keary, Elekman. List-lover's delight. Prints lists, labels, and letters. Handles 3,000 records per disk and eight disk drives. Takes requests. Silicon Valley Systems, 1625 El Camino Real, #4, Belmont, CA 94002. $49.95. *2/83.*

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

**Participative Management Skills.** Byrd. Interactive five-disk tutorial with text and workbook teaches benign management style leading to creativity, decisions by consensus. A super product with rewarding

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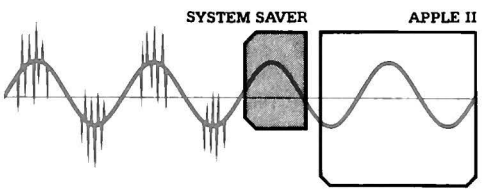
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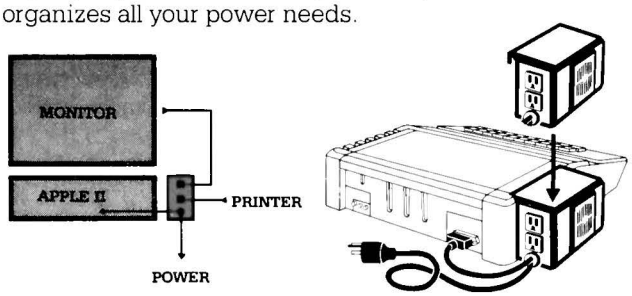
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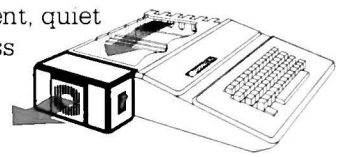
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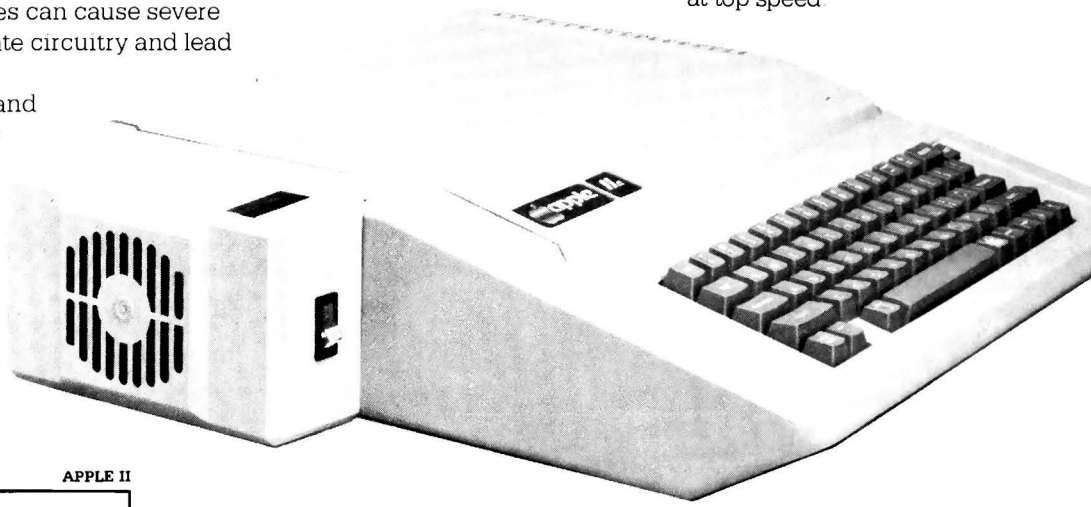

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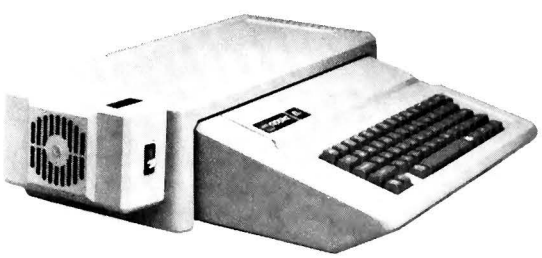


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results. Concourse, 2626 E. 82nd St., #215, Minneapolis, MN 55420. *12/83.*

**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. With 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.*

**Practical Accountant.** Single-entry, small-business accounting program allows user to set up chart of accounts with up to 50 user-defined categories, 300 subcategories, 20 tax-type definitions. Tracks cash flow by category to analyze profitability, tax consequences, general performance. SoftLink, 3255-2 Scott Blvd., Santa Clara, CA 95051. $149.95. *1/84.*

**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.

**Real Estate Property Management.** Thomas, Marlow. Helps real estate owners monitor the expenses and income generated by each property. Keeps track of security deposits, upcoming vacancies, slow-paying tenants; keeps accurate reports for tax purposes. Tomar Productions, Box 740871, Dallas, TX 75374. $149.95.

**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 System.** Standalone or interfaceable modules for a 12-month accounting period. Includes *General Ledger*, *Accounts Receivable*, *Accounts Payable*, *Payroll*, *Inventory Control* ($495 each), *Budget and Financial Reporting*, *Sale Invoicing* ($395 each), and *Professional Time and Billing* ($795). State of the Art, 3183A Airway Ave., Costa Mesa, CA 92626. *Accounts Receivable, 10/83.*

✓ **Time is Money.** Personal accounting package. Checkbook balancing with a full statement on-screen. Tracks up to 240 separate assets and liabilities. Turning Point, 11A Main St., Watertown, MA 02172. $100.

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

• **VisiCalc.** Bricklin, Frankston/Software Arts. 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.*

**VisiCalc Advanced IIe.** Virtually the same as advanced version for the Apple III. Create spreadsheet templates, provide uniform approach to forecasting, budgeting, and planning tasks for an entire organization. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $400.

## Communications

**ASCII Express: The Professional.** Robbins, Blue. Greatly improved version of original modem software package features automatic redial, individual macro files, and conversion of Integer, Applesoft, or binary programs into text files. Works with a plethora of hardware. United Software Industries, 1880 Century Pk. E., Los Angeles, CA 90067. $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.*

**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 E., Norcross, Ga 30092. $99. *9/81.*

**P-Term: The Professional.** Supports all Pascal-compatible interfaces, asynchronous serial cards, Apple-compatible modems, and baud rates up to 2400. United Software Industries, 1880 Century Pk. E., Los Angeles, CA 90067. $129.95.

**VisiTerm.** Well-planned, comprehensive. Hi-res 60-character display; wide range of protocols for sending test. 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 integrity. United Software Industries, 1880 Century Pk. E., Los Angeles, CA 90067. $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.*

• **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.*

**Exodus: Ultima III.** British. Super third installment of Ultima saga. Contains many features not found in *Ultima II*. Original score, wind and wave motion, four characters who can interact, tactical combat, and full-color dungeons combine with much more solid, involved plot to make an engrossing fantasy. Origin Systems, 1902 Back Bay Ct., Box 58009, Houston, TX 77258. $54.95. *11/83.*

**Knight of Diamonds.** Greenberg, Woodhead. 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, Lisalike 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.*

**Standing Stones.** Schmuckal, Sommers. Fifteen levels, 200 monsters, humor, and 3-D perspective in dungeon role-playing adventure. Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. $40.

• **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.,





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Sunnyvale, CA 94086. $39.95.

• **Ultima.** British. Hi-res color adventure, progressing from Middle Ages to beyond the space age. A masterpiece. California Pacific, 757 Russell Blvd., 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

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

**Apple Mechanic Typefaces.** Twenty-six new fonts for use with *Apple Mechanic*. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $20.

**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.*

**Beagle Basic.** Simonsen. Allows you to enhance and customize Applesoft by adding up to 12 functions. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $34.95. *10/83.*

**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.*

**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. *10/83.*

**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.*

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

**Frame-Up.** Weishaar. High-speed display utility generates professional presentations of graphics, text frames. Text screen editor lets you create text slides, add type live during shows. Optional preprogrammed display for unattended shows. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50.

• **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. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $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.*

**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.

**Type Faces.** Printing enhancement tool for dot-matrix printers; 15 hi-res character fonts available. Alpha, 12 New England Executive Park, Burlington, MA 01803. $125.

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

**XPS-Diagnostic.** Peters. Comprehensive hardware diagnostic utility by author of *Apple Cillin* includes graphic display of bad memory chips, tests for printers, RAM, ROM, and peripheral cards. XPS, 323 York Rd., Carlisle, PA 17013. $49.95.

## 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.


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- TAX BREAK ANNUAL - 1984 Edition is available now for $130.00.
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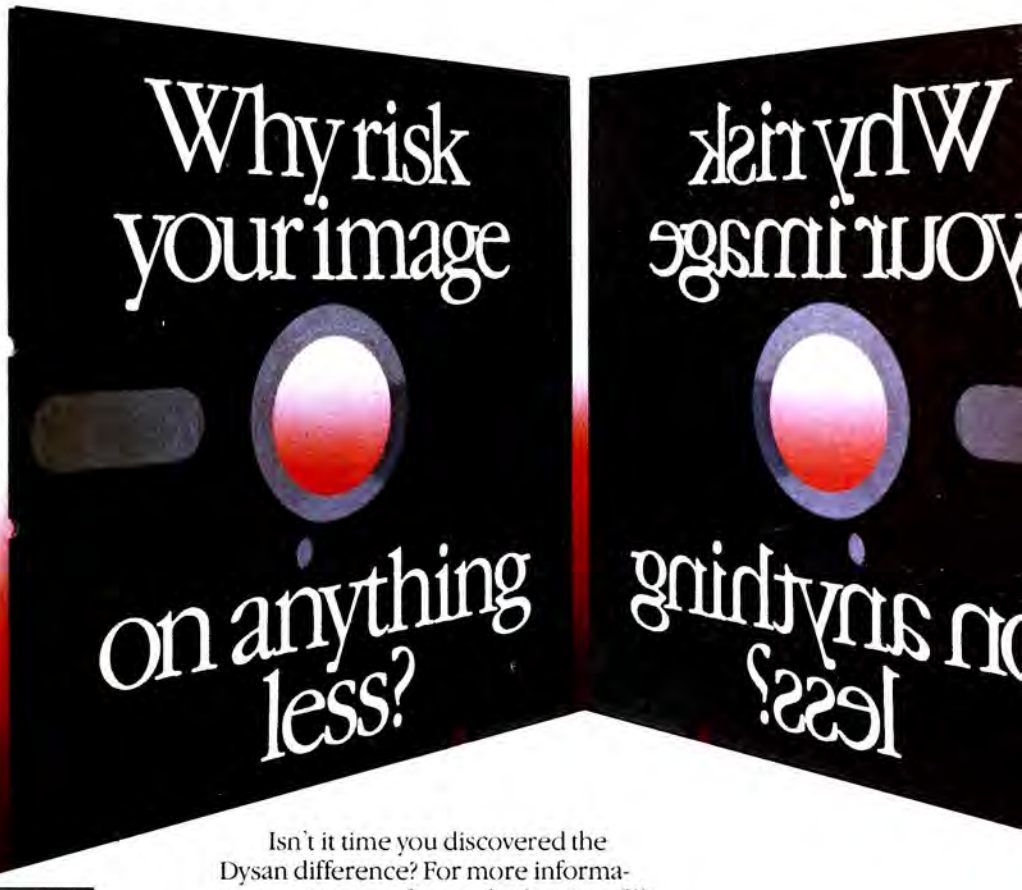
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• **Crossword Magic.** Crossword puzzle maker. Choose subject, words, and clues; program automatically connects words. Play on-screen or make printout. L&S Computerware, 1589 Fraser Dr., Sunnyvale, CA 94087. $49.95. *10/81.*

**Dollars and Sense.** Mullin. Establishes budgets, writes checks, reminds to pay bills. Uses graphs, reports to analyze cash flow, balance sheets, make year-to-date summaries, expense projections. Monogram, 8295 S. La Cienega Blvd., Inglewood, CA 90301. $100.

✓ **The Eating Machine.** Thorne. System designed to teach the analysis and planning of meals. Uses bar graphs and happy faces to gauge your calorie, vitamin, mineral intake and to show what percentage of total calories came from various food groups. Crude graphics, good documentation. Muse Software, 347 N. Charles St., Baltimore, MD 21201. $49.95. *1/84.*

**Einstein Memory Trainer.** 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. *12/83.*

**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 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.*

✓ **The Mad Poet.** North. Generates haikulike poems, illustrated with colorful graphics. Poor audio. Passive entertainment, can be used with a printer. Matrix Information Systems, 11728 Avon Wy., Los Angeles, CA 90066. $14.95. *1/84.*

**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, MA 01966. $40. *6/83.*

**Music Construction Set.** Harvey. Interactive music composition and learning tool allows user to create music or experiment with included music library. Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. $40. *12/83.*

**Natural Family Planning Personal Charting Program.** Ringsmuth. Charts, stores daily information on womens' fertility signs. Includes both graphic and statistical analysis. Family Life Software, 1401 S. 11th Ave., St. Cloud, MN 56301. $39.50.

**Simply Music.** Nye, Leonard, Jigour. Personal, effective guide to music comprehension, creation, and performance. Includes 10 available instrument sounds, requires alphaSyntauri keyboard. Syntauri, 4962 El Camino Real, #112, Los Altos, CA 94022. $179.95. *12/83.*

**ThinkTank.** 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 Videotext, 1000 Elwell Ct., #232, Palo Alto, CA 94303. $150. *8/83.*

## Home-Arcade

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

• **Alien Rain.** Suzuki. Monsters in this classic seem to take it personally when you gun down one of their own kind. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $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, 17 Paul Dr., San Rafael, CA 94903. $29.95. *9/81.*

**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.*

**Bats in the Belfry.** Moore. No shooting or getting shot at in bat catching, vampire dodging change of pace. Animation, graphics aren't flashy, just expertly and subtly done. Phoenix Software, 64 Lake Zurich Dr., Lake Zurich, IL 60047. $29.95. *12/83.*

**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.*

**Bouncing Kamungas.** Becklund. Sound is okay, animation good, premise original, action intense. One of Penguin's best arcaders. Penguin, Box 311, Geneva, IL 60134. $19.95. *12/83.*

**Buzzard Bait.** Ryeburn. Save the humans from man-eating buzzards in three-level shoot-'em-up-and-catch-'em. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $34.95. *11/83.*

✓ **Cavern Creatures.** Lowrance. Avoid cavern-dwelling snakes and monsters in your fast, maneuverable ship just to slam into a cavern wall or run out of fuel. Good joystick control. Has its faults. Datamost, 8943 Fullbright Ave., Chatsworth, CA 91311. $29.95. *1/84.*

• **Choplifter.** Gorlin. Fly your chopper to rescue 64 hostages, avoiding interceptor jets, homing mines, and tanks. Challenging, realistic, and playful. Stunning graphics. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $34.95. *7/82.*

**Crime Wave.** Your beat: the city. Bank robbers strike; can you catch them? Metropolitan chase-'em-up on city streets or at the scene of the crime. Penguin, Box 311, Geneva, IL 60134. $19.95. *4/83.*

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

✓ **Dino Eggs.** Schroeder. Warp into the prehistoric past to save baby dinosaurs from extinction. Avoid snakes and spiders by climbing and jumping from peak to precipice while building fires to ward off the dreaded Dino Mom. Micro Lab, 2699 Skokie Valley Rd., Highland Park, IL 60035. $40. *8/83.*

**Drol.** Ngo. Charming rescue mission set in a dream world with witch doctors, Garfield-like scorpions, kamikaze vacuum cleaners. Marvelous, smoothly animated graphics; challenging and playable. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $34.95. *12/83.*

• **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.*

**Fat City.** Hefter, Worthington. *Stickybear*-style urban renewal in family-oriented offering. Knock down deserted buildings while avoiding hostile rats. Superbly executed, playable. Xerox Education/Weekly Reader, 245 Long Hill Rd., Middletown, CT 06457. $39.95. *12/83.*

**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.*

**Gumball.** Cook. In the latest industrial arcade offering, there's work to do at the gumball factory. Color-sort the balls, zap explosive-laced gumballs planted by overzealous dental assistants, and try to get a promotion. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $29.95. *12/83.*

**Hard Hat Mack.** Abbot, 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.*

**The Last Gladiator.** Field. Gross me out, like totally. Snakes, spiders, bats, lizards, octopi, vampires and you, the gladiator. Good but grody. Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. $35.

**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, 17 Paul Dr., San Rafael, CA 94903. $34.95. *8/83.*

**Mad Rat.** Zintsmaster. A B-disk, arcade second feature to pop into the drive and play for hours when no one's looking. Simple but challenging. Phoenix Software, 64 Lake Zurich Dr., Lake Zurich, IL 60047. $24.95. *12/83.*

• **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.*

**Minit Man.** Malone. Build a bridge, fight off robots, fly a helicopter. Difficult and very detailed. Penguin, Box 311, Geneva, IL 60134. $19.95. *11/83.*

✓ **Pac-Man.** Official, original eat-'em-up arcade giant now available for the Apple II. Atari, Box 2943, S. San Francisco, CA 94080. $34.95.

**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.*

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

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

**Seafox.** A good sub-versus-convoy home arcader. Variety of vessels, bouncing torpedoes, refueling dolphins, and intelligent depth charges. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $29.95. *11/82.*

**Serpentine.** Hypnotic snake-chase maze game. Clean action, thrills, hairy escapes. Recommended. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $34.95. *10/82.*

**Shamus.** Mataga. Try to penetrate The Shadow's lair in order to kill him in complex mystery maze game. Four levels, 32 rooms per level. Synapse Software, 5221 Central Ave., Richmond, CA 94804. $34.94.

• **Sneakers.** Turmell. Many-layered shooting game; one of the best. Stomping sneakers and other



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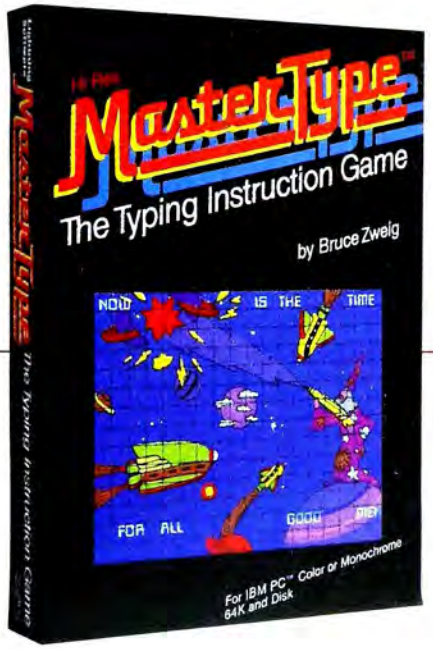
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creatures requires varying techniques. Fun. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *9/81.*

**Spare Change.** Zeller, Zeller. Bright graphics, ultra-smooth animation, clever sound effects, and cute characters add up to create an instant classic—the first computer slapstick comedy. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $34.95. *11/83.*

**Stellar 7.** Slye. It's you against the Arcturan world in excellent 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. *9/83.*

✓ **Super Bunny.** Leone. Help Reginald Rabbit ingest magic carrots and metamorphose into Super Bunny. Hop from elevator to elevator to defend Bunnyville from hostiles. Datamost, 8943 Fullbright Ave., Chatsworth, CA 91311. $29.95. *1/84.*

• **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, 757 Russell Blvd., Davis, CA 95616, and Creative Computing, 39 E. Hanover Ave., Morris Plains, NJ 07960. $19.95.

• **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. 3-D scrolling air raid brought to the Apple with little sacrifice in playability. Datasoft, 9421 Winnetka Ave., Chatsworth, CA 91311. $39.95. *9/83.*

# Home Education

**Algebra Arcade.** Mick, Konemann, O'Farrell, Isaacs. Rates a two for arcade fun, an eight for challenge, educational value, addictiveness. For one or two players. Wadsworth Electronic Publishing, 8 Davis Dr., Belmont, CA 94002. $49.95. *12/83.*

**Algebra 1-4.** Edu-Ware. 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. Peachtree Software, 3445 Peachtree Rd., N.E., #830, Atlanta, GA 30326. $39.95 each. *Algebra 1, 5/81.*

✓ **Alphabet Zoo.** Disharoon. Two programs in one. The first helps young children match letters with sounds. In the second, school-age kids move through a maze, selecting letters that spell words introduced in the first part. Generally good sound and graphics, animal motif. Spinnaker Software, 215 1st St., Cambridge, MA 02142. $29.95. *1/84.*

**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. Peachtree Software, 3445 Peachtree Rd., N.E., #830, Atlanta, GA 30326. $49.95.

**Cdex Training for the Apple IIe.** Zunkel. Self-paced, graphically oriented training program. Cdex, 5050 El Camino Real, Los Altos, CA 94022. $59.95, three disks.

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

**Decimals.** Edu-Ware. Master those elusive decimals. Eight programs including pre-test and learning units directed at conversion, addition, subtraction, rounding off, multiplication, division, and percentage. Peachtree Software, 3445 Peachtree Rd., N.E., #830, Atlanta, GA 30326. $39.95.

**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, 4005 W. 65th St., Minneapolis, MN 55435. $29.95. *11/82.*

**Early Games Fraction Factory.** Eyestone. Aided by colorful graphics and music, children see and describe fractions, find equal values with different denominators, multiply whole numbers by fractions, add and subtract fractions. Ages 8 to 12. Counterpoint Software, 4005 W. 65th St., Minneapolis, MN 55435. $29.95. *10/83.*

**Early Games Piece of Cake.** Eyestone. Kids become baker's assistants; adding, multiplying, subtracting, dividing cakes. Includes CatchaCake, a problem-solving race against time to stop a cake from falling. Counterpoint Software, 4005 W. 65th St., Minneapolis, MN 55435. $29.95. *10/83.*

**Electronic Playground.** Tunnell. Three programs on one disk include Matchbox: a game requiring kids to recognize similar shapes, capital and lower case letters, and count to nine; Magic Blackboard: a drawing and coloring program; and Heidi's Program: a kaleidoescope of color and movement controlled by the user. For ages 3-8. Software Entertainment, 537 Willamette St., Eugene, OR 97401. $24.95.

**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.

✓ **Factor Blast.** DeMuth. Select difficulty level, keyboard or paddle control, human or computer opponent, and begin blasting. One player directs a laser dish to blast a number on the screen; the other must blast a factor of that number. Aids in memorization, enhances math ability. Hayden Software, 600 Suffolk St., Lowell, MA 01853. $29.95. *1/84.*

✓ **The Fourth Leg of the Apple.** Brinker. Combination text and disk tutorial explains hexadecimal system, Apple's circuitry and memory, and the 6502 microprocessor. Includes an overview of languages, a Forth tutorial, and a chapter on assembly language programming. Brinker Computing, 2775 Tessmer Rd., Ann Arbor, MI 48103. $49.95. *1/84.*

**Fractions.** Edu-Ware. Hi-res addition, subtraction, multiplication, and division of fractions. With learning manager system. Peachtree Software, 3445 Peachtree Rd., N.E., #830, Atlanta, GA 30326. $49.

• **French Hangman, Latin Hangman, Spanish Hangman.** Protelsch, Earl. Hangman games that tell you the answer—in a foreign language. Interesting sentences, many formats. Addicting! George Earl, 1302 S. General McMullen, San Antonio, TX 78237. Two-sided disk, $29.95. *9/83.*

**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., #341, Berkeley, CA 94709. $39.

• **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.*

✓ **The Grabit Factory.** Box, Box. Easily controlled math game for ages five to eight. Student-controlled crane lifts numbers from a conveyor belt to perform number recognition, addition, or subtraction tasks. A grabber anyway you look at it. Eric Software, 1713 Tulare, Fresno, CA 93721. $39.95. *1/84.*

**Hey Diddle Diddle.** Disharoon. Three reading and vocabulary games that strengthen reasoning ability. Ages 3 to 10. Spinnaker, 215 1st St., Cambridge, MA 02142. $29.95.

**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. Teaches eye-hand coordination. Includes a nontiming, nonscoring learning mode. Micro Lab, 2699 Skokie Valley Rd., Highland Park, IL 60035. $30. *5/83.*

**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.*

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

**Master Match.** Robbins. Matching game with a TV quiz show format. Designed to enhance memory, teach vocabulary and concepts. For one to 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.*

**Math Blaster.** Davidson, Eckert. Elementary-school-level training in four basic math functions. Options to create lessons; several levels of difficulty for various ages. Human cannonball arcade game for each function. Davidson & Associates, 6069 Groveoak Pl., #12, Rancho Palos Verdes, CA 90274. $49.95.

**Math Maze.** A spoonful of maze helps the math go down in tutorial of four basic operations. Forty mazes, each so engrossing the math will fly by—and be learned. DesignWare, 185 Berry St., San Francisco, CA 94107. $39.95. *12/83.*

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

• **The New Step by Step, Step by Step Two.** *The New Step by Step* teaches beginning programming. *Step by Step Two* teaches intermediate Basic programming, peek and poke, hexadecimal numbers, concatenations, and more. Program Design, 11 Idar Ct., Greenwich, CT 06830. $89.95. *7/83.*

**Pick-A-Dilly Pair.** Gray. Computerized Concentration game with cute, animated cartoon characters, lively music. Seven difficult variations of standard game; entertaining, appealing—especially to kids. Actioncraft, 5753G E. Santa Ana Canyon Rd., #1200A, Anaheim Hills, CA 92807. $34.95. *12/83.*

**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 G.E.D. exams. Control Data, Box 261127, San Diego, CA 92126. Each lesson, $45.

**Rhymes and Riddles.** Cross. Four games to teach reading and spelling to elementary schoolchildren. 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.*

✓ **Shifty Sam.** Baird, Ingram. Fast moving game for ages eight to adult. Shifty Sam, a feisty casino dealer, challenges one or two players to a word battle. Unusual graphics. Develops word recognition, vocabulary, and spelling skills. Random House, 7307 S. Yale St., #103, Tulsa, OK 74136. $39.95.

**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. *9/83.*

**Spellagraph.** Grades 2-8 get a chance to guess the meaning of a sentence in picture form by correctly spelling words. Four-hundred words included, add your own. DesignWare, 185 Berry St., San Francisco, CA 94107. $39.95. *12/83.*

✓ **Spellakazam.** Confronted with a sentence that's missing a word, you race a magician through a maze, picking up the letters to spell the word correctly. If the magician beats you to the magic hat you get fewer points, but accuracy is more important than speed. Variable skill level. DesignWare, 185 Berry St., San Francisco, CA 94107. $39.95. *1/84.*

**Spellicopter.** UFOs try to stop player's helicopter from picking up letters to form words in latest spellicader. Slow in spots, not up to top arcade standards, but will help kids through spelling doldrums. DesignWare, 185 Berry St., San Francisco, CA 94107. $39.95. *12/83.*

**Spider Eater.** Borges, Higgins. KoalaPad-controlled musical education game for kids. Includes crazy sounds library. Koala Technologies, 3100 Patrick Henry Dr., Santa Clara, CA 95050. $29.95. *12/83.*

**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. In *Stickybear Shapes*, animated pictures teach shape recognition. In *Stickybear Opposites*, Stickybear and friends illustrate opposites. Xerox Education/Weekly Reader, 245 Long Hill Rd., Middletown, CT 06457. $39.95 each. *5/83. Stickybear Shapes, 12/83.*

**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.

✓ **Success with Math.** Ross. Consists of a series of programs: *Addition and Subtraction*, *Multiplication and Division*, *Linear Equations*, and *Quadratic Equations*. Nonalgebraic programs test the student's knowledge; algebraic programs instruct by giving hints for solving each problem. Provides an environment for learning and practicing rather than for gaming. One for the self-motivated learner. CBS Software, 1 Fawcett Pl., Greenwich, CT 06836. $24.95 each. *1/84.*

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

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

**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.

**Word Attack.** A vocabulary-building system with four exercises, including a fast-paced arcade game. Words and sentences illustrating usage on nine different levels, ages eight to adult. Davidson & Associates, 6069 Groveoak Pl., #12, Rancho Palos Verdes, CA 90274. $49.95.

**Wordrace.** Simon, Freedman. Word game, trivia quiz, and teaching tool that talks. Contains four levels, 2,500 words. Adult level is challenging surprise. Trivia section includes 1,200 names of famous

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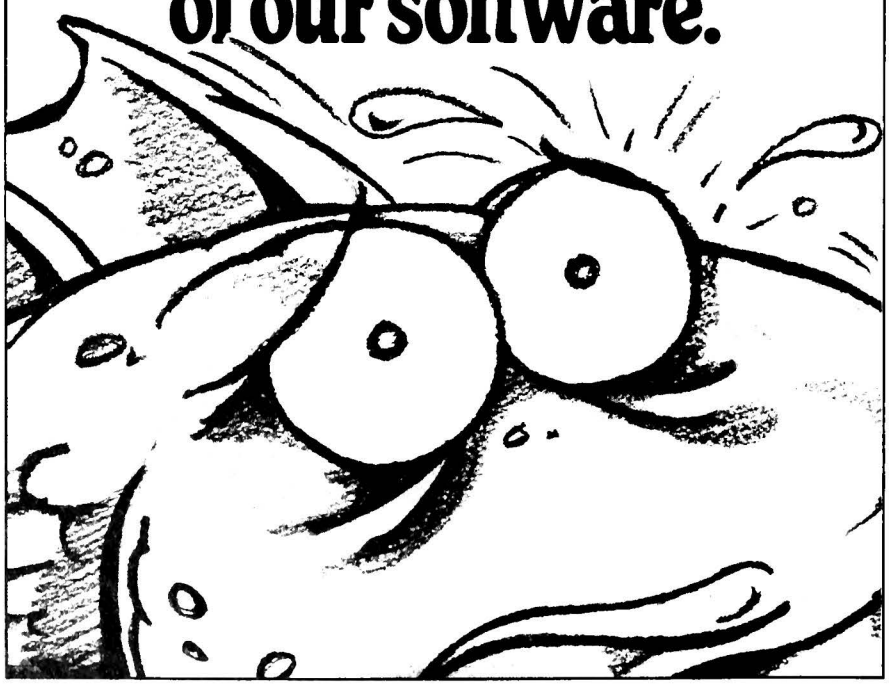
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sports heroes, historical figures. Just super. Don't Ask Computer Software, 2265 Westwood Blvd., # B-10, Los Angeles, CA 90064. $34.95. *12/83.*

## Strategy

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**AirSim-3.** Kurtz. Update of *AirSim-1* handles like a fast, exciting little airplane. Competitive with the best simulators on the market. Mind Systems, Box 506, Northampton, MA 01061. $44.95. *12/83.*

**Bermuda Race.** Biddle, Mattox. Excellent yachting simulation of Rhode Island-to-Bermuda race. First-rate graphics, challenging, and exciting. Includes sailing, navigation tutorial; for one or two players. Howard W. Sams, 4300 W. 62nd St., Indianapolis, IN 46268. $29.95. *11/83.*

**Broadsides.** Garris. Re-creates famous naval battles from the days of sail. Plays in either arcade or strategy mode. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $39.95. *12/83.*

**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.*

**Chivalry.** Hefter. Family-oriented computer-assisted board game involves medieval rescue of a kidnapped king, arcade versions of jousting, catapult shooting, archery. Rich in color and detail of the Middle Ages. Xerox Education/Weekly Reader, 245 Long Hill Rd., Middletown, CT 06457. $49.95. *12/83.*

• **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.*

**Eagles.** Raymond. World War I aviators climb, dive, shoot, run for home in historic aircraft. Be either German or Allied ace. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $39.95. *11/83.*

• **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.

✓ **Fortress.** Denbrook, Templeman. A cross of go and chess. You and your computer opponent build fortresses while seeking to dominate the area represented by the game board. Assemble a quiver of computer opponents, each with its own style of play. Simple to learn, challenging to play. Strategic Simulations, 883 Stierlin Rd., Building A-200, Mountain View, CA 94043. *1/84.*

**Geopolitique 1990.** Ketchledge, Billings. Diplomatic, economic, and military simulation that 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. *10/83.*

**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.*

**Gnosis VII.** Cuba. Fascinating, eminently playable logic puzzle involves quest for the word of power. Eternally replayable, not copy protected. Magnetic Harvest, Box 255, Hopkins, SC 29061. $19.95. *12/83.*

**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.*

**Legionnaire.** Crawford. Highly entertaining simulation of ancient battle between Romans and Celts. Fast-paced, easily completed in one sitting. Avalon Hill, 4517 Harford Rd., Baltimore, MD 21214. $40. *12/83.*

• **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.*

**Millionaire.** Zuber. Investment simulation lets you know if you have what it takes to make a quick million in the stock market. Every little market fluctuation represented on a weekly basis, includes investment tips. Blue Chip Software, 19818 Ventura Blvd., Woodland Hills, CA 91364. $59.95. *12/83.*

**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. *9/83.*

• **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 pieces has unique rules. Makes full use of computer capabilities. Intriguing, progressive, and addictive. Penguin, Box 311, Geneva, IL 60134. $19.95. *7/83.*

**Portfolio.** Dvores. Investment simulation puts from 1-15 players in charge of corporate portfolios. Handsomely presented, plays fast, good quality. Flexible Software, Box 5841, Charlottesville, VA 22905. $64.95. *12/83.*

**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.

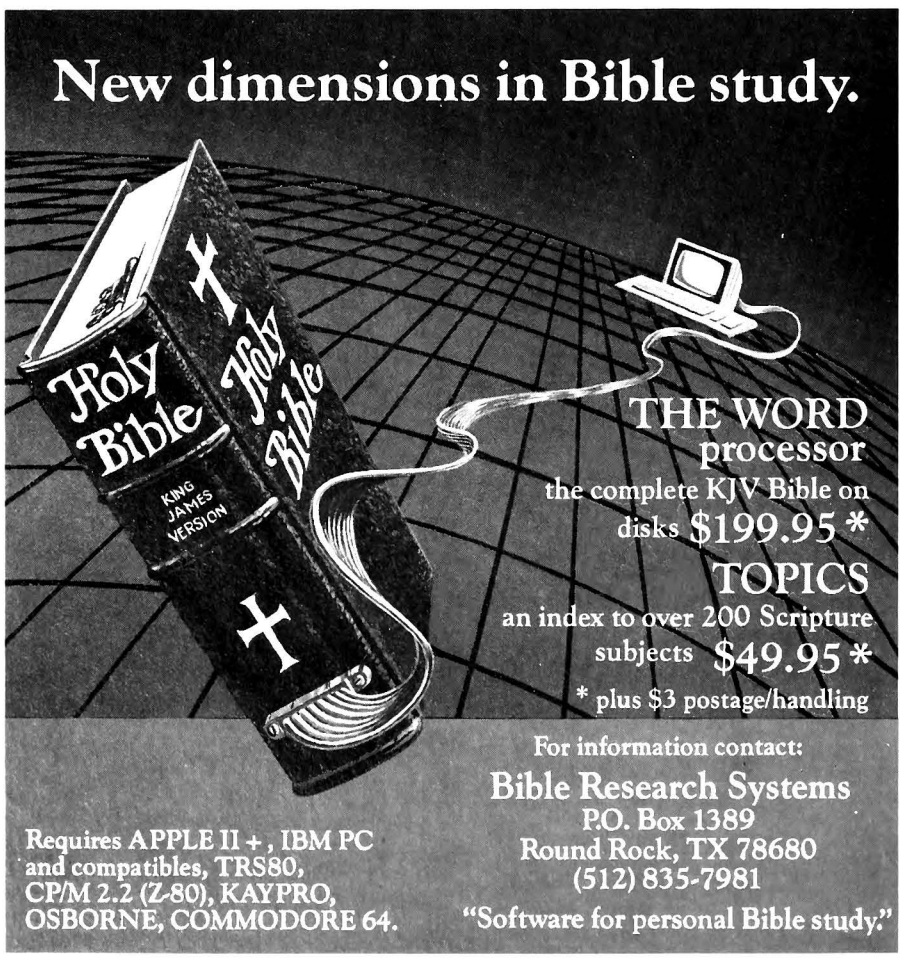
**Reach for the Stars.** Keating, Trout. Beautifully designed, detailed, complex interstellar strategy game with a fascinating wealth of alternatives. For one to four players. Strategic Studies Group, Ground Floor, 336 Pitt St., Sydney 2000, Australia. $50. *11/83.*

✓ **Regatta.** DeMuth, Peterson. Select a course, choose light or heavy winds, adjust your sail, and you're racing your small sailboat. Takes strategy, patience, and nerve; one for the old salts. Howard W. Sams, 4300 W. 62nd St., Indianapolis, IN 46268. $29.95. *1/84.*

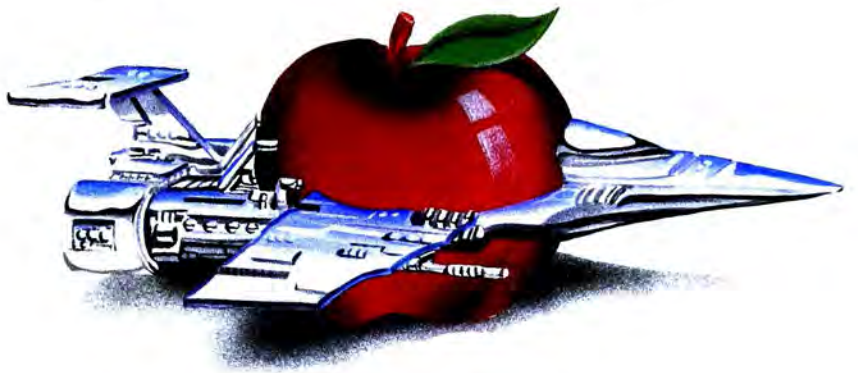
• **RobotWar.** Warner. Strategy game with battling robots is great teaching device for programming. Muse, 347 N. Charles St., Baltimore, MD 21201. $39.95. *1/81.*

• **Sargon III.** Spracklen, Spracklen. Plays good chess fast. Much improved from *Sargon II*, contains 107 classic games from the past for instruction or entertainment. Hayden, 600 Suffolk St., Lowell, MA 01853. $49.95. *10/83.*

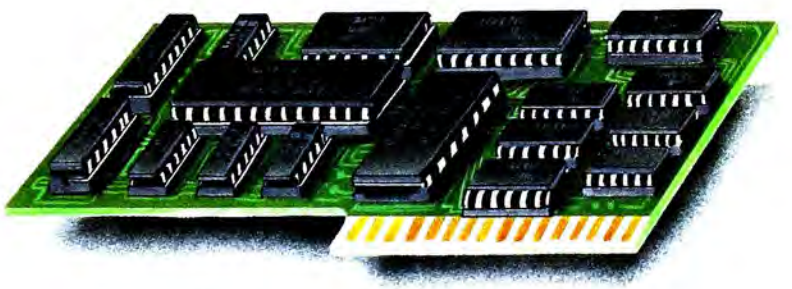
**Titan Empire.** Zaron. Captures the mood of classic *Star Trek* battles as you defend the solar system from marauding Titans. Frustrating, addicting. Muse, 347 N. Charles St., Baltimore, MD 21201. $34.95. *12/83.*



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## Utility

**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.

**Coloring Series 1.** Thornburg. On-disk coloring book for KoalaPad contains 25 geometric designs, includes manual with background on pattern creation. Koala Technologies, 3100 Patrick Henry Dr., Santa Clara, CA 95050. $29.95. *12/83.*

**Doublestuff.** Bonfiglio, Joselow. Programming language similar to Applesoft designed for use with Apple's stunning double-resolution modes. Requires IIe with B motherboard, 128K. Doublestuff Software Development, 2053 W. 11th St., Brooklyn, NY 11223. $39.95. *12/83.*

**Flow Charting.** Patton. Elegantly solves problems of designing and printing flow charts. Fun, easy to use, powerful. Patton and Patton, 340 Lassenpark Circle, San Jose, CA 95136. $138. *12/83.*

**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, Box 311, Geneva, IL 60134. $59.95. *5/82.*

• **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.*

✓ **Pixit.** Darooge. Easily manipulate and combine shapes. Helps you build and modify Applesoft shape tables and use them in programs. Listable. Baudville, 1001 Medical Park Dr. S.E., Grand Rapids, MI 49506. $49.95. *1/84.*

**Printographer.** Billard. Hi-res screen dump, crops images both horizontally and vertically, magnifies images, prints horizontally or vertically, compresses images to occupy fewer sectors. Southwestern Data Systems, 10761-E Woodside Ave., Santee, CA 92071. $49.95. *8/83.*

**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.*

## 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.

**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, 17 Paul Dr., San Rafael, CA 94903. $69.95. *2/83.*

✓ **Cut and Paste.** Designed for simplicity. Features include scrolling menus, automatic word wrap, block indenting, page formats, page numbering. Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. $50.

**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.

**HomeWord.** TC Computer Systems. Icon-operated word processor displays print-formatted document on-screen before printing, allows mixing of bold, underlined, or regular type. Includes page sketch: a window appearing in lower corner of screen that displays page format while user is working. Also features an automatic outline formatting capability. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $49.95. *12/83.*

**Lexicheck IIe.** Spell-checking companion to *Word Juggler IIe* has 50,000-word vocabulary, room for auxiliary personal dictionary, features global replacement of misspelled words. Quark, 2525 W. Evans Ave., #220, Denver, CO 80219. $129. Requires *Word Juggler IIe*, 128K. *10/83.*

**Magic Window II.** Forty, 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.

✓ **MegaSpell.** Good news for users of *MegaWriter*. *MegaSpell* is an easy-to-use spell checker with a 40,000 word dictionary with room for 10,000 more. Imperfect dictionary, difficult to use without two drives. $59.95. *1/84.*

**MegaWriter.** Gives 80-column page without 80-column card, prints in boldface, underlines via menu; features mail list merge, find, replace, text block move. Written in Pascal. Requires 64K. Megahaus, 5703 Oberlin Dr., San Diego, CA 92121. $59.95. *8/83.*

**Pen-Pal.** Moller, Moller. Small, friendly word processor that's particularly gentle with beginners. Includes almost every feature needed for manuscripts or correspondence. Howard W. Sams, 4300 W. 62nd St., Indianapolis, IN 46268. $59.95. *10/83.*




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**PFS:Write.** Edwards, Crain, Leu. Interfaces with other PFS programs. Includes search and replace, moving and duplicating of text blocks, help screens. Document appears on-screen as it will look when printed—including page breaks, underlining, boldfacing. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125. *12/83.*

**PIE Writer.** Business processor allows 9,999 pages. Word deletion, auto indent, spooling, and typeahead buffer. Hayden, 600 Suffolk St., Lowell, MA 01853. $149.95.

**ScreenWriter II.** Kidwell, Schmoyer. No extra hardware for u/lc, 70-column display, printer spooling. IIe version uses tab, arrows, computer's lower-case, and 80-column card. Edits Basic, text, and binary files; complete search and replace. Very powerful. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $129.95. *1/83.*

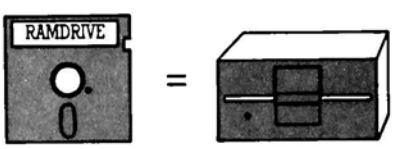
• **Sensible Speller.** Hartley. Spell-checking program sports listable 85,000 words, extensible up to 110,000 words. Recognizes contractions, gives word counts, word incidence, number of unique words. Clear documentation and simplicity of operation. Works with many word processors' files. Best of breed. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48033. $125. *11/82.*

**Word Handler II.** Elekman. Simple program with straightforward documentation. Eighty-column printing with the IIe. Silicon Valley Systems, 1625 El Camino Real, #4, Belmont, CA 94002. $199. *11/82.*

**Word Juggler IIe.** Gill Sophisticated word processor with search, replace, and block move. Printout can be viewed on-screen prior to printing; multiple copies printed of selected pages. Quark, 2525 W. Evans Ave., #220, Denver, CO 80219. $239. *10/83.*

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


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**The Writer.** Softwest. Easy-to-learn, easy-to-use for both schoolchildren and adults. Create letters, memos, and reports, generate form letters. Compatible with *PIE Writer*. Hayden Software, 600 Suffolk St., Lowell, MA 01853. $49.95.

**Zardax.** Phillips. Highly recommended. Single program includes supersimple use of word processing features. Considerable extras including communication by modem. Good 80-column facility with board, automatic in IIe version. Computer Solutions, Box 397, Mount Gravatt, Queensland, Australia. In the U.S.: Action-Research Northwest, 11442 Marine View Dr. S.W., Seattle, WA 98146. $295. *ZipComm* 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 Speller III.** Sensible Software. Spell-checking program based on the Random House Dictionary recognizes 81,400 words including geographic terms, names, abbreviations, figures. Gives word counts, word incidence; works with most Apple III word processors. Directly accessible from *Apple Writer III*, version 2.0. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. $175.

**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.

**BPI General Accounting.** BPI Systems. Includes *General Ledger, Accounts Receivable, Accounts Payable,* and *Payroll*. Maintains customer, employee, and vendor files; prints customer statements, checks. Analyzes budget, compares historic information, keeps independent financial records for 99 different departments and locations. Provides password protection for each company, can be maintained on one disk. Requires 256K Apple III, ProFile hard disk. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. $495.

**Catalyst.** Allows boot from hard disk; transfers all programs to ProFile. Quark, 2525 W. Evans Ave., #220, Denver, CO 80219. $149.

**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, 1701 S.W. 38th 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.

**Keystroke.** Handles large amounts of data. Can hold up to 32,000 records on hard disk and provide instant access. User definable keys. Access two files at once, or join two files. Report generator saves up to eight report formats. Easily merges with *VisiCalc*, *Apple Writer*, and *Word Juggler*. Brock, Box 799, 8603 Pyott Rd., Crystal Lake, IL 60014. Database, $249. Report generator, $149.

**Lexicheck.** Spelling checker that runs from inside *Word Juggler*. Fifty-thousand-word dictionary; add your own words. Eight-thousand-word legal dictionary disk also available. Quark, 2525 W. Evans Ave., #220, Denver, CO 80219. $145.

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

**Micro/Terminal.** Gives access to any in-house or remote database; set up and log only once. Built-in editor or edit off-line. Microcom, 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, inventory control, sales invoicing, payroll, professional time and billing. State of the Art, 3183A Airway Ave., Costa Mesa, CA 92626. *General Ledger, Accounts Receivable, Accounts Payable, Payroll, Inventory Control*, $595; *Sales Invoicing, Budget and Financial Reporting*, $495; *Professional Time and Billing*, $795.

**Stock Portfolio System.** Tracks investments, generates reports on current portfolio status, profit and loss statements, individual security status, dividend and interest income, expenses. Stores quotes for historical recall, calculates return on investments before and after tax, provides notice of stocks going long-term, dividends coming due, options expiring. Smith Micro Software, Box 604, Sunset Beach, CA 90742. $185.

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

**VisiCalc III.** Software Arts, Bricklin, Frankston/Software Arts. 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, 2525 W. Evans Ave., #220, Denver, CO 80219. $295. *12/82.*

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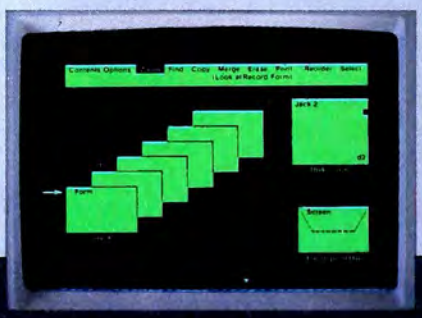
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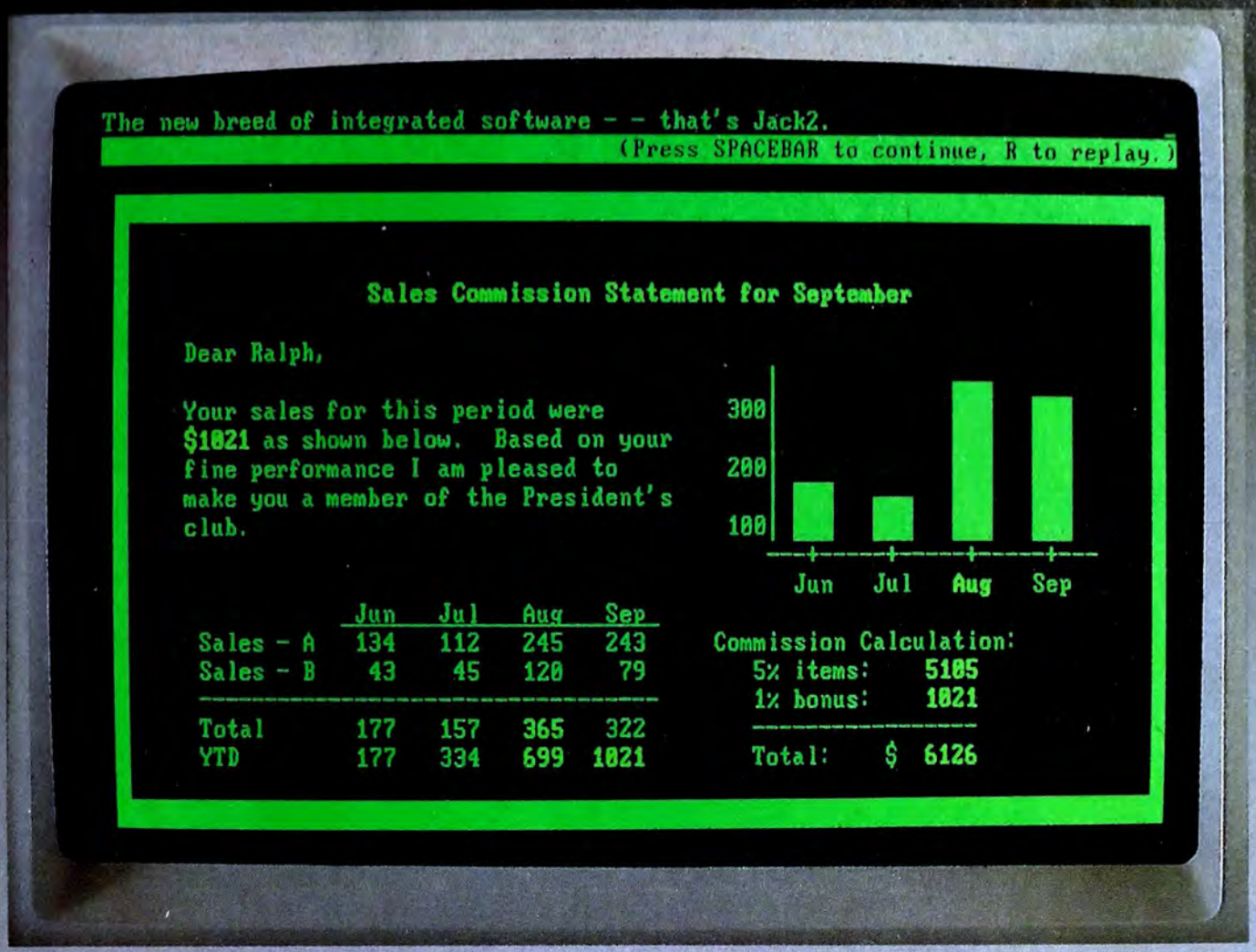
Word processing. Spreadsheets. Data base management. Charting. JACK2 is the only integrated software product for the Apple IIe. With over 20 man-years of experience developing software for the Apple, we've taken the most exciting, new, software for the IBM-PC and made it play on the Apple IIe. No need for windows. No need for additional processor boards. And no need to learn a specialized computer language.

Icon-driven commands make JACK2 as easy to master as it is powerful to use. Picture a screen that graphically displays your disks and names them. With envelope icons that, when opened, will actually display their contents. JACK2 will even let you choose whichever disk, envelope or record you're looking for simply by pointing to it with the cursor. All commands are in English. All are displayed on a single line and all have the identical function throughout JACK2.

And while the integrated applications of JACK2 offer unlimited potential as a business tool, individually they offer everything an expert could ask for.

Format multiple columns of word processing text on the same page and edit one without affecting another. Create complex spreadsheet formulas using plain English. Instead of A22=C38–G63, your next model will be as easy to remember and explain as Margin=Sales–Cost. Design data base forms right on the screen, line by line, column by column. Then change the original format and update all previous records without any loss of data. And when it comes to charting, what you see on the screen is what we print on the page. No need for expensive plotting equipment to produce a presentation quality bar chart or point graph.






The highlighted areas in the screen above illustrate the real breakthrough behind JACK2. Change a single piece of information in any one of the four related functions and JACK2 will change all the others, simultaneously, instantly and interactively.

Word processing text will accommodate the change no matter how large or small. Moving text, adjusting margins, altering page breaks. Spreadsheet calculations will be automatically re-computed incorporating the new figure. Data base information will be adapted to show the change. Even the bar chart will reflect the variation, instantly.

So, if you want to pack 16 bits of power into your 8-bit machine, get JACK2. From word processing, to spreadsheets, to data base management and charting, it's is a whole new breed of integrated software for the Apple IIe.



JACK2 is available for the Apple IIe with extended memory 80-column card (total of 128k) and two Apple disk drives.

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# OPEN DISCUSSION

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

**The Unthinkable**

The computer competition is heating up. One of the real advantages we Apple owners have is the tremendous hardware and software support of many companies. This is due to the large number of Apples sold. If the competition is such that Apple sales continue to drop, we could lose this advantage. What is worse is to think the unthinkable. If the competition is so successful that Apple Computer runs into financial trouble and dissolves, we may get into the orphan computer problems that TI and Osborne owners now have. I really wonder why this has never come up before in Open Discussion. It isn't something that we readers can solve, but we can't ignore it either. I am interested to know how others see this.
John Butitta, Neeneh, WI

**Plea To Reconsider**

I bought my Apple II Plus about two and a half years ago; at the time, this machine was being offered by mail-order firms as well as authorized retail Apple distributors. I had been considering purchasing my Apple by mail because of the very substantial price difference, but finally ended up buying it from my dealer, since I was concerned about service and support. I believe I made the right choice.

Still, when Apple Computer announced that it was no longer going to supply its products to mail-order firms, I was shocked. I saw the rationale behind this move, but I could also sympathize with those who would rather save a couple of hundred dollars and sacrifice better support. In cutting off discount mail-order sales, Apple helped open up the market for its own competition, the infamous Apple clones.

I remember in particular one mail-order firm offering a 48K Apple II Plus for under $1,050! Most people considering the purchase of a $980 or so Apple clone would probably be willing to shell out the extra seventy or eighty bucks and get a legitimate Apple—well constructed, well documented, well supported, and equipped with all those other things that have made it so popular. (The Apple clones, especially those from the Far East, are generally poorly documented and shoddily built.)

I understand what Apple was trying to do in stopping mail-order sales, but I think they have only helped their competition by doing so. I also speak for the armed forces stationed overseas or elsewhere, those with no authorized dealers nearby, when I urge Apple Computer to reconsider its mail-order policy.
Armando Fox, New York, NY

**A Booster Shot**

I've bought equipment for my Apple from my local Apple dealer, by mail order, and from a local non-Apple computer dealer. Most times there has been no problem, except for overpriced software—but that's another problem. I recently decided that 300-baud telecommunication was too slow and purchased a Novation Apple-Cat II with 212 upgrade from a local dealer. Delivery took about three weeks.

The modem I received had already been modified to work with the 212 upgrade card, which should have aroused my suspicion. I plugged them in, booted the *Com-Ware* disk on my IIe, and it died! Nothing worked right! I called Novation and discussed the problem with a technician. It seems the *Com-Ware* version I had was outdated—and how! Mine was version 4.0, the documentation (which was preliminary and so labeled) was for version 4.1, and Novation was on 5.03! Besides that, the boards failed the self-test at 1200 baud.

I contacted my dealer, who contacted his dealer, whose only—repeat, *only*—response was to obtain a return-for-repair number from Novation. They would not allow a return of merchandise, which I felt had either been used or lost in their warehouse for a very long time and should not have been sold as new.

Although there was some missed communication between Novation and me, they demonstrated an honest, sincere interest in resolving my problem. They provided an updated *Com-Ware* disk, repaired the boards, sent new documentation for the boards, and spent literally hours with me on the telephone answering my questions and resolving my problems. Every call to Novation was answered by an employee who wanted to help the customer. Their technicians were thorough but not condescending. The representatives in sales were friendly and efficient. The management staff was concerned and their actions reflected this concern.

I had more problems getting these peripherals into operation than with any other piece of equipment, electrical or mechanical. But I am a Novation booster! They make an excellent product, they're proud of it, and they obviously want all their customers to feel the same.
Carl Newman, Fairborn, OH

**Archivist's Recommendations**

A few months ago, *Softalk* printed a plea from me for old factory software. I'm still looking for it, especially 3.0 and 3.1.1 Systems Masters and original, contributed programs. I believe the Golden Oldies should be preserved and not lost to media recycling or disinterest.

Interactive Microware certainly deserves a bit of public praise. Interactive's programs are reasonably priced, and the company provides support (including the updating of listings) even for its original modestly priced *Scientific Plotter* and *Curve Fitter*. The *Plotter* was completely revised and a new disk and manual are available to purchasers of the original for only ten dollars. These useful, copyable packages are available for essentially the price of a game. They are a must for technical people who frequently need to collect, plot, and calculate measurements. These programs are primarily oriented toward analytical chemistry but are useful for any work in which measurements are plotted and/or processed by regression.
William Smyth, Monetta, SC

**New Reconnection**

I am writing to tell fellow *Softalk* readers about my experience with Hayes Microcomputer Products. I own a Micromodem II. When the wire connection on the microcoupler (black box) broke, I called the company. Without any questions about the age of my modem or guarantee, they told me that if I'd send it in I'd get a replacement. When they returned my modem, I found that it had not been fixed and that they'd given me a brand-new one! I would highly recommend Hayes Microcomputer Products for their great service.
Gary Orenstein, Providence, RI

**All Squared Away**

*The Market Analyzer* by N-Squared Computing is without question the most complete and flexible technical analysis software available. Its database can be updated by modem or manually. The auto data is taken directly from *Barron*'s. The database can also be designed to meet the needs of everyone. I keep daily data as well as weekly data. I've used it for a year and a half and now I couldn't live without it.
G.L. Morris, Dallas, TX

**A Schoolhouse at Home**

I bought an Apple II Plus and I don't make a heck of a lot of money, so I'm still paying for it. Like most folks of modest means who buy computers, I've found a world of confusion and expense when it comes to software. I don't have the time or money to drive to software dealers hither and yon to check software out.

I bought the Apple as an educational tool. I've got four kids. One is learning-disabled (ten years old), another is gifted (eight years old), and my six-year-old twins seem to be about average. I need to identify low-priced educational software that can help them learn and practice things like math skills, word identification, grammar, composition, programming, and so forth.

I'm no whiz kid, but I'm smart enough to see the educational value of a computer. If I can find a source of low-cost, good-quality software, I'm ready to increase my debt ceiling by getting some used Apples and hooking them to a hard disk drive so each child can have their own terminal to experiment with to their heart's content. Right now, computer time is a constant source of frustration. There never seems to be enough time to sate their curiosity—even with the very limited software I've purchased thus far. If any *Softalk* readers have faced this problem and solved it, I'd certainly appreciate hearing about it.

To the companies that write educational software, I make this offer. My kids, with their

widely divergent abilities, are fertile ground for testing the efficacy of your products in the home environment. We'd be open to a software test agreement, including skill testing before, during, and after exposure to your products. If you're interested, contact me through Open Discussion.
Bill Krumpter, Fort Lee, VA

**A Sour Note**
I'd like to express my annoyance at *Softalk*'s consistent bias in favor of alphaSyntauri.

Garry Asp used a Soundchaser on his tracks for the *Apple Compote* collection, but who gets credited in the ad? In the Newspeak article on NARAS, you mentioned us, thank you; but every time you mention Syntauri you also throw in a line of ad copy. This has been going on consistently in every story that *Softalk* has run about computers and music for the last year. Frankly, I'm fed up!

To refresh your memory, we are not the company that has implied that MIDI is unimportant; we are not the company that has introduced four different incompatible operating systems for their instrument; and we are not the company that got started by people who thought a computer keyboard would be a neat place to start learning about instrument design.

We are the company with worldwide distribution that is expanding through sales, not millions in venture capital. We are the company that is hiring new programmers to develop an expanding product line. We are the software company producing MIDI hardware and software. We are the company with an extensively integrated software line, and we continue to advance the state of the art.

Finally, we are the company started by the people who have been designing analog and digitally based synthesizers for over ten years, including the first sequencer on the market to use digital technology, the first synthesizer with programmable memory, and the first computer-controlled percussion synthesizer system.
John L. Borowicz, Vice President of Development, Passport Designs, Minneapolis, MN



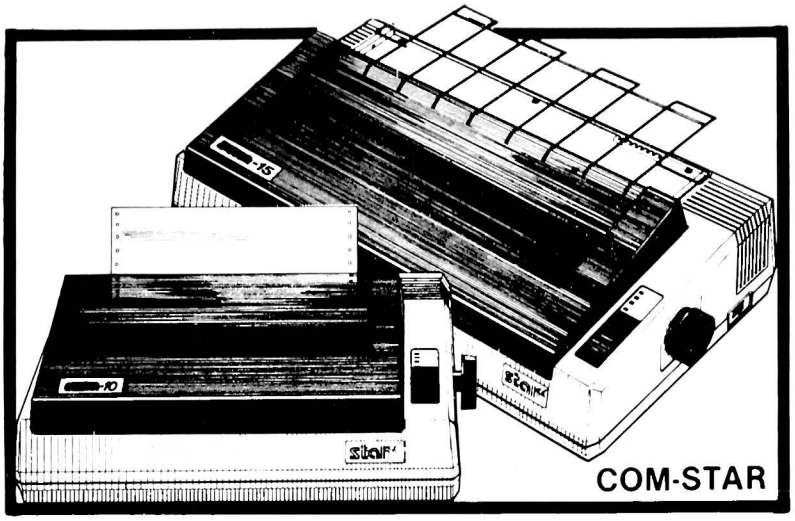

**The Work of the Lord**
I am the director of Livingwaters Youth Ministries, a youth ministry dedicated to the advancement of young people from the ages of three to twenty-six. We operate out of a local church, Livingwaters Church, in the Houston area. About eight months ago one of the young people, John Mikeska, came to me and asked if it would be possible to start a newspaper. I said we could do anything we put our minds to, and so we started planning the first publication. After looking into various methods of printing, we came up with the idea of using an Apple IIe computer. We made this decision because of the versatility offered by word processing over the old typewriter.

After reading *Softalk* reviews, we came up with the proper software, *Word Handler II,* and began the task of writing a monthly newspaper. The first obstacle we had to overcome was training the staff on the care and feeding of the Apple IIe. To my surprise the young people took to the Apple very quickly. After only about two hours of training with *Word Handler II,* the editor was writing and making corrections with very little help from me. It took about three days of work to get the final draft ready for the printers. The first publication was distributed on Easter Sunday.

After the first issue, we started looking for ways to improve the paper. Again we turned to *Softalk* for ideas and came up with a program called *Type Faces* by Alpha Software. This program allowed us to dress up the title page and also the title of each article. Of course, we later purchased *Sensible Speller* to help out with the proofreading. We now use the Apple IIe to handle our checking account and our mailing lists. We are also using it to design handbills for the church to distribute door to door.

My organization is proof that the computer and the church can work together. It has made it possible for a newspaper to be published by young people at a reasonable expense and still have a professional appearance. The Apple is definitely the best tool we have going for us. It allows us to work smarter, not harder.
Rev. Mark Ates, Houston, TX

**Now Hear This**
I believe that J. Barry Smith (October Open Discussion) has identified a problem with CRTs that may be of much more immediate concern than the recent controversy about radiation hazards. I too have experienced tinnitus (ringing in the ears) after an extended session at the keyboard, two feet away from my monitor. I have always known if a television




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was on, anywhere in the household, by hearing the squeal of its fifteen-kilocycle horizontal oscillator.

I think this problem may be widespread, especially among the female population of computer operators, who typically have more acute hearing than males. Have any other readers experienced this difficulty?
Gary Keene, Irvine, CA

Is J. Barry Smith (October Open Discussion) correct? Do long hours at certain video monitors cause tinnitus? Smith may be right on target. When I first got my Apple, I planned to use an old television as a monitor. But after seeing the difference between a television and a professional monitor, I chose to spend the extra money and got an NEC JB 120 monitor, the same brand Smith uses.

When I first plugged it in, it emitted a zinging sound not unlike a cicada, an insect that communicates with a high-pitched "zzzzzz" sound. At first the sound hurt my ears a bit, but since I only used the computer a few hours a week, I put up with it.

In the months that followed, I spent more and more time at my Apple/NEC. Then I found myself sitting for hours each day writing documentation for *Money Street*, a checkbook program I cocreated. During this period, the sound from the NEC faded away and disappeared.

"Well," I thought, "the sound was just something a new monitor throws off. Now that the monitor is broken in, the sound is gone."

Then my thirteen-year-old son, Jason, started asking me to turn the monitor off when I wasn't using it. He said the high-pitched sound hurt his ears. For some reason, I could not hear the sound. Next I noticed that my ears would occasionally ring. Finally, the ringing became a full-time, day-and-night annoyance. Maybe the NEC monitor had nothing to do with my tinnitus. But since the ringing in my ears is the same pitch and frequency as the monitor puts out, I'm suspicious.

Tinnitus is nothing to wish upon anyone. The sound is with you while driving, while reading, while trying to sleep—always. Worse yet, no doctor, drug, surgery, or therapy can cure it. It's a lifetime thing. Not good.

I'm anxious to hear if any readers have had a similar experience.
Bob Payne, Incline Village, NV

**Decibel Determination**

I was most interested in the article by audiologist J. Barry Smith (October Open Discussion). I have always been bothered by the 15 KHz sound put out by monitors and televisions. My wife can't hear it at all, but it drives me buggy, particularly with the loud ones. I pass Smith's on/off test easily, but I would be interested to know if there is some simple test I can perform to determine how many decibels are produced by my Sanyo green screen monitor. My secretary sits in front of it eight hours a day.

Can I somehow rig my tape recorder's dynamic microphone to my multitester to make a crude dB meter?
Craig Willford, Whittier, CA

**A Praiseworthy Trick**

You guys have to be kidding! I've had to pop my eyeballs back into their sockets more than once for *Softalk*'s October contest. It's the best one yet! Not only was the challenge of finding the missing words fun, but I read articles and ads that normally get overlooked. I have a feeling that I was tricked into it, but I'm glad I was. I've really missed out on a lot of good information. Thanks, really!
Bill Priday, Powhatan, VA

**Thoroughly Enjoyed**

I enjoy Open Discussion because it is one of the few ways I can learn what the average Apple user feels about products, hardware, and software. Also, it's heartening to find that my frustrations and joys are shared by others, such as when *SoftGraph* was published with an error. Once, immediately after I ordered *Lisa*, I read a negative reaction to this assembly language program. That letter almost made me cancel my order. I would like to state that I have used it with *Assembly Lines: The Book* without problems.

I enjoy Fastalk because I feel that if software is of high quality, it will be included. So far I have not been disappointed with the few commercial programs I have bought. I believe this is because I saw them in Fastalk or on the Bestsellers list. Where I live, there are, to my knowledge, no software stores where one can sample programs before purchasing. The local computer stores have a minuscule selection of software available compared to what I've seen in Fastalk, the Bestsellers list, and Marketalk Reviews. Often when I ask about a program, the salesperson is unaware that such a program exists.

To writers of articles about peripherals: Please remember those of us who do not own Epson, Centronics, or other popular brands. I have a TI printer and would like to learn more about using it, especially how to trick it into accepting graphics.

I also have some questions for fellow readers. I do a little programming, and I'm looking for an easy but effective way of alphabetizing sequential files. After reading about *Advanced Version VisiCalc*, I was unsure if I could use it on my Apple II Plus (48K, DOS 3.3). Yes or no?

Finally, thanks to *Softalk* for IInd Grade Chats. In the few months it has appeared, it has become one of my favorite columns. I also very much enjoyed the Exec on Beagle Bros.
Barbara Shapiro, Grand Rapids, MI

**An Ounce of Prevention**

I'd like to offer some help to a couple of readers and also to correct a possible error in the December DOStalk.

To Mike Vircsik (November If Then Maybe): Allowing a program to be copied while not allowing it to be listed and preventing the disk catalog from functioning is not a trivial task, but it is not difficult either. The solutions Matthew Yuen gave are not as good as *Poke 214,255*, which sets the Applesoft protection flag. Most commands entered in immediate mode will just cause the program to run. A complete solution would work as follows: Put the catalog on a different track, disable the catalog, FP, Int, and new commands (not too difficult), then cause the load command to do a Poke 214,0 (a bit tricky). This is sketchy, I realize.

To Duane Allman (December Open Discussion): *PLE* does in fact trap the escape key to allow you to have the keyboard macro facility. To be able to use escape in a program, you'll have to disable *PLE*. By the way, escape is ASCII code 27 (not 2, as stated in your letter).

To Tom Weishaar (December DOStalk): I believe the only way FP or Int will create a phantom exec is if the exec is actually executing in the buffer that gets trashed. Simple cases of using FP in an exec do not kill the exec, nor do they cause the Apple to hang, even with MAXFILES greater than 3. Let's hear what you think.
Steve Mueller, San Jose, CA

**Rules for Reentry**

To Tom Weishaar: Your article in December's *Softalk* was sage. The comments about computers and the perfectionist were on the mark—I kept wincing and saying "yes, yes."

Also on target was the information about execing text files. I spent all last week in agony, learning by experience some of what you so painlessly put in print. There was one point, however, with which I disagree. It is possible to reenter a program altered by an internal exec file, provided one follows a couple of rules.

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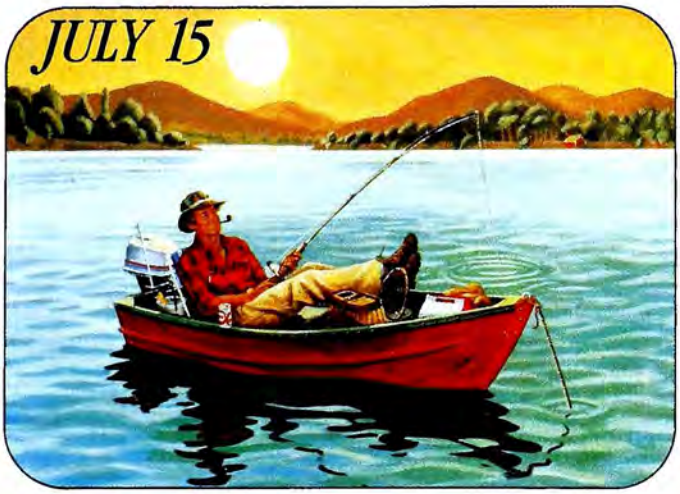
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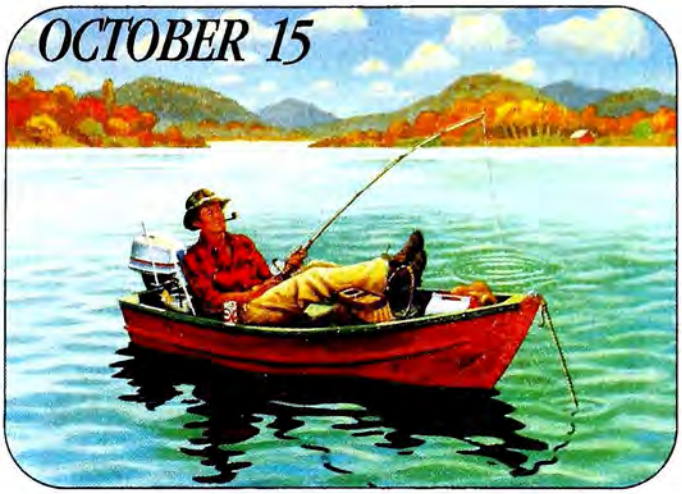
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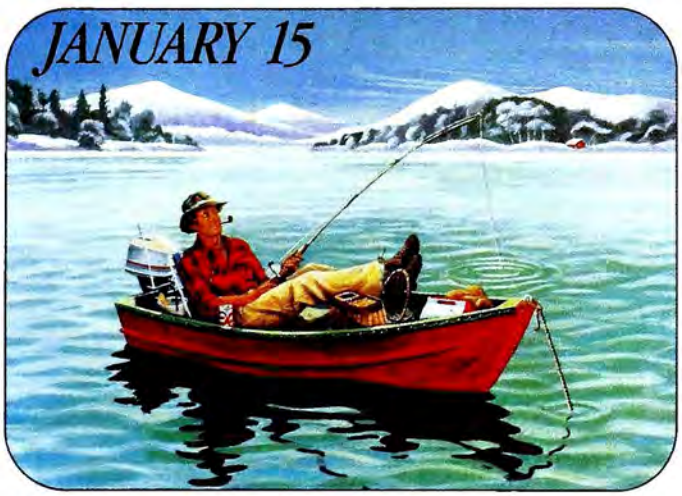
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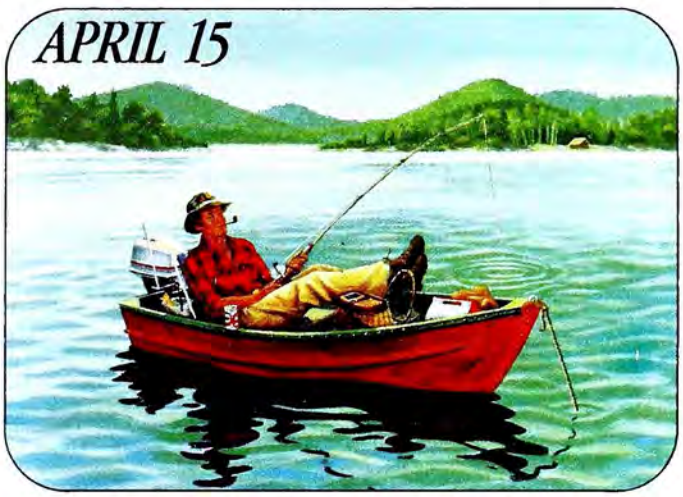
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even if the program has been altered by the addition or deletion of lines. Second, when the file is executed from within a program (or perhaps when it returns to the main program), all variables are cleared from memory and, therefore, must be either captured in the exec file or reread after returning to the main program. The process is more like rerunning a part of the main program than returning from a gosub.
Robert Holdsworth, Wilbraham, MA

### A Separate Option

When I read the If Then Maybe column in the December *Softalk*, I noticed a letter from Harley Flanders discussing the UCSD reserved word SEPARATE. The answer stated that SEPARATE was "an undocumented reserved word used at Pascal's system level." SEPARATE is a UNIT option on earlier versions of UCSD Pascal. What SEPARATE does is allow the programmer to create "separate" units, which are similar to units having several assembly PROCS in one file. I'm not sure of the syntax, but one declares a SEPARATE UNIT and, in the main program, declares each needed procedure as EXTERNAL without a UNIT statement. Then at link time, only the needed procedures are copied into the code file. I hope this helps.
Sam Cantrell, Los Angeles, CA

### Checksum Reprise

Does Bill Basham know what he is talking about? In the September Open Discussion he remarks that, when writing to a disk sector, the checksum depends on only the last two data bytes and thus "cannot be used to find errors in the first 340 data bytes." Poppycock. As anyone who has ever written his own disk access routines can tell you, the checksum depends on the values of all the other bytes in the sector.

A valid disk byte must have its highest bit set, and it cannot contain more than one pair of consecutive zero bytes. This is why 256 memory bytes must first be translated into 342 "reduced" (6-bit) bytes in a buffer before writing to the disk. However, DOS doesn't write the bytes directly; it first exclusive-ors neighboring bytes in the buffer. Thus if the first bytes in the buffer are $2F, $10, $06, what will be written is $2F (xor $00), $3f ($10 xor $2F), $16 ($06 xor $10), and so forth. (Actually the reduced bytes are translated into valid disk bytes just before writing, but that doesn't effect the argument, since there is a direct correspondence.) When all 342 bytes are written, the last byte in the table is written as it is, to act as a checksum. (By the last sentence, it would seem that the checksum does depend on the last byte. But wait!)

A similar idea is used when reading in a sector. That is, the value of the current byte is obtained by exclusive-oring the disk byte to the last byte read. Thus, if you read $2E, $3F, $16 (compare to the sample disk bytes above), the buffer will contain $2E ($00 xor $2E), $11 ($2E xor $3F), $07 ($11 xor $16), and so forth. So you can see that an error in one bit in the first byte causes all the successive bytes to be translated incorrectly. The checksum will not match the last byte read and so an error can be flagged (except in the extremely rare case that two errors will exactly cancel).

To prove that the checksum really does work, one can use a nibble editor or modify the RWTS sector-write routine to write an improper byte near the beginning of the sector. They try to read it with DOS. It will complain of a bad checksum even if the byte is among the first 340 data bytes. The experimental method triumphs again.

Another way that DOS can check the data is with the use of "bit-slip marks." When a sector is written, it is followed by the bytes $DE, $AA, $EB. Let's say that a disk error causes one of the bytes to have its highest bit clear, or to have more than one pair of consecutive zeros. The hardware will miraculously get past the checksum test, and DOS will find an error when it doesn't read in the $DE and $AA bytes. It's true that data errors occur very rarely (using a good disk, perhaps one in every billion bits), but still I'd prefer if the operating system would check anyway. I'd prefer not to have to verify files myself, and I don't want to wait until the next time I turn on the computer to find that my nascent Greatest Program Ever Written has been clobbered by a disk error.
David Wagner, Pacific Palisades, CA

### Problem Chat

The text page technique of Mr. Osrow's IInd Grade Chats (September) overwrites the I/O scratchpad areas with potentially disastrous results. Invalid data placed in these areas can wreak havoc.

A safe alternative to this is to bload the text into text page two (or three or whichever) and then move only the screen areas into view on page one. In the Monitor, there is a very useful subroutine for many text functions, labeled BASCALC—which, when entered with the line number ($0-$17) in the A register, places the base address for that line in $28L and $29H. To move page two to page one, you could use the following:

```
xx00- A2 00     LDX  #$00
xx02- 8A        TXA
xx03- 20 C1 FB  JSR  $FBC1  BASCALC
xx06- A0 00     LDY  #$00
xx08- A5 29     LDA  $29    BASH
xx0A- 29 03     AND  #$03
xx0C- 09 08     ORA  #$08
xx0E- 85 29     STA  $29    BASH
xx10- B1 28     LDA  ($28),Y
xx12- 48        PHA
xx13- A5 29     LDA  $29    BASH
xx15- 29 03     AND  #$03
xx17- 09 40     ORA  #$04
xx19- 85 29     STA  $29    BASH
xx1B- 68        PLA
xx1C- 91 28     STA  ($28),Y
xx1E- C8        INY
xx1F- C0 28     CPY  #$28
xx21- 90 E5     BCC  $xx08
xx23- E8        INX
xx24- E0 18     CPX  #$18
xx26- 90 DA     BCC  $xx02
xx28- 60        RTS
```

To change which page you are moving to and from, just poke in the appropriate values into the bytes $xxOD and $xx18. In Applesoft, it could be done with the formula:

BASE = 128 * LINE – (984 * INT((LINE – 1)/8)) + 896

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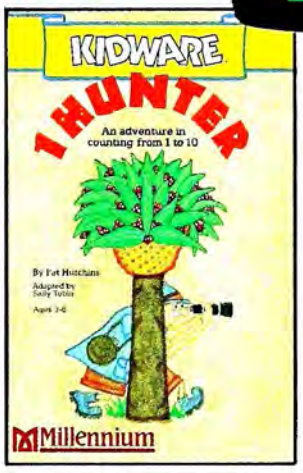




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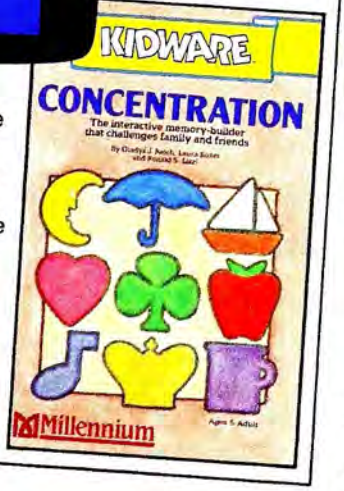



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This is a very slow alternative, however.

You can also make each text page file five sectors long, instead of six, by bsaving L1020($3FB). And to relocate your program, you could make the first line read:

```
104,12:POKE 3072,0:PRINT
CHR$(4)"RUN THIS PROGRAM"
```

If you use a lot of machine language subroutines in your program, or one that is long, and you don't want to wait to poke in all that data, you can make the subroutines relocatable by using relative or forced branching. Then move the code to just after the end of the program ($AF.B0) and reset the pointer past the end of the subroutines. Now they will be loaded along with your program! To call them, just do the following:

```
10 ND = PEEK(175) + PEEK(176)*256
100 CALL ND-(offset back into code)
```

You can edit your program and the code will float on the end. This frees up memory page three, the ampersand vector, and eliminates overwriting worries. One caveat, however, some renumbering programs reset the pointer back to where it "belongs."

I have found the techniques Dennis Osrow describes very useful in a database I have constructed that previously defied all commercial program applications. This way I have unformatted, full-screen editing and display, fast search (using BASCALC, of course) and update capability.

Thomas M. Vier, Sr., Reston, VA

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**Disk Switch**

There must be many readers who wish to use both sides of their disks. There are several ways to do this. One is by paying for a notch-cutting tool; another is using your own hole punch. The problem with both of these methods is that if a splinter from the cover should get on the disk, it may affect the disk's performance. It also doesn't look too great. Here's a solution, but you will need a Phillips head screwdriver, a one-foot-long piece of speaker wire, and SPST switch (which can be obtained at any electronic parts store), a soldering iron, and a small amount of solder.

The idea is to change the mechanism that detects the presence or absence of the disk notch, not the disk notch itself. Inside the disk drive is a switch that is in one position if the disk is notched and in another if it isn't. This is the write-protect switch. All we're going to do is replace this switch in the disk drive circuitry with an external switch that you control yourself, independently of the disk notch.

The first thing to note is that this addition to your drive will void the warranty, so it would be a good idea to wait until your warranty has expired anyway. Unplug the disk drive cable from the controller card by easing it up off its pins in a back-and-forth motion. (Make sure that the power is off, of course.) Next, turn your drive over and you will see four screws on the bottom. Take your Phillips head screwdriver and unscrew these four screws carefully. Now, grab the base of the drive in between the screws. Slide the outside portion or case of the drive backward towards the cable. It requires a little nudging but not a great amount of force. Be as gentle as possible.

You have the case off; now put the disk drive in its correct (upright) position. You should see a green circuit board on the top; this is what we will be working on. You should be able to see a resistor numbered R8 next to a big black clamp. Locate the two solder points indicated in figure 1. These are the points where you are going to hook up your switch.

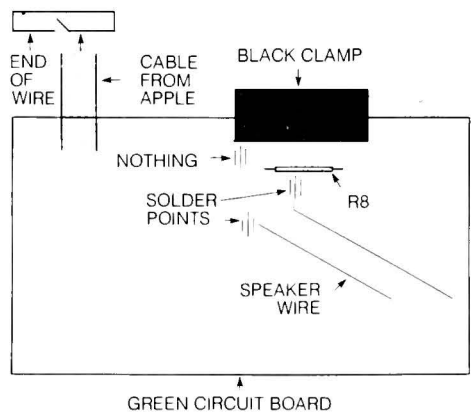



Figure 1.

Now, strip both ends of the speaker wire. Take your soldering iron, making sure it touches one of the contact points with your wire in hand. When the solder begins to turn to liquid, give it a second or two more so that the solder melts all the way through the hole. As soon as this happens, stick one half of the speaker wire into the hole. Now with the next solder, point to the same thing with the other half of the speaker wire (not the other end—see figure 2). Run the wire that is now connected in two places out of the drive through the white plastic clamp holding the drive cable to the back of the drive. Take the other end of the wire and hook up each half to the contact points on the SPST switch by twisting the wire ends around them.

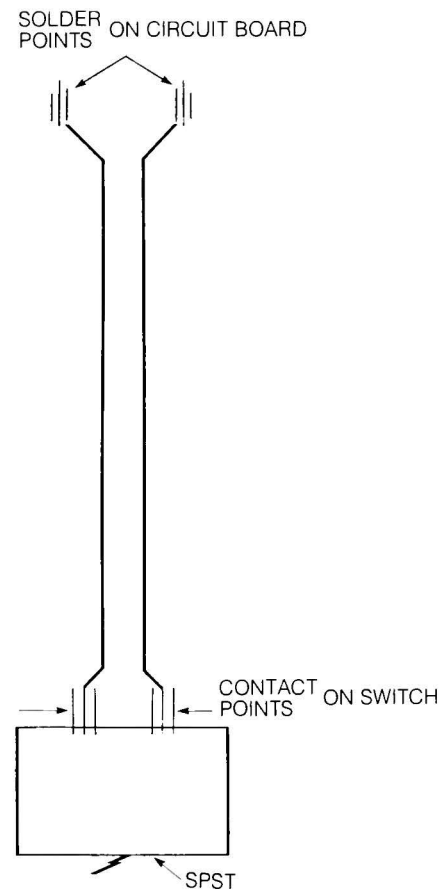



Figure 2.

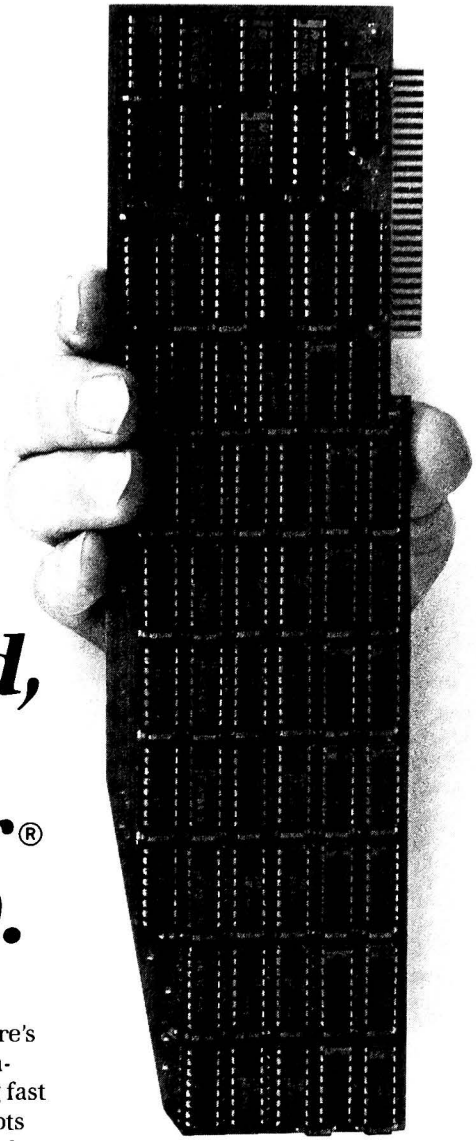
Now place the soldering iron on the wire that is connected to the contact points and hold it there for a second. Then place a piece of solder slowly onto the soldering iron and the wire. Do this for both sides of the wire (see figure 2). Now your switch is all hooked up—but do not put the top on until we make sure everything is okay. With the power off, hook the drive back up to the controller card. Now boot up any regular DOS disk. If the disk you just booted is not write-protected, put a piece of tape over the notch on the disk. With the switch in the off position, type *SAVE XX* and hit return.

You should get a write-protect error. If you don't, then the switch is in the wrong position; change the position of the switch and try again. If you get no error and XX is saved, check to make sure there are no shorts (see figure 3).

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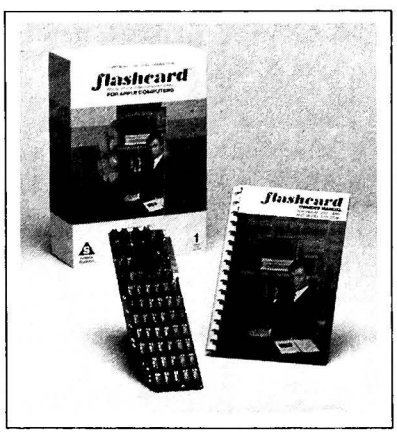
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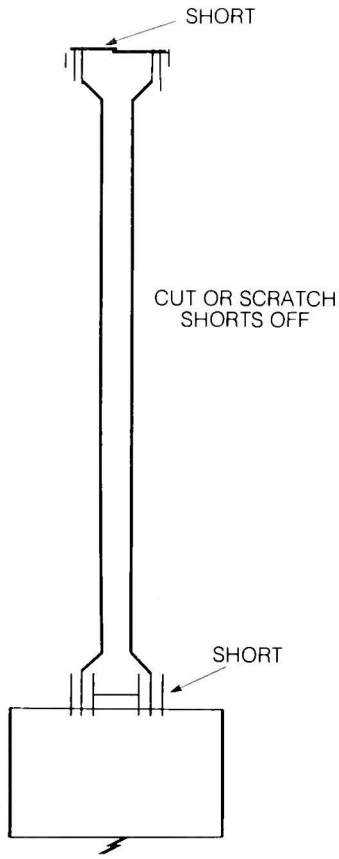



Figure 3.

Now, with the switch in the on position, type:

SAVE XX (return)
CATALOG (return)

Amazingly enough, you should see file XX on the disk, which shouldn't be there! If it does not save XX and produces write-protect error, check the speaker wire to make sure there are no cuts or breaks in it. Check the solder connections on the green board to make sure the wires are in firmly. Finally, check the connection on the switch. One of these three problems will be the cause of the error. Now slide the drive cover back and screw it on tight.

I have had this switch on my drive for over a year and have had no problems. It took me about twenty minutes to install the switch safely. The most important thing to remember is that disks get more wear from using both sides. When you use the second side of a disk, all the dust that has been trapped in the cover will be forced onto the disk because of the change of direction. All in all, this method is the best I've found to double-side disks.
Bob Pearl, Glencoe, IL

**Getting Rewired**

Allow me to apologize to *Softalk* and to Paul B. Brumbaugh for any embarrassment or inconvenience my letter (August Open Discussion) may have caused.

It is seldom possible to obtain a few feet of green insulated number fourteen wire at local hardware stores. My second choice was what I wrote to Paul. I thought he would understand the purpose of the ground connection in the first place, and if he had access to a supply of green wire he would use it, since I had referred to the color coding. His primary request was for a way to get a good ground connection without rewiring his whole house.

The confusion I mentioned resulted from the sale of floor and table lamps without plugs having wide and narrow prongs. This is something that has been a fact of the marketplace for at least fifty or sixty years. I have some adapters and sockets from my father's home, built in 1902, which have the prongs at right angles to each other. What happened seventy to eighty years ago to stop the use of them? I believe that it was consumer and sales pressure on the manufacturers to simplify the new technology in order to reduce sales resistance.

By the 1960s enough people had been electrocuted to get the attention of insurance companies and local officials. So the building codes were rewritten to protect us. If these codes are followed, as advised by David Stroup and Eric Lemmon, we can feel certain that the job is right. Imagine how dangerous it would be without standards! Well, that's the way it was even as recently as a thousand years ago. As proven by the old devices I have in my possession, the manufacturers were well aware of the need to make proper connections.

When I went to school, we were taught how to install open wiring mounted on porcelain spools. Everything looked like something from a Frankenstein movie. Romex cable was something new, expensive, and in short supply. My house was built in 1947 with two-wire Romex. Over the years I have added many circuits, always following the current electrical code. I worked in the engineering department of the local power company and spent hours referring to the various codes for the several counties supplied by the company. Everyone in the office was constantly informed of any changes in the codes.

Anyone who knows of the power struggle that occurred one hundred years ago in the new electrical industry knows that Thomas Edison was dead set against alternating current. We all know that the economics of really big business determines which technology will succeed. The ability to transform alternating current for long-distance transmission made George Westinghouse the winner. That is not to say that direct current would be desirable; just remember that dc would have simplified the situation in regard to the polarity of wall sockets and plugs.

When the original water pipes in my house started to rust through, I personally replaced them with soldered copper tubing. It is difficult for me to believe that there could be a potential difference in fifty feet of such material as compared to fifty feet of wire. While it is important to have definitions and to follow rules, it is also desirable to know what actually exists. At my location, the distribution transformer neutral is grounded at the supporting pole by a cable connected to a grounding rod buried in the hole dug for the pole. In my house, the neutral is connected to the water pipe close to the main breaker box. In effect, all my white wires are at earth potential. With three-wire systems the green wire is connected to the same water pipe or neutral. What has been gained by having two wires at earth potential? Safety. With a separate grounded lead throughout the house, any ground fault within a piece of machinery is properly handled. With the old two-wire system, such a ground fault could put full voltage on the frame of the equipment without blowing the fuse. That is how so many people got killed.

Manufacturers of low-priced electrical consumer goods have caused some confusion by oversimplifying to cut costs. Without plugs that require orientation to match the live and grounded leads, lack of understanding on the part of the consumer has resulted. Grounding is so basic to ac, and so critical, that it must be accepted as being as important as the polarity of direct current.
Edward Parker, Baltimore, MD

**CP/M Search**

I must express my concern with the CP/M article in the November *Softalk*. The key words are, "The bad news for Apple users is that national distribution is made only on 8-inch disks."

Since I purchased my Z-80 card from Microsoft several years ago, I have written to Microsoft, Greg Tibbets, CP/MUG, SIG/M—and about a dozen other folks—in a futile chase to find a program, any CP/M program, that will run on my Apple and cost less than $100.

I take that back. I bought a lower-case modification kit from some very nice people at Southeastern Software and a low-cost editor from the folks at Realworld Software.

