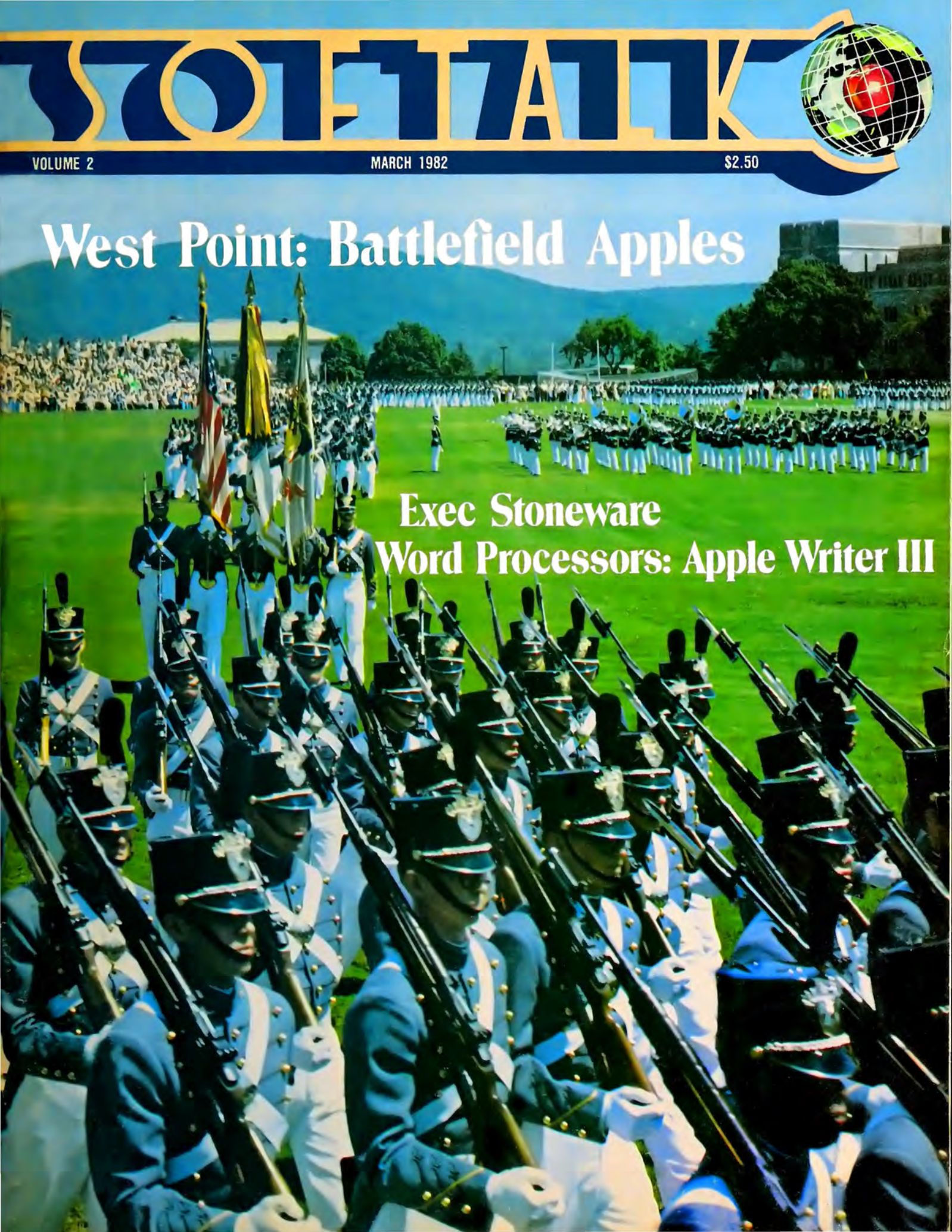
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VOLUME 2 MARCH 1982 $2.50

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Exec Stoneware

Word Processors: Apple Writer III



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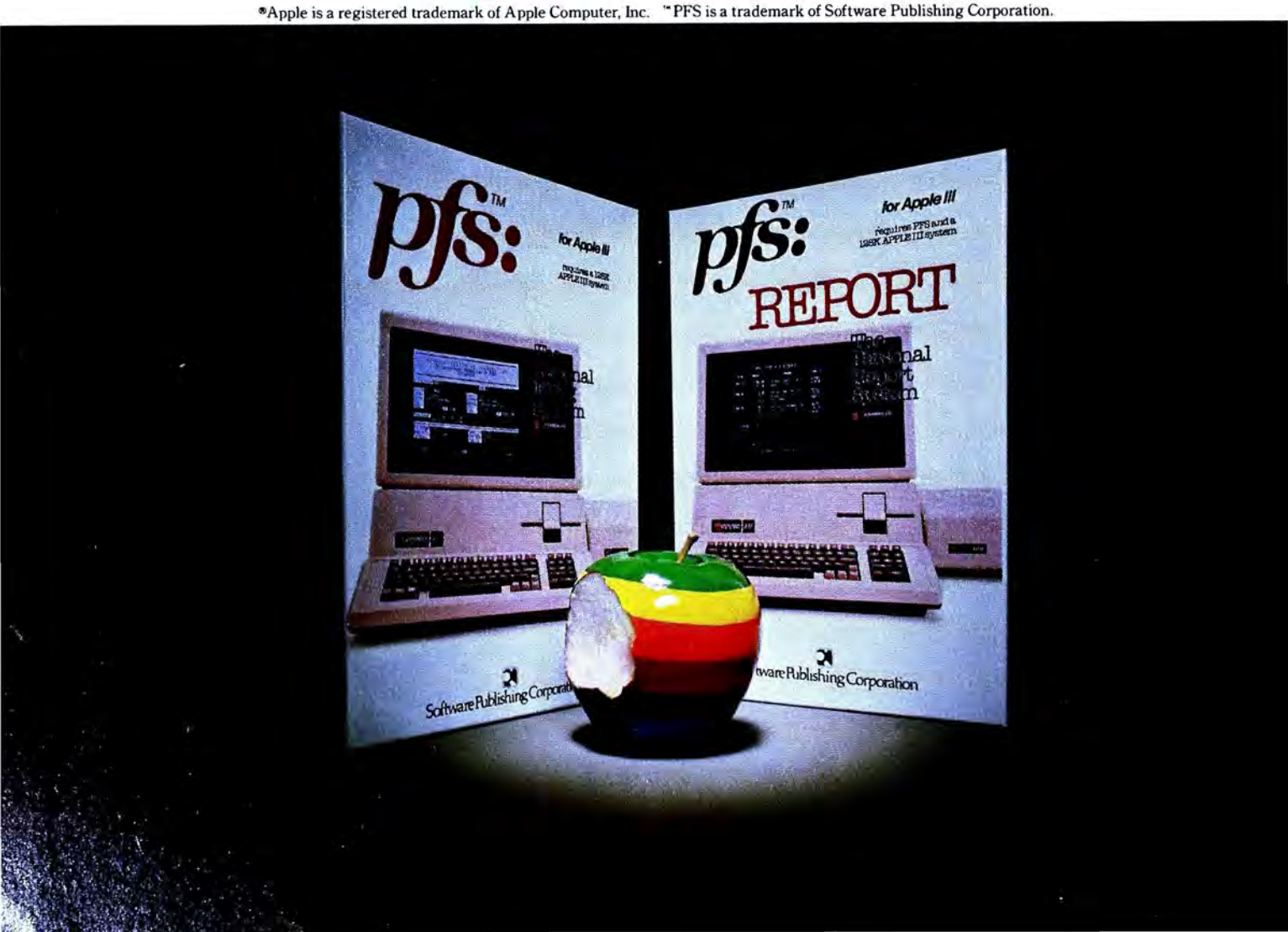
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MARCH 1982



Exec Stoneware: They Try Harder

A lot of people waited a long time for Barney Stone's baby. Now that it's pulling a frequent second on the Top Thirty, it's clear that the wait was well worthwhile.

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Go On and Interrupt Your Apple

With only a small modification, your Apple can run your favorite game and print your letter to Softalk at the same time.

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Apples in the Front Lines at West Point

This summer, USMA cadets will take Apples along with rifles into simulated battle.

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

Problems? If you haven't received your *Softalk* by the fifteenth of the month, or if you have other problems with your subscription, Ron Rennells or Bob Mann can help out. Call (213) 980-5099.

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THE FIRST GREAT APPLE TRIVIA CONTEST

What better way to celebrate the spring equinox than with a chance to win a second Apple disk drive? The Chris Lights, junior and senior, have collaborated on a very special Apple trivia quiz to make sure you'll have earned the disk drive if you win it.

You'll have until June 15, 1982, to get your answers back to *Softalk*. Take care and be precise. In case of apparent ties, more precise answers will win over less precise answers before chance steps in.

If no one gets all the answers to Appletrivia correct, that entry with the most correct answers will win. In the case of a tie, the random number generator will be called into play. Second place winner may choose $50 worth of prizes from goods created by *Softalk* advertisers. Third, fourth, and fifth places each win an extra year's free subscription to *Softalk*. And don't forget that all entrants are, by virtue of entering, entitled to subscribe to *Softalk* at the $18 sponsored rate.

So fill out the entry form on this page and mail it and your answers—printed, computer printed, or typed, but legible—to Softalk Appletrivia, 11021 Magnolia Boulevard, North Hollywood, CA 91601.

Name: _____

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Now, with a new disk drive for the taking, here is the First Great Appletrivia Contest. ◨

BY CHRISTOPHER U. LIGHT AND CHRIS LIGHT JR.

Although some of the questions appear to be devilishly hard—as they're intended to be—all questions are in one way or another related to the Apple computer, peripheral hardware for it, software for it, or material written about it. All sources for the questions have been circulated nationally and have been generally available at one time or another. Just because you own an Apple, you'll already know some of the answers. Other answers will require considerable effort. Good luck!

1. In *The Prisoner*, "The ..... Lives."

2. Name the four creatures that attack you in *Space Eggs*.

3. What hue is lo-res color number 13?

4. What is the real golden apple in *Beneath Apple Manor*?

5. What six cities must you defend in *ABM*?

6. The Pascal language is named after a famous matematician. What was his first name?

7. Who wrote "Alien Chopper Death: the Sound of Venusian 'Helicopters' Destroying New York City May 12, 1983"?

8. Who is the author of the book carried by the girl you meet in "Encounter in the Park"?

9. What symbol does *Apple Writer* use to indicate that the next letter entered will be printed in upper case?

10. In what direction does *Idiot's Delight* rotate?

11. On the Apple bus, what voltage does pin number 33 carry?

12. What two symbols are introduced by *AppleWriter Extended*?

13. Who are Steve Wozniak and Steve Jobs?

14. What vehicles pass you in *Autobahn*?

15. Romanga is one of six cities. What are the names of the other five?

16. How many receptor slots are there in *The Great American Probability Machine*?

17. What program will do both differential and integral calculus?

18. What tune does the Lemonsville weather report play for hot and dry weather?

19. What color is the bull in *Cranston Manor*?

20. *Star Trek* has Klingons. What does *Apple-Trek* have?

21. What is the title of Lauren Radner's cover drawing for volume 1, issue 2, of *Micro Media Magazine*?

22. What does the vending machine in *Cyborg* sell?

23. "A Girl's Best Friend" is ..... ?

24. Describe the wizard's appearance in *Hi-Res Adventure #2: The Wizard and the Princess*.

25. What is the name of Admiral Wormwood's flagship?

26. How many harmonics can the Music-System's instrument definer assign to a single wave form?

27. What is semipro offensive play number 13 in *Computer Quarterback*?

28. What is the value of treasure number 20 in *Temple of Apshai*?

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29. What good are the monkeys in *Odyssey: The Compleat Apventure?*
30. Who wrote *The Screen Machine*?
31. In the original *Adventure* the black rod won't open the clam. What will?
32. What do you find in *Zork* if you travel by raft downriver to a beach and dig in the sand?
33. In *Tawala's Last Redoubt*, what are the names of your messengers?
34. Guzzlers are green, and the Bouncer is white. What color are the Artesians?
35. FID is a DOS 3.3 utility program. What is the name of the equivalent 3.2 program?
36. How many players does *Raster Blaster* allow?
37. Whose fight song does *Hi-Res Football* play when it's booted?
38. What symbol does *Disk-O-Check* use to indicate that a check has cleared?
39. What is the stalling speed of your airplane in *Flight Simulator?*
40. What symbol does *VisiCalc* use to indicate that the cursor is set to move vertically?
41. At level five, what is the average length of time that *Sargon II* takes to make a move?
42. Who is the only woman candidate listed by the author in *President Elect*?
43. What name missing from the following list begins with "D": Alhambra, Sparta, Utopia, and Zoe?
44. Who is the author of *Sabotage*?
45. What is the name of the butler in *Sherlock's Home*?
46. What is the magic word in Scott Adams's *Pirate Adventure*?
47. Which pin on Apple II's slot five goes to ground?
48. What does "CALL −936" do?
49. How many monkeys are there in *The Infinite Number of Monkeys*?
50. What was the name of the Silentype printer before it was modified for Apple?