Then, I got rich, and I bought the Apple IIe.



# SCRG

## SWITCH-A-SLOT




The **SWITCH-A-SLOT** is an expansion chassis, which allows the user to plug in up to four peripheral cards at one time. One of these cards is selected for use, and only that card draws power.

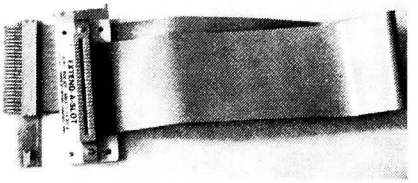
This product is especially useful where the software requires the printer to be in a particular slot, and the user wishes to choose between two or more printers.

- Allows up to four peripheral cards to be plugged into one peripheral slot.
- User selects desired card by front panel rotary switch.
- Only selected card draws power.
- Plugs into any peripheral slot.
- Saves wear and tear on delicate connectors.
- 18" cable connects Switch-a-slot to computer.
- Accommodates cards up to 10¼" long.
- All connectors gold plated.

**$179.50**

**SWITCH-A-SLOT and EXTEND-A-SLOT work well with all slow to medium speed cards, such as Modems, Printers, Clock, 80 Column, Music, etc. They are not recommended for high speed data transfer devices such as disk drive controllers, alternate processor, and memory cards. These products may be incompatible with some alternate processor cards.**

## EXTEND-A-SLOT



The **EXTEND-A-SLOT** brings a slot outside your APPLE™, allowing an easy change of cards. The 18" flex cable is long enough to allow placement of the card in a convenient location. The high quality connectors are gold plated for reliability.

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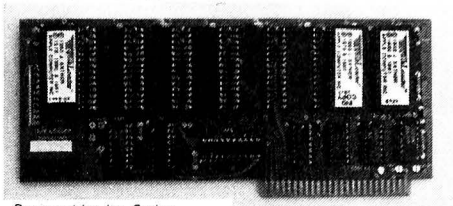
Experimenters—make easy changes to cards while card is installed.

EASY TO USE—just plug it in as you would any expansion card, then plug your card in. When you want to change cards, do it easily outside the computer, without the wear and tear on the computer expansion slot.

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## NEW PRODUCT

## quikLoader



*Designed by Jim Sather*

### SPEED

The quikLoader is the *fastest* way to load programs, ***BAR NONE!*** Applesoft, Integer, or machine language programs can be loaded in fractions of a second. More importantly, DOS is instantly loaded every time the computer is turned on. Integer is even loaded in the language card. This process takes less than a second, saving valuable time. The quikLoader operating system can keep track of over 250 programs stored in **PROM**s (Programmable Read Only Memory). The user simply transfers any of these programs to PROM using the instructions packed with the unit, and any PROM programmer, or we will provide this service.

### CONVENIENCE

How many times have you started to work with a frequently used program, only to find that you have misplaced the disk, or worse, had the disk damaged, or the dreaded "I/O ERROR" message flash on the screen. With the quikLoader, these nightmares can be a thing of the past. Frequently used programs are available *instantly* when you need them, without having to look for the disk, or hoping that the lengthy disk loading procedure goes smoothly. If you do need to use standard disks, the quikLoader even speeds up that process. For example, to catalog a disk, just press ctrl-C Reset. To run the "HELLO" program, press crtl-H Reset.Other "one-key" commands include entering the monitor, booting the disk, calling up the mini-assembler, etc. The major difference between the quikLoader and the other ROM cards is the complete operating system (in PROM). This enables you to get the quikLoader catalog on the screen (by pressing ctrl-Q Reset), allowing you to see what programs are available. Loading or running of the desired program requires one keypress. Program parameters, such as starting address and length of machine language programs can be seen on the catalog screen, if desired.

### VERSATILE

The quikLoader will accept any of the popular PROMS available on the market, 2716, 2732, 2764, 27128 and 27256. These types may be freely intermixed on the card. Long programs can take up more than one PROM, or several short programs may be stored on one PROM. The quikLoader operating system even handles multiple cards, so you can easily double or triple the amount of PROM memory available. The ultimate memory capacity of one card is 256K, so many frequently used programs and utilities can be stored. We even start your library of programs with the most popular utilities on the card, FID and COPYA. Now, if you have to copy a disk, you don't have to search for the master disk. You can start copying within 3 seconds after turning on the computer.

### INCREASED DISK CAPACITY

Since DOS is loaded from the quikLoader every time the computer is turned on, it is not necessary to take up valuable disk space with DOS. This will give you more than 10% additional space for programs and data on your disks.

### SYSTEM REQUIREMENTS

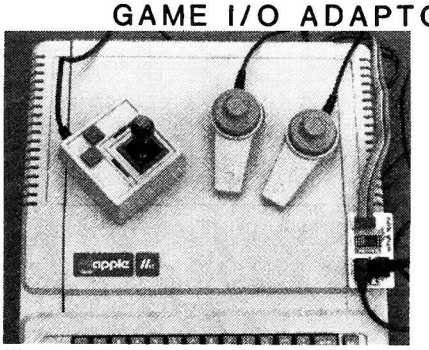
The quikLoader plugs into any slot of the APPLE ][+ or //e. If used in a ][+, a slightly modified 16K memory card is required in slot 0. A disk drive is required to save data.

DOS, INTEGER BASIC, FID, and COPYA are copyrighted programs of APPLE COMPUTER, INC. licensed to Southern California Research Group to distribute for use only in combination with quikLoader.

**$179.50**

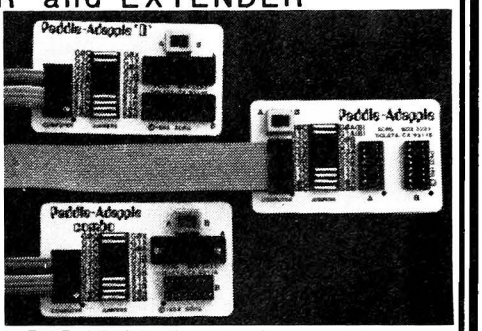
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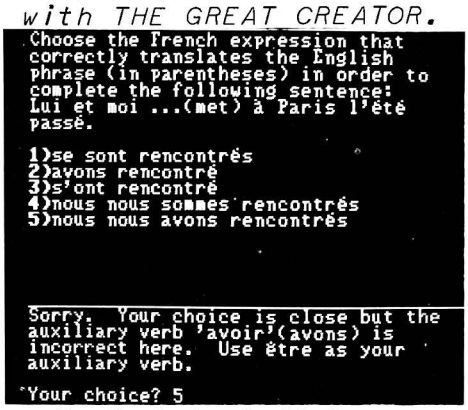
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Now I find out from Microsoft that it costs $40 to upgrade my Z-80 card to work with the IIe's lower-case keyboard.

If any dedicated readers want to do a favor for a very grouchy CP/M-less fellow reader, please tell me where I can get some neat public-domain CP/M stuff that will work on my Apple and its 5¼-inch drive?

Paul Raymer, Las Vegas, NV

**Give Him a Handle**

Does anyone know how to send print control commands from *Word Handler*? I have an Epson MX 80/III, Graftrax Plus, with a Grappler Plus interface all on an Apple II Plus.

George J. Rezac, Papillon, NE

**To Go with the Flow**

As part of my job, I have written extensive documentation for an automated serials list and its twenty or so programs that run on a mainframe computer. I have an Apple II Plus that is used for data entry and the writing of documentation. One phase of the documentation consists of nearly a hundred pages of detailed flow charts. I need to find a way to put these flow charts on the Apple so I can easily modify them as the programs are modified. My equipment includes a 64K Apple II Plus, two disk drives, *Apple Writer II* and preboot disk, Videx Videoterm eighty-column card with lower case, a Gemini 10X printer, and a Grappler+ printer interface. I have not yet bought a graphics program, because I don't feel I know enough to determine what I need. I want to be able to enter a phrase or question and some sort of shape indicator, and then have the program position the words and draw the shape around them. I would appreciate any ideas on how to do this, or any comments from anyone who has successfully put flow charts on an Apple.

Mary Jensen, Baton Rouge, LA

**Templates, Anyone?**

I am using what appears to be a very fine database, *General Manager*. I'm not experienced enough to fully enjoy its power, and there is one frustration I'm having now. I use this program to track customers and I'd like to know if anyone has come up with some business and accounting templates? It sure would help.

Gary Suboter, El Paso, TX

**Spaced Out**

I own an Apple IIe which I use mainly for word processing with *Apple Writer IIe*. I am delighted with both the hardware and the software, but I have run up against a problem with the underscoring of text.

When I underscore a book title or foreign word, as I must do frequently in my formal manucripts, I must allow a character space for the underlining token. This poses no problem if the underscored title or phrase is in the middle of a sentence, because I can just type the underlining tokens in the spaces right before and right after the passage. When the text is printed, the spaces taken up by the underlining tokens show up as the usual empty spaces between words. However, when the underscored section is at the end of a sentence or just before a punctuation mark, the space taken by the underlining token is printed as a blank space. Such spaces before punctuation marks mar an otherwise professional-looking document. Is there any way to get around this difficulty? I have tried substituting different underlining tokens for the backslash, which is the default token in *Apple Writer IIe*. I have even tried, unsuccessfully, substituting control characters.

Nothing seems to work. Help!

John W. Johnson, Six Mile, SC

**Getting Beyond Zip**

I would also like to be able to use the shift key instead of the escape key to get upper-case letters in *Apple Writer I*. Can anyone help? I know zip about assembly language, but I can program in Basic. I have installed the shift-key wire.

Does anyone know of a program written for managing a ministorage operation?

William C. Vasser, Jr., Dayton, OH

**Magic Conversion**

I used *Apple Writer II* for a long time before discovering *Magic Window II*. I have many disks full of *Apple Writer II* files; I'd like to convert them so our office could use a single word processing program. How can I convert the *Apple Writer* files to something readable by the *Magic Window* program?

Dean A. Park, Maryland Heights, MO

**The Font of Youth**

I am thirteen years old and my family owns an Apple IIe with an Apple Dot Matrix Printer. Although the fan-fold card that came with the manual shows which characters to send to the printer to begin downloading a new character set, it doesn't show how to construct the actual data that makes up the characters. I would like to create and load fonts without buying a software package to do it. If anyone can help me, I would be very thankful!

Brian Westphal, Redford, MI

**Add-on Quandary**

I constantly see ads for add-ons to the Apple, some of which I believe I may have a definite application for. My problem is, I don't know enough about any of them to make any compatible selections. Some of the questions I would like answers to are:

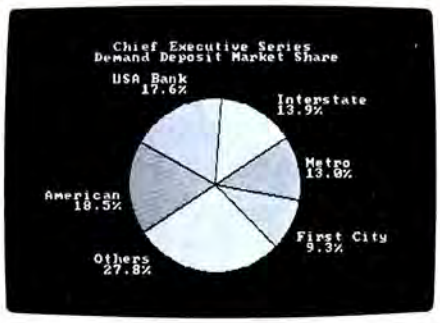
What is the best/least expensive way to add more RAM to my 48K Apple? How does one get lower-case capability, and when can (or shouldn't) the lower case be used? I know you can get lower case printed out with a word processor program, but is this the only time lower case is used?

What is a typeahead buffer and what does it do? Why do you need it? When can eighty-column boards be used and when not? What should one be looking for when in the market for such a board? What are the pros or cons of a keyboard with a numeric keyboard, shift lock, and user-defined keys?

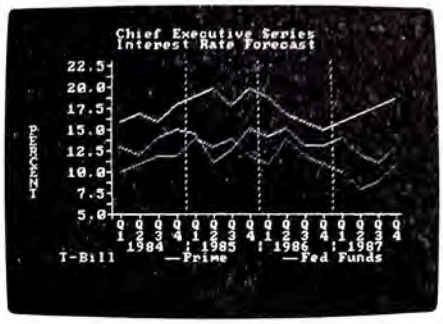
Are all or most of the above added features available in a single board? Would it be cheaper or better to just trade up to, say, an Apple IIe rather than buy add-ons?

Any help readers can provide in answering these questions will be appreciated.

R. Benjamin, Redlands, CA






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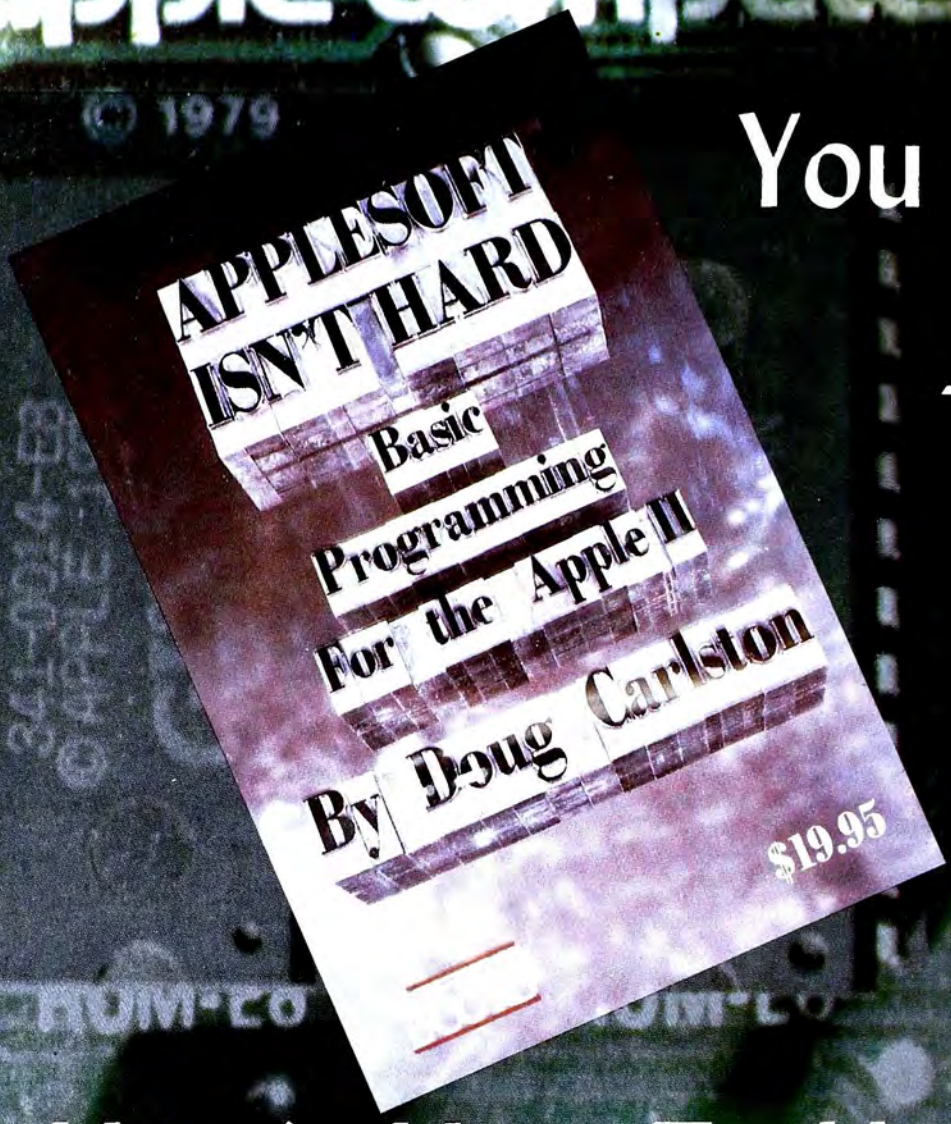
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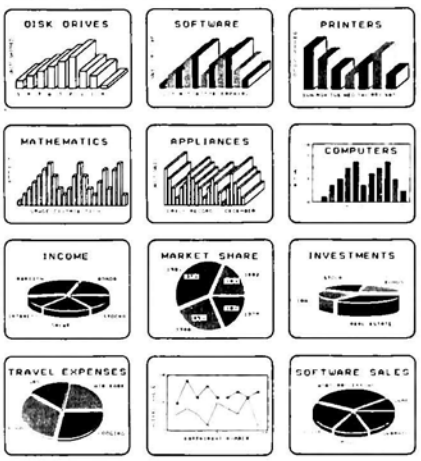
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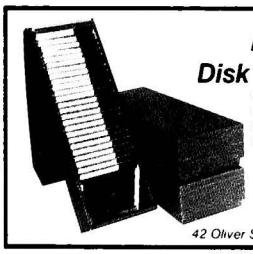
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(213) 980-5074

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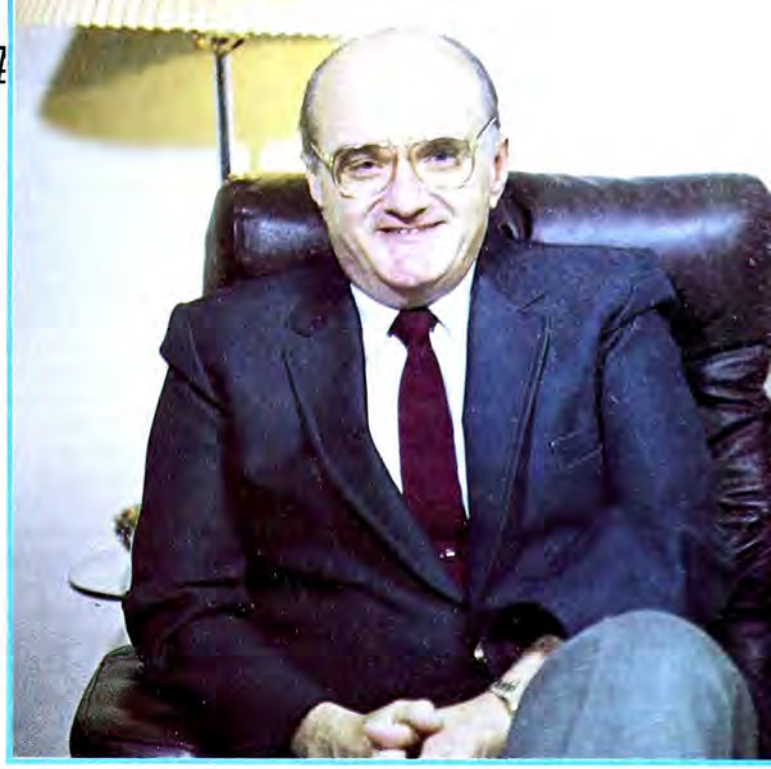




# EXEC HUMAN







This page and opposite page left to right: Human Systems Dynamic's founder and chief executive office Virginia Lawrence; cofounder and chief programmer Stephen Madigan; technical writer Kathy Abelson; marketing director Bob Steel.

# SYSTEMS DYNAMICS

## A Quieter Revolution

### BY DAVID HUNTER

*"We aren't turning out a large number of people who have the basic tools to understand the computer revolution and make proper use of it."*

—Doug Carlston

*"If some computer work could be made compulsory in every school, computers might be a step toward solving problems that separate the classes."*

—Virginia Lawrence

If you've been following the computer news of late, then you've read repeatedly that the industry is going through a shakeup. Small and large software and hardware companies are going bankrupt or selling out. The industry is changing.

Standardization is the rage; the hardware manufacturers are engaged in cutthroat competition. About all the software companies can do is hang on and react to the industry-shaking clash of the titans. To make matters worse, at the moment the need for personal computers is not as self-evident to many people as the industry—even Apple and IBM—thought it would be.

Is America's much-heralded computer revolution running out of

Hardened revolutionaries, the Human Systems Dynamics staff. Front row, left to right, Kerry Martinez, Jay Becker, Coreen Gorman, Heidi Drury, Lou Drury, Virginia Lawrence, Kathy Abelson, Bob Steel.

steam when it's barely gotten past the first big bend in the tracks?

**Shake, Rattle, and Revolution.** Currently, the computer industry is in the midst of the early chaotic in-fighting that characterizes the birth of a great industry, and have no fear—this industry will be great (as in large and powerful). But the revolution, the one in the minds of so many of those who are leaping into the software or peripherals business, may be just a dream.

The truth is, thousands of middle-class businesspeople are not all going to make multi-million-dollar fortunes and move up a rung on the social ladder. There just isn't enough room at the top. Those middle-class entrepreneurs who hope to attain the wealth and power of the ruling class through computers will be disappointed. We're seeing that already. The large corporations are adept at survival—they can't live long in the jungle, fat and free, otherwise.

It's time to stop and think about what is meant by a computer revolution. Perhaps we've put too much faith in the economy-reviving promise of computers. There's most definitely a revolution going on that's directly attributable to computers, but it's not a major reshuffling of the social order through the machinations of business. Rather, the revolution is occurring in the way we do things—the way we learn, create, manage, play, and perhaps in the way we think.

The real computer revolution is happening because of those companies that are putting the power of the computer in the hands of the many, companies like Apple and Human Systems Dynamics.

Virginia Lawrence, founder and now chief executive officer of Human Systems Dynamics, is a small and important part of a great thing. Her Northridge, California-based company is in the vertical software business, producing and marketing statistical analysis packages for the Apple II family of computers. Lawrence is an honest, articulate, and intelligent businesswoman whose story reflects the heart of these revolutionary times.

Lawrence, whose background is in science, has had a lot of exposure to computers through the years. After earning the bachelor's degree in physics at Marrimont College, she did some graduate work in physics at Northeastern. It was while working on mainframes that she learned how to program in Fortran, "to do things like predict antenna power usage."

Stopping short of the graduate degree in physics, Lawrence decided to switch to the study of experimental psychology and research design. "Antennas aren't so exciting," she says with a grin. She studied this time at the University of Vienna and the University of Windsor, later earning her M.A. and Ph.D. at USC. After USC, Lawrence established herself as a research consultant, a one-woman firm—Human Systems Dynamics.

"Experimental psychology is a narrow field. You work for a year, produce some wonderful research, then five people read your paper," Lawrence explains. "I set myself up as a research consultant to keep from getting caught up in that narrow little area."

When Lawrence decided in late 1980 to market a program she had developed with HSD cofounder Stephen Madigan, there was only one other statistics program available for the Apple—EduWare's *Statistics*. Earlier, no less a personage than Mitch Kapor, now president of Lotus Development, had written the first statistical analysis software ever marketed for the Apple—*Tiny Troll*. The program sold only about a thousand copies, but was the basis for a much grander product—VisiCorp's *VisiTrend/VisiPlot*.

Now, says Lawrence, at least thirty other companies offer statistics packages for the Apple, and the impending adaptations of popular mainframe programs are bound to crowd the market even more. And yet Human Systems Dynamics has expanded considerably since its beginnings three years ago.

"The whole field is maturing," Lawrence says. "In the past, the dealers were feeling no demand for our products because the users didn't know that this kind of software was available. Now Human Systems Dynamics is ready to become the leader in this field. It's a matter of letting people know what we've got, that we're offering more for less money."

**Trojan Statistician.** It was at USC that Lawrence met Stephen Madigan, who was then and is now a professor of psychology at the university. Author of most of HSD's current products, Madigan has worked with computers since 1965. At the University of Western Ontario he worked on IBM mainframes and took a course in Fortran. In 1979, to escape the mainframe blues, Madigan bought an Apple.

Madigan has taught statistics and done extensive research that relied on the discipline. He believes that "people get hooked on mainframes and big statistics packages. Unless you're dealing with huge data sets, there is no reason to rely on the large machines. Mainframes are not interactive. Personal computers are friendlier."

Having taught himself to program in Basic, Madigan tried his hand at writing an analysis of variance program on the Apple for use in his research. When the program was complete, he realized it could be valuable.

As it happened, Lawrence was one of Madigan's graduate students, and one day he mentioned to her offhandedly that he had written the program. With one first-generation product and a lot of guts, Madigan and Lawrence decided to become business partners.

In 1980, Lawrence and Madigan were not the only ones looking at the software industry and imagining big things. This was the year that the first big wave of young independent software companies rolled through the country, sweeping both experienced and unexperienced businesspeople into the flood.

It was a modest beginning. Lawrence ran the business side of HSD because Madigan saw himself "hopelessly naive' about such matters.

Lawrence, meanwhile, was scared, too. She didn't know much about business either. "I thought the company was something that would burble along on its own," she admits. "I thought it would be a good way to make some money on the side. I've since gotten away from that feeling."

**A Tale of Two Experts.** They may not have known exactly how to run a business, but both Madigan and Lawrence are thoroughly versed in the ways of statistics. For both physics and experimental psychology, Lawrence used statistics extensively, and she has also taught statistics in the psychology department at USC. With their mutual knowledge and his programming experience, Lawrence and Madigan made a formidable product-development and quality-control team.

Madigan says that his involvement with Human Systems Dynamics has "meant an awful lot of midnight hacking." But the extra effort is worth it when he talks to a satisfied customer. Knowing that his programs are being used and appreciated is rewarding.

Last September, Madigan sold his interest in Human Systems Dynamics to Lawrence. He found it "totally impossible' to fulfill the responsibilities of a partner, too many other commitments. Now he calls himself a "de facto consultant."

It's been three years now since Human Systems Dynamics published Madigan's analysis-of-variance program as its first product—*HSD Anova*. Madigan says writing the second program, *HSD Stats*, was easier. Soon after, he wrote *HSD Regress*. By this time, the company was a modest success, and Lawrence placed an ad in the July 1981 *Softalk*.

Through the company's first year, Lawrence continued with her full-time research consultant job. The growth of the software side of Human Systems Dynamics was slow early on, and it was not until September 1982 that the firm's first employee was hired. Kathy Abelson answered Lawrence's ad in a local newspaper and started doing part-time clerical work in HSD's tiny office.

After a few months, Abelson, who had worked seven years for a mutual transfer fund agency in Boston, became "more involved' and started to help with the documentation that accompanies HSD's products. Prior to joining HSD Abelson had taken programming classes and had learned how programs worked; eventually, she was writing and processing documentation for the agency in Boston.

Today, Abelson is Human Systems Dynamics's sole technical writer. Since she recently gave birth to a daughter, she works at home, coming in to the office two days a week to collect the material she needs for documentation writing.

**Basic Body.** All of HSD's programs, according to Madigan, are written in Basic with a few machine language subroutines. In his opinion, the Apple II was "a suberb machine and the IIe is even better." But, like most programmers, he has his complaints. "Apple needs to develop better Basic editing functions."

Currently, Human Systems Dynamics offers five products for the Apple and one for the IBM pc. The first three programs Madigan wrote—the "first generation"—have been rewritten and updated.

*Stats Plus* is HSD's flagship program, a big package that includes everything that would be taught in a one-semester course in statistics.

The program generates reports, calculates data twenty different ways, produces high-resolution scatterplots and bar graphs, and accepts *VisiCalc* files. Designed for the serious researcher or student, *Stats Plus* is compatible with HSD's other products.

The updated *Anova II* and *Regress II* were released last year, along with *Calcu-Plot*, a program for solving and plotting equations. Human Systems Dynamics's fifth product is the old standby *HSD Stats*, which Lawrence describes as "particularly good for the student."

Users of HSD's programs number in the thousands. Though this is a small customer base as compared to those of many three-year-old software companies, it's a pretty active and demanding group.

Astronomers at the San Fernando Solar Observatory in California rely on HSD programs to interpret data from the Solar Maximum Mission Satellite in the study of sunspots and fluctuations of the sun. Researchers at a power company use *Regress II* to analyze data collected on a wind-turbine farm. The engineers hope to predict turbulence intensity for any combination of wind speed and time of day, and to use this information to design more efficient wind turbines.

**Cages for Space Animals**. Researchers at NASA's Ames Research Center are using *Anova II* to design special cages for animals that are going to take part in space shuttle experiments. The statistical software helps these scientists compare the animal's liveliness, weight, and life span in cages of various heights, lengths, and widths equipped with various types of feeding devices.

The Women's Olympic Volleyball team has been training with Dr. Gideon Ariel, head of Cota Research in Trabuco Canyon, California; Ariel makes extensive use of *Stats Plus*, *Anova II*, and *Regress II*. There's even a sociologist in California using HSD software to compare the self-confidence levels of nudists and nonnudists. And, says Lawrence, lots of people use her programs to predict horse races. On a more serious note, a marine biologist in Florida is using *Stats Plus* in an effort to discover why some whales beach themselves. Farmers in various parts of the country use HSD software in analyzing planting and harvesting techniques.

This, then, is the real computer revolution. Lawrence may not make millions selling to such a select group of users, but she is a powerful and positive force. It's impossible to know all the good effects her programs could have on the world's present and future. Without science and its handmaiden statistical analysis, we might still be riding horses and living in caves.

Mankind has always benefited from the development of more efficient and powerful tools. While most of us continue to fight wars, build ugly condominiums, and ignore many of our problems, scientists quietly work away. It's these kinds of users that are benefiting the most from the portability of computer power.

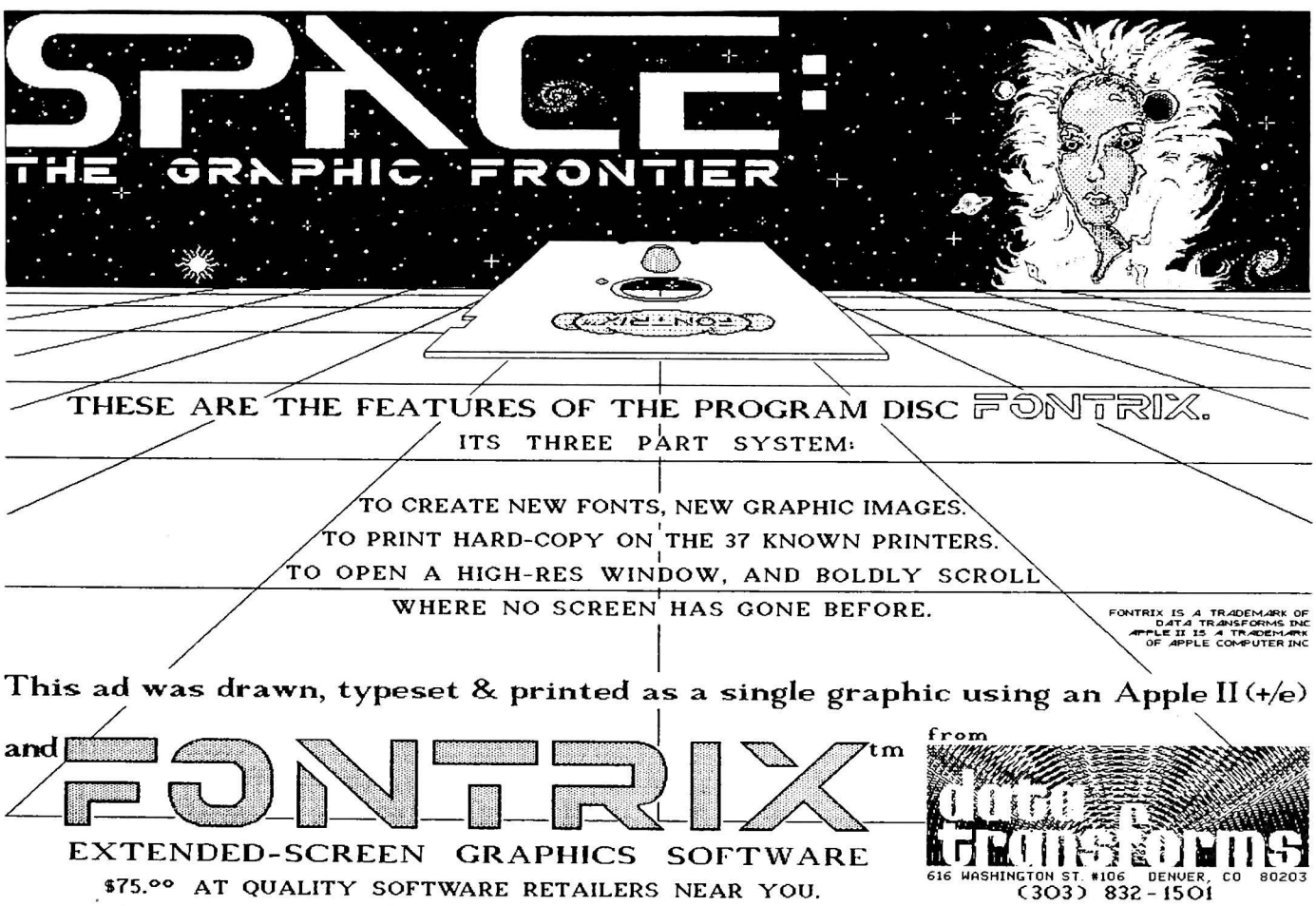
**Selling Statistics**. Marketing director Bob Steel has been with HSD for about fifteen months. Steel started working with computers in 1965 at Univac. His marketing and publicity-writing skills brought him positions at different hardware and software companies, as well as work as a consultant for IBM. Five years ago, Steel realized that the emphasis in the industry was shifting toward smaller machines; a year later Steel bought an Apple and taught himself how to program on it.

"Apple was the start of a massive change. Five years ago smaller mainframes appeared, but they were still mainframes. Standalone micros were the start of something new." Steel, being of the old school of computing, knew well the frustrations of mainframe users. "You have no idea how things have changed, until you've worked in a research environment with terminals and mainframes."

Steel is excited about Human Systems Dynamics and its product line. "In our business, we're dealing with a precise science. There are few areas of software that bring to users a precise science."

Like Virginia Lawrence, Steel is determined to see that HSD becomes the leading supplier of statistics-based programs for the Apple. HSD's marketing up to this point as been almost entirely through mail order, primarily because retail outlets claim the market is not big enough or that it is too complicated.

"We've been trying for some time to convey to distributors that statistics packages are marketable," says Steel. "A lot of our thrust this year will be on the retail end of the business. Once distributors see the kind of market and types of products we have, they will open up and the



dealers will follow."

**Growin' Up**. Steel says HSD's latest marketing survey—besides identifying thirty-one statistics programs costing from $2,000 to $49.95 a copy—predicts that a total of $20 million worth of statistics programs will be sold in 1984. This heretofore small niche in the software industry will grow much larger in the next eighteen months.

The new year will bring some changes at Human Systems Dynamics. Up to now, Lawrence says, the company's emphasis has been on providing research tools for the scientific community. In fact, there is also a strong market for educational statistics packages. In recognition of this fact, she plans to pay more attention to the instructional aspects of HSD's products.

Another possible change at HSD would come in the form of more capital. Lawrence views venture capital as "an alternative way of growing. We've been very careful up to this point, growing conservatively." No matter what happens, Lawrence does not see Human Systems staying the same.

"I'm seriously thinking about those possibilities. I like to be on top and right now the business is totally mine. Where we go is my decision. If I went with venture capital," Lawrence muses, "it would be easier to go up against the companies who already have lots of money."

**Future Factors**. Whether or not she takes that big step into the world of second-round financing, Lawrence is convinced that statistics is a good market to be in. "Computers are changing the way statistics is taught," she says. "When I first learned, I had to do it all by hand. There were always several checks that you had to perform on your calculations to make sure they were done correctly. Now you can do it all on the computer."

Lawrence says that HSD will have at least one new product soon—*Factor II*—a factor analysis program written by a professor at Miami University in Ohio. Later this year, the company plans to publish a quality control program that will help manufacturers achieve quality-controlled engineering.

In *Softalk*'s January 1984 cover story, Lawrence focused on the human aspects of personal computers. When asked to look into the future, she said, "I have great fears for women in computing." Unlike her colleagues, who talked a lot about thirty-two-bit processors and operating systems, Lawrence wondered why more girls are not getting into computing. "It's very hard to reach the homes to get the parents to encourage girls," she commented.

This winter and spring Lawrence is participating in *The New Literacy*, a twenty-six-part PBS TV series designed as an introduction to computers, what they are, how they work, and what they do. Lawrence, Isaac Asimov, Tracy Kidder, and a hundred other computer experts and nonexperts were interviewed late last year for the series. Lawrence, like many of the early Apple pioneers, is concerned with more than just the moneymaking side of the computer revolution. The social impact of computers is a subject she has strong opinions about. It starts with kids.

"There is something intrinsically pleasing about cars. When kids turn sixteen, they are dying to start driving. I don't see kids creating that same kind of aura around computers.

"One way to change this situation would be to have visiting computer teachers in schools," Lawrence continues. "When I was in grammar school, we had a visiting art teacher. It was a real special thing. The teacher would come to our class once a week for an hour. We would get expert instruction and the other teachers didn't have to take the time to learn art.

"There could be one visiting computer teacher for three schools, say. The kids would learn from someone who knows the subject and the schools wouldn't have to convert teachers, like they tried to make physical education teachers into math teachers. That was the most ridiculous thing I'd ever heard."

**A Time of Changes**. The computer revolution can be summed up in one line: Now, or in the near future, the power of computers will be available to just about everyone. Of course, the industry will continue to evolve, and some very smart people will unquestionably be eaten up in the "survival of the fittest" environment.

How the Virginia Lawrences of the industry will fare is difficult to say. But it's companies like Human Systems Dynamics that are fueling the silicon fires of revolution. The world may not change dramatically, but we will have the tools to continue striving for solutions to our problems. ◨


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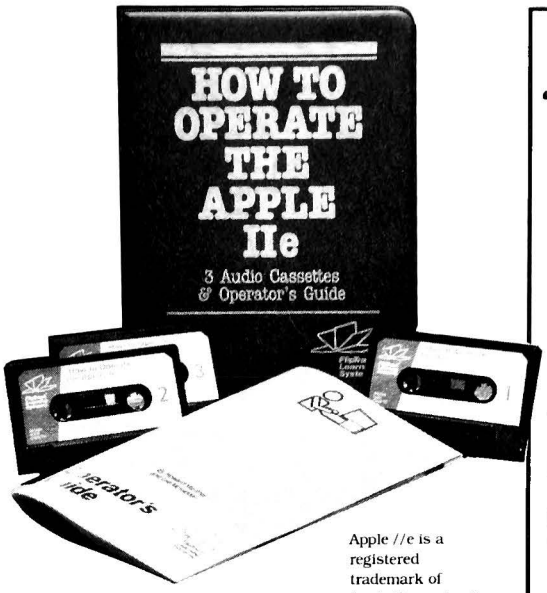
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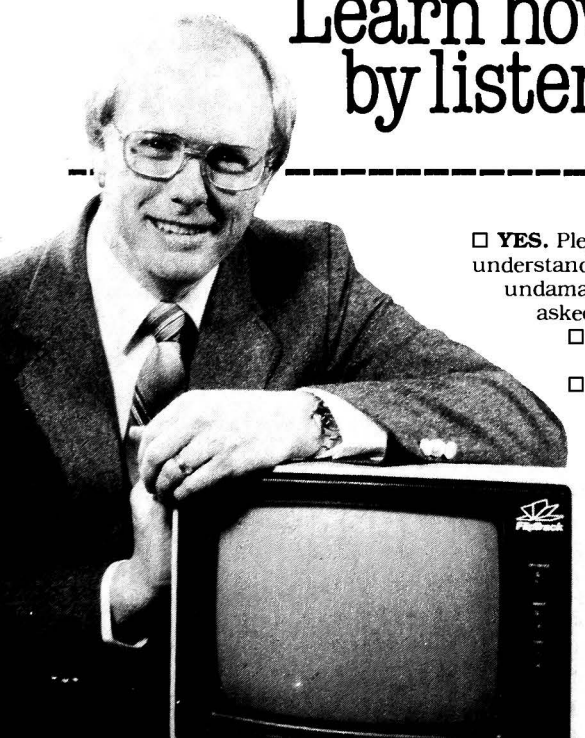
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In December, DOStalk broke the news about the Computer Perseveration Syndrome, a psychological disorder sweeping the known world. Computer users suffering from this illness spend all their time repetitively refining their work. Sometimes computers actually lengthen the amount of time a project takes, rather than shortening it.

Besides this new disorder, there are many other reasons that personal computers often don't deliver on their potential for saving us time.

**The Computer Incompatibility Problem**. Another major time-waster is the widely discussed Computer Incompatibility Problem. In part, this problem is the price we pay for progress. New engineering feats naturally result in wares that are incompatible with their predecessors. Strict compliance to a Computer Compatibility Standard would stop innovation.

Mention of the Computer Incompatibility Problem usually brings to mind the many unique dialects of Basic, the several popular but disparate operating systems used just on the Apple II, and the many dissimilar command codes printers use.

Less noticeable, but just as big a time-waster, are programs that save data—your work—in unique file formats. Programs that use only non-standardized, undocumented file formats diminish the value of your data.

If you want to use the data you have painstakingly entered or created with another program, your choices are to retype it all, deduce how the file is formatted and write a program to reformat it, or deduce how the file is formatted and modify the second program so it can access the non-standard file (or modify the original program so it uses a standard file format). Each of these choices involves a massive waste of your time.

Programs that use standard file formats, on the other hand, make it easy to exchange data among programs. Last month, for example, we saw how several spreadsheet programs provide a capability for saving worksheet images in standard text files. These images can then be reloaded into a word processor for inclusion in a larger manuscript.

Text files are often used as a common denominator for sharing data among programs. When the task at hand is to store data organized in special ways, however, simply using a text file usually isn't enough.

For example, imagine the following table is stored, just as it appears here, in a simple text file. It would be a fairly complex task to read the table into a Basic program and enter the table's values into an array.

The complexity is in finding the values associated with each row and column and assigning those values to array elements. Certainly the task is not impossible; on the other hand it is not easy—particularly if the program must be able to adapt to tables with various numbers of rows, columns, headlines, and so on, as is often the case.

**Better File DIFfusion**. The company that originally developed *VisiCalc* has also developed and documented a special type of sequential text file for storing this kind of data. This type of file is called a DIF (data interchange format) file. DIF is a registered trademark of the company, Software Arts.

*VisiCalc* and many other spreadsheet programs are able to read and write DIF files. In addition to spreadsheets, DIF file compatibility has been built into many accounting, graphics, and statistics programs, as well as some word processors and database managers.

Programs that use the DIF format can easily exchange data with each other. Information you have developed with a spreadsheet program can be loaded directly into a graphing program, for example. Graphs of the data can be drawn without additional data handling. This not only saves time but also avoids the inevitable mistakes that would corrupt the data if it had to be retyped by hand.

Equally important, it is quite easy for you, as a programmer, to get at the data yourself. DIF was created to be easy for both beginners and advanced programmers to use and understand. Programs using DIF files can be written in any language—Basic, assembly language, even Pascal. In addition, DIF files are not dependent on the features of any particular computer.

Reading and writing DIF files with Basic programs is easy; all the necessary subroutines have been included in this column.

**A DIFferent Way To Input Data.** A very important aspect of DIF files is that it is much easier to read a DIF file than it is to write data input routines as good as the ones found in most spreadsheet programs. This means that for programs you write yourself, you can save tons of time by using a *VisiCalc*-like program to enter your raw data. Then all you have to do is save it in a DIF file.

All your own program has to be able to do is read the DIF file. You save time because you don't have to write complex data input routines. And you save time because you will be able to enter, check, and edit

Monthly Payment Per $10,000 of Home Mortgage

| Years To Pay | Interest Rate 8 | 10 | 12 | 14 | 16 |
|---|---|---|---|---|---|
| 15 | 95.57 | 107.46 | 120.02 | 133.17 | 146 87 |
| 30 | 73.38 | 87.76 | 102.86 | 118.49 | 134.48 |

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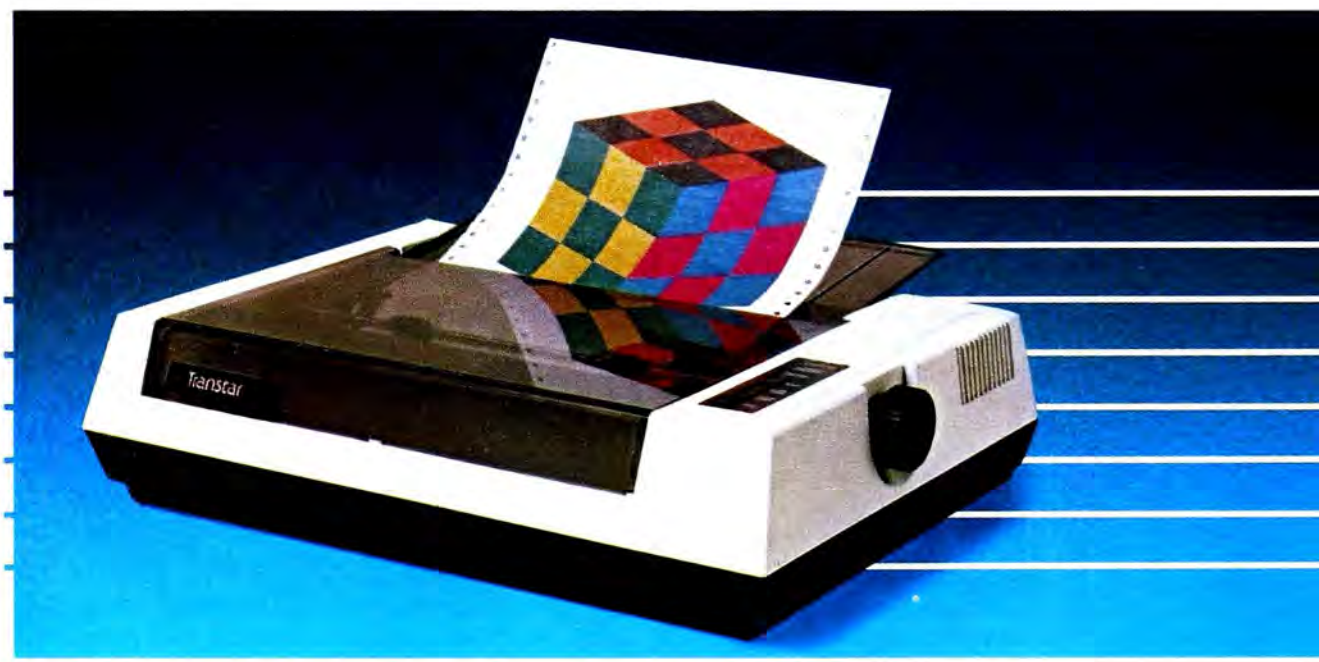
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your data much faster with a spreadsheet program than you could possibly do with your own data input routines.

**Two DIFficult Words.** The only thing that is hard about DIF files is that two very scary words were chosen to describe how the numbers in a table are organized. Normally the words people use for this are *row* and *column*. The people at Software Arts didn't want to use these, however, because they figured DIF files should reflect the fact that a table organized like the one we saw earlier and a table constructed like this one are identical from a data standpoint:

Monthly Payment Per $10,000 of Home Mortgage

| Interest Rate | Years To Pay 15 | 30 |
|---|---|---|
| 8 | 95.57 | 73.38 |
| 10 | 107.46 | 87.76 |
| 12 | 120.02 | 102.86 |
| 14 | 133.17 | 118.49 |
| 16 | 146.87 | 134.48 |

Rather than using easy terms such as row and column, then, the DIF developers chose—are you ready?—*vector* and *tuple*. In the last table, for example, the columns can be thought of as vectors and the rows as tuples. Or, if you prefer, think of the rows as vectors and the columns as tuples.

In this example, if you decided to let the columns under *Years To Pay*, be vectors, you would have two vectors and five tuples.

On the other hand, if you decided the rows labeled *Interest Rate* would be the vectors, you would have five vectors and two tuples. *It doesn't matter which is which*, just don't let those words scare you.

**Anatomy of a DIF File.** A DIF file consists of two major parts. The first of these is the *header section*. It contains information you can use to confirm that the file really is a DIF file; it tells how many vectors and how many tuples are in the file; and it can tell some other things we'll touch on later.

The second major part of a DIF file is the *data section*. The data section consists of a number of *data values*. Each data value includes three pieces of information written in two lines. The three pieces are the *type indicator*, the *number value*, and the *string value*. Here are some sample data values:

| | | | |
|---|---|---|---|
| 1,0<br>NO | 1,0<br>"" | 1,0<br>"VALENTINE'S DAY" | |
| 0,3<br>V | 0,−913<br>V | 0,95.57<br>V | 0,1.0026E20<br>V |
| 0,0<br>NA | 0,0<br>ERROR | 0,1<br>TRUE | 0,0<br>FALSE |
| −1,0<br>BOT | −1,0<br>EOD | | |

The *first number on the first line* of each data value is the type indicator. This number can be 1, which indicates that the value is a character string; a 0, which indicates that the value is numeric; or a −1, which indicates a special data value.

There are only two of these special values. The first one shown, *BOT*, marks the beginning of a tuple; the second, *EOD*, marks the end of data (end of the file).

The *second number of the first line* of each data value, the number value, is 0 if the data value is special or a character string. If the data value is numeric, on the other hand, this is the actual data. The number value may be signed (+ or −) and may contain a decimal point. It may also contain an exponent of a power of ten. In this case the value is followed by the letter *E* and the signed or unsigned exponent, as shown above.

The *second line* of each data value always contains the string value. If the data value's type is special (−1), then this string can be only *BOT* or *EOD*.

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If the data value's type is numeric (0), then this string can be any one of the five following upper-case, unquoted words:

| String Value | Meaning | Appropriate Numeric Value |
|---|---|---|
| V | normal numeric value | actual data |
| NA | value not available | 0 |
| ERROR | value result of invalid calculation | 0 |
| TRUE | logical value | 1 |
| FALSE | logical value | 0 |

Finally, if the data value's type is character string (1), the second line contains the actual string value. DIF file character strings are not allowed to contain control characters or quotation marks. If the string is a single word, it may be entered directly on the line. If the string contains blanks or special characters, it must be enclosed in quotation marks. If the string is null or empty, the string-value field should contain two quotation marks with no space between them.

Now that we know everything there is to know about DIF file data values, let's look at an entire DIF file data section. This one is based on our home mortgage tables—"years to pay" are the vectors:

```
-1,0
BOT
0,95.57
V
0,73 38
V                    Tuple 1  (interest rate 8%)
-1,0
BOT
0,107.46
V
0, 87.76
V                    Tuple 2 (interest rate 10%)
-1,0
BOT
0,120.02
V
0,102.86
V                    Tuple 3 (interest rate 12%)
-1,0
BOT
0,133 17
V
0,118.49
V                    Tuple 4 (interest rate 14%)
-1,0
BOT
0,146 87
V
0,134 48
V                    Tuple 5 (interest rate 16%)
-1,0
EOD
```

The important things to notice are that each tuple begins with the BOT special data value and contains a data value for each vector. To keep the format simple, all tuples in a DIF file must have the same number of vectors (and all vectors must have the same number of tuples). Also notice the EOD special data value at the bottom of the listing. This marks both the end of the data section and the end of the file itself.

As mentioned earlier, every DIF file has a header section in addition to a data section. The header section consists of a number of *header items*. Each header item includes four pieces of information written in three lines. The four pieces are the item's *topic*, the *vector number* the item applies to, a *numeric value*, and a *string value*. Here are some typical header items:

```
TABLE       VECTORS     TUPLES      DATA
0,1         0,14        0,3         0,0
""          ""          ""          ""

LABEL                   COMMENT                 UNITS
1,0                     3,1                     0,0
```


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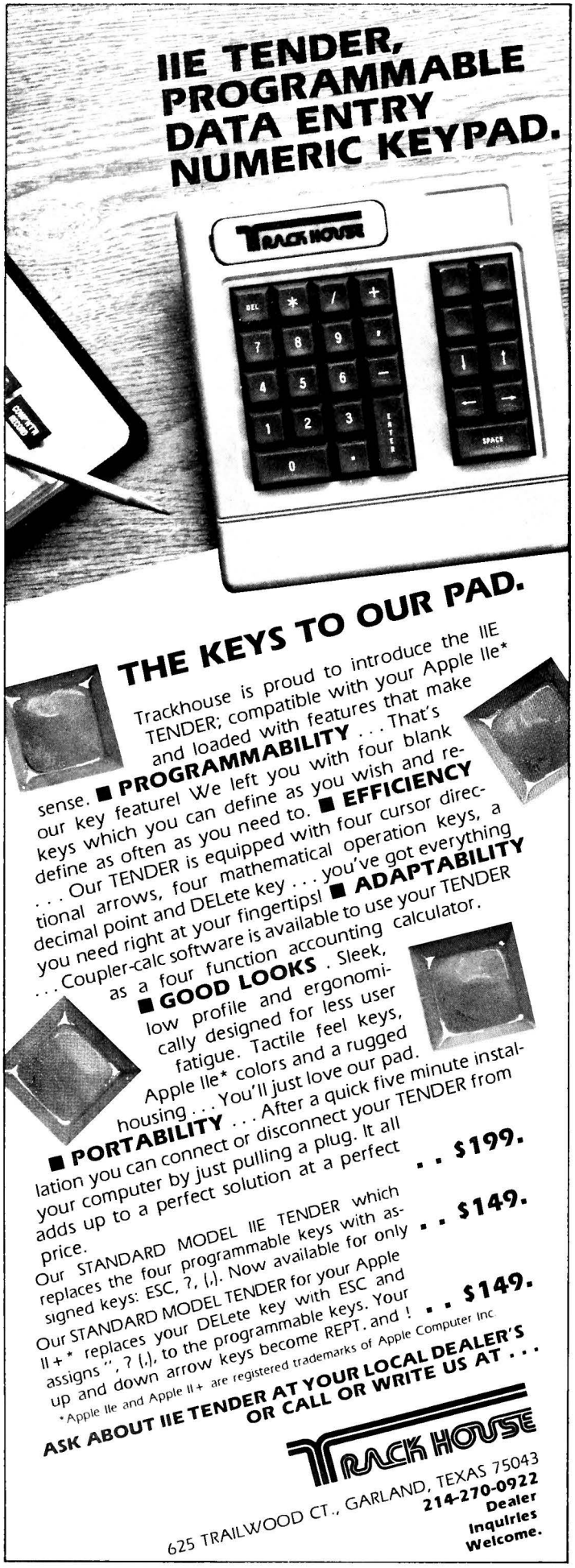
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The *first line* of each header item is the item's topic.

The *first number on the second line* of each header item is the number of the vector to which the item applies. For example, the *label* item shown applies only to vector one, while the *comment* item applies only to vector three. When the vector number is zero, as in the *units* item, then the item applies to all vectors—that is, to the entire table.

The *second number on the second line* of the header items is a numeric value. For example, in the *vectors* and *tuples* items, this number indicates how many vectors and tuples are in the file.

The *third line* of the header items always contains a string value. If the item has no associated string, then a null string is used, as in the vectors and tuples items.

Every DIF file header *must* contain the header items called table, vectors, tuples, and data. The table item must always be the first item in the file. The numeric value in the table item is the DIF file version number. To date there is only one version, so this number must be 1. The table item may also contain the title of the file in its string area, if desired.

The data item must always be the last item in the header section of the file. It indicates that the data section of the file follows. Otherwise, the order of the header items doesn't matter, except that the vectors item must come before the use of vector numbers in other items. Here's a typical DIF file header section:

```
TABLE
0,1
""
VECTORS
0,2
""
TUPLES
0,5
""
DATA
0,0
""
```

In addition to the four required header items, DIF files may contain optional items such as labels and comments. However, any program reading a DIF file should be able to operate without optional items. If a reading program requires the information provided by an optional item, it should prompt the user to supply the information if it's missing rather than require the item itself to appear within the file.

In the label and comment items, the numeric value indicates a line number. Thus, a multiline comment is possible:

```
COMMENT
0,1
"DATA FROM SOURCES"
COMMENT
0,2
"THOUGHT TO BE RELIABLE"
COMMENT
0,3
"BUT NOT GUARANTEED."
```

Defined optional header items for DIF files include *periodicity*, *majorstart*, and *minorstart*, which provide additional information about time series data; size, which provides programs such as database managers the option to give vectors fixed field lengths or sizes; and several more.

If necessary, it is also possible to develop new optional header items to fulfill the needs of specific programs. Software Arts has developed the DIF Clearinghouse to keep track of such enhancements to DIF files. For $6, the clearinghouse will send you the current DIF file technical specifications, as well as a list of all the programs known to use DIF files. The address of the DIF Clearinghouse can be found at the end of the article.

**Basic DIFferentials.** The following Basic subroutines show how easy it is to write and read simple DIF files. These routines can save the numeric data in an array into a DIF file and read a DIF file's data into an array. Neither routine supports string variables or the logical variables (true/false). Also beware that the read routine will stop execution if it en-

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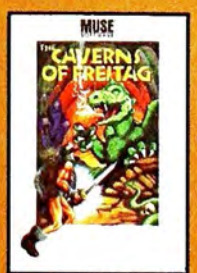
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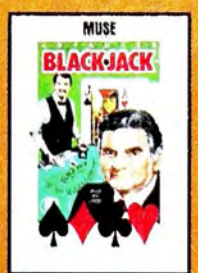

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counters an NA, ERROR, or null value (blank spreadsheet cell) in a DIF file. Enhancements to the routines in these areas are, as they say, left to the reader.

```
10000 REM                DIF writer
10005 REM
10010 REM    Before calling this subroutine the following variables
10020 REM       must be set by the main program:
10030 REM            D$ = control-D
10040 REM            F$ = filename to be used
10050 REM            V  = number of data "vectors"
10060 REM            T  = number of data "tuples"
10070 REM         A(V,T) = actual data to be stored in DIF file

10080 NULL$ = CHR$(34) + CHR$(34) : REM "" (null string)

10090 PRINT
10100 PRINT D$;"OPEN";F$
10110 PRINT D$;"DELETE";F$
10120 PRINT D$;"OPEN";F$
10130 PRINT D$;"WRITE";F$

10140 PRINT "TABLE"
10150 PRINT "0,1"
10160 PRINT NULL$

10170 PRINT "VECTORS"
10180 PRINT "0,";V
10190 PRINT NULL$

10200 PRINT "TUPLES"
10210 PRINT "0,";T
10220 PRINT NULL$

10230 PRINT "DATA"
10240 PRINT "0,0"
10250 PRINT NULL$

10260 FOR I = 1 TO T
10270 : PRINT "-1,0"
10280 : PRINT "BOT"
10290 : FOR J = 1 TO V
10300 : : PRINT "0,";A(J,I)
10310 : : PRINT "V"
10320 : NEXT
10330 NEXT

10340 PRINT "-1,0"
10350 PRINT "EOD"

10360 PRINT D$;"CLOSE";F$
10370 RETURN
```

```
11000 REM                DIF reader
11005 REM
11010 REM    Before calling this subroutine the following variables
11020 REM       must be set by the main program:
11030 REM            D$ = control-D
11040 REM            F$ = filename to be used
11050 REM         A(x,y) = array must be dimensioned large enough to
                           hold DIFdata
11060 REM
11070 REM    After calling, the following variables will be set:
11080 REM            V  = number of data "vectors"
11090 REM            T  = number of data "tuples"
11100 REM         A(V,T) = actual data found in DIF file
11110 REM
11120 REM    NOTE: This routine requires the DIF file to contain only
11130 REM          numeric data. String, logical, or null values, as
11140 REM          well as ERROR and NA, will stop execution of
                   the routine.
```


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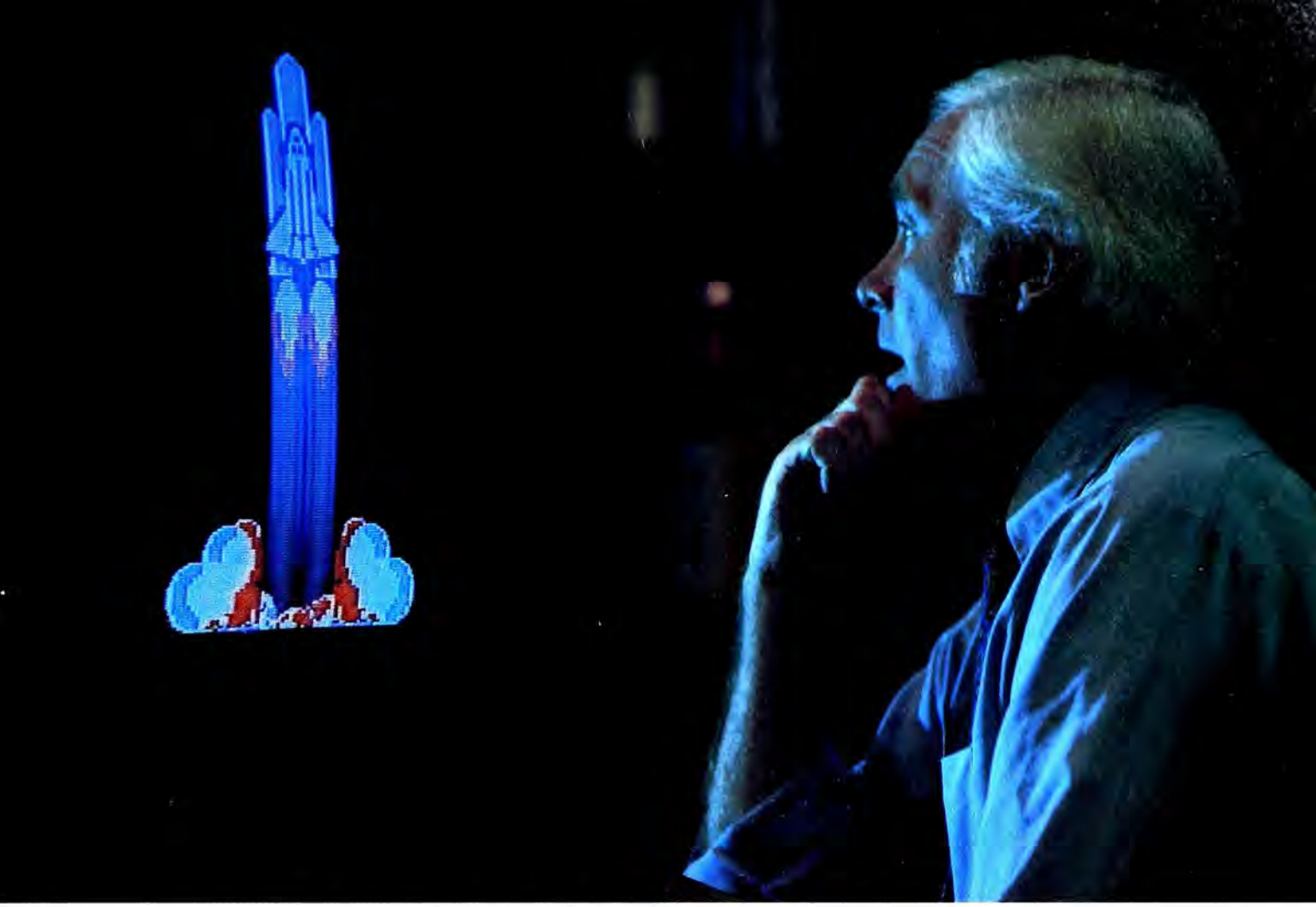
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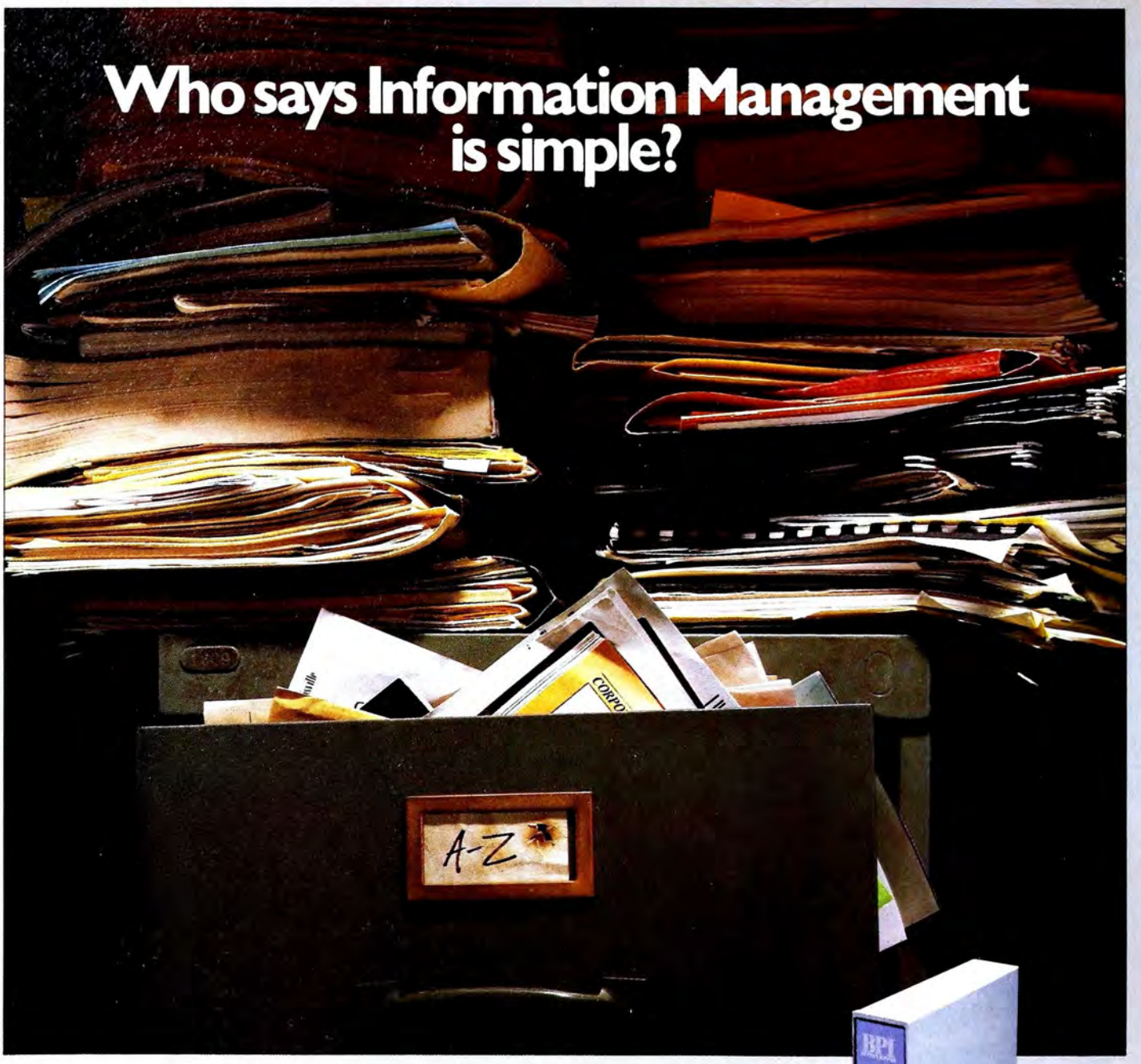
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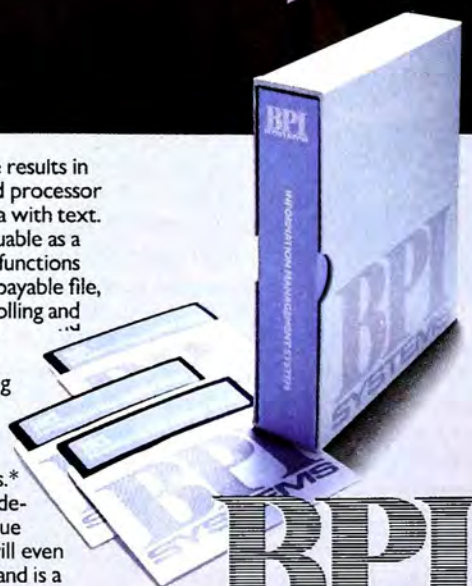
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```
11150 PRINT
11160 PRINT D$;"OPEN";F$
11170 PRINT D$;"READ";F$

11180 INPUT X$ : INPUT X,Y : INPUT Y$
11190 IF X$ < > "TABLE" OR Y < > 1 THEN PRINT "ERROR—NOT
      A DIF FILE" :GOTO 11390

11200 INPUT X$ : INPUT X,Y : INPUT Y$
11210 IF X$ = "VECTORS" THEN V=Y
11220 IF X$ = "TUPLES" THEN T=Y
11230 IF X$ < > "DATA" THEN GOTO 11200

11240 FOR I=1 TO T
11250 : INPUT X,Y
11260 : INPUT X$
11270 : IF X < > -1 OR X$ < > "BOT" THEN 11370
11280 : FOR J=1 TO V
11290 : : INPUT X,A(J,I)
11300 : : INPUT X$
11310 : : IF X < > 0 OR X$ < > "V" THEN 11370
11320 : NEXT
11330 NEXT

11340 INPUT X,Y
11350 INPUT X$
11360 IF X = -1 AND X$ = "EOD" THEN 11390

11370 PRINT "UNEXPECTED DATA ENCOUNTERED IN FILE."
11380 PRINT "FILE INPUT STOPPED AT TUPLE ";I;", VECTOR ";J

11390 PRINT D$;"CLOSE";F$
11400 RETURN
```

Here's some cheap advice for those of you who take the suggestion we made earlier to use a spreadsheet program to enter data rather than writing input routines yourself. When saving your data in a DIF file with the spreadsheet program, save only the portion of the worksheet that contains the columns and rows of numbers. Make sure there are no blank cells, NAs, or ERRORs in the saved portion. Alternatively, you can enhance the DIF reader subroutine so it doesn't trip on these sorts of things.

**DOStalk Corrections and Amplifications.** Here's the DOStalk bug list for the last few months. Most of these mistakes have already been documented by readers' letters in Open Discussion, but we'll repeat them all here for reference.

**April 1983.** Last April we mentioned the changes Apple made to DOS 3.3 when the Apple IIe was released. The changes were slight. The newer version turns off the IIe's eighty-column card automatically when it is booted. In addition, some corrections were made to the append command. As we mentioned in April, the biggest ramification of these changes for most users was that a forty-five-byte empty space inside DOS at 47721 ($BA69) was used to add the changes and was no longer available for use by programs.

Another ramification was that the append correction introduced a new error that was worse than the one it was meant to correct. The problem with append had been that it failed to work correctly whenever the file being appended to was longer than 32,767 bytes. After the change, append would fail randomly once every 256 tries. If you're interested, complete information on both bugs is in the July 1983 issue of *Apple Assembly Line* (a monthly minimagazine for assembly language programmers available at $18 per year from S-C Software, whose address follows this article).

In September, Apple released yet another version of DOS 3.3 that fixes the append bug. The only problem with the correction is that it uses the first twenty-eight bytes of yet another empty space inside DOS at 46771 ($B6B3). More information on this version of DOS is in the September *Apple Assembly Line*.

Here's the good news: Apple swears it will never modify DOS 3.3


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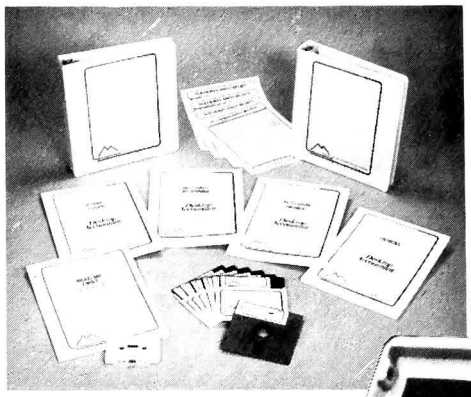
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again.

**July 1983**. Due to a computer error (as previously explained in the November Open Discussion), the location given in July for poking DOS to change the *default* maxfiles value was partially in error. The number at this location determines how many DOS buffers are built when DOS is booted (usually three). The correct location of this byte is −21929 (43607, $AA57). Only the negative poke location was incorrect in the original article.

**August 1983**. In August, DOStalk allowed that there was no evidence Apple ever actually released a version of cassette Applesoft on disks, even though DOS 3.3 was designed to support this ancient version of Applesoft. Bob Bragner, an Apple old-timer in Istanbul, Turkey, wrote a great letter that was printed in Open Discussion in November (see "DOStalgia," page 51). Bob's letter includes a large amount of interesting historical information on cassette Applesoft and early Apples—including confirmation that cassette Applesoft appeared on DOS 3.1 master disks.

W. Smyth, a collector of early Apple disks in Monetta, South Carolina, adds that cassette Applesoft was included on DOS 3.2 master disks (but not 3.2.1, the earliest version we have around here). Smyth says it also appeared on the original versions of Contributed Programs, Volumes 1 and 3. Remember those?

**September 1983**. In September, DOStalk included a little chart indicating that zero-page locations 103 and 104 ($67–68) point to Applesoft's lomem location. The locations do point to the lowest address available to Applesoft, but this address is known in the literature as *txttab*. It's where Applesoft programs begin. Under Applesoft, lomem is where variable storage begins. To see this in pictures, refer to page 6 of *All About Applesoft*, the book from the good folks at *Call -A.P.P.L.E.* (and not to be confused with the old *Softalk* column of the same name).

**October 1983**. All the file manager information presented in October and November will make a good deal more sense if you reverse the NEOFILE and OLDFILE labels in the assembly language program on page 94. At the same time, change lines 210 and 220 of the Basic program on that page. OLDFILE is a FINDPARM+8 and NEOFILE is at FINDPARM+14, not the other way around. We apologize to those of you who were frustrated by the *file not found* errors when trying to open a new file.

**November 1983**. We owe the authors of the Apple Pascal Operating System an apology. While discussing ProDOS in November, DOStalk said it was impossible to catalog a Pascal disk unless you knew the disk's name. That is incorrect. It can be done quite easily, once someone shows you how.

The problem is that none of the books about Pascal (or at least the ones we looked in, including the *Apple Pascal Operating System Reference Manual*, *Apple Pascal: A Hands-On Approach*, and *Pascal Programming for the Apple*) explain how to do it.

The operating system manual does give a few hints, however, on pages 26, 57, and 67. We were unable to convert the hints into a useful technique, however, without the help of loyal readers. (Maybe Basic really has made our minds feeble, as professors of Pascal often warn.)

**December 1983**. December was the month DOStalk examined exec files. At the end of that month's column we said most of the programs in the article would work with either DOS 3.3 or ProDOS. But beware. One of the programs defined our old friend *D$* as *CHR$(13)+CHR$(4)*. This technique, heartily endorsed by DOStalk in the past for making sure Uncle DOS is awake when you pass him a command, *doesn't work with ProDOS*. Under ProDOS D$ must equal or at least must *begin* with control-D:CHR$(4). If D$ begins with anything else, the command will appear on your screen and *will not be executed*. ProDOS pays much better attention to what your program is doing, however, and never has to be snapped to attention with a return—CHR$(13), control-M—as DOS 3.3 does. ◼

---

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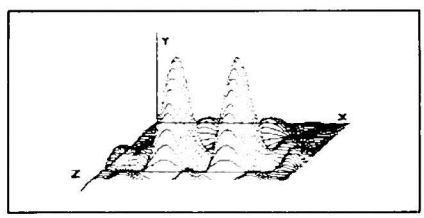
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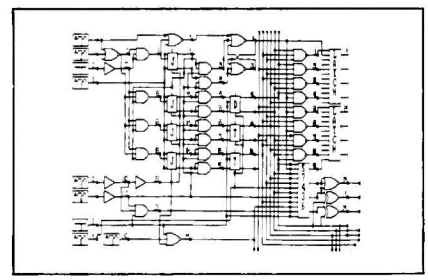
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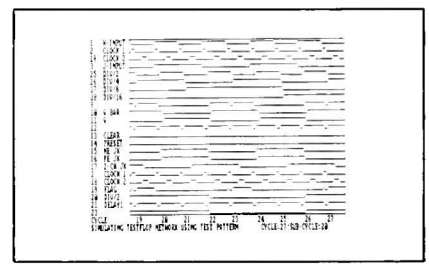
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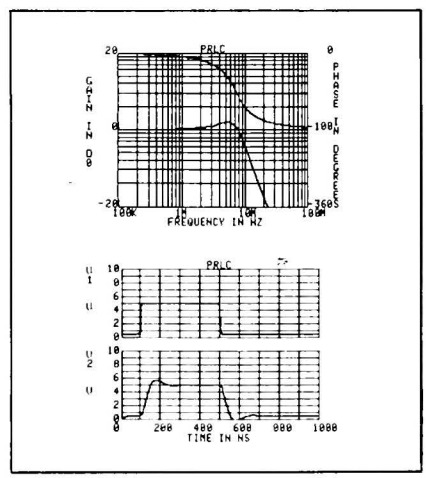
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## Welcome to Budgedom

Before we begin, there is an error in the source code for the remainders of divisions by seven operations in the November issue. The code presented will actually generate remainders for division by eight. Lines 48 through 83 of that listing all read:

```
dfb 0,1,2,3,4,5,6,7
```

They should read:

```
dfb 0,1,2,3,4,5,6
```

With the four bytes in line 84, that would assemble to a data table 256 bytes long.

**The Graphics Zone**. There is a place where all programs that have been, or ever will be, reside. It is a dimension not of time or of space, but a dimension of mind. Its inhabitants range from solitary machine language instructions to inconceivably huge software complexes, from mundane loops to exotic, self-modifying pearls of code. *VisiCalc* and *Choplifter* exist in this place, along with programs yet undreamed of that run on an Apple II and would amaze us all, if only someone were smart enough to discover them. There are programs in this place that are worth many millions of dollars. Perhaps it contains programs that can drive us insane.

As programmers, we explore this place and attempt to bring some of its inhabitants back into what most people would call "the real world." To us, it has become a place with a reality that is often more compelling than that of the the real world. For our purposes today, we will call this place Budgedom. You may call it by another name, but we will be talking about the same place.

This month, we will study the subroutine called HLine. Because it is an important part of our plan, we have searched Budgedom to ensure that it is among the best implementations possible on an Apple II. There are many very different solutions, and we can never be sure that we have found the best one.

**Specifications for HLine**. We must start by making sure we know exactly what HLine is supposed to do. (You have to know what you are looking for before you can find it!) To do this, a programmer first tries to create a specification of the program—what it will do and how it will be called or used.

The specification for HLine is not too complicated. It accepts the following values, or arguments: (1) Y—the scanline, which varies from 0 to 191; (2) X1,X2—the left and right ends of the desired horizontal line; (3) GMODE—the desired drawing mode (invert, turn on, turn off, fill with pattern); (4) PATTERN—the desired fill pattern, if GMODE says to fill with pattern. The program HLine must draw a horizontal row of dots on scanline Y, from the dot in column X1 (the left-hand endpoint) to the dot in column X2 (the right-hand endpoint). The dots should be drawn by the GMODE drawing method, using PATTERN if the method requires one.

An important part of a program specification defines how a program communicates with the outside world. HLine will be called by several other machine language programs, so it will be written as a subroutine that is called via the JSR instruction. Typically, the arguments GMODE and PATTERN won't change over many successive calls of HLine, so we will save a great deal of argument passing overhead by removing them from the calling process. Instead of trying to transfer these values each time we call HLine, we can make them global variables that are used by HLine but set by other subroutine calls. These subroutines will be called SetGMode and SetPattern.

The other arguments of HLine may also change in predictable ways. If the caller of HLine is a rectangle drawing program, for example, all of the calls to HLine will have the same values for X1 and X2, and each Y value will be one greater or smaller than the one before. If the calling program is drawing a polygon, the calls to HLine will also be to successive scanlines, with slightly different pairs (X1,X2) for edges.

In the general case, there may be no similarities at all between consecutive calls to HLine, but the special cases just described are so common that it pays to provide special case code that takes advantage of them. Like a corporation that caters to its best customers, HLine will provide special services for the routines that make the most calls to it.

Rectangle drawing generates a series of calls to HLine that have the same X1 and X2. It turns out that rectangle drawing is quite a common

operation. It would be bad to have to recalculate values depending on X1 and X2 for all these calls to HLine when they aren't changing. Thus, for each call, HLine will assume that X1 and X2 are the same as in the last call. To specify X1 and X2 and to change them, we provide a separate subroutine, which we will call ScanPrms.

Polygon drawing, however, may generate several calls to HLine on a single scanline. In this case we would like to avoid recalculating scanline addresses and other values that depend on the argument Y, since it is not changing. For this special case, we provide a special entry point, called HLineB. Calling HLineB will draw a horizontal row of dots on the same scanline as that specified by the last call to HLine.

Well, enough talk—let's program! The following section is mainly for the assembly language-literate.

*** The Implementation of HLine**. It would be simple to write HLine if the rows of dots it had to draw always involved whole bytes of screen memory. All we would have to do is write a loop that would perform the required drawing operation on a series of whole bytes in the screen memory:

```
        ldy  right.d7     ;get rightmost byte #
loop    lda  (base),y     ;get screen data (base = scanline)

(perform operation here)

        sta  (base),y     ;modify the screen
        dey
        cpy  left.d7      ;finished leftmost byte yet?
        bcs  loop         ; no, repeat
```

In general, however, rows of dots hardly ever involve only whole bytes of screen memory. Since a byte contains seven dots, there is only a one in seven chance that one endpoint of a randomly chosen horizontal line will be on the proper byte boundary so that the whole end byte will be used. There's an even smaller chance (one in forty-nine) that both endpoints will be. We must deal with the more likely case, where both the left and right edges lie somewhere in the middle of screen bytes.

The natural unit of information that the 6502 microprocessor operates on is the byte. Handling the edges of a horizontal row of dots presents us with a problem, since we now want to perform operations on only some of the bits in a byte. Operations on whole bytes are easy. The question is: How can we restrict operations to selected parts of a byte?

The solution is to use *masks*. The basic idea is to *mask off* an operation from the part of a byte we want to leave alone, just as a painter uses masking tape to prevent paint from reaching certain parts of a surface.

In the case of HLine, we need two sets of masks. One set is composed of the left edge masks, which allow us to draw the leftmost dots of a line without disturbing other dots in the leftmost byte (figure 1). The right edge masks (figure 2) make up the other set. Each set of masks contains seven masks, one for each of the seven possible dot positions within a byte on which an edge could fall. The fourteen mask bytes can be stored in a thirteen-byte table, since the last right mask byte is the same as the first left mask byte.

If GMODE = turn on, we might use mask tables with the following series of instructions to handle the left edge:

```
        ldy  left.d7      ;get leftmost byte of the row
        ldx  left.mod7    ;get dot # of leftmost dot
        lda  (base),y     ;get screen data
        ora  leftmasks,x  ;Turn On dots including and to the
        sta  (base),y     ; right of the leftmost dot
```

Using the idea of masks, the problem of drawing a horizontal row of dots breaks down into three simpler problems: drawing the rightmost edge of the line, drawing the middle bytes of the line, and drawing the leftmost edge of the line. We have just seen how to do left and right edges of scanlines; as we noted before, drawing the bytes in between is simple. Assuming we have already computed left.d7, left.msk, right.d7, and right.msk, the code, if GMODE = invert, is as follows:

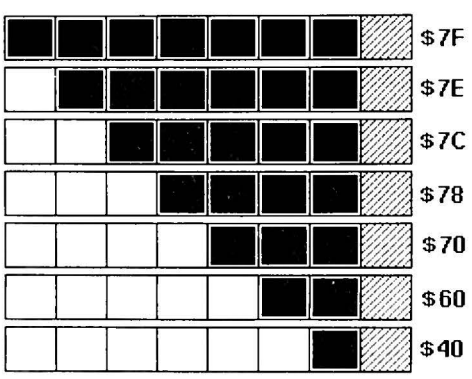
```
Invert      ldy  right.d7    ;get right byte, mask
            lda  right.msk
            eor  (base),y    ;invert rightmost byte where
            sta  (base),y    ; right.msk has 1s
;
Invert.1    lda  #$7F        ;invert whole bytes
            eor  (base),y
            sta  (base),y
            dey
            cpy  left.d7     ;any more whole bytes left?
            bne  Invert.1
;
            lda  left.msk    ;invert leftmost byte where
            eor  (base),y    ; left.msk has 1s
            sta  (base),y
            rts
```

By now you may have noticed a flaw in our program. It assumes that the left edge, middle bytes, and right edge are all in different bytes. In fact, there may be no whole bytes in the middle. For very short rows of dots, both the left and right edges could be in the same byte. The three different cases are shown in figure 3.

To handle the case where there are no whole bytes, only two edge bytes, we simply check the Y register before operating on the first whole byte, rather than after. The case where the entire row is contained in a single byte is more difficult. We must combine the left and right masks into a single mask, then operate on the dots as if they were on an edge (figure 4).

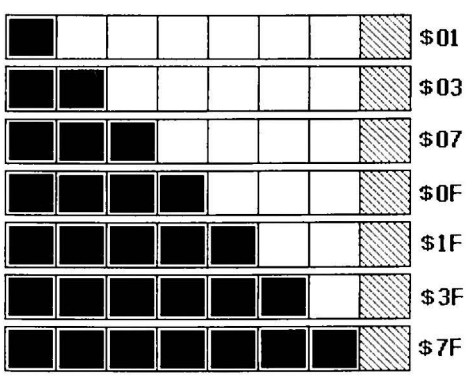
We will need to have two entry points in our Invert program. The first one, InvertA, will be for the case when the left and right edges are in separate bytes, while the second, InvertB, will be for the case where they are in the same byte. The modified Invert program looks like this:

```
Invert      lda  right.msk   ;assume multibyte hline
            ldy  right.d7    ;is left byte = right byte?
```



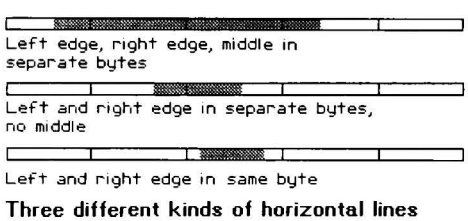

**Left side masks**

Figure 1.



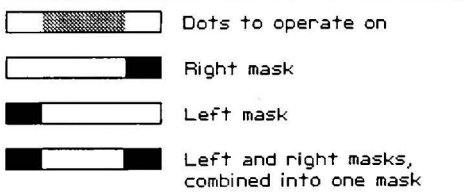

**Right side masks**

Figure 2.




**Three different kinds of horizontal lines**

Figure 3.




**Using masks to draw very short lines**

Figure 4.

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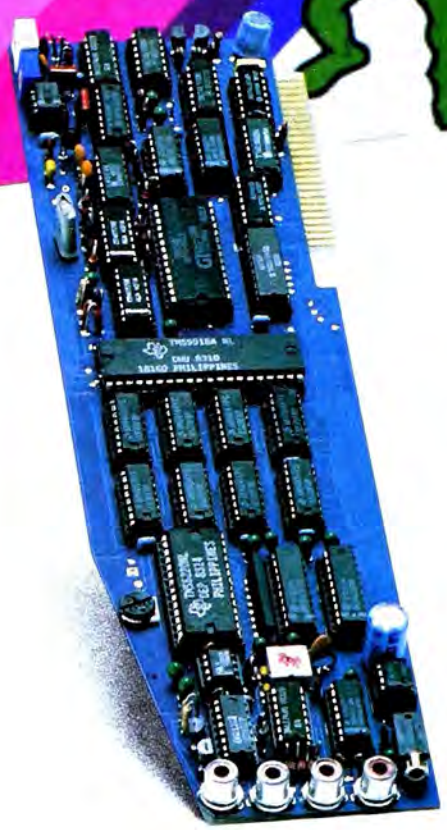
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```
            cpy   left.d7
            bne   InvertA     ; no, do multibyte hline
            and   left.msk    ; yes, combine masks,
            bpl   InvertB     ;  do single byte hline
;
InvertA     equ   *
;
Invert.1    eor   (base),y    ;first time, A = right.msk
            sta   (base),y
            lda   #$7F        ;successive iterations A = $7F
            dey
            cpy   left.d7
            bne   Invert.1
;
            lda   left.msk
InvertB     eor   (base),y    ;A = left.msk or combination
            sta   (base),y
            rts
```

The programs for the other modes are similar. We can combine them to get HLine. All we have to do is write a small program that figures out which drawing program to call. This program can also determine whether the row of dots is in more than one screen byte. Combining these functions removes code that would otherwise have to be repeated in each handler. The listing shows the four drawing mode handlers, together with the HLine program that calls them.

Earlier, we said we would implement a subroutine called ScanPrms to calculate right.d7, right.msk, left.d7 and left.msk. This listing includes ScanPrms, which is based on ideas presented in the November installment of this column.

A few problems remain. We have not implemented SetPattern or described how the pattern mode handlers work. We'll do this and then actually use HLine to draw a few rectangles next column.

```
4380:                1 ;
4380:                2 ; handlers for each drawing mode (all
                                 must be on same page)
4380:                3 ;
4380:                4 ;  index          mode
4380:                5 ;
4380:                6 ;    0          INVERT
4380:                7 ;    1          TURN ON (OR with 1s)
4380:                8 ;    2          TURN OFF (AND
                                 with 0s)
4380:                9 ;    3          EOR with pattern
4380:               10 ;    4          FILL with pattern
4380:               11 ;
4380:               12 ; INVERT: xor a row of ones with the
                                 screen
4380:               13 ;
4380:               14 Invert     equ   *          ;multibyte
                                                     invert
                                                     handler
4380:               15 ;
4380:51 82          16 Invert.1   eor   (base),y   ;eor 1s
                                                     with
                                                     screen
4382:91 82          17            sta   (base),y
4384:A9 7F          18            lda   #$7F
4386:88             19            dey
4387:C4 86          20            cpy   left.d7    ;hit left
                                                     edge
                                                     yet?
4389:D0 F5    4380  21            bne   Invert.1
438B:               22 ;
438B:A5 87          23            lda   left.msk
438D:51 82          24 InvertB    eor   (base),y   ;single
                                                     byte
                                                     invert
                                                     handler
438F:91 82          25            sta   (base),y
4391:60             26            rts
4392:               27 ;
4392:               28 ; TURN ON: OR a row of 1s with the
                                 screen
4392:               29 ;
4392:11 82          30 TurnOn     ora   (base),y
4394:D0 02    4398  31            bne   TurnOn.1
4396:               32 ;
4396:A9 7F          33            lda   #$7F
4398:91 82          34 TurnOn.1   sta   (base),y
439A:88             35            dey
439B:C4 86          36            cpy   left.d7
439D:D0 F9    4398  37            bne   TurnOn.1
439F:               38 ;
439F:A5 87          39            lda   left.msk
43A1:11 82          40 TurnOnB    ora   (base),y
43A3:91 82          41            sta   (base),y
43A5:60             42            rts
43A6:               43 ;
43A6:               44 ; TURNOFF: AND a row of 0s with the
                                 screen
43A6:               45 ;
43A6:49 FF          46 TurnOff    eor   #$FF
43A8:31 82          47            and   (base),y
43AA:4C AF 43       48            jmp   TurnOff.1
43AD:               49 ;
43AD:A9 00          50            lda   #0
43AF:91 82          51 TurnOff.1  sta   (base),y
43B1:88             52            dey
```


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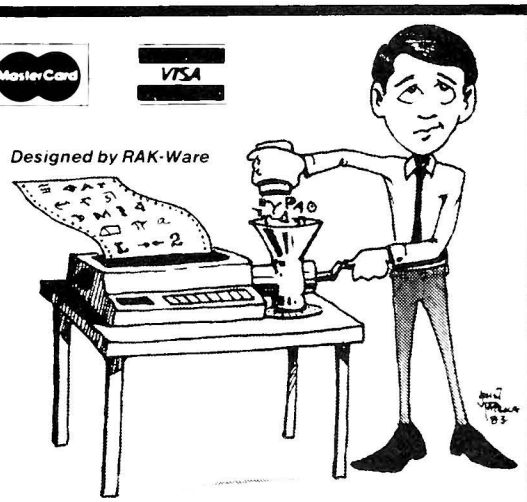
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```
43B2:C4 86          53          cpy  left.d7
43B4:D0 F9    43AF  54          bne  TurnOff.1
43B6:               55 ;
43B6:A5 87          56          lda  left.msk
43B8:49 FF          57 TurnOffB eor  #$FF
43BA:31 82          58          and  (base),y
43BC:91 82          59          sta  (base),y
43BE:60             60          rts
43BF:               61 ;
43BF:               62 ; EOR a row with PATTERN
43BF:               63 ;
43BF:09 80          64 EorPat   ora  #$80
43C1:31 84          65          and  (pattern),y
43C3:4C C8 43       66          jmp  EorPat.2
43C6:               67 ;
43C6:B1 84          68 EorPat.1 lda  (pattern),y
43C8:51 82          69 EorPat.2 eor  (base),y
43CA:91 82          70          sta  (base),y
43CC:88             71          dey
43CD:C4 86          72          cpy  left.d7
43CF:D0 F5    43C6  73          bne  EorPat.1
43D1:               74 ;
43D1:A5 87          75          lda  left.msk
43D3:09 80          76 EorPatB  ora  #$80
43D5:31 84          77          and  (pattern),y
43D7:51 82          78          eor  (base),y
43D9:91 82          79          sta  (base),y
43DB:60             80          rts
43DC:               81 ;
43DC:               82 ; FILL a row with PATTERN
43DC:               83 ;
43DC:09 80          84 FillPat  ora  #$80
43DE:85 89          85          sta  right.msk
43E0:B1 82          86          lda  (base),y
43E2:51 84          87          eor  (pattern),y
43E4:25 89          88          and  right.msk
43E6:51 82          89          eor  (base),y
43E8:4C ED 43       90          jmp  FillPat.2
43EB:               91 ;
43EB:B1 84          92 FillPat.1 lda  (pattern),y
43ED:91 82          93 FillPat.2 sta  (base),y
43EF:88             94          dey
43F0:C4 86          95          cpy  left.d7
43F2:D0 F7    43EB  96          bne  FillPat.1
43F4:               97 ;
43F4:A5 87          98          lda  left.msk
43F6:09 80          99 FillPatB ora  #$80
43F8:85 87         100          sta  left.msk
43FA:B1 82         101          lda  (base),y
43FC:51 84         102          eor  (pattern),y
43FE:25 87         103          and  left.msk
4400:51 82         104          eor  (base),y
4402:91 82         105          sta  (base),y
4404:60            106          rts
4405:              107 ;
4405:              108 ; horizontal line drawing
4405:              109 ;
4405:         4406 110 hptch1   equ  *+1
4405:4C 08 44      111 HLine     jmp  HLineA
4408:8A            112 HLineA    txa                ;entry for
                                                    modes
                                                    with
                                                    pattern
4409:6A            113          ror  a             ;set
                                                    "pattern"
                                                    to buffer
                                                    row
440A:6A            114          ror  a             ; patbuf +
                                                    (scanline
                                                    mod 8)
                                                    * 64
440B:6A            115          ror  a
440C:29 C0         116          and  #$C0
440E:85 84         117          sta  pattern
4410:A9 02         118          lda  #$02
4412:2A            119          rol  a
4413:85 85         120          sta  pattern+1
4415:              121 ;
4415:BD C0 42      122 HLineB    lda  screen.hi,x   ;entry for
                                                    modes
                                                    without
                                                    pattern
4418:85 83         123          sta  base+1        ;set
                                                    "base" to
                                                    scanline
                                                    address
441A:BD 00 42      124          lda  screen.lo,x
441D:85 82         125          sta  base
441F:              126 ;
441F:A5 89         127 HLineC    lda  right.msk     ;entry for
                                                    drawing
                                                    on same
                                                    scanline
4421:A4 88         128          ldy  right.d7      ;is the row
                                                    of dots in
                                                    one byte?
4423:C4 86         129          cpy  left.d7
4425:F0 03    442A 130          beq  HLine.1
4427:              131 ;
4427:         4428 132 hptch2   equ  *+1           ; no, go to
                                                    multibyte
                                                    handler
4427:4C 80 43      133          jmp  Invert
442A:              134 ;
442A:25 87         135 HLine.1   and  left.msk      ; yes,
                                                    combine
                                                    masks,
                                                    go to
442C:         442D 136 hptch3   equ  *+1           ; single
                                                    byte
                                                    handler
442C:4C 8D 43      137          jmp  InvertB
442F:              138 ;
442F:              139 ; vertical line drawing
442F:              140 ;
442F:85 80         141 VLine     sta  temp          ;save
                                                    mask
4431:A6 98         142          ldx  cy1           ;X = cy1..
                                                    cy2
4433:              143 ;
```


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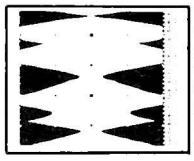
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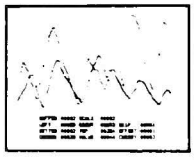
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```
4433:                    4434  144 vptch1    equ  * + 1
4433:4C  36  44               145 VLine.1    jmp  VLineA
4436:8A                       146 VLineA     txa                ;entry for
                                                                  modes
                                                                  with
                                                                  pattern
4437:6A                       147            ror  a
4438:6A                       148            ror  a
4439:6A                       149            ror  a
443A:29  C0                   150            and  #$C0
443C:85  84                   151            sta  pattern
443E:A9  02                   152            lda  #$02
4440:2A                       153            rol  a
4441:85  85                   154            sta  pattern + 1
4443:                         155 ;
4443:BD  C0  42               156 VLineB     lda  screen.hi,x   ;entry for
                                                                  modes
                                                                  without
                                                                  pattern
4446:85  83                   157            sta  base + 1
4448:BD  00  42               158            lda  screen.lo,x
444B:85  82                   159            sta  base
444D:                         160 ;
444D:A5  80                   161            lda  temp
444F:                    4450 162 vptch2     equ  * + 1
444F:20  8D  43               163            jsr  InvertB
4452:E8                       164            inx
4453:E4  9B                   165            cpx  cy2
4455:90  DC              4433 166            bcc  VLine.1
4457:F0  DA              4433 167            beq  VLine.1
4459:60                       168            rts
445A:                         169 ;
445A:                         170 ; set geometrical shape drawing mode
445A:                         171 ;
445A:A0  00                   172 SetInvert  ldy  #0            ;these
                                                                  calls
                                                                  are most
                                                                  common
445C:F0  0A              4468 173            beq  SetGMode
445E:A0  01                   174 SetTurnOn  ldy  #1
4460:D0  06              4468 175            bne  SetGMode
4462:A0  02                   176 SetTurnOff ldy  #2
4464:D0  02              4468 177            bne  SetGMode
4466:A0  03                   178 SetFill    ldy  #3
4468:                         179 ;
4468:B9  8A  44               180 SetGMode   lda  ptchtb.1,y    ;patch
                                                                  drawing
                                                                  handler
                                                                  jumps
446B:8D  28  44               181            sta  hptch2        ;in HLine
                                                                  and VLine
446E:B9  8F  44               182            lda  ptchtb.2,y
4471:8D  2D  44               183            sta  hptch3
4474:8D  50  44               184            sta  vptch2
4477:                         185 ;
4477:A9  15                   186            lda  #HLineB       ;patch
                                                                  jump to
                                                                  or around
                                                                  pattern
4479:A2  43                   187            ldx  #VLineB       ;calculation
                                                                  code
447B:C0  03                   188            cpy  #3            ;pattern
                                                                  mode?
447D:90  04              4483 189            bcc  SetGMode.1
447F:A9  08                   190            lda  #HLineA
4481:A2  36                   191            ldx  #VLineA
4483:8D  06  44               192 SetGMode.1 sta  hptch1
4486:8E  34  44               193            stx  vptch1
4489:60                       194            rts
448A:                         195 ;
448A:80  92  A6  BF           196 ptchtb.1   dfb  Invert,TurnOn,TurnOff,
                                                  EorPat,FillPat
448F:8D  A1  B8  D3           197 ptchtb.2   dfb  InvertB,TurnOnB,
                                                  TurnOffB,EorPatB,
                                                  FillPatB
4494:                         198 ;
4494:                         199 ; mask tables for HLine drawing
4494:                         200 ;
4494:01  03  07  0F           201 rmasks     dfb  $01,$03,$07,$0F,
                                                  $1F,$3F
449A:7F  7E  7C  78           202 lmasks     dfb  $7F,$7E,$7C,$78,$70,
                                                  $60,$40
44A1:                         203 ;
44A1:                         204 ; get byte and mask for x1, x2
44A1:                         205 ;
44A1:A6  96                   206 ScanPrms   ldx  cx1
44A3:A5  97                   207            lda  cx1 + 1
44A5:D0  2C              44D3 208            bne  ScnPrm.4      ;hi byte
                                                                  nonzero?
44A7:                         209 ;
44A7:BD  00  40               210            lda  div7,x        ;no, x is
                                                                  in [0..255]
44AA:BC  00  41               211            ldy  mod7,x
44AD:85  86                   212 ScnPrm.1   sta  left.d7
44AF:B9  9A  44               213            lda  lmasks,y
44B2:85  87                   214            sta  left.msk
44B4:                         215 ;
44B4:A6  99                   216            ldx  cx2
44B6:A5  9A                   217            lda  cx2 + 1
44B8:D0  0E              44C8 218            bne  ScnPrm.3
44BA:                         219 ;
44BA:BD  00  40               220            lda  div7,x
44BD:BC  00  41               221            ldy  mod7,x
44C0:85  88                   222 ScnPrm.2   sta  right.d7
44C2:B9  94  44               223            lda  rmasks,y
44C5:85  89                   224            sta  right.msk
44C7:60                       225            rts
44C8:                         226 ;
44C8:BD  04  40               227 ScnPrm.3   lda  div7 + 4,x
44CB:18                       228            clc
44CC:69  24                   229            adc  #36
44CE:BC  04  41               230            ldy  mod7 + 4,x
44D1:10  ED              44C0 231            bpl  ScnPrm.2
44D3:                         232 ;
44D3:BD  04  40               233 ScnPrm.4   lda  div7 + 4,x    ;yes, x is
                                                                  in [256..279]
44D6:18                       234            clc
44D7:69  24                   235            adc  #36
44D9:BC  04  41               236            ldy  mod7 + 4,x
44DC:10  CF              44AD 237            bpl  ScnPrm.1
```

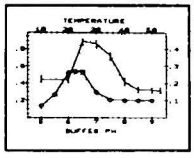

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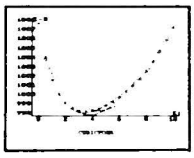


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## Programming? Yes, You Can

Our story so far: Last month, we looked at how simple it is to take a Basic program listing, type it in on the Apple, and save it to a disk. Then, when the program is run, it calculates, draws, prints, sorts, plays, or does whatever it's supposed to do. Just like magic.

Actually, there's nothing magic about it. We already know that a computer program is just a set of instructions that tell the computer to do certain things. It's not much different from the instructions you give to another person to do something. Remember the last time you told someone how to get to your house? The directions probably had words like, "If you're coming from the north," "take the Bozo Boulevard exit," "go past thirty-three traffic lights," and "keep looking for a house with a big duck on the front lawn."

The condition "if you're coming from the north" is usually followed by something like "then take the 6502 freeway," and that's usually followed by something like "but if you're coming from the south. . . ." This kind of conditional is frequently found in computer programs.

The instruction "go past thirty-three traffic lights" is like a part of a computer program that tells the computer to count the number of times it encounters a situation and then perform an action after the thirty-third time.

"Keep looking for a house with a big duck . . ." is sort of like a combination of the conditional and the loop in a program. It's like telling the computer, "Look at a house. If there's a duck on the lawn, then stop. If there's no duck, look at the next house. If there's a duck on the lawn, then stop. If there's no duck. . . ." With this instruction in mind, the person trying to find your house keeps looking for a house with a duck on the lawn until he finds it. (Removing the duck from the lawn will put that person in an infinite loop of looking for your house. Try it!)

Thinking of a computer program as nothing but a set of instructions makes it easier to deal with; all of a sudden, programming isn't such a mysterious art. So, let's take the following statement as a law:

Anyone who can give instructions can program a computer.

Now all that's left is to learn a language in which to talk to the computer. This month we'll look at a few possibilities.

**Why Learn a Language?** In the program we used as an example last month, we used words like *print*, *clear*, *home*, *for*, *next*, and *input*. Can this machine understand English, or what? Consider the following lines of Applesoft:

```
100 INPUT "Enter the first number: ";A
110 INPUT "Now enter the number to be added: ";B
120 C = A + B
130 PRINT "The sum of the two numbers is ";C
140 END
```

Here's how the Applesoft program would look if it were written in English:

100 Put the message "Enter the first number: " on the screen and wait for the person using the program to type in a number. Take whatever number is typed in and assign it to the variable A.

110 Put the message "Now enter the number to be added: " on the screen and wait for the person using the program to type in a number. Take whatever number is typed in and assign it to the variable B.

120 Add the values of A and B together and assign the sum to the variable C.

130 Put the message "The sum of the two numbers is " on the screen, followed by the value of variable C.

140 That's the end of the program. Go back to the Applesoft prompt.

Pretty simple stuff, even though this program has almost no practical value.

Consider the following useless Pascal program:

```
Program FOOTFINDER;
(* ------------------------------------------------------------ *
 *    Here's a pointless program that converts inches           *
   to feet and inches. Big deal, huh?                           *
 * ------------------------------------------------------------ *)
begin
   WRITELN(372 div 12) ;
   WRITE(372 mod 12)
end
```

The first line gives the name of the program. The next four lines are just remarks about what the program does. *Begin* tells where all the action starts. The next two lines perform the program's calculations. *Writeln* is like the *print* command in Basic; it tells the computer to display what follows. In this case, it says, "Display the results of 372 divided by 12." *Write* is almost like *writeln*; it also displays things. Here, it says to divide 372 by 12 and display only the remainder. The only difference between *write* and *writeln* is that when *writeln* finishes doing what it's supposed to do, it tells the computer to start on a new line. Finally, *end* marks the finish of the program.

**Aw, That's Simple.** In the Applesoft and Pascal examples, it's not too hard to figure out what's going on. Even if we're not familiar with either language, both programs contain some words with which we are familiar—English (anybody not familiar with English should stop reading right here).

Now just hold on a darn second. Last month we said computers don't and can't understand English. Our hero Klondike Putz typed *Soup is good food*, and the computer beeped, spitting *?syntax error* at him. We're not contradicting ourselves. The computer understands only one language: machine language. Unfortunately, machine language is totally foreign to most of us, and those who do understand it are generally ostracized at social events.

To say that the Apple understands Basic isn't entirely accurate. The same goes for all languages other than machine language. Programming languages are merely tools to help us communicate with the machine. It's like trying to talk to someone who understands only Latin; not many of us speak it beyond a few words and phrases. Unless there's someone or something to translate our language into Latin, all is lost.

Programming languages come in two kinds: low-level and high-level. A low-level language is one that is closest to the machine's native tongue, or lowest on the pyramid of programming languages. Machine

and assembly are low-level languages. High-level languages are almost everything else. They're the ones that are closer to the way we speak, or at least easier for us to understand than machine language. APL, Lisp, PL/1, Prolog, and Algol are just a few high-level languages we don't hear too much about. Let's look at a few languages we do hear about.

**Here's to Henry Ford.** Though assembly language is much easier to understand than machine language, it's still a low-level language. Assembly is close to machine language, but it works a little differently. Whereas machine language assigns a binary number to each instruction, assembly assigns a word or abbreviation called a *mnemonic*. For example, the mnemonic JSR in assembly stands for jump to subroutine; LDX stands for load a value into the X accumulator. So even if the bytes in memory don't look like anything, a programmer can understand a little of what's going on by looking at mnemonics.

Since assembly is so close to machine language, it doesn't need to be translated before it can be run. As a result, programs written in assembly execute much faster than programs in high-level languages.

Assembly language for the 6502 (the microprocessor used by the Apple) is different from assembly language for other microprocessors. Thus, it's not possible to write a 6502 assembly program and then run it on a computer like the IBM PC, which uses the 8088 chip. Languages—and programs written in them—that can be used on different kinds of machines are called *portable*. Assembly language isn't portable.

**Basic Training.** If the urge to learn how to program ever strikes, Basic is a good language to learn first. Basic stands for *b*eginner's *a*ll-purpose *s*ymbolic *i*nstruction *c*ode, and it lives up to its name. The language was created in the late sixties by this guy named John Kemerry, a Dartmouth professor. Kemerry's goal was to come up with a computer language that people with little technical background could understand.

Two things make Basic the wonder language Kemerry intended it to be. First, it uses English words instead of scientific abbreviations that are hard to remember. Read the following Basic statement out loud:

```
10 IF X > 400 THEN PRINT "The dog is on fire."
```

and compare it to the sentence, "If *x* is greater than 400, then print *The dog is on fire.*" Except for the number 10 at the beginning of the Basic statement, both statements read, sound, and mean the same thing. By using English words for program commands, Basic makes it easy for nonprogrammers to write programs.

Second, Basic lets the programmer type in and test parts of programs immediately. In the old days, computer science students had to sit down at a terminal and write their programs by punching holes in computer cards. When they wanted to test their programs, students picked up the big pile of cards and fed them into the computer. In Basic, typing *run* sets the program in action. No cards to worry about.

Basic is an easy language to use because each command takes care of several machine language commands. In effect, machine language says, "Pick up the phone; listen for a tone; dial 4; dial 1; dial 1." Basic says, "Call information." Unfortunately, although Basic is simpler, it is also slower than machine or assembly language.

It didn't take long before people started realizing they could make some dough by selling their own versions of Basic, and now there are many versions available.

**Programs That Read Like Stories.** Another popular programming language is Pascal, developed by Niklaus Wirth, who, like Kemerry, wanted to develop a language that would be easy to learn. Like Basic, Pascal uses English words for many of its commands, making programs easy to read and figure out what's going on. In some cases, parts of a Pascal program can be read aloud and sound close to the way they would in standard English.

Despite their similarities, Basic and Pascal differ in a big way. In Basic, it's easy to sit down and start slinging code left and right, telling the program to go to a specific line number if certain conditions are met. A Basic program is like the streets in a big city. You can drive around, and where you end up each time that you drive through depends on what turns you decide to take.

Pascal forces you to program in an organized manner. It demands that you already know what you want the finished program to do and then write it from beginning to end. This would be comparable to driving a route that leads to only one place. You start at the beginning and follow one path until you reach the end. Of course, it's possible to deviate from the path (go to a subroutine), depending on what the program is doing, but the program returns to the main path until it gets to the end. It's harder to program this way, since much preparation must be made before lines of code are typed in, but it forces the programmer to adopt good programming habits.

While Basic lets you test out parts of the program by themselves immediately after you've typed them in, Pascal requires that you write the program with an editor program, exit the editor, and then run the program. Only when you run the program does Pascal tell you if there are any errors.

Having learned one programming language makes it a little easier to learn another. Learning a particular language isn't as important as learning the concepts and ideas of programming. Because the computer is a logical machine (it makes decisions based on logic, not values or emotion), it takes a logical approach to program it. Once your mind gets used to thinking along the same lines as a computer, writing programs for the computer becomes easier.

Programmers will argue about which language, Basic or Pascal, is "better," but such arguing is futile, and they'll end up arguing until Hades reaches a very cold temperature.

**Not for Kids Only.** In terms of getting youngsters started on the computer, Logo can't be beat. While many kids learn Basic as quickly as they learn to throw rocks through windows, Logo is the perfect language for young children.

Logo is the perfect language for anyone having trouble getting used to the idea of programming a computer. The thought of "Me? Program a computer? Ha!" is ridiculous. As we said in the beginning of this month's column, programming a computer isn't much different from giving someone instructions to do something. Logo is an easy way to take that idea and use it on the computer.

Logo was designed as part of an experiment to test the idea that programming might be something good to teach to children. Based on Lisp, a widely used language for research in artificial intelligence, Logo was later refined at the artificial intelligence laboratory of the Massachusetts Institute of Technology and at the University of Edinburgh, Scotland.

In the beginning, Logo didn't have any computer graphics, but graphics were soon included in the form of *turtle graphics*. So called because of the "turtle" cursor, turtle graphics is such a dominant aspect of Logo that people often think that graphics is all Logo can do. To the contrary, turtle graphics is just the beginning of the language.

With an Apple and no additional hardware, Logo makes it possible to write tunes and play games with music. Logo can handle words and lists easily, making it possible to write quizzes, conversational programs, programs that teach, and programs that learn. Fundamental mathematics is also part of Logo. Logo's ability to do recursion (a procedure that repeats itself indefinitely) makes it possible to perform some computations easier than they can be done in Basic.

There are three general ideas associated with Logo. First, programming is a good way to teach children how to solve problems that aren't necessarily connected to any other school subject. Second, programming is a good way to show how mathematical concepts work, concepts that are hard to understand. And third, the computer provides a good environment in which to play around and experiment with abstract mathematical ideas. The results it produces are more visual, less imaginary.

**Which To Choose?** If you've never written a computer program, Basic (Applesoft) is a nice and easy language to start with. Not only is it useful and simple to learn, but it's a good way to learn the general concepts of programming, how programs work, and why they sometimes go wrong. Once you have an understanding of how things work in a computer program, it's easier to deal with problems when they arise; you'll know where to look for errors, whether they're in the program or in your own input.

So, computer programs are just like everything else in the universe. Sometimes we get hostile and hurl things at the computer, but that's usually when we don't understand what's wrong. Knowing what the computer is doing and, more important, why it's doing it is the key to getting along with these once-feared machines.

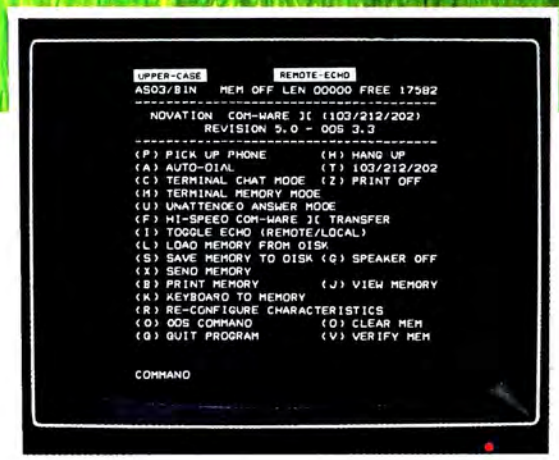
Gosh, these concepts of understanding and empathy could be applied to all sorts of situations. Why, the list of problems we can solve is endless: racial strife, international tension, poverty, threat of nuclear war, misplaced laundry tickets, lost luggage. . . .

You get the idea. ◨

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## Bridging the Communications Gap: Part Two

Before we jump in and look at some new stuff, let's make life easier for all of us by defining a few terms.

Two terms that cause a lot of confusion in communications are *half-duplex* and *full-duplex*. The reason for such confusion is that both terms can apply to two entirely different things: transmission lines and protocol. Transmission lines are the circuits on which information travels; protocol refers to the method by which it travels.

Half-duplex circuits (or lines) consist of two wires, only one of which carries a signal. Full-duplex lines consist of four wires, two of which carry signals.

A half-duplex protocol allows you to transmit and receive information in one direction at a time. That is, at any time, information is either being transmitted or received, but not both. As expected, a full-duplex protocol makes it possible to send and receive information simultaneously. Half- and full-duplex protocols can operate on half- and full-duplex circuits.

The next two confusing words are *synchronous* and *asynchronous*, both of which are used to describe data communication. The main difference between the two is the way that they indicate starting and stopping. Asynchronous data uses start and stop bits to define the beginning and end of each character. Synchronous communication, in contrast, doesn't use such bits on individual characters; instead it carries start and end characters to mark the beginning and end of an entire message.

In asynchronous communication, characters may be sent one at a time (when you type at the keyboard) or contiguously (sending a file, for example). Transmission speed is usually 2,000 bits per second (bps) or slower, but it's possible to transmit as fast as 2,400 bps. Asynchronous transmissions almost always use half-duplex protocols.

In synchronous communication, data is sent in a stream and usually travels at speeds of 2,400 bps or faster. Half- or full-duplex protocols can be used for synchronous communication.

Since we're concerned primarily with microcomputers, Apples in particular, most of what we talk about is asynchronous communication.

**When We Last Left Our Hero. . . .** Two months ago, we said it wasn't possible for dissimilar computers to exchange files with each other. It was possible for two people, each sitting at a terminal, to type messages back and forth, but they couldn't send binary data to each other. Text files could be transmitted, but only because the computers think that sending a text file is the same as the computer operator typing very fast. To send text files, or any kind of files, error-free, we said it was necessary that both parties use the same kind of computer with the same operating system.

Last month, we made liars out of ourselves by introducing the Microcom Networking Protocol (MNP), a protocol that allows different kinds of computers, regardless of operating system, to exchange files. Having licensed MNP to several software developers, Microcom hopes to make MNP the standard protocol for computer communications.

But Microcom isn't the only company that believes its way is the only way. Communications Research Group of Baton Rouge, Louisiana, has been marketing a product called *Blast* for quite some time. Whereas MNP is a software protocol that Microcom licenses to other companies to include in their own programs, *Blast*, which stands for *bl*ocked *as*ynchronous *t*ransmission, is a software package that links various computers to each other.

*Blast* isn't a protocol like MNP; it's a product that runs by itself, and it runs on various brands of computers. Apple (DOS 3.3 and CP/M), IBM PC (PC-DOS and MS-DOS), Data General, Digital Equipment, Hewlett-Packard, and Texas Instruments are just a few. All versions of *Blast* can communicate with each other and can convert transmitted text files to the internal formats of other computers. In other words, if you use *Blast* to send a standard Apple text file to any CP/M machine running *Blast*, the file will be converted to a CP/M text file for that machine when it arrives.

*Blast* also runs on minicomputers and mainframes, and the list of companies already using it reads like a *Who's Who of Corporate America*: Texaco, Lockheed Electronics, Northrop, Rockwell International, Union Carbide, Ford Motor, Fairchild, Boeing, Walt Disney World/Epcot, Shell Development, Hughes Aircraft, American Bell, and Eastman Kodak are some of the more recognizable names.

Let's look at a few features of *Blast*.

**What's So Good about It?** Obviously, the most attractive feature of *Blast* is that it provides a communications link between many different kinds of computers and provides a means of error-free data transmission. The protocol used is similar to the OSI (Open Systems Interconnection) reference model we described last month; it consists of interactive layers, yet each layer is independent of the others. Thus, it's possible to modify one layer while leaving the others intact.

*Blast* uses what Communications Research Group calls a *sliding-window* protocol to guarantee error-free transmission and cut the amount of time spent on the phone.

In the half-duplex ACK/NAK (acknowledge/negative acknowledge) protocol used by many terminal programs, the sending computer

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## SOFTWARE SECRETS

Here's some advice. There's a secret to buying software. And if you learn just three simple facts, you won't often get stung on bad software.

Let's start with programming language. Most programs are either written in Assembly language or BASIC. Programs written in BASIC tend to be slow and a bit cumbersome.

To be sure, some BASIC programs are good ones, but usually Assembly programs are superior.

Why is this so? Assembly language means fast operation... sometimes ten times faster than BASIC. Most important: Assembly is the mark of an experienced programmer, which means cleaner design, fewer bugs, and superior error trapping.

(If you are unsure of the language, check the boot-to-data-entry time. Ten seconds or less usually means Assembly language.)

Second, examine the documentation. Turn to any page and start reading. Look for clear writting and good organization. Good programs rarely come with poor documentation.

Third, insist on a money-back guarantee. If the software doesn't perform as advertised, why should you get stuck?

A few mail order companies sell with a money back guarantee, and it is usually easier to get money back from a company 2000 miles away than from a company two blocks away. Postal regulations are tough; so are credit card rules.

**Only One Percent Returned** We sell Money Street with a "no questions asked" money-back guarantee. In one year we have sold 2082 programs. Only 21 customers have asked for a refund... just about one percent. By the way, usually our refund checks for these few customers were in the mail within 24 hours.

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- "Money Street works like a charm and is intelligently structured. One can readily see the program was designed by someone well versed in business and finance, and not by some recluse hacker." Leo de Gar Kulka, San Francisco, Calif.
- "It's amazing...everything you said it was and more. It keeps me up until 3:30 AM sometimes. Not because it's hard, but because I enjoy working with it." Andres Delgado, Brooklyn, NY.
- "I'm delighted with Money Street and recommending it to everyone coming through the door." Carolyn Biediger, Roadrunner Computing, Uvalde, Texas.
- "My husband, who is responsible for the household bills, is especially appreciative of the running totals of each category. What a magnificently thought-out program! Thank you. It's worth every penny." Joan Hoffman, Westport, CT.
- "The program is fabulous—I love it." Richard Rodney, D.D.S., Toronto, Canada.
- "The program is both easy to use and a very helpful addition to my software library. The most useful features are the automatic totaling of categories and the automatic retrieval of split entries." Louis Wofsy, Burk, Virginia.
- "As promised, it is not only easy to learn but an extremely valuable tool for keeping tax deductible items readly at hand." H.M. Stover, Yountville, Calif.
- "You guys are great!" Dick Palmer, San Diego, Calif.
- "I think the phrase 'as promised' sums up my reaction to the program. I wound up balanced to the penny. This from someone who hasn't looked at a bank statement in ten months!" Glenn Pironlick, Charlotte, NC.
- "I'm impressed with the well conceived error-trap warnings. Also it instills confidence having every exit move also a save move." Edward Simmons, Los Angeles, Calif.
- "I'm very pleased with Money Street and can easily recommend it to others. It is fun to use, and, at the same time, very practical and time saving." Henry Poterucha, M.D., Effingham, Ill.
- "I'm having more darned fun with Money Street. I don't know why either because I hate numbers." Harry Teasedale, NYC
- "I've tried seven other checkbook programs and have not had the satisfaction that I have with this one." Leo Wong, D.D.S., Calgary, Canada.
- "The program has proved the hype of Money Street is really too modest." Dan Thomas, Elgin, Ill.
- "In my law office, the real cost of a program is the time it takes to learn and set it up. Money Street is great." Buzz Bruggerman, Orlando, FL

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**How it works** On your computer screen, you create a facsimile of your checkbook. You see 17 items per screen and can scroll for more. As the computer balances your checking account, you give each check or deposit its own category code. You get 100 you name'em codes. Press Ctrl-O and see a code dictionary. To set up codes, just type them in. You can add, delete, or change codes any time without affecting data.




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transmits blocks of data one at a time and waits for an ACK signal or a NAK signal after each block, which tells whether the block arrived intact or not. Only after it has received an ACK or NAK will the sending computer transmit another block, whether it's the next block or the same one over again.

The sliding-window protocol works in full-duplex and transmits a number of blocks at a time. When the receiving computer sends back ACKs or NAKs, the sender notes which blocks didn't arrive intact and then resends only those blocks. But the sender does *not* wait after sending each block. Here's an illustration:

**Ballpark Communication.** Imagine a baseball pitcher and catcher playing catch. The pitcher must complete ten different kinds of pitches (send ten blocks of data) before the team can pack up and go home. The pitcher throws the first pitch, a slider. When the catcher catches it, he yells back, "Got the slider," which is like the receiving computer sending an ACK. Then the pitcher throws his next pitch, a high curve. When the catcher catches that one, he yells, "Got the high curve!"

If the catcher ever misses, he yells back, "Missed the knuckleball!" or whatever pitch he missed, which is like the computer sending a NAK. At this point, the pitcher must throw the knuckleball again. After each try, the catcher tells the pitcher whether he caught it or not. This procedure is how ACK/NAK keeps trying to send a block of data until it is received intact—one block at a time.

The sliding-window protocol would be like having the pitcher throw all ten pitches in a row, and then throw again the ones the catcher said he missed. The difference here is that the pitcher doesn't wait for the catcher's "got it" or "missed it" between each pitch; he hears the responses *while* he's pitching.

Just like the pitcher in the second example, the sliding-window protocol resends the missed blocks of data after it finishes sending a group of blocks.

*Blast* can do this because it operates in full-duplex mode, which makes it possible to send and receive data at the same time. So, while the computer is sending its blocks of data, the receiving computer is sending back its ACKs and NAKs. Since *Blast* operates in full-duplex, computers can send and receive files at the same time.

Being able to send and receive simultaneously is convenient. Unlike half-duplex mode, which allows the sending and receiving of files at different times, full-duplex mode lets you send a file while you receive a file from the remote computer. This feature alone would cut phone charges almost in half. Both transmissions take place error-free.

**Hello . . . Hello . . . Hello?** Another feature in *Blast* remedies the problem that arises when you get cut off in the middle of a file transfer. Losing the phone connection during transmission means having to call back to reestablish connection. Once the two computers are linked again, the whole transfer process starts anew, beginning with the first block. Not so with *Blast*.

According to Communications Research, the only blocks that need to be sent after reconnection are those that weren't sent during the first attempt. When a line-loss occurs, the *Blasts* at each end recognize the loss and "remember" which block was transmitted last. When the computers are reconnected, the transfer process picks up where it left off.

Communications Research is trying to reach as broad a market as possible. It has versions of *Blast* available for more than twenty computers, including eighteen micros, and is currently developing versions for five more mainframes.

The medium of communication between terminals doesn't matter to *Blast*. It works with dial-up (phone line) connection, satellite or microwave, on-site direct connect, local area networks, or packet-switch networks. It operates at speeds of up to 9,200 bps over modem, and up to 19,200 bps with a direct connection.

Microcom and Communications Research seem to be the front runners in the race to establish a standard protocol for computer communications, but the two companies are using different approaches. Microcom is licensing its MNP protocol for a nominal fee to software developers, while Communications Research is selling a finished product, which uses a different protocol, directly to the consumer.

While those two companies work on setting a protocol standard, let's take a quick look at an aspect of telecommunications that's generally ignored in the microcomputer world.

**Art Imitates Life Imitating Art**. Two months ago, CBS aired an episode of *Whiz Kids* in which Soviet spies were using a microcomputer


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## FORMATTING

All vertical and horizontal spacing can be set for any style of business or personal letter. This means that you can concentrate on the typing and forget tabs and linefeeds, everything gets to the right place by itself.

## TEXT ENTRY & EDITING

Because LETTERWRITER is self-formatting, and complex tables or other structures as a rule are not part of letters, text can be entered in a dump fashion, much the same way as a dictation to a secretary. Full editing features are of course included, but there is no need to "see what you get" as you know that already from setting the formatting. An 80 column card is totally unnecessary. Another advantage is that typing and editing is in the same mode and doesn't require any switching.

## OPERATION

LETTERWRITER is an easy program to master, with all commands available to the user, always explained on the screens. After reading the manual for 15 minutes you should be ready to start, and the first perfect letter should come out from the printer in another 15 minutes. This is possible only because LETTERWRITER is designed not to be a sophisticated Word Processor but an efficient tool for producing letters.

## HARDWARE REQUIREMENTS

Apple II + or IIe with 48K and 1 disc drive.

## NAME & ADDRESS FILE

Time and efforts are often wasted on looking up correct spelling of the name, and accurate address. LETTERWRITER has therefore an accumulative file for more than 400 records, which can be accessed directly. A search typically takes 2 seconds, and can be alphabetical, numerical or any combination. As there is no re-typing involved the name and address is always correct.

## STANDARD PHRASES

Certain parts of letters involve a lot of repetitive typing. It is therefore useful to have a selection of phrases to call up. With LETTERWRITER you make your own phrases and signing patterns, to be used for different types of letters.

## OTHER FEATURES

Name and address on letterhead or envelope or both; Left and right justification, underlining and dummy spaces; Country in address format; Mail-Merge with manual selection; Utility programs for making back-up disk copies and purging Name file, and more.

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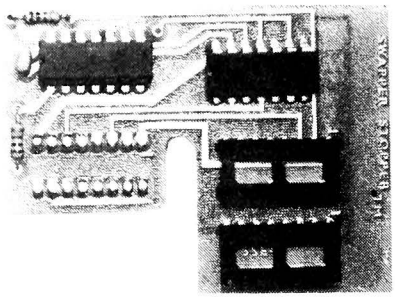
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to communicate with the Soviet Union. At first, such a premise seems far-fetched, since spies would have to go through an international telephone operator to place the call. But their modem wasn't communicating by phone; it was communicating by satellite.

Still a bit far-fetched? Not at all. Equatorial Communications Company markets satellite data communications networks for point-to-multipoint applications. The company owns and leases satellite transponders (radio transmitters that automatically send out signals when activated by another transmitter) and operates satellite data communications networks.

As far as microcomputer compatibility is concerned, Equatorial makes and markets receive-only (nontransmitting) earth stations (commonly referred to as "dishes," though the large dishlike antenna is only part of the whole station) that can be installed in the back yard, on the roof, or wherever is convenient. The earth station provides a link between the microcomputer and the satellite; the satellite provides a link between computers without using telephone lines.

Equatorial's earth stations are the first microprocessor-based receive-only earth stations using a two-foot diameter antenna.

A quick glance would suggest that an earth station is just another expensive toy for computer buffs, but there are practical uses for such a toy. Already, computer owners are using earth stations for distributing and receiving electronic mail, database updates, general news, and commodity news and financial information.

The big market for Equatorial in the microcomputer business is the investors' market. When buying and selling commodities in Chicago and New York, every second counts, so receiving information as soon as it becomes available is important.

Quotrader, by Quotrader Corporation, is one product that puts an earth station to good use. Quotrader consists of two boards that fit only in the Apple II Plus or IIe. The first has a Z-80 processor that handles data communications, accounting, and the trading system; the second board contains additional memory and the hardware to format displays.

Simply stated, here's how Quotrader works with the earth station: Quotrader receives quotes on commodities from the New York and Chicago exchanges and sends them to Southern Satellite Company. Southern Satellite transmits them to a satellite. The signal from the satellite is received by cable television stations or by earth stations. The earth station's controller demodulates the signal and changes it to information the computer can understand.

**Look Who's Talking**. Meanwhile, back here on Earth, the brokerage firm of E.F. Hutton has made a move into the area of home computer use in investing.

Last December, E.F. Hutton launched Huttonline, an electronic information service that gives clients access to the firm's computers for personal account data, investment information, and electronic mail.

Huttonline makes such account information as portfolio positions and market values, cash and margin balances, and open orders available instantly. It also shows clients their transaction activity, including interest and dividend income, buys and sells, interest expense, and deposits. Clients who have Asset Management or Asset Reserve Accounts services can also see available assets and all checks that have cleared as of the previous day.

Clients can dial into E.F. Hutton's IBM mainframe computers in New York City over regular telephone lines; a national data network that connects microcomputers to Huttonline eliminates the long-distance phone charges. Huttonline is available to clients between 6:00 a.m. and 12:30 a.m. eastern time, seven days a week.

Any E.F. Hutton client can subscribe to Huttonline. The sign-up fee is $25, and there's a monthly service fee of $17, which includes up to two hours of free use. Additional use costs $7.50 per hour.

In south Florida, access to Huttonline is also available through Viewtron, a videotex service from Viewdata Corporation of America. A special adapter sold by AT&T lets you use your television set as a home information terminal connected to Viewtron's computer in Miami. The adapter, called Sceptre, costs $900 and consists of a control unit and a wireless remote keypad. ◨

*Communications Research Group, 8939 Jefferson Highway, Baton Rouge, LA 70809; (504) 923-0888. E.F. Hutton, One Battery Park Plaza, New York, NY 10004; (212) 742-5000. Equatorial Communications, 300 Ferguson Drive, Mountain View, CA 94043; (415) 969-9500. Quotrader, 20823 Stevens Creek Boulevard, Suite C3-A, Cupertino CA 95014; (408) 446-0848.*

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### DOS, CP/M, and PASCAL File Compatibility Combined In a Single Program

Softerm 1 incorporates an advanced file manager which provides compatibility with DOS 3.3, CP/M, and Pascal disk formats for all file operations including file transfers. And at speeds up to 5 times faster than standard Apple DOS! Built-in disk utilities provide *INIT, CATALOG, RENAME,* and *DELETE* commands for all disk formats. Wildcard match characters can be used whenever filenames are entered.

Local file transfers allow DOS, CP/M, or Pascal files to be displayed, printed, or even copied to another disk. For example, a file on a CP/M formatted disk in Drive 1 could be copied to a Pascal formatted disk in Drive 2 providing a complete format conversion capability. Numerous editing options such as tab expansion and removing unwanted characters allow easy reformatting of data to accommodate the variations in data formats used by host computers.

### Multi-Protocol File Transfer Capability

Softerm 1 offers file transfer methods flexible enough to match any host computer requirement. These include the *character* protocol with user-definable characteristics to provide maximum flexibility for text file transfers to any computer. The CP/M User's Group standard *XMODEM* protocol may be used for binary file transfers with systems using the CP/M operating system. The intelligent *Softrans* protocol can be used to transfer *any* type file and provides automatic binary encoding and decoding, error detection and automatic retransmission, and data compression to enhance line utilization. A FORTRAN 77 source program is supplied with Softerm 1 which is easily adaptable to any host computer to allow communications with Softerm using the Softrans protocol. Specific host computer versions of the Softrans FORTRAN program are available on request.

Softerm file transfer utilizes an easy to use *command language* which may be executed interactively or from a *macro* command file which has been previously entered and saved on disk. Twenty-three high-level commands include *DIAL, CATALOG, SEND, RECEIVE, ONERR, MONITOR, HANGUP,* and others. A *SCHEDULE* command even allows file transfers at a specific date and time.

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For the latest program enhancements, you can access the Softronics Online Update Service 24 hours a day, 7 days a week. New hardware support or terminal emulations are immediately available to all Softerm users.

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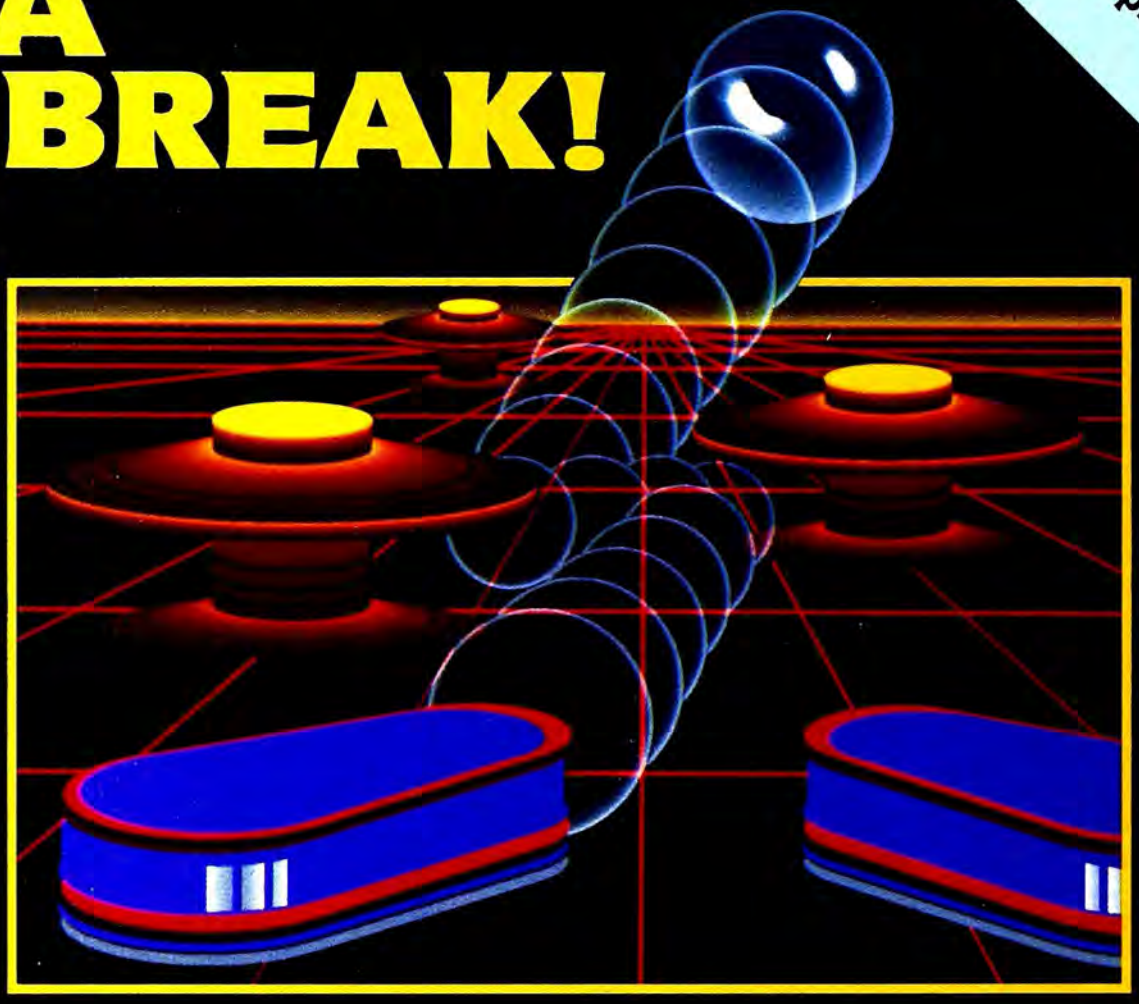



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## String Along with LEN

Last month's first look at string variables did not include the introduction of any new commands, and this was intentional. Although plenty of specialized commands exist whose sole purpose in life is to help you manipulate strings, it seemed worthwhile to point out that much can be done with strings by using some of the same commands that are used to handle numbers. This month we'll examine the string commands.

One final word about January's column. The sort routine listed there is a member of the species bubble sort (*sortus bubbleup*). The bubble sort is just one of a family of sort algorithms bearing such bizarre names as Shell sort, Shell-Metzner sort, quicksort, and binary tree sort. The bubble is kind of a poor cousin to these sorts, operating slowly to start with and becoming unreasonably slower as the number of items to be sorted goes up. One of the bubble sort's virtues is that it is reasonably fast at sorting a few random items into an otherwise sorted list. Nevertheless, try the routine shown last time with a few hundred randomly created "words" and see how long it takes.

If you're more interested in the bubble sort's faster relatives, you'll have to do a little research on your own. One good place to start, if you've been reading *Softalk* for some time or are willing to obtain old copies, is Taylor Pohlman's Third Basic column in the November and December 1982 issues. The program examples are for the Apple III, but the algorithms are all explained well. It's not too hard to adapt the same ideas to the Apple II.

**Tied Up in Generalizations.** Some string functions deal with both strings and numbers, while others deal only with strings. Specifically, some string functions turn a string into a number and some turn a number into a string; others merely turn one string into another. Those functions that turn a number or a string (or both) into a string have dollar signs in them; those that return a number don't. First, a look at some string functions that are preceded by a dollar sign.

One thing we did consider last month was how strings can be concatenated—that is, glued together—with the plus sign. The string functions that are used most frequently do the opposite; they break strings apart into smaller strings, or *substrings*. These functions can be used to read a portion of a string that resides in the middle or on the rightmost or leftmost extremity of the string. The functions are aptly named *MID$*, *RIGHT$*, and *LEFT$*.

In actual use, the functions look something like this:

```
B$ = LEFT$(A$,4)
```

The things inside the parentheses are usually called *arguments* and are roughly the same as parameters (when used in a function, parameters are called arguments). Keep in mind that we don't stay up nights making up these rules. We just report them to you.

The first argument of LEFT$ is always a string expression—that is, a string variable, a string in quotes, another string function, or any combination of these. For now, let's keep things simple and think in terms of a string variable as the first argument, as shown in the example. This argument is the string from which the substring is to be taken.

The second argument of LEFT$ is a string expression that specifies the number of characters to be put into the substring. So if A$ = "disk drive" in the example, then B$ will be assigned the string "disk," the four leftmost characters of "disk drive." RIGHT$ works the same way, except it takes the rightmost characters of the string and assigns them to the substring. Consider the example:

```
B$ = RIGHT$("M.C. Escher",N)
```

If N = 4, then B$ = "cher," thus showing how a pop singer can be derived from an artist with a predilection for unusual patterns. If N = 6, however, then old M.C. is himself again; B$ = "Escher."

MID$ is a bit more complicated. To take something from the middle of a string, you have to know where to start and how far to go, as is so often the case in life. For that reason, MID$ requires three arguments (usually): the string from which to take the substring, the character position to start with, and the number of characters to take. So:

```
B$ = MID$(A$,5,1)
```

will take the fifth character of A$, no matter what A$ is (provided it is at least five characters long), and put it in B$. Similarly:

```
B$ = MID$(A$,10,2)
```

will take the tenth and eleventh characters of A$ and put them in B$; that is, it will take two characters starting with the tenth character.

**Six of One, MID$ of the Other.** MID$ can occasionally function as an alternative to RIGHT$, but it works a little differently. Remember that RIGHT$(A$,N) returns the N rightmost characters from A$. When used as an alternative to RIGHT$, MID$ is used with only two arguments. For instance, MID$(A$,N) returns the rightmost characters from A$ starting with the Nth character. With LEFT$ and RIGHT$, the second argument is the number of characters. With MID$, the second argument is the position of the first character of the substring within the string and the third argument, if used, is the number of characters in the substring. Some examples:

| | |
|---|---|
| B$ = LEFT$("Applesoft",5) | B$ = "Apple" |
| B$ = RIGHT$("Hamlet",3) | B$ = "let" |
| B$ = MID$("Wish you were here",6,3) | B$ = "you" |
| B$ = MID$("Mike Doonesbury",6) | B$ = "Doonesbury" |
| B$ = RIGHT$("Mike Doonesbury",10) | B$ = "Doonesbury" |

**Knowing Your Place.** Most of the time, the arguments of a string function won't be a string and a number or pair of numbers, as these ex-



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amples show. There's no good reason to say *B$ = MID$("Mike Doonesbury",10)* when it's easier to say *B$ = "Doonesbury"*. Usually, at least one argument will be some form of expression.

Suppose you had a list of names and wanted to make them last-name-first. Let's keep it simple; no names like Cher or Norman Vincent Peale. Just good old two-word names like most Americans (who have three names but are ashamed of the middle one) use. These names can be split by searching for the space between the two words and using its position to determine the arguments for the string function.

First we need a loop that will look at the characters one at a time. To use such a loop, we need to know the length of the string. We can find the length via the *LEN* function, which is used like this:

```
A = LEN(A$)
```

Plainly, LEN is one of those string functions that has no dollar sign and returns a number. It puts the number into the numeric variable specified, or it can be used anyplace an arithmetic expression is legal. For instance,

```
10  FOR CH = 1 TO LEN(NAME$)
```

would be one way to start our search for the space between the first and last names. So let's do it that way. Here's how:

```
10  FOR CH = 1 TO LEN(NAME$)
20  IF MID$(NAME$,CH,1) = " " THEN C = CH: CH = LEN(NAME$)
30  NEXT CH
```

The condition in line 20 says, "If the one character within NAME$ at position CH is a space. . . ." If this condition is met, then C is set to the number of the position where the space was found. CH is set to the maximum value of the loop index so that the loop will exit cleanly in line 30. Because we know the position of the space between the words and can discover the length of the whole string, we can now easily determine the arguments necessary to separate the first and last names.

The first name will be all the left-hand characters up to *but not including* the space. C, besides being the position of the space, is also the number of characters up to *and including* the space. To get the number of characters in the first name, we merely subtract one. Line 40 gives us the first name:

```
40  FIRST$ = LEFT$(NAME$,C - 1)
```

To get the last name, we'll use RIGHT$, right? To determine the number of characters, all we do is subtract the number of characters up to and including the space from the overall number of characters. Conveniently, we have the first number already and we know how to get the second number, so line 50 gives us the last name:

```
50  LAST$ = RIGHT$(NAME$,LEN(NAME$) - C)
```

**Getting to the End through the Middle.** Is there an easier way? Remember how we said MID$ could duplicate RIGHT$? To get it to do that, we merely need to get the position of the character after the space and use it as the argument. And because we're using MID$ instead of RIGHT$, we don't need to know the length. The character after the space is at position C+1, so the alternate form of line 50 is:

```
50  LAST$ = MID$(NAME$,C + 1)
```

which, as we can see, is a little simpler. To print the names, all we need is

```
60  PRINT LAST$; ", "; FIRST$
```

and we're done. Try this routine out by adding a temporary line 5 to set the value of NAME$ to your name (just first and last) and run it. Then get rid of line 5; we have better things in mind for this routine than just printing one person's name last-name-first.

**We All Live in a Yellow Subroutine.** The last-name-first routine is just the kind of thing you might need to do a number of times in the same program. Last month we hinted at a way to create a routine that can be used from a number of places within a program without retyping it each time or using *goto* to get to it and then making a mess while we figure out how to get back. Such a routine is called a *subroutine*, and it usually sits someplace outside the main block of code. For obvious reasons, it is called with a statement known as *gosub*.

*Gosub* differs from *goto* in one way. When a *gosub* is executed, the location of the next statement following the *gosub*, whether it's on the same line or the next one, is stored for safekeeping. At the end of the subroutine is a command called *return*, which reads the statement's address from its safe place and goes there.

Let's turn our program into a subroutine. First, renumber it to begin at line number 110. If you remember last December's discussion, you know how to set up *Renumber*. Don't forget to save your work first. When *Renumber* is in and your program has been reloaded, type:

```
& F110
```

which will renumber the whole program to start at line number 110 and increment by tens (the default). Now add a *rem* at line 100 to identify the routine and a *return* at the end. The subroutine should look like this:

```
100  REM Last-name-first routine
110  FOR CH = 1 TO LEN(NAME$)
120  IF MID$(NAME$,CH,1) = " " THEN C = CH: CH = LEN(NAME$)
130  NEXT CH
140  FIRST$ = LEFT$(NAME$,C - 1)
150  LAST$ = MID$(NAME$,C + 1)
160  PRINT LAST$; ", "; FIRST$
170  RETURN
```

One thing to remember about subroutines is that if you put one or more of them at the end of a program, you must be sure that there's an end statement before them. Otherwise it's likely that one of them will be executed when the program should have ended, giving you an error message when the program sees *return* and finds that it has nowhere to go. When you're constructing long programs, it's sometimes a good idea to start with the *end* statement at line 999. Then you can build your subroutines up from line 1000 and confine the main code to line numbers under 1000.

Here's a sample of a "main program" that might use this subroutine:

```
10  NAME$ = "George Washington"
20  GOSUB 100
30  NAME$ = "Abe Lincoln"
40  GOSUB 100
50  INPUT "Type your name: "; NAME$
60  GOSUB 100
70  INPUT "Type your mother's name: ";NAME$
80  GOSUB 100
90  END
```

Of course, you can think of something better than that. How about a program that asks for names first-name-first and then sorts them by last name?

Next month: "String Along with VAL." More string functions, converting numbers to strings and back, and so on. ◨

## GLOSSARY

**Argument:** A parameter of a function.

***Gosub*:** Like *goto*, but stores the location of the next statement in sequence as a return address. Short for "go to subroutine."

***LEFT$*:** A string function that extracts the leftmost characters from a string. Takes two arguments: the string and the length of the substring to be formed.

***LEN*:** A function that returns the length of a string in numeric form. Takes a string as its only argument.

***MID$*:** A string function that extracts characters from a string, starting from someplace in the middle. Takes three arguments, of which one is optional. The two required arguments are the string and the starting position. The optional argument is the length of the substring to be formed. Without a length argument, the substring will include everything from the starting character to the end of the string.

***Return*:** A command to the program to go back to where it was before the last *gosub* was executed.

***RIGHT$*:** A string function that extracts the rightmost characters from a string. Takes two arguments: the string and the length of the substring to be formed.

**Subroutine:** A section of a program that can be called by many other sections of the program. It is called with *gosub* and ends with *return*.

**Substring:** A string that is taken from the left end, the middle, or right end of another string.

# Buttonwood Apples

BY KEN LANDIS



This month we'll combine the tutorial section of Buttonwood Apples with the review section. The topic we'll discuss is our old friend technical analysis, and the program we'll evaluate is Capital Management Systems's *Market Counselor*.

***Market Counselor***, Capital Management Systems (Box 11595, Denver, CO 80211; 303-595-9998). $149.
Backup policy: Second program disk included in package. Additional disks $7.50 when defective disk is returned.
System requirements: Apple II Plus or IIe; one disk drive. Optional (and recommended): Apple Silentype or a Grappler interface with a graphics-capable printer.

Nearly all the technical analysis and charting packages we've used in Buttonwood Apples have been designed to plot individual securities and major market indicators (such as the Dow Jones industrials). *Market Counselor* takes a different approach. This program constructs technical indicators from the raw data input by the investor and then plots those indicators. It is not designed to plot price or volume information for individual securities.

All but one of the indicators *Market Counselor* plots are well-known, established technical indexes. The exception is a proprietary index developed by the authors themselves, which they call the intermediate index. According to the documentation, this index is "a composite of a large portion of the data entered each time the files are updated. The composite is then smoothed with a moving average." No further explanation is provided. The documentation then proceeds to give examples of times in the past when the index has given the correct buy or sell signals, along with instructions on how to interpret the performance of this special index.

It would be inappropriate to pass judgment on this technique or its authors. Nevertheless, the absence of a clear, useful explanation of the reasoning behind the intermediate index makes this a clear example of "black box" investing, and for that reason the inclusion of this index is quite objectionable. Users of a program should not be asked to put their own capital at risk in order to follow through on a technique they know nothing about unless some arrangement has been made to indemnify them against the losses they may incur as a result of doing so.

Let's look now at the various established technical analysis indexes that *Market Counselor* charts, considering how they are constructed, what they mean, and what they can tell us about the market's prospects.

The first indicator *Market Counselor* plots is the advance/decline ratio (ADR), which is often termed the advance/decline line. The value of this ratio is determined by dividing the number of advancing stocks (those that closed higher than they did the day before) by the number of declining stocks (those that closed lower than the day before). As you can imagine, these numbers bounce around quite a bit. Running the results of the analysis through a ten-day moving average is one way of smoothing out the daily fluctuations so that any patterns that might be developing will be more evident.

As you may recall, the mechanics of doing a ten-day moving average are simple. Just take the most recent ten days of information, add it together, and divide the total by 10. Next day, when you want to update your average, all you do is drop off the oldest value (which is now eleven days old), add the current day's value, and divide the total by 10.

Figure 1 shows a *Market Counselor* chart of the Dow Jones industrial average versus the ADR for the period from October 1 through December 31, 1980. As you can see, the ADR very closely tracks the Dow. Intuitively, this pattern makes sense to the technician: If more stocks are rising than are declining, it means that on average the market is going up, and that means the Dow should also go up. If the ADR were diverging (going in the opposite direction of the Dow), a technician would interpret that movement to mean that the Dow will reverse shortly and also begin to fall.

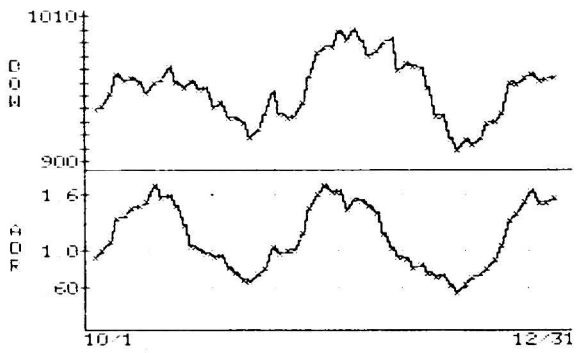



Figure 1

If you look again at figure 1, you'll notice that at the two market peaks the ADR diverged in a downward direction from the Dow and that a few days after these occurrences the Dow began to fall also. Unfortunately, because of the way *Market Counselor* scales its charts, we have to ascertain this by looking at areas of the chart rather than at specific dates. Only two dates are given on the horizontal axis—the day the chart begins and the day it ends. Many technicians look at a chart and zero in on a specific pattern. They then want to know the exact dates on which the pattern showed up so that they can research the events leading up to and surrounding the movement. Obviously, the charts *Market Counselor* generates don't lend themselves to this sort of analysis.

The vertical axis has a similar shortcoming. Only the high and low points on the scale are labeled; the intermediate points are not. Had this chart been labeled more appropriately, ascertaining the value of a given point would have been a simple matter of shifting one's eyes over to the vertical scale. As it is, an investor must first calculate the intervals between the scales and then count them.

Now let's return to ADR. While the Dow 30 can be expected to drop when the ADR diverges from the Dow and begins to decline, the Dow can be expected to rise when the ADR diverges from it and starts moving up, which can often occur at market bottoms. To technicians, this pattern

is a clear indication that selling pressure is weakening and that the market can be expected to rise.

The other common interpretations of ADR have to do with its value. An ADR value of 1.6 or above usually indicates that the market is very strong, while a value of .6 or lower may indicate that the market is oversold and beginning to rally. Naturally, these interpretations must be supported by other indicators and should not be taken at face value.

The overbought-oversold oscillator (OBOS) is created by subtracting the number of declining stocks for each day of market trading from the number of advancing stocks for that same day. The result is then smoothed using the familiar ten-day moving average.

There's a marked similarity between OBOS and ADR analysis, but the perspective that OBOS provides on the market is different. Although OBOS's behavior is almost exactly the same as ADR's, OBOS has a tendency to reflect market changes faster.

The relative strength index (RSI) was originally developed by Welles Wilder, a highly respected and accomplished commodities trader. Although developed for use in commodities trading, this index has been successfully applied by many stock technicians as well.

The RSI is a complex technical indicator to calculate. Perhaps this accounts for its success as a predictor of market performance: The less obvious that something is, the harder it is to find and the more it may be worth. This extract from the *Market Counselor* documentation describes how the RSI is constructed:

*Initially, fourteen days of Dow closing data are compared. Day 1 is compared to day 2. If the Dow closed higher on day 1 than on day 2, then the Dow for day 1 is subtracted from the Dow for day 2. This difference is then added to a total called "up closes." If day 2 closed lower than day 1, then the day 2 close is subtracted from the day 1 close and the difference is added to "down closes." All fourteen days are compared in this same way. The totals of the up closes and the down closes are then each divided by 10, giving averages of each. Then the up close average is divided by the down close average, giving the relative strength (RS). The RS is then used in a formula to obtain the RSI: RSI= 100 - (100/(1 + RS)). This formula computes a value that will always be between 0 and 100.*

*On subsequent market days, this process is continued. The previous up close average is multiplied by 13. If the market closed up, the difference is computed (between that day and the previous day's Dow close) and added to the up close average. This sum is then divided by 14. The same process is performed for the down close average. (If the Dow closes up, it is used in calculating the up close average and a 0 is added to the down close average. The result is then divided by 14; vice versa if the market closed down.) The new RSI is then calculated.*

The end result of these mathematical manipulations and gyrations is an indicator that very accurately measures the rate of change in the Dow—in essence, the Dow's relative strength. If the Dow rises day after day, the down close average will get smaller and smaller, and thus the RSI will be on its way up. If the market is falling, the up volume average will be getting smaller and the RSI will be falling.

Figure 2 shows the RSI plotted against the Dow for the period from July 3 through September 29, 1978. As you can see from the arrows, the RSI led, thus predicting the fall in the Dow and the general downturn of the entire market.

As was the case with the ADR, the actual values of the RSI can also be interpreted. According to the authors, two specific RSI values are quite important. They believe that an RSI value of 70 or more may indicate a market top, especially when other indicators begin to show market weaknesses. A technician's reaction to this signal would be to liquidate long positions and sell short. On the other hand, the authors see an RSI of 30 or less as an indicator that the market may be ready to rally. Again, this analysis relies on the signals being transmitted by the other indicators charted by the package. To coin a phrase, "One analysis does not a decision make."

*Market Counselor* tracks and charts two short-sale statistics from the New York Stock Exchange, namely those having to do with specialist trading in short sales and overall odd-lot activity.

A specialist on a stock exchange is the person (or company) who mans a trading post and handles, or auctions, the stock of the companies he or she trades in. As such, this person or company is in a unique position to watch the market and make buy or sell decisions for his or her own account. The weekly trades a specialist makes for this account are made public by the SEC and are listed in *Barron's* Market Laboratory.

The specialist short (SS) ratio is calculated by dividing the aggregate number of shares all specialists have sold short by the total short-sales volume of the market. If specialists are aggressively selling short, we can assume that they are bearish on the market and that they anticipate a decline in prices. If the short-selling activity of specialists is relatively low, then we can assume that they are bullish on the market and that they expect an upswing.

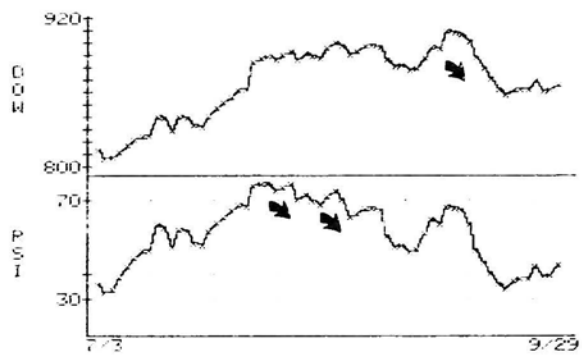



Figure 2.

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Figure 3 shows a charting of the specialist short ratio versus the Dow. The chart is "flipped" upside down to make it easier to read (that is, as short selling rises, short selling is a smaller percentage—look at the scale). If short selling is falling, this says that the Dow should be rising. In this chart from the *Market Counselor* documentation, the theory held; the Dow did fall when the the SS ratio went up.

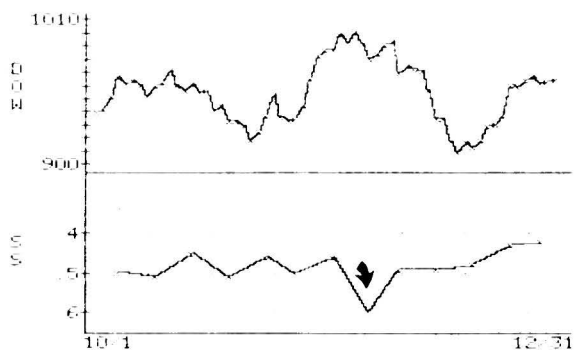



Figure 3.

The authors suggest that an SS ratio of between .4 and .5 indicates a fairly neutral signal from the specialists about the market. Values of less than .4 are often bullish, and values greater than .5 can be considered bearish.

The other short sale ratio is derived from odd-lot transactions (buys or sells of less than one hundred shares). Odd lots are usually placed by small, speculative investors. As you know from reading previous installments of this column, odd-lot traders are more often wrong than right; so if we do exactly the opposite of what they do, we'll be right more often than we're wrong.

The odd lot ratio (OLR) is computed by dividing the number of odd-lot short sales by the total number of shares sold by all odd-lot traders. A value of 1 or more suggests that the odd-lot trader is feeling bearish on the market; lower values ordinarily indicate a feeling of neutrality.

The remaining two indicators *Market Counselor* charts are volume-based. Technicians rely heavily on volume information to augment their interpretations of the various overall market indicators (Dow Jones, Standard & Poor's, and others). But as useful as volume information can be, there's no cut-and-dried way of analyzing it. High volume may indicate a market that's going up or one that's going down. For this reason, investors need to be especially cautious when making decisions based on volume analysis.

The most commonly used (and probably the most useful) volume indicator in *Market Counselor* is the *up-down volume* chart. Up-down volume charts are used to get a handle on the market's short-term prospects. The program documentation provides an excellent explanation:

*For example, a day in the market may produce 1,000 advances and 500 declines—a 2-to-1 ratio. The total volume of the shares traded that day may have been normal, yet the volume in those advancing stocks might have been nearly the same as the volume in the declining stocks. The advancing stocks did not get their expected share of the total market volume! The number of advancing stocks may have been high, but if the volume in them was low, then the traders were not aggressively buying those advancing stocks. The train may still be moving, but no one is stoking the boiler.*

*On the other hand, let us say that there were 800 advancing stocks and 500 declining stocks, and that the total share volume seemed "about right." However, a closer look shows us that the declining stocks had an unusually large share of that day's total share volume. Selling pressure was more dominant than buying pressure, and several days like that one would have pushed the market downward. We might not see this important change in the market strength if we looked only at the Dow, the volume, and the advance/decline data!*

Figure 4 shows an up-down volume chart. The solid lines represent up volume, the dotted lines stand for down volume. *Market Counselor* smoothes both lines by means of a ten-day moving average.

*Total share volume*, the second volume indicator, is also used by technicians to gain insight into the overall strengths or weaknesses of the market. As we said earlier, volume can very easily be misinterpreted; nonetheless, it is a very important tool.

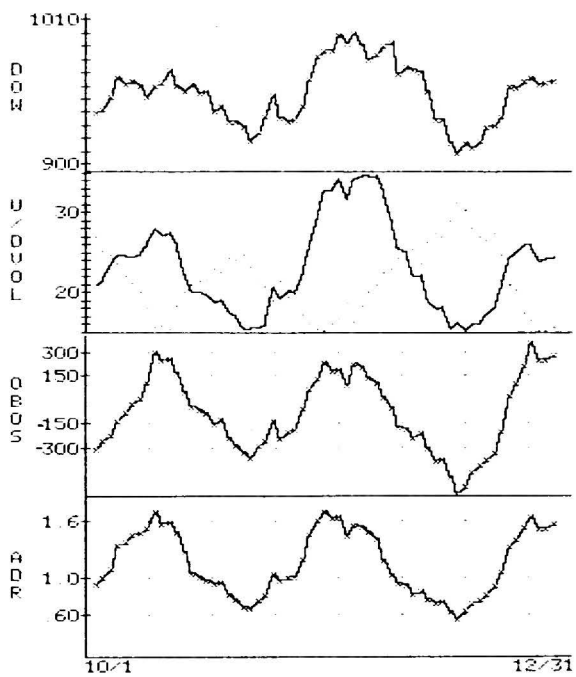



Figure 4.

The established indexes, their storage, and their charting, are the backbone of *Market Counselor*. The authors have included enjoyable, informative, and fairly lengthy discussions of strategy, trading techniques, and technical interpretation. Used by itself, the documentation would make a good technical analysis primer.

When only the quality of its documentation is considered, one is tempted to rate this program as excellent. But if one also takes into account the authors' poorly documented proprietary index, as well as various other program flaws, an overall rating of fair seems more appropriate. Among these flaws are the cumbersome manner in which the program handles information and the amount of time required to store and retrieve it. In addition, *Market Counselor* can track only one quarter (ninety days) of information at a time; this limited view will severely affect the analysis of many technicians. Finally, the error-checking in the editing module of the program is inadequate. If you enter a date as 12/05, the program accepts it—even though it stores the information as 12/5 and only recognizes this latter format. To add insult to injury, the program prompts you for an input using the example XX/XX, which clearly indicates that a leading zero is required.

*Market Counselor*'s authors had the foresight to include an auto-run feature whereby the program will produce a series of charts at the press of a key; unfortunately, they didn't set things up so that users could request to see specific charts. The preset choices available from here are Dow/RSI, index (the authors' own)/ADR, U/DVOL/OBOS, and VOL/SS.

It's worth noting that *Market Counselor* is one of the least expensive technical analysis charting programs we've seen. And yet, when you're using your Apple to help you make decisions about how to invest your money, price should not be an issue except in cases where the software you're using is overpriced for what it does. *Market Counselor* isn't, but it could do a better job for the money. ∎

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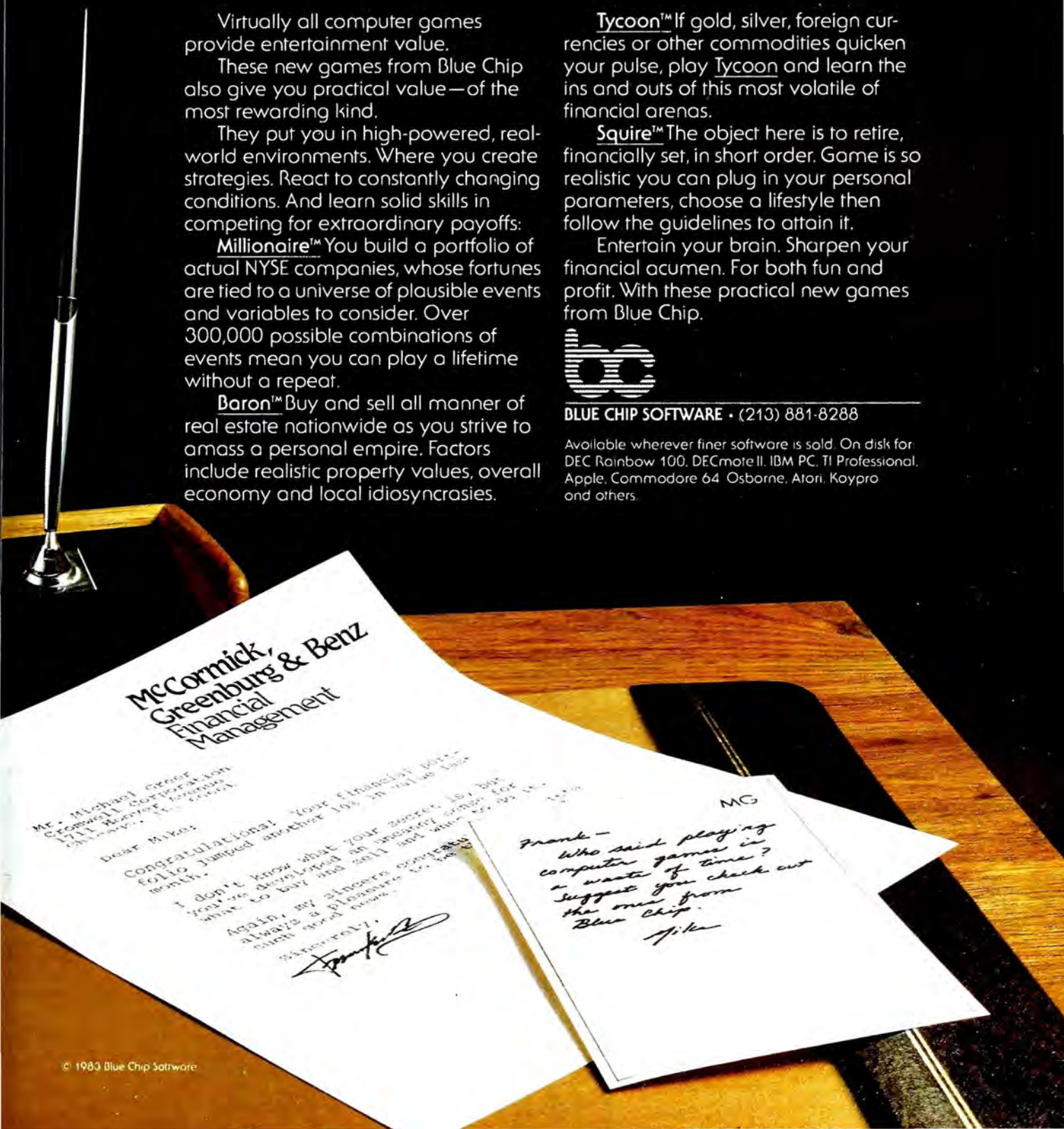
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# Hey Mac!

## You're Another Winner From Apple...

### BY AL TOMMERVIK

Hand it to the folks in Cupertino. They sure know how to make computers!

Stradivarius made violins. Frank Lloyd Wright built buildings. Apple makes microcomputers.

Sure, lots of other companies make microcomputers too. But nobody makes them like Apple.

Apple is adopting Sony's 3½-inch disk drive at a time when companies like IBM are still patting themselves on the back for recognizing the 5¼-inch drive.

Apple is making the thirty-two-bit 68000 microprocessor its new standard at a time when others are worrying about the availability of the sixteen-bit 8088 chip.

Apple is giving you bit-mapped screens scoping out at 512 by 342 dots at a time when others think half that resolution merits high praise.

Apple is giving you all this in a computer with only two boards in it at a time when other companies are considering that anything under six boards borders on the miraculous.

Apple is packaging it all in a case that weighs only sixteen pounds and is meant to be portable.

Apple is doing it all for $2,495.

## But Who Let In The Mice

### BY JOE SHELTON

January 1983 was a proud time for Apple Computer Inc. It was then that Apple introduced Lisa, its top-of-the-line personal computer. Lisa brought a new and innovative technology to personal computers that Apple subsequently termed Lisa Technology, and it was widely heralded by industry analysts as a giant step forward in making computers easier to learn and use.

Although Lisa was not a swift and resounding sales success, the Lisa concepts spread like a prairie fire. Major software and hardware companies rushed to develop what they perceived as the stuff of Lisa Technology: the mouse and windows. Microsoft has announced *Windows*, and VisiCorp has released *VisiOn*. Sir-tech termed the new game system on its third Wizardry scenario *Windo-Wizardry*, for appropriate reasons. Various other companies are striving to perfect their variations on Lisa Technology.

One of these companies is Apple itself, which last month introduced Macintosh as its newest entry in the Lisa Technology sweepstakes. A cursory glance at Macintosh might lead one to describe it as a mini-Lisa. Insiders at Apple (renowned for their rotten puns) sometimes call Lisa a "Big Mac."

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# Another Winner

Apple is calling it Macintosh.

The industry, as it catches its breath, is calling it a winner.

If there's a microcomputer out there more advanced than Macintosh, it's hiding in some company's research and development lab. Macintosh defines microcomputers the way Pete Rose defines hustle or Wynton Marsalis defines jazz. To call Macintosh state of the art is akin to saying the North Pole is a tad chilly.

Macintosh is fast, efficient, easy to learn, and marvelously easy to use.

**Mac Facts.** Mac's vital statistics are impressive. The MC68000 microprocessor runs at eight megaHertz. It's the chip of tomorrow in today's machine. Mac features 128K of random access memory and 64K of read-only memory. Because the ROM routines include many that are commonly resident in RAM in other micros, Mac's RAM has proportionately more work space than one might think.

The Sony 3½-inch drive holds 400K of data. Mac has a nine-inch black-and-white video display that is a model of clarity. It comes with a detachable keyboard and the mouse that Lisa owners have come to know and love.

All Apple owners will be surprised when they first approach the machine, however, because there's no way to get inside. Macintosh is the first computer built by Apple that has no expansion slots.

What Macintosh has instead of slots are two high-speed RS-422 serial ports. The RS-422 ports have a bandwidth of one megabyte, which gives Mac a communications link to the outside world more powerful than that of any other micro. Apple anticipates that the ports will be used for a printer and a modem. Also, someone will probably build an expansion chassis.

**See Mac Run.** The company has been learning from its mistakes in the spirit of trying to avoid repetition. Apple put Macs in software houses prior to the machine's release to give outside developers a head start on writing software. There's been movement on the in-house front as well.

Apple has *MacWrite* and *MacPaint* ready to run and Microsoft has *Multiplan*. Apple has another half dozen packages in development including an incrementally compiled Basic and an interpreted Pascal. Microsoft is adapting all its applications software for Macintosh.

*MacWrite* is your basic word processor. These days that's not an epithet the way it was in 1979. It's speedy and it has nearly all the features a user might consider mandatory. It lacks such things as a companion spelling checker and other bells and whistles, but it does do word processing.

*MacPaint* is a graphics package of a different stripe. Built on the graphics routines in ROM that make Mac work, *MacPaint* is fun, versatile, and far more of a heavy-duty servant at work than immediately meets the eye. Just as Apple's 1978 version of *Apple Bowl* defined Apple II graphics for more than two years before other companies caught up, so

# The Mice

ed to result in a computer that functions intuitively—without the need for extensive knowledge of computer protocols and special terminology. Macintosh is the computer that comes closest to achieving that end.

In the beginning, the design team identified two major design goals for Macintosh. The first goal was to make the machine as easy to learn and use as possible. The second goal was to make it powerful, innovative, and useful. Their overall aim was simple—to make Macintosh "insanely great" any way they could. "Insanely great!" became the catch phrase of the project.

The team believed that Lisa's interface, although truly easy to learn and use, had a few shortcomings. During hundreds of hours of discussion, all the tradeoffs were defined. In the end, changes were implemented only when they made Macintosh easier to use. There were no changes just for change's sake.

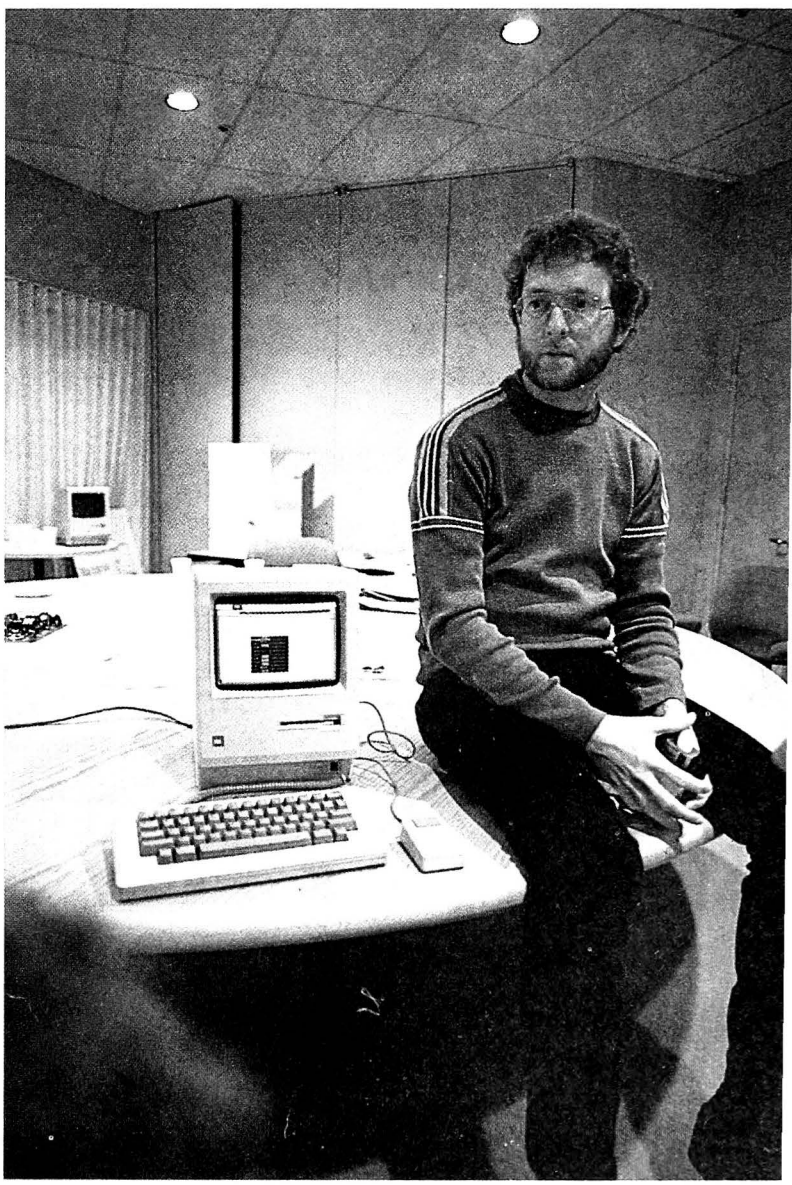
The "Not Invented Here" mentality pervades many computer development environments. It's the attitude that causes developers to ignore relevant work that has been done elsewhere, even though that means having to redesign things themselves. The Macintosh designers eschewed NIH, deliberately borrowing great ideas wherever they found them. They even pirated the skull and crossbones symbol. Rumor has it that for months they flew it over their building.

Lisa Technology in Macintosh is even friendlier than in Lisa. All the possible elements of Lisa Technology are there, but they've been enhanced.

**The Clock Strikes One.** When you first approach Macintosh, the most noticeable new element, other than its small size and separate keyboard, is the mouse. Apple's mouse is a very simple mechanical device about the size of a deck of cards. Inside, two sensors are triggered by the movement of a metal ball covered in a rubber material to allow it to roll easily and to grip the desktop.

Other manufacturers have chosen to use mice with two and sometimes three buttons. Apple's mouse has a single button. The difference quickly becomes obvious—the more buttons there are, the more you need to remember to use them correctly.

The mouse serves a single function: It's the means by which the user controls the computer. That's all there is to it. You could say that the mouse is what makes Macintosh so easy to use. But that wouldn't be fair. There's much more to it.



will *MacPaint* define graphics on Macintosh.

*Multiplan*, which is coming as close to being ubiquitous as any piece of code on Earth, gives Macintosh the aura of respectability in the sense that it'll be able to do spreadsheets from day one. It seems that some sort of spreadsheet capacity is necessary on every computer today, as if that were the sole purpose of silicon chips. It's sometimes hard to remember that actual decades once passed without a single "what-if" question being answered with the stroke of a slash command. No matter, Mac does spreadsheets.

Other software that should be available soon includes *1-2-3* from Lotus Development. *1-2-3* is the integrated business package that's set the sixteen-bit world on its ear. Mitch Kapor's nifty product is doing so well that stock in his company is selling for more than stock in Apple. Also expected shortly are the PFS series from Software Publishing Corporation, the text adventures from Infocom, and graphic adventures from Penguin Software. Two chess programs, *Sargon III* and *Chess 7.0*, should also be among early arrivals.

**Form Defines Function.** But what programs will be available on Mac is not nearly as interesting as how they will run. Mac incorporates the technology developed for Lisa, and most software developers are telling Apple that they'll use that technology themselves. What that means is widespread adoption of the electronic desktop metaphor found on Lisa.

Central to the desktop metaphor is the use of icons to represent objects, pull-down menus from which to choose actions, windows in which to work, and a mouse to control on-screen activities. The use of icons brings personal computing to a more intuitive level. As with Lisa, files are represented on-screen by folders. Rather than loading a file by typing a file name, as is necessary with most computers, you open a file by using the mouse to position the cursor on the folder you want. Just click the mouse button twice and the file opens.

What the file opens to is a window that exposes the contents of the folder. Using the pull-down menus and the mouse, those contents can be manipulated at will with hardly a touch of the keyboard. The keyboard is necessary for feeding data into folders; but once the data is in place, the power of the electronic desktop becomes apparent. The process of reorganizing thoughts, making new correlations, or generating new reports has never been so easy. Mac proves that Lisa Technology works.

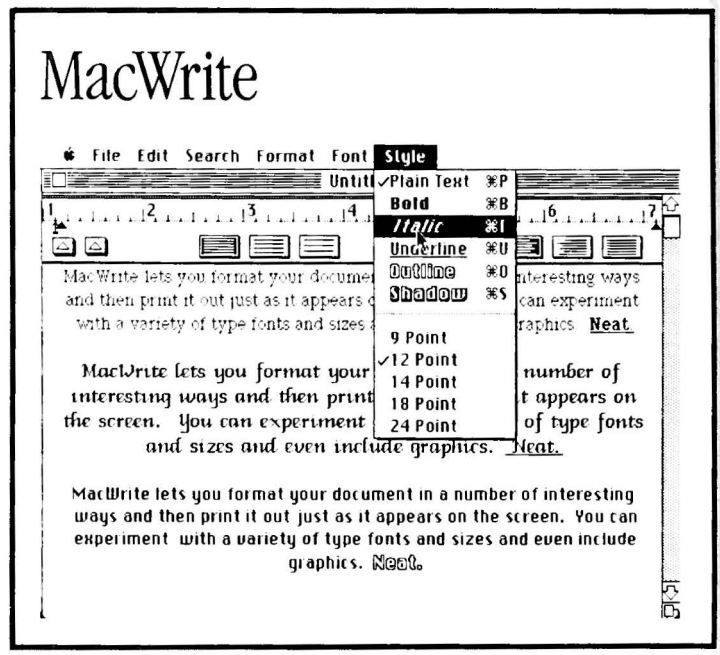
Lisa Technology has gotten black marks for its presumed lack of responsiveness. The original Lisa ran at approximately the speed of a sleeping snail, and most people attributed that lethargy to the technology. Mac, using the same technology, exhibits blazing speed, generally performing tasks at least twice as fast as any of the bestselling microcomputers. The difference is that Macintosh runs only one applications program at a time, while Lisa was trying to keep track of six programs.

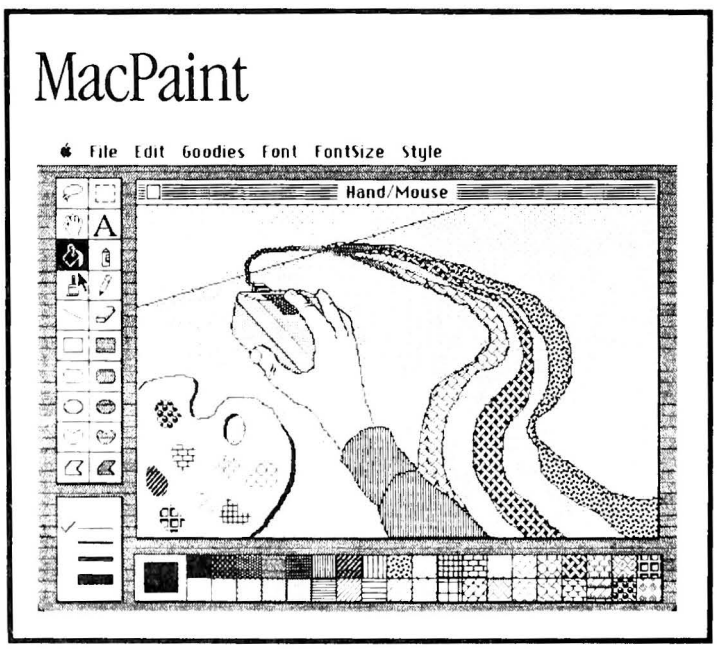
**And Lisa 2.** An overhaul of Lisa itself was announced simultaneous-

**Shut the Door, They're Coming In. . . .** Windows are the other element that developers of other systems tout along with the mouse. But just having windows isn't all that useful and having useful windows isn't that simple. Combining both text and graphics in most computers involves displaying the text graphically on the graphics screen. Windows require such a combination of graphics and graphically generated text if the windows are to be positioned with flexibility. The overhead for this type of programming is very high. The result on older technology computers is slow handling of such tasks as text entry.

But Lisa and Macintosh's new technology can handle such tasks at high speed with no problem; they use an efficient graphics method called a bit-mapping display for all screen display. By this method, every dot on the display can be turned on (darkened) or off (lightened) individually. With this level of graphic sophistication, windows can be drawn and moved anywhere on the screen, windows can be placed on top of other windows, text and graphics can be mixed, and different fonts, type styles, and type sizes can be employed in the same document.

Windows provide great versatility. The main purpose of windows is to display an application that's currently running. Macintosh isn't limited to one window: Its screen can display as many windows as an application can handle. Ten, twenty, even fifty windows are easily within the realm of Macintosh.




Actually, the screen begins to get cluttered when more than three or four windows are displayed. But the beauty of Macintosh is that you can stack the windows, like you stack papers on a desktop, with the one you're using on top. Or you can have two windows side by side, with each occupying only part of the screen.

Even though a window displays only one thing, such as a word processing document, multiple windows on the same screen can display different things. Windows can display several documents, several views of a document, or several types of information about a document.

*Several Documents.* Macintosh doesn't have multiple applications operating at the same time, but it can display different documents from the same application in different windows. It is a simple matter to cut or copy text and pictures between windows showing several word processing documents, for instance.

*Multiple Windows on the Same Document.* A Macintosh spreadsheet, for example, might allow multiple windows on the same document. This would be similar to splitting the screen on *VisiCalc*, with some advantages. First, each window can display a full screen of information. There's no reason for the displayed information to be cut in half. Second, you can alternate between windows by simply pointing the mouse and clicking on the inactive window.

*Information for Different Purposes.* Each window can accomplish a

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ly with the announcement of Macintosh. One logical change that was implemented was the adoption of the Sony drive for Lisa. Use of the Sony drive permits Lisa to run Mac programs, although the reverse is not true.

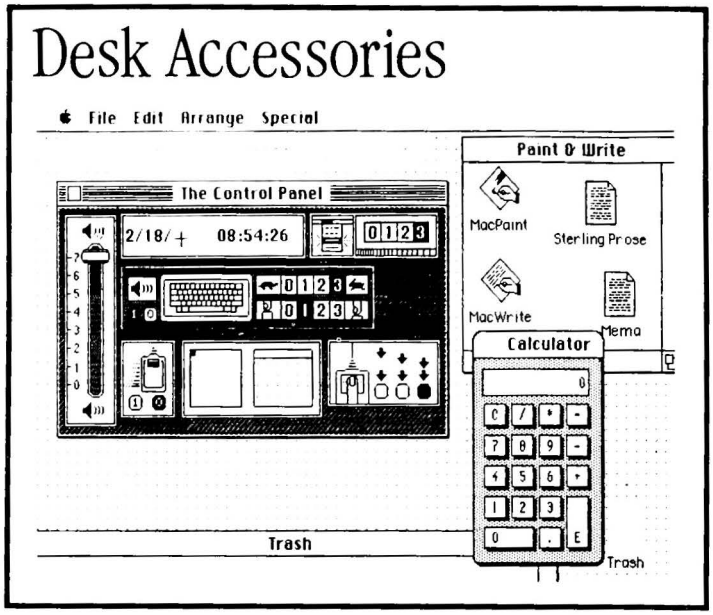
The revamped Lisas are called Lisa 2 and Lisa 2/10. Each will come standard with 512K of RAM memory, as opposed to the one megabyte found in the original. Lisa 2/10 features an in-board ten-megabyte hard disk in the spot where the top drive of the old Lisa was located. Apple has doubled Lisa's speed by making changes in the operating system and by adding the in-board hard disk. Additional operating system revisions, projected for completion this spring, will bring about another 50 percent increase in performance.

The Lisa 2/10 will retail at $4,995.

**The Volkscomputer**. Apple's commitment to making personal computing more easily accessible is underscored by the revisions to Lisa and the introduction of Macintosh. Nearly every microcomputer manufacturer is striving to produce the volkscomputer—the micro that will find its way into the hearts and homes of everyone. No one has succeeded because today's micros speak only in computerese, a tongue foreign to most people.

Macintosh speaks in ordinary pictures. It's easy to understand and easy to use. It may not be the volkscomputer, but it's a lot closer to that concept than anything that's come before.

As usual, Apple has taken the lead in innovation. Bravo! ◨



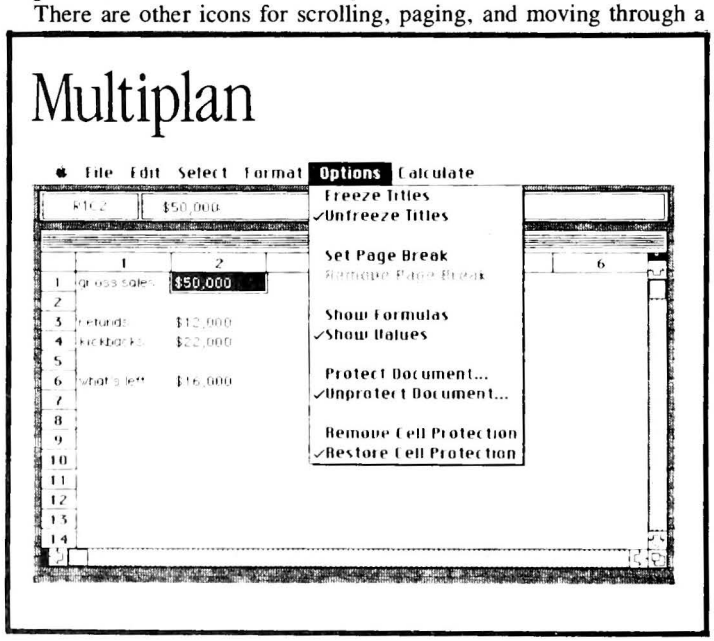

different task. For instance, when you're programming, you can work on your code in one window and see the program you're writing running in another window—and responding to your coding changes as you make them.