ONTEST WINNERS CONTEST WINNERS CONTEST WINNERS CONTEST



Contest Contest Revisited. Philip Suh's first-prize-winning Apple Jumble has turned out to be one of *Softalk*'s most popular contests, despite the misspelling of Hectar Plagbits's name. Most entrants caught the error and took the correct spelling from the name tags illustrating the story; a few folks even enjoyed the added challenge.

Coincidentally, Suh and Alan Nayer, one of the Contest Contest runnersup, both frequent AIDS Computer Center in San Francisco. Store vice president Raymond Tong arranged for them to pick up their prizes at the same time and snapped their picture together. Results are not yet in on Nayer's contest, ASCII Railroad, which appeared in February's *Softalk*.

Art Gallery. Talent, it would appear, takes second place only to spirit among *Softalk* readers. A surprising number of talented people entered our November Art Gallery contest, especially in the computer-generated design division.

The task was to design a package for an imaginary or real software program, then to render the design either by hand or by computer. Most entrants chose the imaginary, and some even included descriptions of the games they were representing. Good ideas, too.

The *Softalk* staff has chosen six hand-done and six computer-rendered designs. It's up to you to vote for the one in each category that you like best, and the two that get the most votes will win the first prizes.

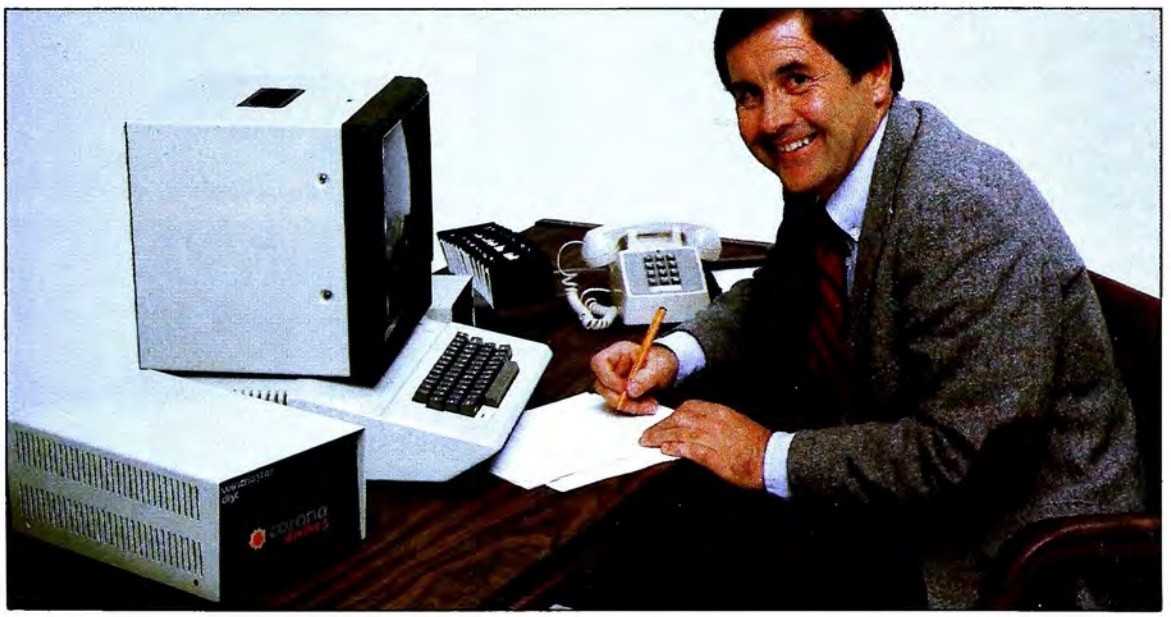
Two of the entries below, *The Wind* and *Land of the Pharaohs,* came with detailed descriptions of the games but without titles and imaginary logos, probably because of lack of knowledge of how to combine these with the paintings in slide form. Because of the quality of the artwork, we believed they should be included anyway.

To keep the vote fair, the order in which the finalists are listed is unrelated to the order of the art works. Finalists, who will receive $10 credits at their local computer dealers and an additional year's free subscription to *Softalk* if they don't win, are: Eddie Moore, Mesquite, Texas; Jeff Coyle, Anaheim, California; Ben Lanterman, Bridgeton, Missouri; Nathan Jensen, Austin, Texas; Mary Ciccolella, Piscataway, New Jersey; Bob Martin, Boulder, Colorado; Chuck Arnold, Dalton, Georgia; Wendel Kirkbride, Idaho Falls, Idaho; Mildred Edwards, Waterloo, Iowa; and Brian Taylor, Pasadena, California. If you counted fewer entrants than entries, you're sharp; two entries each from two people made the finals.

Election Bonus Sweeps. There's more than one reason to vote for the artists you like best. Not only does it support your fellow readers, but your ballot is your automatic entry into the other kind of drawing. Ballots will be numbered as they come in. On or soon after April 16, the random number generator will be put to work, and the person whose ballot number corresponds to the number the rng chose will win $100 in products of advertisers in *Softalk*.



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21541 Nordhoff St., Unit B, Chatsworth, CA 91311

Use the coupon to send your votes by April 15, 1982, to Softalk Artists, 11021 Magnolia Boulevard, North Hollywood, CA 91601. Remember to vote twice: once for each of your favorites in the two categories.

Circle one hand-drawn entry and one computer-drawn entry for the best imaginary software packaging.

HAND-DRAWN

1 2 3 4 5 6

COMPUTER-DRAWN

1 2 3 4 5 6

Name: _____

Address: _____

City/State/Zip _____

Phone: _____

Choice of prizes: _____

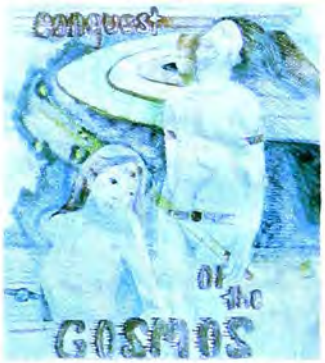
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Send this ballot to Softalk Artists, 11021 Magnolia Boulevard, North Hollywood, CA 91601, by April 15, 1982. Vote for the one illustration of your choice in each of the categories.
(Remaining information is required only for Sweepstakes entry.)


1.



2.



3.



4.



5.


6.



1.



2.



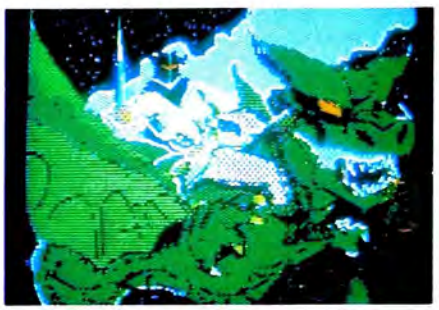
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OPEN DISCUSSION

Words from a Winner
Just a note to thank you again for the Oracle '81 prize. Everyone here has been very excited about the contest, although I must say that I'm glad it's over! A few days ago we took a picture of me picking up the disk drive at AM which you should have already received.

Well, it's been a lot of fun and thank you all again, not only for the disk drive but for producing my favorite Apple magazine—I really appreciate the time and effort that must go into making it what it is.
Jim Ganz, West Hartford, CT

Getting Straight on the Beagle Bros.
I saw in your January Hobby 10 list that you finally listed Jack Cassidy as coauthor of *DOS Boss*. That's correct; we wrote that one together.

However, you also show him on the same list as coauthor of *Utility City*. That's wrong! I wrote *Utility City* by myself; he had nothing to do with it!

Lookit; I work my fingers to the bone on this software, and all the while that egomaniac is sitting at home watching soap operas and writing letters to *Softalk*. That guy will try to take credit for anything! He once told me he wrote VisiCalc!

But don't let him intimidate you. The true program authors are listed in our ads. And you can tell by looking at his picture (January, page 65) that he has shifty eyes.
Bert Kersey, San Diego, CA

On Subscriptions
I've had an Apple since early 1980, and have been getting your magazine since issue #1. I want you to know I'll be happy to pay for it. My wife and I subscribe to about twenty publications—important stuff like *Barron's, Business Week, Science News, National Geographic*, and so on. I even get a stack of computer magazines. But *Softalk* is the only one I pounce on and devour the day it is delivered.

I am a journalist by trade and a consultant by profession. I use your magazine as an example when trying to explain to Editorial Types the importance of advertising as editorial material. For while I gain a lot from your articles and reviews, I am also intensely interested in the ads.

It has been a pleasure watching you grow from that first skinny issue seventeen months ago. I wish you good luck in your conversion to a subscription publication. I don't think you'll have any trouble at all.
Tom Weishaar, Overland Park, KS

For the last few months I have had a gripe about your magazine. It's not with *Softalk* itself, but with the cover. Every issue I have received from your company has had the cover fallen off of it. So when January's issue came along, I was not really surprised. But by looking

Penguin Pioneers Unprotected Good Will

Penguin Software announces a new policy on copy protection: an open letter to all Apple owners.

In conjunction with the release of *The Graphics Magician* and the updated *Complete Graphics System II*, Penguin Software is announcing a new policy with our applications software for the Apple. The *Complete Graphics System II, Special Effects,* and *The Graphics Magician* will all now be available on nonprotected disks.

We've been torn between two points of view. As computer users, we appreciate the ability to have several working copies of our applications software, and even the ability to go in and modify the code, if desired. We'd use programs such as *VisiCalc* or *DB Master* for dozens of other applications if we could have them running off several separate disks and didn't have to guard our master copies with such extreme care. Being programmers also, occasionally we'd like to adapt a program slightly to our system or our needs. On locked disks, much of a software product's potential usage goes untapped.

On the other hand, as publishers we've been drawn into the prevailing point of view that lack of copy protection means greatly decreased sales due to casual "piracy." This is not just a crazed overreaction; we've all been to user group meetings, homes of acquaintances, and even some computer stores where we've been aghast at the almost encouraging attitude toward copying copyrighted software, most of which took authors months, maybe years, to perfect.

The real scare here is that many of us have decided to take a risk on a very new industry and trust our livelihoods to it. Suddenly, individuals out there become statistics, some of which say that for every nonprotected program sold there are at least a dozen "pirated" copies. Those kind of numbers could really wreak havoc on paying the bills. Scary? Yes.

From these conflicting points of view, our desire to make a good product better won, but not by much, over our fear of tampering with something that is already going well. Our policies, from pricing to support, have always been very consumer-oriented. Ultimately, it is from that viewpoint that we decided to go ahead with removing the protection. We feel that you, the consumer, are entitled to software as useful as possible for the money you spend.

Our hope is that the added convenience will result in more sales, not less, and that the software market has matured to the point where people realize that the result of illegal copying is less convenience for everyone with all software. We hope that people will think twice before accepting copies from friends, and we hope to be able to continue this policy and start a new trend toward improved usability of all applications software.

Please don't abuse our trust in you.