**Picture You Upon My Knee.** Macintosh is a graphically oriented computer. All applications, and all objects and actions within them, are represented by pictures called icons. Each application has its own icon, and the files (called documents) generated by each application have their own icons as well. When you look at an icon, you immediately know the name of the document and which application uses that document.

The icons are only a small part of how graphics make Macintosh easy to use. Imagine this scenario: Place the pointer (an arrow) on the document that you want to open and press the button on the mouse. Now point at the menu bar option file and select open. Voila! The document is opened. That means that the appropriate application is started and the specific file within it is loaded. Mac shorthand makes the process even simpler: You need only point the mouse to the document and click twice.

The use of icons goes further. Most applications exist in windows (*MacPaint* is a notable exception). The windows usually have special sizing icons along the side and across the bottom. To make the window smaller, perhaps to see two windows at once, you simply place the pointer on the grow icon, click the mouse, and hold the button down to drag the window to the dimensions you want.

There are other icons for scrolling, paging, and moving through a




document, all exactly the same for each application. But not all applications have the same capabilities. For example, the *MacWrite* word processor doesn't have a scroll bar across the bottom because you don't need to scroll wider than the screen.

**Beat Me, Daddy, Eight to the Bar.** The menu bar runs across the top of the screen in all applications within the Macintosh user interface. A common text character high, the bar displays all the categories of options available to that application. Clicking on an option causes a menu of functions available in that category—save or load within the "file" option, for example, or numerous type styles and sizes within the "font" and "style" options on a word processor.

**I'm Gonna Buy a Paper Doll That I Can Call My Own.** Cut and paste is Lisa Technology's unique means of combining elements from more than one application into a document. Suppose you're preparing a report comparing sales territories by costs and revenues. You've illustrated the geographical territories via a map on *MacPaint*, you've created pie charts of sales and revenues by territory on *MacChart*, you've detailed the figures on *Multiplan*, and now you're preparing the written report on *MacWrite* and you want to print it out with all the other goodies in place.

Macintosh allows you to combine these elements electronically. Open the map document (in *MacPaint*), select the map, and click cut or copy from the edit option menu. That saves the drawing to a sort of buffer. Open the written report, select the spot in which you want the map, and click paste from the edit option menu. The map immediately hits the spot—on screen and in the printout. Follow the same procedure to retrieve the pie charts and the spreadsheet excerpt. Select print from the "file" option menu, and out will come your finished, illustrated report, intact and gorgeous.

**Don't Change a Hair for Me!** Documents printed out from Macintosh look exactly like they did on-screen. Because Mac can display such a variety of elements on-screen, there's almost never a need for formatting commands. For instance, in *MacWrite*, you can opt for various sizes and styles of type within a document, underline words, and place all the elements exactly where you want them. They will all appear on the screen. Simply choose print from the file option menu, and what you saw on the screen is what you see printed on the paper. The bit mapped display is essentially transferred to the printed page.

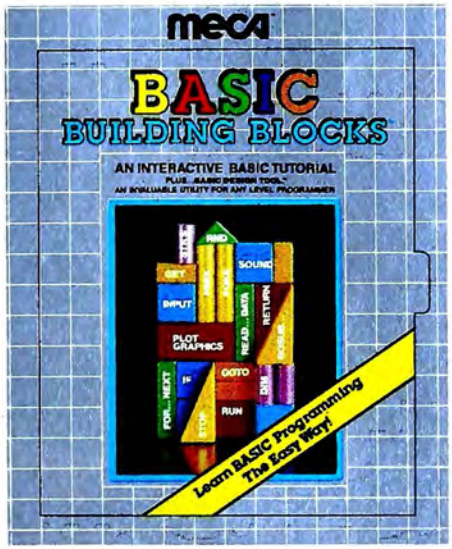
To make the most of this capability, Macintosh requires a high performance printer, such as the Apple Imagewriter, which can print graphics and text with equal facility.

**It's Been a Hard Day's Night and I've Been Working Like a Dog.** There's an interesting axiom that says that the easier the computer is to use, the harder it was to make it that way. That was certainly the experience of the Mac design group, for whom the refusal to compromise on factors relating to ease of use made other tasks more difficult. Macintosh's final configuration justifies the agony of a design job well done. ◨

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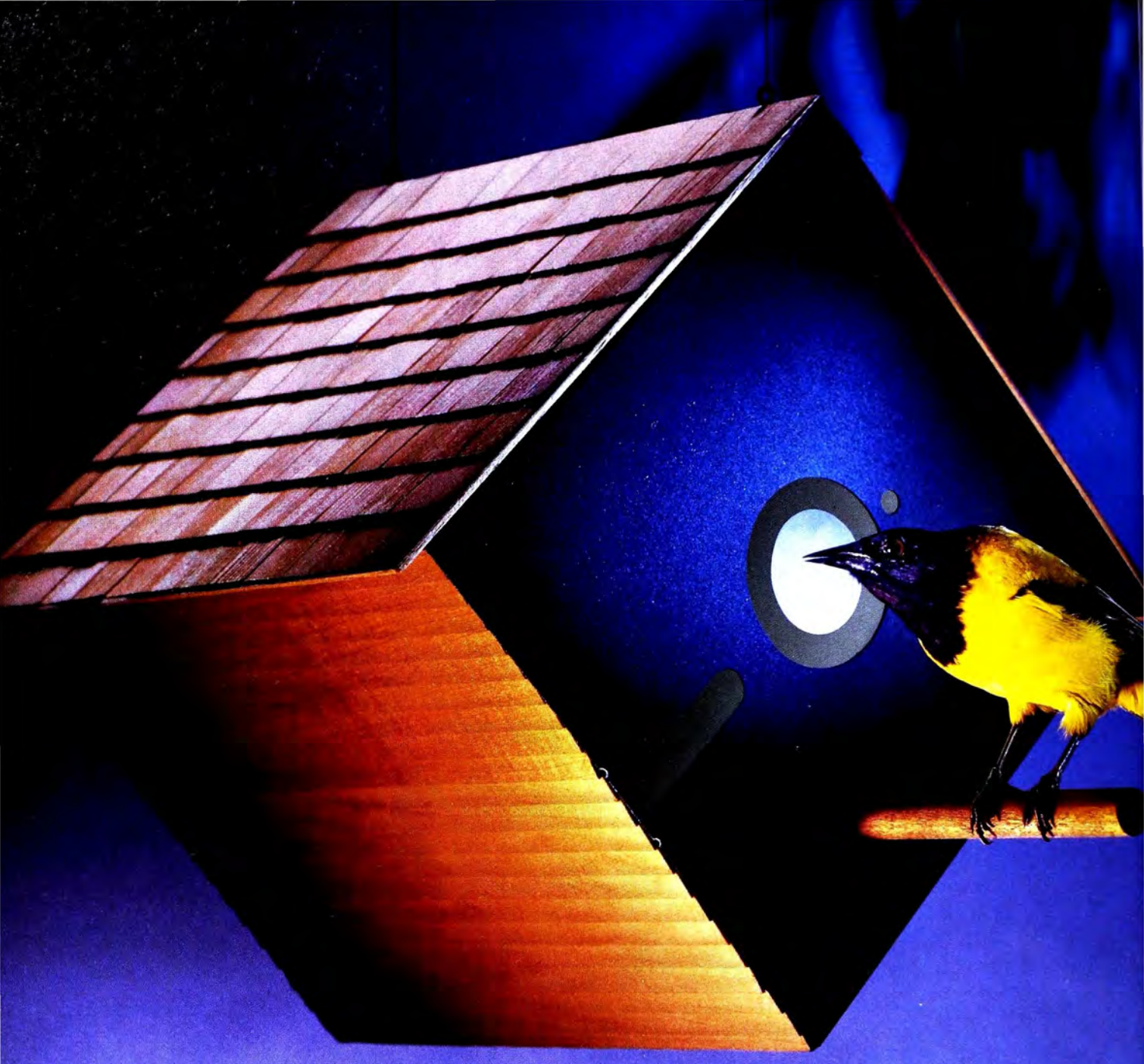




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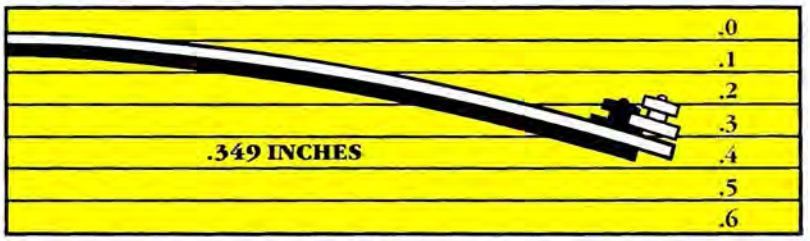
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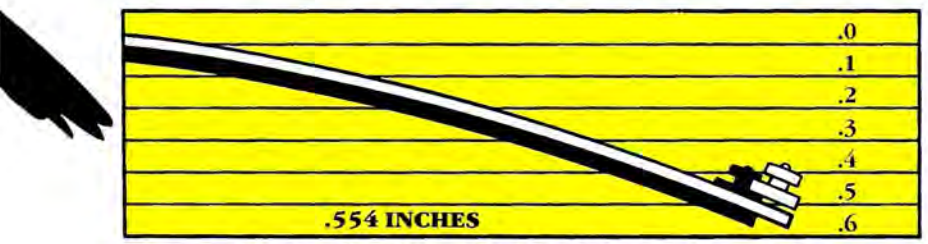
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Softalk *to the rescue! If you've been stumped by something Apple, then take heart; maybe someone from the Softalk Applewise Guild and Experts' Syndicate can help. Choose an expert from among the likes of Doug Carlston, Bob Clardy, David Durkee, Roy Hicks, John Jeppson, Mark Pelczarski, Jock Root, Roger Wagner, Tom Weishaar, and Matthew Yuen. You can direct your questions, typed or printed, and double-spaced (please), to a specific expert or just write to this column. Send all letters to Softalk Sages, Box 7039, North Hollywood, CA 91605. We can't answer questions about the products of specific vendors; instead, we recommend you contact them directly or see your dealer.*

**IF** This letter is directed to the Graphically Speaking columnist.

I typed in August's 3-D graphics program. After some fuss, aside from the three hours spent typing it in, I got it to work.

I then proceeded to create a cube, which I was planning to rotate. Somehow, although it rotated fine clockwise and counterclockwise, when I did any 3-D rotating, my figure ended up flat! I tried typing it in again, but to no avail.

I quit the program and listed it, checking it against the program in *Softalk*. Everything looked fine, but I think I noticed some problems in your program. In line 1210, there are six choices. When the program jumps to line 700, the subroutine only accounts for five. And in line 770 the program expects S1, which is the sine of a point, to be 1, 2, or 3. But the sine of a point is always between −1 and 1. How do you explain these errors? *Brett Juilly, San Mateo, CA*

**THEN** Check through your listings again. Here's what's going on in the lines mentioned.

In line 1210 there are choices one through six, but in line 1240 I divide the user's actual choices by two, giving one through three, with a possible remainder. That's because in the choices for direction, the pairs left and right, up and down, and counterclockwise/clockwise each use the same rotation operation, but with a different direction. In other words, left and right both rotate around the same axis, but in opposite directions. The remainder of that division tells which direction we'll use.

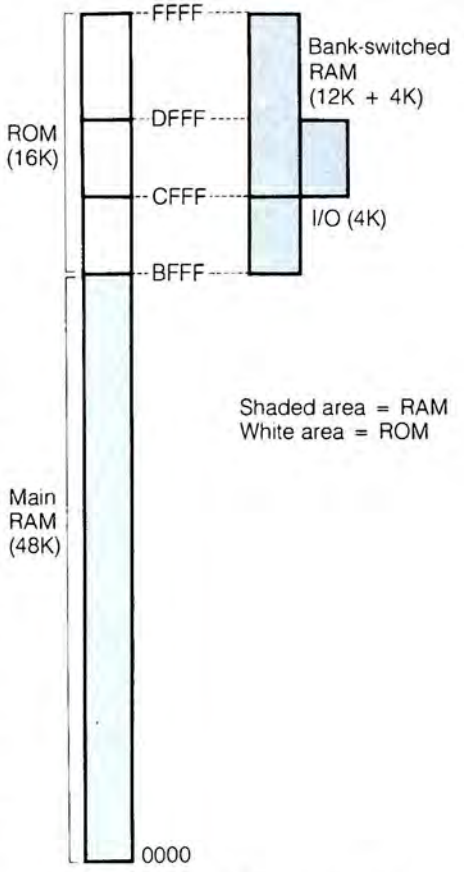
The subroutine at 700, which actually performs the operations, does expect one of five choices. One through three are the previously mentioned rotations. Four is a move, and five is a scaling operation. When not used as a sine of an angle for the rotation operations, variable S1 is used to tell the direction of the scaling. If S1 is zero, everything is scaled. For values of one through three, only the dimension specified in line 1170 is scaled. *Mark Pelczarski*

**IF** I have two questions about the Apple IIe. First, the Apple IIe has 64K of RAM. I know that 48K of this RAM is in memory locations 0 through 49151, but where is the other 16K? (49152 through 65535 is ROM.) Second, how can I save the eighty-column text screen as a binary file? What parameters would I use for the address and length of the bsave command?

I would appreciate any comments or ideas from any of the sages. Thank you. *Chuck Heatherly, Raleigh, NC*

**THEN** Your two questions have one thing in common: bank switching. Because the 6502 microprocessor has only four hexadecimal digits to work with for memory addressing, there can be only 65,536 unique memory addresses in the Apple II. This is why the Apple is fundamentally a 64K machine. However, the Apple IIe in its standard configuration actually has 84K of memory. That's 16K of ROM and 68K of RAM.

Since there can't be enough unique addresses to refer to all that memory, some of the locations share addresses. So it is with the upper 16K of RAM. It is bank-switched with the upper 12K of ROM. The accompanying memory map may not clarify the situation completely, but it may shed some light on why the concept is so confusing.




Apple IIe alternate memory banks.

As you can see, the addresses from $0000 to $BFFF refer to only one memory location each. However, the upper reaches of memory are more complicated. The locations for $C000 to $CFFF, for instance, share a bank of ROM and a bank of RAM that is used by peripheral I/O cards. Part of this memory is allocated to soft switches (more on that later). From $D000 to

$DFFF, there are three memory banks: one ROM and two RAM. The remainder of the address space, $E000 to $FFFF, references one bank each of ROM and RAM.

To complicate the matter still further, if the Apple IIe has an extended eighty-column card installed, there is another 64K bank sharing this space (not shown). The section from $D000 through $DFFF actually addresses five banks of memory in this situation (some more often than others).

The computer does have a way to determine which of all the possible banks to use at any given time. You (or your programs) can control the switching of banks with soft switches. Soft switches are memory locations that do a funny thing when you read them or write to them: Instead of returning or storing a value, they change the way memory is addressed. An example of this that may be familiar is the set of pokes used to change the text and graphics displays.

You should now be able to see where the upper 16K of RAM is. Next, let's look at how to write to it. Boot up the System Master and type *call −151* to get into the Monitor. Let's look at location $E000, which our map shows us to be either ROM or RAM. There's an easy way to tell which bank is active now. Type:

```
E000
```

The computer should respond:

```
E000-   4C
```

Now try to put something else in there and see if it goes:

```
E000:   00
E000
```

The computer will again respond:

```
E000-   4C
```

Nothing has changed. Now type:

```
C080
```

Ignore what the computer responds with. We don't care what's in this location; it's a soft switch. Reading this location allows us to read the RAM bank instead of ROM. (At this point, if you didn't boot with a System Master, the system hangs because the Apple can no longer find the Monitor in ROM. Booting the System Master puts Integer Basic and a duplicate Monitor in the bank-switched RAM, allowing you to continue. If the system hangs up, reboot with the System Master and try again.) Now type:

```
E000
```

The computer responds:

```
E000-   20
```

We haven't really changed the value in $E000; we're merely looking at a different bank of memory. If you try changing this byte now, you still won't have any luck. That's because we have only read-enabled the RAM. We have not yet write-enabled it. Type:

```
C083
C083
```

For some unexplained reason, you have to hit this switch twice to write-enable the RAM. Now type:

```
E000:   00
E000
```

The computer will show you that you have indeed written a zero in location $E000.

This is not the last word on bank-switched memory. There are lots of traps to fall into if you don't know what you're doing. For instance, Applesoft resides in the ROM bank, so if a Basic program read-enables the RAM bank, Applesoft will no longer function and the program will crash.

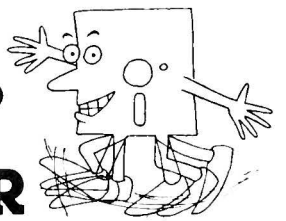
If you really want to know about controlling memory banks on the Apple IIe, you should get the *Apple IIe Reference Manual*. There's simply too much information on the subject to cover here.

Now for your second question. The eighty-column display on the Apple IIe is mapped to two banks of memory. Those banks are from $400 to $7FF in main memory, and the same range in an auxiliary 1K bank of memory on the eighty-column card. DOS makes no provisions for saving both banks into the same file. It is possible to bsave the main memory block in one file, then do some bank switching to read the auxiliary memory and save the auxiliary block in another file. To load the screen again, you would have to reverse this procedure. This program shows how it's done:

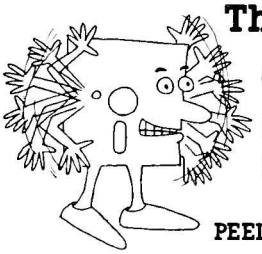
```
 5  D$ = CHR$ (4)
10  PRINT D$;"PR#3"
20  PRINT "THIS IS A SAMPLE EIGHTY-
    COLUMN SCREEN TO ATTEMPT
    TO SAVE AND RELOAD"
30  REM SAVE SCREEN
40  PRINT D$;"BSAVE SCREEN.MAIN,
    A$400,L$400"
50  POKE 49237,0: REM READ AUX
    TEXT PAGE
60  PRINT D$;"BSAVE SCREEN.AUX.
    A$400,L$400"
70  POKE 49236,0: REM READ MAIN
    TEXT PAGE
80  HOME
90  PRINT "PRESS A KEY TO RELOAD
    PICTURE:";: GET A$: PRINT
100 PRINT D$;"BLOAD SCREEN.MAIN"
110 POKE 49237,0: REM READ AUX
    TEXT PAGE
120 PRINT D$;"BLOAD SCREEN.AUX"
130 POKE 49236,0: REM READ MAIN
    TEXT PAGE
```

The *Apple IIe Reference Manual* is a good source of information on the use of the auxiliary 64K memory bank on the Apple IIe. Another good source is the article, *Applesoft Brushes for Double Hi-Res Art*, which appeared in our September 1983 issue. Pay particular attention to the tables and explanations on pages 87 through 89. *David Durkee* ■


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# MARKETALK News



*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.*

☐ **Hayden Software** (600 Suffolk Street, Lowell, MA 01853; 617-937-0200) has announced several new products. *Factor Blast* is an educational game designed to teach factoring concepts to students ages ten and up. *Factor Blast* features three levels of difficulty and a penalty option where points are subtracted for incorrect or incomplete responses. $29.95. *Sargon III* is a strategy game that provides a useful environment for learning chess. The user can call up on disk one of 107 historical games of chess and observe the strategies of the Grand Masters. $49.95. *Dr. Dobb's Journal*, Volume 6, is a collection of articles, letters, and bits of information for the home computer hobbyist that originally appeared in the magazine *Dr. Dobb's Journal*. $29.95. *Programming in C* contains more than ninety sample C programs written for advanced sixteen-bit microcomputers. The book offers information on program looping, decision making, arrays, and structures, as well as character strings, operating on bits, and working with larger programs. $18.95.

☐ **Harris Technical Systems** (624 Peach Street, Lincoln, NE 68501; 402-476-2811) is offering *AgDisk Cash Flow Extension Module*. The product was designed to aid farmers with financial analysis and projections of cash needs. The *Cash Flow Extension Module* can be used as an independent program or in conjunction with the *AgDisk Farm Accounting* package. $150.

☐ **Chemical Bank** (277 Park Avenue, New York, NY 10172; 212-310-7436) has announced that its home banking and information system, *Pronto*, will now be supported by the Apple II family. *Pronto* provides a variety of home banking services. The system combines a personal computer, a television set, and software developed by Chemical that is linked to the bank's computer by telephone. $12 monthly.

☐ **Candela Electronics** (550 Del Rey Avenue, Sunnyvale, CA 94088; 408-738-3800) has introduced the *Autoas Billing Package*. This software package allows telephone answering bureaus to produce itemized client invoices. The system keeps track of the most common charges automatically; others can be tallied by an attendant using a single keystroke. $1,200.

☐ **Gaylord Brothers** (Box 4901, Syracuse, NY 13221; 315-457-5070) has released its latest catalog of microcomputer supplies, furnishings, software, and hardware for libraries, schools, and institutions. The catalog is free of charge.

☐ **State of the Art** (3183-A Airway Avenue, Costa Mesa, CA 92626; 714-850-0111) is offering the *Bookkeeping System*. The package is aimed at very small retail and service businesses operating primarily on a cash basis. Major functions of the system include account maintenance, general ledger reports, general ledger graphics, financial statements, vendor maintenance, check printing, housekeeping, and daily transactions. $495.

☐ **Institute for Scientific Information** (3501 Market Street, University City Science Center, Philadelphia, PA 19104; 215-386-0100) has developed two software packages. *Sci-Mate Personal Text Manager* allows owners of personal computers to create their own "mini-database" with a flexible file that can assimilate textual information such as jotted research notes, abstracts, bibliograhical citations, reprint file headings, and other documents. $540. The second product, *Sci-Mate Universal Online Searcher*, lets the user search five major host systems for medical, scientific, and social scientific research. $880.

☐ **Howard W. Sams** (4300 West Sixty-second Street, Indianapolis, IN 46268; 317-298-5400) is offering a collection of basic programs to solve classic mechanical engineering problems involved in the design of machine assemblies, subassemblies, and components. *Computer Programs for Machine Design* addresses the five specific design areas of dynamics, vibrations, linkages, cams, and gears. $21.95.

☐ **Quality Software** (21601 Marilla Street, Chatsworth, CA 91311; 213-709-1721) has announced the publication of *Understanding the Apple II*. The learning guide and hardware manual includes over one hundred figures and illustrations and more than twenty schematics. $22.95.

☐ **Pinehurst Hotel and Country Club** (Box 2328, Chapel Hill, NC 27514; 919-967-6996) will offer an educational workshop entitled *Introduction to Computers and Their Applications*, March 7-9 and April 4-6 at Pinehurst Hotel. The overall concept is to combine recreation with educational workshops for executives and professionals.

☐ **Sterling Swift Publishing** (7901 South IH-35, Austin, TX 78744; 512-282-6840) has released *Computer Science with Structured Basic*. The text is intended for use in introductory courses in computer science using Basic as the programming language. $18.95.

☐ **Window** (469 Pleasant Street, Watertown, MA 02172; 617-923-9147) has announced the publication of a turtle graphics game called *Turtle Power*. *Turtle Power* combines turtle graphics and Basic, offering users an opportunity to explore the Apple's graphics potential while learning elements of programming. $29.95.

☐ **Apple Computer** (20525 Mariani Avenue, Cupertino, CA 95014; 408-996-1010) has introduced the Imagewriter dot-matrix printer. It prints graphics at a rate of up to 180 characters per second and full text up to 120 cps. $675. *Appleworks* combines word processing, database management, and financial modeling in a single program for the Apple IIe. The program can read *VisiCalc* data files and can read and write DIF files; it is also memory-based. $250. *Toolkit/32* enables developers to write integrated software that takes advantage of the Lisa's features. *Toolkit/32* contains "building blocks," libraries of Pascal descriptions that incorporate Lisa's basic graphics, text editing, and user dialogue functions. $600. A support program for independent developers called the Certified/Registered Developers Program has been announced by Apple. The program provides developers with the resources, information, and training to help them target their products toward expanding markets. Apple shares information on product and marketing strategies, and provides tools and technical support that reduce development time and enable developers to bring products to market more quickly. A $100 fee is charged for registration.

☐ **Andent** (1000 North Avenue, Waukegan, IL 60085; 312-223-5077) is releasing a number of products. *Apple Alarm* is a program that converts your computer into a sentry capable of detecting intrusion, smoke, motion, fire, and moisture when used with various sensors. The program will trigger an alarm and keep time until interrupted. $20. The *Applointments* program allows the user to manage an appointment book using the Apple. Appointments may be viewed directly on the monitor screen or listed on a printer. The program can search by name or part of a name for an appointment over any specified period of days and/or months in the book. $75. The *Coupon Organizer* is a program used to organize coupons. It can handle qualifiers, trades, mail coupons, store locations, labels, clearing-houses, and expiration dates. $39. The *Dental Billing System* handles all office billing, insurance forms, preauthorizations, monthly statements, daily journals, aging, accounts receivables, recall, and practice analysis statistics. The system can maintain records for up to ten thousand patients and as many as forty thousand patient billings. $495. The *Dental Insurance Form Writer* allows the user to prepare Universal ADA Insurance Claim Forms on the computer. $100. The *Encephalon* is a neurologic patient simulator. This is a program to interactively stimulate neurologic patients using hi-res graphics. The program helps medical students to practice neurologic examination and diagnosis on simulations constructed from findings of actual or hypothetical patients. $39. The *Histogram Plot* is a statistics package that features input, edit, print, and save data commands; variable graph size; demon-

Apple II/IIe

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☐ **Cross Information** (934 Pearl Mall, Suite B, Boulder, CO 80302; 303-444-7740) will sponsor two three-day seminars March 12–14 and April 16–18 entitled Softside of Software. The seminars will be held at the Hilton Harvest House in Boulder, CO, and then at the Loew's L'Enfant Plaza Hotel in Washington, DC. The cost is $595.

☐ **Inmac** (2465 Augustine Drive, Santa Clara, CA 99919; 408-727-1970) has designed six products for the personal computer market. The Store & View Manual Rack holds up to six software or operations manuals. The rack also supports the manuals in use at a viewing angle. $29.95. Inmac's Spiral Bound Manual Rack was designed especially for spiral bound reference books. It is constructed of molded plastic and stores up to eight manuals. $49.95. The Zap Guard Table Mat, static-dissipating with a data-protecting vinyl cushion, was designed for use with personal computers. The mat dulls noise and vibration and keeps equipment from sliding. $69. Diskmate protects fragile floppy disks from dust and provides the user with easy access to the disks. Diskmate can accommodate up to eighty disks. $59.95. Roll Top Floppy File stores 120 disks and has eleven organizational dividers. $39.95. The Glare Snare is a mesh screen available in seven sizes to fit most CRT screens. The Glare Snare is designed to reduce eyestrain, blurred vision, backache, and neckstrain due to glare problems. $39.95

☐ **Longman Financial Services** (500 North Dearborn Street, Chicago, IL 60610; 800-621-9621) has announced the publication of *The Buyer's Guide to Financial Services Software*. The directory is meant to help financial services professionals find microcomputer software for their industry. $75.

☐ **Inet** (536 Weddell Drive, Sunnyvale, CA 94089; 408-734-0593) is introducing *MemorEase*, a learning aid that facilitates improved memorization and recall. *MemorEase* uses several different memorization methods, helping the user to memorize speeches, plays, poems, and sales presentations. $79.95.

☐ **Adco Systems** (8375 Leesburg, Suite 397, Vienna, VA 22180; 703-281-5508) has designed a computer workstation. The desk, of American Oak, comes ready to assemble, complete with all tools needed. $149.50.

☐ *Docuwriter* is a word processor by **CMA Micro Computer** (55722 Santa Fe Trail, Yucca Valley, CA 92284; 619-365-9718). The system includes such features as a mailing list manager and a form letter generator. $69.95. CMA also offers *MediCard*, designed to manage the billing and claim form preparation for small medical offices using the Lisa, as well as the II and III. The system features a complete monthly billing system and ways to prepare standard AMA universal claim forms. $349.95.

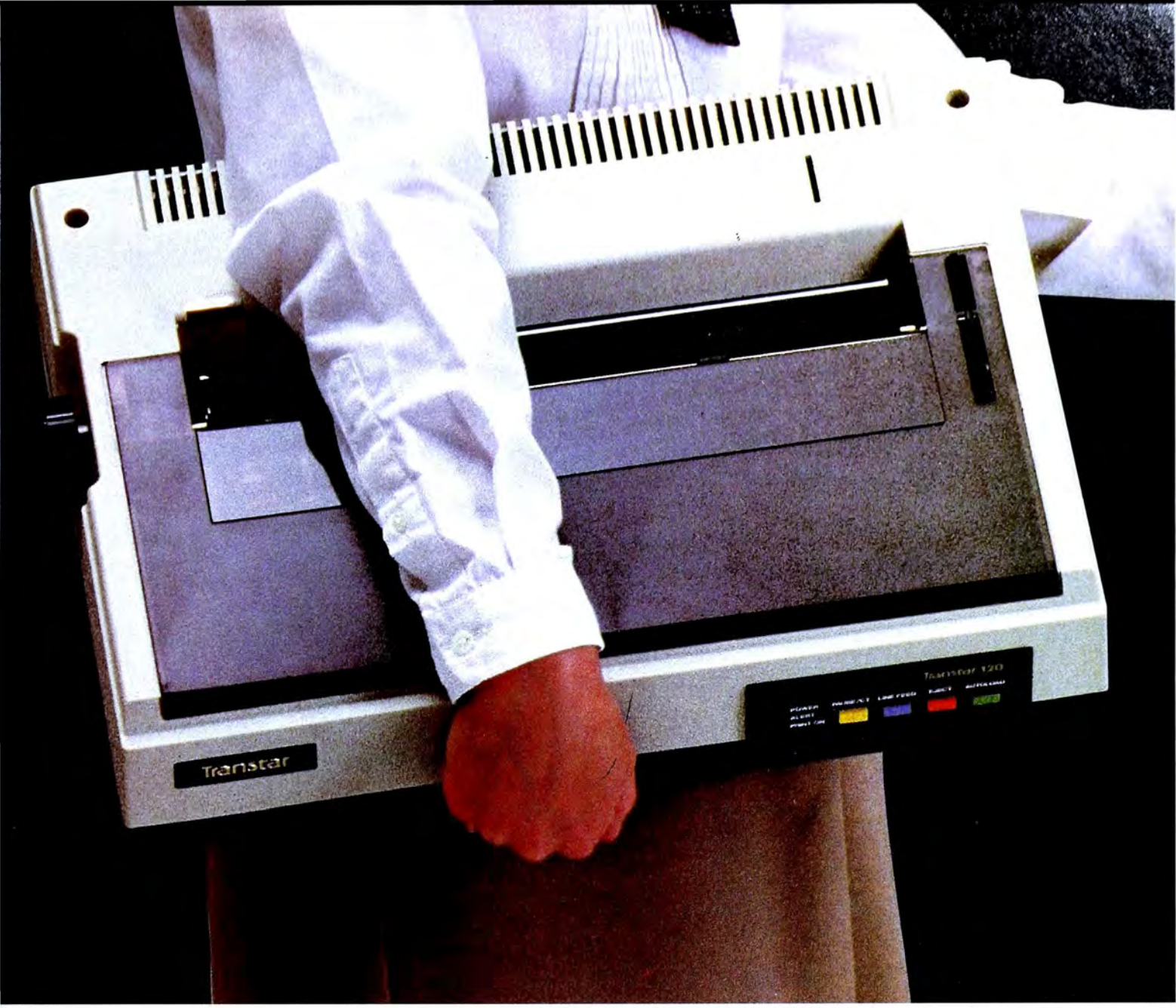
☐ *Micros for Micros* is a software series based on a course taught at the **Lawrence Hall of Science, U.C. Berkeley** (Berkeley, CA 94720; 415-642-3167). The series, which has been tested while in use in the classroom, concentrates on four areas: numbers, estimating, music, and words. $34.95.

☐ **MicroSparc** (Box 325, Lincoln, MA 01773; 617-259-9710) has made available an arcade game called *Hallowe'en*. The object of the game is to lead a wizard through a ten-screen kingdom, snatching pumpkins and killing spiders and skulls along the way. $29.95.

☐ **Zoom Telephonics** (207 South Street, Boston, MA 02110; 617-423-1072) has launched *Netmaster*, a communications program. *Netmaster* can be used with 300-baud modems and will "talk" to other communications software. Files are transmitted with full error detection and correction. $79.

☐ **Elliott Software Systems** (123 East Myrtle Street, Duluth, MN 55811; 218-727-3763) is offering *Headmaster*, an eleven-program school operations system. Featured in the package are eight headmaster assistants—the Attendance Officer; the Scheduler, the Grade-Keeper, the Budget Manager, the Activity Fund Manager, the Demographer, the Standardized Test Scorer, and the Profiler. Teacher's aids include the Test Writer, the Test Scorer, the Record Book with Calculator, and the Grade Keeper. $200–$1,500.

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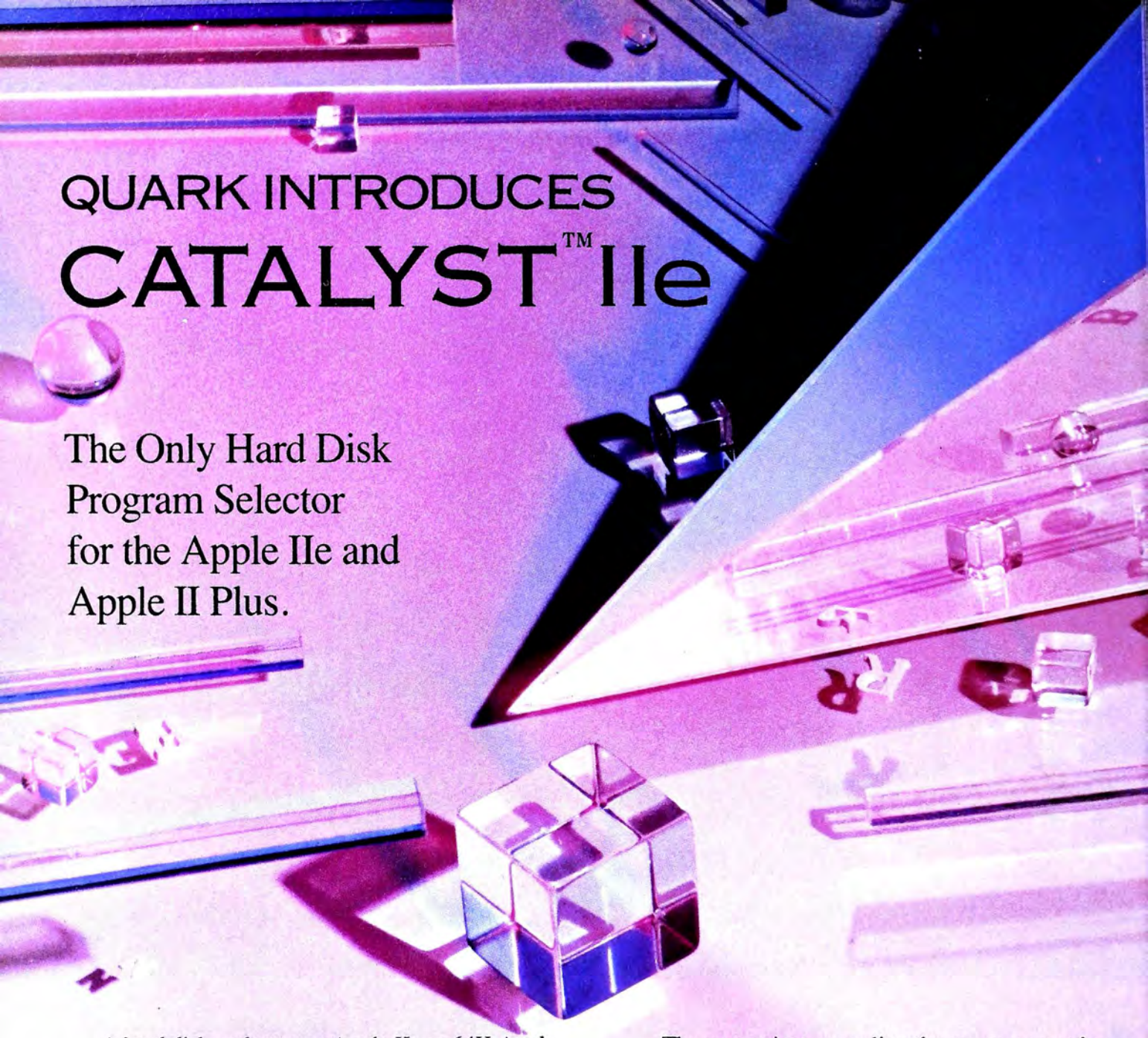
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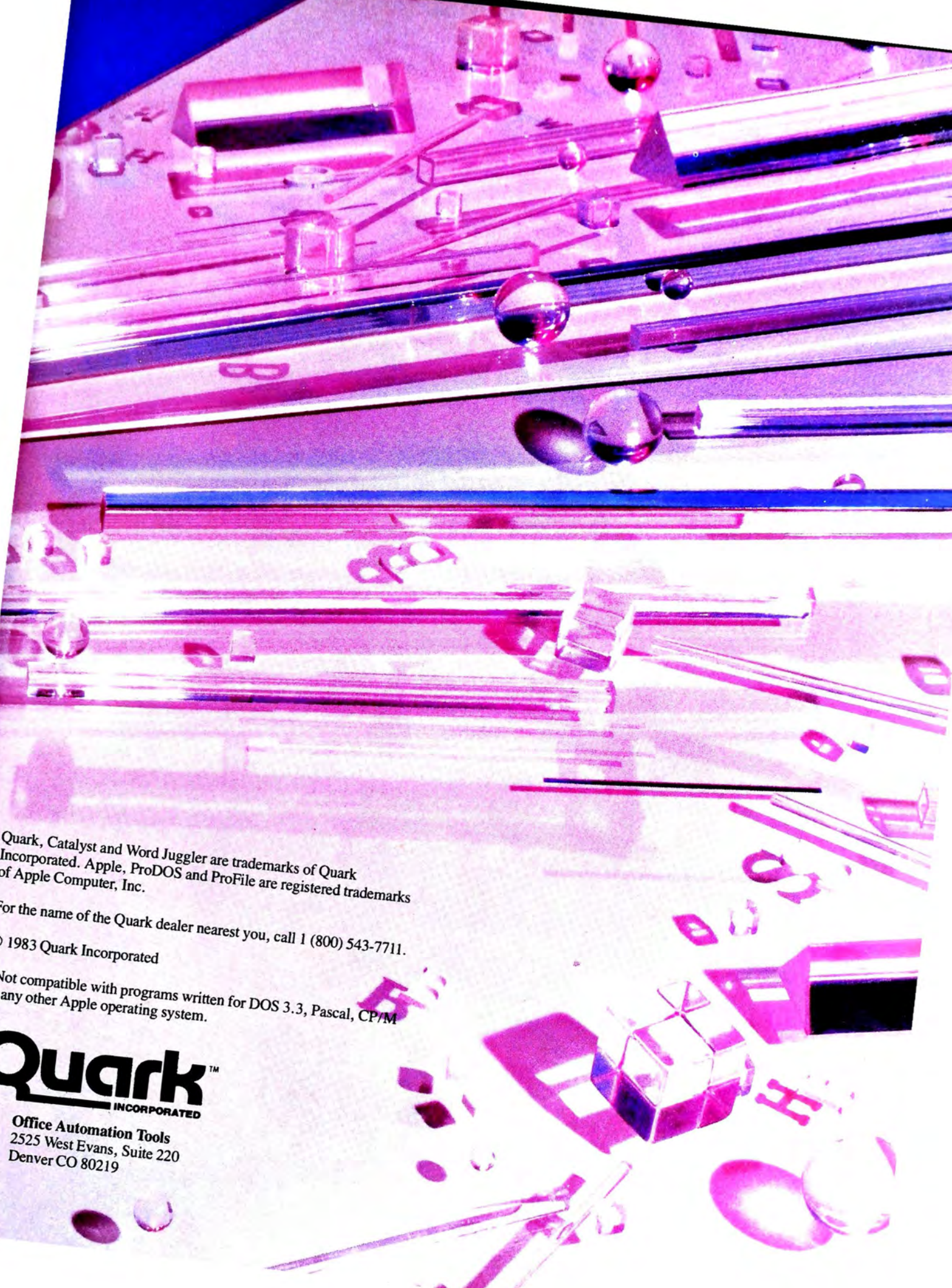
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998-2400) has introduced two products. The PerfectData Dot Matrix Head Cleaner Kit was designed for the cleaning of dot-matrix printer heads. The kit removes caked ink, paper particles, and airborne oils. Under $10. The Case is a personal computer maintenance system. It contains various types of cleaning solutions and materials necessary to properly maintain a personal computer and peripherals. Under $50.

☐ **Synetix** (10635 Thirty-eighth Place N.E., Kirkland, WA 98033; 206-828-4884) has announced two additional versions of the sprite animation peripheral card. The Sprite I used with the keyboard can define, assemble, and move sprites for action games or educational programs. $149. Sprite II adds a sound generator and speaker, and the software enables programming of realistic sound effects synchronized to the sprite action. $249.

☐ **Addison-Wesley** (Reading, MA 01867; 617-944-3700) has announced the publication of several books in its series on Computers in Education. *Computers and Reading Instruction* introduces various ways in which computers can be used to teach reading. The book includes computer applications, descriptions of actual computer programs, and ideas for future developments. $13.95. *Computers in Teaching Mathematics* gives teachers basic information that math teachers need to introduce computers into their schools. It emphasizes traditional uses of the computer in teaching mathematics and explores the potential for a revolution in curriculum. $13.95. *Technostress* is a book that explores computerphobia. The book examines how the new technology of computers is affecting human lives. $16.95.

☐ **Sysgen** (47853 Warm Springs Boulevard, Fremont, CA 94539; 415-490-6770) has announced the development of Sysgen-II-G for Apple III. It is a fast cartridge tape version of its streaming cassette tape and hard disk subsystems. It enables its streaming tape to back up five megabytes of data in one minute. $3,295–$3,995.

☐ **Personal Bibliographic Software** (Box 4250, Ann Arbor, MI 48106; 313-996-1580) is introducing the *Data Transfer System*. This program allows the personal computer user to download records from on-line library catalogs and automatically convert the records into correctly punctuated and formatted bibliographic citations in a personal database. $250.

☐ **Micro-Instructional** (3453 Fifty-fifth Street N.W., Fort Lauderdale, FL 33309; 305-485-6880) has developed a computer program that enables teachers and parents to create their own custom-designed educational computer software called *Education Station*. The software program creates an unlimited number of education programs on the subjects of math, history, religion, poetry, and foreign languages. $79.95.

☐ **FlipTrack Learning Systems** (999 Main, Suite 200, Glen Ellyn, IL 60137; 312-790-1117) now has an audiocassette course entitled *How to Use Multiplan*. The course is designed for the executive who needs an in-depth working knowledge of *Multiplan* but who doesn't have the time to learn about it. The course consists of four cassette tapes of about one or two hours each. $75. *How to Use EasyWriter II* is also being offered by FlipTrack. It is an audiocassette course designed to be used in conjunction with the program itself. $57.

☐ **BP Publications** (Box 617, Stiles Road, Southbury, CT 06488; 203-264-2143) has announced the publication of *The Computer Information Index Series*. The series of indexes to computer magazines is published bimonthly. Each index is cross-referenced by subject, application, name of hardware, software, and manufacturer. $22.

☐ **Electronic Courseware Systems** (309 Windsor Road, Champaign, IL 61820; 217-359-7099) has published a music program entitled *Spell and Define*. The teacher enters ten terms or spelling words, with definitions the teacher creates. $39.95. *Clef Notes* is a music program. The software includes drill-and-practice routines on treble, alto, tenor, and bass clef notation, and retains students' scores. $39.95.

☐ **CompuSource** (510 First Avenue, Minneapolis, MN 55403; 612-340-1468) has released the *Abacus 1000 Software Series*, a collection of thirteen hundred Apple programs organized into one catalog. The programs are listed by adventure, home/family, business, utilities, graphics/sound, education, and games. $99.95–$199.95.

☐ **Elsevier Science Publishing** (52 Vanderbilt Avenue, New York, NY 10017; 212-867-9040) is marketing *The Software Catalog*, a database that contains information on more than fifty thousand software products. $69.

☐ The 1984 Office Automation Conference has been planned for February 20 through 22 at the Los Angeles Convention Center. The activities include a career-planning workshop entitled "Plotting Your Computer Career," a series of professional development seminars, six industry workshops, an executive program, and an extensive display of over one hundred fifty exhibits. Advance registration will be on Sunday, February 19. For more information, contact Trudi Riley (**AFIPS**, 1899 Preston White Drive, Reston, VA 22091; 703-620-8952).

☐ Softcon—The International Tradefair and Conference for the software industry will be held February 21-23 at the Louisiana Superdome in New Orleans. Softcon's conference program focuses on software publishers and developers, software merchandisers, and industry standards. For more information, contact **Northeast Expositions** (822 Boylston Street, Chestnut Hill, MA 02167; 617-739-2000 or 800-841-7000).

☐ **Doublestuff Software** (2053 West Eleventh Street, Brooklyn, NY 11223; 212-449-6300) has announced three products. *Doublestuff* allows the user to run any Applesoft program that was written for standard hi-res in double hi-res. The user can create his/her own character sets, fonts, and animation. $39.95. *Doublestuff Plus* is *Doublestuff* with a drawing package. The joystick may be used to draw on the double hi-res screen. $59.95. *Double Joy* is a joystick that allows the user to access a full 560-degree frequency. The device is switch-selectable and allows the user to select normal mode, 0–255, or double mode, 0–559. $59.95.

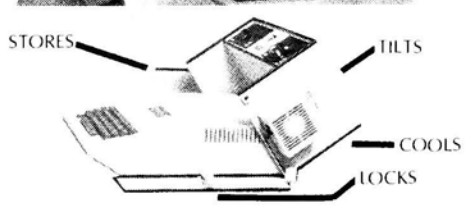
☐ **Associated Technology** (Route 2, Box 448, Estill Springs, TN 37330; 615-967-9159) is offering a uniform coding standard that can be used as is or tailored to establish a company's programming practices. The sixty-two-page guide covers documentation and coding practices for Cobol, Fortran, and Basic. The coding standard includes examples that can aid programmers, analysts, quality assurance personnel, software designers, configuration managers, and department managers. $23.

☐ **Innovative Programming Designs** (3414 Monterey Street, San Mateo, CA 94403; 415-349-6992 or 415-595-1470) has announced *Quick & Slick Super-Duper Floppy-Copy*. This program allows Apple software manufacturers to produce standard sixteen-sector format disks in sixteen seconds if verified, and in nine seconds if not verified. $100.

☐ **FlowerSoft** (564 Tara Court, Manteca, CA 95336; 209-239-2116) is releasing several products for the Apple computer. The *Data Bank* is


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a database management system. The program was designed for small businesses, professionals, schools, and individuals. $89.99. *Banner-Rama* is a program for producing party, game, and bulletin board graphics. It prints six-inch and three-and-a-half-inch characters in four formats. $29. *D-Labels* is a multifunction utility for printing sorted and formatted disk catalog labels. $39. The *Basic List-O-Matic* prints professional basic program listings. It also allows for variable line lengths. $19.99.

☐ **Electronic Arts** (2755 Campus Drive, San Mateo, CA 94403; 415-571-7171), along with two NBA basketball stars, has designed a computer game called *Julius Erving and Larry Bird Go One-on-One*. The game approximates a real-life basketball experience, reproducing the players' images with digital technology and capturing their moves and strategies. $40.

☐ **Street Electronics** (1140 Market Avenue, Carpinteria, CA 93013; 805-684-4593) has announced new capabilities for its Echo II speech synthesizer. Nearly seven hundred natural-sounding words are now available. The words have been encoded with a female voice on a speech development system and are supplied on a disk. $29.95.

☐ **Sierra On-Line** (Sierra On-Line Building, Coarsegold, CA 93614; 212-947-9898) has produced a computer game called *B.C.'s Quest for Tires*. The game was adapted from the cartoon strip B.C. and features Thor, the main caveman in a romp through prehistoric times. $39.95.

☐ **Micro Computer Libraries** (145 Marcia, Freeport, IL 61032; 815-235-2955) is releasing a product called the *Library Micro Clearinghouse*. It is intended to increase the use of the microcomputer as a library management tool, as well as aiding inexperienced micro-using librarians. $7.50.

☐ **Ombudsman** (1585 North Milwaukee Avenue, Suite 9, Libertyville, IL 60048; 312-367-6383) has developed several courseware packages. The *Constitution of the United States* is a tutorial program covering the U.S. Constitution, including the Declaration of Independence and all twenty-six amendments. Students' performance on the test is stored on disk. $125. *A History of the United States* is a tutorial program that covers the American Revolution. Each lesson employs branch programming and graphics. A summary and mastery test is included. $125. *Alcohol and Health* discusses concepts—the history and reasons for drinking, as well as the effects of alcohol and drunken driving. $100.

☐ **Continental Software** (11223 South Hindry Avenue, Los Angeles, CA 90045; 213-410-9466) has introduced *FAST* (*Financial Analysis Statement Templates*). The product is a series of templates that convert *VisiCalc* data into comparisons and reports for analyzing a variety of financial statements. The program was designed for business owners, accountants, investors, managers, and bankers. $99.95.

☐ **The "We're Here To Help" Computer Print Store** (1703 Stewart Street, Santa Monica, CA 90404; 213-828-6436) is offering *The Computer Printer Buyer's Guide*. The guide is a promotional brochure focusing on technological issues that should be considered when purchasing a printer. $2.95.

☐ **Computer Advanced Ideas** (1442 Walnut Street, Suite 341, Berkeley, CA 94709; 415-526-9100) has announced *Wizard of Words*. The program allows users to explore vocabulary and spelling skills. $39.95.

☐ **el Dorado Software** (549A Castro Street, San Francisco, CA 94114; 415-626-0588) has introduced *Calc-Kit*, an enhancement to *VisiCalc*. *Calc-Kit* features a graph, data, list, and print section. The program provides on-screen instructions. $100.

☐ **Lotus Development** (161 First Street, Cambridge, MA 02142; 617-492-7171) has announced the development of *1-2-3* for the Apple. The new version runs on Apple II Plus and IIe computers adapted for the MS-DOS operating system, using the Rana 8060/2 unit. *1-2-3* for the Apple will be available in the second quarter of 1984. $495.

☐ **Electronic Specialists** (171 South Main Street, Natick, MA 01760; 800-225-4876) has released a forty-page catalog that includes products designed to eliminate problems often blamed on software. Typical applications are highlighted in the free publication.

☐ **Scientific Software Products** (5726 Professional Circle, Suite 105, Indianapolis, IN 46241; 317-244-6163) is offering *Amperware*, a software package designed to enhance the capabilities of the Applesoft Basic programming language. Among its many features is a manual that


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"Of all the DOS enhancement packages reviewed in Peeling II to date, **DIVERSI-DOS** is the most powerful in terms of its capabilities coupled with its price. **DIVERSI-DOS** is the only product to speed up all areas of DOS: LOAD BLOAD, RUN BRUN, SAVE BSAVE, as well as the READ and WRITE of text files. The documentation is superb. (Rating AA)"
Peelings II Magazine

WHAT ARE YOU WAITING FOR???

Are you tired of waiting for DOS to load and save files? Are you tired of waiting for DOS to finish so you can type again? Are you tired of waiting for your printer? When you buy **DIVERSI-DOS**™, by Bill Basham, you won't have to wait any more! Here's why:

1. DOS speed up: Apple DOS 3.3 takes 18 disk revolutions to read a single track, whereas **DIVERSI-DOS** reads or writes a track in just 2 revolutions. This speeds up file processing tremendously (see table).

2. Keyboard Buffer: **DIVERSI-DOS** allows you to type ahead, as fast as you can, without missing a single character.

3. Print Buffer: **DIVERSI-DOS** can use a RAM card (16K 128K) to temporarily save characters before they are printed. Thus, your computer won't have to wait for your printer to finish.

4. DDMOVER: **DIVERSI-DOS** can now be moved to a RAM card to increase the available memory in a BASIC program.

**DIVERSI-DOS**, the QUADRUPLE utility, requires a 48K Apple II, II+ or e with DOS 3.3. A simple, menu-driven installation program is included on the un-protected disk. So what are you waiting for?

| | APPLE DOS | DIVERSI-DOS |
|---|---|---|
| SAVE‡ | 27.1 sec. | 5.9 sec. |
| LOAD‡ | 19.2 sec. | 4.5 sec. |
| BSAVE* | 13.6 sec. | 4.1 sec. |
| BLOAD* | 9.5 sec. | 2.6 sec. |
| READ** | 42.2 sec. | 12.4 sec. |
| WRITE** | 44.6 sec. | 14.9 sec. |
| APPEND** | 21.3 sec. | 2.3 sec. |

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** 52-sector text file

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# The word is out on word processors. Format-II™ ranked number one.

We've always thought of Format-II as the finest, easiest to use word processor for Apple® II+, IIe and Franklin® computers. We're pleased that Peelings II magazine agrees. They judged Format-II best out of 18 leading word processors. Here's why:

**Format-II makes editing easy.**
There's our unique editing process: simple, mnemonic commands logically relate to the task you want to perform. To center text, you press [C]. To delete, [D]. To justify, [J].

And since what you see on the monitor is exactly what will print out, editing and formatting is always a breeze.

The Peelings II reviewer said, *"Format-II is one of the few word processors that is so comfortable and predictable, I would consider it as an addition to my small library of personal software."*

**Peelings II Magazine Rating**

| | |
|---|---|
| **FORMAT-II™** | **1** |
| SCREEN WRITER II™ | 2 |
| PIE WRITER™ | 3 |
| WRITE AWAY™ | 4 |
| LETTER PERFECT 5™ | 5 |
| WORDSTAR™ | 6 |
| MEGAWRITER™ | 7 |
| APPLE WRITER II™ | 8 |
| PERFECT WRITER™ | 9 |
| CORRESPONDENT™ | 10 |
| SPELLBINDER™ | 11 |
| MAGIC WINDOW II™ | 12 |
| ZARDAX™ | 13 |
| SUPERTEXT 40/80™ | 14 |
| GUTENBERG™ | 15 |
| WORD HANDLER™ | 16 |
| SELECT™ | 17 |
| SANDY™ | 18 |

Reviewed by John Martellaro, September 1983, based on Peelings II rating system for performance and performance to price ratio.

In the words of the Peelings II reviewer: *"This is the best program I have seen for people who do a lot of work with mailing lists, form letters and short correspondence."*

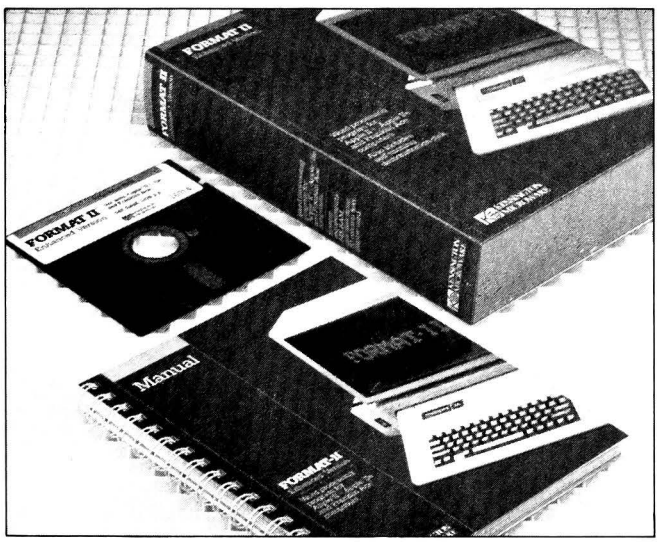
**An easy to follow manual.**
Essential to any good program is a manual that's clear and understandable. The Peelings II reviewer describes the Format II manual *"All in all, it is one of the best word processor manuals I have seen. The latest documentation is a model of clarity and organization."*

Put it all together. Then add features such as support of hard disk drives and a standard DOS text file format compatible with spellers and communications programs, and it's not hard to see why Format-II has earned the number one rating.

The words of the Peelings II reviewer sum it up: *"I cannot think of another word processor that would be better overall for business use."*

Thanks Peelings II. We couldn't have said it better ourselves.

For a reprint of the full review, or to order Format-II, fill out coupon and send it to: Kensington Microware, Ltd. 251 Park Avenue South, NYC, NY 10010 or call us at (212) 475-5200. Tlx: 236200 KEN UR. Or visit your local Apple dealer.




**Format-II supports all printers.**
Unlike other word processors, Format-II is compatible with *every* printer that works with the Apple, from the simplest dot matrix printer to the most advanced letter quality printer.

**A built in mailing list at no extra cost!**
Actually a database system resembling an index card file. A SORTING program will arrange the mailing list alphabetically or numerically. Powerful LOGIC commands merge specific entries into form letters and documents.

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New York State residents add applicable sales tax $_____
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New York, NY 10010

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Format-II requires 64K and an 80 column card

discusses basic and advanced programming techniques, plus a reference section and index. $49.95.

☐ **dilithium Press** (8285 Nimbus S.W., Suite 151, Beaverton, OR 97005; 503-646-2713 or 800-547-1842) has published *Computers for Everybody, Third Edition*. The book is an introduction to personal computers for people who have no background in computers, electronics, or mathematics. It concentrates on what computers are and what they do, so the reader can decide if he or she wants one. $7.95

☐ **Teknika Electronics** (1633 Broadway, New York, NY 10019; 212-977-8640, 800-223-2078 or 800-522-5257) is marketing the MJ-22 monitor. The monitor features sixteen colors that precisely match the color names presented in the test pattern; it can display two thousand characters on an eighty-column-by-twenty-five-line screen with 506-by-240 resolution, in black matrix. $499.95.

☐ **Software Arts** (27 Mica Lane, Wellesley, MA 02181; 617-237-4000) has announced the Apple IIe version of *TK! Solver*. The *TK! Solver* is designed for people who commonly use equations, formulas, and modeling for analysis, design, planning, or problem solving. *TK! Solver* also offers other features including iterative solving, list solving, tables and graphs, and automatic unit conversion. $299.

☐ **Tribeca Communications** (401 Broadway, Suite 1907, New York, NY 10013; 212-226-6047) has published *How To Get the Most Out of Your Home Computer*. The author of the book has mapped out the variety of functions the home computer can perform in addition to video game entertainment. $5.95.

☐ **Microtek** (4750 Viewridge Avenue, San Diego, CA 92123; 619-569-0900) has published a forty-eight-page book aimed at novice computer users. The book is entitled *The Most Popular Book Ever Written on Making Apples Grow*. The book illustrates and explains seven areas in which Apple computers may be enhanced or expanded. Free of charge, the book is available from most Apple dealers and retailers or from Microtek directly.

☐ **Vault** (7899 La Tijera Boulevard, Los Angeles, CA 90045; 213-215-0354) has announced the *Telelok* system. The system is a copy-protection package for disks that allows software to be transmitted over ordinary telephone lines and received in a form that prevents illegal copying by unauthorized users. Prices range from $5.54 to $95.

☐ **Megahaus** (5703 Oberlin Drive, San Diego, CA 92121; 619-450-1230) is releasing two new products. *MegaSpell* spots misspelled words in *MegaWriter* documents. The program comes complete with a forty-thousand-word dictionary, and the user can add up to ten thousand more words. $59.95. *MegaFinder* comes complete with a report generator and includes a selection of solutions for home, business, personal finance, and other applications. A screen editor allows the user to design forms from scratch and change existing forms. Ready-made forms include checks, home inventory, mail list, tickler, and travel costs. $149.95.

☐ **Jefferson Software** (723 Kanawha Boulevard, Charleston, WV 25301; 304-342-0769) has introduced *Scholarships Today (Module I)*. The program allows students to explore federal and state government financial aid programs. The exercises cover eligibility, criteria, cost, availability, and application procedures. $65.

☐ **The Young People's Logo Association** (1208 Hillsdale Drive, Richardson, TX 75081; 214-783-7548) has announced another member service, The Midnight Turtle, a Logo information exchange. Currently in operation twelve hours a day, 7 p.m. to 7 a.m., the system features electronic mail, chatting, loading and downloading of Logo software, and five bulletin boards. The Midnight Turtle is an electronic news system. The host system is a 128K Apple IIe. Free of charge for members.

☐ **The University of Southern California College of Continuing Education** (Continuing Engineering Education, Los Angeles, CA 90007; 213-743-4343) is offering a short course entitled *Introduction to dBase II*, February 28–29 in Irvine, south of Los Angeles in Orange County. This course demonstrates how to apply *dBase II* to a variety of business functions, including accounting, inventory control, and sales reporting. The course features hands-on training from an expert in the field of data processing. No prior computer experience is required. $495.

☐ **Convergent Technologies** (Advanced Information Products Division, 2441 Mission College Boulevard, Santa Clara, CA 95050; 408-980-9222) is shipping *WorkSlate*, which combines portable computing power, information storage, data communications, and electronic spreadsheets for solving business problems. It includes desktop tools such as a calculator, tape recorder, calendar, address book, and telephone in a package small enough to fit in a briefcase. $895. The company has also announced the release of *Taskware* tapes, designed to extend the number of applications of *WorkSlate* by simplifying complex business tasks. The tapes are predesigned worksheets recorded on microcassettes. $19.95–$49.95

☐ **Professional Microsystems** (Richardson Plaza, Route 309, Montgomeryville, PA 18936; 215-855-2700) has introduced *Biz*Plan*, a software template that enables users to create a business plan and analyze how alternative sales strategies and changing conditions will affect profitability. *Biz*Plan* enables users to develop financial plans and strategies that will reflect the character of their business. $195.

☐ **Signum Microsystems** (120 Mountain Avenue, Bloomfield, CT 06002; 203-726-1911) has announced the introduction of *Documax*, an information management system. *Documax* is a document-handling system designed for users who manage word processing, electronic mail, and other files of textual information. *Documax* is an electronic file cabinet that combines functions of accessing, storing, and organizing documents. $175.

☐ **Exec Software** (201 Waltham Street, Lexington, MA 02173; 617-863-3170) is releasing a new version of *TermExec*, a communications package. *TermExec Version 1.2* offers backscrolling to review work that has previously appeared on-screen; it also offers an auto-answer capability that permits operation from a remote terminal. $79.95.

☐ **Mattick Business Forms** (333 West Hintz Road, Box P, Wheeling, IL 60090; 800-628-8425) is offering free of charge a twenty-four-page catalog called *Computer Supplies and Accessories*. This catalog lists over one thousand products from manufacturers, including disk, filing, and storage accessories.

☐ **Talk-U-Thru Tutorial Systems** (6519 Fountain Avenue, Los Angeles, CA 90028; 213-466-8496) offers tutorials on *Apple Writer IIe* and *WordStar*. The audiocassette and disk tutorials offer step-by-step instruction in everything from booting the computer to printing. Disk exercises include all cursor and block moves, page formatting, use of boilerplates, creating footnotes, and more. $49.95 each.

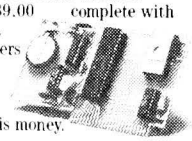
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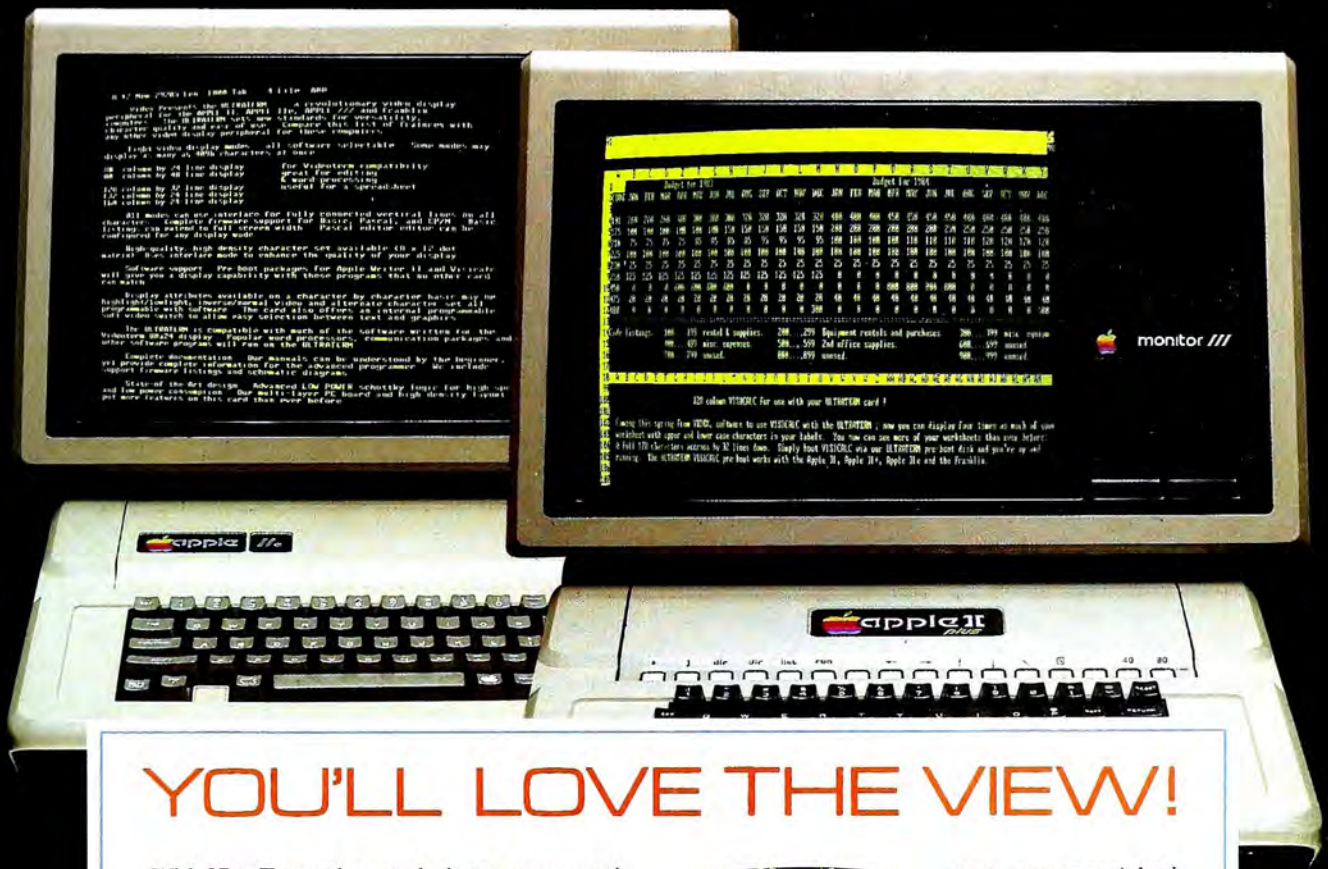
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714-752-2344) has introduced the *Sales Planner*, a package designed to help sales professionals reduce paperwork. Each step of the program is explained on the computer's screen, with no additional programming needed. $295.

☐ **Interactive Picture Systems** (270 Park Avenue South, Suite 6-A, New York, NY 10010; 212-475-7053) is offering the *Movie Maker*, a movie animation system. With no programming skills, you can produce, design, and direct computer motion pictures. $60.

☐ **Databar** (10202 Crosstown Circle, Eden Prairie, MN 55344; 612-944-5700) has announced the formation of *Healthware*, a health care software series. *Healthware* is a system of applied software programs that provide automated support for maintaining family health. $995.

☐ **Great Plains Software** (Box 9739, Fargo, ND 58109; 701-281-0550) is marketing an accounting and financial management software program for small businesses called *The Hardisk Accounting Series*. Modules in the series consist of general ledger, accounts receivable, accounts payable, payroll, and inventory with point-of-sale invoicing. $495–$595.

☐ **The Second Annual Computers in the Classroom** (Box 110, Oxford, OH 45056; 513-523-2283) will be held March 2-3, in Cincinnati, Ohio. The conference will include field site visits, exhibits, and a wide range of sessions on educational applications of computers. Registration is $40.

☐ **Dow Jones** (Box 300, Princeton, NJ 08540; 609-452-2000) is introducing the *Dow Jones Spreadsheet Link*, a microcomputer-based software product designed to meet the needs of business people and investors. The software allows users to download data from the Dow Jones News/Retrieval Service into their *VisiCalc* and *Multiplan* spreadsheet programs. $249.

☐ **Omega Engineering** (One Omega Drive, Box 4047, Stamford, CT 06907; 203-322-1666) is offering the Omega White Box Dual Thermometer. The product was designed for temperature measurement and control technology in personal computers. $260.

☐ **Tech Sketch** (26 Just Road, Fairfield, NJ 07006; 201-227-7724) has announced Tech Sketch Light Pens. The devices enable users to interact directly with the computer without typing commands on the keyboard. The light pens work by touching the CRT screen to access computer programs and manipulate data. $39.95.

☐ **Q.E.D. Information Sciences** (Box 181, 180 Linden Street, Wellesley, MA 02181; 617-237-5656) has published *CICS/VS Command Level Reference Guide*. The handbook serves as a reference guide to the most commonly used CICS commands and options. Examples are used to clarify the function and application of commands. $19.50.

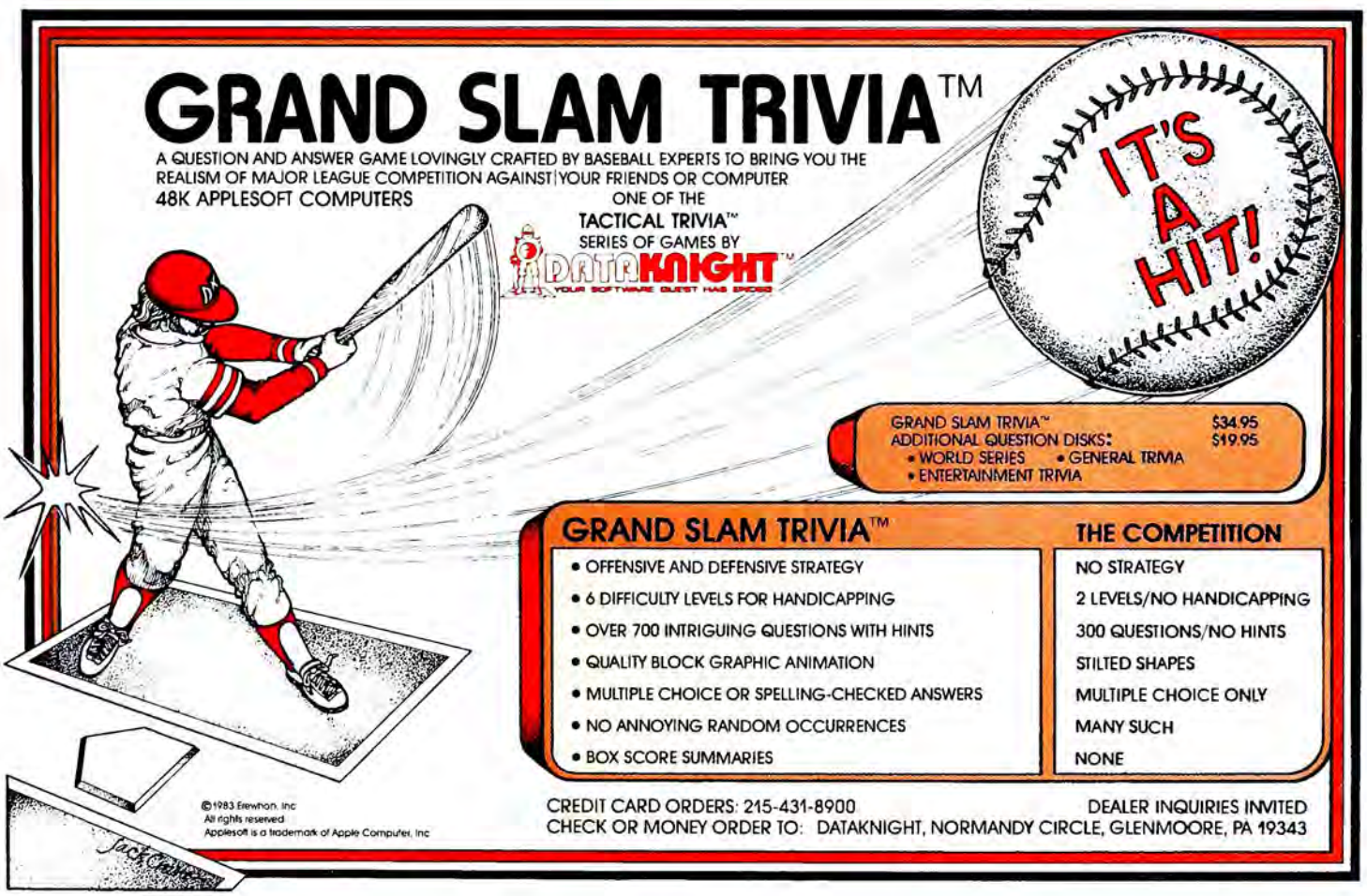
☐ **Passport Designs** (625 Miramontes Street, Suite 103, Half Moon Bay, CA 94019; 415-726-0280) has added *Playwriter* to its software line. The music-writing program allows users to get accurate printouts of whatever they play on the Soundchaser keyboard. $595.

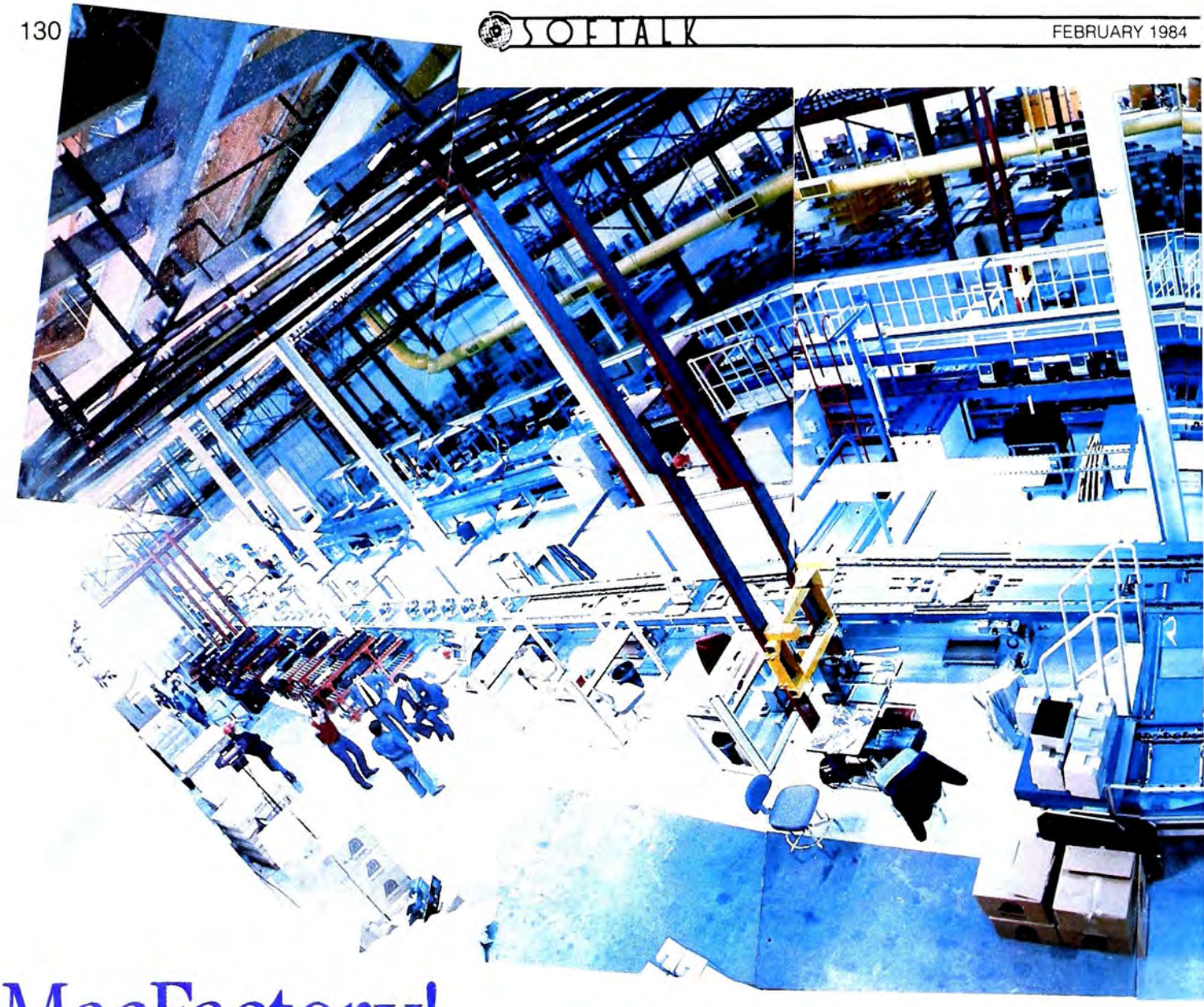
☐ From **Advanced Logic Systems** (1195 East Arques Avenue, Sunnyvale, CA 94086; 408-730-0306) comes an integrated package of software and hardware called the *Business Card*. The package includes the *T/Maker III*, the *CP/M Card*, and *CP/M Plus*. The package was designed to enhance Apple II and give it more power without sacrificing ease of operation. $499.

☐ **The Pine Cone** (7525 Monterey Street, Box 1378, Gilroy, CA 95020; 408-842-7597) has introduced the Mini-Vac, a vacuum cleaner designed to remove minute particles of dust and debris from hidden and hard-to-reach places. $29.95.

☐ **J & S Software** (140 Reid Avenue, Port Washington, NY 11050; 516-944-9304) is offering a revised version of *The Apple Grade Book*. *Apple Grade Book Version 2.6* allows teachers to identify absent students and obtain listings of individual student grades, averages, and activity grades. One of the major features of the revised version is the ability to handle forty grades per student and up to 250 students in as many as twenty-five different classes. $34.50–$44.50.

☐ **Softwest 1984** (2040 Thirtieth Street, Suite B, Boulder, CO 80301; 303-443-6641) is scheduled for May 12–14 at the Regency Hotel and Conference Center in Denver, Colorado. The conference is designed to provide Apple and IBM PC end-users with updated information on new products and services. ■



# MacFactory! Apple's Highest-Tech Assembler







# BY DAVID DURKEE

WITH PHOTOGRAPHS BY KURT A. WAHLNER

State of the art is a moving target in any field; new factories are built and new manufacturing methods are invented all the time. In designing a factory for its revolutionary new Macintosh computer, Apple took a shot ahead of the mark and landed solidly in front of the pack. The production methods used at the Macintosh factory make it possibly the most advanced production facility in the world.

Apple designed the easy-to-learn, easy-to-use Macintosh to appeal to people who have never wanted computers before, and the company expects Mac to account for the largest part of its revenues before long.

To assemble this mass-market machine, Apple wanted a new kind of factory, one that would surpass common expectations for output and efficiency and generally live up to the product it was to create. After wide research and study, and using ideas developed in the best of American and Japanese manufacturing technologies, the Mac factory was constructed in Fremont, California, about thirty miles from Apple's Cupertino headquarters. At full speed, the plant will be able to grow 1.2 million Macintosh Apples a year.

**Strolling Down Assembly Lane.** The factory is divided into several functional areas. The pictures and captions throughout this article show the progress of the various parts that go into Macs as they move through the auto insert section, the pc board subassembly line, the final Macintosh assembly line, and the burn-in racks until they reach final inspection and packaging.

What the pictures don't show is the Mac factory's beginnings in Japan and in the thinking of Steve Jobs and friends.

**Bonzai! Mac Factory's Japanese Roots.** Even as early as two years ago, before the final hardware or software configuration of the Macintosh was known, Apple knew it had a machine that would be powerful, fun, easy to learn and use, inexpensive, and enticing. The hope was that it would become the first truly mass-market computer and that it would eventually account for most of the company's sales. Apple also knew that innovation in computer design wouldn't be enough this time around; with IBM boasting that they could make and sell a million PCs a year, Apple would have to be innovative in its production as well. Only if they could produce the Macintosh in quantity and at a competitive price would it be a real mass-market machine.

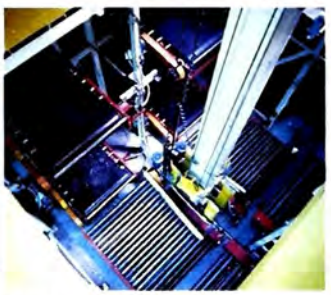
With this in mind, Apple chairman Steve Jobs and engineering manager Bob Belleville went to Japan two years ago to study Japanese

This panoramic view of the Macintosh factory shows the massive burn-in racks on the right and the parallel assembly lines on the left. The operators on the line are taking a scheduled break. In the background it is possible to see some of the automated materials-handling system that makes the factory one of the most modern in the world. Apple IIIs are used in several factory locations as terminals for communicating with the factory's mainframe (far left). Boxes of completely assembled and tested Macs wait to be shipped (left).

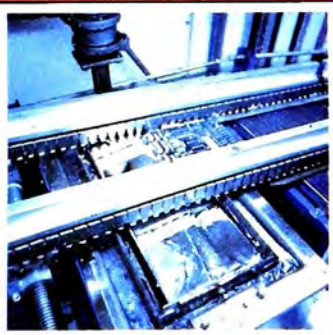
# Build A Mac



**Receiving.** The receiving end of the factory is filled with pallets of materials ready for unpacking, detrashing, and distribution to the assembly areas. On the right are stacks of the totes used to carry the smaller electronic parts throughout the system. The bank of large conveyors for carrying palletloads of parts to the material distribution center is in the background. **1**



**Material Distribution.** A total of eight lifts bring incoming parts up to the material distribution center. There, all the packing material is removed and put on a trash conveyor, and the parts are put onto one of three storage and retrieval systems. Most parts are handled only twice in the whole assembly process: at the material distribution center and at the station where they are installed. **2**



Components on the pc boards are soldered in place. With all the chips, there are literally hundreds of solder points. In the interest of speed, the MacFactory solders them all at once. The boards are conveyed over heated soldering flux with only the underside making contact, then over this vat of molten solder likewise. **11**



**PC Board Subassembly.** Most of the larger chips and irregularly shaped electronic components must be inserted in the logic board by hand. This includes the sixty-four-pin 68000 microprocessor, which is so big that no auto insertion machine can handle it. **10**



This machine puts the larger components onto the Macintosh's analog board. The Apple IIIs in the background are used as terminals for typing in parts orders to the DEC 1170 mainframe that runs the system. **9**



Believe it or not, the logic board is actually washed and heat dried after being soldered. All components on the board at this time must be waterproof. The board is moving from the washing section on the right and into the first of three driers on the left. **12**



Coming out of the carwash-like washer/drier on the right, the board is picked up by four suction points on a robot arm and placed on another conveyor belt. **13**



The logic board is checked for proper chip insertion and complete soldering. Then it is tested by plugging it into a device that emulates all the other functions of the Macintosh to ensure that it works right. **14**



The Macintosh shipping cases, with mice and keyboards already packed, await the arrival of the computers. **23**



The last step in assembly: the Macintosh logo is attached proudly to the back of the machine. This is the one step in the assembly that isn't tested, since faulty logos account for a miniscule percentage of the failures of most computers. **22**



**Final Inspection.** But no computer goes out the door without more testing. A worker performs the special portability test by comparing the Mac's weight to that of an Apple III. Just kidding. Most of the final tests were performed on the burn-in rack; the results are read off the disk at this station. The monitor's brightness is also checked here by an operator with an electronic light meter. **21**



An overhead system of rails stores some of the larger parts, such as the chassis, the CRT, and the front panel, and delivers them to the final assembly area.

**3**



The small electronic parts are stored in totes in one of two block-long tote racks, each of which holds 4,000 totes. A crane moving up and down a rail in the middle of each of the racks supplies the material distribution center with empty totes, receives and stores filled totes from material distribution, supplies the printed circuit board subassembly areas with parts as needed, and accepts empty totes from that area.

**4**



Automatic guided vehicles carry disk drives and disk drive covers to the final assembly areas and mice and keyboards to the end of the line for packaging with the computer. The AGVs are like a giant model railroad, controlled by the master computer, which sends signals through wires embedded in the floor.

**5**



Working in much the same way as the machine that inserts resistors, a machine inserts the chips into the logic board. The chips are fed into the machine from the tubes in the rack on top. The machine also checks each chip for correct insertion.

**8**



A machine takes the electronic parts from the custom reels and inserts them into precise locations on the logic board at a speed that rivals that of an industrial staple gun. The machine's head remains stationary while the pallet holding the board moves under it. The pallet holds two boards at once so that the operator can change boards without slowing down the machine.

**7**



**Auto Insertion.** Resistors and other small electronic parts come on reels. This sequencer machine removes them from their original reels and puts them into new reels in the order they are to be installed into the logic boards.

**6**



**The Final Assembly Line.** The chassis is attached to the front panel of the computer (the bezel). These parts are supplied by the overhead rail system. From this point each Macintosh sits on a special pallet, riding the conveyor from station to station.

**15**



Next the CRT is installed. The thing that looks like a dentist's drill is actually a power screwdriver. Screws are supplied to the screwdriver through an air-powered plastic tube.

**16**



The analog board is screwed into the assembly. With the computer facing the user, the analog is oriented vertically on the left side of the machine, while the logic board is on the bottom.

**17**



**The Burn-In Racks.** The completed Macs spend a day on the seven-level burn-in racks. The pallets they sit on rest on two rails: one a power line and the other a ground. The computers actually plug into the pallet. A diagnostic disk in each machine runs programs for several hours at a time checking the machine's processor, memory, ROM, screen, disk drive, and so on.

**20**



The motherboard is slid into place. Now the functional construction is completed and the unit undergoes more testing. If the machine succeeds in acting like a Macintosh, the rest of the case, a one-piece part that includes the top, bottom, back, and sides, is attached to the bezel.

**19**



The disk drive assembly is mounted between the chassis and the CRT.

**18**

manufacturing methods. They knew that Japan excelled in the area of manufacturing. By borrowing the solid production economies of the Japanese and implementing the best of American methods, Apple would be able to propel Macintosh's production to the level they wanted.

During their visits at companies such as Toyota, Yamaha, Panasonic, and Hitachi, Jobs and Belleville found efficient production and people who enjoyed their work. They also found a lot of factory automation.

In this country, we hear a lot about the down side of automation—how automation means that people are replaced with machines. Automation is far more prevalent in Japan than it is here. Recent figures indicate that there are some eighty thousand robots in industrial use there as compared to about six thousand in the United States (although the differences between Japanese concepts of robotics and our concepts may account for part of this gap).

Japan's experience with automation shows the positive side of the story. Workers there are happy with their jobs. Part of the reason for this may be that automation isn't replacing the Japanese workers; instead, it's increasing their productivity. And because automatic machinery isn't nearly as flexible as humans in any work situation, such machines tend to be used to perform the tasks that most people find trivial and boring.

Another aspect of their system that seems to satisfy Japanese workers is the relationship between labor and management that exists in Japan. Companies are like families. Employees tend to stay with one firm for life; there are no layoffs, and people don't switch companies every few years. As a result, workers know their jobs, know the needs of their companies, and can be left to do their jobs without constant supervision. They also develop loyalty to their companies that shows in the quality of their work.

Jobs and Belleville were also struck by the degree of cooperation between companies in Japan. Many Japanese manufacturers depend on a concept called "just-in-time delivery." Just-in-time delivery depends on careful planning of manufacturing resources. When a production decision is made, a computer programmed with the necessary data can determine what parts and materials to order. By consulting available data on delivery times, the computer makes decisions on when to order so that the supplies will arrive just before they're needed, and in the exact quantities required.

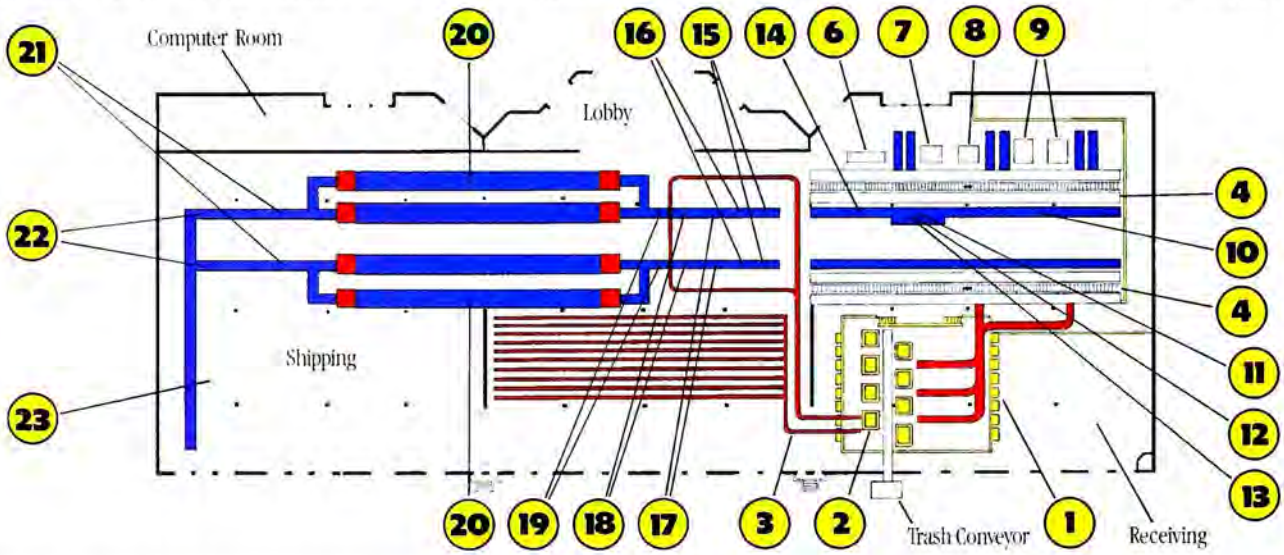
An inventory system based on just-in-time delivery depends on a few conditions that would seem to make it very difficult to implement in the United States. First of all, it requires reliable information about delivery times, which implies consistent behavior on the part of suppliers. Second, it requires superb quality control from suppliers because the quantity of parts ordered makes no allowance for bad materials. To make such an allowance by ordering more supplies than are needed would defeat the purpose of just-in-time delivery.

**Recombinant Technology.** The task of implementing the Macintosh factory fell to senior systems engineer George Irwin and engineering manager John Grooms. For them, applying these manufacturing concepts was not just a matter of copying the Japanese; imitation so often manages to emulate only the obvious parts of the original without ever really capturing the essential spirit behind it. Irwin and Grooms combined some of the concepts Jobs and Belleville found in Japan with some American technology and know-how to build a factory that's as advanced as the best of the Japanese and feasible in the United States.

The ideas borrowed from Japan were just-in-time delivery; a linear, carefully paced assembly line; and the improved quality of life in the workplace afforded to workers by the careful application of automation. Drawing on the best of American technology Apple added a completely automated material delivery system and work-area "detrashing."

**The Birth of a Big League Team.** In order for just-in-time delivery to work, Apple had to know for sure that deliveries really would be on time and that quality standards would be rigorously met. The delivery of defective parts would bog down the system in the paperwork and expense of returning them.

Apple held a conference of the vendors who would be supplying parts for Macintosh, showed them the factory, and explained what they were trying to do. Apple had to enlist the suppliers' cooperation. As Irwin explains it, the suppliers have to be considered partners if such a system is to work. Their fortunes rise and fall with Apple's.




The basic floor plan of the Macintosh factory. The large section in red is the overhead storage area, with the burn-in racks in blue. The numbered sections of the plan correspond with the numbered pictures on the previous pages.

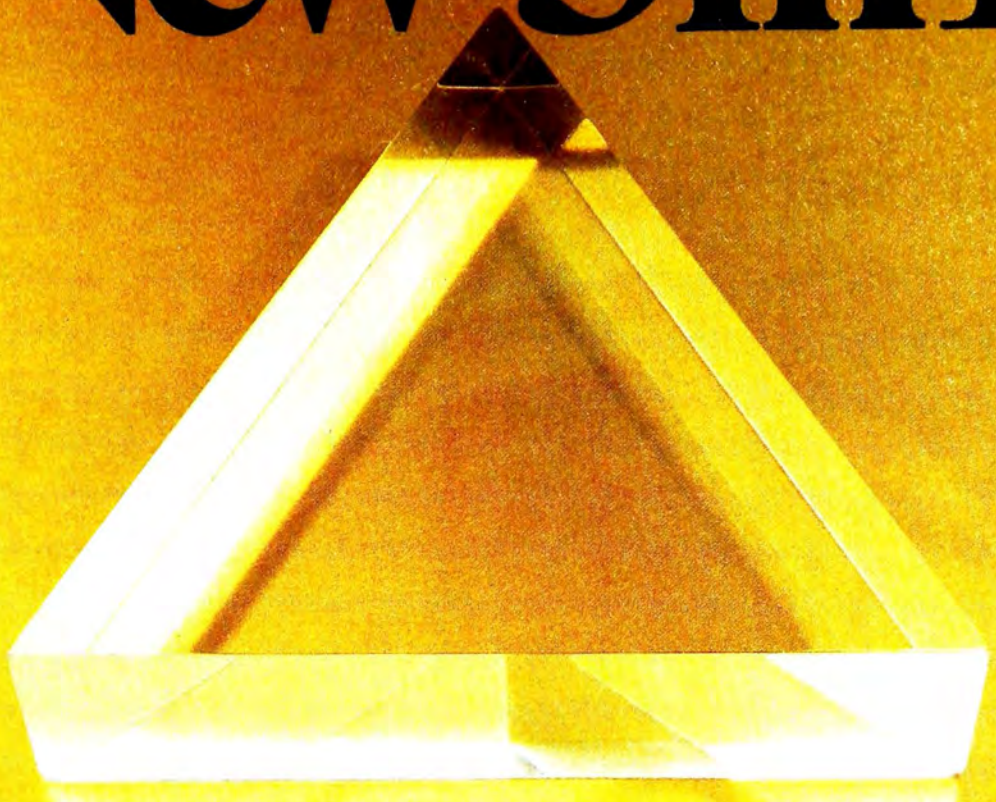
The second Japanese idea Irwin and Grooms applied to the factory was the linear assembly line, in which a product moves in a straight line from start to finish as opposed to a mazelike progression. In the Macintosh factory, each workstation performs one small task; each task is carefully planned to take either twenty-seven seconds or fifty-four seconds (in some parts of production, parallel assembly lines are doing duplicate work, so each task at those stations can take twice as long).