Mark Pelczarski, President, Penguin Software

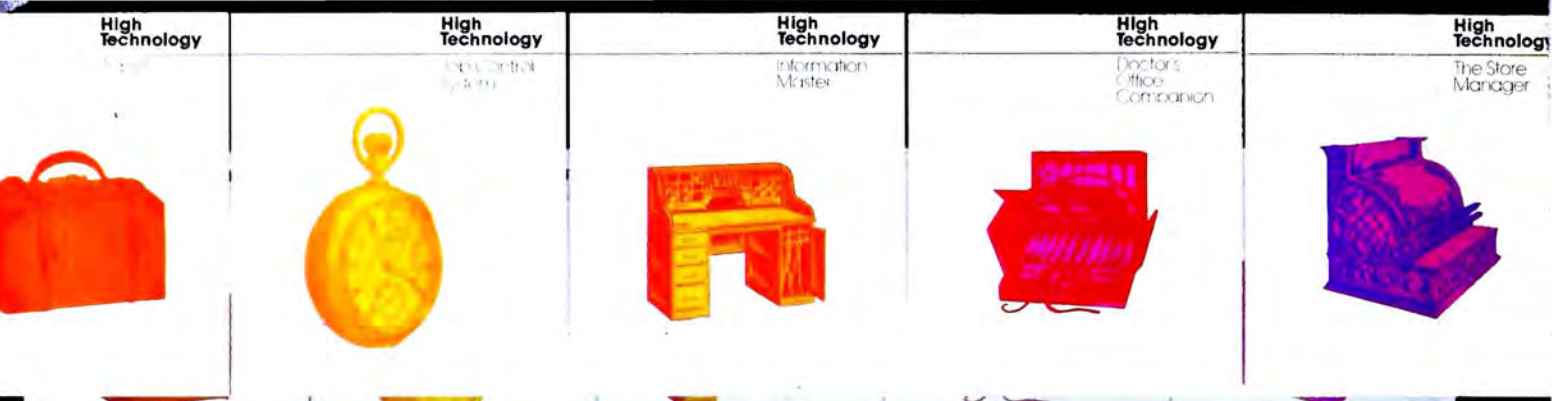
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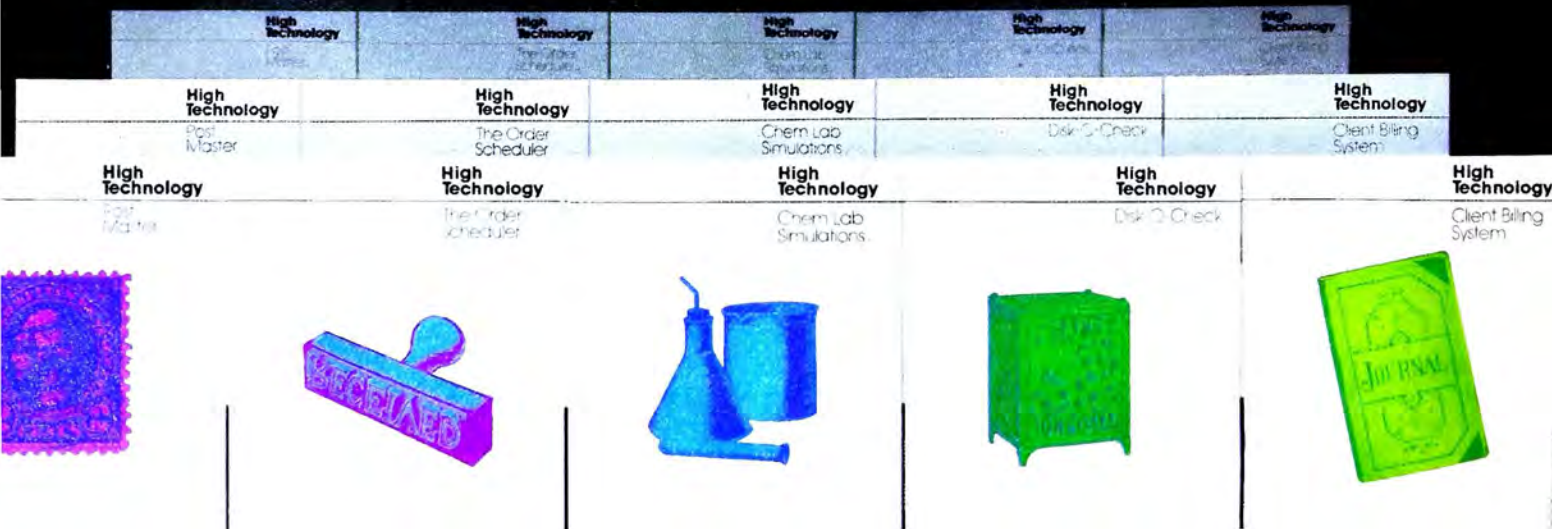
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through the best Apple II magazine, I saw your article about distribution policy and thought right away that *Softalk* would not be free to me anymore. Now I know most of us computerholics of the world are disappointed. But I'll put it to you straight. I imagine that everyone will be happy to comply with paying for *Softalk*, because it's invaluable to the health of us and our Apples no matter what the price. (And thanks for the new cover protection.) Keep up the good work.

P.S. Now I can get back to playing Gorgon.

Steve Cohen, Thousand Oaks, CA

The purpose of this letter is to give you my views concerning your change in policy by going to subscription rates. Up until now you have been giving the Apple user something for which they invested only time and thought to consume.

For this, I am appreciative and have read your magazine thoroughly. With that policy, your obligation to the reading public is minimal . . . user beware. Anything advertised in your magazine has been helping to, or has paid for my subscription price. Once you begin charging the reader for the right to read your magazine, you have committed yourself to an additional obligation. No longer has the advertiser in your magazine as significant a part in furnishing the magazine to the reader.

If I am to pay $2.50 monthly for your magazine, I expect you to exercise editorial license to evaluate all advertisements in your journal. I consider you responsible to back claims made in your ads. Consumer's Union charges $1.50 per month for their consumer's report, they have no advertisements and they objectively evaluate all merchandise discussed. Are you willing to make that step?

At least 50 percent of the software and hardware advertised in your magazine is not as good as the advertisement promises. I have several items sitting in my shelf to prove this point, i.e., *Easy Writer, DB Master, Data Factory, Apple Paddles, Broderbund Payroll Program, Videx eighty-column card, Charles Mann Payroll* and *Accounts Payable* programs.

I have several good programs as well . . . including *VisiFile* and *VisiCalc*. If the increase in the amount of advertising in your magazine still does not pay your expenses, I would think you need to reevaluate your advertising charges. If, on the other hand, the reason for this move is a matter of supply and demand . . . there is no question that there is a great demand for your magazine . . . then please be honest with the public.

Darrell H. Hunsaker, M.D., FACS, P.S., Yakima, WA

The percentage of ads to editorial in Softalk *has not increased; the circulation has skyrocketed. To charge the advertisers accordingly would put ad prices out of reach of all but a handful of manufacturers—not nearly enough to support even a thirty-two page book such as our premiere issue. The alternative would be to limit circulation. Will you take the responsibility of telling half our subscribers and all new Apple owners that they can't get* Softalk *at all because Darrell Hunsaker wants his free?*

To test the products of every advertiser would entail—among many other practical problems—a separate staff that did nothing else—driving our cost and yours skyhigh. Refer to Marketalk Reviews for our opinions. Incidentally, Videx and Charles Mann have never advertised in Softalk*; nor has Apple advertised its paddles.*

As to other reasons, and your implication that (horrors!) we might be willing to take a profit, we do indeed look forward to such a day. The principals of Softalk *have yet to take a full salary.*

A Generous Spirit

I think *Softalk* is the best computer magazine currently being published, and, although I'm sorry to see you end your free distribution policy, I will be glad to pay for it. You have had a phenomenal degree of success, going from a slim little magazine mostly in black-and-white to an enormous one full of color pictures, all in just a little over a year.

I have a few comments to make about letters in your letter column. As for Paul Wilson's contention that it is stupid to publish your programs in a magazine rather than market them, I disagree. It takes a lot of time, effort, and money to market a program. If you want to do all that, you have to feel a program is really marketable. All-text adventures, such as the ones described in the letter, probably do not have that much of a market now, due to competition from the many sophisticated hi-res ones. To succeed, an all-text game needs to have a really novel twist. However, simple text adventures can still be very entertaining, both to play and to program. As a matter of fact, I have recently written two of them myself. Since, as I said, they probably are not very marketable, I submitted them to *Softdisk Magazette,* which is "throwing them away" according to Mr. Wilson. I don't feel that, as writing the programs was a good exercise of my programming skill, and I hope they provide entertainment to the subscribers. As a subscriber, I hope other readers take the same pride in creating quality programs to submit; this makes the publication (in this case a magazine on diskette, but the same is true of print magazines including software) better for everyone.

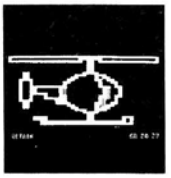
Adding my input to the ongoing obscenity controversy, if, as you state, more people have supported you for publishing the so-called "obscene" ads than have denounced you, why have you only

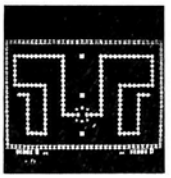
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printed the letters of those who criticize your publishing of these ads? I think it would be fair to print letters from both sides. The letters you have published seem to show your readers to be of a puritanical morality, rather than of the forward-thinking type that I would expect most computer users to be. While the so-called Moral Majority (really an immoral minority) is attempting to throw the country back one hundred years, throwing out the First Amendment in the process, I think publications such as yours should fight this.
Daniel Tobias, Poughkeepsie, NY

Thanks, Coach
I have never written (or 'APPLEWROTE') a letter to any editor or author, but I was so enjoyably enlightened by your article "All About Applesoft" that I was truly compelled to write to thank you.

I have had my Apple for about three months and I have been very successful in utilizing some of the software on the market. During these months I have spent many hours trying to work through the Apple manuals to learn also to program. Frustrated and confused I would resort to a favorite game program to unwind. I decided that I must find some book or some person that would "break" my Apple into edible and understandable bytes, so I visited my local computer store and looked through every book on their shelves to find that one author who would talk to me in bits. I came home to find my second issue of *Softalk* in the mailbox. Wrongly, I thought to myself, "Self, here is another 'over my head' computer magazine" when I spied (after your new subscription policy) "All About Applesoft." Anxiously, I raced through all necessary duties, chores and amenities of the day and finally sat down to try to figure out the APPLETRUTH as told by Doug Carlston. I started getting excited as I read each sentence with understanding and not frustration. Just to prove to myself that I did understand, I listed the first program without peeking (or is it poking?). I was so pleased that my APPLEMONSTER now hears and obeys its Master's voice, that I was compelled to tell you my story and thank you for beginning to teach me to talk to my new APPLEFRIEND.

Please advise me if this article is part of a book you have written or must I keep bugging my mailperson each month to quickly deliver my *Softalk*.

With your help, by the time my free subscription runs out, I'll be able to appreciate all of *Softalk* and will gladly buy a subscription!

I think David summed it up best after learning how to slay Goliath when he said "Thanks, Coach!"
Neil Wyenn, Saugus, CA

A Light Trip
That four-page "ego trip" you allowed Christopher U. Light to indulge himself in his column Ventures with VisiCalc this month is uncalled for.

You *certainly* must have some feeling for how much help such a column *could* be.

Of course, I am interested in paying for my subscription to *Softalk*. The magazine is current, it addresses itself to my hardware, and I believe, overall, makes a contribution to my effort and understanding. It goes without saying, however, that articles of that nature certainly don't encourage me.
Paul F. Swinford, Romeoville, IL

Flying Horse Found
We are the software developers of Pegasus, the Apple Pascal database system. Last month's Open Discussion contained a letter asking our whereabouts. From phone calls and letters it appears that people have had a hard time locating our address. Our address is Shakti Systems, Inc., Box 94543, Schaumburg, IL 60195. For Pegasus ordering information, call James Powers, 609-589-5500.
J. David Lehman, Schaumburg, IL

Clones?
I've been waiting awhile for an excuse to write a letter! In January '82 Open Discussion you said, in response to a question, that one can never have two programs with precisely the same name on the same disk. Unfortunately, this is not true. You can *"rename"* every file on a certain disk to have the same file name.

On another subject, does anyone know of a way to enlarge hi-res screen printouts on the Epson Mx-80FT?

I think there should be a separate category of the bestseller lists for games.

Anyhow, I want to congratulate *Softalk* on keeping me up to date on every aspect of the Apple world. I am sure it is an arduous task.
Ian M. Rose, White Plains, NY

Family Game in Demand
Perhaps you can help me obtain a specific program for my Apple. Some time back I purchased a copy of *Warlords*, produced by Speakeasy Software, Kemptville, Ontario, Canada. It was on tape, which fit my system at the time. My family and I liked it a lot, especially since it involved all four of us together. After a while the tape developed a glitch, and refused to load the second half of the program. I sent it back, along with an explanation, requesting a working tape. Since then I have called the phone number listed in their literature, and written additional letters, all to no avail. I heard a rumor that Speakeasy is no more, also.

What I want is to get a working copy of the game, so that I can put it onto a disk and make a few changes to improve it, and so on. The game was not sophisticated by current standards, but we liked



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it. Can you put me in touch with someone who can provide a copy?
Jay Warner, Racine, WI

Can You Justify Those Numbers?
My Apple II Plus and I appreciate very much receiving your outstanding magazine. It's been a big help.

As an old Fortran fan, I've come to appreciate the many excellent features of APPLESOFT a great deal—except for one: the difficulty in right-justifying columns of numbers, especially when trailing zeroes are needed. While there are solutions—and even an example program in the reference manual—they seem to be computationally inefficient. I've never completely solved the problem, but have come up with a useful algorithm for right-justifying data, to wit:

```
10  B$="      ":REM - INITIALIZE BLANK MASK
15  N = 15 :REM - INITIALIZE COLUMN WIDTH
20  V = any expression :REM - COMPUTE
    NUMBER TO BE PRINTED
25  FOR I=1 TO 4
30  PRINT RIGHT$ (B$+STR$( V )+" ", N); :REM
    - PRINT THE VALUE OF V IN A COLUMN N
    SPACES WIDE
35  NEXT I
```

The above will print V four times (for example, as the first row in four columns of numbers) in a relatively neat format, with each column precisely N spaces wide including leading and trailing blanks. In this example, B$ supplies the leading blanks necessary to right-justify the numbers, and +" " concatenates an additional blank to the end of the number for positive spacing. While one must be sure that V won't require more than N−2 digits to use the algorithm—else significant digits will be lost—it's more convenient than PRINT SPC(N−LEN(STR$(V)));STR$(V);SPC(20); I hope it helps someone.
Paul T. Burnett, Alamogordo, NM

More on Crystal
The letter from P. T. Carroll, Fort Story, Virginia, in the December 1981 issue of *Softalk* prompted me to write. Mr. Carroll described the recurrent problems he has had with *Lasar Wars* from Crystal Software. I'd like to mention some similar problems that I've had with another of their programs, *Sands of Mars*. Apparently, I purchased one of the first copies of *Sands of Mars*, because it contained over *ten* major errors, several of which were serious enough to require resetting the computer and aborting the program.

In May 1981, I began a long and frustrating correspondence with John Bell, the president of Crystal computer. First, Mr. Bell acknowledged that there were several bugs in the "original version" of *Sands of Mars*, and supplied me with a print-out of the corrections. He requested that the purchasers of the first copies inform him of any additional bugs and promised that they would be reimbursed $10 per original bug. I phoned Crystal that day and informed them of four bugs which I had discovered, but which were not mentioned in his corrections. I also sent a letter to Crystal that same day, detailing a total of *nine* new bugs and their corrections. A few days later, Mr. Bell's wife wrote, thanking me for my letter, and enclosing a new copy of the program. This new disk had not even been initialized and, of course, it would not boot on my Apple. I wrote again to Mr. Bell, informing him of this, and inquiring about the bugs and corrections that I had supplied. He sent me a third copy of *Sands of Mars*. It, too, had some of the same serious problems. Mr. Bell mentioned he had not received my corrections. I finally wrote again and told him of my complete dissatisfaction with his product and company.

If anyone else has had similar problems with Crystal or other software vendors, please voice your opinions; we have no other practical recourse as yet.
Michael Davis, Ph.D., Tucson, Arizona

Listing Lapses
I just received my first issue of *Softalk*, and I love it already! As a new Apple owner, I think it's better than having a second disk drive.

However, I do agree with David Fellman (I'm glad to see I agree with another Rochesterian, too!) that you should publish listings in a form that would be a facsimile of the actual working program. Typesetting involves at least one human operation, and that opens the door for errors. Since the Apple, like all its brethren brains of copper and silicon, is very unforgiving when it comes to typos, typeset solutions can often cause more work than they save.

A case in point: Richard Patton's program for converting hexidecimal numbers is a very handy thing to have around. I have no great difficulty doing the conversion on a calculator that I keep on the desk within arm's reach of the Apple, but, as I said before, humans make mistakes. And even an obvious error can hide itself for hours before you find it . . . like the error in line 150 of Dave's program. It should read:

```
150  PRINT "AN ILLEGAL CHARACTER WAS
     DETECTED IN THE INPUT STRING. IT IS -
     "MID$(A$,N,1): RESTORE: GOTO 30
```

Another: Robert Leedom's suggestion to eliminate the glitch in *Renumber* is something every Green Apple should know about. But how does a Green Apple actually *do* it? I'll tell you how! He spends hours, hours he can ill afford sometimes, pouring over the manuals, researching areas of programming that

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are still over his head, before he discovers how to get past line 10010 of *Renumber*. I cannot understand why, if Apple knew as far back as May 1980 that they had a glitch, they are still selling uncorrected programs, but I find it even more puzzling that you would publish the solution without giving us *all* of the solution.

I still think it's a great magazine . . . and many thanks to Dave and Bob for their letters.
Robert D. Curtin, Rochester, NY

Talking to Apples
I read J. Barry Smith's letter in the January 1982 issue (page 13) and I'm not sure if he's pulling someone's leg by asking about voice recognition units. The specifications he states are almost word-for-word the ones listed for two products that I know about.

One is the Heuristics H2000 and the other is the Cognivox VIO-1003 by Voicetek. Both cost between $250 and $300. Unfortunately, I have been unable to view a demonstration of either unit. I suggest writing for specs and dealers: Heuristics, 1285 Hammerwood Avenue, Sunnyvale, CA 94086; Voicetek, Department B, Box 388, Goleta, CA 93116.
Roy Trahan, Fullerton, CA

Programmed Perplexity
Just a line to let you know that the (Jan. '82) Poke 33, 33 instruction is just great. However the cursor drops two lines after the return. Is there any way to make the cursor go to the next program line?

I need help in appending files and correcting a mistake when initially creating a file. I have an Apple II Plus, language card, and one disk drive.

It would help if you would include more REM statement, analyze and discuss the purpose of the various operations and variables, and give a heading and goal of each program at the beginning of the listing.
Jerome Roth, Brooklyn, NY

Let's Put Apples in the PX
This [letter] concerns the recent policy action by Apple Computer—that policy that eliminates mail order sales of Apple products. I have been an Apple owner since mid-1979. Since then I've expanded my system to disk drives and Silentype printer, as well as other accessories. I felt very strongly about the Apple computer—and the company—and have heartily recommended it to other non-computer owners.

No longer!!! Apple's policy of prohibiting Apple sales by mail is ludicrous. All of my hardware and most of my software has been obtained by mail order. Why? Because I, like thousands of others, am in the military and am stationed overseas where the only method of obtaining Apple products is by mail.

I am president of Manzana Panama, the Panama Apple Users Group. Over 90 percent of our membership is made up of military members, and all but one obtained their computers by mail order. By prohibiting mail order sales, Apple has effectively cut off all sales to overseas personnel who simply cannot "walk into a local store" to buy an Apple. Even if there is a dealer overseas, the military member must now pay local prices (which often include import taxes) that are well above list price.

I understand one of the reasons for the curtailment was because of a lack of dealer service. Well there is a common concept when dealing with mail order firms—caveat emptor. We are well aware of the risk associated with mail order, *but we are willing to undertake that risk!* I would rather take a chance on service with the firm I ordered the computer from than not have a computer. Local word of mouth is very effective in determining the best mail order firms—look at the success of Huntington.

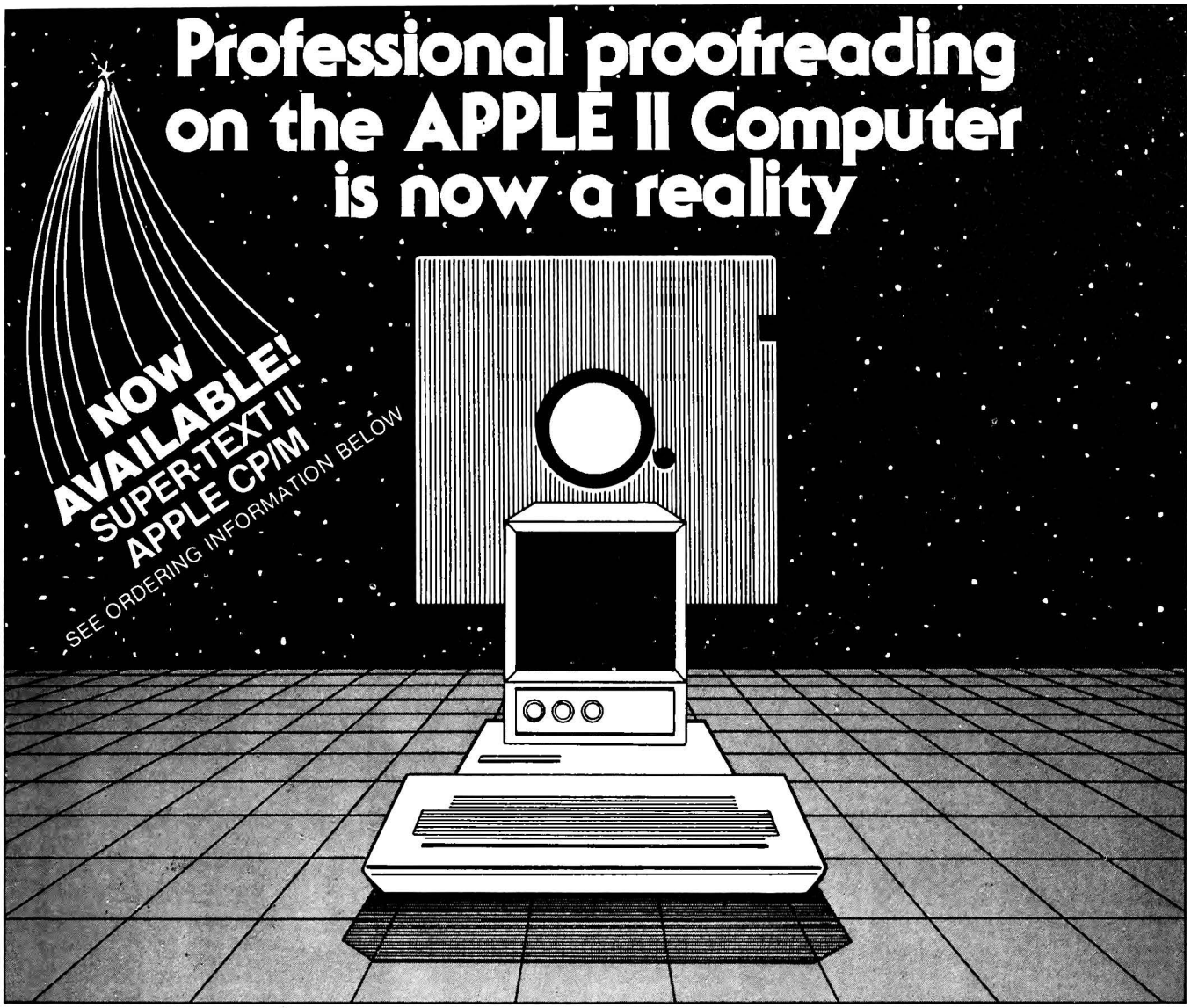
The net result is that I can no longer support Apple Computer Inc. nor Apple products. Those individuals who come to me asking me what computer to buy, I can now only refer them to the Atari, or IBM, or other computers that can be mail ordered easily. Additionally, all other peripheral equipment I buy will be manufactured by other companies (Lobo, Vista, and so on).

I realize these actions on my part will have little impact. But I cannot help but feel that the court actions I've read about by mail order firms, plus the detriment to public image, can only hurt Apple. I whole-heartedly urge Apple to reconsider their decision.
Montgomery A. Lee, Captain, USAF

Roots of the Apple
I read the letter "A Better Way To Trace Roots" in your January issue of *Softalk* in which a reader described his dilemma of trying to locate a good computerized genealogy system. About 15 months ago a friend of mine expressed, very strongly, the same desire to me. After contacting numerous genealogy societies and researching available software I too was convinced of the need.

In March of this year I am going to release a genealogy package called *"The Genealogist's Right Hand"*. This system, like many others on the market, has the ability to generate the standard reports such as a family tree, pedigree chart, and sorted indexes of all the people in the system. This however is where the similarity ends. First of all there is no real limit to the number of people the system will manage, it will handle literally millions. Next you ask how much and what information can you collect about each person and I will answer this by saying basically anything and as much as you like. The question of how many children and by how many marriages is also answered by the word *unlimited* in both cases.

Professional proofreading on the APPLE II Computer is now a reality



THE APPLE SPELLER fills the void that has consistently kept the large variety of excellent word processing packages for the Apple II Computer from approaching the power of a dedicated work processor. Finally, the first professional quality spelling verification program is available for the Apple II. The Apple Speller will certainly be the standard against which all other similar programs are compared.

The Apple Speller interfaces to the most popular Apple word processors, including Applewriter, Apple Pie, Executive Secretary, Letter Perfect, Magic Window, and Superscribe II, just to name a few. In fact, The Apple Speller can analyze the output of any editor that writes a standard Apple binary or text file to a diskette. In addition to this flexibility, the performance of The Apple Speller will astound the microcomputer world.