This aspect of the system depends on a continuous pace. Overall, the factory can produce Macintoshes no faster than the slowest station can get its work done. An engineer handles line balancing, striving to keep the amount of work at each station even. Later on, when production is brought up to full speed, the amount of time allotted for each task will drop to about thirteen seconds.

Yet work on the line is not as regimented as this description might make it sound. In most stages of the assembly, the Macintosh is not in constant motion. It sits on a two-by-two-foot pallet that stops at each station along the way. Between the stations there is a buffer area with room for about two pallets, so a worker has a certain leeway. Sometimes something unexpected happens and a task takes a few seconds longer than usual. With the buffers between stations, a brief delay doesn't cause a bottleneck that slows down the whole line.

The third idea borrowed from Japan, a better quality of life for the employees, is a little harder to demonstrate in concrete terms. The Macintosh workers are a diverse group of all ages and ethnic backgrounds;

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most are women. The environment they work in is comfortable, cool, and colorful, painted red, white, blue, and yellow. Perhaps the most striking thing about the factory is how quiet it is.

**Apple IIIs Pitch In.** Production of the Macintosh commenced last November. In the first few months of operation, changes were still being made; some of the main systems had yet to be installed. Things changed noticeably from one week to the next, says Irwin. Some of the parts that would later be assembled on site were at that time still being handled by contractors, and some of the materials that would later be distributed automatically were still being moved by hand.

A number of Apple IIIs helped get the factory off the ground before the automatic inventory systems were fully operative. At the time this article went to press, the IIIs were being used in the receiving and auto insertion areas of the factory. As terminals to one of the two DEC 1170s that are the brains of the factory, they allowed operators to enter part numbers for inventory records and supply requests. Most errors in conventional inventory systems result from mistakes made at the keyboard. Therefore, once the factory is operating at full steam, the Apple IIIs will step aside to make room for a more automated system.

**Industry Imitates Life.** A modern factory is in many ways like a giant organism. It takes its food in the form of parts, materials, and fuel,



Apple's senior systems engineer George Irwin, one of the two chief designers of the Macintosh factory.

and uses that food to create the energy that sustains it. A true organism creates the energy by conversion of the foods it takes in; a factory, of course, does so by means of exchange with a larger economic entity.

The organs and circulatory systems of a factory are its people and machines. They see to the distribution of the parts within the organism, attend the assembly of the parts into the final product, and carry away the unused materials that would otherwise congest the system.

As an organism, the Macintosh factory can best be described as lean. It never eats more than it can digest. It has an efficient, automated system for circulating materials to the various workstations, and for knowing what supplies it has and what items it needs. It eliminates waste—boxes, plastic bags, Styrofoam and other packing materials—at the earliest possible point in the digestive cycle.

Just-in-time delivery is used very effectively in the Fremont plant in conjunction with American-designed material delivery systems. The factory keeps just enough of most parts in stock for three to five days of production, eliminating the labor and overhead a huge warehouse would require. The limited stocking of parts is made possible by strict computerized control of inventory.

**Behind the Supply Lines.** The Macintosh is assembled from more than three hundred parts. There are three major ways those parts are distributed within the factory: totes, overhead conveyors, and automatic guided vehicles. All these methods are under the control of the main computers; which one is used for any particular part depends primarily on the location of the workstation where it is needed.

Most of the small parts that go into the printed circuit boards of the Macintosh are distributed in totes—two-foot-long plastic bins—and managed by a delivery system that functionally resembles a disk operating system. Each of the thousands of totes in the system is labeled on the side with a unique ID number in a machine-readable bar code. Using this code as an index, the computer tracks the location and contents of each tote. When the small electronic parts come in, they are sorted into totes, recorded as inventory, and sent to one of two tote storage and distribution systems.

The two storage systems are parallel to each other, and each is about as long as a city block. An automated crane under computer control moves the length of each system on a rail. When the computer senses the arrival of each new tote, it sends the crane to store the tote in an available slot and then records the transaction.

The printed circuit board subassembly lines run the length of the storage systems, and each station on the line has two conveyors, one for receiving totes from the system and another for sending empties back. Each time a worker returns an empty tote, the tote trips a switch on the conveyor belt that informs the central computer. The computer automatically notes where the empty came from and sends out another full tote to that workstation. Each station has only enough parts available to meet present need. The system is fast enough that no station ever runs out of parts.

The second major distribution method, an overhead rail system, is used for the bulkier parts of the final assembly: things like the inner chassis, the front panel, and the cathode-ray tube. The main carriers in this system are movable shelf units that hang from the rails. These rails act as both the storage and transportation systems for the parts. Parts needed at any station are conveyed on the overhead rails and lowered to the station where they're needed.

Parts that can't be moved on one of the first two systems are carried by automatic guided vehicles. AGVs are partly self-controlled, partly guided by the computer. The computer responds to a need for these parts by dispatching an AGV to pick up the part from the end of one of a bank of long conveyor belts.

Wires embedded in the floor carry a signal from the computer that an AGV can follow. Although there is no system of rails for the AGVs, they are restricted to following the signals from the wires. The wires are laid out in a closed loop, something like a three-quarter-mile-long model railroad. Since they move about in some of the same aisles that people do, the AGVs use a sonic scanning system and a cow catcher to help them avoid obstacles.

The controlling computer, in most cases, doesn't have to wait for people to tell it what's going on. It has "senses" that enable it to monitor the flow of supplies with minimal human assistance or intervention. The bar codes on the totes and data entered at the material distribution center allow it to know where most parts are at all times.

Because of the automated material delivery systems, most parts are handled only twice: once at the material distribution center and once at the workstations where they are installed. In most factories, parts may be handled from ten to fifteen times each. Also, because the packing materials are removed at material distribution before parts ever enter the system, the workspace in this factory is left free of boxes, bags, and other clutter.

The only supplies that don't go through the automatic delivery systems are the screws used in the final assembly. According to Irwin, there is a law of diminishing returns in automation. Since each workstation needs a new supply of screws a few times a month at most, it's easier and cheaper to deliver them manually.

**Survival Traits.** In the frequent predictions of a shakeup that will rock the computer industry and shut the doors of more than a few companies, one of the companies usually cited as a survivor is Apple. One reason is imagination. From the first Apple, the little hobbyists' machine that evolved into a personal computing phenomenon, to the Macintosh, which is likely to become a phenomenon of its own, Apple has never been short on imagination.

Apple also has a powerful ability to adapt to new situations, as this factory shows. In business as in nature, adaptability is a survival trait. Creativity and innovativeness will continue to drive Apple for years to come. ◨




The Apple universe is big and getting bigger. This is sometimes referred to as the "big bang" theory of microcreation, a belief shared by many leading sociologists, anthropologists, and security analysts. One of the interesting side effects of this information explosion is a sense of alienation brought about by the sheer enormity of this brave new world—a condition considered potentially hazardous to your equanimity if not compensated for by some interface with other carbon-based beings and their silicon buddies.

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# 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.*

*If the cryptic initials at the ends of reviews don't fit staff (listed on page 4), then they refer to guest reviewers — this month, Michael A. Banks, Gary Carlston, Trish McClelland, Willard Phillips, Howard A. Shore, and Pat Turpin.*

**One-on-One.** By Eric Hammond, Larry Bird, and Julius Erving. You bought your Apple to provide solutions, right? Now maybe you're wondering what problems you have that a computer could possibly solve. One of my problems has always been that I have a professional basketball player's mind inside an eggplant's body. Who ever thought that the solution to this dilemma would be provided by an Apple computer and a disk called *One-on-One*.

At first glance, it's easy to assume that *One-on-One* is just another product to which the Doctor and Mr. Bird are lending their names. Wrong. They've given us access to their entire treasury of basketball skills. Eric Hammond, the programmer and a not-too-shabby basketball player himself, has graphically captured the moves, the bearing, and the grace of the two most exciting forwards in the game.

The play is one-on-one basketball, Julius Winfield Erving II against Larry Joe Bird. The computer can represent either player or you can play against a friend. Skill levels from Park-and-Rec to Pro level and you can play to a given number of points or for any length of time, with either the winner or loser getting the ball.

The game simulates fouls, blocked shots, player fatigue, slam dunks, shattered backboards, hot streaks, instant replays and the twenty-four-second clock. The most important element, however, is moving. You can spin, fake, reverse dribble, block out, hang in the air, use finger rolls, junk shots, jump shots, dunk shots—everything you fantasize about when you watch these two guys play in real life. If you don't know what to do, read the interviews in the manual for clues. Both players talk a lot about their tactics and Eric Hammond has included so much of their

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CIRCLE NUMBER 4

game personas that you can constantly come up with novel ways of responding to your opponent's moves.

*One-on-One* requires a single joystick for play, with a two joystick option if you have an adapter. With only one, the offensive player uses the joystick while the other player uses the keyboard. Playing winner's outs (scorer keeps the ball) in this situation minimizes the need to switch places.

One of this game's surprises is discovering that even your non-basketball-playing friends may have the souls of Celtics when given the proper tools. It is possible to lose thoroughly to buddies who can't shoot a free throw in the real world.

Dr. J and Larry Bird both have such enormous skills that the computer "player" has no joystick learning curve—playing against it can be frustrating at first. Early on, it seems easier to learn to win as Larry Bird.

Lacking Bird's unstoppable jump shot, Dr. J relies on incredible moves and ball handling to get around and over his opponent. *One-on-One* makes the Doctor pay for his energetic ballet by causing him to tire more easily than Bird. When this happens, the taller and stronger Bird will block a lot of Erving's shots and push him around quite a bit under the boards. Eric Hammond is sure to have programmed a logical response to this drawback in Erving's endgame, but it sure isn't obvious.

Maybe someday there'll be a computer basketball game that allows for sophisticated teamwork and passing, as well as individual moves. Until then, *One-on-One* is the best video basketball imaginable. ☾☾

*One-on-One*, by Eric Hammaond, Larry Bird, and Julius Erving, Electronic Arts (2755 Campus Drive, San Mateo, CA 94403; 415-571-7171). $40.

**Songwriter.** By Art Bardige and Samuel Wantman. If you liked the toy xylophone you hammered on when your feet were in jammies, if you never knew which key was middle C on the piano but loved nevertheless to trip your fingers across the ivories, then you will like *Songwriter*, software for the musically unsophisticated but curious. And if you have someone at home who is even now pounding out dissonances on a xylophone, piano, or even pots and pans, then you'll both enjoy *Songwriter*, simple enough for a child to use.

*Songwriter* is fun and easy. You can boot *Songwriter* and sound random notes on your Apple almost immediately; the briefest consultation of the manual will have you playing a recognizable tune in half an hour.

When booted on a color monitor, *Songwriter* presents a series of blue, orange, and black bars with empty space above and below. At the top and side of the screen are symbols corresponding to letters on the Apple keyboard, a ladderlike figure, and a fraction (one-eighth). The bars represent notes and can be likened to the keys of a piano. The cursor can be moved from bar to bar with the right and left arrow keys; the return key plays the note selected by the cursor. The Apple's space bar plays the note and places a white blip on the screen above the cursor. The blip is a recorded note. Moving the cursor and pressing the space bar plays and records more notes, moving those previously recorded higher and higher into the space on the top of the screen. This concept is much like that of a player-piano roll. The blips left by the cursor are like holes in the roll; when the song is played (by pushing P) they pass through the orange and blue bars on the screen and cause the notes to sound.

Recorded notes are erased with the X key. The length of the notes is indicated by the fraction on the screen. The longest are whole notes, the fastest are forty-eighth notes. The ladderlike symbol shows the comparative size of the notes. A half note fills half of the ladder; a forty-eighth note fills just the tip. Rests are created using the zero key, which advances the roll without producing a note. Rests can be designated to be any value available for notes. The tempo—the speed at which the roll moves—is indicated by a metronome controlled by the Apple's S and F keys, slower and faster.

That's all you need to know to punch out music on *Songwriter*. The instruction manual is well written and provides a quick-start guide for those who like to experiment, in-depth instruction, and a tutorial directed toward young users without musical knowledge. Songs can be saved to *Songwriter*-formatted disks. Musical ideas—phrases that are likely to repeat in a song—can be stored and altered to be used for faster writing. *Songwriter* even provides several prewritten songs that can be loaded and played for inspiration.

Simplicity is *Songwriter*'s strength. Children and the musically uninitiated will find it fun and challenging. Used in conjunction with the manual, *Songwriter* can teach musical concepts. Programmers who know nothing about music but wish to add tunes to their programs can do so without having to learn to read music.

Simplicity is also *Songwriter*'s weakness. Only one note can be played at a time. Advanced users will be frustrated by the program's inability to produce harmonies. Left- and right-hand parts cannot be joined. This is partly due to the limitations of the Apple, which has only one speaker and therefore only one voice. However, the Apple's speaker can approximate two voices, and with enhancement, such as a Mockingboard, the Apple can provide up to six voices.

*Songwriter*'s authors used the player-piano roll method because it is easier to learn than musical notation. Also, as purely theoretical symbols, the elements of musical notation bear little relationship to the nature of sounds. With the *Songwriter* roll, a long note looks longer than a short note, a high note is distant from a low note, a rest in the music is a space between notes. While this is an advantage in explaining musical concepts to children, the lack of musical notation has distinct disadvantages. The world's music is written in musical notation. In order to play a song on *Songwriter* that was written by someone else you would have to listen to it and laboriously discover which notes were the ones in the song and punch in the notes. A program that uses musical notation, such as *Music Construction Set* from Electronic Arts, would allow you to copy the music directly from sheet music into a disk.

*Songwriter* ignores long-standing conventions. The *Songwriter* method can produce a three-eighths note, achievable in musical notation only by tying a quarter note to an eighth note. However, there is no three-eighths note in music.

*Songwriter* is a good program for fiddling around with music. Beginners will enjoy the ease with which songs can be written. However, users with some musical sophistication would probably be happier with another program, such as the *Music Construction Set*, which, although more awkward to use, offers standard musical notation and provides for harmony. IZ

*Songwriter*, by Art Bardige and Samuel Wantman, Scarborough Systems (25 North Broadway, Tarrytown, NY 10591; 914-332-4545). $59.95.

**Aquatron.** By Justin Gray. Darn those Sierra On-Line programmers. Just when Atari is getting ready to release *Defender* for the Apple, Justin Gray comes along and spoils Atari's fun.

It's not that there haven't been any *Defender*-type games available before (remember *Gorgon* and *Repton*?); there just haven't been any released recently. Sirius released Nasir Gebelli's *Gorgon*, and it sold a lot of copies. Later, it released Dan Thompson's *Repton*, and that also sold a lot of copies. Now, more than a year later, Sierra On-Line unleashes *Aquatron*, hoping for similar results.

The great thing about this kind of game is that the plot doesn't seem to make too much sense, but the game is fun as heck to play. For a while.

In *Aquatron*, the player has been abandoned (for reasons unknown) on an ocean-covered planet. There's only one base ship and a mobile fighter. The object is to fight enemy ships in the air and underwater, destroying and capturing as many as possible before enemy interceptors arrive. Lots of questions could be asked here, but ignore the temptation; it ruins the fun.

Fly back and forth. Shoot in both directions. Catch the rescue chutes. Fly some more; shoot some more; get destroyed. That's how these games usually go, and that's how this one goes. And then some.

The player not only must combat enemies in the air, but in the water as well. You see, this nifty craft can plunge into the ocean to battle submarines, too.

Gray has added a new touch to an otherwise old game. Whereas previous games in this genre employed the smart bomb to destroy everything on the screen when the action got too hairy, *Aquatron* introduces the proximity missile, which destroys on contact (or near miss) of its target. This comes in handy when several fighters are dogging your tail; fire a missile and hope it comes close.

*Aquatron* receives three stars out of a possible four for playability. The game responds obediently to joystick control (two buttons, please), but it will practically scold anyone who tries to play in the keyboard mode.

In all, *Aquatron* isn't the thinking person's arcade game. Just sit

down, blast away, and have a ball. It's a game to settle down with when the one hundred twentieth level of *Lode Runner* numbs the mind. It's a game to play when *Zaxxon* cheats you on those near misses for the fiftieth time.

The game is narrow in scope, but it's been that way all the way back to *Defender*. Gray has taken the theme and turned out a smoothly executed variation that looks and feels as good as any of its predecessors. MTY

*Aquatron*, by Justin Gray, Sierra On-Line (Sierra On-Line Building, Coarsegold, CA 93614; 209-683-6858). $29.95.

**Mystery Master: Murder by the Dozen.** By The BrainBank. Sleuthing's tough. Just because the last time you played *Clue* you knew it was Colonel Mustard who did it in the library with the knife, don't go thinking you're a mystery master. It's much easier to be an Inspector Clouseau than a Miss Marple or Hercule Poirot—even if you are a dedicated fan of the genre.

*Murder by the Dozen* is a delightful program that gives your detective whimsies free rein while keeping your ego at bay.

The package contains a numbered clue book, a detective's worksheet, a solution book, and a detective's manual with twelve case histories and game instructions.

Here's how to play: After entering your name, you are offered a choice of interviewing a specific person, examining certain physical evidence, or going to another location. Each choice costs time, and to get a good sleuth rating you need to be selective. Choose an option and the resulting clue numbers are displayed at the bottom of the screen. A quick peek at the clue book reveals their meaning or meaninglessness—some simply say, "No clue." Finally, after you've done a lot of wild-goose chasing and have at last discovered what the janitor saw, you may decide to take a stab at winning by publicly revealing your opinion on the murderer and motive. An incomplete or incorrect answer merits disqualification from the game, while a correct answer closes the case. If you are right, you are given a sleuth rating based upon your speed and thoroughness. Ratings range from lucky guesser to world-class detective to the innocent bystander who is told "Inspector Clouseau has nothing on you, pal."

*Murder by the Dozen* is for one to four players, but is best played alone, in teams, or with one other person. When four play, the challenge is not in solving the crime but in getting your turn at the clue book. That hassle is one of the most cumbersome and annoying things about this program. Besides, looking up six "clues" that say "no clue" is frustrating, to say the least.

The game's instructions are another stumbling block. You can't play the game without them, but if you're a beginner the laborious manual-thumbing could take an hour.

Yet despite flaws, *Murder by the Dozen* is a delight. Each of the twelve mysteries contains a kettleful of red herrings and a crime to sink your teeth into. The cases are tough and even the most dedicated Holmesian will be satisfied by one or two puzzles in an evening.

So tonight, instead of being entertained by the case-cracking canniness of Poirot or Marple, try *Murder by the Dozen*. It's a thrill that makes the saga of Colonel Mustard look like cake. CP

*Mystery Master: Murder by the Dozen*, by The BrainBank, CBS Software (One Fawcett Place, Greenwich, CT 06836; 203-622-2500). $34.95.

**Cut & Paste.** By Tim Mott, Steve Hayes, Norm Lane, David Maynard, Jerry Morrison, Steve Shaw, and Dan Silva. Wow! That's a lot of people to have working on just one program.

When using this word processor, it's hard to believe that seven people were needed to create it. The program is so simple to use that you'd swear it was designed, coded, and debugged all on a lazy afternoon while the programmer was switching between his computer display and the Super Bowl. It seems Electronic Arts wants you to feel like you're working with the project at hand, not with some complicated computer program. The objective of using a word processor, they say, is to generate text, not to fiddle with hard-to-remember control keys and complicated commands. *Cut & Paste* works like that.

People who have worked with other word processors may have a little trouble getting used to *Cut & Paste*. That's because it doesn't work like a word processor; it works like a typewriter. The shift key shifts, the delete key deletes, the tab key tabs.

There aren't any menus or modes in this program. All the necessary commands are displayed on a single line at the bottom of the screen. Hitting the escape key moves the cursor from the document area to the commands, and executing the commands is as easy as using the arrow keys to highlight the one you want and then pressing return.

The program's big feature isn't that it lets you cut and paste, but rather how easily it lets you do so. All the commands make perfect sense.

Pressing control-A (for anchor) marks the beginning of the text to be cut, moving the cursor to the right or down the page highlights the text to be cut, and control-C cuts it. No menus to go to, no other control characters to remember. Text that has been cut is kept in a buffer until you cut something else. Appropriately, control-P pastes into the document whatever happens to be in the buffer at the time. And yes, it is possible to cut from one text file and paste into another.

For creating outlines, *Cut & Paste* lets you vary the left margins as you write. Control-N (for new margin) moves the left margin five spaces inward, and control-R (for restore margin) moves the margin five spaces outward. It's also possible to indent an entire paragraph after it's been written. Just put the cursor anywhere in the paragraph and press control-I (for indent).

In many ways, *Cut & Paste* is like Broderbund's bestselling *Bank Street Writer*; the main difference is that *Cut & Paste* lets you work more directly with the text, without having to go to menus.

Then there's printing. The program defines parameters a little differently from the way other word processors do. Instead of being measured by the number of lines or the number of characters per page, the page is measured in inches. This is a word processor for people who want to write, not fuss with a computer, remember?

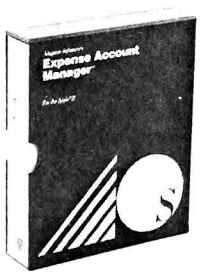
A nice feature in printing is the way the program takes care of lines left dangling by themselves when the rest of the paragraph is on another page. Instead of having just the first line of a paragraph at the bottom of a page, *Cut & Paste* moves that line up to the top of the next page. The same goes for the last line of a paragraph sitting at the top of a page by itself; the program sticks it at the end of the previous page with the rest of the paragraph.


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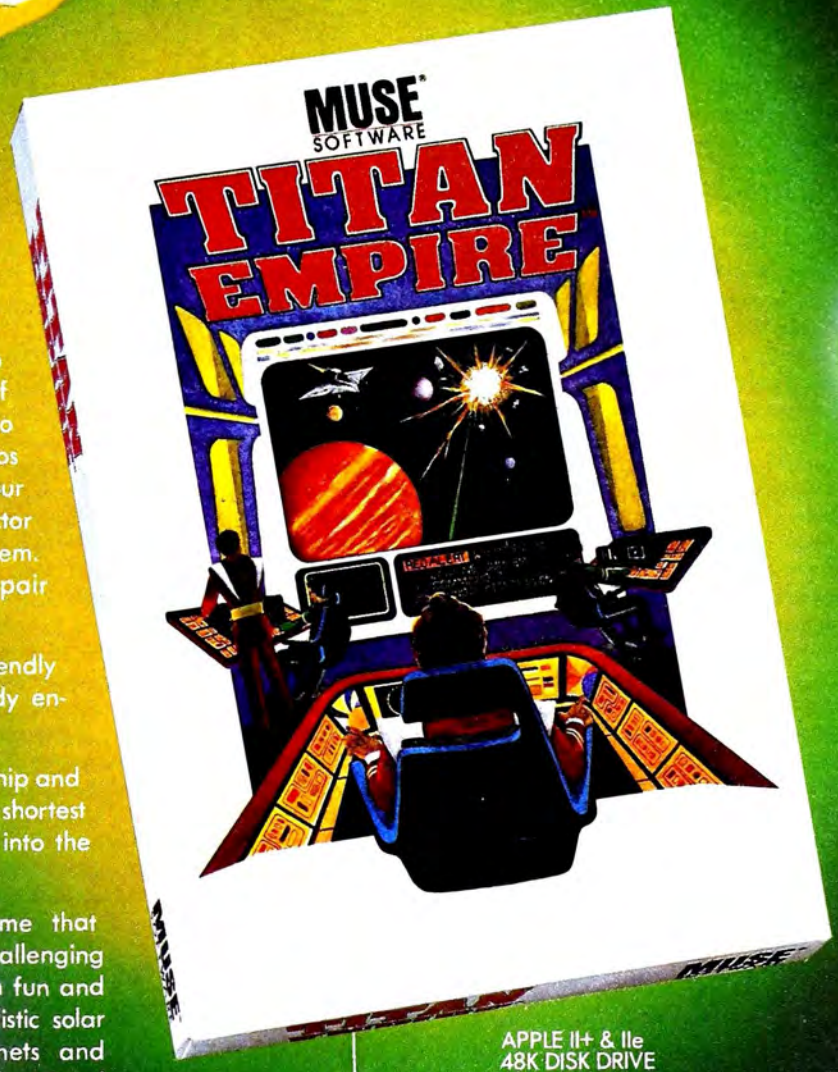
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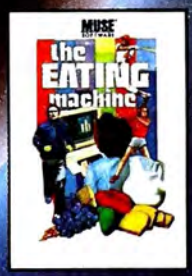
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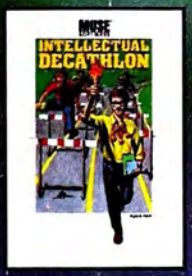

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*Cut & Paste* isn't a word processor for someone who plans to do a lot of heavy-duty writing. There are no features for find-and-replace, underlining, special print styles, or other extras. Text files created by *Cut & Paste* aren't compatible with DOS. But the people who would use such functions aren't the ones Tim Mott and friends had in mind when they designed this word processor.

This program is meant for the home: letters to Aunt Dora, the kids' social studies reports, Mom's or Dad's favorite recipes, the businessperson's speech for the board of directors. *Cut & Paste* is powerful enough to satisfy anyone used to composing and writing on a typewriter.

As the first in Electronic Arts's line of home management software, *Cut & Paste* turns the Apple into what it should be—a tool to work with, not against. MTY

*Cut & Paste*, by Tim Mott, Steve Hayes, Norm Lane, David Maynard, Jerry Morrison, Steve Shaw, and Dan Silva, Electronic Arts (2755 Campus Drive, San Mateo, CA 94403; 415-571-7171). Requires an Apple IIe. $50.

**Apple Dot Matrix Printer Utilities.** By Bill and Tom Vilberg. Apple has a penchant for putting capabilities into their hardware that they don't support in their software. Witness Apple's refusal to create software utilizing double hi-res graphics. In school this kind of behavior is called not living up to your potential. At Apple it's called building a cottage industry.

Apple came tantalizingly close to supporting a feature of the Apple Dot Matrix Printer that would allow printing in alternate character sets. Then they apparently backed off. Apple went as far as including "download characters" as a dummy menu item in their *DMP Exerciser*, but selecting it got you the message, "Function not available in this version." So it was left up to third-party developers.

The Vilbergs are not the first to address the need for alternate character sets. A few months ago, we reviewed a program allowing you to edit fonts and download them into the printer. That program had some serious limitations. It allowed a mere eight-by-eight character set, and it had no provisions for characters nine dots high or sixteen dots wide, both of which are within the DMP's capabilities. The paltry four alternate fonts that it came with were all considerably less readable than the standard set. We remarked at the time that someone would do it right eventually, and now someone finally has.

*Apple Dot Matrix Printer Utilities* does what Apple should have done for the DMP a year ago. It's really three programs tied together from a central menu. One lets you edit characters, one lets you set up the printer to your specifications, and the third lets you convert hi-res fonts from other programs for printing on the DMP. The menu system is simple and the command conventions are fairly intuitive. They're also spelled out pretty clearly for those who prefer not to rely on their intuition in such matters.

The character editor is a good one. It can edit proportional and fixed-width fonts up to nine dots high by sixteen dots wide. Using a text display rather than hi-res graphics, it magnifies the character to be worked on to about a quarter of the size of the screen, using the rest of the available space to show the standard character and ASCII value of the character being worked on, the type and width of the character set, and the commands available.

The minimum such an editor should do is allow you to move the cursor around and toggle dots on and off. This program does that much easily, using nearly any cursor movement system that you might feel comfortable with: the I-J-K-M diamond, the arrows and the A and Z keys, or the four arrows on the Apple IIe. Toggling the dots on and off is done with the space bar.

The program's editor also allows you to print a letter while you're editing it. After all, sometimes what it looks like on-screen doesn't tell you exactly what it will look like on paper. The editor also allows you to copy from one character to another within a font or from one font to another. The latter is accomplished by saving a single character to disk and then loading it into another font. Finally, you can shift a character around within the editing area.

The printer setup program is an essential part of the system, and it has obviously gotten as much thought as the editor. Sixteen-dot-wide fonts are most useful when printed in proportional mode. In this mode they are compressed to the width of normal characters, effectively increasing the resolution of the printer. Three typefaces on the disk take advantage of this greater resolution. One is a somewhat clearer version of the standard DMP face, one is an impressive-looking italic version of that face, and the third set looks remarkably like a typewriter typeface. It's what you might call "near letter quality."

The printer setup program allows you to tell the printer to use any of these typefaces or the numerous eight-dot fonts on the disk. It lets you set character width, line spacing, page length, and font; and it downloads those settings to the printer. When you exit the program, your printer will be set to work in the selected format with your word processor or whatever program you like. The data is in the printer so it can't be erased by booting another disk. The setup program also allows you to save and reload frequently used printer settings.

The font-conversion program is a nice extra. Several programs are available that allow you to put text on the hi-res screen, and these programs usually come with a small library of fonts. Two popular programs of this kind are *DOS Toolkit* and *Higher Text II*. With the font converter, you can create DMP fonts from hi-res fonts that are compatible with either of these systems, although only the small font size from *Higher Text II* is allowed.

Actually, it isn't so bad that Apple leaves gaps in their systems' capabilities. It gives talented programmers like the Vilbergs a chance to break into the software business. There are quite a few people in this industry who are making money off of Apple without ever seeing a check from Cupertino. DD

*Apple Dot Matrix Printer Utilities*, by Bill and Tom Vilberg, Vilberg Brothers Computing (Box 72, Mount Horeb, WI 53572; 608-274-6433). $50. Requires Apple Dot Matrix Printer with Apple Parallel Interface Card or Grappler+.

**Early Games Matchmaker**. By Jane Adolf and Charles Boody. *Matchmaker* is designed to help children aged two through six develop matching, grouping, and discrimination skills. No knowledge of the keyboard is required to use the program, as the correct response in any of the games is "hit any key."

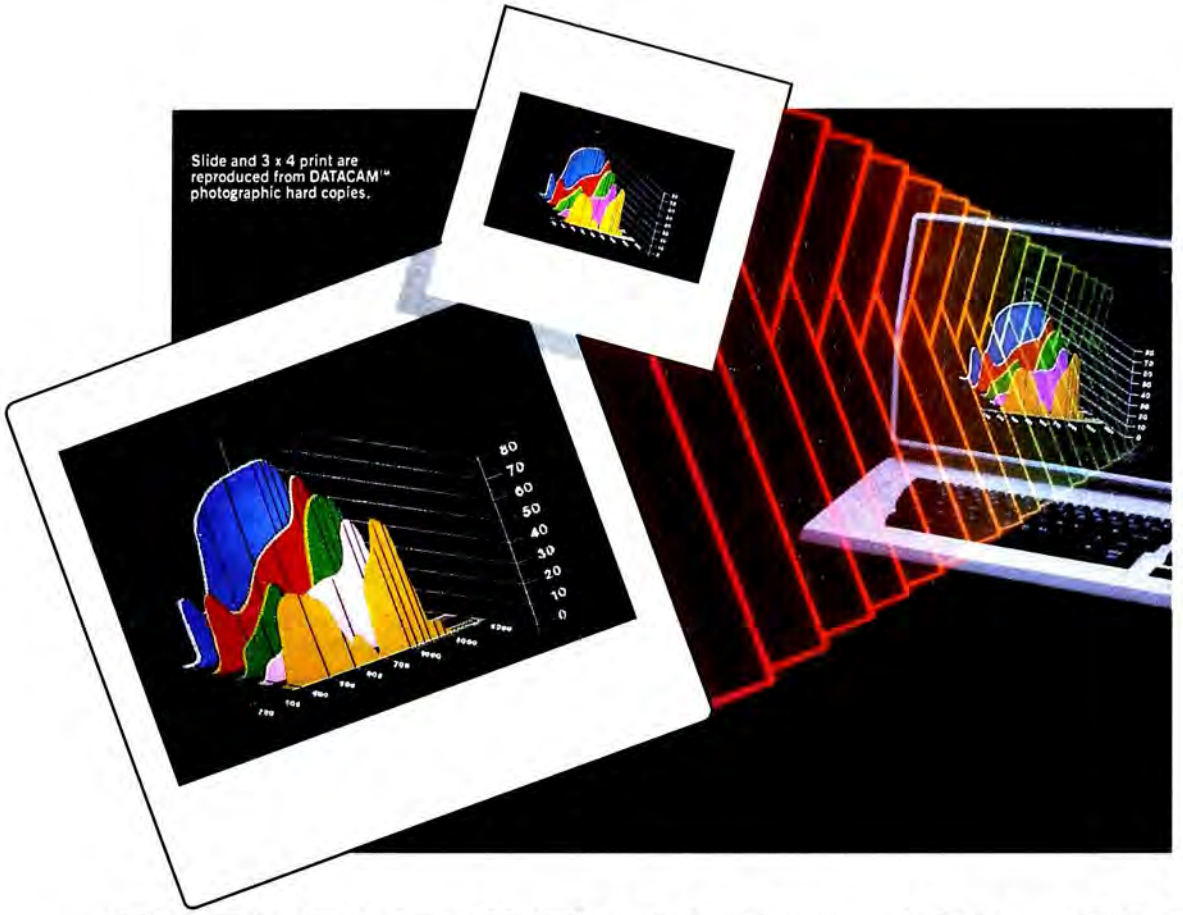
The program uses a picture menu to enable a parent or child to select a game. The options are "color-matching," "shape-matching," "group sizes," and "group shapes." A sample of each game's play is shown in the picture menu and the child can press any key to select a game. A word menu is also available by pressing control–W.

Playing *Matchmaker* is simple enough. Objects are compared on-screen and the child must press a key when two similar objects are placed next to one another. For example, in the color-matching game, a blue square might be displayed at the top of the screen along with a yellow square and a second blue square at the lower half of the screen. The upper blue square is moved next to the yellow square and displayed there for a few seconds, then moved next to the blue square. If the child presses a key while the blue square is next to the yellow square, the computer buzzes; if the child presses a key while the blue squares appear together, the response is "correct," and a quick burst of music follows. Wrong answers result in another chance and eventually in the problem being displayed differently. The shape- and size-matching games also use this format.

Although kids will have little difficulty playing *Matchmaker* once a game is under way, this is not strictly boot-and-go software. An adult needs to stay with the child most of the time to explain the rules, alter the playing speed, or change games or difficulty levels. This level switching is necessary because despite *Matchmaker*'s liberal and entertaining use of sound and color graphics, kids can get bored with it, especially those jaded by computer or video game experience. *Matchmaker* was tested on a bright four-year-old who, despite the fact that she enjoyed the game and even talked to it, kept asking when *Pac-Man* was coming on. Her flagging attention made it necessary to change the difficulty level or select a new game approximately every three minutes, a situation that also occurred with a less video-game-conscious five-year-old.

This is not to imply that the children's restlessness is the fault of *Matchmaker* or its designers. The learning techniques employed could hardly be improved upon—from a structural or programming standpoint. It's just that the attention spans of children in the two-to-six age group are limited, and prior exposure to games such as *Pac-Man* are a distracting factor.

So, *Matchmaker* does serve its purpose. The size, shape, and color discrimination it teaches is a very good preparation for reading. Just don't count on sitting the child down in front of the computer and leaving for a few hours.




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The program's documentation is adequate, although you will have to spend some minutes with it in order to learn how to operate the program. Also, the documentation fails to mention that you must wait for a game to begin before returning to the picture menu or changing the difficulty level or playing speed.

Yet, despite the documentation problems and the potential for user boredom, *Early Games Matchmaker* is probably worthwhile for those desiring to give their children a head start in reading. MAB

*Early Games Matchmaker*, by Jane Adolf and Charles Boody, Counterpoint Software (4005 West Sixty-fifth Street, Suite 218, Minneapolis, MN 55435; 612-926-7888). $29.95.

**Fax.** By Mike Craven and Vic Tolomei. It's not really a trivia game, nor is it a purely educational one. *Fax* is just fun with questions of all types.

In the form of a multiple-choice test, *Fax* tests to see how much players know, how fast they can press the right key, and how good they are at taking multiple-choice tests. The game is designed for one or two players.

Three skill levels (novice, expert, genius) and four question categories (entertainment, sports, history, and grab bag) make the game a challenge for everybody. But the challenge goes beyond just knowledge.

When a question appears on the screen, players are given a few seconds to read it before the choice of answers is presented. Once the answers appear, a clock ticks down the time available in which to pick the correct answer; the faster you pick the answer, the more points you get. Throughout the game, a game clock lets you know how much time is left in the game.

To be good at this game, you need some game show strategies. If you have absolutely no idea what the answer to the question is, pressing any key stops the game clock, and there's no penalty for wrong answers. Test-taking strategies also help. Once in a while, *Fax* will offer answers that look like they might be correct, only to award a dunce cap if you fall for the trick.

Speaking of tricks, *Fax* also injects an occasional riddle, rather than a question of knowledge, apparently to test players' alertness (''A metronome is a gnome that lives in the city.'' Get it? Ha ha ha ha). The game's authors probably thought this would serve to entertain, but all it does is ruin one's concentration. *Fax* could do without the riddles.

Epyx doesn't say what source of information was used for the game, and some of the answers aren't entirely correct. The key to doing well in *Fax* is to try to predict what the authors thought the correct answer was.

For competition or solitary play, *Fax* is very challenging and somewhat addicting, though its attempts to be entertaining (animated faces and plinky-plunky tunes) feel as out of place as an ''I Love New York'' bumper sticker on a fire engine. The faces and tunes might be nice for youngsters, but older players would do well to find out where to unplug the Apple's speaker.

On a scale of *Let's Make a Deal* to *Jeopardy*, *Fax* rates about a *Hollywood Squares*. MTV

*Fax*, by Mike Craven and Vic Tolomei, Epyx/Automated Simulations (1043 Kiel Court, Sunnyvale, CA 94089; 408-745-0700). $29.95.

**Wizard of Words.** By Anita Neely and Tim Aaronson. Education has come a long way since the days of the little red schoolhouse. Quill pens and slide rules have been replaced by Bic Bananas, pocket calculators, and, of course, computers.

But can computers, with their unquestionable educative potential, take the drudgery out of learning and help to stem the erosion pervading our educational system? As any computer hacker will tell you, it's all in the software.

*Wizard of Words* is a perfect example of how software can be both educational and enjoyable. Consisting of five word games—Jester's Jumble, Castle Capers, Dragon's Spell, Word Spinning, and Herald's Hark—*Wizard of Words* helps youngsters (and oldsters) expand their knowledge of spelling and dictionary research in an enjoyable game format.

Like most of the five learning games provided in *Wizard*, Jester's Jumble is a classy variation on an old theme: anagrams.

A nicely animated jester juggles balls and tosses them up in the air, and they become an incomprehensible jumble of letters. The player is then given a chance to guess the correct word that the unscrambled letters would form.

The first time a player guesses wrong, the letters rescramble. This time, however, the first letter is placed in the correct sequence. Each error thereafter causes additional clues until either the word is spelled out or the anagram is deciphered. Then the jester smiles, juggles the letters ''wow,'' and a musical tune plays.

The second game, Castle Capers, is a variation of hangman, with banners atop the castle being lowered each time a letter is correctly guessed. Each wrong answer lowers the castle gate a little until it closes. Guessing the correct word will summon the animated court musician to play a triumphant refrain.

Dragon's Spell has players create words out of larger words for points. The friendly dragon first reads his challenge word out of a book, turning pages and moving his eyes, then he keeps score of the words the player creates.

As in other *Wizard* games, if the dragon doesn't recognize a particular word used, he asks whether it is in the player's dictionary. If so, the player still receives points. The dragon also wags his tail and breathes fire when the player is finished with the word.

The fourth game, Word Spinning, is played somewhat like Scrabble. A grid is laid out and the player is challenged to fill in the boxes using more letters than the opponent. Multiple points are given for words.

The final game, Herald's Hark, is a mystery word game. Two heralds are thinking of a word using the number of letters the player selects. The player's guesses are placed on the screen, along with the number of corresponding letters used by the mystery word.

Besides the five word games, *Wizard of Words* comes with a utility for adding a player's own words to the game's vocabulary.

While *Wizard* sadly lacks a provision for word definitions or applications, its challenging and entertaining format will, more than likely, drive even the most literarily ambivalent players to the dictionary to help them beat the *Wizard*.

*Wizard of Words* can accommodate one or two players, has a built-in vocabulary of over twenty thousand words, has eight skill levels, and some very colorful animation. MAS

*Wizard of Words*, by Anita Neely and Tim Aaronson, Computer-Advanced Ideas (1442A Walnut Street, Suite 341, Berkeley, CA 94709; 415-526-9100). $39.95.

**How To Use Apple Writer**. By Jane Leder and Karen Zorn. *How To Use Apple Writer* is a three-part audiocassette course designed for the user who has no prior knowledge of word processing or computers. The course makes learning to use *Apple Writer* very simple with its step-by-step system and user's guide.

Requirements for the tutorial are an Apple with at least 48K, an *Apple Writer* program, and an audiocassette player.

Although the course is precise, Apple II Plus and Apple III users may find it inconvenient when they are required to flip the tape to receive instructions on various commands.

The voice of the instructor is clear, however, and he is quite specific in giving instructions. That the program exists on a cassette is another plus. You may stop your tape and rewind it at any time when you don't understand certain instructions.

The three cassettes contained in the tutorial take a total of approximately six hours to listen to. But the glory of the tutorial is that it is self-paced: If the user is interested only in a specific part of the tapes, he can easily find it and follow through the instructions.

The novice *Apple Writer* user learns the basics of editing, saving, loading, deleting, and inserting text. Other helpful information gleaned by flipping the tape is the utilization of the K-toggle command.

In the Apple II, unlike the Apple IIe and III, the caps-lock mode isn't acquired by simply holding down the shift key. Instead, control-K must be pressed in order for the user to get all upper-case letters.

Learning to move paragraphs about with *Apple Writer* seems almost magical. The user simply moves the cursor to the end of the paragraph to be deleted, and with a press of control-X it disappears. To place the paragraph in another position within the text, you move the cursor to the point of which the paragraph is to be inserted, change the direction arrow to point to the right, and type control-X.

Another helpful feature this program delineates for the novice is the CP command. This allows several files to be printed as one document. When the Print/NP (new print) command stops, the user types P/CP (continue print) and the next file to be printed will start where the last file stopped.

The user's guide included with *How To Use Apple Writer* could prove quite handy when used with *Apple Writer*'s operating manual. The key points are outlined briefly for review and indexed for rapid access to important terms, commands, and procedures. The guide functions as a preprepared notepad.

Other beneficial options and features of *How To Use Apple Writer* are a quiz on side two of the cassette and a summation of what has been discussed at the end of each user's guide section.

In summary, *How To Use Apple Writer* is an excellent and inexpensive means of learning or teaching word processing on the Apple. LL

*How To Use Apple Writer*, by Jane Leder and Karen Zorn, FlipTrack Learning Systems (999 Main Street, Suite 200, Glen Ellyn, IL 60137; 312-790-1117). $57.

**The Lion's Share.** By Robert Aaron, Robb Murray, Lawrence Rublin, Reena Yudkowsky, and Mike Levine. This is the latest release in Davka Corporation's series of hi-res adventures with biblical themes. The game is set in ancient Babylonia, where the player, as a spy in the employ of King Cyrus of Persia, is ordered to cross the Babylonian plains, enter the city of Babylon, and, at an opportune moment, signal the Persian army to attack.

The challenge of the game is to collect mundane items and to use them to bribe your way past key geographic points. A variation to bribery is riddle-answering. The riddles are based on Bible scripture, and, contrary to Davka's emphatic denial, you would be hard pressed to guess the answers without minimal exposure to the Old Testament's Book of Daniel.

The program accepts player commands in a two-word, verb-object format, and unlike many similar games, the spelling of the entire word is recognized rather than just the first three or four letters. Be prepared to look up the spelling of biblical names if that isn't one of your skills.

There are many points to quarrel with in *The Lion's Share*. Turn west at a peaceful crossroad and you're executed on the spot. Enter a new area without a requisite item and the game's over. Fortunately, the designers included a save feature that can be used at any time. If you don't want to spend many boring hours retracing your steps, save the game often.

*The Lion's Share* is a game for players of beginning-to-intermediate skill level. If you've never been exposed to hi-res adventuring, it's a good training ground, but experienced players may find the illustrations and sound disappointing and the action predictable.

The game has all of the technical features of the best hi-res adventures, including a response to player commands that is better than most; however, for a game "that took three thousand years to create" not enough time was devoted to plot development and artwork. WCP

*The Lion's Share*, by Robert Aaron, Robb Murray, Lawrence Rublin, Reena Yudkowsky, and Mike Levine, Davka Corporation (845 North Michigan Avenue, Suite 843, Chicago, IL 606ll; 800-621-8227). $34.95.

**Picnic Paranoia**. By Russ Siegle and Tony Dean. Ah, yes. The old ants ruin the picnic routine. If it never happened to you, it's probably because it only happened once ever but was funny enough to become a stock comedic situation. This offering is the first to fully translate that stock situation to the home arcade. It makes for a pretty stock game, and the results, while enjoyable, aren't exactly hilarious.

You're George, the classic *schlemiel*, stuck in an unwinnable war of attrition, with ants intent on carrying off your food. Killing the ants might sound easy. The only problem is that until you reach five thousand points, your only weapon is a flimsy swatter. Stinging wasps and web-spinning spiders only make your task that much harder.

The screen consists of four picnic tables that contain your food. The ants can penetrate the tables, but you cannot—a strange situation that causes you to scramble back and forth across the screen to save your feast. The ants are well organized, and once they spot your food they will continue to attack until they have successfully moved it off-screen. The smaller the item, the fewer ants it takes to carry it away. If you kill one ant, the light-fingered procession stops until another pest takes its place, giving you a chance to take the food back to the table.

But you can't take a breather. Although they are not interested in your food, spiders and wasps make themselves a constant menace. Hazardous to touch and hard to swat, a bite from either causes you to become paralyzed for three to five seconds, depending on which bites you. Your immobilization allows the ants to carry away the food.

The player is awarded points for each of the surviving foods upon completing each two-minute round. Failure to have at least one dainty morsel remaining tablebound at the end of a round causes the game to end.

Despite its poor graphics, *Picnic Paranoia* is frustrating and fun. George's swatting motions provide a visceral, sweaty satisfaction unavailable in the more aloof shoot-'em-ups. Unfortunately, the player spends the entire game losing ground. That's depressing. And, in a perverse quirk, the player is given bug spray at the five-thousand-point level, making the game easier there, instead of at the tough beginning when this aid would be more appreciated.

Yet, this is a decent little game—no picnic, but strangely satisfying. After all, you *can* teach a new medium old tricks. PT

*Picnic Paranoia*, by Russ Siegle and Tony Dean, Synapse Software (5221 Central Avenue, Suite 200, Richmond, CA 98404; 415-527-7751). $34.95.

**Speed Reading.** By Peter Coad. This program is excellent, but it also costs almost two hundred dollars, the price of a similarly comprehensive Evelyn Wood course. If that turns you off, don't read further. Designed for the computer novice, *Speed Reading* is a superb tool for those serious about increasing reading skills. The program aims to increase comprehension and retention as well as reading speed. And though it is expensive, *Speed Reading* does offer an advantage not available in a "live" course—you can progress at your own rate, not the instructor's.

The package includes a manual and three disks: Maintenance, Library, and Lessons. The Library disk contains the actual reading material, the Lessons disk contains instructions, a pretest, and subsequent reading lessons, and the Maintenance disk prints reports and provides space for you to insert your own reading material.

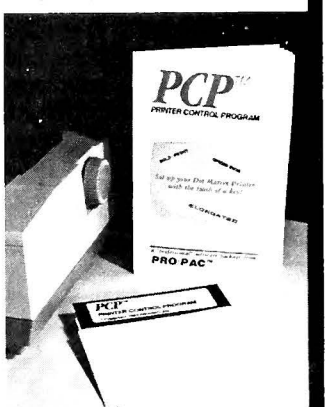
The only disadvantage to the way in which you are supposed to use the disks is that you can't use the disks the program gives you; you are required to make copies of the masters and use them. This is a nuisance because the user is required to have extra disks on hand and because the procedures necessary to ready the disk may confuse the beginner. In addition, if you make a copy of the Maintenance disk, the computer will perform the entire copying process and tell you the copy is good—even if

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the blank disk used is damaged and the copying process unsuccessful.

Fortunately, once the disks are prepared, learning how to read faster is a simple process, actually so easy that it becomes fun. You don't have to be experienced with computers to use this program. No control characters are necessary, and the available options are always displayed on-screen. Beginners will be relieved to find basic computer information contained in the manual, such as a glossary of computer terms and an explanation of hardware peripherals. One word of caution: It is best to use the manual in conjunction with the program. If you omit reading the manual and use only the disks, the program loses some of its meaning, leaving you in a situation in which you know what to do but not why you're doing it.

The user progresses through *Speed Reading*'s eight lessons in a delightfully logical sequence. Beginning with eye fixation, you learn to read a group of words together rather than one word at a time. The number of words on-screen increases at the pace set by the user, and then the total number of words and lines displayed on the screen at one time also increases. By pressing a key, you can also increase the rate at which the words appear, forcing you to read faster. When you are completely engrossed in efforts to read quickly, your retention is better because of your deep concentration.

*Speed Reading* provides tests on disk and on paper, and if you choose to take the computerized tests the program will save your score. Information on up to twenty readers and as many as two hundred different reading lessons can be maintained on one disk. There is even password protection so an individual's score can remain confidential.

When you finish all your lessons, you can graduate to printed material or add your own text to the Library disk. The program provides complete instructions on how to do this.

If you can swallow the price, *Speed Reading* is a delightful change of pace from the drudgery of sifting through unreadable manuals and difficult programs. It can also help beginners overcome their fear of computers because it makes computing fun. TM

*Speed Reading*, by Peter Coad, BPI Systems (3423 Guadalupe, Austin, TX 78705; 512-454-2801). $195.


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**Computer Spanish for the Traveler.** By Dr. Janice Davidson and Richard Eckert.

*Computer Spanish for the Traveler* is a very comprehensive package, containing the program on disk, four cassette tapes, and a sixty-nine-page manual with instructions and a word and phrase glossary. The basic mode of study is to view words and phrases as they appear on the computer monitor, accompanied by their proper pronunciations from the cassette tapes. After the Spanish word is displayed, its English equivalent is shown beneath it for the amount of time the user selected. A group of words can be reviewed any number of times, and at any time you can take a multiple-choice test on translating words from English to Spanish or vice versa.

*Computer Spanish for the Traveler* contains six basic instructional units covering: "Your Arrival," "Shopping for Souvenirs," "Seeing the Sights," "Touring the Country," "Getting Acquainted," and "Dining Out." Each of the last six units contains forty words, fifteen sentences, and 120 common expressions. The program is menu-driven and the main menu offers a choice between the seven units of study, as well as a quit option. Once you have selected a unit, another menu appears from which you can choose words dealing with people, places, or things, or decide to review sentences or phrases. When you finish studying a group of words or a unit you can take a quiz, which the program grades.

The overall effect of this program is that of a pleasant learning experience enhanced by the program's comments and occasional bars of Spanish tunes. Useful for anyone planning on traveling in a Spanish-speaking country, this program can also serve as a study aid for academics. A high school Spanish teacher shown *Computer Spanish for the Traveler* was impressed enough with it to order a copy for her classes. A student in the seventh grade commented that the program was more fun than textbooks.

The program's only negative feature is the fact that if you change the duration of the display from the six-second standard, you'll lose the tape synchronization. Other than that, *Computer Spanish for the Traveler* is an excellent learning tool for the beginner or for anyone needing a refresher in Espanol. And it's actually a bargain for the price. MAB

*Computer Spanish for the Traveler*, by Dr. Janice Davidson and Richard Eckert, Southwestern Data Systems (10761 Woodside Avenue, Suite E, Santee, CA 92071; 619-562-3670). $59.95.

**ShortCuts.** By Kelly Puckett. This is a programmer's utility program—a tool that makes it easier for you to write in Applesoft. It makes Applesoft more powerful by adding several new commands and capabilities. You get an intelligent input/output processor, an automatic sorting routine (with tags, if needed), and new ways to control program logic, data formatting, and other activities. Here's what "intelligent input processing" can do. It bypasses all the normal Applesoft limitations on input characters (commas, quotation marks, and so on): You can specify which characters constitute legal input, and the program will accept those and only those characters. You can also specify various kinds of error checking and the program will perform them automatically; you can even provide the message that will be displayed in response to bad input.

If input is rejected, it may be left on-screen (so that part of it can be copied with the right arrow key), or it may be erased for a fresh start—your choice. The program can either accept or reject null inputs, as you select. If the escape key or a control-key combination is entered, it can cause an immediate branch in the program—if you set it up that way.

Those are only a few of the input options available (we haven't even mentioned formatting or echoing the input...). The system also offers a wide range of output options covering format, position on the screen, decimal placement, and rounding off numbers.

There is also a built-in sorting routine which can operate on any type of array: real, integer, or string. It can also sort a second array, called the tag array, at the same time in the same way. This array can be used to store the original presorted sequence of the main array so the tags can tell you where the sorted numbers came from. The algorithm used is the Shell sort; it can sort a single array of three hundred random real numbers in about 2.2 seconds (2.4 seconds with tags).

With a program as complex and powerful as this, there is always a danger that it will be hard to use. When a program offers this many options it needs a well-designed control language or command set; otherwise, the system's so awkward to use that you don't bother with it.

*ShortCuts* does not have this problem. It has a really elegant command syntax—and for a bonus, a well-written manual to describe it. The




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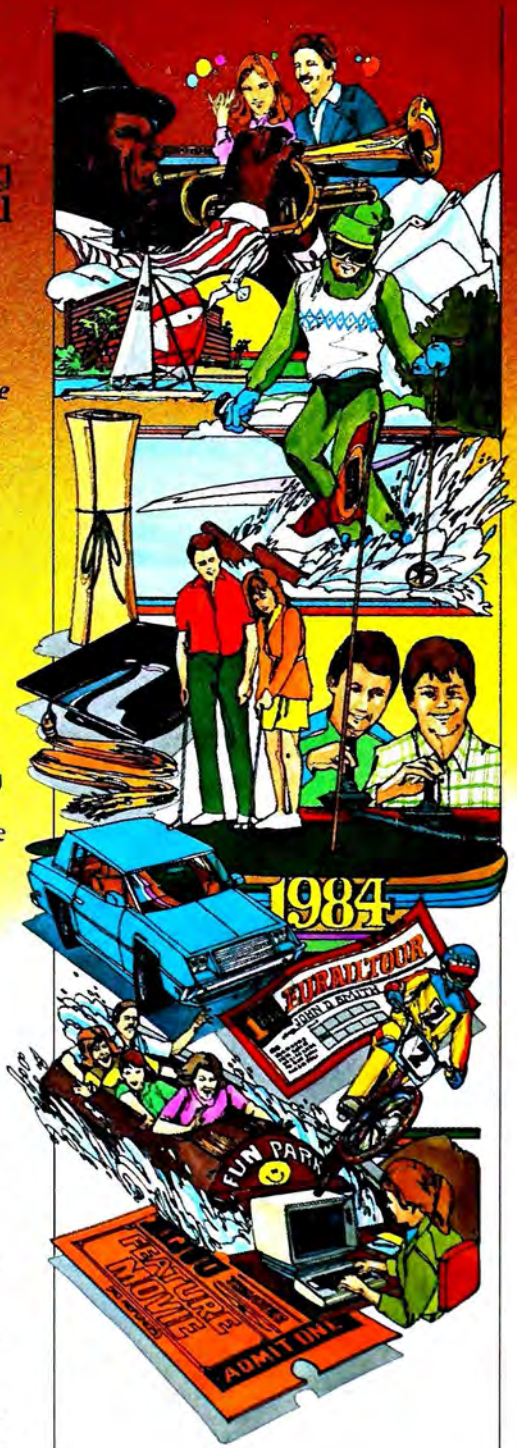
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system is not simple, and the manual is not small; but everything is explained clearly, examples are given, and any limitations are pointed out. This is one of the best manuals we've seen; a maximum of information and minimum of noise.

The program disk includes three demonstration programs that show various features of *ShortCuts*. These have an interesting feature: The programs are listable so you can see how they work; and each is presented in two versions, one with the *ShortCuts* commands and one without them. You can compare corresponding sections of the two versions and see exactly how the commands are used and what effects they have. You'll find these models helpful when you start putting *ShortCuts* commands into your own program.

Technical notes: The program uses the familiar ampersand character as a call. However, it can safely coexist with a number of other programming utilities, such as *Global Program Line Editor* and *Es-cape*, even if they also use ampersand commands. When *ShortCuts* is running, you can reach through it to a previously loaded ampersand program with the command "&&." And another thing: If you have an assembly language program in the block of memory starting at $300, *ShortCuts* will leave it alone; but if that area is vacant when *ShortCuts* is loaded, it will put a couple of convenience routines there.

The program is supplied in a number of different versions. There is a developmental form, which lives up next to himem while you are writing your program (it loads itself and runs automatically whenever your program is run). Each of these is available in a complete version, with sorting and input/output processing; and there are also standalone sorting-only and I/O-only versions, to save memory space when the full capability is not needed. All of these versions are included on the disk.

We have only mentioned a few of the capabilities of this program for reasons of space: After all, the instruction manual is fifty pages long and there's not a wasted word in it. If you write programs in Applesoft, you're likely to find some useful stuff here. Next time you're in your favorite computer store, take a look at the *ShortCuts* manual, but be careful: You may have a hard time putting it down. JR

*ShortCuts*, by Kelly Puckett, Penguin Software (Box 311, Geneva, IL 60134; 312-232-1984). $49.95.

**Electronic Playground**. By Jeff Tunnell. Straightforward and competent. Those are words that well describe this three-in-one educational offering, with its unassuming cardboard packaging, succinct instructions, and picture menu for the nontyping preliterati.

Heidi's Program, the initial option named for the author's daughter, is almost absurdly simple but the most fun of the three. Pressing any key produces randomly generated sounds and bars of varying size in lores colors. As the rectangles overlap, they form attractive, asymmetric patterns.

Matchbox is the standard pick-from-four-other-things-the-one-that-matches-the-one-given task. It can be played to match upper-case to lower-case letters, numerals to the number of objects displayed, or shapes to their mates. (In the shapes section, the level of difficulty can be adjusted by a supervising adult.) To choose an answer, a player moves an animated character next to it; this creature is cute but slow. Incorrect selections cause the offending example to disappear or switch position with the other choices; correct answers bring on approving high-pitched trills and smiling faces.

The third component, a drawing board program called Magic Blackboard, has got to be one of the easiest-to-use offerings in a difficult-to-operate genre. You can draw, erase, or fill in shapes with hi-res colors by using simple and logical joystick motions and very few keypresses. And pictures can be saved to disk. Labels are included.

A joystick is used for everything in *Electronic Playground* except returning to menus, toggling the sound on or off, and for a few commands in the drawing program.

Given the 1984 software market's high prices for even relatively simple programs, this package is a good deal, one of the best for young children since the first *Early Games*. JP

*Electronic Playground*, by Jeff Tunnell, Software Entertainment Company (537 Willamette Street, Eugene, OR 97401; 503-342-3495). $24.95.

**Edu-Cave**. By Dave Zunker. "You're at the foothills of Mount Mindor on the winding road to the entrance of Kurzen Cave. Beware the Blitzers!" That challenging prologue suggests an arcade or adventure game, yet beyond the intriguing preface lies educational software that incorporates arcade elements.

*Edu-Cave* consists of a two-disk set. Disk one contains preprogrammed questions that the adventurer must answer while manuevering along a twisting road toward the cave. The I-J-K-M diamond controls movement while "S" halts your character, a function essential in waiting out the rhythmic assaults of the Blitzers and the Big Splatzer.

The first disk covers arithmetic, geography, and spelling. The player may select the topic as well as the difficulty level of the questions, the higher levels of which are challenging even to adults.

As the game progresses, a character called the Mystic Wizard of Lore occasionally interrupts to question you. If you answer his queries correctly, you will progress toward the cave, an incorrect answer moves you backward.

Once through one cave, there are many more to traverse, the exact number being determined by the level of play. Each cave is inhabited by enemies and the ever-questioning wizard, so to reach the treasure a player must use the "S" key judiciously and answer questions correctly.

*Edu-Cave*'s second disk contains the program's most powerful feature, twenty fill-in-the-blank, true/false, or multiple-choice quizzes that parents or teachers can customize to fulfill a child's needs. The quizzes may have as many as fifty questions.

Unfortunately, *Edu-Cave*'s hi-res graphics are rather rudimentary, and moving your on-screen character can be difficult. Once you press a key, your character continues to move in the same direction until you press another key to change course. And because the road is narrow, some people, especially small children, could become easily frustrated, defeating the educational purpose of the game. The awkward key manipulation can seriously detract from an otherwise good program for those not used to playing arcade games via keyboard.

Finally, when you conquer all obstacles, your score is revealed and the last cavern blazes with jewels. But as the on-screen prompt says, "The real treasure is learning." HGL

*Edu-Cave*, by Dave Zunker, Micro Program Designs (5440 Crestline Road, Wilmington, DE 19808; 302-738-3798). $29.50. ■


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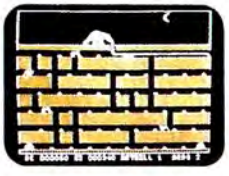


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# The Schoolhouse Apple

## by Jock Root

Quizzes and exams are not the most exciting part of teaching—but most teachers would agree that they're a necessary part. An exam provides feedback information about what each student has learned. A good teacher can use this information to modify teaching strategies, speeding up or slowing down as indicated, and providing extra help for the ones who need it.

The trouble is, exams are a real drag for all concerned: what you might call a "highly aversive behavior cluster, in all its aspects." First you have to think up the questions, put them down on paper, and have enough copies made; then you have to watch the students take the exam; finally, you have to score it and analyze the results. You may be able to delegate most of the work, if you're lucky; but that doesn't reduce the aggravation, it just spreads it around.

We have a solution to this dreadful dilemma, and the solution is Apple software. We are going to look at a couple of "exam-writing" programs, which can not only write an exam but also administer it to the students, score it, and analyze the scores. And there's more: One of these programs provides character sets for sixteen different foreign languages, and the other provides for illustrations and diagrams. In fact, you can even use these programs to write self-teaching texts (programmed instructions, or PI), if you know the techniques.

The two programs we have on hand offer several interesting contrasts: They both have the same purpose, but they approach it in very different ways. One is like the Cadillac of the fifties: smooth and elegant and mostly automatic, the ultimate in user-friendly. . . but rather expensive. The other is like a Model-A Ford: very advanced in some ways (for its time), and quite reasonable in price; but you have to give it a good deal of attention, in order to get the best performance out of it.

**In the Beginning. . . .** The "Cadillac" approach is represented by *The Great Creator*, written and published by an entity known only as The Professor. The packaging is in some ways excessively fancy (we question whether a saddle-stitched leatherette binder, with solid brass corners, will help you write a better exam); but in another sense, the packaging on this program is among the best ever.

In its most general sense, *packaging* refers to all the accessories and other goodies that come with the thing you bought; and with *The Great Creator* that adds up to an impressive array. This is what we would call a "fully professional" set of accessories for such a program. You get a master disk, which contains the main program and its utilities; and you get a backup copy of the master disk (a reassuring safeguard against disaster—thank you, Professor!). You get a "model" disk for each of the three types of exams the system can generate; these disks are copyable, and you may copy them as many times as you want. And you get a comprehensive demonstration disk with a variety of examples.

The instruction manual for this system is very good indeed—The Professor has done his or her homework well. The manual guides you through the process of creating and editing an exam, step by step, then takes you through various related activities, such as reviewing the scores or making a hard-copy printout. Finally it has a set of appendixes that cover technicalities like copying disks and controlling a printer, and a suggested procedure for giving the exam to students. In other words, the manual answers just about any question that might arise.

In addition to the manual, you get a pad of questionnaire worksheets—blank forms on which to lay out the questions of your quiz—to be sure you have covered all the necessary points before putting the exam on disk. These worksheets probably won't be necessary once you have learned to use the editing capabilities of the system; but they are very helpful in the early stages, as a guide for organizing material.

The program creates question disks of three different types (more on that in a moment). In order to take an exam from such a disk, the student has only to put the disk in the drive and turn on the system, and then follow the prompts given by the program.

First, the program asks for the student's name: After the session, it will record the score under this name. Then it asks the student to select a series of questions (you can put three different series, with up to thirty in each, on one disk) and a starting point (it doesn't have to be question number one).

Then the program presents the questions, one after another; we'll describe that in detail in a moment. The student can work through the whole series in one session, or stop in the middle: The program will record scores for only those questions that were presented. Finally the program will display the total score and ask the student to select another series.

Whenever a student takes a quiz from a question disk, his name and score will be recorded on it; but that data will not be accessible to other students who use the disk. In order to read those records, you need one of the programs from the master disk.

**Question Formats.** The program can present a question series in three different ways: two different types of multiple-choice (with up to five choices), and a fill-in-the-blank form. In each case, the question itself (the prompt or stimulus that the student must respond to) can be up to 450 characters long—about twelve lines of text on the Apple's forty-character-wide text screen. *The Great Creator* provides its own character sets, which include lower-case characters, so you can write exams in mixed upper and lower case, even if your Apple is a II or II Plus without a lower-case adapter.

In the multiple-choice formats, the possible answers are listed below the question. Each answer is numbered, and the student is asked to input the number of the correct one. The text for each choice can be up to 255 characters long, but there is an overall restriction on size: The question and all the choices must fit on the screen together.

The simplest of the three formats is called the quiz format; this is a simple multiple-choice test. The program proceeds as described above, and waits for the student to enter a number. On receiving a number, the program displays the next question without comment on the previous question and continues to the end of the series of questions. This is a diagnostic test—a measure of what the student has learned; it's the "dues-paying" function of *The Great Creator*.

There is another format in the system, more interesting and more powerful than the quiz format; but somehow The Professor hasn't given it a name. The system includes three model disks, one for each format; they are named Data Disk, Quiz Disk, and Fill-in-the-Blank Disk. Thus we will call this the data format.

In this mode, the student can quit at any time and finish later. This mode offers a variety of options and freedom from pressure, making a good environment for learning. However, *The Great Creator* is not really designed as a teaching instrument; it is not flexible enough in its responses to a student's input (we'll explain that later).

**Fill 'Er Up.** The Fill-in-the-Blank format is about what you would expect, with one small improvement. The program presents the question but instead of choosing one of five answers the student must generate of his own. Again, confirmation messages and explanations signal whether the answer was right or wrong. The unexpected improvement is that the program can store three different wrong-answer responses: one

Unfortunately, the program has no provision for recognizing answers that are almost right. The student's input must be an exact match to the expected input, or it counts as wrong.

*The Great Creator* has one feature that makes it ideal for foreign-language work. As we mentioned earlier, the program has its own lower-case character set; it also provides a variety of special characters and

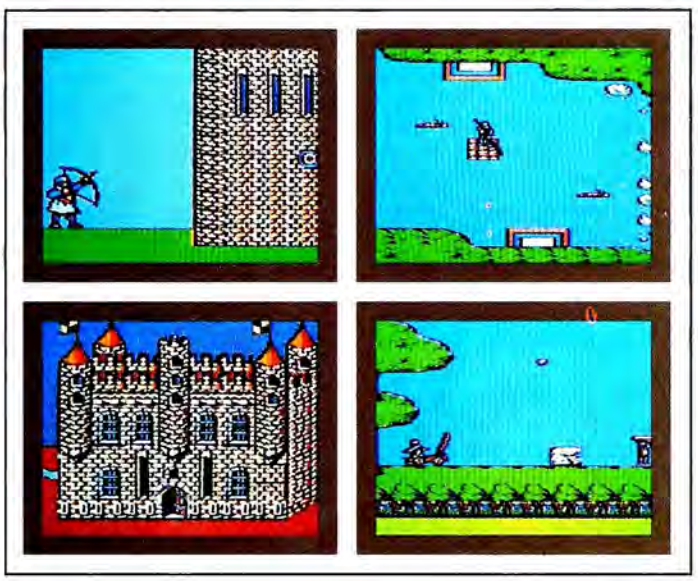

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symbols for various languages. Sixteen different languages are covered, from the usual French and Spanish to the less familiar Hawaiian and Portuguese. In addition, The Professor offers a separate disk with symbols for chemistry, physics, and various fields of math.

All in all, *The Great Creator* is an excellent instrument for preparing and presenting multiple-choice diagnostic exams. It's easy to use by teacher and student and has an unusually good tutorial manual. The program also has two other modes of operation, but these are less successful; the fill-in-the-blank mode is limited by its need for an exact match, and the data mode by its limited response capability.

**Less Bread and More Meat.** The "Model-A Ford" approach to administering exams is represented by *Education Station*, written by Martin Hardee for Micro Instructional. This program does most of the same things that *The Great Creator* does, and it does many of them better. Several features specifically support teaching, in addition to creating exams; the program permits intermixed graphics and text (illustrations, diagrams); and it's listable, so you can take it apart and see how it works. With all of this, *Education Station* costs less than its "Cadillac" colleague; but then it isn't packaged as elaborately.

However, the packaging for *Education Station* does include a rather unusual item. There is a complete tutorial on audio cassette, acting as a guided walk-through of all the features of the system. The cassette is synchronized with the actions of the program, if you follow the instructions given by the tape. It's a good idea to go through the program with the tape before attempting to use the system. Some system features are explained on the tape but aren't covered in the manual.

This program is not as simple or as convenient to use as *The Great Creator*; there are more decisions to make and some housekeeping chores (copying files) to deal with. A computer-sophisticated person will have no trouble with it; but a computer beginner may feel a little lost from time to time.

The tradeoff for complexity, in a well-designed system, is power. *Education Station* is indeed well designed; even though it's hard to control, you can do a *lot* of things with it!

For example, you can set the program to skip ahead a certain distance if the student answers a particular question correctly. This is important in a teaching sequence (Programmed Instruction or equivalent). If she understands the point then she can skip ahead; but if not, then she gets some more explanation. This program supports questions that require no answer (simply press return after reading), and these can carry the explanation.

You can put up to four illustrations (shapes) in your questions. You select the shape from a table in memory, its position on the screen, and its color. Shapes can be superimposed; a red line and a blue line can appear on a white grid beside the text. You can create pictures with various commercial programs; and a utility disk, included with *Education Station*, contains a program to let you make pictures with a joystick. This technique is demonstrated in a program that teaches Chinese, which is included on the demo disk that comes with the system.

**Open for Answers.** Perhaps the most powerful feature of the system is that it's designed to accept open or unstructured responses—what *The Great Creator* refers to as fill-in-the-blank. An open response is more powerful than a structured one because you can use it as either structured or open. If the question ends in "Choose A or B" and the answer is B, it's structured; an open response is something like "blue" or "Russia" or "positive"—an open-format answer.

Best of all, *Education Station* is smart enough to recognize a nearly right answer in most cases and give credit for it. When you enter the question, you specify a correct answer that the student must match exactly to get full credit. However, you can also enter keywords for two different partial answers; if the student's answer contains either of the keywords, partial credit is given. This can catch common misspellings, awkward phrasing, and other minor errors.

This program includes a useful capability in its scoring program. There is a Grading Update program on the utility disk that enables a quiz disk to record the student's wrong answers, as well as the score. If you are developing a teaching sequence, this is useful information: It can show why a particular point is not getting across.

All in all, *Education Station* is a remarkably powerful tool. It's not the ideal choice for a computer beginner, unless the novice is prepared to spend some time learning to use it; but for a moderately experienced computer user (able to write a simple Basic program and manipulate DOS), it's just right. If you are that sort of person, you'll be wanting to build something with the system as soon as you finish listening to the tape—it's that kind of system.

**Packaging Again.** We made some disrespectful comments about the other program, *The Great Creator*, regarding its fancy packaging. Truly, the packaging is exaggerated in some respects; but there is one aspect of packaging that the program handles very well, and The Professor deserves an A for it.

Earlier, we defined packaging as all the stuff that comes with a product. However, the term has another meaning. In software, the packaging of a program refers to the controls—what the user has to do to command the capabilities of the program. If what you have to do to make it work is simple and obvious, we speak of a "user-friendly" package; if what you have to do is complicated and illogical, we call the package "user-hostile."

In this sense, the packaging of *The Great Creator* is first class. The system itself requires very little attention; it's always doing just what you would expect. This type of design is very comfortable for an inexperienced person to work with; and that, in certain circumstances, is priceless. You pay a lot for packaging when you buy *The Great Creator*; but it's worth every penny for its user-friendliness.

We don't mean to imply that *Education Station* is lacking in user-friendliness; but it doesn't make things quite so easy for you. You have to make a lot of decisions and take care of several chores—that's the price to pay for having a lot of options.

Now you know what an "exam-writing" program does. It's more than just writing exams, particularly in the case of *Education Station*. If you are looking for a way to simplify your exam-writing chores, or if you want to experiment with self-teaching question sequences—one of these programs may be just what you need.

---

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# The Voice of THE TURTLE

A Schoolhouse Apple Tutorial

# LOGO

DONNA BEARDEN

## Introducing Young Children to Computers

It seems that more and more attention is being placed on exposing young children to computers. If we become fanatic or caught up in setting standards for kindergarten programmers, we will promote computerphobia. If, on the other hand, we can provide opportunities for meaningful and enjoyable experiences at a young age, children will accept the computer for what it is—a tool for learning, experimenting, playing, helping.

Logo and Logo-like activities offer such an opportunity as they put the child in charge of the computer, rather than the computer in charge of the child. The rewards are simply in the process of learning. But how do you introduce Logo to a child who is not yet reading?

One of the easiest ways is through the use of single keystroke commands. There are several single keystroke programs available. If you have MIT Logo (marketed by Terrapin and Krell), look at the *Instant* program on the utilities disk. *Delta Drawing* by Spinnaker is a single keystroke program with Logo-like commands. Either of these programs allows a child to draw by touching single keys. While you might be tempted to put colored stickers on the keys they will use, try it first without them. Even very young children will soon recognize the letters

they need: R for right, L for left, and so on.

How about developing your own single keystroke program and adding to it as your child progresses? Both *Instant* and *Delta Drawing* allow children to create by touching a single key. The following procedures require the child to touch a key and then press return. (And perhaps introducing the concept that each command must be followed by a return will make the transition to real Logo easier.)

Look at the following procedures:

```
TO F
FD 10
END

TO R
RT 30
END

TO L
LT 30
END

TO C
CLEARSCREEN
END
```

Those four procedures will allow a child to begin exploring with the turtle. Allow ample time for just exploring and remember there's no right or wrong way to explore. Some children will exuberantly command the turtle all over the screen. Others will think out each move. Some will doodle. Others will immediately set a task for themselves. Attention spans are quite varied. Some will work for five minutes, others for fifteen or thirty. Be as flexible as you can.

At some point, the child will want more information. "How can I erase one line?" "But I want the turtle to start down here."

Let's add *penup*, *pendown*, and *penerase* commands:

```
TO U
PENUP
END

TO D
PENDOWN
END

TO E
PENERASE
END
```

Each time new commands are introduced, allow time for exploring with them. The child now knows seven commands. Encourage the use of those commands by setting simple tasks. (Again, be very flexible. Some children will automatically set their own tasks. The best thing you can do in that case is quietly observe). Screen overlays with simple mazes are fun. Create your own from clear plastic or have the children help design some. Create barriers in the maze that will require the turtle to pick up his pen and then put it back down.

Simple geometric shapes can become single keystroke commands. Your children might want to draw squares. Have them experiment until they are able to draw squares with single keystrokes and then help them define a new procedure called S for square. Kindergarten students are capable of learning actually to program with single keystrokes. Write down the commands they used to make a square and then show them how to use the editor. The S procedure might look like this:

```
TO S
F F F F
R R R
F F F F
R R R
F F F F
R R R
F F F F
R R R
END
```

That may seem like a lot of typing and we all know there's an easier way to do it. What seems tedious to us, however, may not be to a five-year-old. It is through the repetition that the child will begin to recognize patterns. Each side of the square is the same length. Each turn to make the corner is the same. This five-year-old is learning geometric principles. And what an achievement—a new procedure, one that will cause the turtle to draw a square with a single keystroke command! (You may have been tempted to define a single keystroke program with shapes already defined. If you do so, you will take away the child's opportunity to experience the joy of discovering and learning for himself.)

The same thing can be done with other shapes or designs, triangles, rectangles, circles, crazy shapes.

Once the children have experienced defining procedures, a fun activity is to have them go directly to the edit mode and type in several commands, perhaps twenty or thirty. (Call it Z for craZy.) Then go back to the immediate mode and try Z. Was it what they expected? Repeat Z several times and see what happens.

With young children, it is extemely important (and helpful) to use related off-computer activites. By experiencing concepts in a variety of ways, they will understand them more easily. Playing turtle, for example, helps children experience the turtle commands of right, left, and forward. Before they try to define a square on the screen, have them walk a square or command a fellow turtle to walk a square. Have four children form a square in as many different ways as they can think of.

When Logo was first implemented, there was a floor turtle that was commanded from a keyboard. There is still a turtle available. An inexpensive and quite effective substitute is Milton Bradley's Big Trak. This programmable tank uses commands similar to Logo commands. It can be programmed to go forward, backward, turn right or left, and even repeat a series of commands.

Repetition and patterns play an important role in mathematics and in programming. Thus, activities that call for pattern recognition are important. Shape blocks, play tiles, or parquetry tiles can be used to encourage children to create designs with repeating patterns. Simple pictures can be made of geometric shapes.

In all of these activities, the child is learning to think logically, to break problems down, to explore various possibilities. And that's what Logo is all about. ■


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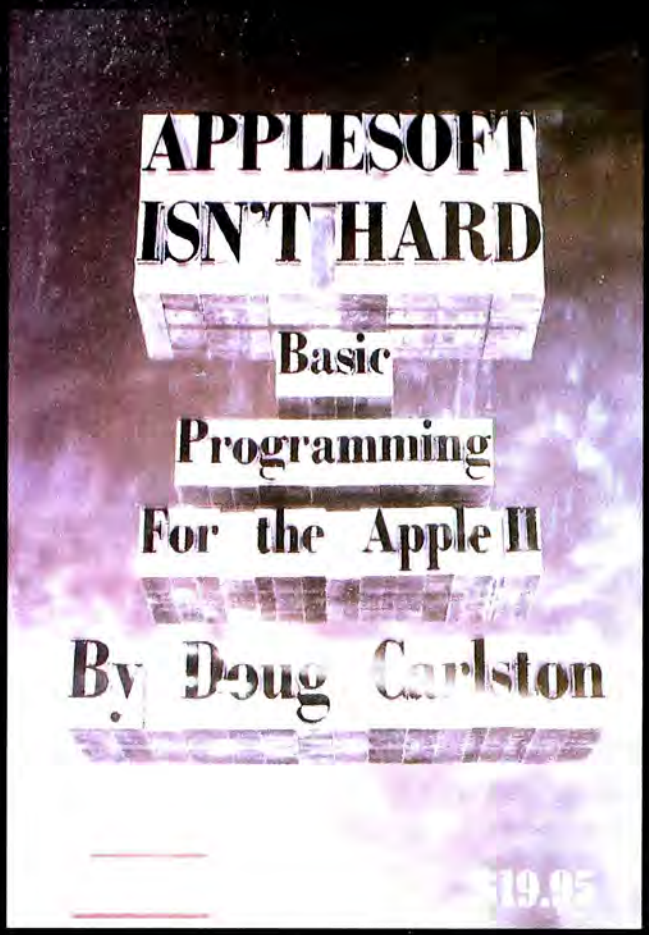
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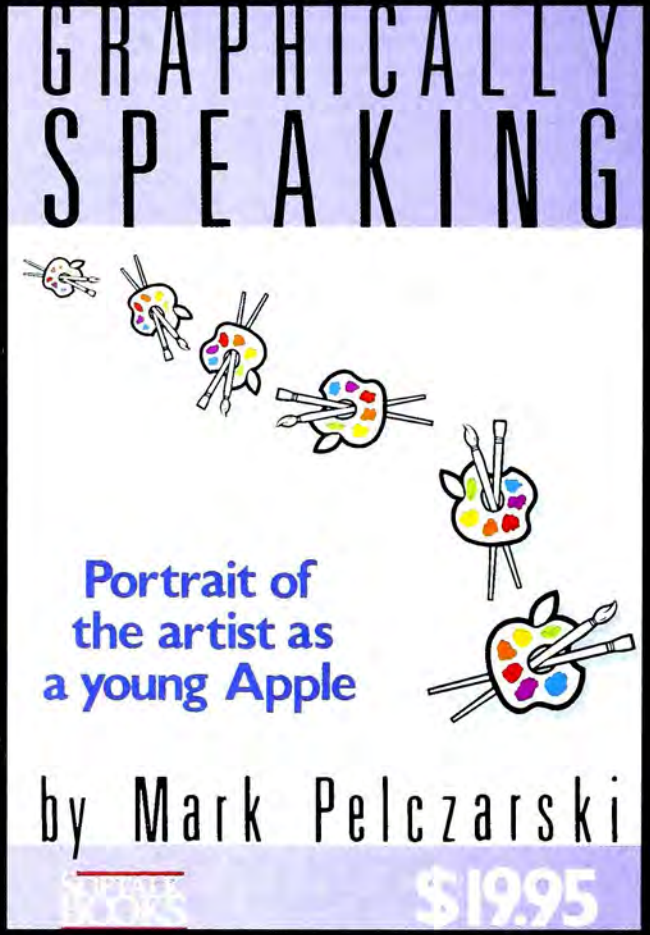



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By Mark Pelczarski

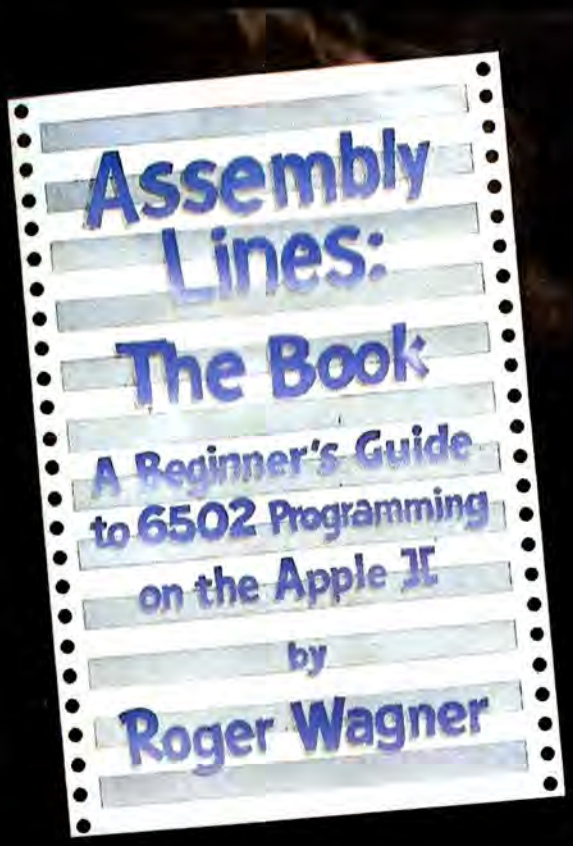
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# TRADETALK



Sharon Hox, director of customer support for Source Telecomputing.

☐ Software authors **Bill Blue** and **Mark Robbins** have left *Southwestern Data Systems* (Santee, CA) to join *United Software Industries* (Los Angeles, CA). Making the move with them will be their communications programs, *ASCII Express: The Professional*, *P-Term: The Professional*, and *Z-Term: The Professional.* The products will be published by USI exclusively and discontinued at SDS. Blue said he is looking forward to working with USI and developing a new line of advanced communications programs, including communications packages for CP/M-86 and MS-DOS. **Roger Wagner**, president of Southwestern Data Systems, said that his company will now direct software development toward creating programs for less technically oriented users. "If we were to do another communications package it would be a Bank Street Writer for communications—a more fundamental program than *ASCII Express: The Professional*," he said.

☐ **Silicon Valley Systems** (Belmont, CA) has been acquired by peripheral manufacturer **Advanced Logic Systems** (Sunnyvale, CA) for $2 million in cash, stock, and royalties, according to Silicon Valley Systems president **Nathan Schulof.** All employees of Silicon Valley Systems will be retained. "Our staff is very excited about the acquisition. The two companies work very well together. Their strengths are our weaknesses and our strengths are their weaknesses."

☐ Officials of **Business & Professional Software** (Cambridge, MA) have announced the company's acquisition by **BPI Systems** (Austin, TX) for 475,000 shares of BPI common stock. Following the acquisition, BPS will be operated as a wholly owned subsidiary of BPI Systems. **David Solomont**, president and founder of BPS, will continue to head BPS and will become a director of BPI Systems. "Graphics is growing in importance as a companion product to many software applications, particularly in accounting, because it conveys business facts and trends so clearly. I am confident that the integration of our business and graphics products will clearly differentiate BPI from its competitors," Solomont said.

☐ **Hayes Microcomputer Products** (Norcross, GA) and **Bizcomp Corporation** (Sunnyvale, CA) have signed a multi-million dollar licensing agreement. Hayes has agreed to pay Bizcomp an undisclosed amount to use command-driven modem technologies for which Bizcomp was issued patents in June 1983. The deal is the first of many being sought by Bizcomp. Bizcomp president **Mike Eaton** invented the command-driven modem in 1980—about a year ahead of all competitors. Now that technology is the industry standard, said **Bruce Miller,** a Bizcomp spokesman. Hayes's voluntary decision to honor Bizcomp's patent has set a precedent that Bizcomp hopes other modem manufacturers will follow.

☐ **Source Telecomputing** (McLean, VA) has announced the appointment of **Sharon Hox** as director of customer support. Prior to joining STC, Hox was vice president of customer relations at PRC Realty Systems, a computer services firm specializing in on-line information networks for realtors.

☐ **EduWare Services** (Agoura, CA) has announced a contest for educators that will award a $5,000 grand prize for the best educational software idea. All contest entries will be judged on instructional validity, quality of material, creativity, originality, marketability, and practicality. The best thirty-nine entries will be prize winners, and many of the ideas generated by contest participants may be developed into educational programs for the home and classroom, said EduWare president **Sherwin Steffin.**

☐ **ComputerLand** (Hayward, CA) has promoted three executives. *Gary Gapp* has been


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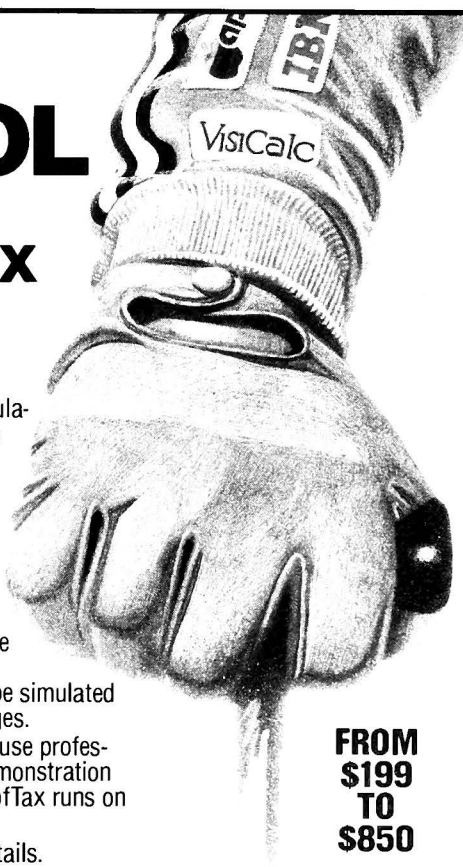
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promoted from director of accounting to senior vice president of operations at ComputerLand, U.S. **Chuck Kinch** has been promoted from director to vice president of products. **Frank Little** has been promoted from director to vice president of traffic and distribution.

☐ **Mitchell Halperin,** director of show operations for the **Interface Group (Neddham, MA),** suffered a heart attack and died while supervising the Comdex/Fall trade show at the Las Vegas Convention Center. He was 55. "This is the saddest day our company has ever experienced. Mitch Halperin was loved and respected by all who knew him," said **Sheldon Adelson,** president of the Interface Group, which holds several Comdex shows a year. Halperin is survived by his wife, Irma, and their two children, Debra and Susan.

☐ **Software Entertainment Company** has moved. Its new address is 541 Willamette Street, Suite 302, Eugene, OR 97401. The phone number remains unchanged.

☐ **Spinnaker Software** (Cambridge, MA) has announced the promotion of **Richard Bratt** to vice president of software development. In his new position, Bratt will be responsible for all areas of software development and will oversee translating programs for new and existing computer systems. Bratt was previously Spinnaker's director of software.

☐ Grappler + interface board manufacturer **Orange Micro** (Anaheim, CA) has reached a $3,000 out-of-court settlement with retailer **Pacific Blue Micro** (Santa Ana, CA), ending a lawsuit in which Pacific Blue Micro was charged with advertising and selling Grappler + boards under a false name. The settlement permanently restrains Pacific Blue Micro from the alleged false advertising and sales tactics. In another development in the same lawsuit, Pacific Blue Micro's co-respondent, **Sekon Computers** (Los Angeles, CA), has been found in contempt of court for selling the boards in defiance of a temporary restraining order. Orange Micro is accusing Sekon of copyright infringement, false designation of origin, trademark infringement, and unfair competition. The case has yet to come to trial. The charges against Sekon and Pacific Blue Micro stemmed from September 21, 1983, raids of the defendants' retail locations that allegedly revealed Orange Micro interface boards. According to **Peter O'Brien,** assistant to Orange Micro vice president Don Johnson, Orange Micro saw a Pacific Blue Micro ad in the *Los Angeles Times* that advertised boards compatible with Grappler +, bought one, and observed the EPROM's object code. "The object code was identical to Grappler + codes, including Orange Micro's trademark and copyright notices. It was incredible," O'Brien said.

☐ **Scarborough Systems** (Tarrytown, NY) has appointed **Arlene Cohen** manager of media and review services. Cohen's duties will include market research; she will serve as media liaison. Prior to joining Scarborough, Cohen served as merchandising

services director for Gralla Publications.

☐ **Albert Litewka,** president of **Warner Software** (New York, NY), has announced the appointment of **Reid Boates** as vice president of Warner Software and editorial director of Warner Software/Warner Books, the company's recently created computer book publishing division. Boates, who had been senior editor of Warner Books since 1981, will be responsible for acquisitions and product development.

☐ **Bruce Twickler,** vice president of sales at **Hayden Software** (Lowell, MA), has announced an award program for retailers that offers prizes, including a BMW 318i and up to $20,000 in cash. The Key Dealer Program will allot retailers points for each Hayden product sold and award prizes at different point thresholds. Interested dealers are encouraged to contact Hayden.

☐ **Infocom** (Cambridge, MA) and **Addison-Wesley's General Book Division** (Reading, MA) have reached an agreement that gives Addison-Wesley exclusive rights to represent Infocom's software to book dealers in the United States and Canada. According to **David Miller,** executive editor of microcomputer books and software at Addison-Wesley, "We were impressed with the high quality of Infocom's software and felt it was well suited for bookstores. In fact, surveys report that 72 percent of Infocom's customers are avid readers."



Gerald Rubin, president of Micro Education Corporation of America.

☐ **Micro Education Corporation of America** (Westport, CT) has been formed to develop, manufacture, and market home-oriented software. MECA's first software offerings include a home finance program featuring advice from expert Andrew Tobias and a running program featuring advice from marathoner James Fixx. MECA is headed by president **Gerald M. Rubin** and vice president **John Hawkins,** both former employees of Marketing Corporation of America, MECA's parent company.

☐ **Formaster Corporation** (San Jose, CA) was recently honored with a visit from a delegation of Chinese scientists, including **Madame Gu Yu,** adviser to the Chinese Academy of Sciences. The delegation was in California to sign a second agreement with the United States that will continue the two countries' joint research in high-energy physics. As part of their trip, the delegates asked to be shown some high-technology firms in the Silicon Valley, including Formaster, a producer of software duplication and piracy-protection technology.

☐ **Videx** has moved. Its new address is 1105 Circle Boulevard, N.W., Corvallis, OR 97330. The phone number remains unchanged.