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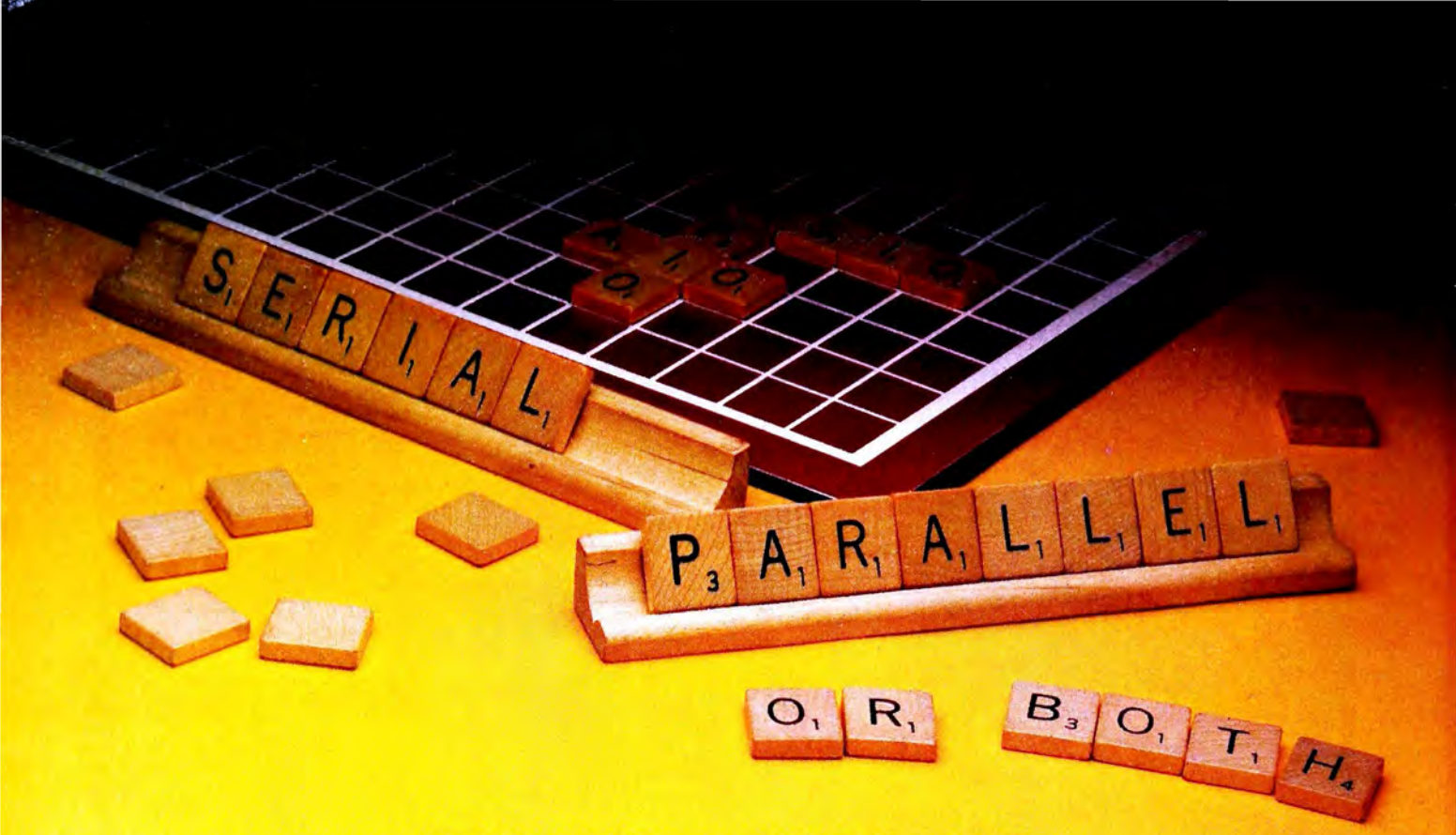
Numerous options are provided throughout the program to enable you to completely control all activities of The Apple Speller. These include the ability to ignore both control codes and formatting commands, an alphabetical listing of either mispelled words or all the words in your document along with usage frequencies, multiple options for the action taken with each misspelled word, and much, much more! A verification mode is provided to allow you to examine and dispense with misspelled words while viewing them in the actual context in which they appeared in your file.

The Apple Speller requires an Apple II/Apple II+ equipped with 48K, DOS 3.3, and 1 or 2 disk drives. Two disk drives are required to delete or add words to the dictionary.

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The Transformation People

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There is one last very important facility I want to mention briefly and that is the dynamic report generator. This allows you to very easily and quickly design very simple reports such as mailing labels for club meetings or Christmas cards all the way up to family reports showing any amount of detail about a person along with their father, mother, children, and wife or wives.

There is much more but I think that this should give your readers interested in genealogy the general flavor of the sytem.

George B. Wissing, Fairfield, OH

My Kingdom for a Write-Protect Sticker

Enclosed are copies of two letters I sent to On-Line and Muse that I believe may be of interest to readers of *Softalk* as well as other software authors. The letters describe a problem I encountered when using a Muse product with suggested solutions. These letters are self-explanatory so I won't repeat it all here.

If you would publish two items, I believe it would be a useful service to your readers:

1. Publish a warning for users of *Castle Wolfenstein* describing the reset wipeout danger
2. Publish the five listed suggestions in the Muse letter to emphasize some of the characteristics required of quality commercial software

Softalk continues to be my favorite Apple periodical and I look forward each month to its arrival. I am one of its charter "subscribers" and will continue to subscribe with your recent change in policy.

George Anderson, Scottsdale, AZ

George Anderson's Letter to Muse

I received your Castle Wolfenstein for Christmas and have thoroughly enjoyed it for three weeks, until yesterday. Unfortunately, your software caused the wipe out of another of my valuable disks.

The purpose of this letter is to explain how this happened so that you may consider precautions in your software and instructions to prevent this occurrence. According to the Apple DOS manual, one procedure for booting my Apple Plus is: Place disk in drive, reset, PR#6, <CR>. After having finished playing Castle Wolfenstein—that is, the program halted with "you're caught" on the CRT, I proceeded to boot another of my disks. Using the above procedure, when reset was pressed, your software became unexpectedly activated and began overwriting (and wiping out) my program disk in a "save game" mode. Your instructions require escape to save a game, not reset! Your instructions warn not to press reset while the disk drive is active. The drive was *not* active when I pressed reset.

My suggestions to you and your industry to prevent such unhappy situations are:

1. Be specific in your instructions about required inputs and error-trap all illegal inputs.
2. Place caution notes in both the CRT prompts and in your written instructions if number 1 is not accomplished.
3. Always maintain the operating characteristics of the Apple as described in the Apple manuals, such as the expected response to pressing reset.
4. Always return the Apple to its resident language at the end of a program instead of leaving it hung. Power cycling a computer is not a proper way to exit a program.
5. Your software should always verify the presence of the correct disk in the drive by first reading a "key record" before writing.

Having these types of features in your products is the difference between quality commercial software and merely a hobby program. Although I am very unhappy about the loss you have caused me, I understand that your industry is still embryonic and you may not have the total resources needed to develop product quality assurance. However, I believe that the future belongs to those companies that mature most rapidly in quality.



ity. I hope my suggestions help keep you among the survivors.

Anderson's letter to On-Line repeats much of the Muse letter; its purpose was to obtain a replacement for the wiped-out disk, which was Threshold.

Basic Solution a Month Later

Per your request in the December issue of *Softalk*, I am taking the time to write and tell you that I really enjoyed your column. In fact, I enjoyed it to such an extent that I typed in the short program submitted by Brad Stone for a "Hello" program. Anything to make life easier and more tricky, right? Well, in this case, tricky it was, as I was not able to detect any typos with my inexperienced eye, something I was specifically looking for as my abilities as a programmer are limited. And we have all seen the corrections to programs that have been listed in magazines run in the next month's issue, right?

Well, right at the end of the listing, on line 320, there is a lower-case b. Then right on line 1000 there is a symbol that I cannot find on my Apple keyboard. So I saved the program to disk until such time as I can fix it or read in your column next month how to do it. It is not all that bad, however, for in the process of trying to fix the program I learned some more about Basic and a couple of other items of interest about the Apple, so I consider the time well spent anyway. But just in case I can't fix it, you will print the corrections, right?

I have, as you have undoubtedly gathered, an Apple, with two drives, a monitor, and a C.ITOH M-85 printer. I am stationed in Tokyo, Japan, with the U.S. government and was able to get the monitor and printer at really nice prices as they are manufactured here. The M-85 is the counterpart of the Epson MX-80. There is quite a lot of activity in the area, with both Japanese and Americans getting together for talk and demonstrations, really an exciting atmosphere. Some of the Japanese are really talented at hardware fabrication and machine language, a real joy for a neophyte like me to be around.

By the way, *Softalk, Softside, Nibble*, and *C.A.L.L. Apple* seem to be the most popular English language magazines here, but the Japanese have a whole slew of publications with quite technical articles.

Well, this was just a short note to say "Keep up the good work," but as usual this is so much fun that I got carried away.

Oh, the types of programs that I like are the ones that make life easier, like the one in the December issue.

Again, enjoyed your column and hope to see more programs like the above. But I think I will wait until the corrections come out next time, at least until I find out more about programming.
Brant Shockly, Camp Zama, Japan

And a Little Babe Shall Lead Them

I challenge you to publish the attached letter.

[*The letter:*]

In glancing through the "letters to the editor" in your January 1982 issue, I noticed the usual assortment of complaints about "uncopiable" software; one person found his purchase (a diet program) so protected that it didn't even do the tasks that it was advertised to be able to do; another person bought a game that was subsequently discontinued by the company that made it.

Then there were—and are—the countless others who didn't write to you to tell you that a "protected program" they bought couldn't be modified to suit the buyer's needs, couldn't be saved on eight-inch disks or other recording media that suit the buyer, couldn't be backed-up with a copy, etc., etc.

I was amused to see that, predictably, you sided with your advertisers in seeing nothing wrong with such practices; yet you condemned any suggestion that buyers of such software can do as they please with their purchase, be it removing the "protection" scheme, modifying the program, etc.

How hypocritical!

Consider the following arguments:

1. It takes no more effort to write a good program than it takes to write a good book. Yet you won't see books selling for up to $500 a copy. What a nerve it takes to sell a program for $100 to $500 when one can buy books by mankind's best minds—Einstein, Russell, Freud, and others—for a few dollars.

2. When I buy a program, I buy the instructions that constitute that program; I do not buy the box that the program came in. I feel perfectly entitled to do as I please with my purchase except to make a profit from its author's work. I can break the code, modify it, give it to friends, eat it, burn it. Being prevented from so doing is simply unacceptable.

3. How many kids do you know who can afford to buy many programs at $30 to $500 a copy? These kids are tomorrow's technocrats. If I give them a copy, the software manufacturer is not losing a sale he wouldn't have made in the first place (because of the outrageously high prices he charges).

4. The only reason why people don't bother to make tapes of music albums they buy and pass them to friends is because the cost of the blank tape is only slightly below the cost of the original album. Until software makers understand this simple truth, "bootlegged" software will outnumber original purchases by well over twenty to one.

I suppose that you have to placate your advertisers by not condoning software trading. But you don't have to be hypocritical and lose your personal respectability in the process. Just confine your editorializing to technical issues.
Peter Hohenbrink, Age fifteen,
Placentia, CA

Enough of Buccaneers and Barons

Having long watched the pirate manufacturers controversy swirl in the pages of the computer magazines, I have concluded that both sides spend more time rationalizing than reasoning, and what I have to say will make little difference either way. From several minutes of distracted study I have summarized the major points of both sides. First, for the pirates:

1. Software is overpriced, and the only reason they steal software is the price.

2. Software has to be backed up, and only by learning pirating techniques can it be done.

3. Software manufacturers often make misleading claims about their product, and rather than paying a lot of money for software that turns out to be less than advertised, it is better to pirate it first.

4. Software that is no longer available cannot be had any other way.

5. Numerous other excuses that can probably be gleaned from combining 1 through 4 above or The Devil Made Me Do It.

And now for the manufacturers' side.

1. If their product is pirated, they'll go out of business.

2. They spend a lot of money developing software, and their prices reflect not only development but also materials, royalties, advertising, shipping, distributor/dealer mark-up, and so on.

3. They support updates on their software; so that the consumer who buys the original can have it updated inexpensively if there are flaws in it or if improvements are made.

4. It's unAmerican to steal and hurts their business.

Such homilies as "There's truth to both sides" are banal, and, in my opinion, both sides are probably hypocritical. First, I don't care what software costs, if people can get it free, they'll probably take it. Since I have not met one single person—including software manufacturers, dealers, distributors, and software authors—who does not have pirated software, I seriously doubt that anyone can cast stones. Secondly, manufacturers do have various costs, but any businessman worth his salt doesn't figure the minimum amount he can get for a product and sell it at that. He figures the maximum, and if he doesn't go too high, he'll get rich. Look at *VisiCalc*, for example—they got their development costs back a long time ago and they're making a bundle selling both old and new versions. However, as for manufacturers supporting their software, with

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The publisher reserves the right to reject any advertising that he feels is not in keeping with the publication's standards.

Heads will be set in 10 point bold face, all capitals only. Italics are available for body text only; please underline the portions you would like italicized.

The body text of the ad will hold roughly 53 characters per line. Spaces between words are counted as one character. Heads will hold roughly 25 characters per line, with spaces between words counted as one character. Please indicate if you would like the head centered or run into the text.

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"low cost" updates—that's a joke. For example, one piece of software I bought with promises of updates for $7 charged $20 when the updates finally were made. However, one of the updates was on the original—only you couldn't get to it unless you had a "broken" copy. (That's how I found it was there.)

If manufacturers came out with high quality, low cost, and well supported software, I doubt it would make a bit of difference. Pirating would go on regardless. The fact that there is a lot of junk and unfulfilled promises does shore up the excuses of the pirates, but, let's face it, as long as there are ways to copy software, everyone is going to end up with some hot programs. About the only bright spot in this (for the manufacturers) is that I have only come across one person dumb enough to try to sell pirated material. He didn't get very far since no one was willing to pay him for what they could get free.

So what's the point of this letter? Well, I'm tired of hearing bull from both sides—mainly in the form of lame excuses. The pirates are trying to get something for nothing, and the manufacturers are trying to get rich. Maybe they deserve each other, who knows? But, please . . . let's not hear any more of the false morality that has pervaded the whole issue.
Bill Sanders, San Diego, CA

Opening Apple's Mail—by Request
The Northwestern University Apple Users' Group has today sent the enclosed letter to Apple Computer, asking that the ban on mail-order sales of Apples be lifted. We hope you will publish our letter.
Colin C. Graham, Evanston, IL

The letter:

Dear Mr. Markkula:

I write in my capacity as chair and founder of the Northwestern University Apple Users' Group. This users' group consists of about one hundred people representing somewhat more than one hundred Apples. We are generally delighted with Apple products. But we, as a group and individually, deplore Apple Computer's recent implementation of a policy banning mail-order sales. We urge you to change that policy for the following reasons:

1. For some Apple buyers, mail-order is quite appropriate; they are located so far from the nearest dealer that meaningful dealer support is impossible; they are so knowledgeable that dealer support is not necessary.

2. The existence of the mail-order option obliges local dealers to provide high quality service, since otherwise people will learn that the higher cost that they pay for a locally purchased machine brings no commensurate benefit. The existence of that option also provides a competitive stimulus to local dealers to keep their businesses efficient. The mail-order sales ban is likely to lead to a degrading of local dealer support.

3. Apple's banning of mail-order sales is in restraint of trade. I leave the legal aspects of that to lawyers. The ethical aspect is plain and does not enhance the reputation of Apple Computer as a company that wishes to provide the best possible computers at the lowest possible price commensurate with appropriate levels of customer support.

4. To the extent that the ban on mail-order sales artificially raises the price of Apple hardware, other suppliers will be encouraged to produce competing, equivalent equipment. That has already begun with RAM cards and 5¼-inch disk drives. I personally have mixed feelings about such developments; you should not.

We urge Apple Computer to rescind its mail-order sales ban. Thank you for your interest.

Yours sincerely,
Colin Graham
Professor of Mathematics
Chair, N.U. Apple Users' Group

The Best Argument
I want to echo the objections of Michael Daugherty, John Zimmer, and other *Softalk* readers to pornographic advertising in *Softalk*. But I object for different, and I think more important, reasons.

The problem is not erotica in media, or toplessness, or even whether the kids will see a picture of a breast. The problem is not *obscenity*. Rather, the problem *Softalk* needs to address is *sexism*.

Ads that present women as sexual objects are sexist, and I object to them on that basis alone. They include On-Line's *Softporn* ad, to be sure, and Don Fudge's *Hi-Res Secrets* ad, and others. But I would add to the list Howard Software Services' ad for *Creative Financing*, which, despite the claim that it is "for the *serious* personal computer user," features a woman in a most unbusinesslike kimono letting her hair down, under the double-meaning headline, "Worth Waiting For."

Women are not merely fixtures for the sexual enjoyment of men. They are people. Depicting them as sexual objects denies their personhood. Sexist ads help create and reinforce sexist attitudes. And *Softalk* cannot pretend neutrality: either you are *for* sexism—by your action of aiding and abetting it—or you are *against* it.

If making decisions about what is sexist and what is not sexist seems inappropriate to an advertising staff, consider this: would you run an ad depicting a black person in overalls eating a watermelon? Would you run an ad that contained the words "nigger," "gook," or "spic"? Of course not. You know better than to print a racist ad. You *should* know better than to run a sexist ad.

This is, after all, 1982.
Don Doumakes, Iowa City, IA

Dislocated Memory?
I have several questions that I hope you or some reader might be able to answer.

First, why did Apple choose to put the hi-res graphics memory where they did? Several times I have written programs in Applesoft, only to find that the program is too long to use page 1 of high graphics, and, due to a large number of string variables, I can't use page 2. I'm sure there is a way around this problem, but how can someone who is not a computer expert and does not want to spend money for extras get around it?

Second, in the March/April 1980 *Apple Orchard*, the internal entry point for *xdraw* was given to be $F65D. In the latest *Softalk*, it was given to be $F76F. There were several other differences also. First, which is right, and, second, why doesn't someone give concrete examples as to how to use these entry points? I have tried dozens of variations and have yet to get any results that are predictable. Won't someone please treat us as the dummies we are and give some extremely basic yet informative examples to go by?

Third, as chips with larger amounts of memory (such as 64K chips) are developed, does Apple have any plans to allow for finer graphics as some of the Japanese are doing?

Finally, as more and more software is developed for the Apple, would it not be possible for *Softalk* to have a continuing evaluation of programs by readers to be published monthly rather than just the yearly voting? As you pointed out, your top thirty indicates what is being purchased, but it doesn't give feedback as to how good the program is.
Richard Arnold, Hogansville, GA

Earth, Wind, and Fire
I found the review of *Volcanoes* very interesting, perhaps especially so because it may indicate something of what we can expect from *InfoWorld*, etc. There are a few points that are not clearly stated, or may even be somewhat misleading to someone who has never played the game. From the top (as I used to say when I was directing plays): (1) volcanoes are not "true" (or "false")—they are real or imaginary. (2) The initial budgets for players are in part a function of how many are playing the game; evidently, your reviewer had in mind only the two-player format when citing a budget of about $350,000. If players have smaller areas of responsibility, they have smaller budgets with which to do investigations. (3) If seismic surveys are done with one or two seismometers installed on the slopes of the imaginary volcanoes, their costs are not significantly different from those of gas analyses. (4) Players

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Compute.

Compute.

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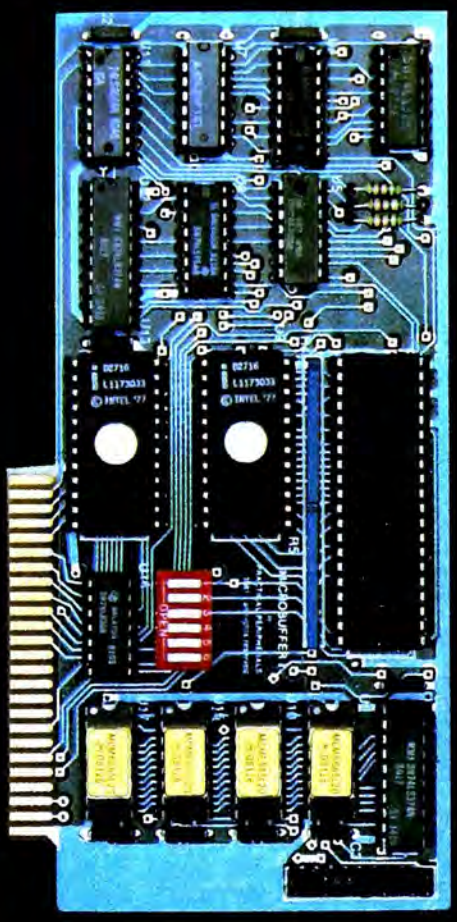
Compute.

Compute.

Compute.

Compute.

Compute.



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Print.

Print.

Print.

Print.

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may not only exit a game, they may also re-enter any saved game. Perhaps that is implicit.

Finally, (5) we were amazed that no mention was made of the quality of the graphics. Perhaps your reviewer has only a limited "visual sense," and did not notice the exceptionally vivid depictions of volcanic eruptions, in several distinct artistic styles. (I can effuse about these images because, except for very minor contributions, I did not draw them. If, in analogy to books, I am the author of *Volcanoes,* then my wife is the illustrator.)

I expect that you have not had a chance to see these eruption images yourself. If you look at the March-April issue of *Educational Computer,* you will see a half-page ad in color, part of which depicts one of these images, shot directly from the video monitor.
Gordon G. Goles, Earthware,
Eugene, OR

Apple-Controlled Video Recorder?
I recently saw an Atari 800 being used with a piece of educational software. Its unique feature was that it could, through program control, start and stop its tape recorder. This feature has great potential for educational programs.

Is this possible with the Apple through hardware additions or modifications?

Is there a way to control VCR equipment in the same manner?

Softalk's a great magazine made even better by the addition of a column on hardware. Long overdue!
Steven C. Helms, Bettendorf, IA

Graft or Good Sense?
I read Mr. Mazur's article on coprocessor cards in the November issue with some interest since Southern Semiconductor also has a 6809-E card for the Apple II which we have been shipping since mid-summer of 1981. Unlike the Mill, ours was introduced with little fanfare but with system software to make it immediately usable. An editor, assembler, and utility routines were included with the card. These programs are all written in 6809 assembler and will run with either Integer or Applesoft (or no) Basic. We are now also supplying a stand alone debugger which will interface directly with DOS and provide breakpoint and hardware trace capability.

I have tried on several occasions to contact Mr. Al Tommervik about a possible review of our product but he hasn't seen fit to return my calls. Seeing the ad for the Mill included with the article may explain that. Does *Softalk* do reviews of products before the manufacturer starts advertising in *Softalk*? If so who is the proper person to contact?
David Ramsey, Norcross, GA

A bit of thoughtful paging through Softalk *would have precluded your question and suspicions about reviews and advertising. You would have found numerous products reviewed and featured in other articles that have never been advertised in this magazine. There is one secondary connection, however; companies that advertise in* Softalk *are usually careful to send us samples of new products so that we can review them.*

You saw the Mill ad where it was because that was the most appropriate place in the magazine for it. You will generally see business products advertised near the business columns and assemblers near Assembly Lines. We attempt to place all ads where they are most apt to be read by readers who'll be interested in them. Your product would be treated in exactly the same way whenever possible.

Down in the Dumps Again
Mark Lavetter's improved version of Art Christopher's Screen Dump Program (January 1982, page 18) was a great help. I commend him for making the program faster and significantly shorter. When I tried to use the program in Diarmuid McCarthy's Applesoft tutorial, though, I discovered that my Epson printer would not print inverse or flashing characters correctly. After studying page 15 of the Apple II *Reference Manual,* I added two statements that convert all characters to normal before printing. Of course the program is a little longer and slower, but it can now handle inverse and flashing characters with no trouble. Unfortunately, the program can no longer fit on one line. It could fit on two lines, but I chose to use three lines for readability.

```
    1  REM EPSON SCREEN DUMP
    2  REM BY MARK LAVETTER
    3  REM 11-5-81
    4  :
    5  REM BASED ON
    6  REM SCREEN DUMP PROGRAM
    7  REM BY ART CHRISTOPHER
    8  REM LETTER TO
    9  REM SOFTALK 11/81 P. 15
   10  :
   11  REM FURTHER MODIFICATION
   12  REM BY MARK C. WALWORTH
   13  REM 1-8-82
   14  :
63997  PR#1:
       PRINT CHR$ (9) "80N"
63998  FOR H = 0 TO 80 STEP 40:
         FOR I = H + 1024 TO H + 1920 STEP
         128:
           FOR J = I TO I + 39:
           A = PEEK (J):
           A = A + 64 * (A < 64) + 64 *
            (A < 128):
           A = A + 64 * (A < 160):
           PRINT CHR$ (A);:
           NEXT J
63999      PRINT CHR$ (13);:
           NEXT I:
       NEXT H:
       PR#0:
       RETURN
```

If you are absolutely positive that the screens you dump will contain no flashing or inverse characters, by all means take advantage of the extra speed of Mark Lavetter's version. I'm curious to see if there will be even more improvements of the Screen Dump Program appearing in future issues of *Softalk.*
Mark C. Walworth, Riverside, CT

Pascal and the Epson
The following may be helpful re the problem described by Jim Burke on pages 22 and 23 of the January 1982 *Softalk.*

There is a problem in interfacing *recent* Apple II Pluses and Epsons for Pascal programs and for programs that are Pascal-driven (whatever that may mean), like Personal Filing System. Some cards will just not work, and that includes the Epson Apple Card and the Mountain Computer multifunction card.