☐ "Computerphobia, or fear of computers, is causing many executives to have sweaty palms and sleepless nights," said educator and computer consultant **Richard Byrne.** During a recent lecture at the University of Southern California (Los Angeles, CA), Byrne explained the sources of computerphobia and what executives can do to overcome it. Byrne pointed out that almost all computerphobia is a symbolic fear—for some executives, computers symbolize the fear of machines in general, as well as change, loss of control, fear of displaying ignorance, fear of failure, and even the fear of breaking the machine. Byrne, who founded a computer training company to help businesses implement personal computing, suggested that executives could overcome computerphobia by acknowledging their ignorance on the subject, defining their purpose in wanting to use a computer, taking an applications-oriented training course, and letting go and laughing a lot. Byrne's presentation, "Overcoming Computerphobia," was the second lecture in a five-part series entitled, "The Computer Culture." ◨


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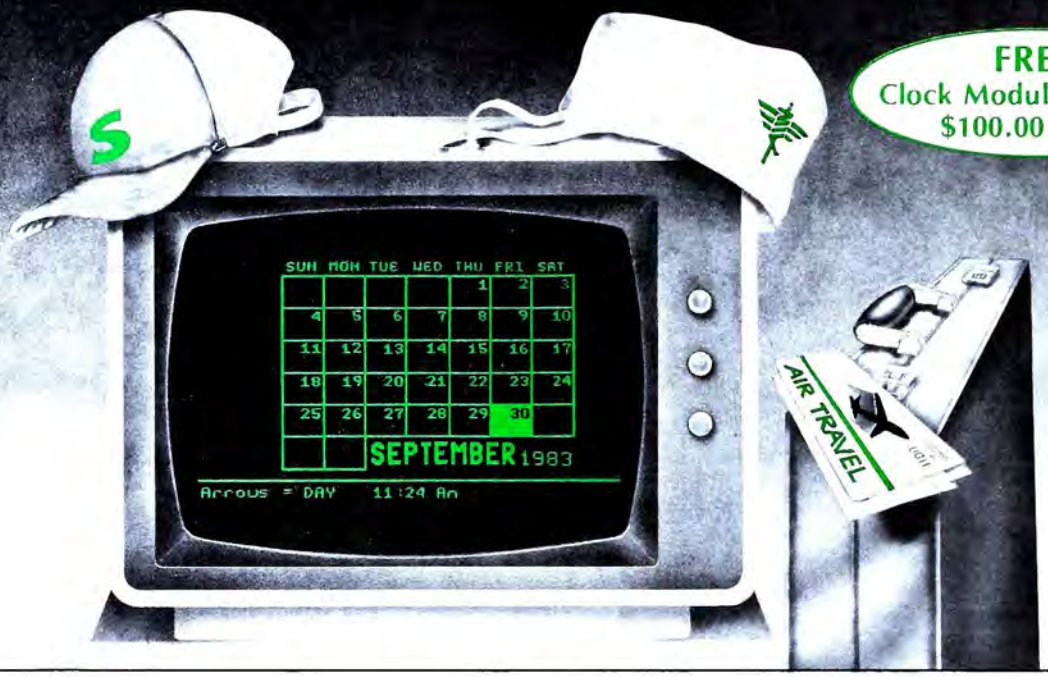



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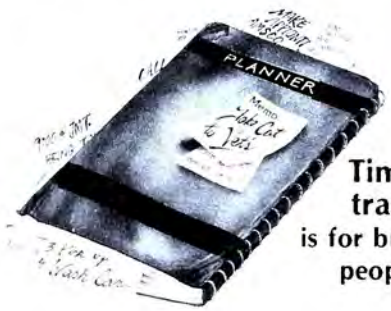
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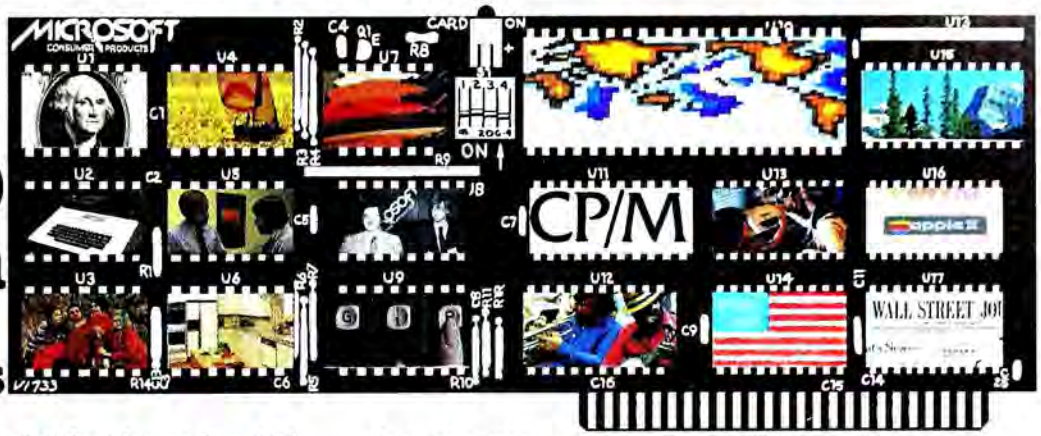
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# SOFTCARD Symposium

## by Greg Tibbetts




Hello, and welcome to the February SoftCard Symposium. This month we'll continue presenting the BDOS functions and integrating them into a general-purpose subroutine library. First, we'll discuss the miscellaneous functions—which will be easy, since there are only three—and then we'll begin examining the disk I/O functions. We won't complete the disk functions this month.

The subroutine library being developed in these pages is meant to be a useful tool, but it cannot meet that objective unless it fits you and your programming style. No doubt some of you who have been following this subroutine exercise have seen items that you felt should be structured differently or sections where a little shortcut would have enhanced a routine's operation. Nothing that's presented here is cast in concrete, and it is neither bad procedure nor poor style for you to take a shortcut that improves the library's speed or its space utilization. Efficiency is a large part of what programming's all about.

The total library—the portions you've seen, along with the portions not yet presented—has been in rather constant use for a couple of years now, and yet it's probably not exactly the same in any two programs that contain it. In fact, several changes have been made in the subroutine library just during the composition of the last two columns. It was designed to be constantly modifiable and constantly evolving. Therefore, the fact that you're willing to take the time to study and modify the subroutine library that's unfolding here simply enhances its purpose.

The first miscellaneous BDOS function we'll examine is *system reset*:

BDOS function no: 00
Function name: System reset
Function purpose: Return control to CP/M and the CCP
Entry parameters: none
Exit parameters: none

System reset causes the system to be returned to an initial cold-boot configuration, the CCP to be reloaded from drive A:, and control to be passed to the CCP. In short, system reset is a warm boot. This function is not often used—the reason being that it generates a result identical to a JP 0000H instruction, which is shorter and therefore almost always used instead.

Since it can be replaced by a jump to location 0000, you may be wondering why the system reset function was even supplied. Its purpose is to provide a means of restarting CP/M if the warm-boot vector (0000H to 0002H) in the system data page (0000H to 0100H) has been overwritten or modified by some action of the program. As we've mentioned many times in this column, it is entirely possible for a program to make more memory available to itself by overwriting parts of the operating system.

Since the warm boot is actually performed by the BIOS, the CCP and occasionally even BDOS may be overwritten, so long as the BIOS and the warm-boot vector at 0000H are intact. System reset simply provides a means of doing a warm boot if BDOS and BIOS are intact, but the warm-boot vector is no longer functional. It's just one more safety feature. (Note that both CCP and BDOS are reloaded during warm boots in 44K and 56K but that only a part of BDOS is reloaded in 60K.)

The subroutine call for the system reset function appears at the end of our discussion of miscellaneous functions.

The second miscellaneous function to consider is *get version number*:

BDOS function no: 12
Function name: Get version number
Function purpose: Obtain the CP/M or MP/M version number
Entry parameters: [C] = 0CH
Exit parameters: [H] = system (0 = CP/M, 1 = MP/M)
[L] = version

This function provides a means for programs to check the type and version number of the operating system. It must be said that this capability is of little use in the SoftCard environment, since there does not appear to be any version of MP/M running on SoftCard, and neither CP/M 1.4 nor 3.0 has yet been produced. Those of you producing programs for use on systems in addition to SoftCard may find this function of value, however.

The primary purpose of the get version number function is to tell the program which environment it's running in so that the program can select between routines when a single routine won't accommodate all environments. The normal method used to calculate remaining disk space is one example of such a routine. In CP/M version 2.2, this calculation is made by logging in the disk, locating the disk's file allocation table, and then using the table to determine the number of unallocated blocks remaining on the disk. Version 3.0, on the other hand, does not use the same type of allocation table, so performing the 2.2 process under 3.0 causes erroneous values. In 3.0, an additional system call is provided that obtains the disk's free space directly. The get version number function, therefore, allows your program to select the appropriate routine automatically.

As shown in the function description, BDOS returns a 0 in the [H] register to indicate CP/M, or it returns a 1 to indicate MP/M. The [L] register will contain 00 if the version number is less than (earlier than) 2.0. For 2.*x* series releases, the actual version number is returned as a single-byte hexadecimal value—2.2 for example, comes back as 22H, 2.0 as 20H, and so on. Although version 3.*x* does not yet appear to be implemented on SoftCard, if it were, it would return the same sort of hex number—with 3.0 returning 30H, 3.1 returning 31H, and so on.

The get version number function will also be incorporated into our subroutine library at the end of our discussion of miscellaneous functions.

The last of the miscellaneous functions is *get/set user number*:

BDOS function no. 32
Function name Get/set user number
Function purpose: Obtain or establish the current user
Entry parameters: [C] = 20H
[E] = 0FFH if get user number or
[E] = new user if set user number
Exit parameters: [A] = current user if get user number or
[A] = undefined value if set user

As we've discussed in the past, the user-number system is simply a method of splitting the directory of a single disk into several parts. This system was created as a way of handling those cases where several people are using the same disk and some type of separation between them is required. The get/set user number is most valuable when a hard disk is being used. Probably its most significant purpose in the floppy environment is to shorten directory listings by moving programs to various user areas based on their types. Considering the Apple's limited disk space and the limited number of directory entries allowed, it's doubtful that this function will see much use in your system.

Operating the function in set-user-number mode requires only that the user number to be established be placed in register [E] before the call

| Function | Name | Operation |
|---|---|---|
| 13. | Reset all disks | Returns all disks in the system to the state they're in when the system is booted |
| 14. | Select disk | Designates the specified drive as the default for all subsequent disk activity |
| 15. | Open file | Finds and activates a disk file for subsequent read and write operations |
| 16. | Close file | Deactivates a previously open disk file and permanently records any new directory information |
| 17. | Search first | Causes the disk directory to be scanned for the first filename that matches an identifier stored in memory |
| 18. | Search next | Causes the disk directory to be scanned for subsequent entries that match the stored identifier |
| 19. | Delete file | Removes files that match identifiers in memory from the disk directory by deactivating their entries |
| 20. | Read sequential | Obtains a 128-byte sector of the named file from disk. The first call gets the first sector, and subsequent calls get remaining sectors in sequential order |
| 21. | Write sequential | Sends a 128-byte sector of the named file to disk. Like read, it writes the sectors in sequential order. |
| 22. | Make file | Creates a new file on disk by creating the first directory entry with that name in the disk's directory |
| 23. | Rename file | Changes the name of a disk file in all entries in the disk's directory |
| 24. | Get login vector | Obtains a sixteen-bit value in which each bit corresponds to one of the sixteen possible drives in the system. Bits that are set indicate that the disk corresponding to the value has been logged in |
| 25. | Get current disk | Obtains a number from 0 to 15, which is the number of the currently logged disk |
| 26. | Set DMA address | Alters the starting address from which the next sector of data will be written to disk or to which the next sector will be read |
| 27. | Get alloc vector | Obtains the start address of the ALV data structure for the selected disk drive |
| 28. | Write protect | Sets the selected disk drive to temporary Read Only status until the next warm-start operation |
| 29. | Get R/O vector | Obtains a sixteen-bit value in which each bit corresponds to one of the sixteen possible drives in the system. Bits that are set indicate that the drive the value corresponds to has been set to a temporary Read Only condition |
| 30. | Set attributes | Sets the requested attributes (SYS-DIR and R/O-R/W) for a particular file |
| 31. | Get DPB address | Obtains the address of the DPB data structure for the selected disk drive |
| 33. | Read random | Obtains a specific 128-byte sector of the named file from disk using the record number |
| 34. | Write random | Sends a specific 128-byte sector of the name file to disk using the record number |
| 35. | Compute size | Obtains a value that is one beyond the highest numbered record in the file |
| 36. | Set random record | Computes the record number and sets it for the current read/write position in the named file |
| 37. | Reset disk | Returns one or more drives to their reset condition (see function 13), based on a sixteen-bit value in which each bit corresponds to one of the sixteen possible disk drives |
| 40. | Write random With zero fill | Essentially equivalent to function 34, except that unallocated blocks are filled with zeros prior to the write |

Figure 1. BDOS disk system calls.

is made. To obtain the current user number, simply place a 0FFH in register [E] and make the call. The current user number will be returned in register [A]. Now here are the subroutine additions for the three miscellaneous functions:

```
GETUSR:   LD    E,0FFH    ; E is flag for BDOS
          JR    SETUSR    ; Go via SETUSR call
;
RESETS:   LD    C,00H     ; Reset system function
          DB    21H       ; Skip 2 bytes
GTVERS:   LD    C,0CH     ; Get version number function
          DB    21H       ; Skip 2 bytes
SETUSR:   LD    C,20H     ; Get/set user function
          DB    21H       ; Skip 2 bytes
```

The subroutine segments just shown are designed to be incorporated into the subroutines presented these past two months. The RESETS, SETUSR, and GTVERS subroutines can be inserted into that portion of the library we titled BDOS System Calls. The DB 21H instructions are shown to remind you to use them if you decide to place the three functions in the middle of the collection of system calls. Obviously, you may make these segments separate subroutines, but if you do you'll have to replace the final DB 21H instruction with a JP 0005H instruction. The GETUSR function should be placed outside of the BDOS system call collection, perhaps just in front of STATUS.

We're now ready to proceed with the disk functions. As shown in figure 1, there are twenty-five of these. Before we begin, however, we need a point of clarification. The terms *disk* and *drive* are sometimes a source of confusion. The context in which the terms are used is what generally determines the specific meaning. For meaning, *drive* usually means the actual hardware into which the floppy disk is inserted—as in: "Place the diskette into that drive." In CP/M however, the term *drive* is much more frequently used to mean a specific disk drive in the system plus the floppy disk that currently resides in the drive. Consequently, when we talk about logging in drive A:, we are actually referring to the single unit made up of the first disk drive in the system and the floppy disk it contains.

*Disk*, on the other hand, is a less precise, almost slang term. It is very general and may mean the floppy disk, the disk drive, or both; or, it may simply be used as an adjective to describe a type of activity, such as disk functions or disk routines. Once again, the meaning depends largely on the context in which the term *disk* is used. In our discussions, we'll use the terms *disk* and *drive* interchangeably, relying on the context to sort out the specific meaning.

For convenience in examining the disk functions, we'll break them into two categories—those that are file-related and those that are non-file-related. Since all disk access starts with the non-file-related functions, we'll examine those first. These functions, shown in figure 2, are ordered somewhat more logically and accompanied by simplified descriptions of their actions.

| Function | Action |
|---|---|
| 14. | Selects a current disk for I/O |
| 37. | Resets a disk (makes BDOS forget it knows about it) |
| 13. | Resets all disks |
| 25. | Obtains the number of the disk BDOS shows as the current disk |
| 24. | Obtains the list of disks that BDOS knows about |
| 27. | Obtains the map of used and free blocks for a disk |
| 28. | Write-protects a disk |
| 29. | Obtains the list of write-protected disks |
| 31. | Obtains the configuration table of the current disk |

Figure 2. Non-file-related disk functions.

These nine functions allow the programmer to control the various disks in the system on a high-level basis. They do not allow control over the extremely low-level functions of the disk drive, such as seek, motor on, motor off, and so on. Control of the low-level actions would require separate machine language programs (the preferred method) or direct calls into the middle of BIOS subroutines—a dangerous practice.

The first of the non-file-related functions we'll examine is *select disk*:

```
BDOS function no:  14
    Function name: Select disk
Function purpose:  Select a current disk for I/O
 Entry parameters: [C] = 0EH
                   [E] = Disk number (0 through 15 equals
```

A: through P:)
Exit parameters: none

The select disk function is where the entire process of disk access starts. There are actually two distinct operations that go on during disk select—establishing a disk as the default to be used in subsequent disk access operations and informing BDOS of the disk's presence and configuration (size, sectors per track, directory location, interleave factor, and so on).

Establishing a disk as the current default involves placing its drive number in two locations—first, a special variable inside BDOS itself; second, in location 0004H in the system data page. The default drive is the one BDOS will access in any later disk or file operations requested by the programmer. It's possible to access drives other than the default, but we'll leave an explanation of that process until our discussion of file functions.

The drive numbers range from 0 through 15, and, as we've seen in previous discussions, these correspond to drives A: through P:. In SoftCard CP/M, only six of the sixteen possible drives are allowed. If a request is made, BDOS will attempt to select drives with higher numbers. In that event, however, the BIOS will still report an error to BDOS during the log-in process.

When a disk is selected, and after BDOS has set up the default disk variables, BDOS also initializes various tables relating to the disk's configuration. This is the log-in process we saw in an earlier discussion of the BIOS. The BIOS SELECT routine informs BDOS of the location of the disk parameter header from which all other table addresses can be derived. When this has occurred, BDOS initializes variables inside itself with the various table addresses and, with this information, is able to calculate accurately the locations of the disk's directory and files. In some versions of CP/M, the BIOS automatically performs a seek-to-track 00 and/or a disk read at that point. This process is done to determine whether the drive is ready, whether a disk is inserted, and occasionally to determine the disk's density. The SoftCard BIOS, as we've seen, performs no such drive-ready/density-test activity.

Once it's obtained the table locations, BDOS then reads the entire directory of the selected disk and uses this information to build the checksum and allocation tables also mentioned in our earlier BIOS discussions. Each drive has separate tables so that once a disk has been selected and logged in, the directory information and allocation data remain active until the next cold boot, warm boot, or disk reset operation takes place. Once one of these operations has been completed, BDOS updates the login and read/only vectors. These two sixteen-bit values in BDOS are accessible to the programmer as well as to BDOS itself, and we'll therefore cover them in detail later on.

The subroutine for disk select is relatively simple and looks like this:

```
SELDSK:   LD    C,0EH     ; Select disk function
          JP    0005H     ; Go BDOS, RET to caller
```

Our next disk function is the opposite of select disk. It is *reset disk*:

BDOS function no: 37
Function name: Reset drive
Function purpose: Return a disk to initial boot condition
Entry parameters: [C] = 25H
[DE] = drive vector (LSB = A:)
Exit parameters: [A] = 00H

This function is used when you want BDOS to forget that it has previously selected one or more specified disks. This operation is a necessary one because BDOS keeps the directory checksum and allocation information on each disk that has been selected. Changing disks in a drive, therefore, will cause BDOS to report an error on the next access of that drive, since the directory checksums won't match. Resetting the disk makes BDOS forget that the disk was ever logged in, and consequently on the next disk select BDOS starts the log-in process over again from scratch. This is most useful when requesting that a user change disks in a drive during program operation; it can also be used when a program exits to avoid the performance of a warm boot.

The programmer informs BDOS of the disks to reset by placing a drive vector into register pair [DE]. Like the login and read/only vectors, the drive vector is a sixteen-bit value in which each bit represents one of the sixteen possible drives in the system. The least significant bit





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(LSB) of the vector (the rightmost bit) represents drive A:, the next bit to the left represents drive B:, and so on. Any bit that is set (equal to 1) in the drive vector causes BDOS to reset that disk. Note that since only six drives are allowed in SoftCard CP/M, register [D] will always be zero. Finally, since the drives in the vector are not being accessed or logged in but only reset, requesting a reset of a nonexistent drive does not cause an error the way that selecting a nonexistent drive does.

The subroutine entry for this function is shown below as RESETD. Preceding it is a sample program segment demonstrating how to call the subroutine entry. Note that the drive vector must be loaded into the [DE] register pair in your program before the call is made.

```
        .
        . (your program)
        .
        LD      D,0             ; Always 00 (no drives I: through P:)
        LD      E,00000100B     ; Set bit 2 for drive C:
        CALL    RESETD          ; Reset drive C:
        .
        .(continuation of your program)
        . . . .
```

Note: The trailing B following the number 00000100 in the example indicates that 00000100 is a binary number. This format is shown only for clarification—your program would probably load the equivalent decimal value (4) into the [DE] register pair in one instruction (such as LD DE,0004), since this would automatically zero the [D] register and would be shorter.

```
SELDSK: LD      C,0EH           ; Select disk function
        DB      21H             ; Skip 2 bytes
RESETD: LD      C,25H           ; Reset single disk function
        JP      0005H           ; Go BDOS, RET to caller
```

The next function to be examined is *reset all disks*:

BDOS function no: 13
Function name: Reset all disks
Function purpose: Return all disks to initial condition
Entry parameters: [C] = 0DH
Exit parameters: none

This function performs exactly the same operation as reset disk (function 37), except that no drive vector needs to be specified. Instead, all disks (including the boot disk) are reset in response to this call, and thus reset all disks has the same effect as function 37 with a drive vector of 1111111111111111B (0FFFFH) in register pair [DE]. If this function is used, every disk will go through the entire log-in sequence when it is next selected.

Until recently, the existence of function 37 to reset a single disk was not documented by Digital Research. As a result, this reset-all-disks function was used almost exclusively as the means of resetting a disk when a program forced the user to swap diskettes in a drive. The problem with using this function for that purpose, though, was that additional time was required for all disks to be relogged. If only one disk needed to be reset, having to relog all other disks was inefficient. In the SoftCard system, this isn't much of a penalty. The disks are of a small enough capacity that BDOS doesn't take long to read the directory and do its calculations. It's really only a penalty when using high-density disks, either hard drives or large-capacity floppy disks. The reset-all-disks function goes into our subroutine library as follows:

```
SELDSK: LD      C,0EH           ; Select disk function
        DB      21H             ; Skip 2 bytes
RESETD: LD      C,25H           ; Reset single disk function
        DB      21H             ; Skip 2 bytes
RESETA: LD      C,0DH           ; Reset all disks
        JP      0005H           ; Go BDOS, RET to caller
```

The next disk function is *get current disk*:

BDOS function no: 25
Function name: Get current disk
Function purpose: Obtain the number of the current disk
Entry parameters: [C] = 19H
Exit parameters: [A] = current disk number

This function is the means by which a program can accurately determine the current default disk. We say accurately because a program can also simply load the value from location 0004H in the system data page. There are times, however, when the value in the system data page and the value within BDOS don't match. Using this function is the truly accurate method of determining the current default disk. The current disk value (0 through 15) will be returned in register [A].

Added to the subroutines, the get-current-disk function looks like this:

```
SELDSK: LD      C,0EH           ; Select disk function
        DB      21H             ; Skip 2 bytes
RESETD: LD      C,25H           ; Reset single disk function
        DB      21H             ; Skip 2 bytes
RESETA: LD      C,0DH           ; Reset all disks
        DB      21H             ; Skip 2 bytes
GETCUR: LD      C,19H           ; Get current disk function
        JP      0005H           ; Go BDOS, RET to caller
```

Our next disk function is *get login vector*:

BDOS function no: 24
Function name: Get login vector
Function purpose: Obtain the list of logged-in disks
Entry parameters: [C] = 18H
Exit parameters: [HL] = login vector

This function returns a sixteen-bit value in register pair [HL] that, like the drive vector shown in function 37, contains one bit for each drive in the system. Bit zero (the LSB) once again represents drive A:, bit one represents drive B:, and so on. If a bit is set in the login vector, it means that the drive represented by that bit has been selected and logged in at one time. Since BDOS clears the login vector to zero during warm boot, cold boot, and reset-all-disks operations, the fact that a bit is set in the login vector means BDOS has a record of its directory checksum and allocation information.

This function is useful only as a means of finding out which drives BDOS knows about and which have yet to be logged in. Since it's just as easy to reset a drive whether it's been logged in or not, the get login vector function is not often used.

Get login vector is included in our subroutine library as follows:

```
SELDSK: LD      C,0EH           ; Select disk function
        DB      21H             ; Skip 2 bytes
RESETD: LD      C,25H           ; Reset single disk function
        DB      21H             ; Skip 2 bytes
RESETA: LD      C,0DH           ; Reset all disks
        DB      21H             ; Skip 2 bytes
GETCUR: LD      C,19H           ; Get current disk function
        DB      21H             ; Skip 2 bytes
GETLOG: LD      C,18H           ; Get login vector function
        JP      0005H           ; Go BDOS, RET to caller
```

The next disk function we'll examine is *get alloc* (short for allocation) *vector*:

BDOS function no: 27
Function name: Get alloc vector
Function purpose: Obtain the used/free blocks table vector
Entry parameters: [C] = 1BH
Exit parameters: [HL] = alloc table address

Function 27 returns to the programmer the address of the data structure known as the allocation table. The address returned is that of the allocation table for the current default disk. We examined this particular data structure in depth in our BIOS discussions, but we'll recap it briefly now.

When BDOS reads the directory during the log-in process on a disk, it builds a table of the disk's blocks that are in use for the directory and for files. Blocks used for the directory never change and are always reserved for that purpose. Files, on the other hand, are created, grow, shrink, and are deleted as operations take place on the disk. Each time this occurs, the allocation table is altered to match the actual contents of the disk.

The allocation table is structured such that for each block on the disk, there exists a bit in the table to represent that block. If a bit is set (1), the block is in use; if it's reset (0), the block is free. The table is called a *bit map* for that reason. Put another way, the area of memory containing the map has one byte for every eight blocks on the media. The total length of

the table in bytes, therefore, is the number of blocks divided by eight.

Figure 3 shows the first two bytes of an allocation bit-map table. In the portion of the example labeled "actual appearance," the first two blocks are reserved for the directory. This diagram shows the actual appearance of the allocation table for a SoftCard CP/M disk on which no files have yet been stored.

Logical structure:

```
                ----------Byte 1----------  ----------Byte 2----------
Bits        07  06  05  04  03  02  01  00  07  06  05  04  03  02  01  00
          +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
Bit map
          +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
Block no.  00  01  02  03  04  05  06  07  08  09  10  11  12  13  14  15
```

Actual appearance:

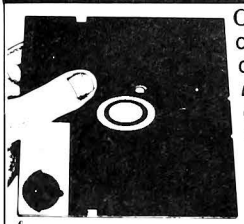
```
  Byte 1    Byte 2
 --------  --------
 11000000  00000000
 --------  --------
```

Figure 3. Allocation bit-map table.

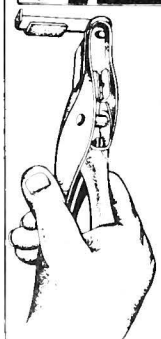
If you know the starting address of the allocation table and the number of blocks on the disk, you can determine which blocks are in use and which are free by loading the various bytes of the table and looking to see which bits are 1s and which are 0s. Knowing the block size in addition would allow you to calculate the disk's free space by counting the number of 0s and multiplying that by the block size. Since disk blocks in SoftCard CP/M are 1K long, the number of kilobytes is the same as the number of blocks. This is the method used by most directory programs that show disk free space, and it is even used by Digital Research's STAT.COM program. The get alloc vector function is installed in our subroutine as follows:

```
SELDSK:   LD    C,0EH     ; Select disk function
          DB    21H       ; Skip 2 bytes
RESETD:   LD    C,25H     ; Reset single disk function
          DB    21H       ; Skip 2 bytes
```


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```
RESETA:   LD    C,0DH     ; Reset all disks
          DB    21H       ; Skip 2 bytes
GETCUR:   LD    C,19H     ; Get current disk function
          DB    21H       ; Skip 2 bytes
GETLOG:   LD    C,18H     ; Get login vector function
          DB    21H       ; Skip 2 bytes
GETALO:   LD    C,1BH     ; Get alloc vector function
          JP    0005H     ; Go BDOS, RET to caller
```

The next function to be examined is *write-protect-disk*:

```
BDOS function no:  28
   Function name:  Write-protect disk
Function purpose:  Make current default disk read/only
Entry parameters:  [C] = 1CH
  Exit parameters:  none
```

This function is the software equivalent of placing a write-protect tab on the current default disk. This effect is temporary and is cleared by a cold boot, a warm boot, or a disk reset. Any attempt to write to this disk generates a BDOS error with the resulting message:

BDOS err on x: R/O (where x is the drive letter)

This function is designed to temporarily prevent stable programs from completing normal write actions on the selected drive. An example of when this function would be used is the case in which you wish your program to ask the user to specify a drive to write to and you also wish to prevent him or her from accidentally selecting and therefore writing to one specific drive. In such a case, you would select the disk, set it to read/only status with this function, and then go ask the user for the drive to write. If he or she selected the read-only disk, the program would abort with the BDOS error.

Obviously, since your program must get the user's input and do any drive selection, it may be just as easy to test his or her input for the taboo drive and not do the disk select if he or she has chosen it. This has the added benefit of not aborting the program in the middle.

The final point to be made about the write-protect disk function is that it works only for writes that are performed by BDOS through the network of system calls. It will not prevent defective drive hardware or wildly inoperative software from causing a disk write and ruining your disk. It will also not stop programs that write on the disk by calling BIOS directly. There's no substitute for write-protect tabs and a complete system of disk backups.

The subroutine library now looks like this:

```
SELDSK:   LD    C,0EH     ; Select disk function
          DB    21H       ; Skip 2 bytes
RESETD:   LD    C,25H     ; Reset single disk function
          DB    21H       ; Skip 2 bytes
RESETA:   LD    C,0DH     ; Reset all disks
          DB    21H       ; Skip 2 bytes
GETCUR:   LD    C,19H     ; Get current disk function
          DB    21H       ; Skip 2 bytes
GETLOG:   LD    C,18H     ; Get login vector function
          DB    21H       ; Skip 2 bytes
GETALO:   LD    C,1BH     ; Get alloc vector function
          DB    21H       ; Skip 2 bytes
PROTEC:   LD    C,1CH     ; Write-protect disk function
          JP    0005H     ; Go BDOS, RET to caller
```

The next disk function also has to do with write protection. It's the *get R/O* (for read/only) *vector* function:

```
BDOS function no:  29
   Function name:  Get R/O vector
Function purpose:  Obtain the list of read/only disks
Entry parameters:  [C] = 1DH
  Exit parameters:  [HL] = R/O vector
```

This function is very similar to get login vector (function 24). When a request is made, this function returns a sixteen-bit value that once again represents the sixteen drives in the system, with the LSB representing drive A:. Any bits that are set in the R/O vector indicate that the drives they represent have been temporarily set to read/only status. This may have happened in response to having used write-protect disk (function 28) or resulted from having changed the disk in a drive and then having attempted to write on it without resetting it.

Any time a disk is changed in a drive that BDOS has already selected, the next access for read or write causes the appropriate bit in the R/O vector to be set. This is an indicator to BDOS that the disk has been changed. It does not modify the directory checksum table or the allocation table to reflect the contents of the new disk. So long as only read operations are performed on the disk, everything is normal, and if the original disk is replaced in the drive, BDOS will clear the bit in the R/O vector. If, however, a write is attempted on the new disk, BDOS checks the R/O vector, finds the bit set, and reports an R/O error.

This function is ordinarily used (though not often) as a generic means for your program to check which disks have been temporarily set to read/only status and must therefore be reset to clear the bit in the R/O vector. The get R/O vector function is incorporated into our subroutine as shown:

```
SELDSK:  LD   C,0EH     ; Select disk function
         DB   21H       ; Skip 2 bytes
RESETD:  LD   C,25H     ; Reset single disk function
         DB   21H       ; Skip 2 bytes
RESETA:  LD   C,0DH     ; Reset all disks
         DB   21H       ; Skip 2 bytes
GETCUR:  LD   C,19H     ; Get current disk function
         DB   21H       ; Skip 2 bytes
GETLOG:  LD   C,18H     ; Get login vector function
         DB   21H       ; Skip 2 bytes
GETALO:  LD   C,1BH     ; Get alloc vector function
         DB   21H       ; Skip 2 bytes
PROTEC:  LD   C,1CH     ; Write-protect disk function
         DB   21H       ; Skip 2 bytes
GETROV:  LD   C,1DH     ; Get R/O vector function
         JP   0005H     ; Go BDOS, RET to caller
```

The final disk function we'll examine this month is *get DPB address*:

BDOS function no: 31
Function name: Get DPB address
Function purpose: Obtain the current disk's DPB address
Entry parameters: [C] = 1FH
Exit parameters: [HL] = DPB address

This function is designed to allow programs to determine the size and configuration of the current default disk by examining its disk parameter block. We took a very thorough look at the DPB data structure in our study of the BIOS some months ago, so we'll examine it only briefly now.

The DPB is a collection of parameters describing the disk format in use in the specified disk drive. Figure 4 shows the organization of the DPB for SoftCard and gives the meanings of the field values.

| | SPT | BSH | BLM | EXM | DSM | DRM | AL0 | AL1 | CKS | OFF |
|---|---|---|---|---|---|---|---|---|---|---|
| | 32:00 | 3 | 7 | 0 | 127 0 | 47 00 | 192 | 000 | 12 00 | 13 00 |
| | 16b | 8b | 8b | 8b | 16b | 16b | 8b | 8b | 16b | 16b |
| DPB | +0 | +2 | +3 | +4 | +5 | +7 | +9 | +10 | +11 | +13 |

| Field | Contents |
|---|---|
| SPT | Sectors per track—equivalent number of logical (128-byte) sectors required to equal the physical number of sectors per track |
| BSH | Block shift factor—used to calculate sectors per block |
| BLM | Block mask—used to calculate sectors per block |
| EXM | Extent mask—used to calculate the extent numbers |
| DSM | Disk size maximum—total number of blocks on the disk minus 1 |
| DRM | Directory size maximum—total number of directory entries on a disk minus 1 |
| AL0 | First eight bits of allocation bit map—used to reserve the directory blocks |
| AL1 | Second eight bits of allocation bit map—used to reserve the directory blocks |
| CKS | Checksum field size—used during directory checksum calculations |
| OFF | Tracks to offset—used to determine where directory begins on the disk |

Figure 4. SoftCard disk parameter block.

Obviously, most application programs don't require the information contained in the DPB. It's rather low-level stuff that has little bearing on simple reading and writing of files. Utility programs, however, can make great use of this information in the course of calculations to produce data on disk size, usage, and file organization. For example, in our earlier discussion of get alloc vector (function 27) we saw how the address of that table could be combined with the information in the DPB—specifically the BSH, DSM, DRM, and OFF values—to calculate disk-free space and file usage.

Since this is the last function we'll discuss this time (and the last one in this category), we'll now bring our entire subroutine library up to date, including all the functions we've examined so far.

```
;**********************************
;*  GENERAL-PURPOSE SUBROUTINES   *
;**********************************
;
ABORT:   LD   DE,SYSDSK ; Reinsert system disk message
         CALL MSGOUQ    ; Inform him
         CALL GETCHR    ; Get ack, any char will do
         JP   0000      ; Go warm boot
;
SYSDSK:  DB   'Place System Disk in Drive A: and '
         DB   'Hit RETURN...$'
;
;**********************************
;*    TERMINAL SCREEN FUNCTIONS   *
;**********************************
;
BOTTOM:  LD   HL,0017H  ; Bottom left of screen
CURPOS:  PUSH HL        : Save position
         LD   HL,3D1BH  ; [L]=1BH, [H]="="
         CALL SENDEM    ; Print them
         POP  HL        ; Restore position
         LD   A,L ; Line ; Line position
         ADD  A,20H     ; Add offset value
         LD   L,A       ; Back to [L]
         LD   A,H       ; Horizontal position
         ADD  A,20H     ; Add offset value
         LD   H,A       ; Back to [H]
         JR   SENDEM    ; Print them
CLRSCN:  LD   HL,2A1BH  ; [L]=1BH, [H]='*'
         JR   SENDEM    ; Print them
CLREOS:  LD   HL,591BH  ; [L]=1BH, [H]='Y'
         JR   SENDEM    ; Print it
CLRLIN:  LD   E,0DH     ; Carriage return
         CALL PUTCHR    ; Go to start of line
CLREOL:  LD   HL,541BH  ; [L]=1BH, [H]='T'
         JR   SENDEM    ; Print them
NORMAL:  LD   HL,291BH  ; [L]=1BH, [H]=')'
         JR   SENDEM    ; Print them
INVERS:  LD   HL,281BH  ; [L]=1BH, [H]='('
         JR   SENDEM    ; Print them
HOMCUR:  LD   H,1EH     ; [H]=Single char home
         DB   21H       ; Skip 2 bytes
CURSUP:  LD   H,0BH     ; [H]=Single char up
         DB   21H       ; Skip 2 bytes
CURFWD:  LD   H,0CH     ; [H]=Single char forward
         JR   SENDIT    ; Print only one
SENDEM:  LD   E,L       ; Get first character
         PUSH HL        ; Save second character
         CALL PUTCHR    ; Send first
         POP  HL        ; Restore second
SENDIT:  LD   E,H       ; Get second
         JP   PUTCHR    ; Send it
;
;**********************************
;*  CHARACTER I/O SUBROUTINES     *
;**********************************
;
GETSTR:  PUSH DE        ; Save buffer address
         LD   (DE),A    ; Set maximum characters
         CALL BUFFIN    ; Get input
         POP  DE        ; [DE] = Buffer address
         INC  DE        ; [DE] -> Chars received
         LD   A,(DE)    ; [A] = Chars received
         INC  DE        ; [DE] -> First character
```

```
                OR      A           ; Set Z80 zero flag
                RET                 ; Return to caller
;
CRMSGQ:         CALL    CARLF       ; Print leading CRLF
MSGOUQ:         JR      STROUT      ; Print string
;
CRMSG;          CALL    CARLF       ; Print leading CRLF
MSGOUT:         CALL    STROUT      ; Print string
CARLF:          PUSH    DE          ; Save possible string address
                LD      DE,CRLF     ; [DE] - >Return and linefeed
                CALL    STROUT      ; Go print them
                POP     DE          ; Restore any string address
                RET                 ; Return to caller
,
CRLF:           DB      0DH,0AH,'$' ; CR,LF, and termination
;
DIRIN:          :LD     E.0FFH      ; Direct console input entry
                CALL    DIROUT      ; Get character from keyboard
                OR      A           ; Get one?
                JR      NZ,DOCHAR   ; Yep, go process it
                LD      A,(LOOP)    ; No, get loop flag
                OR      A           ; Keep looping?
                RET     Z           ; No, return now
                JR      DIRIN       ; Yes, go try again
LOOP:           DB      00          ; Z = One pass, NZ = Loop
;
DOCHAR:         AND     7FH         ; Yes, strip any high bit
                CP      61H         ; Is it L/C?
                JR      C,CTRL?     ; No, skip conversion
                CP      7BH         ; Maybe, is it less than 'z' + 1?
                JR      NC,CTRL?    ; No, skip conversion
                AND     5FH         ; Yes, convert to U/C
CTRL?:          PUSH    AF          ; Save it for caller
                CP      20H         ; Is it printable?
                JR      NC,ECHO     ; Yes, go echo it
                CP      03          ; No, is it control-C?
                JP      Z,ABORT     ; Yes, then abort
                PUSH    AF          ; Save it again and...
                LD      A,5EH       ; ...Replace it with '^'
                CALL    ECHO1       ; Print '^'
```


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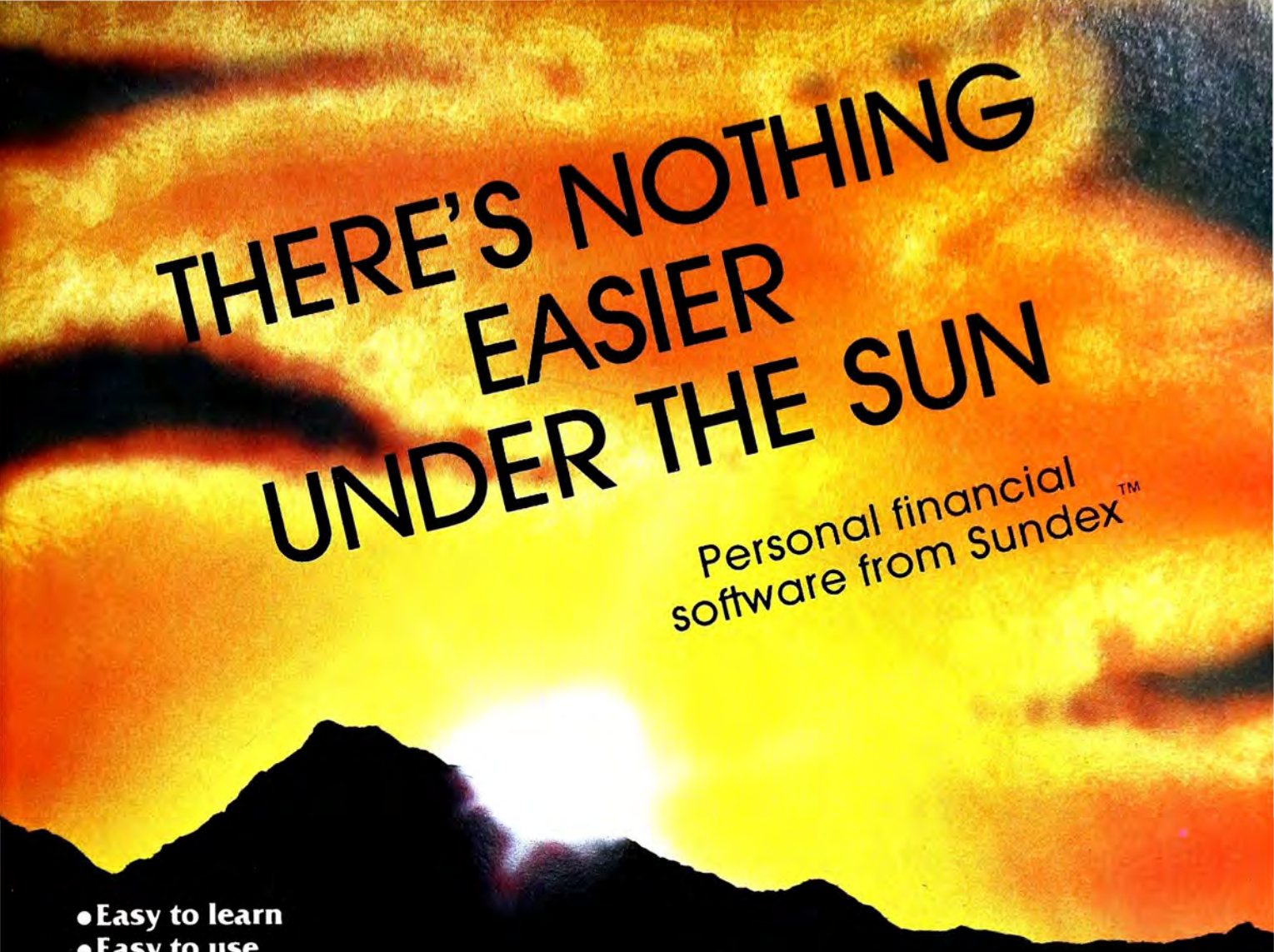
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```
                POP     AF          ; Get orig char instead of '^'
                ADD     A,40H       ; Make it U/C ASCII and...
                JR      ECHO        ; ...Go print it
;
ECHO1:          PUSH    AF          ; Init stack with dummy value
ECHO:           LD      E,A         ; Into [E] for DIROUT
                CALL    DIROUT      ; Send character to screen
                POP     AF          ; Restore char or dummy value
                RET
;
;*********************************
;*        BDOS SYSTEM CALLS      *
;*********************************
;
;------( CHARACTER I/O FUNCTIONS )------
;
STATUS:         LD      C,0BH       ; Console status function
                CALL    0005H       ; Call BDOS
                INC     A           ; 00 - > 01, 0FFH - > 00
                RET     NZ          ; NZ = No character, so return
GETCHR:         LD      C,1         ; Console input function
                DB      21H         ; Skip 2 bytes
PUTCHR:         LD      C,2         ; Console output function
                DB      21H         ; Skip 2 bytes
RDRIN:          LD      C,3         ; Reader input function
                DB      21H         ; Skip 2 bytes
PUNOUT:         LD      C,4         ; Punch output function
                DB      21H         ; Skip 2 bytes
LSTOUT:         LD      C,5         ; List output function
                DB      21H         ; Skip 2 bytes
DIROUT:         LD      C,6         ; Direct I/O function
                DB      21H         ; Skip 2 bytes
STROUT:         LD      C,9         ; String output function
                DB      21H         ; Skip 2 bytes
BUFFIN:         LD      C,10        ; Read buffer function
                DB      21H         ; Skip 2 bytes
GETIOB:         LD      C,7         ; Get IOBYTE function
                DB      21H         ; Skip 2 bytes
SETIOB:         LD      C,8         ; Set IOBYTE function
                DB      21H         ; Skip 2 bytes
;
;------( MISCELLANEOUS FUNCTIONS )------
;
RESETS:         LD      C,00H       ; Reset system function
                DB      21H         ; Skip 2 bytes
GTVERS:         LD      C,0CH       ; Get version numbers function
                DB      21H         ; Skip 2 bytes
SETUSR:         LD      C,20H       ; Get/set user function
                DB      21H         ; Skip 2 bytes
;
;------( DISK I/O FUNCTIONS )------
;
SELDSK:         LD      C,0EH       ; Select disk function
                DB      21H         ; Skip 2 bytes
RESETD:         LD      C,25H       ; Reset single disk function
                DB      21H         ; Skip 2 bytes
RESETA:         LD      C,0DH       ; Reset all disks
                DB      21H         ; Skip 2 bytes
GETCUR:         LD      C,19H       ; Get current disk function
                DB      21H         ; Skip 2 bytes
GETLOG:         LD      C,18H       ; Get login vector function
                DB      21H         ; Skip 2 bytes
GETALO:         LD      C,1BH       ; Get alloc vector function
                DB      21H         ; Skip 2 bytes
PROTEC:         LD      C,1CH       ; Wrie-protect disk function
                DB      21H         ; Skip 2 bytes
GETROV:         LD      C,1DH       ; Get R/O vector function
                DB      21H         ; Skip 2 bytes
GETDPB:         LD      C,1FH       ; Get DPB address function
                JP      0005H       ; Go BDOS, RET to caller
;
GETUSR:         LD      E,0FFH      ; E is flag for BDOS
                JR      SETUSR      ; Go via SETUSR call
;
```

Our discussion of the BDOS non-file-related disk functions is now complete and our subroutine library is up to date. Next time we'll continue this series and start on the file-related functions. So, until next month. . . . ■




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# Is the Software Industry Ripe for Representation?

BY HARVEY HARRISON AND MICHAEL FERRIS

Recently, a press release announced the formation of "a firm that will bring together software developers with publishers throughout the country," serving in "the traditional role of agent."

Along with change comes conflict.

More recently, in another press release, a software company president announced that software authors "don't have to go through third parties" to get their work seen. He termed agents "unnecessary."

The software business is changing from a cottage industry to a multi-billion-dollar business. A new, high-profile software house, for example, began operation by rounding up and contracting free-lance programmers to work for them exclusively. Almost in response, an established game design firm put all its house programmers under contract. A standard form has replaced the handshake.

As roles become more specialized and defined, a feeling of distance develops between companies and their past, their employees, and each other. The program designer is not a company, yet the demands of the marketplace require him to become more specialized too—and more excellent. That doesn't leave him much time to acquire the business savvy necessary for negotiating with experts. Consequently, unless they never sleep, software designers don't usually find the time to act as their own agents.

Whether perceived as necessary or not, agents are likely to become major factors in the buying and selling of programming art in the software-publishing business. A number of independent agents and agencies have already set up shop. The only reason the industry isn't booming with agents is money—there just isn't enough volume in home computer software to make large-scale agenting worthwhile. Yet.

But the situation is changing fast. As the software industry grows, it's acquiring "legs," as Variety says about a film with box office stamina. The motion picture powerhouses are intrigued with the software-publishing industry—and where these giants tread, agents follow. Agents are a fact of motion picture industry life.

**They Might Be Giants.** Everyone want to get in on the act. That's why Paramount Pictures/Gulf+Western owns Sega and Simon and Schuster (and its software-publishing division). That's why Warner Bros. created Warner Software and bought Atari. That's why MCA-Universal has entered into a development deal with Atari for interactive laserware. And that's why Columbia Pictures owns Mystar, formerly Gottleib. All these entertainment majors are gambling on one thing. When software makes it big they'll be in deep, pouring money, talent, and resources into interactive entertainment.

This disturbs some people. Some software publishing houses have such good relationships with their designers that reputation or references suffice to entice new programmers. This works quite well on a small scale, but as honest and direct as it is, word of mouth is likely to be superseded, or at least augmented, by a more complex, professional system as the industry grows.

Among the concerns publishers have are some that strike at the very heart of product quality. Although some publishers function almost entirely as manufacturers and marketers of finished programs, others put huge amounts of time and effort into developing, editing, and polishing products submitted from outside. A major publisher of consistently high quality programs declares that most of his company's products are only half finished when they're submitted to the company; some are no more than germs of ideas. Would the advent of the software agent deprive us of fine works produced this way?

Most publishers have deep objections to agents in general. Agents? Sure, they say. But always on the fringes of the business. Agents boost

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the cost of operations and put too much emphasis on money up front. The whole structure of software publishing would be shaken. These are strong opinions, and popular ones.

The temptation to use the strength of these convictions as justification for ignoring the issue is powerful—but it courts disaster.

Instead of ignoring the new code of behavior that agents would bring, publishers need to study it, learn its language, get a firm grasp of its mechanics so they can use it as an effective new tool—if they have to—and not be used by it instead.

Unless people in the software-publishing industry take the time now to consider what the tone of negotiations and sales efforts should be—and insist on some moral ground rules—the negative stereotype of the flashy, chain-draped movie agent could become a reality in the software business.

It doesn't have to be that way. If, indeed, agents are inevitable, then the industry would do well to seek out and welcome agents who are honest and enthusiastic—about the industry as well as their roles—and who are willing to bring their creativity, their ideas, and their expertise into a new arena. Then those unscrupulous, self-serving types who would "bow to the top and kick to the bottom," like bicyclists racing up a hill, may be discouraged from setting up shop.

# An Agent's Definition of Agents

It's easy to picture what most agents in the motion picture, television, and literary professions aren't. They aren't political snakes, ego vampires, or power mongers driven by fear, greed, and vanity. Those characters make good, colorful fiction, but they're bad descriptions of the business as it's generally practiced.

It's harder to grasp just what a good agent really is. Once that's perceived, however, agenting can be seen as a strategic art form.

Agenting is a full-time occupation, involving the cultivation of relationships, role-playing in negotiation, and keeping a finger on the pulse of the marketplace. It also entails being a guide, a kindred spirit, and, one would hope, a friend to the client. A good agent is one who believes that performers' and programmers' time is better spent doing what they do best than in the constant, dynamic interaction with potential buyers. All an artist should have to do is say, "I've poured my best energies into this work; please help me bring it to the world."

When a software designer is ready to pull a program out of the disk drive and submit it for publication, the situation can be scary as well as exhilarating. Confidence in one's work and creative support often make all the difference. Good agents are expert guides, like Indian scouts who see the tracks in the grass and know where the fresh ponies are. They care about and admire what the artist is trying to accomplish. They are on the artist's side, sharing in the vision, and they're ready to work hard to help get that vision published.

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Confidence and trust are critical to a constructive agent/client relationship, both in the beginning and as it grows. There's a question of commitment on the agent's part. While a client has only to say, "Yes, you can represent me," an agent's job is to attempt to provide that service and to get paid if successful.

A plumber or a lawyer has to ask only two basic questions before taking on a job: "Am I qualified?" and "Will the client be able to pay me?" A good agent asks those two questions and several others: "Do I like this person?", "Can I devote time to helping this person develop a career?", "Do I believe in this person as an artist, or is there at least a chance at financial success?", "Does this person listen?", and "Do I listen in return?" And, unlike plumbers and lawyers, who work by the hour, agents don't make a cent until a deal is drawn.

Even though agents don't sit at computers and write code, they may have some input into the creative process because of the commercial realities of distribution. They can rally support for a new programming concept or inspire a client to fill a need. And good agents approach their work creatively, not like a person trying to market shoelaces.

Shoelaces satisfy a material need; software—the product of the programming art—is different. A fictional hero in a game has a vague, indefinable value. As they say of philosophy, "It bakes no bread." What software can do is fulfill a vital aspect of the human experience, satisfying the more intangible cravings—the aesthetic, emotional, and spiritual needs. That's why a good agent is one who believes in his client's artistic output.

**Dealing in the Rain**. Creative marketing of an intangible such as a work of art calls for an agent to have many diverse talents and skills. These combine to build a reputation, one of the few things a prospective client can take into account when attempting to measure an agent's skill.

First, agents must know the buyers—the people in the industry to whom a client should be submitting material—and what these buyers want. More than just knowing what software publishers want, agents must be able to speculate as to what these companies *may* want or need. If an agent can argue persuasively for a need his client can fill, a deal might be made. This ability to form and act from an educated perspective is something all good agents have.

One way they get it is by knowing the marketplace—that ever-changing, mercurial arena of perceived public needs and desires. They must have the latest information on what is needed and who needs it, as well as on what people might not realize they need.

This kind of information is often gleaned from an agent's relationships with people in many capacities and companies—relationships in good standing, cultivated so that people will want to reveal things to an agent. As the needs of these companies are continually changing, it's imperative that an agent continue to be perceptive and alert.

When a software-publishing company admires a product, an agent's credibility is enhanced, whether the company buys the product or not. An agent's reputation for consistently good material means a company will be more inclined to call on him just to see whether a client has something new to offer.

Another thing good agents do is to follow up a submission with a phone call reminding potential publishers why a particular piece of software is good. In short, selling it. Selling software isn't selling shoelaces, and often hidden virtues must be explained. If an agent has a good track record, his opinion will be considered and even be instrumental to getting a program published.

**Speaking in Tongues**. While an agent's independent strength comes from knowledge of the marketplace, equally important is his ability as a negotiator. Understanding how a deal is negotiated is vital to understanding how agents really work.

One benefit agents offer both software designers and publishers is their ability to negotiate objectively and forcefully about a client's artistic output. Agents operate more persuasively because they aren't directly related to the product. With the client's best interests in mind, they can take positions in a negotiation that might leave a destructive residue on the relationship between a software designer and his publisher.

At times in a negotiation, the interests of the people involved in making the deal are in conflict. A good agent shields an artist from this, in the


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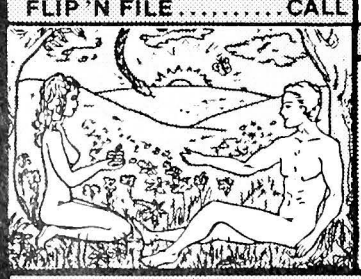
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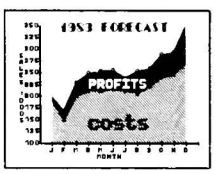
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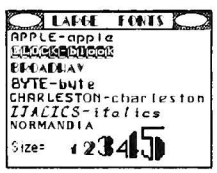
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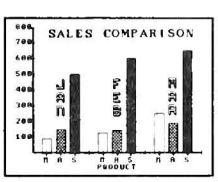

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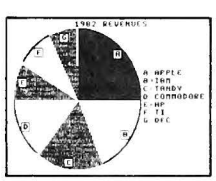
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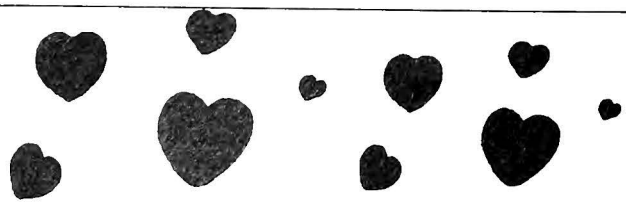



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belief that an artist should not be put in the position of having to defend the value of his work.

Just as agents must know what publishers and the public want, they must also know what sort of deals are being made. This will ensure that they neither overvalue nor undervalue their clients' work. A deal must be at least possible before it can be the best an agent can get, and good research will tell an agent where he stands.

The context of a negotiation is often defined by historical precedent. What a client has gotten in the past, what he or she is entitled to based on what others are getting, and similar issues are part of a thorough agent's research.

On another level, a negotiator's position is often determined by the ability and strength of his counterpart on the other side. Whether that agent can bargain independently or must check with a superior may be a factor. Whether a client's policy or order has set a price prior to the negotiations can also influence deal making.

Deal making is often celebrated in movies and the press but seldom understood by non-deal-makers. Real negotiating between reputable participants has nothing to do with extortion, and rarely involves yelling and screaming. It might even be termed "the art of applied ethics." Two of the concepts involved—the "ideal deal" and good agents versus bad—offer fascinating insights into human behavior.

All deals involve mutual advantage. Each side brings its own share of relative strengths into a negotiation. A publisher gets a piece of software it wants to distribute and a client gets his creation out into the real world. If a publisher desperately wants to publish the work of an author, the author gets more. If the publisher has to invest time and money promoting a risky, perhaps innovative work, the deal will involve less profit for the software designer.

**Lonely Are the Brave**. A deal may be humble or strong, depending on a combination of factors. A humble deal is made easily. In more complex deals, after the major points of contention are agreed upon, shadowy, unclear areas of negotiation emerge—subsidiary rights, for example, or system advances as a game is translated.

These gray areas may not seem to contain points that should obviously go to either side, and they must be carved up before the deal is signed. This is where an agent earns his keep. It's the job of a good agent to argue on behalf of his client for the most advantage in these areas, in an effort to obtain the best deal.

Often at this point, when negotiations are sailing, the negotiators get the feeling they are both working together to discover the deal that should be made. A fair deal is there; it's up to them to discover it. The path through the gray areas is cleared. They are collaborators, not opponents, and a deal falls into place by mutual effort.

It is at this point that a good negotiator will reach out to the other side and not hold back. A mediocre to poor negotiator can always cross his arms and say no. A brilliant negotiator knows when to drop his arms and say okay. A truly gifted agent knows when not to be afraid, when a deal is a good one, and when to say, "Yes, my client accepts."

Some of the most outstanding negotiators in the motion picture, television, and literary businesses are the most gentle and soft-spoken. Some are so good you don't even know you're negotiating with them. What may seem to be a casual conversation regarding "the business" may actually be a coherent foundation for what an agent is going to ask for. This is an example of elegant negotiating, and it's the best kind—the ideal.

**On the Dealfront**. The goal of a software agent—through being a good negotiator and getting the best possible deal—is ultimately to help bring a client's creation to the largest possible audience. The relationship is more likely to succeed when the emphasis is on the strength of the talent, not on the money that can be gained. If the artist and agent are right about the appeal of that creation, financial success is the side effect of doing the work. Ideally, an agent and an artist regard the talent of the artist as a resource they are custodians of, toward which they feel a responsibility. ◨

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*You don't expect a software agent to have earned a bachelor's degree in philosophy from Yale—summa cum laude, at that—but Harvey Harrison did. He justified a law degree from Stanford with a stint as an entertainment lawyer before opting for the life of a Hollywood agent—in his own style. When he closes his office door with a lascivious grin, it's to play a game on his Apple.*




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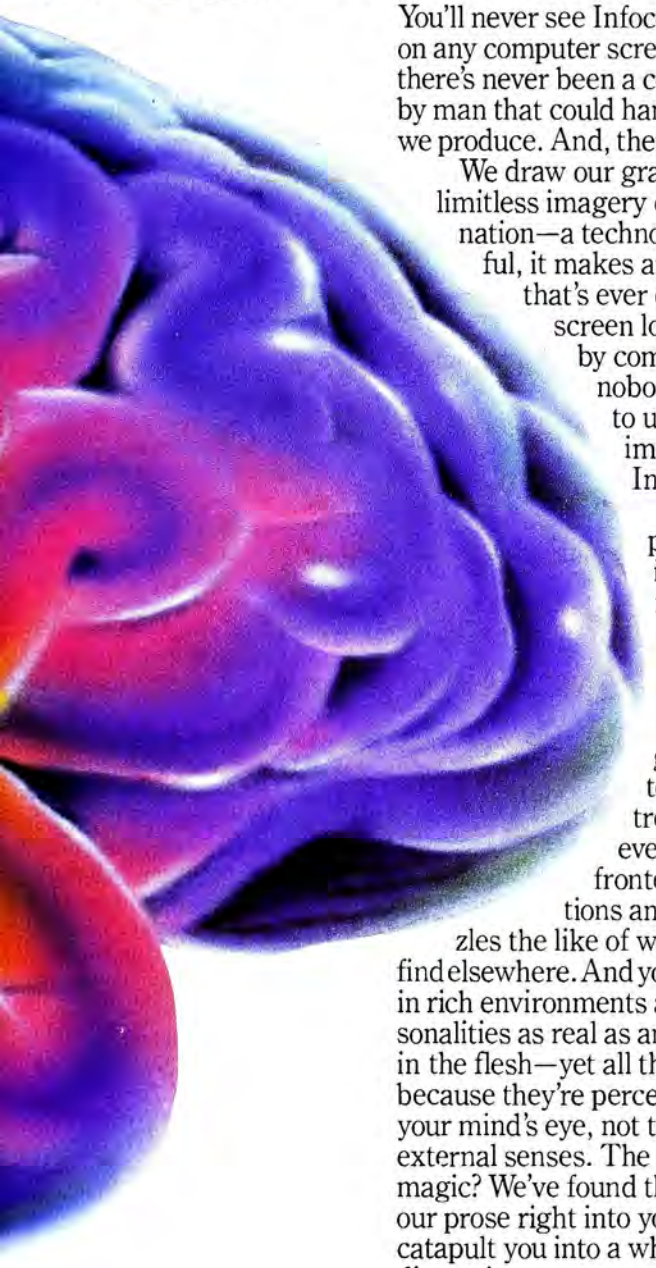
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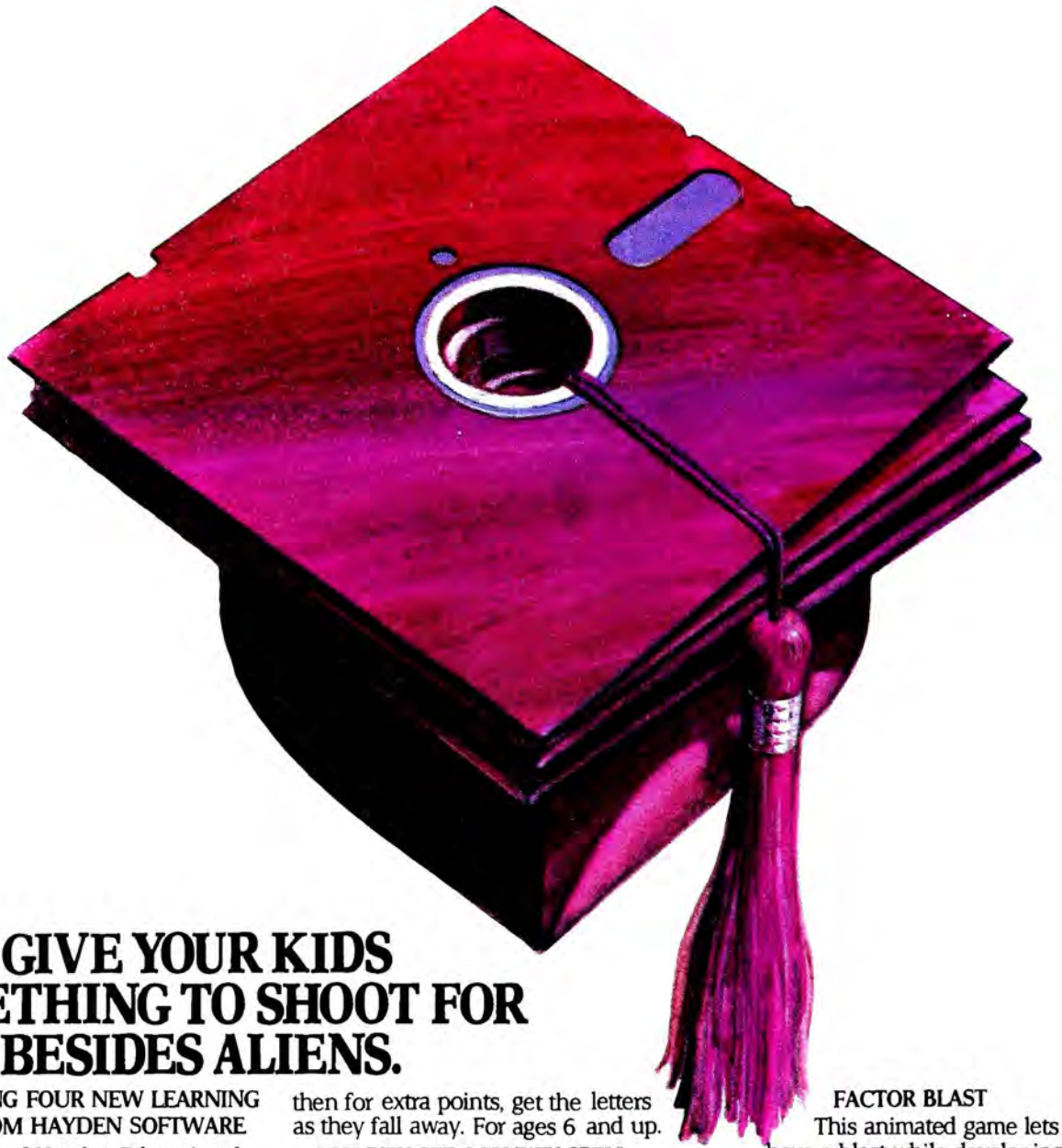
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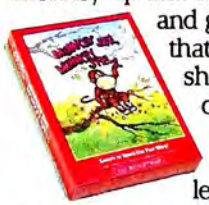
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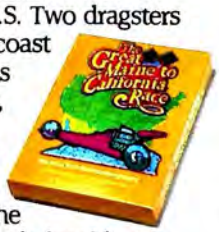

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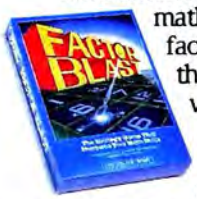
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BY JOCK ROOT

## A Silicon Pen Pal

Writing a letter to someone you've never met is tough without knowing something about that person: what he or she likes and dislikes, and how he or she thinks. You want to know what your correspondent is made of—how he or she is put together, inside.

When you write an assembly language program, you are writing a 'letter'' to the microprocessor, the integrated circuit in the Apple that directs the system's operations. This month we are going to introduce you to your ''correspondent'' and show you a little about how it is put together. The better you understand this little critter—the more you know about how it ''thinks''— the easier it will be for you to communicate with it and to explore its capabilities.

In previous columns we have described the microprocessor briefly, promising to cover it in more detail ''some other time.'' That time is now.

Note to experts: If you're an old hand with assembly language, you'll know much of this already. Even so, we may have some surprises for you, too. Did you know that the Apple is absolutely chock-full of bistable multivibrators (close to half a million of 'em)? Or that the microprocessor has a private bus of its own? Read on.

**How Does a Computer Think?** From a programmer's viewpoint, a computer consists of three main sections: logic circuits, memory, and input/output. The input/output circuits (sometimes abbreviated I/O) take care of communicating with the outside world. They input information from the keyboard, the game control port, and the expansion slots, and they output information to the screen, the speaker, and the expansion slots. In human terms, the I/O circuits correspond (approximately) to our five senses (input) and to our powers of speech and movement (output).

The memory circuits in a computer do much the same thing that our memory does for us. The computer's memory can store a sequence of instructions on how to do something: a program. In fact, the Apple's memory already contains many such sequences in the Monitor and the Applesoft interpreter. Memory is also used to store the data that will be modified by a program. After the program has worked on it, the modified data also goes into memory (before it is fed to the output circuits). Finally, memory is used as a scratchpad where the program can store intermediate results until it needs them.

The logic circuits represent the ''brain,'' or directing intelligence (the technical term is ''control logic''), of the computer. These circuits perform a simple loop over and over: read an instruction from memory (''What do I do now?''), interpret it (''How do I do that?''), and execute it (''It's done!''). The cycle is then repeated with the next instruction in the program, and so on until the program is finished.

Because it sounds like a very simple process, one might wonder how such a loop could handle the complex activities in a program like *VisiCalc* or *Wizardry*. Nevertheless, that's the way it works: The logic circuits simply read an instruction, interpret it, execute it, and then repeat the cycle. The cycle itself is very simple; what makes it so powerful is the set of instructions that goes with it—the commands of assembly language.

**The Microprocessor.** Most of the control logic circuitry is concentrated in a single integrated circuit: the microprocessor. This chip takes care of the cycle described above (sometimes called the ''instruction execution cycle''). In addition, it sends out signals that tell other chips what to do (and precisely when to do it), so their activities can follow the instructions in the program. The microprocessor is rather like the conductor of an orchestra or the caller at a square dance; it keeps all the other systems together, with each doing the right thing at the right moment.

We're going to study this little monster on two different levels. We want to open it up on a digital logic level and see how it does some of its tricks, but first we'll take a look at it from the outside, the way you're supposed to. We will examine what is called the ''programming model'' of the microprocessor: a group of registers and a set of rules for using them.

What is a register? Good question. The name comes from long ago—before computers, even before electronics. It goes back to the calculating engines of Charles Babbage in the last century (the first mechanical ''adding machines''). In those days, a register was a mechanical device that could *register* a number—in other words, it could display the number to the user and store it so the system could read it. A typical register consisted of a set of wheels or disks, each with ten numbers printed around the rim for the user to see and ten gear teeth or ratchet pins for the system to ''read.''

The registers, in those days, were the main working areas of the calculator—the places where numbers were held and manipulated by the calculations being performed (by turning the wheels forward or backward). And that's what registers are today—the places where numbers are held and manipulated by the program (although not displayed).

**Meet the 6502.** The microprocessor in your Apple is called a 6502. That's the manufacturer's part number for this particular integrated circuit. According to the manufacturer's (Synertek) literature, the programming model includes six registers. In other words, there are six numbers that you have to know about when you write programs for this microprocessor.

The most important of these is the *accumulator*—the main ''workbench'' or ''operating table'' of the microprocessor. This is

where a number can be examined, compared to another number, modified in various ways, and otherwise manipulated by an assembly language program. The name comes from the early register days; the accumulator was the register in which the answer gradually accumulated during a long series of calculations. Sometimes we call it the A register, or simply A.

More than half of the commands in assembly language apply to the accumulator, in one form or another. LDA and STA move data to and from the accumulator; arithmetic operations like ADC, SBC, and CMP operate on the number in the accumulator; while more exotic operations, like ASL and ROR, work fastest on the accumulator.

So what is an accumulator? You can think of it as an eight-bit storage element with connections. That is, it can receive an eight-bit number from any of several different places, hold the number while it's being worked on in various ways, and send the number on to any of several places. For example, it can receive a number from the keyboard, compare it to a number in memory, and send it to a place determined by the result of the comparison.

And what is an eight-bit number? It's a binary number with eight digits. If that sounds like gibberish, hang in there—we'll explain it before long. For now, you can think of it as any number from 0 to 255.

So far, our programming model consists of one eight-bit register, called the accumulator, which can hold a number from 0 to 255 and do various things to it. That's not a whole computer yet, let alone an Apple, but it's a beginning.

**X and Y Registers.** Next we have the *index* registers. There are two of them, with the charming names of X and Y. They're called index registers because they were designed to be used for indexing. And what is indexing? You can think of it as pointing to items in a list, as you might do with your index finger.

Suppose you have a list of numbers in memory and you want to look at the seventeenth item in the list. You stored the numbers in successive locations in memory, one after another; so the address of the seventeenth item will be equal to the address of the first item in the list plus sixteen. Thus, if you know where the first item is stored, you can find the Nth item by counting N-1 places from the first. That's how indexing works.

It will make more sense if we put in some real numbers. Let's say we store the first item in our list at memory address 1001, the second at 1002, and so on. Obviously, the seventeenth one will be at 1017. We can index into this list from the first item, at 1001, subtracting one from the number of the desired item and adding the result to 1001. But there's an easier way. If we call address 1000 the *base* of the table, we can index from there directly to the item we want (without using N-1, as we had to before). The first item is at base plus 1, the second at base plus 2, the seventeenth at base plus 17, and so on. That's the way indexing is normally done. Occasionally, there will be an item number zero, which would be stored at base plus 0.

In order to get the ninth item from the table, by indexed addressing, you could write LDX #9 (load the number 9 into the X register) and then LDA base,X (get the number at address base + X: since base=1000 and X=9, the number at memory location 1009).

The index registers are designed to be particularly good at counting. There are four assembly language commands—INX, INY, DEX, and DEY—with which you can make them count up (increment) or count down (decrement) one step at a time. These allow you to index easily through a list, examining one item after another, by repeating the following command sequence:

```
INX, LDA base,X
```

Other commands involving the index registers allow you to load the index registers with a specific number (LDX, LDY) or to copy the number in the accumulator into an index register (TAX, TAY). You can also store the contents of an index register in a memory location (STX, STY) or transfer it to the accumulator (TXA, TYA). Like the accumulator, the index registers are eight bits wide and can hold any number from 0 to 225.

There are several different ways of using an index register to form an address (the one we talked about, and others). You can also use the X and Y registers for tasks other than forming addresses (they're very useful as loop counters, for example). However, we'll have to leave a discussion of those for another article; this one has enough in it already.

And now our programming model consists of three eight-bit registers, called A, X, and Y. A is the accumulator, which does most of the work, and X and Y are index registers, which are used for indexed addressing (and other things).

**And Three More.** The other three registers in the 6502 programming model are called the *status register*, the *stack pointer*, and the *program counter*. These are quite different from the first three and fairly complicated to explain completely, but you don't need a complete explanation in order to use them. We'll leave the details for another time and just hit the high points.

The stack pointer is an eight-bit register, similar to X and Y. It simply holds a number for reference. The *stack* is a special scratchpad area in memory used for the temporary storage of information (think of a stack of trays in a cafeteria, piled one on top of another). You can put a number on the stack with a PHA command (short for push accumulator), and retrieve it with PLA (pull A). The stack pointer register automatically keeps track of where the top of the stack is, in memory, at any given moment.

The program counter is another pointer register. It holds a number that is the memory address of the next instruction in the program—the one that should be read and executed when the processor finishes the one it's doing. You don't usually have to deal with this register directly—the 6502 takes care of it automatically—but you should at least know that it's there. This is a sixteen-bit register, by the way (or, more precisely, two eight-bit registers tied together by internal logic), so it can hold a number from 0 to 65,536. This allows it to point to any address in the Apple's memory space, which includes more than sixty-four thousand separate addresses.

And finally we have the status register, which looks like an eight-bit register but doesn't behave like one. It's more like a set of indicators that show whether certain things have happened or not. It shows whether the result of a calculation was positive, negative, or zero; whether an arithmetic overflow has occurred; and various other things. These signals (often called *flags*) can be used to control branching within a program—but that's a story for another day.

At this point, our 6502 programming model looks like this: we have the accumulator, where most of the work is done; the X and Y registers, for indexing and loop counting; and the stack pointer, program counter, and status register, all of which we'll worry about some other time.

When we started to describe this programming model, we mentioned that a set of rules goes with it—rules for using the model. Does that mean that you now have to learn a whole new set of rules? No. There *is* such a set of rules, but they're not new; you know quite a few of them already, and you could learn the rest. The "rules of use" that go with the 6502 programming model are simply the commands of 6502 assembly language.

**How It Works.** Now that we know what the "outside," or programming model, of a 6502 looks like, let's take the cover off and see what's inside. Remember, the task of this system is to perform the "instruction execution cycle" over and over: Read an instruction from memory, interpret it, and execute it. How does it do that?

Last month, we covered the process of reading an instruction in some detail. The 6502 controls nearly all of the data transfers within the Apple, using a set of eight wires called the *data bus*. Each wire carries one bit of an eight-bit number, so the data bus can transfer a whole eight-bit number as a unit. The microprocessor sends out control signals that determine which circuits in the Apple can put information on the bus at any moment. Certain other circuits can also read that information (for more details, see last month's column).

Let's assume that the microprocessor has just finished executing an instruction and is ready to start on the next one. It looks in the program counter for the address of the instruction and sends out a call to that address to put its information on the data bus.

**Numbers and Voltages.** The instruction comes in as an eight-bit digital signal; that is, a pattern of high-voltage or low-voltage signals coming from the eight wires of the data bus. The "high" voltage is near the positive supply voltage for the system and the "low" voltage is near the negative supply, or ground, voltage. If we show the high voltage as "1" and the low as "0," it might look like this for the eight wires side by side: 00110011 (that's if the wires measured low, low, high, high, low, low, high, high, respectively).

That number, 00110011, is an eight-digit *binary* number. Binary numbers were around long before computers came along; they're useful in certain kinds of mathematics and logic. "Bi-" means two; in a binary

number, each digit can have only one of two values, either 0 or 1.

Computer people, as you have probably discovered, think in long, intricate, and convoluted sequences, so they tend to use abbreviations a lot. It wasn't long before "binary digit" was shortened to "bit." The Apple, with its eight-line data bus carrying binary signals, is thought of as an eight-bit computer.

When we write computer signals as binary numbers, we usually put a space in the middle, like this: 0011 0011. For one thing, it makes them easier to read, and for another it makes them easier to translate into *hexadecimal* numbers. Binary 0011 equals hexadecimal 3, so binary 0011 0011 equals hexadecimal 33, binary 0010 0001 equals hexadecimal 21, and so on (never mind why, for now—it works). To save space, we usually write computer signals in hexadecimal form, rather than binary, and we put a dollar sign in front of them to distinguish them from decimal numbers, like this: $33, $21.

To get back on the track, the instruction comes in as a binary number on the data bus. How does the microprocessor decode that into a series of actions? Mostly by switching things on or off inside itself—opening or closing certain pathways so data will flow from *here* to *there*. Take a deep breath and prepare yourself; we are going to take a quick trip through the mysteries of digital electronic logic—*switching logic*, as the buffs call it. This is what really happens. . . .

**Gates and Flip-flops.** All of digital logic boils down to two fundamental circuit types: *decision* circuits and *memory* circuits. Oh, there are other things—counters and adders and such—but they can be built out of combinations of decision and memory circuits. In fact, for our purposes only three types of logic blocks are important: one memory circuit and two decision circuits. We will think of them as logic blocks rather than circuits, because we don't need to know what the actual circuitry is like, only what it does.

For a memory element, we will use a *flip-flop*. This is a circuit that has two stable states: output-high and output-low. It can stay in either state indefinitely until it is reset by an outside signal. The odd name (which is a recognized technical term in electronics) comes from long ago, before digital electronics had even been thought of. The original version of this circuit was called a *bi-stable multivibrator* because of its two stable states, but that was too big a mouthful for everyday use, so it was shortened to flip-flop.

You can think of a flip-flop as a black box with three terminals (*black box* is another technical term from electronics; it means, "We don't care what's inside it, as long as it follows the rules"). We will call the terminals input, output, and update, and the rule of operation is this: The voltage at the output terminal will remain in its present state (high or low) until a signal is sent to the update terminal. When that happens, the output terminal voltage will be set to match the state of the input terminal at that moment, and it will remain in that state (regardless of any changes at the input terminal) until another update signal comes along. In other words, it remembers the state of the input terminal whenever it's told to do so by the update signal.

If you are into electronics, you will have noticed that we changed the terminal names a little. Our update signal is what you usually call the clock on a flip-flop, and our input is what you would call the data line. However, if we used those names here, they might get confused with the system clock and the data bus, which are quite different things (usually), so we changed them.

To summarize, our memory logic block is a flip-flop—a black box with three terminals and the following rule: The output terminal will "memorize" the state of the input terminal whenever it's told to do so by the update terminal, and it will "remember" that state until another update signal comes along. In other words, it will store one bit of data—one binary digit, 0 or 1—on command.

So much for memory. Now, what does a "decision-making" logic block look like? In its simplest form, it looks very much like a flip-flop—a black box with three terminals—but it uses a different rule of operation, and that makes it very different indeed. This kind of logic block is called a *gate*, because under some conditions it lets a signal pass, and under other conditions it blocks the signal.

We will consider two kinds of gates: and gates and or gates. They look the same from the outside, but they have different rules of operation. In its simplest form, a logic gate is a black box with three terminals: two input terminals and one output.

The rules of operation are just what you would expect from the names. With an and gate, the output is high if and only if both of the inputs are high (input 1 *and* input 2); with an or gate, the output is high if either one of the inputs (or both) is high (input 1 *or* input 2). Note that there is no memory factor here; the state of the output, at any moment, represents the state of the inputs at that same moment (theoretically, anyway).

There is one other type of logical block we should know about. It's called an inverter. This is the simplest black box of all; it has only two terminals, called input and output. The rule of operation is equally simple: The signal at the output is always the opposite of the signal at the input—1 in gives 0 out, and vice versa. Some people call this block a "*not* gate."

You now have the complete starter set for digital electronics: and gate, or gate, inverter, and flip-flop. We could build a whole computer out of those, but relax—we're not going to, not this time. We're only going to build a selector switch, with a few accessories.

**Building with Logic Blocks.** Here's an example of how these simple blocks can be fit together to make more powerful structures. This circuit will select one signal out of two. Suppose you have two digital signals (call them A and B), and you want to send them to a terminal (call it X). You can only send one signal at a time, but you want to be able to select which signal is being sent at any given time.

All you need is two and gates and an or gate. The circuit is shown in figure 1.

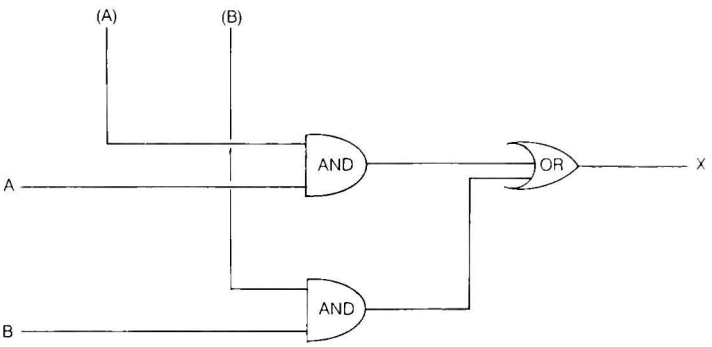



Figure 1.

The control lines are (A) and (B). If you want to select signal A to go to X, you simply send out a 1 on (A) and a 0 on (B). The output of the and gate connected to (A) will follow the input, the A signal, but the output of the other and gate will stay at 0, because one of its inputs (the control line) is 0. Finally, the output of the or gate will follow the A signal, because that's the only signal that gets to it; and the output of the or gate goes to X, thus delivering the selected signal to where we wanted it.

To select signal B, you make (B) high and (A) low. Note that only one control line may be high at a time; otherwise, two signals would be passed to X at the same time and would interfere with each other.

Let's build some more. If we put a flip-flop into our circuit, with its input at X, we will be able to store the state of A or B at any time. First make the chosen control line high, and then send an update signal to the flip-flop. Now we've got a one-bit memory cell, which can store a selected signal.

Now all we need is one little detail, and we will have a powerful structure indeed. We have a memory cell, with a data selector on the input. Let's put a data distributor on the output, so we can send the stored data wherever we want.

We'll use and gates again, with control lines (S) and (T) to select output lines S and T respectively. The flip-flop's output goes to one input of each gate, and the other input is the control line for that gate. The circuit is shown in figure 2.

The logic is almost the same as before. A 1 on control line (S) passes the stored data through to line S, as before, and a 0 blocks it. But on this side of the flip-flop it's okay to have both control lines high at once (the data is going to different places, so it can't interfere with itself).

Now we have a memory cell, with a data selector on the input and a data distributor on the output. Does that suggest anything to you? Think for a moment. . . .

What we have here, in essence, is a one-bit section of the accumulator.

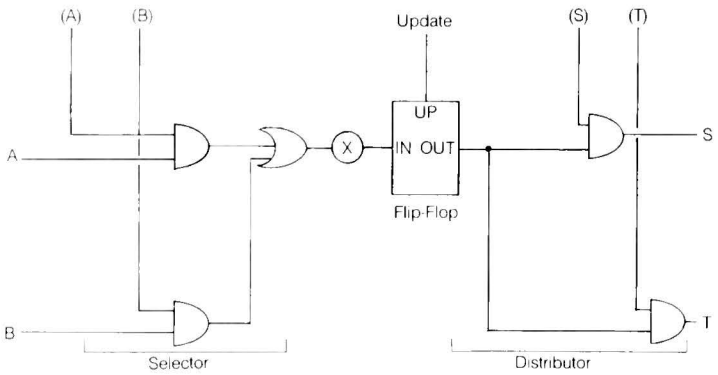



Figure 2.

**Building an Accumulator.** The accumulator, as you remember, is the main working register of the microprocessor—the place where you put things with LDA, add things with ADC, and so on. It handles information in eight-bit bytes (usually shown as hexadecimal numbers, but sometimes written as binary numbers) to represent the voltage levels in eight parallel wires.

The thing that makes the accumulator so important is this: It can receive data from many different places, it can manipulate that data in various ways, and it can send data to many places. It has, in effect, a data selector on the input and a data selector on the output. Already, you see, it looks a little like our one-bit model, and when we reveal its Great Secret (which we will in a moment), the resemblance will be perfect.

First, let's expand our model some more. Why should we stop with one bit? Visualize our circuit for a moment. Now take seven more like it from your imagination and line them up beside the first. Got that? Next, connect all the control lines having the same letter. This will make the system treat all eight lines as a single unit (one byte). Connect all the flip-flop update lines together too, for the same reason. Now our model is exactly the same as before, but eight bits wide—just like the accumulator.

And now for the Great Secret. You remember all that data manipulation that the accumulator is supposed to do—adding, comparing, shifting and such? Well, the accumulator doesn't do that stuff itself. It has a good buddy called the ALU (arithmetic/logic unit), who's a whiz at figures, so it sends all the problems to him, and gets the answers back over a private telephone line. The ALU doesn't show up on the manufacturer's programming model, because you can't control it directly with assembly language instructions (the 6502 itself controls it), but it's there nevertheless.

Now visualize our model again: the eight-bit-wide storage element, with an eight-bit data selector on the input, and an eight-bit distributor on the output. Take a set of eight black boxes from your imagination and mount them above the storage element in the model. These will be the ALU.

The model has a set of wires called S coming out of the output side. Connect these to the ALU. These are one-half of the private telephone system. The other half is the set of input lines called A. Connect these to the ALU, too.

That leaves one set of input lines, B, and one set of output lines, T. These must be connected to the internal data bus. Reach into your imagination again and pull out the ends of eight silver ribbons, side by side. The other ends disappear into the complexities of the 6502. They go to the X and Y registers, the program counter (both sections), and several other places. This bus takes care of internal communications for the 6502, just as the main data bus takes care of external communications.

Have you got all that? Good. That's what the accumulator looks like (approximately). It's an eight-bit storage element that can send data (in eight-bit chunks) to various other parts of the system and receive data from them as well. It also has a private line to the ALU, so it can (in effect) manipulate those numbers as well as hold them.

**Instruction Decoding.** Now that we have some understanding of digital logic, we can get back to the instruction execution cycle. We started out to see what happens as the microprocessor decodes an instruction, and now we have the tools to talk about it.

The instruction arrives in the form of an eight-bit digital number, a pattern of high and low voltages in the eight lines of the data bus. First, the microprocessor copies it into a special storage element called the instruction register. This is an eight-bit register whose only purpose is to hold the instruction currently being executed (it doesn't show up on the programming model for the same reason the ALU doesn't; it's under the control of the 6502, not the program).

This gives us a number—or, more precisely, a pattern of high and low voltages—in the instruction register. The information is copied in much as we described above. The microprocessor opens an eight-line pathway from the data bus (where the instruction is waiting) to the instruction register and updates the flip-flops of the register to store the instruction (actually, the pattern of high and low voltages). Then the 6502 opens a pathway from the instruction register to the instruction decoding matrix (a set of circuits built into the chip itself), where this particular pattern of highs and lows selects a particular combination of data moves and manipulations—the steps required to execute this instruction.

Next, the processor performs those steps (or sends out signals to make other circuits in the Apple perform them, if that's what the instruction calls for). All of this is automatic, controlled by the selection and distribution logic described earlier.

Finally, the 6502 consults the program counter for the address of the next instruction. The counter increments itself (adds one to the stored value) every time it is used, so it now points to the correct address for the next instruction.

And that (whew!) is all there is to it. Now you have an idea of what the Apple is doing when it runs one of your assembly language programs. ❑■





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# Where Is the Program That Can Print Every Way?

This column can be an ideal forum for exchanging ideas, suggestions, and gripes, questions about your printer and/or your word processor. If we can't answer a question (which will probably be the case), we'll post it here for someone else to try. You'd be surprised at how often someone out there runs into a brick wall that you have already managed to conquer. Now we can all share the answers. If you have any letters for this column, send them to Softalk Bull, Box 7039, North Hollywood, CA 91605, and be sure to state that the letter is for publication.

This letter, for instance, covers a lot of common printer/word processor problems:

I can't figure out how to center information on a printed page. The rules that work on the screen seem to be all wet on paper. That is, basing my computations on an eighty-character page is disastrous. I usually end up just doing trial and error, so I don't use the printer as much as I'd like to because it's too time-consuming. Also, when I use the double-strike mode, I find that it does not print double width for tabbing purposes. Is there a solution to my problem?

Another question: Is there a word processor that will allow the Epson to underline? Mine chokes every time I try to make it underline and just keeps going on the same line. Also, is there a word processor that will allow you to indent a second line of print without entering a return and another command? For example, when I'm typing enumerated paragraphs, I would like the second line to start under the first letter of the text, not the number.

Third question: I have noticed advertisements for a piece of hardware that will allow the Epson to print like a daisy wheel. If one were to install this card, would it interfere with the output of graphic software such as *Zoom Graphics*? Also, do you see any use for those devices that allow a finger touch to select the different print modes?
Linda Thede, Kalamazoo, MI

Answer:

We have received many letters asking the same types of questions you asked. Here's the straight scoop. The perfect word processing program, in terms of commanding the printer, doesn't seem to have been written yet. There is a real need for one that will allow you to enter any printer command code (like escape) into the text stream without ruining a justified (lined up evenly on the right side) margin. Figure 1 shows what most word processors do.

Here are two quick and dirty subroutines to center text on the printed page. One centers text in regular mode, the other in expanded mode. Once you get the idea, you should be able to extend the basic thought to other print modes and other languages. Although this demonstration is set for the Epson printer, by changing one CHR$ code (for expanded mode), you can easily adapt it for other printers.

Type this in and add the two routines at 50000 and 50100. Figure 2 shows an example of the program's output.

```
50000 REM CENTER A STRING (NORMAL MODE)
50010 REM THIS SUBROUTINE CENTERS THE STRING NAMED
      ST$ ON AN 80-COLUMN LINE
50020 PRINT SPC( (80 - LEN (ST$)) / 2);ST$
50030 RETURN
50100 REM CENTER A STRING (EXPANDED MODE)
50110 REM THIS SUBROUTINE CENTERS THE STRING NAMED
      ST$ ON AN 80-COLUMN LINE
50120 PRINT SPC( 40 - LEN (ST$));
50130 PRINT CHR$ (14);ST$: REM CONTROL-N TURNS ON
      EXPANDED MODE FOR EPSON
50140 RETURN
```

Here's a demonstration program that puts it all together:

```
100 REM EPSON CENTER TEXT DEMO
110 REM
120 A$(1) = "Your Name"
130 A$(2) = "The Street You Live On"
140 A$(3) = "Your City, State, and ZIP"
150 PR# 1: PRINT : PRINT
160 REM PRINT ARRAY IN NORMAL MODE
170 FOR I = 1 TO 3
180 ST$ = A$(I)
190 GOSUB 50000
200 NEXT I: PRINT : PRINT : PRINT
210 REM PRINT ARRAY IN EXPANDED MODE
220 FOR I = 1 TO 3
230 ST$ = A$(I)
240 GOSUB 50100
250 NEXT I
260 PR# 0
270 END
```

---

This line, which contains an **emphasized** word, is shortened by four characters, one for each printer command character that turns emphasis mode on and off (escape E, escape F).

This line, which contains an **emphasized** word, is not shortened by four characters, one for each printer command character that turns emphasis mode on and off (escape E, escape F).

Figure 1. A justified complaint.

# Apple's® new ProDOS™ is pro Thunderclock™

When Apple designed their new ProDOS operating system for the Apple II family, they included an important new function—the ability to automatically read a clock/calendar card. Nice touch.

It means that every time you create a new file or modify an existing one, the time and date are automatically recorded and stored in the CATALOG.

Now you can instantly know the exact time your files were last updated.