I resolved the problem by replacing my Epson Apple Card with the Grappler, which works fine. The Apple Centronics and parallel cards may well work, as might the increasing number of parallel cards that advertise themselves as Pascal compatible.

But it is a good idea to take one's programs to a dealer that has an Apple hooked up to an Epson to see if the connection really works. Dealers tend thus far to say that they are unaware of the problem, but there are people at both Apple and Epson who are aware of it, and it is real.
John M. Allswang, Los Angeles, CA

In response to the request of Jim Burke and the Epson Parallel Card and Apple Pascal 1.1; the following program set up works fine on my system:

```
PROGRAM TESTPRINT;
VAR PRINT:TEXT;
BEGIN
  REWRITE(PRINT,'PRINTER:') (* THIS INITIATES
  THE FILE TO THE PRINTER.*);
    WRITELN(PRINT,'THIS LINE SHOULD GO TO
    THE PRINTER');
  CLOSE(PRINT) (*THIS CLOSES AND CLEARS THE
  FILE.*);
END.
```

This is the setup I received from Apple after I had trouble getting my printer to work. They have a tech hotline in Texas that will answer most any question you can come up with about any language that runs on the Apple II. The telephone number is (214) 245-0228. You will get a recording most of the time asking the nature of the problem, language, and a phone number where you can be reached. They will then get your answer all ready and call you back within three working days, thus saving you long distance charges. Most of the time your answer comes within three or four hours. I hope this answer is able to help pull you out of your problem.
Edwin F. Christian, Saint Peters, MO

Review from the Top
Your "Hit Parade," the top thirty, is great. How about including next to the descriptions a notation as to when you reviewed each entry? Readers could go right to the review if they have any questions.
Bill Black, San Jose, CA ◨

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CPU Inc., Montgomery, AL
Computer Shop, San Antonio, TX
Computerware, Encinitas, CA
Computerland, Eau Claire, WI
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Baker Computing, Huntington Beach, CA
Custom Computer Corp., Medford, OR
Computer Systems Unlimited, Redding, CA
Computer Port, Arlington, TX
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Computerware, Modesto, CA
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Compushop, Dallas, TX
Bite-soft, Burbank, CA
Computer Shack, Pueblo, CO
Computer 'N Things, Austin, TX
SEB Computers, Jacksonville, FL
Computer Corner, White Plains, NY
Computerland, Madison, WI
Computerworks, Westport, CT
Computer Source, Pittsfield, MA
Micro Co-op, West Chicago, IL
Computermart, East Lansing, MI
Northwest Systems Services, Aloha, OR
Computerland, Fort Wayne, IN
Computerland, Boca Raton, FL
Columbus Computer Centers, Columbus, GA
Zim Computers Inc., Brooklyn Center, MN
Amercomp Inc., Venice, FL
The Computer Place, Kalispell, MI
Computers Etc., Annapolis, MD
The Computer People, Lafayette, LA
Grice Electronics, several Florida locations

The list of manufacturers, OEM suppliers, and Apple user groups:

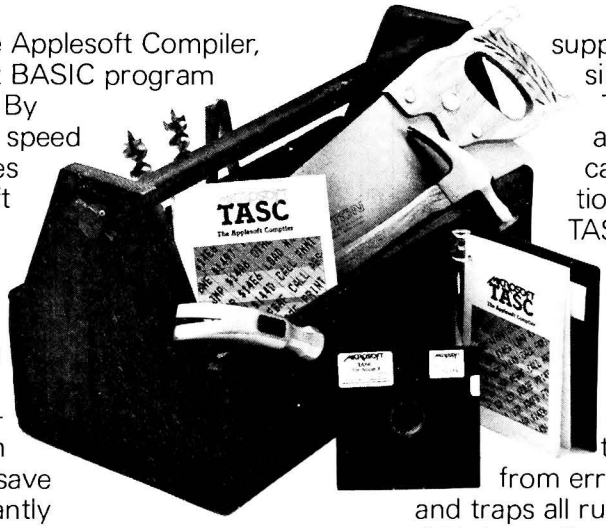
Southwestern Data Systems, Santee, CA
Adam and Eve Users Group, Madison, WI
Softsel, Inglewood, CA
On-Line Systems, Coarsegold, CA
Penguin Software, West Chicago, IL
The Carlton Agency Company, St. Louis, MO
Crane Software Inc., Huntington Beach, CA
Rainbow Computing Inc., Northridge, CA
Simi Valley Apple Users Group, Simi Valley, CA



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VENTURES WITH VISICALC

BY CRAIG STINSON

Our *VisiCalc* application this month will address itself to the care and feeding of your local—and national—taxman. Or, rather, to the reduction of hassle attendant thereto.

We could conceivably apply *VisiCalc* to the task of computing federal income taxes, but it would be tough to come up with a single model that could accommodate the wide variety of individual needs. Instead, we'll tackle the taxman in his recurrent—should we say chronic—manifestation; we'll build a model to calculate withholding taxes and other payroll deductions.

This model is in some ways the opposite of what we did last month. Then, you may recall, we used *VisiCalc* to create a table of numbers representing the future value of an investment at various points in time, given various assumptions. This time we're going to use *VisiCalc*'s @LOOKUP function to extract information from a previously input table of values and relationships.

The lookup function is ideal for a lot of situations where you want *VisiCalc* to select some number from a table and use it in a calculation. Which number the program selects will depend on some other criterion, which is input by the user.

Figure 1 illustrates a tiny lookup table, representing a frequency discount scheme for a certain size of magazine ad. B10 holds the price for a single insertion; B11 is the price per insertion for a three-month contract, and B12 is the price per month for six or more months. To extract a value from this table, you'll need two *VisiCalc* cells. The first will hold the search criterion, the second the result.

For example, if you put the value 3 at A13, then the formula @LOOKUP(A13,A10 . . . A12) will return the value 540. The function gets or calculates the search criterion at A13, finds it in the table range A10 . . . A12, and returns the value to the right of the appropriate position in the lookup table. If the table is arranged in rows, the function finds the search criterion in the upper row and returns a value from the lower.

If the table does not include the search criterion, the function returns the value opposite the next lower entry in the source range. In other words, putting a 4 at A13 would still cause the formula @LOOKUP(A13,A10 . . . A12) to return the value 540.

Tax computations, however, are based on many different variables, and there are few linear relationships with which the behavior of one variable may be tied to another. So our payroll deduction calculator is going to have lots of lookup tables, and we'll need to find some way to choose a single end result from a multiplicity of plausible ones.

Tax computations are based on many different variables, and there are few linear relationships with which the behavior of one variable may be tied to another. So our payroll deduction calculator is going to have lots of lookup tables, and we'll need to come up with some way to choose a single end result from a multiplicity of plausible ones.

	A	B
10	1	600
11	3	540
12	6	480

Figure 1

Our worksheet, like many a good program, will have an area for input, an area where some processing will take place, and an area for output. We'll need to pay some attention to the spatial arrangement, so that these three functions—input, processing, and output—occur in the proper time sequence. In general, the output should appear to the right of anything else on the screen if your sheet is set to calculate in columns, and below everything else if you're calculating by rows. If you're going by columns—*VisiCalc*'s default arrangement—your lookup tables ought to be columnar as well.

It's nice to have input and output areas visible at the same time, so that you don't have to go traipsing all over the sheet whenever you want to see the results of a change in input parameters. Since we're going to need a large area for processing, the way we'll bring input and output both into view is with a vertical window. The final result of our labors will look like figure 2; notice that all the processing areas are neatly tucked away off screen.

This sheet is set up to calculate withholding for federal income tax, social security, California state income tax, and California state disability tax. The first two items on that list will be relevant to most people reading this article. For state and any other taxes you'll need to put in whatever information pertains to your locality. The methods used on this worksheet should be applicable most places in this country.

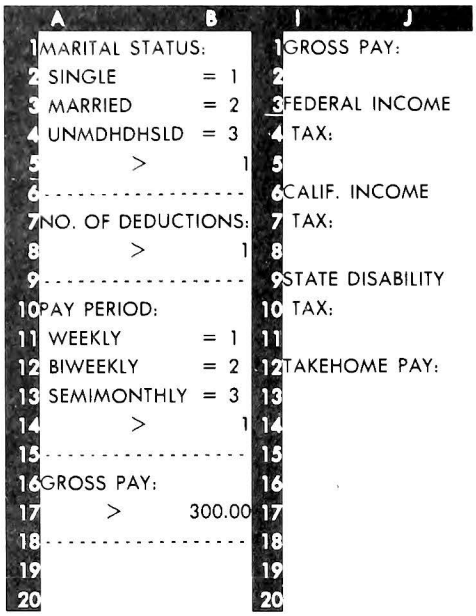
On the left side of the sheet you'll find the four independent variables: marital status, number of dependents claimed, pay period, and gross pay per period. The third item under marital status, unmarried head of household, is a special category meaningful to the California state income tax collector.

Under pay period we've included only three categories. Others are obviously possible; the federal tax tables acknowledge eight: weekly, biweekly, semimonthly, monthly, quarterly, semiannual, annual, and daily or miscellaneous. The problem with allowing for all of these options on your worksheet is that you'll run out of memory. Besides, it's almost certainly a lot of unnecessary work. Use whatever data applies to your situation; we've included three periods for illustrative purposes.

The sheet as we have it here, by the way, uses 17K of memory. On a 48K Apple using *VisiCalc* 3.3, that leaves 1K for any additions. In a typical company application, however, where everyone's pay period is the same, you could eliminate one independent variable and save quite a bit of memory. That would allow for the inclusion of other kinds of deductions, like voluntary contributions or automatic savings deposits.

On a clear worksheet, run your cursor over to J1, then move it back one column so it sits on I1 and J1 still shows on the screen. Now type /WV to establish the vertical window.

There are some things to note as you do this. *VisiCalc* preserves the default column width of nine on the left side of the sheet but narrows the columns on the right to eight. When you type in the window command with one column to the right of



	A	B	I	J
1	MARITAL STATUS:		1	GROSS PAY:
2	SINGLE	= 1	2	
3	MARRIED	= 2	3	FEDERAL INCOME
4	UNMDHDHSLD	= 3	4	TAX:
5	>	1	5	
6	----------		6	CALIF. INCOME
7	NO. OF DEDUCTIONS:		7	TAX:
8	>	1	8	
9	----------		9	STATE DISABILITY
10	PAY PERIOD:		10	TAX:
11	WEEKLY	= 1	11	
12	BIWEEKLY	= 2	12	TAKEHOME PAY:
13	SEMIMONTHLY	= 3	13	
14	>	1	14	
15	----------		15	
16	GROSS PAY:		16	
17	>	300.00	17	
18	----------		18	
19			19	
20			20	

Figure 2.

the cursor, the program assumes that you want to see two columns displayed in the right window at all times, and it just makes whatever adjustments it needs on the right side to fit the new set of row numbers on the screen. The program always tries to use all forty columns on the Apple display. Each set of row numbers takes up three columns, and the rest of the available space gets distributed as equitably as possible, with the specifications requested (or accepted by default) for the left window taking precedence over those requested for the right.

The column widths can be modified, of course, and in a vertical-window model you can specify one width for one side and a different one for the other; that's the only situation where *VisiCalc*, in its present revision, permits differing column widths.

Now that you have your windows set up, you can type in the material shown in figure 2. The semicolon key will take you back and forth from one window to the other.

On the input side, you'll probably want to put in a /F$ at B17 for the sake of neatness. Likewise, on the output or results side, cells J2, J5, J8, J11, J14, and J17 should be given the dollar format. As for the formulas for those locations, J2 is clearly +B17, and J17—the bottom line on this chart—can be entered as +J2-J5-J8-J11-J14.

The formula at J8 can be entered as simply +J2*.07. Social security is the simplest tax to calculate because it's a straight percentage—currently 7 percent—of gross wages. The only time you'll need to change this formula is when the government increases the rate.

The California State Disability payment is, likewise, a simple percentage taken off the top. That tithe now stands at 0.6 percent. There is one complicating factor here, however. The state only takes a maximum of $136 dollars a year, regardless of how much you make. To cover the possibility that an employee had already met his state disability obligation for the year, we can use one of *VisiCalc* 3.3's conditional functions.

Start by entering the label PERIOD #> at A20. At B20 you'll need to add another independent variable representing the number of the current pay period. If your paycheck is semimonthly, this will be the number of the month times two, plus one if you're in the middle of the month—and so on.

At C1, enter the formula +B17*B20*.008. This will return the amount of money paid to the state disability fund up to and including the current pay period, assuming that the gross pay for the current period is an amount close to the average pay per period recorded by this employee this year.

At C2 enter @IF(C1>136,0,.008). The @IF function has three fields. The first is an expression yielding a Boolean result—true or false. If the result of that expression is true, the @IF function returns the value of the second field—whether that value be a constant or a formula. If the result of the first field is false, the function returns the value contained in the third field.