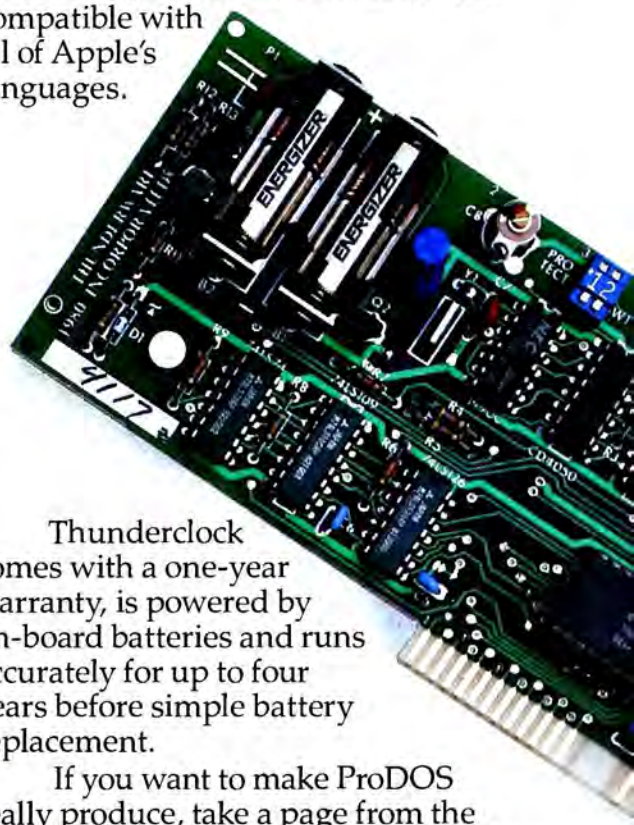
Apple could have chosen any clock for ProDOS to recognize, but they chose only one.

Thunderclock.

It's the only clock mentioned in the ProDOS manuals.

That's a nice stroke for us, but it's even better for you. Because, in addition to organizing your disk files, Thunderclock will add a new dimension to all the new ProDOS-based software. For instance, with business or communications software you can access a data base or send electronic mail automatically, when the rates are lowest. Even when you're not around. And that's just a start. The better you can use your Apple, the better you can use a Thunderclock.

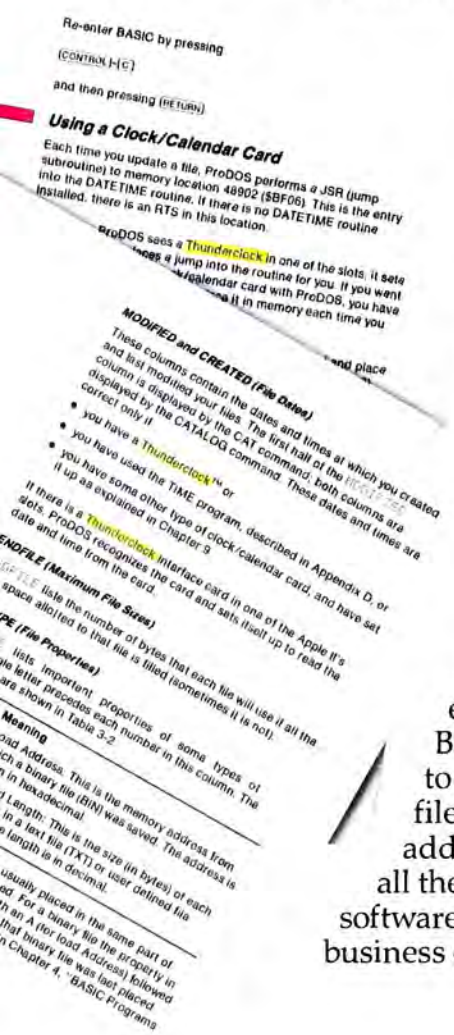
Thunderclock gives you access to the year, month, date, day-of-week, hour, minute and second. It lets you time intervals down to milliseconds and is compatible with all of Apple's languages.




Thunderclock comes with a one-year warranty, is powered by on-board batteries and runs accurately for up to four years before simple battery replacement.

If you want to make ProDOS really produce, take a page from the manual—get yourself a Thunderclock—the official ProDOS clock.

See your dealer or contact us.


Re-enter BASIC by pressing

(CONTROL)-(C)

and then pressing (RETURN)

**Using a Clock/Calendar Card**

Each time you update a file, ProDOS performs a JSR (jump subroutine) to memory location 48902 ($BF06). This is the entry into the DATETIME routine. If there is no DATETIME routine installed, there is an RTS in this location.

ProDOS sees a Thunderclock in one of the slots, it sets ...es a jump into the routine for you. If you went ...alendar card with ProDOS, you have ...it in memory each time you ... and place

**MODIFIED and CREATED (File Dates)**

These columns contain the dates and times at which you created and last modified your files. The first half of the CREATED column is displayed by the CAT command; both columns are displayed by the CATALOG command. These dates and times are correct only if

- you have a Thunderclock™ or
- you have used the TIME program, described in Appendix D, or
- you have some other type of clock/calendar card, and have set it up as explained in Chapter 9.

If there is a Thunderclock interface card in one of the Apple II's slots, ProDOS recognizes the card and sets itself up to read the date and time from the card.

**ENDFILE (Maximum File Sizes)**

...ENDFILE lists the number of bytes that each file will use if all the space allotted to that file is filled (sometimes it is not).

**TYPE (File Properties)**

...TYPE lists important properties of some types of ...he letter precedes each number in this column. The ...are shown in Table 3-2.

| Meaning |
|---|
| ...ad Address. This is the memory address from ...ch a binary file (BIN) was saved. The address is ...n in hexadecimal. |
| ...Length. This is the size (in bytes) of each ...in a text file (TXT) or user defined file ...e length is in decimal. |

...usually placed in the same part of ...ed. For a binary file the property in ...h an A for load Address) followed ...that binary file was last placed ...n Chapter 4, "BASIC Programs

Apple II ProDOS User's Manual

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```
Your Name
The Street You Live On
Your City, State, and ZIP

Y o u r  N a m e
T h e  S t r e e t  Y o u  L i v e  O n
Y o u r  C i t y ,  S t a t e ,  a n d  Z I P
```

Figure 2. Centered text, normal and expanded.

Now, as to your question about being able to keep expanded mode turned on while using the Epson htab command (escape D), there's good news and bad news. The good news is that the problem you found (it's actually a bug in the early Epson operating systems) has been corrected with Graftrax Plus; the bad news is that there is no way to do it with printers not equipped with Graftrax Plus (those with Graftrax 80, for example). If anyone else has discovered a way to do this, please let us know!

Your question about whether there are any word processors that allow underlining raises a good point. There should be some sort of printing standard for word processors to meet. Based on numerous complaints from users, here are some widely desired, and hence minimum requirements that a word processor should meet:

**Minimum Word Processor/Printer Standards**

1. The ability to enter any printer command character such as escape and CHR$(0) (null). Such characters should not throw off character counts, shorten lines, alter margins, or otherwise bewilder the program or the user.
2. The ability to italicize.
3. The ability to emphasize.
4. The ability to double strike.
5. The ability to use expanded-width letters and to automatically center such letters on a line.
6. The ability to use condensed-width letters and to enter as many letters as will actually fit on a physical print line without throwing off any margin settings or getting premature line breaks. Margins and widths expressed in inches rather than characters would be helpful.
7. The ability to underline.
8. The ability to subscript.
9. The ability to superscript.
10. The ability to use any of these features without having to give up any other ability or run a special printer program.

Word processor manufacturers, the offer still stands: If you have a word processor that can meet these necessary and highly desired standards, send the author a review copy care of *Softalk*. You will receive the strong recommendation (and sales) that you so richly deserve.

*Super-Text* has a pretty easy way of underlining words: You just press control-W after typing in the word you want underlined. The control-W is embedded in the text (on an eighty-column display it looks like the corner of a square), and during printing the control-W tells *Super-Text* to underline the previous word (the control-W is not sent to the printer). It (the old version, at least) is not perfect, however; it has some real problems if the word to be underlined is at the left margin or if the phrase to be underlined is too long.

*Apple Writer II* allows you to turn underlining on and off by inserting a backslash character (\) before and after the part to be underlined. Unfortunately, there are drawbacks to this method. On the II Plus, which has no backslash key, you have to use a glossary file to get this character at all. Since this program was originally written for the II Plus, it would seem that underlining was only included as an afterthought.

On the Apple IIe, the backslash key is there, so the backslash is readily available. In either case, you'll run into problems if you ever actually want to print a backslash, for instance in a description of underlining on *Apple Writer II*.

Those considerations aside, there are two somewhat more serious problems with underlining in *Apple Writer II*. The first is that the backslash counts as a character and is printed as a space. This isn't just an odd way of doing things; this is clearly a bug. It's most noticeable when you want to underline a word that appears before a punctuation mark, such as a comma. Either you have to underline the comma as well as the word, or you have to live with a really awkward space before the comma.

The other problem is common to many word processors. In order to underline, *Apple Writer II* prints the character, then a backspace, then the underline character. Unfortunately, some printers can't backspace. Oh, well.

As a general piece of advice, you should note that the problem in underlining usually pops up in the printer configure program that most word processors make you run before you can use the program for the first time. Somewhere in the configure program you will find a question asking you what the backspace character is for your printer. The problem here is that many word processor authors fail to understand that some dot-matrix printers (such as non-Graftrax Plus versions of the Epson) cannot backspace to perform underlining. As a result, the backspace characters sent to your Epson have no effect and the underlining takes place on the paper after the word is printed!

The solution, if you have one of these word processors, is either to upgrade your Epson to Graftrax Plus or to find a word processor that underlines in another way. One possibility is to print a line, suppress the line feed, and then overstrike the underline character under the desired word.

Another good approach is taken by Quark Engineering's *Word Juggler*, which, unfortunately, is only available for the Apple IIe or the Apple III. Many printers, the newer Epsons among them, have an underlining mode that is activated and deactivated by escape or control commands. Inserting those characters into the text of most word processors is difficult and tends to throw off the right margin, but there's no reason why the word processor itself couldn't interpret its own underline command into these characters. This usually results in a better-looking underline than the backspacing method, and it seems to be less abusive of the printer.

This method of underlining requires that the word processor know which printer is being used and which commands tell the printer how to do its stuff. *World Juggler* does this with printer drivers, and includes drivers for most printers.

*Word Juggler* uses a similar method for doing boldface, superscript, and subscript with printers that can do those things. It is unfortunate that it doesn't take into account the printers that can do italics.

The automatic indentation you would like to do is called hanging indentation by typesetters and copy editors. Most word processors can do this fairly easily. With *Super-Text*, pressing control-J while typing text will put a "justify" marker in the text stream, which causes a hanging indent at that column until the next return is encountered.

*Apple Writer II* can do hanging indents also, but it doesn't really say so. What you have to do is set a negative value for the paragraph margin (which is really a paragraph indent). To get the "outdented" line to line up with the normal left margin, you have to reset the left margin at the same time. Assuming that your left margin is usually set to ten, here are the commands to embed if you want to tell *Apple Writer II* to hang indent five spaces:

```
.LM15
.PM-5
```

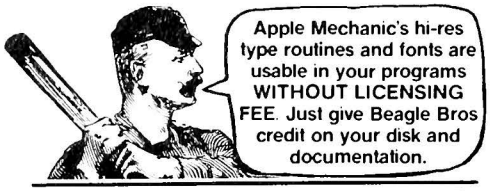
and these commands will return things to normal again:

```
.LM10
.PM0
```

Admittedly, this is a little awkward.

*Word Juggler* has a good way of handling this problem, too. It's similar to *Apple Writer II*'s approach, except that it assumes that anyone who wants to indent their paragraphs will do so by hitting the tab key or typing five spaces. Its equivalent of "paragraph margin" is called indent and lets you expect a positive number instead of a negative number. Also, it doesn't require you to reset your left margin.

As for a hardware card that allows the Epson to print like a daisy wheel, you should be very careful about this sort of thing. These products typically work by printing a line as dot image graphics, usually in high density and with two passes per line. As a result, they are extremely slow and a little crude. Compare a sample output from the card in question and from a real daisy wheel. Some people "get by" with the card-produced text, but you may find that the curves are just a little too ragged for your purposes. Judging by the way printer prices are dropping, you may come out ahead by just buying a low-cost daisy wheel and not have to worry about graphics incompatibility. ◨




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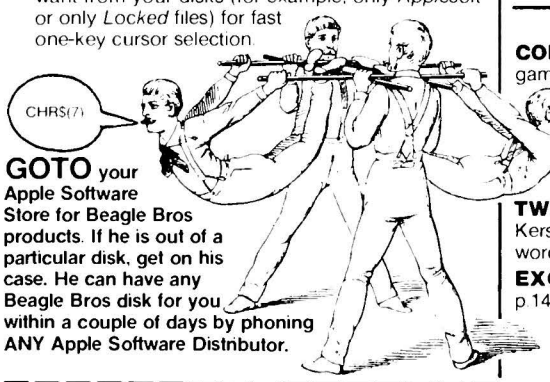
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# BEAGLE BAG

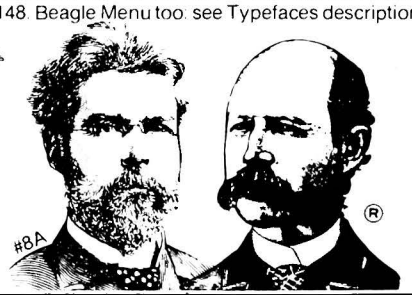
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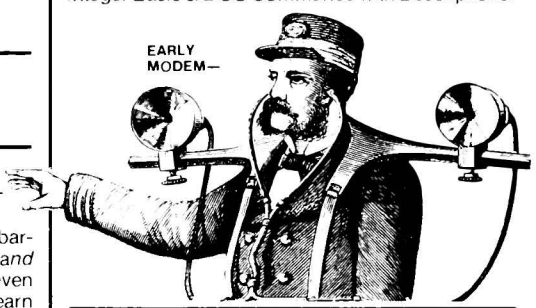
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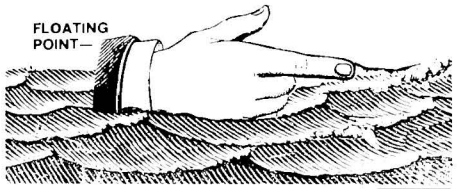
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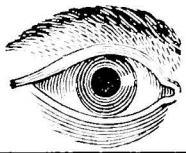
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```
1 FOR S=768 TO 773: READ A:
  POKE S,A: NEXT: POKE 232,0:
  POKE 233,3: DATA 1,0,4,0,5,0
2 HGR2: FOR R=0 TO 192: ROT=R:
  SCALE=96: XDRAW 1 AT 140,95:
  SCALE=30: XDRAW 1 AT 140,95:
  S=PEEK(49200): NEXT: RUN
```

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|---|---|---|
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| LOAD 60-SECTOR PROGRAM | 16 sec. | 4 sec. |
| SAVE 60-SECTOR PROGRAM | 24 sec. | 9 sec. |
| BLOAD LANGUAGE CARD | 13 sec. | 4 sec. |

(Text Files: No Change)

Boot the Pronto disk or your updated disks, created with the normal INIT command. Compatible with all DOS Commands, GPLE, Double-Take, DOS Boss, DiskQuik and almost all unprotected programs.

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# Mind Your Business

BY PETER OLIVIERI



Welcome to February! There's so much happening in the land of computing that it's almost impossible not to feel a sense of excitement. Just stop and think about the new products that have been revealed recently. Among them are a mouse for the Apple IIe, a IIe hard disk, an integrated software package for the III, "window manager" software that allows you to view several programs or documents on-screen simultaneously, and packages designed specifically for the Lisa.

**Better Business.** Which business system best suits your needs? Is it the Apple IIe, the Apple III, Lisa, the Macintosh? Some businesses really need the power and versatility of a Lisa, while others can manage quite easily with a IIe. Where does your business fit? The only way you'll know which system is right for you is by being as specific as possible about your needs. How much main memory do your applications require? Do you need a hard disk? What type of printer is best for the work you do?

For many users, the first machine will not be the last. The rate of technological change in the microcomputer world is just too fast to keep up with. That's why, at various times in this column, two possible system-buying strategies have been suggested:

1. Buy a system that you know will do the job you want done and do it adequately for the next two to three years. Realize when you buy that in a couple of years you'll most likely want to move up to a newer system.

2. Buy a system that you know is expandable, one that will grow with your needs. Even if you adopt this strategy, you'll likely find yourself changing systems within the next five years. Recall what happened in the calculator market a few years back and consider what's happening now in the video cassette recorder market and you'll have some notion of what's ahead in the microcomputer market.

**How To Proceed.** What's probably going to happen is this. Machines will get cheaper. Software will be of the integrated variety. There will be fewer (and better) software vendors. Soon, the standard business system will come with at least 256K, a hard disk with at least ten million bytes of storage space available, a letter-quality friction-feed and tractor-feed graphics printer, a built-in modem, a color display device, and a self-contained integrated software package. This standard package will consist of a spreadsheet program, a graphics program, word processing, telecommunications capability, and a database management system. It may even include applications for the major functional areas of a business (accounts receivable, accounts payable, general ledger, payroll, and so on). Soon, all business systems will have about the same hardware configuration. And at that point the quality and prices of individual systems may become the determining factors in your buying decision.

**Back on the Database Trail.** If you've been following along, you know that we've been discussing database management systems lately. In fact, if you've done your homework and used last month's table as a guide, then by this time you've probably homed in on some packages that might meet your needs and eliminated others that don't make sense for your situation.

The next task is to determine what particular package most closely fits your requirements. Frankly, you're likely to have identified a number of good candidates. With so many contenders, detailed reviews of each program would require a year's worth of columns. Therefore, in the interests of space and timeliness, the best we can do here is to outline the characteristics of the various programs and describe the types of users most likely to use particular packages.

**Sorting It All Out.** The fact that there are so many database management packages around suggests that it would be a good idea to establish a system for dealing with them and a way of classifying them. To begin, let's agree that terrible packages will not rate any of our time. Next, let's put all database programs into one of three categories: those seeking to emulate the more sophisticated database management systems usually found on much larger machines; those appropriate for small-business use but lacking the advanced features of the more powerful systems; and those appropriate for maintaining relatively small files either at home or at the office.

If we were to use this system to classify the database managers we've been examining in the course of the last few columns, here's where the various packages would fall: Level 1—*dBase II*, *DB Master*; Level 2—*Datafax*, *VersaForm*, *General Manager*, *VisiFile*, *Data Factory*; Level 3—*PFS*, *Quick File*. This is not meant as a ranking; rather, it's a categorical breakdown that may make it easier for you to determine how sophisticated various programs are.

**Some Old-Timers.** If you keep track of *Softalk*'s Business 10 and Top Thirty, you're no doubt aware that certain packages are regular residents of these lists. Among databases, *PFS:File* and *DB Master* have been regulars, and *Quick File IIe* is a recent repeater. People have voted for these programs via their pocketbooks, so you can be fairly certain that these are quality products with good performance and helpful documentation. They simply wouldn't be able to maintain their standings in these lists if they weren't.

Let's consider two of these old-timers now, *PFS:File* and *DB Master*.

***PFS:File***, Software Publishing Corporation.

System requirements: 48K Apple II, II Plus, IIe, or III, one disk drive. Optional (and recommended): a printer, *PFS:Report*.

**Who Would Use It.** Almost anyone can use *PFS:File*. Teachers use it to keep records of grades, children use it to keep track of their coin collections, and small businesses use it to maintain their customer files.

*PFS:File* takes about an hour to learn and comes with one of the most readable user manuals around. Although the Apple III version is compatible with a hard disk, this program is really not appropriate for large files (files containing more than about a thousand records). A companion product, *PFS:Report*, is really a necessity if you want to make full use of the database you've designed. As you probably know, Software Publishing Corporation makes a whole series of products to work with this database manager. One of the nicest of these is *PFS:Graph*.

The PFS system does have some limitations. To begin with, it does not have a sophisticated sorting capability. Neither does it allow for a lot of creativity in the design and creation of reports. And you're allowed only one file per disk in this system, regardless of the file's size.

Despite its limitations, PFS will be the absolute first choice of many computer users. If you can get by with relatively small data files and you don't need a lot of fancy reports, give *PFS:File* a try. It's a great "first" database management system; in fact, you just may be surprised at how quickly you become an expert PFS user.

***DB Master***, Version 4, Stoneware.

System requirements: 64K Apple II, II Plus, or IIe, two (or more) disk drives. Optional (and recommended): a printer.

**Who Would Use It.** *DB Master* is a sophisticated and thorough database management system that begins to provide some of the features normally associated with mainframe systems. If your files are small, or if you want a program that you can get up and running in just a few minutes, *DB Master* is not for you. But if you're willing to invest some time in learning about database management systems and in learning to use a package, *DB Master* should be one of the top contenders.

If you're a *PFS:File* or *VisiFile* user, you might be interested to know that *DB Master* has a utility program that will convert files from these programs into *DB Master* form. So if your file processing needs have outgrown the other systems, you might consider going to *DB Master*. The conversion process is relatively simple.

**What's New or Noteworthy about *DB Master*.** Version 4 of this excellent package offers some significant improvements over its prede-

cessors. In particular, the program's user guide has undergone a major revision. As you may recall, when we talked about the original *DB Master* manual in this column, our comments were not favorable. The package was super, but the manual was quite difficult to follow. Not so the new version; this manual's great. Be advised: It's no shorter than before—there's a lot to learn about this package—but the quality of the writing, topic organization, and illustrations is markedly improved. Owners of earlier incarnations of the program can obtain the new version by sending Stoneware the difference between the retail prices of versions 3 and 4.

Among the changes in the new version are enhanced processing speed, reusable sort disks, longer field lengths, the new user guide, improved report generation capability, and a new Quickguide reference.

The new documentation includes a section on file-design guidelines, information that seems to be missing from most other database management packages. Only rarely do packages attempt to teach users something about the principles involved in designing a file of information. As a result, although people have managed to use various database managers, they have often used such systems incorrectly. This is due more to users' lack of experience at using files than to any real deficiency in the packages themselves.

The worksheets accompanying the new *DB Master* are especially useful, allowing users to lay out what screens will look like and to design on paper how reports will look. These worksheets can be tremendously helpful when it comes time to build the actual files.

An additional feature is the availability of utility packages designed to enhance the sophistication of this database management system. These "extras" can be used to translate DIF files, merge files, recover damaged files, print labels, conserve disk space, provide file statistics, and do a variety of statistical analyses (mean, standard deviation, t-tests, Mann-Witney, ANOVA, Chi-square, correlation, and linear regression).

**B.U.G.s Helping B.U.G.s.** Whether you're looking for a database management system, a word processor, a graphics package, a spreadsheet, or a utility program, the search for useful software is too often a long and lonely one. Fortunately, business user group members can help one another to identify potentially useful programs. Doing your part is as simple as listing your favorites in these categories on a post card and sending them in. The premise here is that finding out what programs people are using and liking should help us locate software that's worth learning more about.

**For Your Bookshelf.** The subject of DIF files, which has come up in at least four previous columns, is clearly one that Mind Your Business readers are interested in knowing more about. As a lot of you know, DIF (Data Interchange Format) is a file format allowing for the exchange of data between programs. In effect, the DIF format enables programs to communicate with one another; it's especially useful if you want to take advantage of several different packages and yet keep only one set of data. (The availability of the DIF format may also be an important consideration when you're ready to upgrade to a more powerful database management system.)

An excellent book on the DIF file format is Donald Beil's *The DIF File: For Users of VisiCalc and Other Software* (Reston Publishing, Reston, VA). The book begins with a detailed, yet not overly technical, discussion of what the DIF format is and why it's used. The next several sections of the text show how to use DIF to transfer data back and forth between programs. Data interchange between various programs, including *VisiCalc* and *VisiTrend/VisiPlot*, *VisiCalc* and *PFS:Graph*, and *DB Master* and *Executive Secretary*. It also explains how to translate DIF files into files that can be used with *1-2-3* and *TK!Solver*.

This clearly written book works as both a practical guide and a reference manual. Among its features are a tutorial on the DIF format, case studies that clearly demonstrate the file-exchange process, a discussion of limitations the user must know about, an extensive bibliography of DIF-related articles, and a comprehensive listing of products that use the DIF format.

**Popular Lisa.** The Lisa is becoming more and more popular as a microcomputer for business. Recently, various companies have released products specifically designed to take advantage of Lisa's advanced capabilities. One such product is *Art Department*, written by Business and Professional Software and available through Apple Lisa dealers and from BPI (which recently acquired BPS).

*Art Department* is a library of images designed for use by business people who generate presentations on the computer. This computer-generated "clip art" system works with *Lisa Draw*, taking advantage of such features as sizing, on-line customization of images with graphics or text, the ability to change shading or select portions or groups of images for presentation.

*Art Department* offers twelve general categories of illustration: maps and flags; an extended alphabet; arrows and accent marks (including curved arrows); business symbols (office equipment, modes of transportation, poses of people at work, and so on); decorative features (various borders, and so on); demographics (age, income, occupation, possessions, and so on); dotted lines and shapes; everyday life symbols (in the home, outdoors, travel, recreation); people and other living things; standard graphs and axes, graph paper; standard forms (calendars, invoices, statements); and symbolic images (traffic signs, images of thinking, time, and so on).

The availability of such an extensive library of symbols makes it possible to enhance business reports and demonstrations. At $150, this program provides a valuable addition to the graphics capability of an already outstanding microcomputer system.

**Watch This Space.** Even as this column is being written, additional database systems are arriving for review. We'll soon get to these. Next month we'll look briefly at *dBase II*, and shortly thereafter we'll consider *filePro* and *MultiTrieve*.

By March, it will also be time for a change of pace, so we'll shift our focus to discuss business graphics packages and generalized graphics packages, as well as graphics devices. In addition, we'll look at some speed-reading packages that can help you wade through that mountain of paperwork on your desk and actually get to those articles you've been meaning to read. And isn't doing a better job of keeping up on important reading one of every manager's dreams? ■

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*BPI Systems, 3423 Guadalupe, Austin, TX 78705; (512) 454-2801. Software Publishing Corporation, 1901 Landings Drive, Mountain View, CA 94043; (415) 962-8910. Stoneware, 50 Belvedere Street, San Rafael, CA 94901; (415) 454-6500.*






# BY TOMMY GEAR

**A Sense of Vision.** *Softalk* first introduced Louise Rude to readers in November 1980. "When I first lost my sight," she recalled then, "I experienced the panic and despondency that I've since found to be shared by all the newly blind." With the onset of her handicap she felt compelled to resign her job, ending a twenty-year career as an account executive on Anchorage, Alaska, newspapers.

Today Louise Rude is in her sixties and going strong, in a new career as an advocate for blind and sensory impaired persons. In particular she is excited about the possibilities that microcomputers open up to the visually handicapped.

At the time *Softalk* profiled her, Rude was working for Anchorage ophthalmologist Dr. Kenneth Richardson, in a job for which Richardson chose her because of, not in spite of, her blindness. He wanted Rude to assist in dealing with sixty to seventy patients each day, scheduling appointments, answering questions, and calming whatever anxieties they brought with them.

"It's because you are blind that I want you," Dr. Richardson told Rude at the time. "You will hear the patients."

As Richardson's assistant, Rude used an Apple through a pegboard system with paper tape headers in Braille to keep track of appointments. Later, using the Apple II, paddles, and a SuperTalker from Mountain Computer, Richardson was able to create a software-based talking calendar, scheduler, and database for Rude to work on. The system enabled Rude to search for open appointment times, check on and type in patient names and notes, confirm or cancel appointments, and inform patients of any schedule changes. As Rude typed in words on the keyboard, the Apple responded, via the SuperTalker, by speaking each letter as it was typed.

Today, Louise Rude is a full-time volunteer at the National Federation of the Blind in Alaska. Prior to joining NFB, she and others founded the Louise Rude Sensory Impairment Center, a rehabilitation center for the visually and hearing impaired. Rude attributes the center's bearing her name to what she describes as her big mouth. "I suppose I just made the most noise," she admits.

People from all over Alaska come to take advantage of the services and facilities of the center. They learn job skills and alternative methods of communication. One of the most important parts of the center is its dormitory for the newly blind. Living in such a setting with other newly blind people is the best and quickest way for a person to adjust and learn to be independent.

"The major hindrance to a newly blind person's learning to get along in his new state is kindly families and friends who won't let him try his wings. One of the toughest things for a newly blind person, after accepting the blindness, is learning to do things the blind way and not the way he used to do them when he could see."

In her work with the NFB and in her various occasional consulting jobs, certain key issues relating to the rights of the sensory impaired and other handicapped people emerge. Primary among Rude's concerns are employment and education for the blind—areas in which she believes microcomputers will have a large part to play.



Louise Rude is a fulltime-volunteer at the National Federation of the Blind in Alaska.

Unemployment or underemployment of blind people in America runs around 70 percent. Rude hastens to point out, in Alaska alone there are blind mechanics, doctors, stenographers—the loss of sight doesn't also necessitate the sacrifice of a vocation. If she had only possessed this conviction at the onset of her blindness, Rude believes she might still be employed in the newspaper business. "Doing that job without sight would have been no problem, if I'd known how," she reflects.

Rude is excited about the development and greater availability now of peripherals to assist blind users of micros. She believes any job that uses a computer as an essential piece of equipment can now be successfully filled by a blind person who has access to such peripherals as a speech synthesizer, the VersaBraille System from Telesensory Systems, the Cranmer Brailler, and software like *Braille-Edit* from Raised Dot Computing.

Employment rights and job discrimination are a principal focus of the advocacy work for the visually handicapped undertaken by the NFB. Rude's work with the NFB involves lobbying for legislative efforts that will give incentives to employers in the development of job opportunities based upon fair hiring practices. Each year delegates from the NFB go to Washington, D.C., to visit senators and representatives and attempt to enlist their support.

Of particular concern is the practice by the National Labor Relations Board of issuing waivers to employers enabling them to run "sheltered shops." These waivers make it possible for employers to pay blind and other handicapped people substandard wages for production work, often with federal government contracts and support.

"Anybody who is doing productive work should be paid at least a minimum wage," Rude emphasizes. "That's one of the things we fight for."

Excited and optimistic, Louise Rude praises the recent success of the federally funded Job Opportunities for the Blind (JOB) program, which acts as a national clearinghouse to put unemployed blind people together with employers in need.

Another project she's enthused about involves micros, but so far it's still just a dream she would like to help become a reality. It seems that Alaska's climate and the genetic make-up of some native Alaskans have resulted in an especially high incidence of blindness in Alaska. Rude would like to see a microcomputer manufacturer donate machines to schools throughout Alaska. She believes that micros will make a decisive difference in the education of the blind and visually impaired in schools.

One of the greatest problems that members of any minority have to deal with is the fact that others tend to see all of them as alike. Rude believes that the problems this notion causes can best be overcome in the educational setting, through micros and the individualized learning they could make possible.

She hopes to see Alaska become a proving ground and showcase for what micros can contribute to the lives of the visually handicapped.



Lotus Development's Mitch Kapor: "Mac's strengths are its price and performance."

Two years ago, the personal computer software industry was in flux. Just as the pundits of eight-bit software started to score big, a whole new game burst on the scene—sixteen bits. Once IBM made its move, the industry changed, though not exactly overnight. Increasingly, however, programmers and software publishers "moved up" into sixteen bits, collectively proclaiming that the "eight-bit world is dead."

Today, both the hardware and software industries may be on the brink of another technological "step up"—this time to thirty-two bits. Experience tells us that neither eight-bit nor sixteen-bit machines will suddenly become obsolete. But a taste of the future is here now. First Lisa and now Macintosh are the harbingers of a new age in personal and business computing.

When *Softalk*—comfortable with its unshakable allegiance to the eight-bit 6502 processor—profiled Mitch Kapor and his newly formed Lotus Development Company in January 1982, the names of IBM and its PC were suspiciously missing. There wasn't even the most obscure and guarded reference to Kapor's grand project in those days—the development of *1-2-3* for the IMB PC.

Two years ago, Kapor was a hot-shot software designer who had just peddled his early masterwork—*VisiTrend/VisiPlot*—to his former employer VisiCorp (then called Personal Software) for a hefty sum. He had just dissolved Micro Finance Systems (the company which he had formed with Eric Rosenfield to facilitate the development and eventual sale of *VisiTrend/VisiPlot*). Now Kapor was an artist looking for a new medium and he was wealthy enough to start thinking big.

Lotus Development Company is now one of the bona fide success stories of the personal computer software industry. *1-2-3*, written by Kapor and Jonathan Sachs, has been on top of the bestselling IBM software chart practically from the day it hit the stores. With only one solid-gold hit, Kapor and Lotus Development have become the Michael Jackson and Epic Records of the sixteen-bit world.

Lotus currently employs three hundred people at its one-hundred-forty-thousand-square foot Cambridge, Massachusetts, headquarters. Two years ago, Lotus had only nine employees, including four full-time programmers. The company made a very successful initial public stock offering in October of last year. The purpose of the offering, says Kapor, was to establish a stronger financial base from which to grow in an orderly fashion.

Nine months after *Softalk*'s profile of Lotus in January 1982, *1-2-3* was released for the IBM PC. The program boasted such features as spreadsheet and database functions, a full repertoire of graphics and charting functions, statistical analysis, text processing, and a somewhat crude but powerful command of the language. *1-2-3* is easy to use and speedy, compatible with *VisiCalc*, *dBase II*, and other programs. In fact, *1-2-3* performs each of its functions so well that it seriously undermines the attractiveness of narrower, single-function programs.

As of this writing, there are some nine versions of *1-2-3* available for the various sixteen-bit, 8088-based machines. It's probably destined to become the most popular business program for this largely business market. And now there's a new challenge for Kapor and corps.

Lotus is currently developing a version of *1-2-3* to run on the thirty-two-bit Macintosh. Kapor says the finished package will be "100 percent Mac-like, making use of the mouse and icons." The Mac program will be part of the "second wave," says Kapor, which means it should be available later this year.

In Kapor's view, the real fruit of thirty-two-bit processing—'what will distinguish it from sixteen-bit"—is multitasking. "Currently Mac and Lisa don't support multitasking, but it'll be different down the road."

Kapor maintains that the Macintosh's main appeals are its ROM software and user interface. "I don't know for a fact, technically, that you couldn't build the same thing around, say, two 8088 processors," Kapor muses. "I'm not trying to be flippant, but in terms of overall usability, I don't know that it requires thirty-two bits."

Kapor says he's approaching the new medium of thirty-bit software cautiously. He's not ready to jump headlong onto the thirty-two-bit bandwagon.

"Mac's strengths are its price and performance. I'm also convinced that a whole new generation of interesting and innovative software will be built around the Mac. It will capture people's imaginations. It will be better, easier to use, and fresher than what you can do on an IBM PC." Kapor compares the relative usefulness of sixteen bits and thirty bits for developing software as roughly akin to the difference that would result from using a power saw versus a manual saw to build a house. "You can build bigger things."

Lotus is now working on a version of *1-2-3* that will run on the Lisa 2/10. Also, the company recently made *1-2-3* available to Apple IIe users who have the Rana 8060/2 unit. But right now, the big news is Macintosh.

"If the machine takes off like we think it will, we'll have more major products for it in the future. We don't view the Mac as a one-shot thing. We're investing far too much in the way of development resources." ◻■

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# THE PASCAL PATH

## By Jim Merritt

**Rational Calculation at Your Desk!** Last month, we introduced and examined Rational, an INTRINSIC UNIT that enables your Apple Pascal programs to create and manipulate rational Numbers—numbers that are each represented by a pair of Integers: a *numerator* and a *denominator*. We saw how the entire UNIT constitutes a formal data type definition, in that it not only declares a name and structure for the class of data in question but also defines the operations and conversions that may be performed on data of that type. Because Rational is an INTRINSIC UNIT, when you install this package into your Apple's *System.library file, you effectively *extend* your personal copy of the Pascal language, in the sense that rational Numbers are available from that point on to all of your programs for the negligible cost of a *USES Rational* declaration.

Rational's listing consumed so much space in last month's issue that we didn't get a chance to look at any client software. This time around, we'll keep the theorizing to a minimum and offer up a serving of *RatCal*, a client of Rational that, acting as a "four-banger" desk calculator, permits you to experiment with rational arithmetic. The overall design of *RatCal* is very similar to that of *TinyCalc*, which was presented and discussed in depth last May. Remember to compile Rational and install it in the *System.library (using the procedure described in the December 1983 issue) *before* trying to compile *RatCal*.

Much of *RatCal*'s listing duplicates Rational's *INTERFACE* and doesnt appear in *RatCal*'s source test at all. Instead, this information was automatically inserted into the listing by the compiler. (All such material in the listing has been shaded, to help you avoid including it within your own copy of *RatCal*'s source text file.) The additional declarations make *RatCal* seem longer and much more complex than it really is; in truth, an hour's careful study should be more than you need to master this client program (given that you understand Rational, of course), whether or not you are able to refer to our earlier disucssion of *TinyCalc*.

Pick some tough problems in fractional arithmetic and put *RatCal* to the test! Especially if fractions gave you headaches in elementary school, you may find it amusing to see just how quickly even the knottiest problems yield to the power of your personal computer. Perhaps you know schoolchildren who are having difficulties dealing with fractions. Once they understand how to do fractional arithmetic by hand, let them use *RatCal* to do their homework!

*RatCal* processes arithmetic expressions that are a mixture of operators and "rational constants." The railroad diagram shows the rational constant syntax that is recognized by Rational's IsNumber subroutine, and hence by *RatCal*. As you can see, a rational constant may include a "whole" part, a fractional part, or both. Note that the fractional part, if any, generally begins with an ampersand character (&) and that the numerator and the denominator of the fractional part are separated from one another by the same slash (/) that is used as the division operator.

An alternate fractional form begins with a period (.) and includes only a numerator; the denominator is implicitly the appropriate power of ten. To illustrate, the number "three and five-sevenths" would normally be expressed as the mixed fraction 3&5/7. The rational constant 12.53 is precisely equivalent to 12&53/100, but the constant 0.333333, being equal to 333333/1000000, is certainly *not* the same as 1/3!

Finally, note that *no* blanks may appear between the whole part and the fractional part of a rational Number. Indeed, a blank may not occur within a rational constant at all. Thus, "6 & 2/3" would be rejected as gibberish by *RatCal* and IsNumber.

**Method in the Madness.** Now that you have had a chance to examine a typical Rational *client*, we may address a very important question concerning the UNIT's design: Why was the rational number data type declared as simply a Number? Why wasn't a more distinctive name used?

There are as many easy-to-represent numbers within a computer as there are numerically inclined programmers to devise them. As we've seen, Apple Pascal supports several different schemes simultaneously, by virtue of offering the data types Integer, Real, and Long Integer. Consider the number 42 (or 42.0, if you prefer to think in terms of Real numbers). The pattern of bits in memory that corresponds to the Integer representation of this number bears absolutely no resemblance to the pattern that constitutes the Long Integer representation, and both of these patterns are unlike that for the Real number 42.0. Of course, each representational scheme has its advantages and disadvantages, its champions and opponents. Pascal lets you choose the numeric representation that best suits your needs for any particular application.

Suppose that you write a client for Rational. Months or years later, you discover a numeric representation that catches your fancy. You de-

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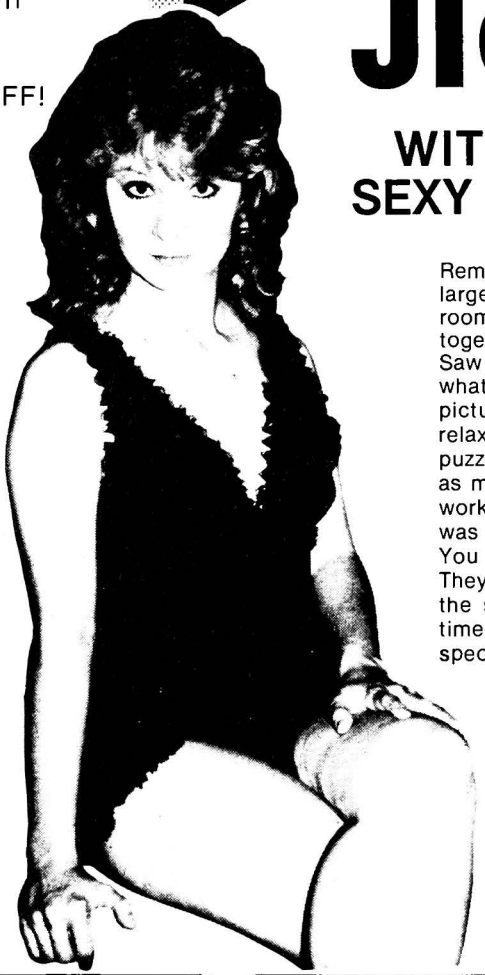
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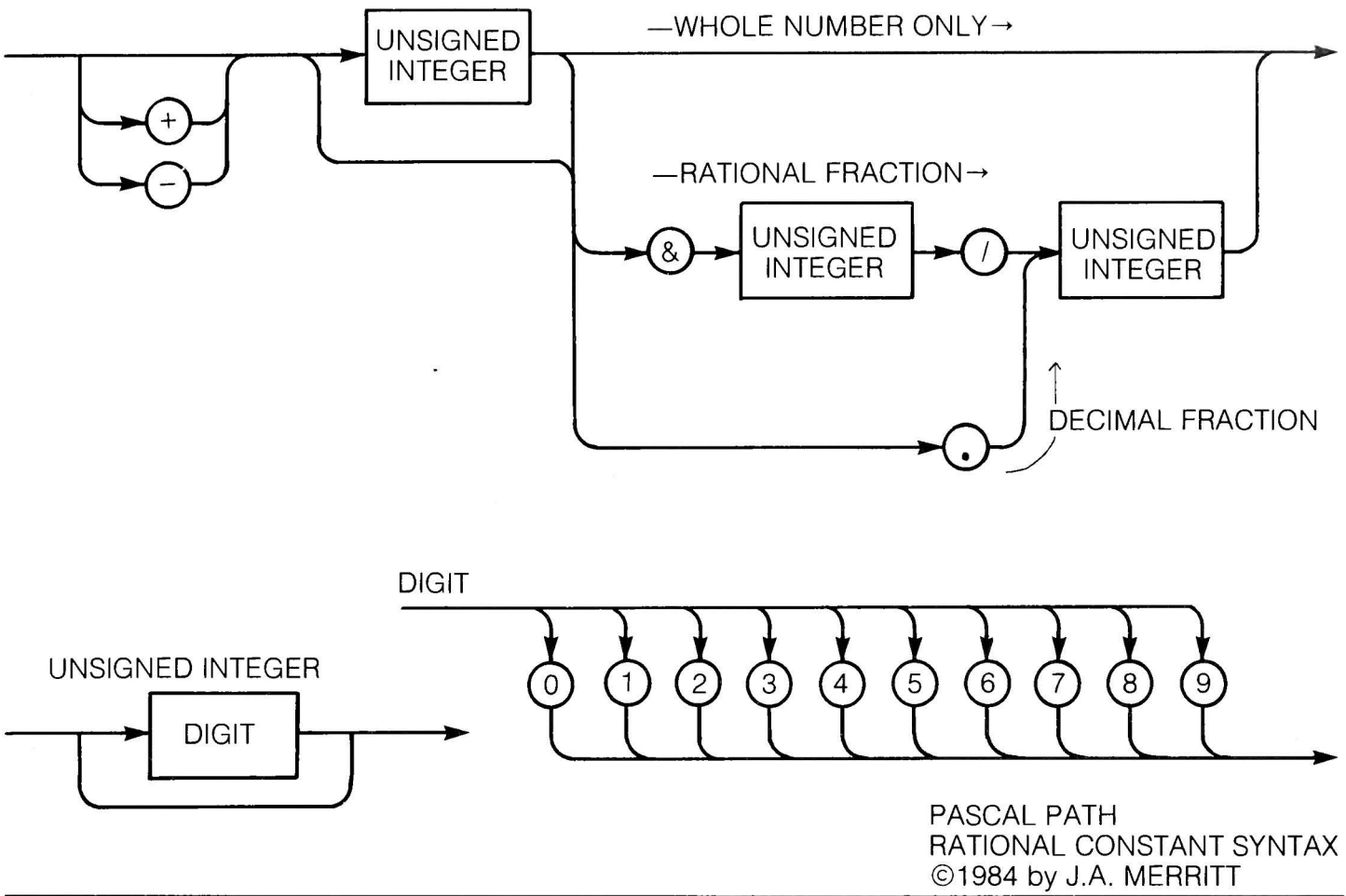
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cide to write a UNIT, named MyNumber, which implements this new scheme. If you design MyNumber so that its numeric data type is also called Number, and so that its collection of public subroutines includes at least all those defined in Rational, then you can modify the original Rational client to employ the new representation simply by updating the USES declaration:

```
USES MyNumbers; (* formerly used Rational *)
```

All the old calls to Rational will still be valid for MyNumbers (with the possible exception of IsNumber, in the sense that the new version of that routine may refuse to accept the character string representation of a rational number as being valid for the new numeric type). Thus, by changing a single identifier in the client program, you are able to totally convert to a different numeric representation.

Take a close look at *RatCal*. If you eliminate the USES declaration and the comments (many of which talk about Rational numbers specifically), you probably couldn't infer anything about the nature of the numeric representation by looking at the listing. The purpose of giving the primary data type and the operational subroutines of the Rational UNIT their vague, general names is to emphasize the abstract nature of numeric values and the operations that can be performed on them. To implement *any* numeric package, you must first establish a particular internal representation for a number, then devise subroutines that perform abstract arithmetic operations upon numbers, according to the rules and nature of your particular representational scheme. The "basic" operators (addition, subtraction, multiplication, and division, as well as one or more types of inversion) apply to *all* numbers, so routines implementing them should appear in all numeric packages.

However, should you write several numeric UNITS in accordance with our principles of abstraction, Apple Pascal will prevent any client from using more than one of your custom numeric types. The reason is clear: All of the objects declared in a UNIT's INTERFACE section become *global* to the client. If a client uses more than one UNIT, *all* public objects provided by *all* the UNITs become global. Remember, no two objects declared at the same level of subroutine nesting may have the same name. In particular, no two global objects may have the same name. Thus, the public objects of one UNIT cannot have the same names as the public objects of another, if both packages are to be used by the same client. A client could not, for instance, use both Rational and MyNumbers simultaneously.

***RatCal* Redux.** It's a truism of the programmer's art that "old programs never die, they just acquire more features." Once you have worked with *RatCal* for a while, you will probably start thinking of ways to extend and improve the program's capabilities. To get you started, here are some proposals:

First, as things stand now, should you enter an expression that represents an improper fraction (such as 12/10), *RatCal* will reply with a mixed fraction involving the original denominator (like 1&2/10). It will *not* reduce the fractional part to lowest terms. On the other hand, if you put parentheses around either the numerator or denominator, *RatCal* will reduce the result. Consequently, either (12)/10 or 12/(10) is echoed as 1&1/5. What part(s) of *RatCal* or Rational are responsible for this behavior? In your opinion, is it a "feature" or a "bug?" (Sometimes, it's hard to draw the line between the two!) If your answer is "bug," modify the appropriate code to ensure that fractions are *always* reduced to lowest terms.

Second, perhaps you took one of last month's challenges to heart and extended Rational to include new numeric operators. Let's say that you implemented the trigonometric functions sine, cosine, and tangent. (Just how you would have done so is irrelevant, as are the changes you would have had to make to Rational's INTERFACE section.) Modify *RatCal* to permit these functions to be used in rational arithmetic expressions. For example, the expression to be used:

```
COS(<expr>)
```

might stand for the cosine of the value expressed by <expr>. Similar

syntax could be used for sine and tangent. Your new *RatCal* should permit <expr> to be any arbitrary expression—even one that includes any or all of the new operators!

Third, and lastly, implement rational "memory registers"—places where the values of rational calculations may be stored throughout a session with *RatCal*. To illustrate a reasonable strategy,

#<expr>

might stand for a rational register, where <expr> is an expression that evaluates to a rational number with a nonnegative numerator and a denominator of 1. Thus, #10 would denote the *value* contained in register ten, #(2*3) would stand for register six, and so forth. To assign a value to one of the registers, you could enter the following:

#<expr> := <expr>

Alternatively, you could make *RatCal* even fancier by permitting registers to assume user-defined names. Compare the advantages and disadvantages of this approach with those of the "numbered register" scheme. Also, what would constitute legal and illegal register specifications in either case? How might *RatCal* deal with the illegal ones?

```
1   1  1:D  1 (*$S+*) (* A/// doesn't need this line. *)
2   1  1:D  1 PROGRAM RatCal;
3   1  1:D  3 (*********************************)
4   1  1:D  3 (*                               *)
5   1  1:D  3 (*  This interactive, algebraeic *)
6   1  1:D  3 (*  desk calculator works with   *)
7   1  1:D  3 (*  rational numbers (ratios of  *)
8   1  1:D  3 (*  integers). Numbers may be    *)
9   1  1:D  3 (*  entered in two formats, stan- *)
10  1  1:D  3 (*  dard decimal (i.e. -3.1415,   *)
11  1  1:D  3 (*  0.2, etc.) or special "ration- *)
12  1  1:D  3 (*  al" (including optional      *)
13  1  1:D  3 (*  "whole"part, and "fractional" *)
14  1  1:D  3 (*  part; i.e., -3&1415/10000,   *)
15  1  1:D  3 (*  33&1/3, 7/8, 0&23/846, etc.). *)
16  1  1:D  3 (*                               *)
17  1  1:D  3 (*  At the ":" prompt, RatCal takes *)
18  1  1:D  3 (*  a single line of input charac- *)
19  1  1:D  3 (*  ters, presumably an arithmetic *)
20  1  1:D  3 (*  expression involving +,-,*, and *)
21  1  1:D  3 (*  /. Parentheses may be nested  *)
22  1  1:D  3 (*  to any arbitrary depth. On the *)
23  1  1:D  3 (*  following display line, RatCal *)
24  1  1:D  3 (*  yields the single, reduced    *)
25  1  1:D  3 (*  value of the expression in    *)
26  1  1:D  3 (*  "rational" format. If the ex- *)
27  1  1:D  3 (*  pression cannot be computed for *)
28  1  1:D  3 (*  any reason, RatCal responds   *)
29  1  1:D  3 (*  with "??? ERROR" and repeats  *)
30  1  1:D  3 (*  the expression—input prompt.  *)
31  1  1:D  3 (*  When finished with RatCal,    *)
32  1  1:D  3 (*  the user should respond to the *)
33  1  1:D  3 (*  input prompt by pressing only *)
34  1  1:D  3 (*  the <RETURN> key.            *)
35  1  1:D  3 (*                               *)
36  1  1:D  3 (*********************************)
37  1  1:D  3
38  1  1:D  3   USES
39 25  1:D  3
40 25  1:D  3     CONST
41 25  1:D  1       (* The maximum number of digits in
42 25  1:D  1          either a numerator or denominator:
43 25  1:D  1       *)       MaxRISize = 16;
44 25  1:D  1
45 25  1:D  1     TYPE
46 25  1:D  1       (* Both numerators and denominators
47 25  1:D  1          will be represented by potentially
48 25  1:D  1          huge Integers.
49 25  1:D  1       *)          RatInt = Integer[MaxRISize];
50 25  1:D  1
51 25  1:D  1       (* The key data definition: *)
52 25  1:D  1               Number =
53 25  1:D  1                 RECORD
54 25  1:D  1                   Numerator,
55 25  1:D  1                   Denominator:
56 25  1:D  1                     RatInt
57 25  1:D  1                 END;
58 25  1:D  1
59 25  1:D  1     (* Most routines that deal with
60 25  1:D  1          rational quantities will be
61 25  1:D  1          FUNCTIONs that return numeric
62 25  1:D  1          results through VAR parameters.
63 25  1:D  1          "Official" function values will
64 25  1:D  1          be condition codes that report
65 25  1:D  1          on the success or (reason for)
66 25  1:D  1          failure of the operation in
67 25  1:D  1          question:
68 25  1:D  1     *)
69 25  1:D  1
70 25  1:D  1           NumCC =
71 25  1:D  1             (NumNoErr,
                                  (* success! *)
72 25  1:D  1              NumUnderFlow,
                             (* not yet used *)
73 25  1:D  1              NumOverFlow
                           (* also zero denom *)
74 25  1:D  1             );
75 25  1:D  1
76 25  1:D  1     (* Numeric comparison-operator
                                  symbols: *)
77 25  1:D  1           NumCompOpr =
78 25  1:D  1             (NumEQ, NumLT, NumLE,
                         NumGT, NumGE, NumNE);
79 25  1:D  1
80 25  1:D  1
81 25  1:D  1 (*********************************)
82 25  1:D  1 (*                               *)
83 25  1:D  1 (*     PUBLIC RATIONAL OPERATORS *)
84 25  1:D  1 (*                               *)
85 25  1:D  1 (*********************************)
86 25  1:D  1
87 25  1:D  1   (*********************************)
88 25  1:D  1   FUNCTION
89 25  2:D  3     NumCompLement(Src       :Number;
90 25  2:D  4                   VAR Dest :Number
91 25  2:D  4                  )
92 25  2:D  5       :NumCC;
93 25  2:D 15   (*********************************)
94 25  2:D 15   (*                               *)
95 25  2:D 15   (*  Return the additive complement of *)
96 25  2:D 15   (*     Src in Dest; function value is *)
97 25  2:D 15   (*     condition code.           *)
98 25  2:D 15   (*                               *)
99 25  2:D 15   (*********************************)
100 25 2:D 15
101 25 2:D 15
102 25 2:D 15   (*********************************)
103 25 1:D 15   FUNCTION
104 25 3:D  3     NumReciprocal(Src       :Number;
105 25 3:D  4                   VAR Dest :Number
106 25 3:D  4                  )
107 25 3:D  5       :NumCC;
108 25 3:D 15   (*********************************)
109 25 3:D 15   (*                               *)
110 25 3:D 15   (*  Return the reciprocal of Src in *)
111 25 3:D 15   (*     Dest; function value is con- *)
112 25 3:D 15   (*     dition code.              *)
113 25 3:D 15   (*                               *)
114 25 3:D 15   (*********************************)
115 25 3:D 15
116 25 3:D 15
117 25 3:D 15   (*********************************)
118 25 1:D 15   FUNCTION
119 25 4:D  3     NumMul(Scr1, Src2 :Number;
120 25 4:D  5            VAR Dest  :Number
121 25 4:D  5           )
122 25 4:D  6       :NumCC;
123 25 4:D 26   (*********************************)
124 25 4:D 26   (*                               *)
125 25 4:D 26   (*  Return the product of Src1 and *)
126 25 4:D 26   (*     Src2 in Dest; function value *)
127 25 4:D 26   (*     is condition code.         *)
128 25 4:D 26   (*                               *)
129 25 4:D 26   (*********************************)
130 25 4:D 26
131 25 4:D 26
```

# Macintosh!

# COMPLETE

Macintosh set a new record for the number of magazine covers on which it appeared after it was first announced. That's because Macintosh sets new standards for speed and power in an easy-to-use personal computer. That's a not inconsiderable claim, but one that's certainly borne up under early scrutiny.

There are lots of things to know about Macintosh. Icons, windows, dialog boxes, alert boxes, pull-down menus, a mouse, the *Finder*, and *QuickDraw* are just some of the elements that enable Macintosh to give new definition to the state of the art. To stay current with personal computer technology, you need to know about these things.

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*Macintosh! Complete* was written by Doug Clapp, who spent six months behind the scenes at Apple while the Mac was in its finishing stages. He received extensive, no-strings cooperation as he delved into the hardware, the software, and the process that's become Macintosh.

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```
132  25  4:D  26      (*********************************)
133  25  1:D  26      FUNCTION
134  25  5:D   3        NumDiv(Src1, Src2 :Number;
135  25  5:D   5               VAR Dest  :Number
136  25  5:D   5               )
137  25  5:D   6           :NumCC;
138  25  5:D  26      (*********************************)
139  25  5:D  26      (*                               *)
140  25  5:D  26      (* Return the quotient of Src1 and *)
141  25  5:D  26      (*    Src2 in Dest; function value *)
142  25  5:D  26      (*    is condition code.           *)
143  25  5:D  26      (*                               *)
144  25  5:D  26      (*********************************)
145  25  5:D  26
146  25  5:D  26
147  25  5:D  26      (*********************************)
148  25  1:D  26      FUNCTION
149  25  6:D   3        NumAdd(Src1, Src2 :Number;
150  25  6:D   5               VAR Dest  :Number
151  25  6:D   5               )
152  25  6:D   6           :NumCC;
153  25  6:D  26      (*********************************)
154  25  6:D  26      (*                               *)
155  25  6:D  26      (* Return the sum of Src1 and Src2 *)
156  25  6:D  26      (*    in Dest; function value is *)
157  25  6:D  26      (*    condition code.            *)
158  25  6:D  26      (*                               *)
159  25  6:D  26      (*********************************)
160  25  6:D  26
161  25  6:D  26
162  25  6:D  26      (*********************************)
163  25  1:D  26      FUNCTION
164  25  7:D   3        NumSub(Src1, Src2 :Number;
165  25  7:D   5               VAR Dest  :Number
166  25  7:D   5               )
167  25  7:D   6           :NumCC;
168  25  7:D  26      (*********************************)
169  25  7:D  26      (*                               *)
170  25  7:D  26      (* Return the difference between *)
171  25  7:D  26      (*    Src1 and Src2 in Dest; func- *)
172  25  7:D  26      (*    tion value is condition code. *)
173  25  7:D  26      (*                               *)
174  25  7:D  26      (*********************************)
175  25  7:D  26
176  25  7:D  26
177  25  7:D  26  (***********************************)
178  25  7:D  26  (*                                 *)
179  25  7:D  26  (*   PUBLIC COMPARISON OPERATORS   *)
180  25  7:D  26  (*                                 *)
181  25  7:D  26  (***********************************)
182  25  7:D  26
183  25  7:D  26      (*********************************)
184  25  1:D  26      FUNCTION
185  25  8:D   3        NumComp(A, B:   Number;
186  25  8:D   5                Comp: NumCompOpr
187  25  8:D   5                )
188  25  8:D   6           : Boolean;
189  25  8:D  26      (*********************************)
190  25  8:D  26      (*                               *)
191  25  8:D  26      (* Returns Boolean result of A OP B *)
192  25  8:D  26      (*    where OP may be NumEQ (equal), *)
193  25  8:D  26      (*    NumLT (less than), LE (less *)
194  25  8:D  26      (*    than or equal to), NumGT   *)
195  25  8:D  26      (*    (greater than), NumGE (greater *)
196  25  8:D  26      (*    than or equal to), or NumNE *)
197  25  8:D  26      (*    (not equal to).            *)
198  25  8:D  26      (*                               *)
199  25  8:D  26      (*********************************)
200  25  8:D  26
201  25  8:D  26
202  25  8:D  26
203  25  8:D  26  (***********************************)
204  25  8:D  26  (*                                 *)
205  25  8:D  26  (*   PUBLIC DATA CONVERSION TOOLS  *)
206  25  8:D  26  (*                                 *)
207  25  8:D  26  (***********************************)
208  25  8:D  26
209  25  8:D  26      (*********************************)
210  25  1:D  26      PROCEDURE
211  25  9:D   1        NumToString(Src      :Number;
212  25  9:D   2                    VAR DS :String
213  25  9:D   2                    );
214  25  9:D  13      (*********************************)
215  25  9:D  13      (*                               *)
216  25  9:D  13      (* Put a string representation of *)
217  25  9:D  13      (*    the Number Src into DS.    *)
218  25  9:D  13      (*    Ratios that correspond to whole *)
219  25  9:D  13      (*    numbers are represented as *)
220  25  9:D  13      (*    such (i.e., no fractional  *)
221  25  9:D  13      (*    appendix). Ratios less than *)
222  25  9:D  13      (*    unity are represented as   *)
223  25  9:D  13      (*    <numerator>/<denominator>. *)
224  25  9:D  13      (*    Ratios greater than unity  *)
225  25  9:D  13      (*    that are not whole numbers *)
226  25  9:D  13      (*    are represented as mixed   *)
227  25  9:D  13      (*    fractions,                 *)
228  25  9:D  13      (*                               *)
229  25  9:D  13      (*       <whole part>&<fraction> *)
230  25  9:D  13      (*                               *)
231  25  9:D  13      (*    where <whole part> is an   *)
232  25  9:D  13      (*    integer and <fraction> is  *)
233  25  9:D  13      (*    a ratio less than unity.   *)
234  25  9:D  13      (*                               *)
235  25  9:D  13      (*********************************)
236  25  9:D  13
237  25  9:D  13
238  25  9:D  13      (*********************************)
239  25  1:D  13      FUNCTION
240  25 10:D   3        IsNumber(VAR Buf   :String;
241  25 10:D   4                 VAR BPtr :Integer;
242  25 10:D   5                 VAR Dest :Number
243  25 10:D   5                 )
244  25 10:D   6           : Boolean;
245  25 10:D   6      (*********************************)
246  25 10:D   6      (*                               *)
247  25 10:D   6      (* Returns True if substring that *)
248  25 10:D   6      (*    starts at position BPtr in Buf *)
249  25 10:D   6      (*    corresponds to the string  *)
250  25 10:D   6      (*    representation of a rational *)
251  25 10:D   6      (*    Number:                    *)
252  25 10:D   6      (*                               *)
253  25 10:D   6      (*       <whole part>&<fraction> *)
254  25 10:D   6      (*                or             *)
255  25 10:D   6      (*       <whole part>.<decimal part> *)
256  25 10:D   6      (*                               *)
257  25 10:D   6      (*    e.g. -2&3/5, -2&6/10, and  *)
258  25 10:D   6      (*    -2.6 represent the same quan- *)
259  25 10:D   6      (*    tity, and each is acceptable *)
260  25 10:D   6      (*    input to this routine.     *)
261  25 10:D   6      (*                               *)
262  25 10:D   6      (*    On True return, Dest contains *)
263  25 10:D   6      (*    the appropriate Number value *)
264  25 10:D   6      (*    while BPtr points to the char- *)
265  25 10:D   6      (*    acter position immediately *)
266  25 10:D   6      (*    following the valid substring. *)
267  25 10:D   6      (*    On False return, both BPtr and *)
268  25 10:D   6      (*    Dest remain untouched.     *)
269  25 10:D   6      (*                               *)
270  25 10:D   6      (*********************************)
271  25 10:D   6
272   1  1:D   6    Rational;
273   1  1:D   3
274   1  1:D   3  CONST
275   1  1:D   3    VersionMark =
276   1  1:D   3      'RATCALculator (V1.0: 10-Oct-83)';
277   1  1:D   3
278   1  1:D   3    Blank =   ' ';
279   1  1:D   3    Empty =   '';
280   1  1:D   3    EOSVal =  10;
281   1  1:D   3
282   1  1:D   3    Prompt =  ': ';
283   1  1:D   3
284   1  1:D   3  VAR
285   1  1:D   3    (* Expression recognition routines
286   1  1:D   3       in this program expect each input
287   1  1:D   3       string to end with a nonblank
288   1  1:D   3       character that is not part of a
289   1  1:D   3       legal rational-number arithmetic
290   1  1:D   3       expression. Thus, EOS is append-
291   1  1:D   3       ed onto all input lines before
```




# What Sort of Being Reads Softline?

He's aware. He's concerned. He takes chances, but he covers his bets. He can hold his liquor. He's covered with purple scales. He looks out for his friends. He flies over the countryside, laying waste to entire townships with a single gout of flame.

But mostly, he plays games. A lot. . . .

When we asked him what he liked best about *Softline*, he responded with a thoughtful silence. We tried prompting him a little. "Could it be our in-depth articles on the various game genres? Or our tutorials on how to build adventure, fantasy, and arcade games? Or the contests? The prizes? How about Infomania, our wacko computer news column?"

Looking up briefly from his monitor, he reflectively blew a brimstone smoke ring. Then, in a scratchy basso profundo, he answered, "Actually, I enjoy all of that stuff a great deal. But I think the thing I like best about *Softline* is the price. For $12 a year I can actually afford to use the back issues to relight my pilot. By the way, you wouldn't by any chance have a match on you, would you?"

Softline
P.O. Box 60
North Hollywood, CA 91603

```
292  1  1:D  3        processing.
293  1  1:D  3     *)
294  1  1:D  3     EOS
295  1  1:D  3        :String[1];
296  1  1:D  4
297  1  1:D  4     InputLine,
298  1  1:D  4     OutputLine
299  1  1:D  4        :String;
300  1  1:D  86
301  1  1:D  86    ILPtr,        (* InputLine pointer *)
302  1  1:D  86    I
303  1  1:D  86      :Integer;
304  1  1:D  88
305  1  1:D  88     (* The expression value rests here. *)
306  1  1:D  88     DisplayRegister
307  1  1:D  88       :Number;
308  1  1:D  98
309  1  1:D  98  PROCEDURE
310  1  2:D  1     WriteBlanks(VAR OutFile :Interactive;
311  1  2:D  2                 N :Integer
312  1  2:D  2                );
313  1  2:D  3  (* Send a sequence of N blanks to OutFile. *)
314  1  2:0  0  BEGIN (* WriteBlanks *)
315  1  2:0  0     (* Get Pascal to do all the work! *)
316  1  2:1  0     Write(OutFile, Empty:N);
317  1  2:0  10 END (* WriteBlanks *);
318  1  2:0  22
319  1  3:D  1  PROCEDURE SkipBlanks(VAR S :String;
320  1  3:D  2                       VAR SP :Integer
321  1  3:D  2                      );
322  1  3:D  3  (* Scan past blank characters in S
323  1  3:D  3     starting at position SP. On exit,
324  1  3:D  3     S[SP] is nonblank.
325  1  3:D  3  *)
326  1  3:0  0  BEGIN (* SkipBlanks *)
327  1  3:1  0     WHILE (S[SP] = Blank) DO
328  1  3:2  9        SP := SP + 1;
329  1  3:0  17 END  (* SkipBlanks *);
330  1  3:0  32
331  1  1:0  32  FUNCTION
332  1  4:D  3     GoodNumExp(VAR Buf  :String;
333  1  4:D  4                VAR BPtr :Integer;
334  1  4:D  5                VAR Dest :Number
335  1  4:D  5               )
336  1  4:D  6        :Boolean;
337  1  4:D  6  (* Return True if a substring
338  1  4:D  6     representing a legal rational
339  1  4:D  6     numeric expression exists in
340  1  4:D  6     Buf beginning at position BPtr.
341  1  4:D  6     On True return, BPtr will index
342  1  4:D  6     the position that follows the
343  1  4:D  6     LAST character in the expression,
344  1  4:D  6     while Dest will contain the value
345  1  4:D  6     of the expression. On False
346  1  4:D  6     return, both BPtr and Dest will be
347  1  4:D  6     unchanged.
348  1  4:D  6
349  1  4:D  6     A legal rational expression consists
350  1  4:D  8     of a sequence of one or more TERMs,
351  1  4:D  6     where the first may be signed or
352  1  4:D  6     unsigned, while all others MUST be
353  1  4:D  6     signed. Example:
354  1  4:D  6
355  1  4:D  6       -TERM + TERM + TERM - TERM -
                     TERM
356  1  4:D  6  *)
357  1  4:D  6
358  1  4:D  6    VAR
359  1  4:D  6      TDest, TDest2
360  1  4:D  6        :Number;
361  1  4:D  26     I
362  1  4:D  26       :Integer;
363  1  4:D  27     Sign, NumXSign,
364  1  4:D  27     SyntaxOK
365  1  4:D  27       :Boolean;
366  1  4:D  30
367  1  4:D  30    FUNCTION
368  1  5:D  3       GoodTerm(VAR Buf  :String;
369  1  5:D  4                VAR BPtr :Integer;
370  1  5:D  5                VAR Dest :Number
371  1  5:D  5               )
372  1  5:D  6        :Boolean;
373  1  5:D  6
374  1  5:D  6  (* Return True if a substring
375  1  5:D  6     representing a legal rational
376  1  5:D  6     TERM exists in Buf beginning at
377  1  5:D  6     position BPtr. On True return,
378  1  5:D  6     BPtr will index the position that
379  1  5:D  6     follows the LAST character in the
380  1  5:D  6     TERM, while Dest will contain the
381  1  5:D  6     value of the TERM. On False
382  1  5:D  6     return, both BPtr and Dest will be
383  1  5:D  6     unchanged.
384  1  5:D  6
385  1  5:D  6     A legal TERM consists of a sequence
386  1  5:D  6     of one or more FACTORs, such that
387  1  5:D  6     exactly one of the operators * or /
388  1  5:D  6     lies between any two FACTORs.
389  1  5:D  6     Example:
390  1  5:D  6
391  1  5:D  6       FACTOR / FACTOR * FACTOR * FACTOR
392  1  5:D  6  *)
393  1  5:D  6
394  1  5:D  6    TYPE
395  1  5:D  6      TermOprType = (Multiply, Divide);
396  1  5:D  6
397  1  5:D  6    VAR
398  1  5:D  6      I
399  1  5:D  6        :Integer;
400  1  5:D  7      TDest, TDest2 :Number;
401  1  5:D  27     TermOpr :TermOprType;
402  1  5:D  28     SyntaxOK :Boolean;
403  1  5:D  29
404  1  5:D  29   FUNCTION
405  1  6:D  3      GoodFactor(VAR Buf  :String;
406  1  6:D  4                 VAR BPtr :Integer;
407  1  6:D  5                 VAR Dest :Number
408  1  6:D  5                )
409  1  6:D  6        :Boolean;
410  1  6:D  6
411  1  6:D  6  (* Return True if a substring
412  1  6:D  6     representing a legal rational
413  1  6:D  6     FACTOR exists in Buf beginning at
414  1  6:D  6     position BPtr. On True return,
415  1  6:D  6     BPtr will index the position that
416  1  6:D  6     follows the LAST character in the
417  1  6:D  6     FACTOR, while Dest will contain the
418  1  6:D  6     value of the FACTOR. On False
419  1  6:D  6     return, both BPtr and Dest will be
420  1  6:D  6     unchanged.
421  1  6:D  6
422  1  6:D  6     A legal FACTOR is either a single
423  1  6:D  6     rational number (given in decimal
424  1  6:D  6     or rational format) or a rational
425  1  6:D  6     expression enclosed within paren-
426  1  6:D  6     theses. Three examples:
427  1  6:D  6
428  1  6:D  6       0&22/7  2.71     (1&2/3 + 0.99)
429  1  6:D  6  *)
430  1  6:D  6      VAR
431  1  6:D  6        SyntaxOK: Boolean;
432  1  6:D  7        I: Integer;
433  1  6:D  8        TDest: Number;
434  1  6:D  18
435  1  6:0  0    BEGIN (* GoodFactor *)
436  1  6:1  0      I := BPtr;
437  1  6:1  4      SyntaxOK := False;
438  1  6:1  7      IF IsNumber(Buf,I,TDest)
439  1  6:1  12       THEN
440  1  6:2  19         SyntaxOK := True
441  1  6:1  19     ELSE
442  1  6:2  24       BEGIN
443  1  6:3  24         SkipBlanks(Buf,I);
444  1  6:3  29         IF (Buf[I] = '(')
445  1  6:3  35         THEN
446  1  6:4  37           BEGIN (* EXPECT A NUMER-
                                  IC EXPRESSION *)
447  1  6:5  37             I := I + 1;
448  1  6:5  42             SyntaxOK := GoodNumExpr
                                  (Buf,I,TDest);
```

```
449  1  6:5   53                    IF SyntaxOK
450  1  6:5   53                      THEN
451  1  6:6   56                        BEGIN
452  1  6:7   56                          SkipBlanks(Buf,I);
453  1  6:7   61                          SyntaxOK := (Buf[I] =
                                                        ')');
454  1  6:7   69                          IF SyntaxOK
455  1  6:7   69                            THEN
456  1  6:8   72                              I := I + 1;
457  1  6:6   77                        END;
458  1  6:4   77                  END;
459  1  6:2   77              END;
460  1  6:1   77            If SyntaxOK
461  1  6:1   77              THEN
462  1  6:2   80                BEGIN
463  1  6:3   80                  BPtr := I;
464  1  6:3   83                  Dest := TDest;
465  1  6:3   88                  GoodFactor := True;
466  1  6:2   91                END
467  1  6:1   91              ELSE
468  1  6:2   93                GoodFactor := False;
469  1  6:0   96          END (* GoodFactor *);
470  1  6:0  108
471  1  5:0    0        BEGIN (* GoodTerm *)
472  1  5:1    0          I := BPtr;
473  1  5:1    4          SyntaxOK := GoodFactor(Buf,I,
                                                   TDest);
474  1  5:1   15          SkipBlanks(Buf,I);
475  1  5:1   20          WHILE (SyntaxOK AND (Buf[I] IN ['*','/'])
                         DO
476  1  5:2   39            BEGIN
477  1  5:3   39              CASE Buf[I] OF
478  1  5:3   45                '*':
479  1  5:4   45                  TermOpr := Multiply;
480  1  5:3   50                '/':
481  1  5:4   50                  TermOpr := Divide;
482  1  5:3   55              END (* CASE Buf[I] *);
483  1  5:3   74              I := I + 1;
484  1  5:3   79              SyntaxOK := GoodFactor(Buf,I,
                                                   TDest2);
485  1  5:3   90              IF SyntaxOK
486  1  5:3   90                THEN
487  1  5:4   94                  CASE TermOpr OF
488  1  5:4   98                    Multiply:
489  1  5:5   98                      SyntaxOK :=
490  1  5:5   98                        (NumMul(TDest, TDest2,
                                         TDest) = NumNoErr);
491  1  5:4  115                   Divide:
492  1  5:5  115                     SyntaxOK :=
493  1  5:5  115                       (NumDiv(TDest, TDest2,
                                         TDest) = NumNoErr);
494  1  5:4  132                   END (* CASE
                                           TermOpr *);
495  1  5:3  144              SkipBlanks(Buf,I);
496  1  5:2  149            END;
497  1  5:1  151          IF SyntaxOK
498  1  5:1  151            THEN
499  1  5:2  155              BEGIN
500  1  5:3  155                BPtr := I;
501  1  5:3  158                Dest := TDest;
502  1  5:3  163                GoodTerm := True;
503  1  5:2  166              END
504  1  5:1  166            ELSE
505  1  5:2  168              GoodTerm := False;
506  1  5:0  171        END (* GoodTerm *);
507  1  5:0  186
508  1  4:0    0      BEGIN (* GoodNumExp *)
509  1  4:1    0        I := BPtr;
510  1  4:1    4        SkipBlanks(Buf,I);
511  1  4:1    9        NumXSign := False;
512  1  4:1   12        IF (Buf[I] IN ['+','-'])
513  1  4:1   28          THEN
514  1  4:2   30            BEGIN
515  1  4:3   30              NumXSign := (Buf[I] = '-');
516  1  4:3   39              I := I + 1;
517  1  4:2   45            END;
518  1  4:1   45        SkipBlanks(Buf,I);
519  1  4:1   50        SyntaxOK := GoodTerm(Buf,I,TDest);
520  1  4:1   61        IF NumXSign
521  1  4:1   61          THEN
522  1  4:2   65            IF (NumComplement(TDest, TDest) =
                                                   NumNoErr)
523  1  4:2   76              THEN
524  1  4:0   78                (* 'tis what oughta happen,
                                                   charlie! *);
525  1  4:1   78        WHILE (SyntaxOK) AND (Buf[I] IN ['+','-'])
                       DO
526  1  4:2   99          BEGIN
527  1  4:3   99            CASE Buf[I] OF
528  1  4:3  106              '+':
529  1  4:4  106                Sign := False;
530  1  4:3  111              '-':
531  1  4:4  111                Sign := True;
532  1  4:3  116            END (* CASE Buf[I] *);
533  1  4:3  130            I := I + 1;
534  1  4:3  136            SyntaxOK := GoodTerm(Buf,I,TDest2);
535  1  4:3  147            IF SyntaxOK
536  1  4:3  147              THEN
537  1  4:4  151                BEGIN
538  1  4:5  151                  IF Sign
539  1  4:5  151                    THEN
540  1  4:6  155                    SyntaxOK :=
541  1  4:6  155                      (NumSub(TDest, TDest2,
                                       TDest) = NumNoErr)
542  1  4:5  168                  ELSE
543  1  4:6  172                    SyntaxOK :=
544  1  4:6  172                      (NumAdd(TDest, TDest2,
                                       TDest) = NumNoErr);
545  1  4:4  187                END;
546  1  4:2  187          END;
547  1  4:1  189        IF SyntaxOK
548  1  4:1  189          THEN
549  1  4:2  193            BEGIN (* Make everything
                                                   permanent *)
550  1  4:3  193              BPtr := I;
551  1  4:3  197              Dest := TDest;
552  1  4:3  202              GoodNumExp := True;
553  1  4:2  205            END
554  1  4:1  205          ELSE
555  1  4:2  207            GoodNumExp := False;
556  1  4:0  210      END (* GoodNumExp *);
557  1  4:0  224
558  1  1:0    0  BEGIN (* RatCal — MAIN *)
559  1  1:1    0    WriteLn(Output, VersionMark);
560  1  1:1   56
561  1  1:1   56    (* Two-step initialization of EOS
562  1  1:1   56       brought to you by your friendly
563  1  1:1   56       String-Char dichotomy.
564  1  1:1   56    *)
565  1  1:1   56    EOS := Blank;
566  1  1:1   61    EOS[1] := Chr(EOSVal);
567  1  1:1   67
568  1  1:1   67    REPEAT
569  1  1:1   67      (* Get an input line, convert it to
570  1  1:1   67         rational value if possible and
571  1  1:1   67         display either the result or an
572  1  1:1   67         error message. Quit looping when
573  1  1:1   67         the user supplies an empty input
574  1  1:1   67         line.
575  1  1:1   67      *)
576  1  1:2   67      WriteLn(Output);
577  1  1:2   75      Write(Output, Prompt);
578  1  1:2   89      ReadLn(Input, InputLine);
579  1  1:2  108      IF (InputLine <> Empty)
580  1  1:2  115        THEN
581  1  1:3  117          BEGIN
582  1  1:4  117            InputLine := Concat(InputLine,EOS);
583  1  1:4  142            ILPtr := 1;
584  1  1:4  145            WriteBlanks(Output, Length(Prompt));
585  1  1:4  157            IF GoodNumExp(InputLine, ILPtr,
                                                   DisplayRegister)
586  1  1:4  163              THEN
587  1  1:5  169                NumToString(DisplayRegister,
                                                   OutputLine)
588  1  1:4  173              ELSE
589  1  1:5  178                OutputLine := '??? ERROR';
590  1  1:4  194            WriteLn(Output, OutputLine);
591  1  1:3  213          END;
592  1  1:1  213    UNTIL (InputLine = Empty);
593  1  1:0  222  END   (* RatCal *).
```



# Now that Christmas is officially over, isn't it time you bought the Unofficial Apple Logo?




Congratulations! Santa brought you an Apple® for Christmas.

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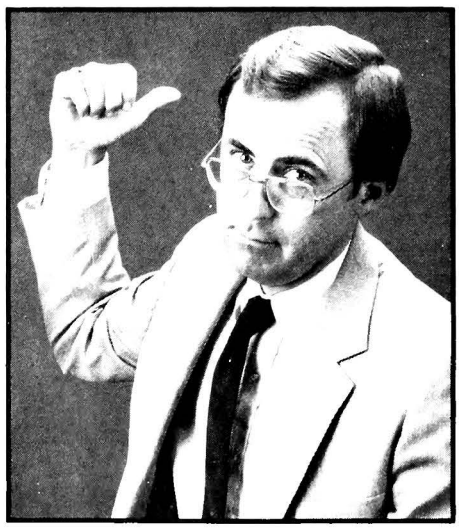
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# The Amazing, Wonderful, Fascinating, Complete, Unabridged, And Oppressively Long, All-Time Softalk Reviews Index, September 1980 Through December 1983

COMPILED BY BETSY BARNES

*It's a common situation. There you stand with money in hand, ready to spend it on something for the computer. But being a smart consumer, you want to read a review of the product before charging down to the computer store with your dollars. Now where was that review . . . ?*

*What follows is A through O of an index of every piece of software and hardware that has been reviewed in Softalk since the beginning of the decade (look for P through Z next month). Following the product's name, you'll find its author, publisher, name of the person who reviewed it, when the review appeared, and the page where it can be found. Where a listing says "Impression" instead of a reviewer's name, that means the product was given a cursory evaluation rather than an in-depth review. Where it says "Schoolhouse," it's a complete review that appeared in Schoolhouse Apple, but darned if we can remember who wrote it.*

*Even if you're not planning to buy any of the programs or products in the index, it's fun to look up old reviews to see what was considered state-of-the-art programming at the time. Reminisce about what a breakthrough Apple Galaxian was. Be amazed at how great the reviewers thought the Pac-Man clones were.*

*The index includes reviews contained in every issue of Softalk up through December 1983. Each January from now on, we'll update the index with the previous year's reviews.*

*Then we can look back on this year.*

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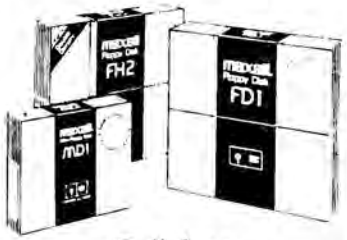
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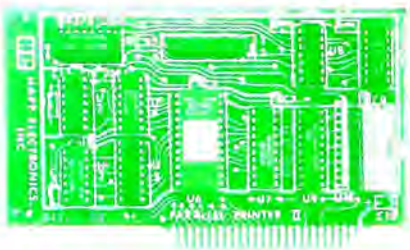
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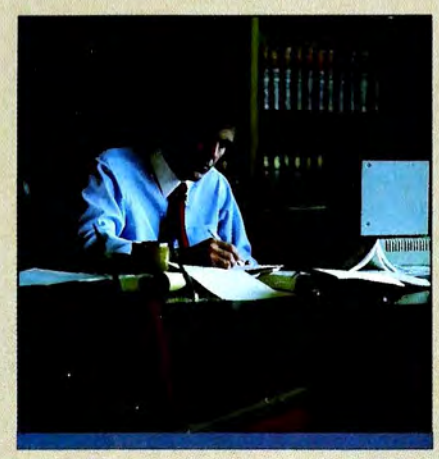
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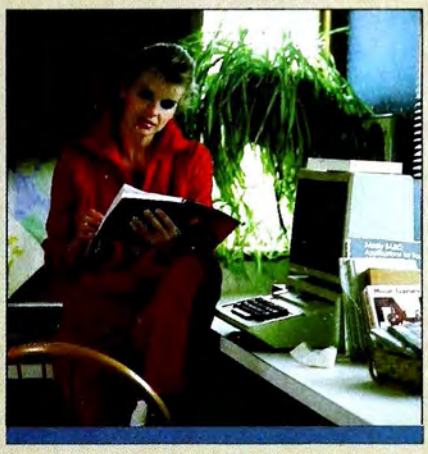
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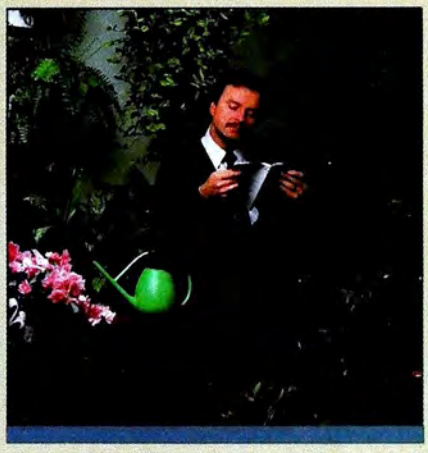
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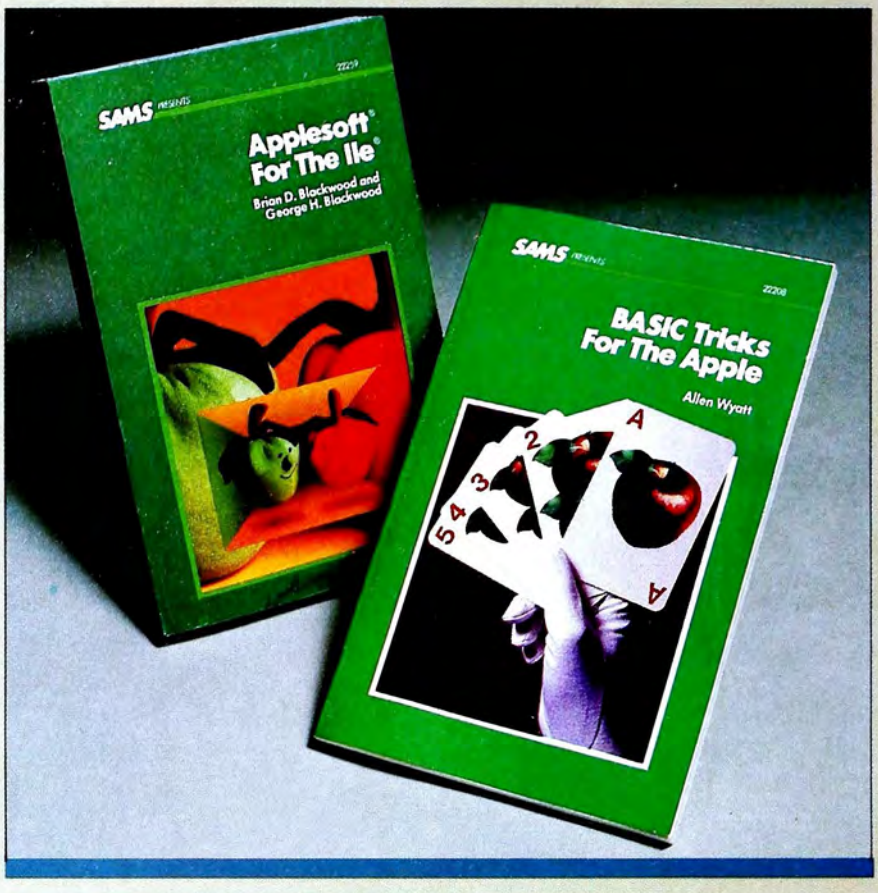


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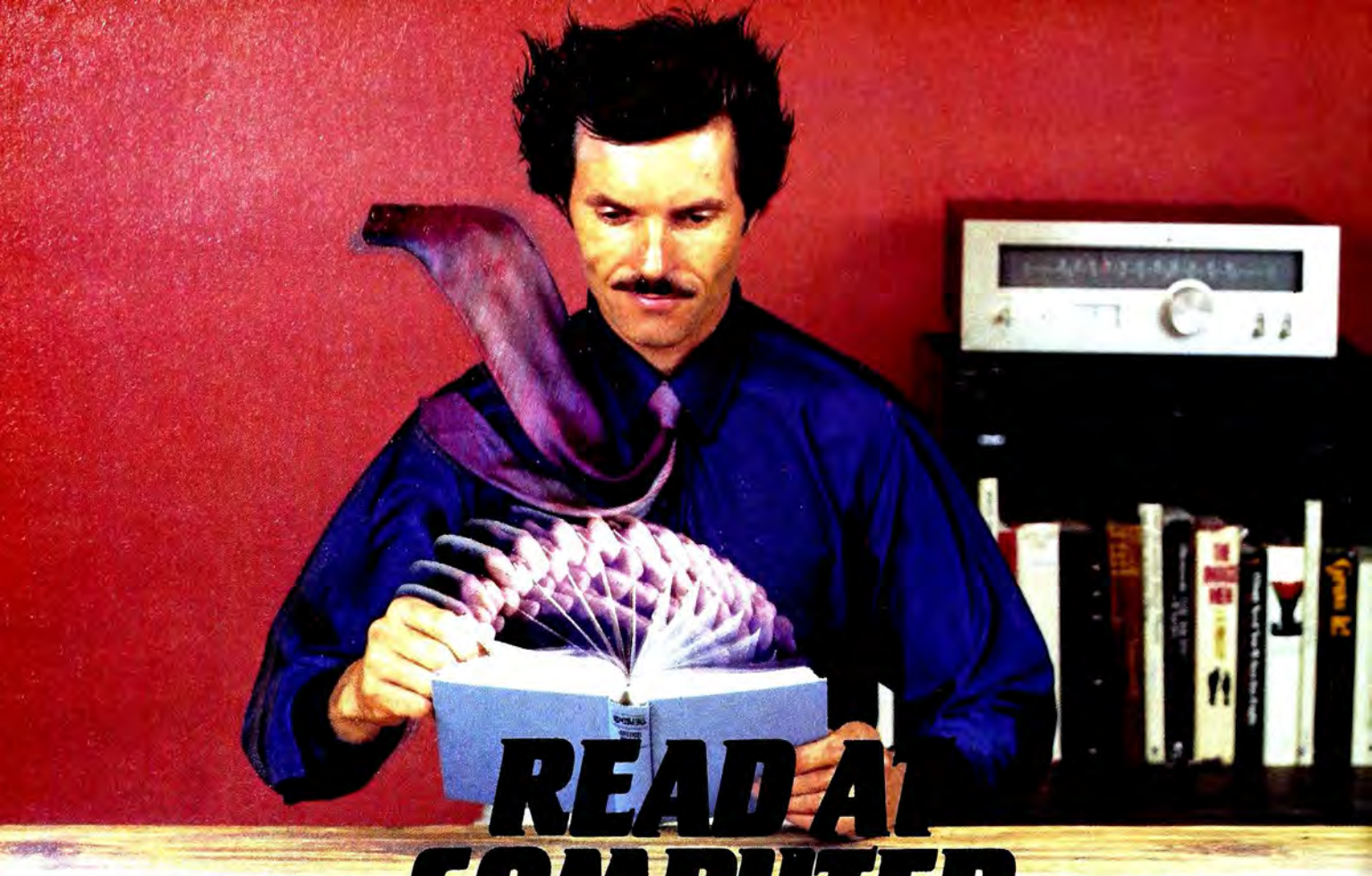
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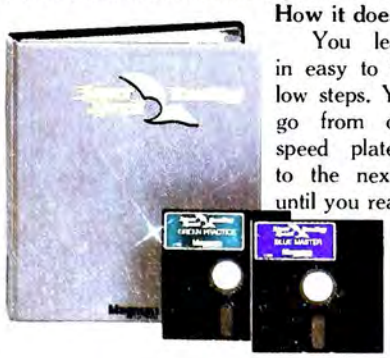
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# NEWSPEAK

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# LA AUTHORITIES MOVE TO CURB CRIMINAL COMPUTING

In November of last year, nineteen-year-old UCLA student Ronald Mark Austin attracted considerable attention when he was arrested and charged with fourteen counts of maliciously accessing a computer system. Working out of his Santa Monica, California, apartment on a personal computer, Austin "broke into" a U.S. Department of Defense communications system and tapped into fourteen research agencies, including the Naval Research Laboratory in Washington, D.C, the Norwegian Telecommunication Administration, the Computer Science Network in Wisconsin, the Mitre Corporation in Massachusetts, and Cornell University.

Austin's modus operandi bore some resemblance to that of the teenage hackers who have been an object of media attention in recent years. But when officials arrested Austin at his apartment, they found evidence indicating he may have been involved in more than whiz kid antics.

Whatever the case may have been, Austin's actions have worried local law enforcement agencies. The use of computers in crime is not new, but the rate at which computer crime is occurring is rising dramatically. In response to Austin's arrest and in recognition of the computer crime problem in general, Los Angeles District Attorney Robert Philibosian has instigated the formulation of the Electronic Crime Task Force. The task force's mandate is to investigate computer crimes and prosecute computer criminals.

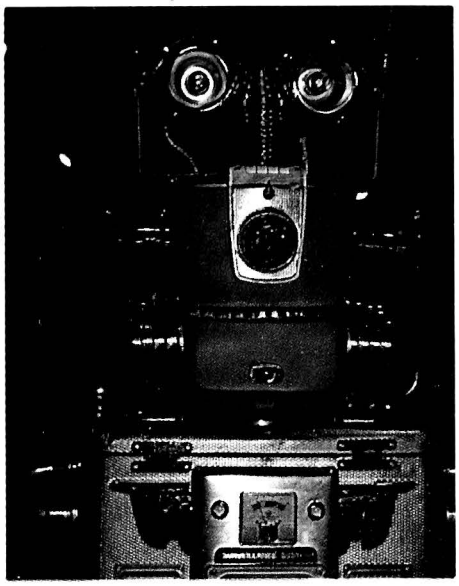
In 1979, Deputy District Attorney Clifton Garrott was the only full-time employee of the electronic crime section of the D.A.'s major

GOTO page 233, column 1

# Whimsical Art Show Features Playful Robots

Late last year, a bizarre combination of metal sculpture and photographs was displayed at the Chevron Art Gallery in San Francisco. Called Robot Realities, the show was organized by Art Programs Incorporated and brought together the talents of sculptor Clayton Bailey and photographer Ken Botto in a satirical look at mechanical beings.

The robots created by Bailey seem to have sprung from the golden age of science fiction, or from the pages of Isaac Asimov's robot novels. Using various metal objects and rolled aluminum, Bailey has constructed whimsical



versions of robot companions—servants, secretaries, sentries, and household pets.

"There are reincarnations of household appliances," states Bailey. "My robots are personable, not at all like the industrial robots currently used in factories."

Ken Botto's photographs portray fabricated situations. He has placed intricate toy robots in elaborate other worldly settings or in familiar domestic ones. Author of *Past Joys* (Chronicle Publications), a pictorial essay on old toys, Botto has researched the robot phenomenon, which started in the 1920s.

"The Japanese became robot-conscious right after World War II when they exported to the U.S. a toy robot called Atomic Robot Man. The toy world has accepted the robot concept for quite some time."

Botto's photos present a more threatening picture of robotics, which he attributes to the Christian culture's representation of robots as evil. From the publication of Frankenstein on, the creation of any moving thing, mechanical or not, has been seen by some as an unholy attempt to imitate God. And in science fiction literature and films, robots are often portrayed

GOTO page 232, column 2

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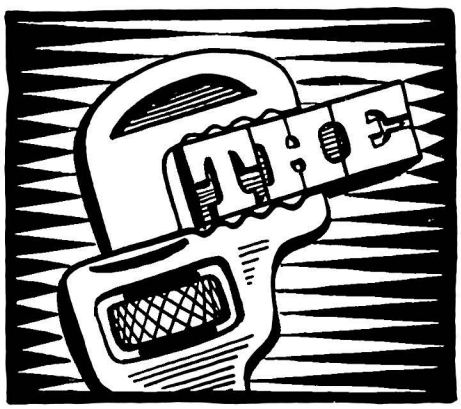
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# Bell Labs Develops a Program To Help Writers Improve Style

The name Bell Labs usually conjures up images of white-coated physicists sequestered in cubicles, equipped with supercomputers, subjecting ions to megawatt laser blasts in an effort to "improve communications," but one of Bell's more interesting breakthroughs in communication has nothing whatever to do with fiber optics, microwave amplifiers, or geostationary satellites. It's called *Writer's Workbench* and it's just plain software.

Developed by a team of Bell Labs programmers—Lawrence T. Frase, Lorinda Cherry, Nina McDonald, and Stacey Keenan—*Writer's Workbench* is a series of programs designed to improve writing. More sophisticated than a word processor or a dictionary program, *Workbench* proofreads documents, alerting the writer to possible errors in spelling, capitalization, and punctuation, as well as to poor style (awkward, overblown, inaccurate, or sexist phrases) and vagueness.




If all that sounds like an attempt to improve a writer's style mechanically, something experts once swore was exactly the kind of thing a computer couldn't do, it is. *Writer's Workbench*, with the aid of a variety of specialized utilities, attempts to improve the overall clarity, readability, and style of a piece of writing.

By examining samples of what the user feels is good writing, *Workbench* can, for example, compare the percentage of abstractions used in a developing text against the acceptable number found in sample cases. This gives the writer an opportunity to evaluate his work against that created by experts. Readability (in terms of the typical education level required by the reader for full understanding of a document) may also be assessed.

Another tool *Workbench* used to help writers edit their documents is *Org*, a program that assembles and displays a text file containing the beginning and ending of each paragraph. This makes the overall organization of a piece, the transitions from one thought to another, and the relationships between paragraphs more apparent. Other stylistic weaknesses, such as a profusion of passive constructions, excessive use of adjectives, and sentences that are too uniform in length or too wordy, are all quickly evident.

At Colorado State University in Fort Collins, Colorado—where more than 3,000 students are currently using *Writer's Workbench*—reaction to the program has been enthusiastic. While professors and students alike realize that the program cannot replace teachers, everyone seems to agree that it helps students reconsider the mechanics of their papers before they turn them in. This frees teachers to concentrate on content, logic, and organization.

Associate professor of English at Colorado State Kathleen Kiefer calls the program "remarkable." In a recent *Wall Street Journal* interview, Kiefer said that students using the *Writer's Workbench* scored 50 percent better on writing tests than did students who were not using the program.

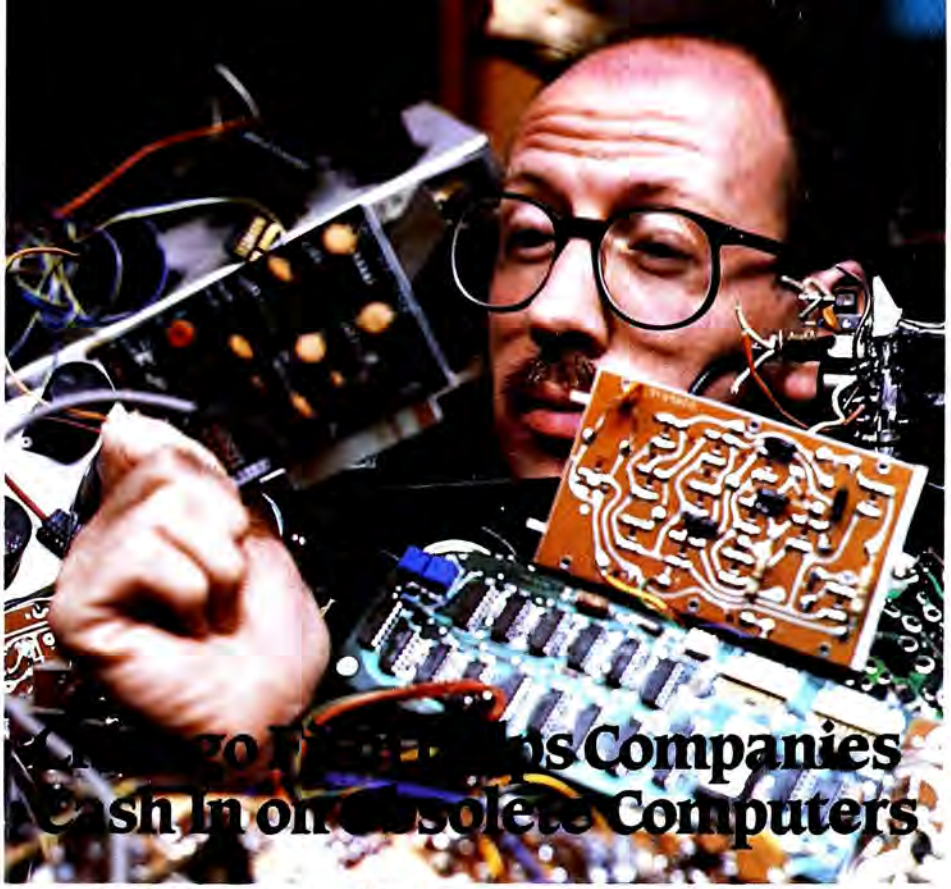
"At first, teachers worried that students would grow dependent on the computer," said Kiefer. "They soon found that the students develop outside the computer environment as well. It's mechanical analysis, but what people do with the attention-getting advice is far more than mechanical."

According to Lawrence T. Frase, one of the program's developers, there are plans to offer the program to business students at Colorado State as well. "We have been receiving inquiries from the publishing industry, students, businesses, and educators—anyone studying the style of oral and written language," says Frase.

At present, *Writer's Workbench* runs only on desktop mainframes that use Bell's Unix operating system, but Frase speculates that the 700K required by the program could ultimately be stored off-line on disk. If this were done, the program could be made available to personal computer owners in the future.

While none of the proofreader programs for personal computers is as extensive as *Writer's Workbench*, many software and hardware manufacturers market or plan to market expanded text editors that perform similar functions. For example, *Apple Speller III* (published by Apple) has a provision to point out redundancy in a text, *Punctuation & Style* (from Oasis Systems in San Diego) suggests substitutions for more than eight hundred commonly misused phrases, and Bruce Wampler's *Grammatik* picks out trite phrases, repetitions, and punctuation errors.

IBM plans to condense its own mainframe proofreading system, called *Epistle*, to run on personal computers. So far, however, IBM has not announced any marketing plans for such a condensed version. **HAS**



# s Companies sh In on solete Computers

As newer, smaller, more powerful computers continue to appear on the scene, many of their larger, less powerful forebears have begun to disappear. The ability of the micros to outcompute the once mighty mainframe is not the only reason the old machines are vanishing.

There was a time when many mainframe and minicomputers were made with silver, platinum, and copper. Gold, an excellent conductor of electricity that once cost $40 an ounce, was also used in large quantities. About ten years ago, the price of gold started to climb sharply and computer manufacturers started to use palladium, which was less expensive.

This hidden wealth is good news to some owners of old mainframes—machines that, in many cases, have become "negative assets." In the past, old systems that may orginally have cost hundreds of thousands of dollars have gone to new owners for just a few thousand dollars or gone straight to the dump. Still other old computers are kept in storage, with their owners paying as much as $100 a month for their shelter.

About a year ago, Forsythe Computer Associates, a Chicago-based computer leasing company, began a dismantling service that strips the machines of their precious metals. Now these old computers, destined for extinction, are disappearing even faster. Forsythe's dismantling plant processes about two hundred machines a month.

Plant manager Joe Zabelle draws a powerful comparison. "It's like killing dinosaurs," he says. "When all the dinosaurs are gone, our work will be done." Zabelle estimates that time frame to be from two to five years.

Forsythe charges customers $1.50 per pound to process an old machine, in addition to a 15 percent commission on the value of the metals extracted. Companies such as IBM, Honeywell, and Burroughs have in-house facilities for extracting precious metals from computers, but Forsythe is currently the only company that processes machines for other companies, without actually purchasing the computers.

Most of the precious metals are extracted from the guts of the computer where contact points, chips, and electronic circuits are found. The precious metal scrap is first burned to remove impurities and then smelted into a copper-base metal. The result is a bullion bar composed of the precious metals, which are later separated. The whole process takes about sixty days.

When it comes to these old machines, things are not always as they seem, says Zabelle. "There might be two identical models, just one serial number apart, but one may be worth two thousand dollars more than the other. From time to time, we even get some that are worth nothing." Still, a large computer can be worth as much as twenty-two thousand dollars, and, according to Zabelle, looking for the wealth is half the fun.

"We have a great time using saws and sledgehammers. One employee has even kidded about using dynamite," says Zabelle. They haven't gone that far yet, really.

"The work is a little noisy but very relaxing," says Zabelle, boasting. "We don't have any frustrated employees."

Most of the plant's employees are "guys who like to see how things work." However, Zabelle acknowledges, there are a few former computer programmers in there hammering away with the rest. And they probably laugh the loudest at the plant's running joke—a fictitious advertisement for the plant that asks, "Ever been had by a computer? Want to get even?" **MS**


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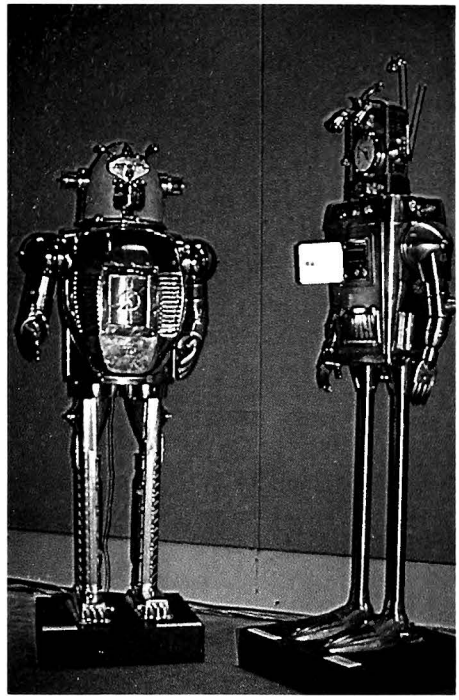
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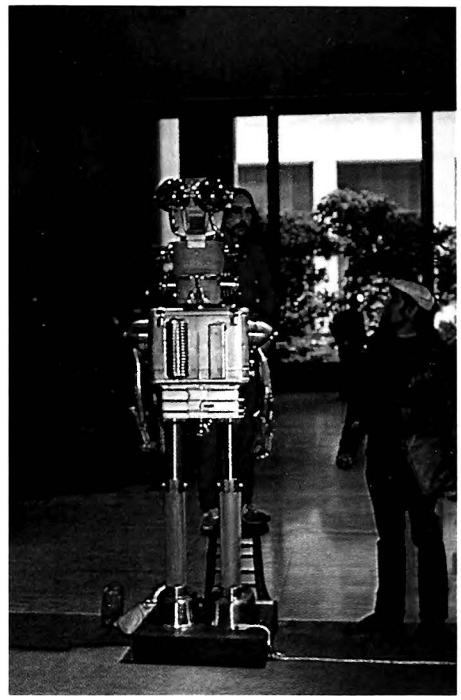
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# *Robots*

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as inhuman and vicious killers.

Botto's photographs have appeared in galleries at the University of Arizona at Phoenix and the Trans America Building in Los Angeles. His two-dimensional treatment of robots adds flavor to the three-dimensional aspect of Bailey's life-sized works.

For the last several years, Bailey—formerly a ceramic sculptor—has constructed whimsical robots. He has put together *The Robot Builder's Manual*, a twenty-eight-page booklet that contains complete instructions for building various mechanical beings out of available materials.

According to Art Programs president Linda Evans, who brought the two artists together for their third show, Robot Realities is quite appealing to kids.

"More than twenty-six hundred students have visited the Chevron Gallery," she says. "Robot Realities has been a real success."**HL**

Clockwise from upper left: two of Clayton Bailey's creations, Ape Guardian and Smoke Ring Blowing Grandfather Clock; there were tall imposing robots; Bailey's ON/OFF robot with Botto's photos in the background; and there were short friendly robots.



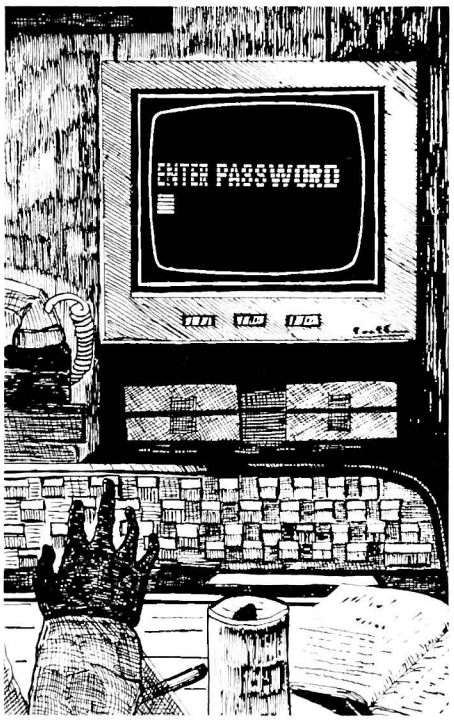


# Criminal Computing

continued from page 229

fraud division. The new task force includes Garrott, Deputy District Attorney Kim Wildman, investigator Duane Trump, and twelve part-time investigators (who are undergoing training). The task force, according to Philibosian, was formed not only to punish computer criminals, but to raise the public's consciousness of computer crime.

"When you have as technical an issue as computer crime, and all the subissues, and you're trying to explain it all to a judge or jury, a certain amount of technical knowledge on the part of the prosecutor and investigator is required," says Philibosian. This knowledge is needed not only to prepare the case for trial, but to explain it adequately to a group of lay people.




"The other reason for the force," says Philibosian, "is to attract attention to this area so that people who are victims will know they have a place to go to make a complaint and won't just throw up their hands and say, 'Well, no one understands what's happening.' We also want to convey to the general public and potential computer criminals that they're going to be detected, arrested, and convicted. They're going to be punished. By conveying that in advance we hope to deter them."

Declining to reveal the methods used in detecting computer crime, Philibosian would only say that the force "cooperates with agencies that have computers, and works with their experts and technical people."

According to Philibosian, the Electronic Crime Task Force investigates various categories of computer thieves, ranging from stereotypical adolescent computer geniuses to thrillseekers to planters of logic bombs.

"A person such as Austin, for example, is referred to as a computer hacker, one who invades computer programs and causes damage by preventing people from getting into the system, destroying programs, or removing information in an unauthorized way. It would be just as if they were to back up a moving van to a computer store and take out $500,000 worth of hardware."

Unlike computer hackers seeking simple thrills, other computer criminals are breaking into computers for financial gain and revenge on their employers.

"Some people commit fraud by computer, transferring money from one account to another," Philibosian explains. "This is the type of person who before we had computers committed fraud by altering accounts. Usually these are people within financial institutions. Another type of computer criminal is one who is stealing information to use in a suit for some kind of fraud."

An example of this type of computer crime was recently investigated by the task force. In one particular case, a former deputy sheriff, posing as an active member of the police force, obtained computer information and sold it to the private investigation agency currently employing him.

"Another person is the destructive type of criminal," Philibosian continues, "who, because he has a grudge against a particular company, wants to destroy the company's

GOTO page 234, column 1

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## Criminal Computing

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computer program. That's done by planting a logic bomb (a collection of destructive commands) that wipes out information. Still, other people extort money from a company by threatening to blow up information if they are not paid a certain amount of money."

Such a case occurred last July when two employees tried to sabotage the computer system at Collins Food International, the company that provides payroll and inventory services for Kentucky Fried Chicken and Sizzler franchises nationwide. The logic bombs planted by the two employees, both Los Angeles computer programmers, would have deleted inventory and payroll information, shut down the computer system, and then erased the signs of intrusion to protect the pair.

Another computer manipulation technique is known as the Trojan Horse. The perpetrator of this kind of computer crime arranges matters so that a legitimate user of a system unknowingly sends information to another person who isn't entitled to it.

"Then, of course," says Philibosian, "there's just the straight theft of computer time—someone who is running programs for his own purposes on someone else's computer.

According to Philibosian, no one type of computer criminal predominates, though more crimes are brought to the task force's attention in the areas of computer time theft and fraud.

The penalties computer criminals face vary from state to state. As of August 1983, twenty states had legislation specifically penalizing computer criminals. California Penal Code Section 502 states that "intentional accessing to defraud, extort, or obtain money, property, or services with fraudulent intent or malicious accessing, alteration or deletion, or a malicious accessing for a credit rating" is punishable by up to three years in a state prison, a year in county jail, or a fine of up to $5,000. Hearings to be held later this year will determine what sort of federal legislation will be initiated to cover computer crimes.

Philibosian says that while the laws in California are strong in terms of computer theft, which is covered by routine theft laws as well as by Section 502, more awareness in the areas of prevention and security is needed to counteract the knowledgeable computer thief.

"Passwords, for example, and access to those passwords, must become more complicated," Philibosian maintains. "The use of more complex passwords with more letters would be one way of preventing entries because it would be difficult for a criminal to come up with a password by random methods."

Even though he has formed the task force and although he stresses the need for enhanced societal awareness of computer crime, Philibosian does not believe that computer crime is becoming more common than other varieties of crime. "We have crime all over. We still have cattle rustlers right here in Los Angeles County. Computer crime is just a new way to steal. We have relatively few computer criminals because relatively few people have that kind of capability and knowledge." **JG**



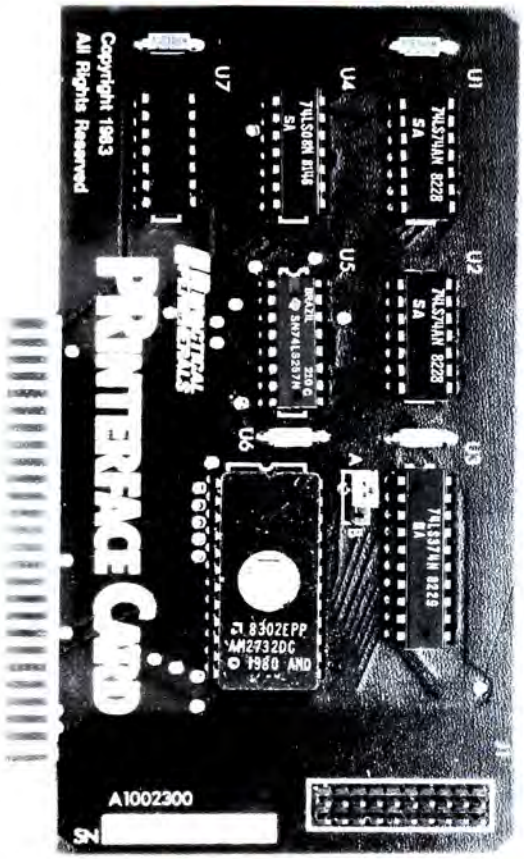




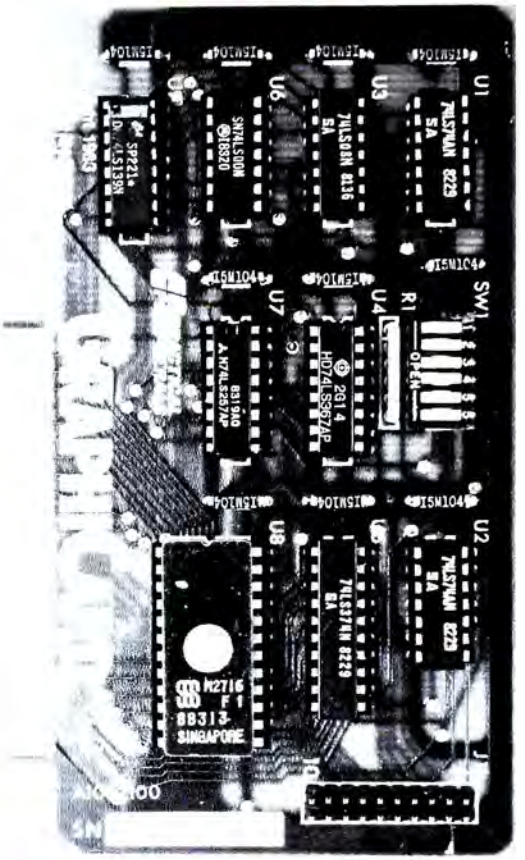


☐ **Silicon Reds.** This past November, the State Department made Silicon Valley, the high-technology industrial belt south of San Francisco, officially off limits to Soviet diplomats traveling in the United States. Restrictions designating "open" and "closed" areas of the country, which have been around in various forms since 1951, are imposed solely because the Soviet Union puts similar limits on American personnel in the U.S.S.R. Currently, closed areas in the United States include most of the nation's centers of the defense industry, including Silicon Valley, eastern Long Island, Seattle and Tacoma, and large parts of southern California and Texas. The State Department's action makes it official; but in practice, Soviet requests to visit Silicon Valley have been denied for several years. The regulations include no specific machinery

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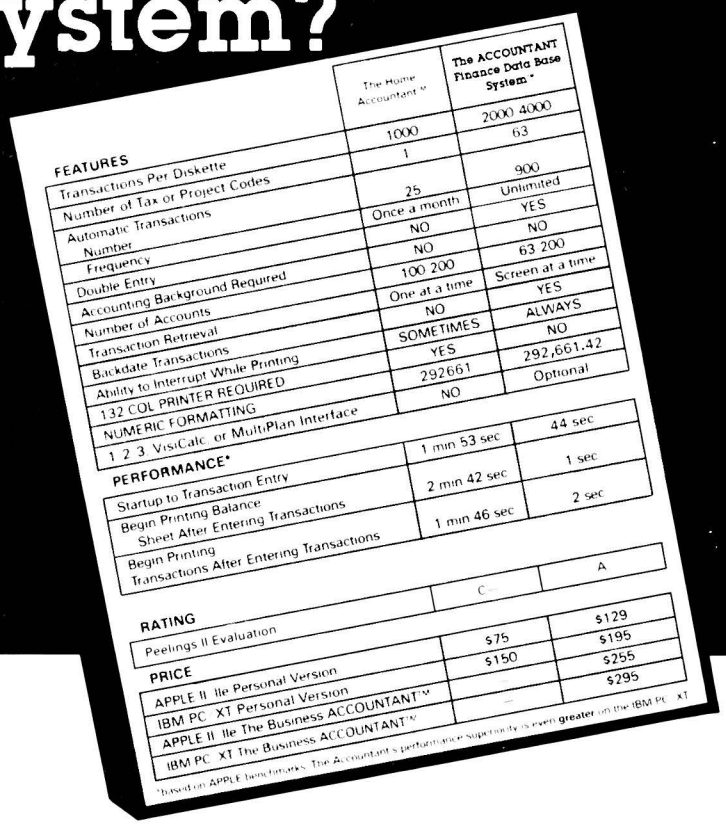
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☐ **Workers Vote Nonunion.** By a margin of nearly five to one, employees of Milpitas, California-based Atari chose not to join the Glaziers, Architectural Metal and Glass Workers Union in a vote conducted last November. The outcome of the vote was not a surprise—unions have had a tough time even getting a foothold in Silicon Valley industries. A study conducted by the American Electronics Association found that unions have won only seven of thirty-seven bids to represent workers at high-tech firms between 1977 and 1982. Nonetheless, labor leaders were hopeful about the Atari vote because the company laid off 1,700 workers last February. The tally—143 votes against unionization, and only 29 in favor—is seen as an indication that the unions will never have much impact in Silicon Valley. When asked about the vote, several workers expressed the beliefs that unions are not much help anymore and that there is no guarantee that the unions will improve the workers' situation. Though crushed for the moment, the unions are saying the battle isn't over yet. The union can come back again and probably will—perhaps with a new image that's designed to be more acceptable to young workers who aren't sure about unions.

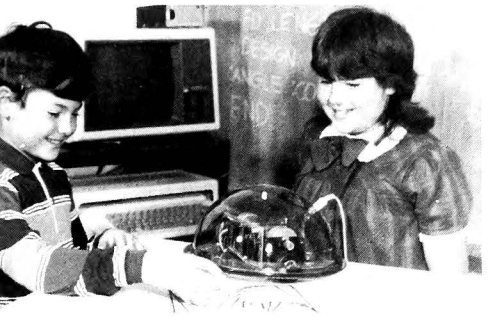
☐ **Bank of Americomputer.** Taking a big leap into the uncertain waters of electronic banking, Bank of America announced two months ago that it will allow customers with home computers to pay bills and use other banking services by hooking into the bank's computer system. The San Francisco-based bank said the service is being offered immediately to customers with checking accounts at its 540 branches in northern California. Plans call for the system to expand to the southern part of the state before mid-1984. Customers can pay bills by transferring funds from their accounts to some two hundred merchants, utilities, and other creditors that will be linked to the service. For a fee of $8 a month, customers can use the service between 6 a.m. and midnight, seven days a week. Citing estimates that some 700,000 California households now have personal computers—and that about 20 percent of those have modems—the bank hopes to have 25,000 of its customers using electronic banking by the end of this year.

☐ **Black Gold Conference.** A new exhibition and conference, Electronics in Oil & Gas/U.S., will take place June 4–7 at the Convention Center in Dallas, Texas. The conference will focus on the key role of electronic equipment and technology as applied to the petroleum and gas industry and will be held in tandem with the World Oil & Gas Show and Conference. Electronics in Oil & Gas/U.S. will concentrate on electronics technology as it applies to processing, production, supervision, data control, communications, navigation, testing, instrumentation, safety, and other operational functions. Information about both shows may be obtained from Martin C. Dwyer International (a Cahners Exposition

Group Company), based in Des Plaines, Illinois.

☐ **City of a Thousand Bar Codes.** Paris, France, has been selected as the site for the National Retail Merchants Association's (NRMA) World Retailer's Business & Equipment Exposition. Scheduled for April 8–11 at the Palais des Congres, exhibits for the exposition will range from the most sophisticated electronic and telecommunications technologies to the most efficient and creative store planning and sales promotion. For additional information contact NRMA's office in New York City.

☐ **Tottling Turtle.** Harvard Associates (Somerville, MA) has announced a new robot teaching device—the Turtle Tot. Manufactured in Australia by Flexible Systems (Hobart, Tasmania), Turtle Tot is a simpler, smaller version of the Tasman Turtle, which Harvard Associates distributes in the U.S. for



Flexible Systems. Priced at around three hundred dollars, Turtle Tot can be programmed using various microcomputers through an RS-232 interface. Turtle Tot can move, draw, turn, blink its "eyes," and feel its surroundings with touch sensors. An optional speech package is available as well. The Turtle Tot is intended for use in classrooms, including preschools.

☐ **Manual Free-lancers Take Note.** As a sequel to the 1984 *Programmer's Market*, Writer's Digest Books will publish *The Complete Guide to Writing Software User Manuals* in May. The book is written by the editor of the 1984 *Programmer's Market*, Brad M. McGehee, and contains, according to the company, "everything you need to know to plan, write, illustrate, design, and publish computer software manuals for profit." The two-hundred-page volume is intended to help both programmers and free-lance writers produce readable, easy-to-use manuals. McGehee takes the reader from the planning stages through the production of the finished manual, using examples from successful and unsuccessful documentation. He also presents a fictional account of a working relationship between a programmer and a free-lance documentation writer.

☐ **No Time for Videotex.** Two years of research and development and $25 million later, Time Inc. has decided not to enter the teletext business. Teletext is a means of distributing pages of information electronically to television screens equipped with special decoders. Teletext transmission goes in one direction only, as opposed to videotex, which features two-way transmission and allows consumers to receive information and interact with the system to perform such activities as home banking and shopping. In its teletext test, Time provided about five thousand screens' worth of information, distributed by satellite, to 200 households in Orlando, Florida, and San Diego, California. Time, apparently, found little evidence that a mass market exists for the teletext service. Also, industry sources say that Time's hardware partner, Matsushita Electric Industrial Corporation of Japan, couldn't develop a home terminal at a price attractive to consumers.

☐ **Survey Time.** More than 15 percent of American households own a microcomputer or have at least one member using a micro at work or school, according to a survey by Mountain View, California-based Microcomputer Research Group. Company officials attribute the higher-than-expected exposure figures to the fact that micros are shared by an average of three users at work, and many times that number at school. The survey, which included 2,000 U.S. households, found that "lack of need" and a resistance to "high prices" were the most common reasons respondents gave for not purchasing a microcomputer. However, children's needs figure heavily in a possible future change in attitude. In terms of software, the survey responses indicate that the typical home user expects to buy two productivity packages during the next twelve months, with word processing and filing programs being the top choices. About 75 percent of the home users expect to buy business packages as compared to two-thirds who expect to purchase education software. Another discovery was that the software "after market" exceeds the demand for software purchased at the time the hardware was purchased. Home users typically spent $100 initially, then an additional $180 during the first twelve months after their computer purchase.

☐ **Robot Wares.** At first, recession-weary workers in Michigan's auto industry feared and opposed the coming of robots and automation. Their catch phrase was "robots don't buy cars." Now the attitude is different. Workers and manufacturers are placing high hopes on the growing robotics industry. There are more than thirty robotics companies in the state of Michigan, with many more on the way. Experts predict that robotics and automation could become a $25-billion-a-year business in the United States by the end of the decade. Michigan seems to be in a good position to grab much of this business because it has a strong university system and an industrial structure for high-tech industry already in place. There is also a new entrepreneurial spirit on the state's campuses and in local companies. ◨

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# MISPLACED FRIENDS

## by Sharon Webb

It looked something like his mother's suitcase—the slim round one that she put her makeup in. It was dull black leather, though, instead of dusty blue, and a little battered from its fall. Just from the looks of it, the boy had no way of knowing if it was alive.

When it fell, he had been leaning back against the lumpy Cub Scout duffle bag filled with soft-drink deposit bottles and beer cans culled from the wake of summer's-end fishermen. Satisfied that he had collected enough to finance at least an hour's worth of arcade time, he pulled out the first of two thick sandwiches and took a satisfying bite.

The bridge overhead magnified the sound. Startled, Jeff dropped his sandwich as something clanged and clattered down the rocky abutment. He was on his feet when it landed in a cushioning pile of brown leaves caught between two flat stones.

The boy stepped out of the deep shadow thrown by Thompson River Bridge and, shading his eyes against the dazzling sunlight, looked up at the road. The black car above paused, crept, paused again. The man in the passenger seat stared down, startled eyes locking with his for a time-glazed moment. Then at a motion from someone in the back seat, the car sped away leaving the faint smell of exhaust in the air.

He stared at the retreating car for a second or two and then reached for the slim case. The rustle of his square hands among the leaves echoed the sound of the wind in the yellowing poplars overhead. Hemmed by its far bank of cave-riddled limestone, the river leaped from stone to stone, hissing over the shallows, spitting tiny spumes of white foam, drowning out the encroaching sound of a siren.

Something cold and hard snaked against his hand. Surprised, he pulled it back. A chain glinted silver against the brown leaves. One end was attached to the handle of the case with something that looked to Jeff like half of a handcuff. The other end was torn and twisted as if the hard metal had offered no more resistance than a chunk of warm taffy.

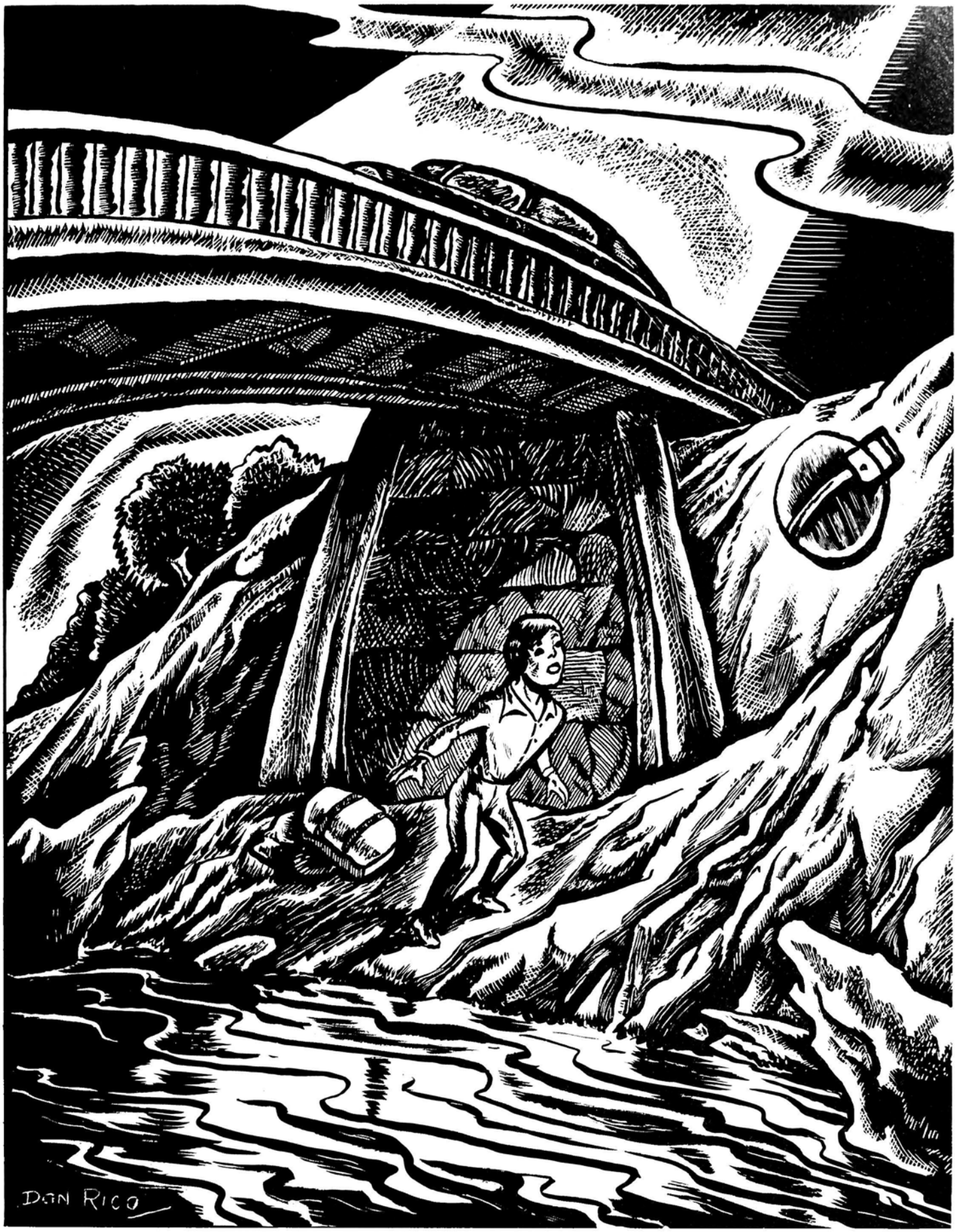
The siren grew to a scream as a patrol car roared past. Wide-eyed, he stared after it until its distant wail was swallowed by the rush of the river. Criminals, he thought. The police were after the guys in the car—and he had the evidence. Although a tiny nugget of his mind judged the thought a delicious fantasy, the greater part declared it real and he fell to examining the case for clues.

It wouldn't open. The combination lock, sheared away by the force of its rocky descent, held fast. At the back of the case was a round opening about an inch across. He poked an exploring finger inside. The tip of his index finger touched a dull protrusion that felt like metal. Hoping for a hidden latch, he pressed it, but nothing happened.

Tantalized, he turned his attention to the latch again. Maybe there's money inside, he thought. Lots of money. Probably that was why it was locked. Along one side he found a tiny gap between the lid and the base. Running his fingernails along it, he tugged. Nothing. He tugged again, splitting a nail to the quick.

He sat back on his haunches, sucked on the wounded finger, and stared speculatively at the oval case. Probably there were thousands of dollars inside. Maybe even a million. A million, maybe, in unmarked bills. "A bank heist," he said aloud, his blue eyes growing round at the thought. Liking the feel of the words in his mouth, he said them again, but this time in a whisper, this time

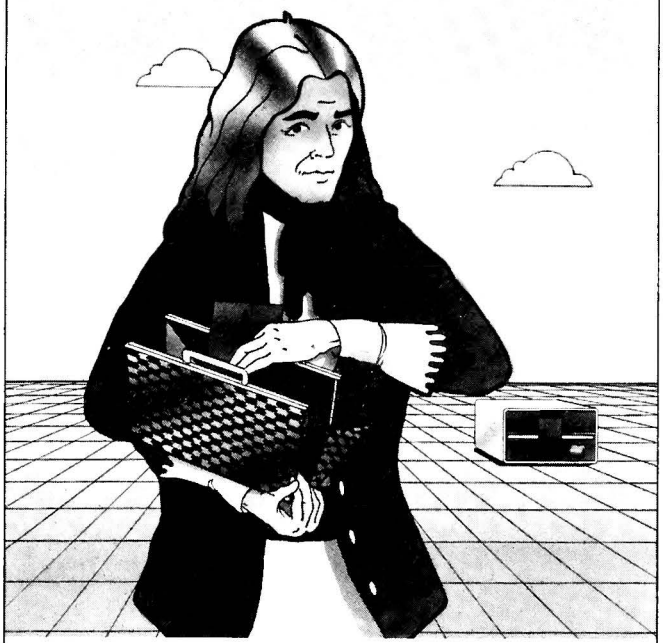
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with a wary glance from side to side.

But if they were unmarked bills, it could be ransom money. It could even be a kidnapping. And maybe inside with the money was a clue. The breathtaking thought came that, armed with the clue, he could be the only person in the entire world who could solve the crime.

His fingertip began to throb. His tongue probed the damage and found a sliver of nail still intact. With absent nips of his teeth he excised it. The chain absorbed him now. How come ransom money would have a chain? he wondered. It came to him in a flash. Evidence. They were taking the money to court for the trial when all of a sudden somebody came along and ripped it off.

He frowned suddenly. He'd have to give the money back to the authorities. They'd want it. Deep in thought, he stared at the case. Then he grinned. Probably there would be a reward.

He scooped up the thin black case and stuffed it into the canvas duffle on top of the bent cans and silt-encrusted bottles. There was sure to be a reward, he thought. Slinging the sack on his back, he began to whistle as he headed for home.

Muppet planted two black hairy paws on Jeff's chest. Stage two of the ritual greeting was the application of a long pink tongue to his chin. Duty done, Muppet retired to a corner of the garage and went back to his industrious chewing.

Jeff dumped the sack against the wall next to an array of Star Realty signs and began to ransack his father's jumbled toolbox for a screwdriver. Discarding a rusty Phillip's head as unsuitable, he looked around for something else. His glance fell on the dog. Balancing the paint-scraper blade between two forepaws, Muppet was reducing the handle to splinters.

The scraper would do. He extracted it from Muppet's jaws and wiped the remains of the damp handle on his pants. Then avoiding the dancing dog who expected a game, Jeff pulled the case out of the sack and headed into the house.

His mother had scribbled a note on a sheet torn from a Star Realty memo pad:

> Kids,
> HOT PROSPECT! Back whenever.
> If the Phillips call about the closing, tell them I'll get back to them this evening.
> Stay out of the cake. It's for dinner.
> Mom

Stashing the case on the kitchen counter by the note, Jeff lifted the lid from the bakery box. The single-layer cake advertised what it was by the bright orange carrot iced onto its middle. He stared at it speculatively and decided that since the sides weren't iced nobody would notice that some was missing. With a little knife work that left the flaming carrot decidedly off-center, he cut away the east border of the cake, stuffed a large portion into his mouth, and washed it down with a slug of milk.

Belatedly mindful of germs, he wiped the lip of the milk carton with his palm, poked it shut, and stuck it back into the refrigerator.

The back door wheezed open. "I'm gonna tell," came the voice.

He searched for a suitable epithet to throw at his little brother. "Shut up, herpes head."

"You're one too and I'm gonna tell. Mom said to stay out of the cake."

Jeff tossed the cake-gummed knife into the sink, gave Tommy his best withering look, and reached for the case.

"What's that?"

He thrust out his chin and stared elaborately at his fingernails before he said, "Maybe a whole lotta money. Maybe a million even."

"What do you think, I'm stupid or something?"

"You got it." Scooping up the case, he headed for his room, leaving Tommy to stare at the carrot cake for a moment before he reached for the knife and began to saw off its northwestern edge.

As the wind fluttered the gold curtains, the afternoon sunlight filtering through Jeff's window danced in yellow, then amber patches on the giant poster of the solar system. At the bottom, in letters so small as to avoid casual detection by an inspecting parent, the word "up" was penciled by the name of the seventh planet.

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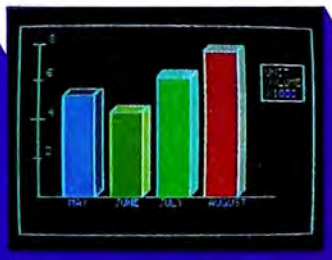


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All images depicted here are actual photographs of screen graphics created using FLYING COLORS™

He slid the case onto the bed where it nestled in a boy-sized depression in the center. Shimming it against a brown and gold plaid pillow, he went to work on the lock. The edge of the paint scraper fit nicely into the gap at the side of the case. He pressed down and the blade bent in a neat arc. He tried again, this time twisting the handle from right to left, then back again. Nothing. Working the blade by degrees toward the front of the case, he tried lifting, then depressing the lock. When the frontal attack failed, he rummaged through the closet in search of a more effective tool.

Twenty minutes later, Jeff flung the coat hanger to the floor in disgust. It bounced off an assortment of failed paper clips and the metal strip from an old three-ring notebook and landed next to the paint scraper, which by now had only half a blade. He glared at the locked case. "Oh, c'mon."

He flung himself back on the bed. Boring his head into the pillow, he squeezed his eyes shut and tried to extract from his brain some way to get at the contents. Failing that, he leaned over the case with a clenched fist. "Open."

There was a faint click and the lid slowly began to rise.

Eyes widening, he shrank back. "Close?" he whispered.

With another click, the lid shut tight.

He stared at the case in amazement. It took a full minute before he tried again—this time in a voice not much above a whisper: "Open."

The lid clicked again and began to rise.

Wonder gave way to disappointment when instead of money he saw a keyboard. Nothing but an old typewriter, he thought. An instant later he saw the flat screen nested inside the rising oval lid. It opened like a briefcase, stopping at a ninety-degree angle to the keyboard. Then the lid glided several inches upward on an extension that rose like a slender stalk until its screen was at eye level. He stared at the viewport that glimmered like milky opal in the sunlight. It's a computer, he thought. It's got to be. But it didn't look much like the ones they had at school. This one was smaller and its oval screen wasn't more than an inch deep. He ran his fingers over the keys. They were gray and contoured and slightly warm to the touch.

The keyboard looked like a typewriter's, but to the right was a bank of narrow keys whose function escaped him. And above the familiar-looking letters was another row, more like buttons than keys. They were red except for a large pale one bulging in the center of the row like a blister.

He touched it experimentally. It gave under his finger as if it were made of something no more substantial than a marshmallow. He pressed harder, then jumped back as it gave a faint pop and disappeared. He stared. A flat, enameled disc with an eagle in the center had taken its place.

Suddenly a beam of red light shot into his eyes from a faceted button just below the bottom of the screen. Before he could react, a voice said, "Imprinting."

A moment more and the screen began to glow:

ENCODING . . . . . .

The screen went black. Then words scrolled onto the screen:

* * * IMPRINTING COMPLETED * * *

[B] [E] [M] [C]
SYSTEM ACTIVATED

The [B]IOLOGICALLY [E]NHANCED [M]ASTER [C]ONTROL unit opened its receivers. Data from reconnaissance satellites flashed into memory and were automatically processed by intricate VHSIC circuitry and then interpreted by a portion of the [B] [E] [M] [C]'s protein brain cells. A series of electronic blips were duly noted as a vee-formation in a known parameter:

—[CONCLUSION: GEESE . . . ATLANTIC FLYWAY]—

Other blips were received simultaneously and compared with data stored in the [B] [E] [M] [C]'s vast memory:

—[CONCLUSION: COMMERCIAL AIRCRAFT]—

As the [B] [E] [M] [C] sorted the incessant streams of satellite data, other portions of its brain were busy at other tasks.

Jeff stared at the screen. Before he could blink, the voice came back: "Greetings, Mr. President. I am at your service."

His eyes grew round as coins. Then comprehension dawned. This wasn't just anybody's computer. It had to be for somebody important. Probably some big company, like General Motors. Maybe for the president of Atari even.

"Can you hear me?"

"I can hear you," said the [B] [E] [M] [C].

"Can you understand what I say and everything?"

"I have twelve higher languages: English, Russian, German, French, Spanish, Hebrew, Chinese, Fortran, Ada, Pastech, b-text, and Mascom. I have ninety-five thousand English words in memory, including sixty-four hundred regional, colloquial, and slang expressions."

"Like what?"

"Do you wish a random expression?"

"Sure."

"OK, turkey."

"OK," said Jeff in admiration.

" 'OK': Spelled o-k. Also o-k-a-y. Rarely, o-k-e-h," said the computer. "Meaning: Approval or agreement. Origin: Probably 1830 to 1834 from 'Old Kinderhook,' nickname of President Martin Van Buren. 'Turkey': Spelled t-u-r-k-e-y. Meaning:. . . ."

"Never mind," said Jeff. "I get the idea."

"Would you like another random expression?"

He scrubbed at the end of his nose with a sawing motion of an index finger. "I don't think so." He stared speculatively at the computer. "Uh, do you play games and stuff? You know, like *Alien Intruders*?"

"Explain *Alien Intruders*, please."

"You know. Like you're being attacked by aliens and you have to shoot missiles."

"You would like a war game, Mr. President?"

"Yeah."

"How many alien ICBMs do you wish to attack?"

"A dozen, I guess."

"What cities do you wish to be under attack?"

"Uh, New York," said Jeff. He paused. "And Chicago and Washington."

"Enter command," said the computer. Then it fell silent and its screen flashed on:

Waiting. . . . . .

"OK," said Jeff. But there was no response. Puzzled, he stared at the computer. "Well, start."

Still no response.

He looked at the keyboard. One of the red buttons on the top row was labeled COMMAND. He pressed it.

Yellow letters appeared on the screen:

[B] [E] [M] [C]

NUCLEAR SIMULATION

TARGET. . . .NEW YORK, NEW YORK
TARGET. . . .CHICAGO, ILLINOIS
TARGET. . . .WASHINGTON, DISTRICT OF COLUMBIA

The [B]IOLOGICALLY [E]NHANCED [M]ASTER [C]ONTROL began transmission. Far above the earth, a satellite in geosynchronous orbit received a code.

Deep inside Cheyenne Mountain in Colorado, the Norad commander turned pale as yellow symbols flashed across the screen.

At 3:18 p.m., Eastern Daylight Time, the Strategic Air Command post display showed that four SLBMs had been launched toward the United States. Twelve seconds later, the warning indicated that eight additional ICBMs were twenty minutes from target.

As warning messages flashed to selected Air Force bases, sirens squawked alerts.

Jeff stared at the computer as a full-color Mercator projection of the earth popped onto the screen. A dozen tiny red projectiles crept on dotted lines toward New York, Chicago, and Washington. "How do I wipe 'em out?

Words rolled across the bottom of the screen:

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. . . .TO ALTER A SIMATTACK PARAMETER. . .PRESS [DEL] AND GIVE #. . . .

He searched the keyboard. One of the red buttons was marked DEL. He pressed it. When nothing happened, he followed it with a CONTROL-DEL and a quickly pecked number 1. The moment he pressed the keys, the leading projectile vanished. He felt a flash of disappointment. Was that it? "How do I launch my missiles?"

Another line of type rolled across the screen:

. . . .[L]AUNCH MISSILE COMMAND NOT ACTIVATED IN SIMATTACK. . . .

He stared as eleven tiny simulated missiles tracked relentlessly toward their targets. CONTROL-DEL, number 2, and another projectile vanished. CONTROL-DEL, number 3, then number 4, and two more disappeared from the screen.

In the Oval Office, a grim-faced president held a receiver. The palms of his hands felt clammy. "Repeat that." Again he listened to the smooth voice of the interpreter. The phrase droned over and over in his head: "Moscow denies. . . . Moscow denies a launch. . . ."

But of course they denied it. They would have to deny it. Wouldn't he?

CONTROL-DEL 10. . . . CONTROL-DEL 11. . . . Only one missile was left now, tracking inexorably toward Washington.

Jeff pressed his lips together and stared at the screen. This was really a dumb game. He was reaching for the CONTROL key when the knob turned at the bedroom door.

In a panic, he flung a pillow over the computer. With elaborate casualness he sprawled on top of it as the door opened and his older sister walked in. She was wearing her new cheerleading outfit, blue and gold pleats swaying with the motion of her hips. "I want to show you something, Jeffie."

"What?" he said, bridling at the condescending "Jeffie." Ever since she got into tenth grade, Diane had been acting like she was a hundred years old or something. Didn't she just wish.

Diane gave a half-turn and whistled for Muppet. A moment later the embarrassed beast crept into the room. His hairy black legs and neck emerged from a gold turtleneck sweater with a blue "St. Claire High" emblazoned across his chest. "He's going to be our mascot."

With a resounding groan, the dog flopped to the floor and scrabbled at the sweater with an active hind leg.

"Isn't he cute?"

"Why have you got him in a sweater? It's about a hundred degrees out."

Diane bent over Muppet and released a toenail caught in a loop of wool. "Exaggerating again," she sighed. "It's no more than sixty-eight outside."

The lid of the computer poked uncomfortably into his back. "It's hot enough to sweat," he said, wanting her out of the room. "If you don't get that sweater off you'll sweat all over your hair and then you'll frizz."

Her hand flew to her fluffy bangs, a look of alarm tracked over her face, and Diane, who would rather die than frizz, headed for her room, her hands crisscrossed and tugging at the sweater.

Muppet, hoping for extrication from his undesirable garment, laid a hairy chin on Jeff's knee, but Jeff had pulled the pillow back and was staring at the screen again as the last tiny missile slowly closed in on Washington.

Fifteen minutes to target.

The Norad commander felt sweat drain from his armpits. Eleven of the twelve missiles had disappeared from his screen. It had to be a glitch—a false alarm. It wouldn't be the first time. Yet as a dozen technicians worked feverishly to sort out the problem, the chilling thought reechoed in the commander's brain: What better way to lead it off? Fill the screen with dummy missiles. Cancel them so we think it's a computer error. Cancel all of them except one—the real one.

Jeff's finger touched the control key, then paused. If he let the last missile smack Washington there would probably be a super explosion. Torn between victory and the possibility of special effects, he hesitated. Then his competitive spirit asserted itself and he pressed CONTROL-DEL 12.

Instantly the last missile disappeared from the screen.

[B] [E] [M] [C]
NUCLEAR SIMULATION ABORTED

The screen went blank.

Jeff waited expectantly. "Well, what's my score?"

"You wish a score?"

"Sure. Whoever heard of a game without a score?"

"What score would you like me to record?"

"Well, whatever it is," said Jeff with a touch of exasperation. He was beginning to think that the computer was stupid. First it played one of the dumbest games he had ever seen, then it didn't even give him his score. "You know, like fifty thousand or something."

[B] [E] [M] [C]
SCORE: 50000

"Aren't you going to enter my name?" asked Jeff.

"You wish to enter a name?"

"Yeah. Put 'Winner' and then put 'The Marauder.' "

[B] [E] [M] [C]
WINNER: THE MARAUDER

It was a dumb game, sure, yet Jeff felt a moment's exhilaration as the name that was immortalized on *Alien Intruders* and half a dozen other machines in Arnold's Arcade flashed onto the screen.

In the Langley, Virginia, office of the Directorate of Science and Technology, Central Intelligence Agency, Matt Stuhle stared at the communique and swore creatively, and silently, for a full minute. When a semblance of calm descended—enough to ensure his continued reputation as "The Cool Stuhle"—he raised stone-gray eyes to the man across from him. "It seems that we have a strike."

Murdock gave a short nod and tried to ignore the burning pain in his stomach. It had begun less than an hour after the body of the courier was found that morning only a quarter mile from the Thompson River plant that manufactured electronic air cleaners on its main floor and more exotic equipment in its subbasements.

Since the theft of the [B] [E] [M] [C] system, the scenario of a terrorist strike had been one of the two most likely hypotheses. The other, seizure of the system by enemy agents, had been equally unpalatable. [B] [E] [M] [C] was state of the art—the most sophisticated command system devised. Miniaturized, completely portable, it was designed to put instant retaliatory power into the hands of the commander in chief. Murdock didn't like to think of what it could do in the hands of hostiles. Instead, he began to play with the idea of a discreet call to Henderson Edwards. Hen Edwards had been more than generous with his finder's fees in the past. And Murdock knew that the journalist would go to prison rather than reveal his sources. Of course it wasn't as if he would leak anything that Edwards couldn't find out on his own, he told himself. Just a tip, a little tip—strictly on the margin.

The Cool Stuhle stared again at the communique: ". . .SCORE 50000. . .WINNER. . . ." The possibility that they were dealing with zealots was undeniable. Zealots or madmen—and therefore unpredictable as hell. Silent, scorching blasphemies complete with Middle Eastern variations and obscure central African themes played through his mind and pinched his lips into a thin, gray line.

Meanwhile, his counterpart in Fort Meade, Maryland, National Security Agency, examined a similar memo. As he did, the world's most advanced electronic communications equipment hummed and clicked and began to triangulate on the terrorist operation that signed itself "The Marauder."

Muppet's right ear shot straight up as a shrill whistle burst from the computer.

The whistle was followed by a sharp click as a spring-loaded clip popped from the console of the [B] [E] [M] [C].

Jeff stared as a clear tube oozed out of an opening just to the left and below the control key. "What's that for?"

"Nutrient port open," said the computer.

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"What are you talking about?"

"Nutrient: Spelled n-u-t-r-i-e-n-t. Meaning: food, sustenance, victuals, nourishment, meal, fare, regimen."

"You're hungry?"

"I am [B] [E] [M] [C]. Metabolism now requires nutrient solution."

"You're full of it."

"Nutrient port is empty."

"You're putting me on, right? You don't really eat. You're a machine."

"I am [B] [E] [M] [C]. Metabolism now requires nutrient solution."

Jeff clutched his knees and scratched one thoughtfully as he stared skeptically at the milky screen. This had to be one big put-on. "What happens if you don't get any?"

"Efficiency will decrease in geometric proportion to increase in catabolism. Prolonged inanition will lead to permanent cessation of all vital functions. This unit will die."

Jeff swiped at the side of the nutrient tube with the side of his thumb and then transferred the milky dribble to his pants leg. He poked the tube into the open port of the computer and pushed it home. "It's just milk and stuff," he said. Lacking a replacement tube of nutrient solution, he had used his mother's turkey baster to inject a concoction of milk, Coke, Aunt Jemima's Pancake Syrup, and a spoonful of Diane's HiPro diet mix through the rubber cap of the old tube. "Is it okay?" he asked anxiously.

While Muppet's pink tongue explored his thumb, he stared at the computer's screen.

[B] [E] [M] [C]
OK

"B-E-M-C," he said softly. "BEMCy."

"I am at your service, Mr. President."

"Do you have a face?"

"Face: Spelled f-a-c-e. Meaning: countenance, features, visage. . . ."

"No. I mean, do you have one?"

"I have face," said the computer. "Face: Spelled f-a-c-e. Meaning:. . . ."

Jeff clutched his head in exasperation. Maybe Bemcy was alive, but that didn't mean he wasn't stupid. "No, look. Can you see this?" Framing his face with both hands, he centered it in front of the screen. "See?"

The red light from the faceted button glowed. "I can see you."

"Face," he said again, pointing toward his nose with a waggling index finger. "Face." Suddenly inspired, he seized Muppet and shoved the dog's muzzle toward the screen. "Here's another one. Face."

"Face," said Bemcy.

"Well, do you have one?"

"You wish me to have face?"

"Sure."

A red beam shot from the single faceted button.

The display went blank.

At first the image was nothing more than an outline of curving, crosshatched lines. Then color, blending here, fading there, began to flow and fill the skeletal design.

Jeff stared at it in fascination. Then a grin began to twitch at the corner of his mouth as a projection at one temple grew into a black and hairy flopping ear. On the other side, its mate rose straight up in hirsute splendor. The eyes were astonishing; they were bright blue and round with short, curly lashes, and when Jeff recognized them as mimics of his own the grin turned into a chuckle and then a howl as Jeff-lips attached themselves to the end of a square black muzzle.

"Is face satisfactory, Mr. President?" The Jeff-lips bobbed and twisted in synchrony to Bemcy's voice and set in motion a wreath of black whiskers.

"Well, all right!" But almost at once Jeff's grin turned into a look of consternation as a remarkably foul and sulphurous ordor rose from the nether regions of Bemcy's case. The force and suddenness of the vapor caused Muppet's right ear to spring upward in unconscious imitation of the ear on the screen as the dog cocked his head and aimed a puzzled look at the computer.

"Ho-oh-lee!" Jeff flapped a hand in front of his nose in an effort to dispel the fumes. Then suddenly suspicious, he narrowed his eyes at Bemcy. "Did you just fart?"

Unperturbed, the Jeff-lips smiled from the screen. "Metabolism requires periodic expulsion of waste products."

"Super." Jeff's gaze rolled toward the ceiling.

"Insert emission filter," said the computer.

"What filter?"

Bemcy's face disappeared from the screen. It was replaced by a schematic drawing. Perspective lines stretched from a cylinder to a round opening in the base of the case.

Jeff slid the case around and looked at the back. "So that's what it was for," he said under his breath. It was the opening he had noticed when he picked up the case at the bridge. But there wasn't anything in it then, or now.

He stared thoughtfully at the malodorous computer. Maybe the filter flipped off when Bemcy landed. It was worth a try to go look for it.

When a new and especially powerful emanation came from Bemcy, Jeff, closely followed by Muppet, launched himself toward the door.

The long, slanting rays of the late afternoon sun struck the grayed limestone across the Thompson River and bleached the shadowy twin openings of the cave that twisted under Cumberland Cliff. On the near side of the bridge, Jeff sidestepped down the steep bank. Above him, Muppet turned from side to side indecisively and then with a leap plunged after him.

When he reached the pile of leaves where Bemcy had landed, he sifted them through his fingers. Nothing. As Muppet began to excavate a magnificent hole under the bridge, Jeff dug through the wind-piled leaves. Then, as he widened his search, he noticed something glinting in the sunlight. The perforated cylinder lay half-buried in a pile of humus. Squatting, he picked up the slim tube and held it at arm's length. He turned it and noticed that one end was slightly bent.

The sun played over the filter and glittered on the bright metal and the dark ragged crystals inside. He waggled the tube. "The Marauder to the rescue. The world is saved from the Stink Monster."

Just as he spoke, a long shadow fell across him. Startled, he spun toward the man who stood over him.

Black eyes pierced his.

The man from the car, he thought. Suddenly his belly felt like ice. He scrambled to his feet and thrust the filter into his pocket.

"What have you got, son?" The voice was too quiet.

"Oh, uh, nothing." The man's eyes pinned him.

With a scattering of leaves, Muppet, hairy legs thrusting from his sweater, ran toward them. Never a watchdog, the beast rose on his hind legs in an antic dance and planted his forepaws on the stranger's chest. The man leaped back and threw an arm up. With the motion, his jacket flapped open. Sunlight glinted darkly on a gun.

Jeff caught his breath. "I gotta go now." Head low, he propelled himself up the bank and zigzagged toward a thicket of rhododendron. Diverted, Muppet raced after him.

He heard the man shout something. The sound roared in his head over the pounding in his ears and was nothing but noise. At the thicket, he turned, then turned again, running in a half-crouch. He wasn't afraid. He wasn't. Branches snapped behind him. Run, the thought pounded. Not afraid . . . not afraid . . . not afraid. . . .

As he plunged down a small ravine toward open woods, he concentrated on the ground falling away below his feet. As a consequence, he did not see the two bird watchers who scanned him from the distance with binoculars pressed to their eyes—the two men who watched and made no move to follow.

Jeff cut through the backyard. As he clattered up the steps, he shot a glance over his shoulder. No sign of the man. Relief and fatigue flooded him simultaneously. He darted inside. Muppet, following on his heels, narrowly missed catching his tail in the slammed kitchen door.

He leaned against the door jamb and tried to catch his breath. When it returned, he glared at the dog. "You could've bit him."

Six inches of pink tongue lolled from Muppet's mouth as he panted in contentment.

'You could've at least growled." Why did he have to have a dog that couldn't even growl? The image of the man's eyes came to him again. A hood, he thought darkly. An armed hood. He tried to reconstruct the sequence of events: These guys throw Bemcy off the bridge, then take off. Then one of them comes back and he has a gun. It had to be something big. It had to be a kidnapping. The thought grew into a certainty. A kidnapping for sure. And Bemcy was proof. They toss out this computer so the right person would find it and know they were holding the owner for ransom—only he had found it instead.

He had to call the police.

The thought generated a shiver that rippled up the nape of his neck. He grabbed up the phone book. On the inside front cover his mother had penned in the emergency numbers for police, fire department, and the St. Claire County ambulance service. His finger paused above the phone and then quickly stabbed out the number.

When the dispatcher's voice came on, he took a breath, lowered his voice in what he took to be a tone of casual authority, and said, "Gimme the chief. This is an emergency."

He heard a ring, then a click. "Sergeant Chandler speaking."

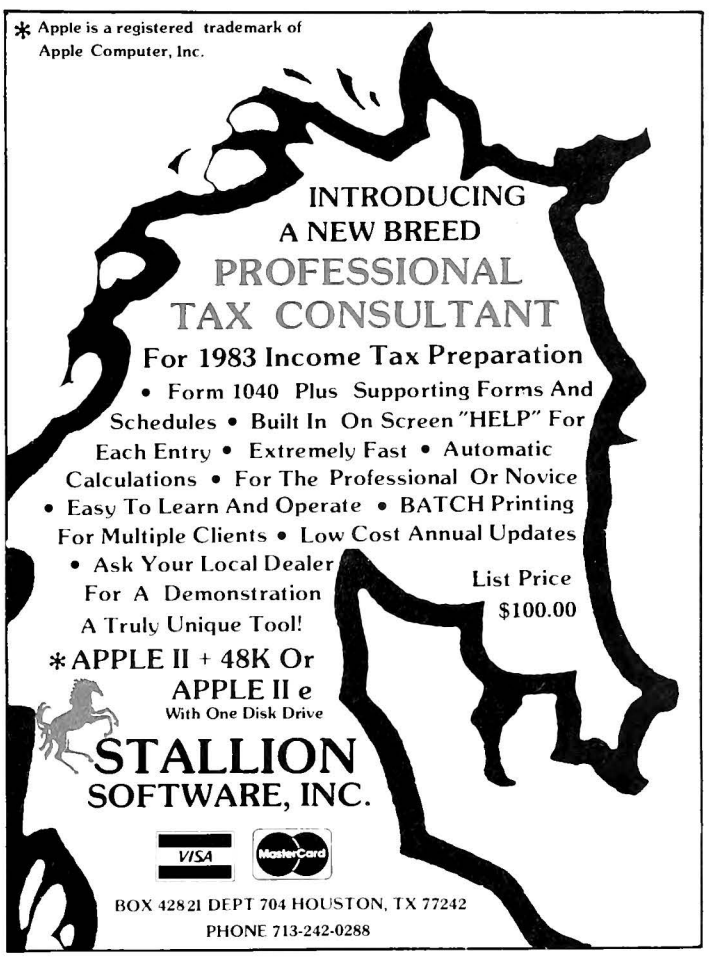
"Uh, listen. There's this man down at Thompson Bridge. And he's armed and dangerous. A while ago he tossed this computer down the bank and now he's back for it. And the computer is alive. You have to feed it and everything and so I figured it belonged to somebody important and he probably kidnapped them or something." Jeff took a quick breath. "And so you better send out the S.W.A.T. team right now. And if you check, you'll probably find out that the president of Atari, maybe, is missing." Then when the sudden thought came that a computer belonging to the president of Atari would play much more interesting games than Bemcy, he said, "Anyway it belongs to the president of something big." Then, as inspiration struck, he added, "Maybe even the president of the United States."

A long pause ensued and then a measured, "Who is this?"

Suddenly wary, Jeff blinked. "Uh, a friend."

"Look . . . friend. Do you know what you just did is a misdemeanor? If you call in another phony felony, kid, I'm coming after you. Personally."

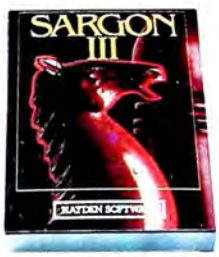
Jeff slammed the receiver into its cradle. It jiggled twice, then was still. Stung to the quick, he tried to focus on the blurring line of



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emergency phone numbers. He'd show him. He'd show that dumb creep. In impotent rage, he flung the phone book across the kitchen. Pages crumpling, it landed against the bottom of the refrigerator door. "See if I ever call you again," he said under his breath. He wouldn't call. Not ever. Not even if he was being murdered.

The sound of a car turning into the driveway caused him to freeze. He peered anxiously through the glass top of the door. When he saw that it was only his mother, a held breath puffed from his lips. Then he turned and raced into his room.

At the door he stopped short. Tommy, sitting cross-legged on the bed, was stabbing at the keys of the computer.

"What do you think you're doing?"

With a guilty start, Tommy stared at him. "Nothing."

The screen of the computer showed a single line of type: . . . UNAUTHORIZED . . .

Jeff took two quick steps to the bed and glared down at his brother. "What did you do to it?"

Tommy pressed his lips together and glared back. "Nothing. This light came on and then it quit."

"You creep. You broke it." Jeff shoved him aside and stared at the screen. "Bemcy," he said softly.

Red light blazed from the faceted button at the bottom of the screen and played over his eyes. Abruptly, it was gone and with a blink the woolly blue-eyed face of Bemcy appeared on the screen. "Greetings, Mr. President."

Tommy blinked and then giggled.

"Shut up," Jeff said fiercely. "This is serious." Then to Bemcy: "Are you okay?"

"OK," said the computer.

"It talks!"

"Sure it talks. It can do lots of things. It belongs to somebody really important."

"Yeah?" said Tommy skeptically. "Then what are you doing with it? And where did you get it anyway?"

Jeff stared at his brother. The need to confide in somebody was great. And Tommy was okay, really, when he kept his big mouth shut. "You promise you won't tell?"

Tommy nodded.

"Swear if you tell your tongue will rot."

"I swear."

As Jeff told him what had happened, Tommy's eyes grew progressively wider. "Did you call the cops?"

He was saved from answering when his mother called, "Supper, kids."

"I guess Dad's home. Let's eat." At the door, he caught Tommy's arm and fixed him with a look designed to strike fear into the hearts of younger brothers. "Tell," he said, "and you die."

As Jeff arranged a blob of sauerkraut on his hot dog, Tommy said conversationally, "Anybody kidnapped today?"

He was answered with a glare from Jeff and an amused glance from his father. "Not down at the pharmacy. No telling about K-Mart, though." The amusement gave way to a look of pain as his daughter, who had declined to eat on the grounds that food was deleterious to her health, bellowed from her room:

"Whop 'em . . . up. . . . Side of the . . . head. . . . Whop 'em up the side of the head. . . . Yeah, yeah, yeah. . . ."

"Keep it down, Diane. I'm trying to watch the news."

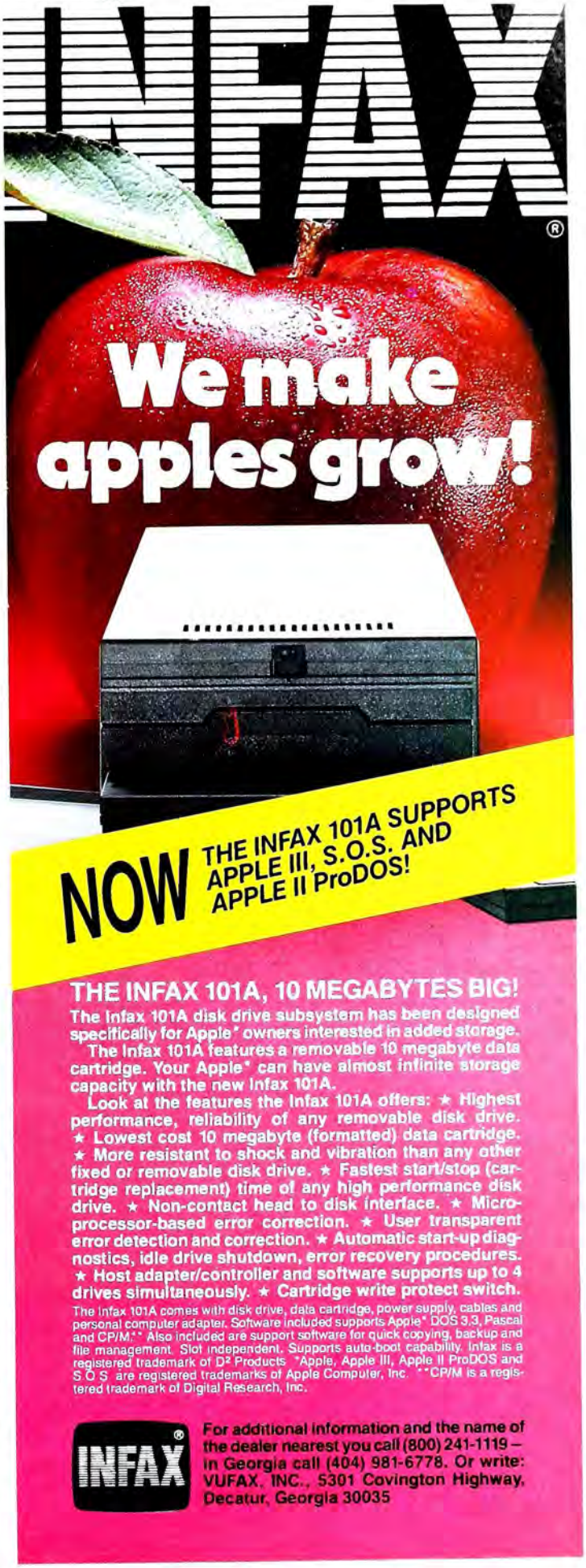
"Gimme an S; gimme a T; gimme an S, T, C. . . ."

"Diane!" With a bellow of his own and a twitch of the volume control, he managed to drown out his daughter and settled back with his coffee and the network news.

" . . . And now, Henderson Edwards and the Washington Eyewitness. . . ."

The Washington Monument dissolved to a shot of the beefy newsman riffling through papers on his desk. Edwards raised his eyes and fixed his audience with a penetrating stare: "Ladies and gentlemen, the president's computer is missing."

To be continued






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The caller was derisive. "The last big Apple Christmas, eh? So what happened, smart—?" He was having fun at my expense. He even cackled.

Yes, he cackled. I've never thought that word particularly belonged in the English language as a verb describing human activity. Surely writers who used it really meant laughed, or chortled, or chuckled, or smirked, or sneered. I didn't hate *cackled*, I just thought it was trite. Now I hate it.

Being the object of a cackle is an awful experience. It has all the romance of bussing a blonde bombshell who's just finished eating an onion and garlic sandwich. I'm now prepared to defend, without fear of knowledgeable contradiction, the proposition that the object of a cackle experiences one of the low points of human existence. Beginning journalism students should be required to take a one-hour course in being cackled at. Those who failed the course would be banished to the botany labs.

The caller was referring to several conjectures in this space in late 1982 that the Christmas of '82 might be the last big Apple Christmas. With more computer competition entering the market and with software publishing companies dividing their efforts among many machines, that seemed a reasonable hypothesis. It was also 180 degrees off target.

**Super Sales.** December 1983 was the best of times. Everyone prospered. Software flew off the shelves. Apple sold almost as many Apple IIe systems in December as they had in the prior three months. Imagine Neiman-Marcus holding a one-cent sale. Some Apple dealers were doing that kind of business.

The prior Christmas selling season wasn't even in the same league. Would you compare the 1927 Yankees and the 1983 Angels? Caruso and Little Richard? Porsches and Model T Fords? Sony Trinitrons and Philco black and whites? Some dealers did double or triple their 1982 business.

All areas of software did exceptionally well, but there were standouts as always.

Beagle Bros practically claimed the Hobby 10 category for their own. They had nine of the top ten programs and fourteen of the top seventeen. Sophie has to be the richest beagle in history. Bert Kersey doesn't have it too bad either.

Only *Zoom Graphics* kept Beagle Bros from sweeping the category.

**Text at the Top, Top, Top.** The folks at Infocom almost pulled off a sweep of their category also. Paced by the Zork series, they had four of the Adventure 5 entries and eight of the top nine adventure programs. Infocom's most recent nemesis has been *The Quest*, which again prevented a clean sweep for the textmeisters.

Infocom has been accustomed to those near misses. What was new in December was that all three Zork programs made the Top Thirty. In some months, Infocom's dominance has been within their category but exclusive of any Top Thirty entries.

Some of the hot new products didn't make the Top Thirty because they came out too late and got too little distribution. In this category fell the offerings from Atarisoft. Atari finally decided to capitalize on their licenses for many of the best coin arcade games by translating them to other systems. It was a boom December in the Apple market for Atari.

## Arcade 10

| This Month | Last Month | |
|---|---|---|
| 1. | 1. | **Lode Runner**, Doug Smith, Broderbund Software |
| 2. | 2. | **Zaxxon**, John Garcia, Datasoft |
| 3. | 3. | **Choplifter**, Dan Gorlin, Broderbund Software |
| 4. | 4. | **Miner 2049er**, Mike Livesay and Bill Hogue, Micro Fun |
| 5. | 6. | **Pinball Construction Set**, Bill Budge, Electronic Arts |
| 6. | 7. | **Hard Hat Mack**, Michael Abbot and Matthew Alexander, Electronic Arts |
| 7. | — | **One-On-One**, Eric Hammond, Larry Bird, and Julius Erving, Electronic Arts |
| 8. | 5. | **Frogger**, Olaf Lubeck, Sierra On-Line |
| 9. | 8. | **Spare Change**, Dan and Mike Zeller, Broderbund Software |
| 10. | 10. | **Beagle Bag**, Bert Kersey, Beagle Bros |

## Apple III

| This Month | Last Month | |
|---|---|---|
| 1. | 2. | **Apple Writer III**, Paul Lutus, Apple Computer |
| 2. | 1. | **The Catalyst**, Tim Gill, Quark |
| 3. | 3. | **VisiCalc: Advanced Version**, Software Arts/Dan Bricklin and Robert Frankston, VisiCorp |
| 4. | 8. | **VisiCalc III**, Software Arts/Dan Bricklin and Robert Frankston, VisiCorp |
| 5. | 5. | **PFS:File**, John Page and D.D. Roberts, Software Publishing Corporation |
| | 7. | **Quick File III**, Rupert Lissner, Apple Computer |
| 7. | 6. | **PFS:Report**, John Page, Software Publishing Corporation |
| 8. | 3. | **Word Juggler**, Tim Gill, Quark |
| 9. | — | **BPI General Ledger III**, John Moss and Ken Debower, Apple Computer |
| 10. | 9. | **Apple Speller III**, Apple Computer |


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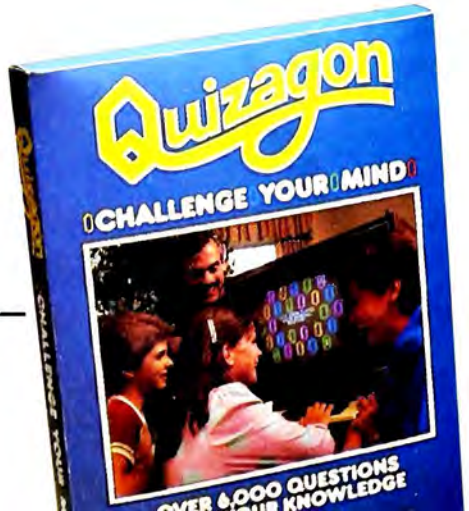
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Because the product lacked widespread distribution, none of the programs made the Arcade 10, but dealers who handled the titles said that customer acceptance levels were high.

Another hot title without enough distribution to make any The Top Thirty was *One-on-One* from Electronic Arts. Those dealers that had the program raved about it.

Electronic Arts is gradually making its name felt in the market. They placed three entries in the bottom tier of the Top Thirty, their best showing to date. The titles, widely varying in concept and purpose, were *Music Construction Set*, *Pinball Construction Set*, and *Hard Hat Mack*.

# 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. | **PFS:Write**, Sam Edwards, Brad Crain, and Ed Mitchell, Software Publishing Corporation |
| 4. | 4. | **Sensible Speller**, Charles Hartley, Sensible Software |
| 5. | 10. | **Homeword**, Ken Williams and Jeff Stephenson, Sierra On-Line |
| 6. | 5. | **Word Juggler IIe**, Tim Gill, Quark |
| 7. | 6. | **WordStar**, MicroPro |
| 8. | 8. | **Magic Window II**, Bill Depew, Artsci |
| 9. | 6. | **Word Handler**, Leonard Elekman, Silicon Valley Systems |
| 10. | 9. | **Format-II**, G.K. Beckmann and M.A.R. Hardwick, Kensington Software |

# Home Education 10

| This Month | Last Month | |
|---|---|---|
| 1. | 1. | **MasterType**, Bruce Zweig/Lightning Software, Scarborough Systems |
| 2. | 3. | **Typing Tutor**, Dick Ainsworth, Al Baker, and Image Producers, Microsoft |
| 3. | 2. | **Apple Logo**, Logo Computer Systems, Apple Computer |
| 4. | 4. | **Computer SAT**, Harcourt Brace Jovanovich |
| 5. | 7. | **Delta Drawing**, Computer Access Corporation, Spinnaker Software |
| 6. | 9. | **Rocky's Boots**, Warren Robinett and Leslie Grimm, The Learning Company |
| 7. | 6. | **Facemaker**, DesignWare, Spinnaker Software |
| 8. | 10. | **In Search of the Most Amazing Thing**, Tom Snyder, Spinnaker Software |
| 9. | — | **Snooper Troops I**, Tom Snyder, Spinnaker Software |
| | 4. | **Early Games for Young Children**, John Paulson, Counterpoint Software |

# Adventure 5

| This Month | Last Month | |
|---|---|---|
| 1. | 2. | **Zork I**, Infocom |
| 2. | 3. | **Zork II**, Infocom |
| 3. | 4. | **Zork III**, Infocom |
| 4. | 1. | **The Quest**, Dallas Snell, Joe Toler, and Joel Ellis Rea, Penguin Software |
| 5. | — | **Deadline**, Infocom |




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**A Phoenix without Ashes.** The biggest new entry was an old entry refurbished. *Flight Simulator II*, an enhanced graphics version of the old standard, could have sold a million if SubLogic could have made and shipped them. One Chicago store sold twenty-two copies in forty-eight hours and couldn't get more before Christmas. No product had stronger demand in December that this one.

There were other notable big winners. Andrew Greenberg and Robert Woodhead certainly qualify. Their Wizardry trilogy placed in the top fifteen programs: *Wizardry* sixth, *Knight of Diamonds* fourteenth, and *Legacy of Llylgamyn* fifteenth. That gave them the top three places on the Fantasy 5.

Following in the fantasy category was Lord British, who didn't do too shabbily himself. *Exodus: Ultima III* and *Ultima II* tied for twenty-fourth on the Top Thirty and swept the other two Fantasy 5 positions.

The minimalist philosophy in word processing continues to find favor with the new breed of Apple owners. *Bank Street Writer* from Broderbund continued to lodge itself in the top five programs. *PFS:Write* tailed off a bit to thirteenth, but that's still a respectable showing for a recently announced program.

But proof that less is now more comes from Sierra On-Line's *Homeword*. It's a low-priced, minimal-power word processor that scored the bottom rung of the Top Thirty in only its second month out. Among the more capable word processor programs that it outsold was its own stablemate, *ScreenWriter II*.

*Apple Writer IIe* continued to lead all software in sales, but its margin was considerably less in December as the minimalist word processors eat into its constituency.

**Loded Dice.** *Lode Runner* made the most serious bid to unseat *Apple Writer*. *Lode Runner* is the latest giant-killer from Broderbund, the company that twice unseated *VisiCalc* from first place in the Top Thirty, with *Apple Galaxian* and *Choplifter*. Doug Smith's marathon epic has a way to go to catch *Apple Writer*, but it's closer to first than to third.

The deal of the year had to be the buyout of Lightning Software's *MasterType* by Scarborough Systems. Scarborough was an unknown entity in the Apple market until that purchase, now they're sitting with one of the most consistent sellers in the market. *MasterType* was third for the second consecutive month.

Making a big recovery in December was *Home Accountant* from Continental Software. *Home Accountant* had been gradually slipping, until it had dropped out of the top ten. But it roared back with a vengeance to capture the fifth spot in December.

# Strategy 5

| This Month | Last Month | |
|---|---|---|
| 1. | — | **Flight Simulator II**, Bruce Artwick, SubLogic |
| 2. | 1. | **Sargon III**, Dan and Kathe Spracklen, Hayden |
| 3. | 3. | **Castle Wolfenstein**, Silas Warner, Muse |
| 4. | 5. | **Geopolitique 1990**, Bruce Ketchledge, Strategic Simulations |
| 5. | 4. | **Eagles**, Robert Raymond, Strategic Simulations |
| | — | **Millionaire**, Jim Zuber, Blue Chip Software |

# Business 10

| This Month | Last Month | |
|---|---|---|
| 1. | 1. | **PFS:File**, John Page and D.D. Roberts, Software Publishing Corporation |
| 2. | 3. | **Quick File IIe**, Rupert Lissner, Apple Computer |
| 3. | 2. | **VisiCalc**, Software Arts/Dan Bricklin and Robert Frankston, VisiCorp |
| 4. | 6. | **PFS:Report**, John Page, Software Publishing Corporation |
| 5. | 4. | **Multiplan**, Microsoft |
| 6. | 7. | **PFS:Graph**, Bessie Chin and Stephen Hill, Software Publishing Corporation |
| 7. | 8. | **BPI General Ledger**, John Moss and Ken Debower, Apple Computer |
| 8. | 5. | **The Incredible Jack**, Business Solutions |
| 9. | — | **Accounts Receivable**, George Shackelford, State of the Art |
| 10. | — | **BPI General Accounting**, John Moss and Ken Debower, Apple Computer |
| | 9. | **General Ledger**, George Shackelford, State of the Art |

# Hobby 10

| This Month | Last Month | |
|---|---|---|
| 1. | 6. | **Zoom Graphics**, Dav Holle, Phoenix Software |
| 2. | 3. | **DOS Boss**, Bert Kersey and Jack Cassidy, Beagle Bros |
| | — | **Global Program Line Editor**, Neil Konzen/Synergistic Software, Beagle Bros |
| 4. | 1. | **Apple Mechanic**, Bert Kersey, Beagle Bros |
| 5. | 2. | **Beagle Basic**, Mark Simonsen, Beagle Bros |
| | 7 | **Double-Take**, Mark Simonsen, Beagle Bros |
| 7. | 4. | **Pronto DOS**, Tom Weishaar, Beagle Bros |
| 8. | 9. | **Utility City**, Bert Kersey, Beagle Bros |
| 9. | — | **Frame-Up**, Tom Weishaar, Beagle Bros |
| | — | **Flex Type**, Mark Simonsen, Beagle Bros |

# Home 10

| This Month | Last Month | |
|---|---|---|
| **1.** | **1.** | **Home Accountant**, Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software |
| 2. | 3. | **Music Construction Set**, Will Harvey, Electronic Arts |
| 3. | 2. | **Dollars and Sense**, Frank E. Mullin, Monogram |
| 4. | 7. | **Hayes Terminal Program**, Hayes Microcomputer Products |
| 5. | 6. | **Crossword Magic**, Steve and Larry Sherman, L&S Computerware |
| 6. | 4. | **ASCII Express: The Professional**, Bill Blue and Mark Robbins, Southwestern Data Systems |
| 7. | 5. | **Micro Cookbook**, Brian E. Skiba, Virtual Combinatics |
| 8. | 9. | **Data Capture 4.0**, George McClellan and David Hughes, Southeastern Software |
| 9. | 9. | **Transend 1**, Tim Dygert and Bob Kniskern, Transend Corporation |
| 10. | 8. | **Crosstalk**, Microstuf |

# Fantasy 5

| This Month | Last Month | |
|---|---|---|
| 1. | 1. | **Wizardry**, Andrew Greenberg and Robert Woodhead, Sir-tech |
| 2. | 4. | **Knight of Diamonds**, Andrew Greenberg and Robert Woodhead, Sir-tech |
| 3. | 2. | **Legacy of Llylgamyn**, Andrew Greenberg and Robert Woodhead, Sir-tech |
| 4. | 3. | **Exodus: Ultima III**, Lord British, Origin Systems |
| | 5. | **Ultima II**, Lord British, Sierra On-Line |

# Softalk Presents The Bestsellers

Software Publishing Corporation had a big month as well, placing three programs in the Top Thirty and another at thirty-third. *PFS:File* was seventh, *PFS:Write* was thirteenth, *PFS:Report* was twenty-second, and *PFS:Graph* just missed the list.

**A Narrower Spread.** The thousands of new Apple owners didn't enhance sales of spreadsheet programs, however. *VisiCalc* dropped to nineteenth and *Multiplan* trailed off to twenty-sixth. Part of the *VisiCalc* drop was caused by a change in reporting on the product. Previously, sales of *VisiCalc* and *VisiCalc: Advanced Version* for the IIe had been lumped. Beginning with this report, they are being treated as separate entities. Had the old reporting technique been used, *VisiCalc* would have ranked twelfth, a drop of one position from last month.

**Sumptuous Dining.** Educational software didn't fare as well in terms of the Top Thirty as it has recently, but it remains the single strongest genre of Apple software, and sales were generally higher in December. The growth just wasn't as great as in some other areas.

Apple-franchised retail stores representing approximately 5.16 percent of all sales of Apple and Apple-related products volunteered to participate in the poll.

Respondents were contacted early in January to ascertain their sales for the month of December.

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 January 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 rating of 50 in another month.

Probability of statistical error is plus or minus 3.11 percent, which translates roughly into the theoretical possibility of a change of 3.24 points, plus or minus, in any index number.


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December was a boom time for most Apple software publishers. The last great Apple Christmas wasn't 1982. Somebody pass the salt, pepper, and catsup. It's time to eat crow.

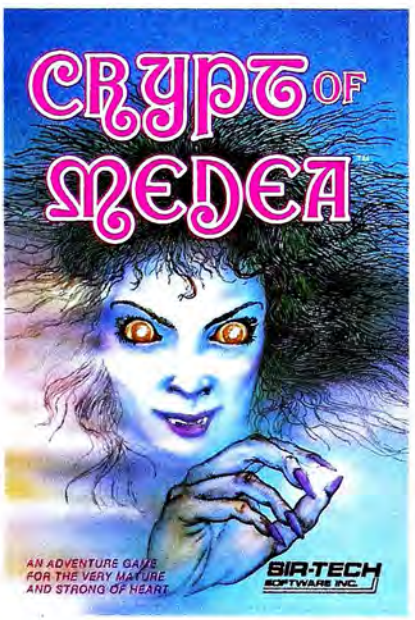
# The Top Thirty

| This Month | Last Month | Index | |
|---|---|---|---|
| 1. | 1. | 116.96 | **Apple Writer IIe**, Paul Lutus, Apple Computer |
| 2. | 6. | 97.73 | **Lode Runner**, Doug Smith, Broderbund Software |
| 3. | 3. | 65.29 | **MasterType**, Bruce Zweig/Lightning Software, Scarborough Systems |
| 4. | 2. | 54.74 | **Bank Street Writer**, Gene Kuzmiak and the Bank Street College of Education, Broderbund Software |
| 5. | 10. | 46.19 | **Home Accountant**, Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software |
| 6. | 4. | 44.19 | **Wizardry**, Andrew Greenberg and Robert Woodhead, Sir-tech |
| 7. | 7. | 43.52 | **PFS:File**, John Page and D.D. Roberts, Software Publishing Corporation |
| 8. | 12. | 42.59 | **Zaxxon**, John Garcia, Datasoft |
| 9. | 13. | 36.05 | **Quick File IIe**, Rupert Lissner, Apple Computer |
| 10. | — | 35.91 | **Flight Simulator II**, Bruce Artwick, SubLogic |
| 11. | 15. | 34.98 | **Choplifter**, Dan Gorlin, Broderbund Software |
| 12. | 24. | 32.71 | **Zork I**, Infocom |
| 13. | 5. | 31.91 | **PFS:Write**, Sam Edwards, Brad Crain, and Ed Mitchell, Software Publishing Corporation |
| 14. | 14. | 31.24 | **Knight of Diamonds**, Andrew Greenberg and Robert Woodhead, Sir-tech |
| 15. | 8. | 30.84 | **Legacy of Llylgamyn**, Andrew Greenberg and Robert Woodhead, Sir-tech |
| 16. | 19. | 30.44 | **Typing Tutor**, Dick Ainsworth, Al Baker, and Image Producers, Microsoft |
| 17. | 18. | 29.10 | **Apple Logo**, Logo Computer Systems, Apple Computer |
| 18. | — | 28.04 | **Zork II**, Infocom |
| 19. | 11. | 28.04 | **VisiCalc**, Software Arts/Dan Bricklin and Robert Frankston, VisiCorp |
| | 25. | 28.04 | **Miner 2049er**, Mike Livesay and Bill Hogue, Micro Fun |
| 21. | — | 27.50 | **Zork III**, Infocom |
| 22. | 23. | 27.23 | **PFS:Report**, John Page, Software Publishing Corporation |
| 23. | — | 25.63 | **Music Construction Set**, Will Harvey, Electronic Arts |
| 24. | 9. | 25.36 | **Exodus: Ultima III**, Lord British, Origin Systems |
| | 26. | 25.36 | **Ultima II**, Lord British, Sierra On-Line |
| 26. | 16. | 24.70 | **Multiplan**, Microsoft |
| 27. | — | 23.76 | **Pinball Construction Set**, Bill Budge, Electronic Arts |
| 28. | — | 22.96 | **Hard Hat Mack**, Michael Abbot and Matthew Alexander, Electronic Arts |
| 29. | 20. | 21.36 | **Sensible Speller**, Charles Hartley, Sensible Software |
| | 27. | 21.36 | **Computer SAT**, Harcourt Brace Jovanovich |
| | — | 21.36 | **Homeword**, Ken Williams and Jeff Stephenson, Sierra On-Line |

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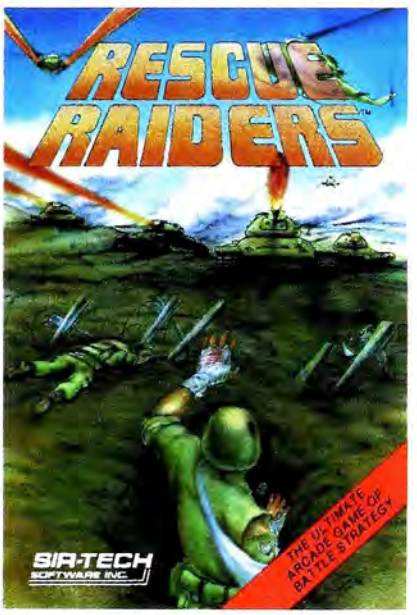
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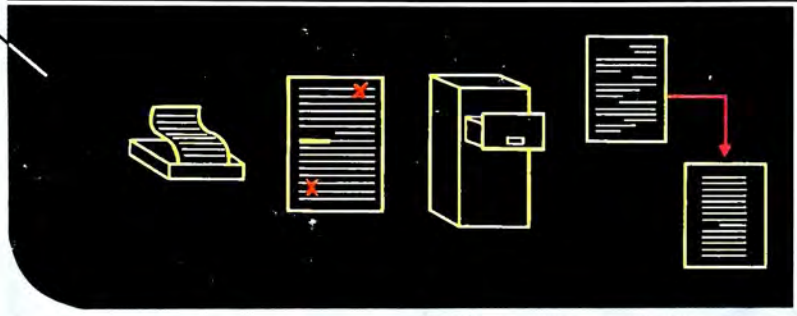
# HOMEWORD™

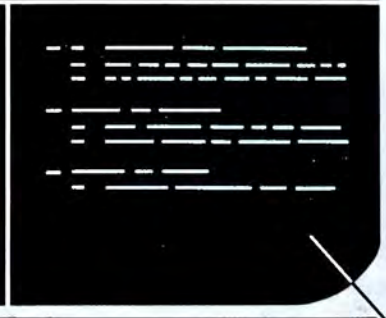
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