In this case, the program checks to see if the amount contributed to the state disability fund exceeds the maximum required. If it does, then C2 will hold the value 0; if not, it will hold .008. The final step, of course, is to enter the formula +J2*C2 at location J14.

Now we've got two of our four deductions figured. The last two—the federal and state income taxes—are going to take a little more work.

The first step in calculating the amount to be withheld from an employee's pay for the federal income tax is to deduct a certain amount from the gross pay; this amount, which is dependent on both the number of deductions claimed by the employee and on the pay period, is exempt from taxation.

To figure the exemption, we'll put a small lookup table at A22 to A24 and B22 to B24. The three values in column A will represent the three pay-period options that our sheet will allow. The corresponding figures in column B represent the exemption, per claimed deduction, for each of these pay periods. The table should look like this:

	A	B
22	1	19.23
23	2	38.46
24	3	41.66

So, for example, if an employee claims three deductions and is paid weekly, the amount of his paycheck that's exempt from withholding is found by multiplying $19.23 by three.

In order to calculate the amount of money subject to withholding, enter the following formula at B30: +B17-(B8*@LOOKUP(B14,A22...A24)). B17 holds the gross pay and B8 the number of deductions claimed. The lookup

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WEEKLY Payroll Period

(a) SINGLE person—including head of household:

If the amount of wages is:		*The amount of income tax to be withheld shall be:*	
Not over $27		0	
Over—	*But not over—*		*of excess over—*
$27	—$63	15%	—$27
$63	—$131	$5.40 plus 18%	—$63
$131	—$196	$17.64 plus 21%	—$131
$196	—$273	$31.29 plus 26%	—$196
$273	—$331	$51.31 plus 30%	—$273
$331	—$433	$68.71 plus 34%	—$331
$433		$103.39 plus 39%	—$433

(b) MARRIED person—

If the amount of wages is:		*The amount of income tax to be withheld shall be:*	
Not over $46		0	
Over—	*But not over—*		*of excess over—*
$46	—$127	15%	—$46
$127	—$210	$12.15 plus 18%	—$127
$210	—$288	$27.09 plus 21%	—$210
$288	—$369	$43.47 plus 24%	—$288
$369	—$454	$62.91 plus 28%	—$369
$454	—$556	$86.71 plus 32%	—$454
$556		$119.35 plus 37%	—$556

Figure 3.

function selects an exemption allowance dependent on location B14, which represents the appropriate pay period.

You can dress this table up a bit by adding the values 0 and 4 at A21 and A25, respectively, and @ERROR in both the corresponding positions of column B. Then edit the formula at B30 to make the lookup table extend from A21 to A25. This will catch any out-of-bounds data entered at B14. If someone enters a pay-period code of 5, for example, the value ERROR will show up at B30 and, when we're done, at J5 and J16 in the output section of this worksheet.

The data for this lookup table, as well as all the other data pertaining to federal income and social security taxes, comes from the IRS's Circular E (Publication 15). To determine the amount of tax to take out of our employee's paycheck, we need to consult the tables on pages 16 and 17 of Circular E. One of those tables, the one that covers withholding from weekly pay, is reproduced in figure 3.

The IRS table shows that for each of seven income brackets, the tax consists of a specified base amount, plus a specified percentage of the taxable income in excess of the bracket cutoff point. For example, if our employee is single, claims one deduction, and grosses $300 a week, we calculate his tax as follows: first we observe, by means of the lookup table we established earlier, that his taxable pay with one deduction is actually $280.77. Then we locate him on the fifth tier of the IRS's table and see that his tax will be $51.31 plus 30 percent of the difference between $280.77 and $273.

We can get *VisiCalc* to do the figuring for us by entering the four columns of numbers shown in figure 4. You'll find it convenient to kill the window setup— by typing /W1—before entering the data. You can always reinstate the window later on.

The four columns of numbers represent, respectively, the following information: the cutoff points that determine the employee's tax bracket, the base tax for that bracket, the percentage that must be taken of the amount in excess of the bracket cutoff point, and the cutoff point again. The first and fourth columns may initially appear to be redundant, but there are a couple of reasons why they both need to be there.

First of all, these four columns will be used as three overlapping lookup tables. That is, we're first going to look at column A, the bracket boundaries, and pick out the appropriate base tax in column B. Then we'll use that base tax value as a search criterion for a lookup table made up of columns B and C. The result of that operation will give us the proper percent figure to be applied to the amount in excess of the bracket cutoff. But the appropriate cutoff figure itself has to be pulled out of a lookup table based upon the various percentages. Since the two columns of a lookup table have to be adjacent to each other, we need to repeat column A as column D.

There's an important difference between column A and column D, however. We've added a penny to the values in A, to cover the possibility of an employee landing exactly on the cutoff line. The IRS table says that an employee so situated on the cuff between two brackets is entitled to remain in the lower of the two. Putting that extra penny onto the figures in column A allows for the eventuality.

One more note about this set of lookup tables. The values at B33 and B34 are both shown as zeros, but they're not identical.

	A	B	C	D
32	WEEKLY SINGLE			
33	0	0	0	0
34	27.01	0	.15	27
35	63.01	5.4	.18	63
36	131.01	17.64	.21	131
37	196.01	31.29	.26	196
38	273.01	51.31	.3	273
39	331.01	68.71	.34	331
40	433.01	103.39	.39	433
41				
42	BASE	51.31		
43	PCT.	.3		
44	TAX	53.64		

Figure 4.

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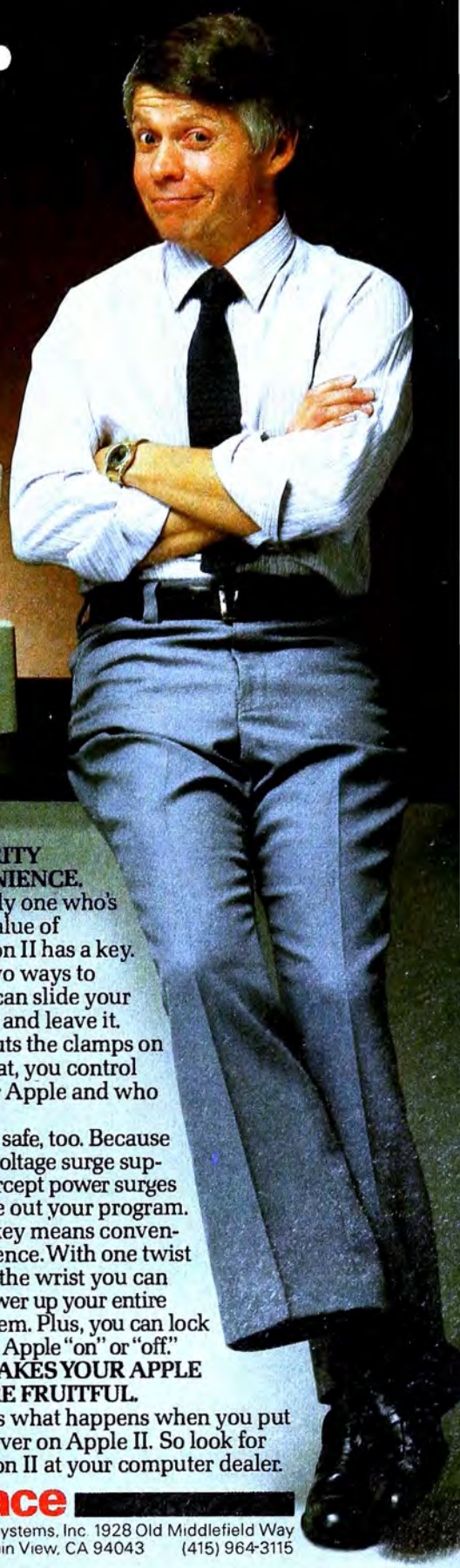
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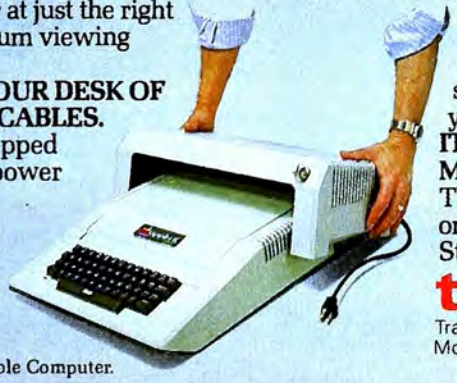


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All the values on the left side of a columnar lookup table have to be unique and arranged in ascending order. So B34 actually holds .001 rounded to zero by means of a /FI. When @LOOKUP selects a percentage figure from column C, it will recognize the difference between B33 and B34. The base tax value actually held in B34 is a mil higher than it ought to be, but since all our final calculations will be rounded off by /F$, the error will have no effect.

Having exact zeros at both B33 and B34 could lead to some aberrant results. For example, if a single person claiming one deduction earned gross pay of $25 per week, his tax ought to be a base amount of zero, plus zero percent of the excess over nothing. But our lookup operation that selects the percentage amount would overlook the first zero in column B and arrive at the figure of .15; the error would be propagated into the next operation, so that 15 percent would be applied to the excess over $27—a negative amount. Our employee might not mind; he'd be owed $3.18 by the government. But it would be hard to explain that to the authorities.

Below the overlapping lookup tables shown in figure 4 we have three formulas that calculate the base tax, percentage, and total tax to be withheld—for the single person drawing a weekly paycheck. Those formulas are as follows:

At B42 we can calculate the base tax with @LOOKUP(B30,A33...A40). B30, you may remember, holds the amount of wage subject to withholding—calculated from the number of deductions claimed and the pay period.

B43 figures the proper percent multiplier by @LOOKUP(B42,B33...B40). B42 is the value we just calculated; note once again that these calculations have to be performed in the proper time sequence.

The formula by which the tax is computed, at B43, looks like this: +B42+(B43*(B30-@LOOKUP(B43,C33...C40))). B42 is the base tax, B43 the percent multiplier, B30 the total subject to taxation, and the last term—generated by the lookup function—is the cutoff point of the tax bracket.

This result, of course, is valid only for the single person drawing a weekly check. The remainder of our chore in setting up for the federal withholding consists of entering more lookup tables for all the bases we wish to cover. Since married people get their own tables, separate from and mathematically unrelated to single people's, if we want to cover three pay periods we'll need a total of six table sets.

We leave the rest of the data entry to you. Note, however, that within a given marital status category—single or married—the percentage figures are the same for all pay periods. Only the base tax amounts and the bracket boundaries change. So you can replicate the numbers from the tables you've already entered to other parts of the worksheet.

Also, the three formulas at B42 to B44 can be replicated for each set of tables. All the cell locations in these formulas should be replicated *relative*, except for B30, which represents the total wage subject to taxation. This one has to be replicated *no change*.

After you've finished putting in the data to cover all the options you need, you'll have a *VisiCalc* model that computes a number of different tax-due figures for a given amount of taxable income. You still need a way to use the pay period and marital status data entered at the top of the model, in B14 and B5, respectively, as criteria for determining which tax-due figure should be carried over to the righthand window, to the output section of the worksheet. The simplest way we found to do this is to use yet another lookup table.

In our worksheet the two remaining independent variables—marital status and pay period—can be configured a total of six different ways. That is, we have data for three pay periods—weekly, biweekly, and semimonthly—each of which is broken down into a section for married folks and a section for nonmarried folks. If we can combine the two variables into a single variable with a domain of six possible values, then we can use that variable as the search criterion for one last lookup table that will carry the appropriate tax figure to the other side of the screen.

	A	B
116	CODE:	11
117	10	ERROR
118	11	53.64
119	12	39.04
120	13	37.55
121	14	ERROR
122	21	41.95
123	22	29.12
124	23	27.29
125	24	ERROR

Figure 5.

The way to make that combination is to multiply the marital status value, at B5, by 10 and add it to the pay period value, at B14. This will produce a two-digit code that can hold six different values—11, 12, 13, 21, 22, or 23. So the bottom of our federal tax processing area looks like figure 5.

The code at B116 is derived from the formula +B14+(10*B5) and is used as the selection criterion for the lookup table below it. The values in the right side of that table are simply pulled from the appropriate cells at higher elevations on the worksheet. The error results at 10, 14, and 24 are provided to forestall input screwups.

Last, but by no means least, at J5, in the right-hand window, we have the lookup formula that selects the appropriate entry in this ultimate table: @LOOKUP(B116,A117...A125).

Actually that's not the end of the problem, since we still have the state tax to compute. But the California income tax, with its third marital category, low-income exemption tables, and tax credits, is horrendously more complicated than the federal. So, while *VisiCalc* is perfectly capable of handling the computation, we'll spare you the details. ◨



THE PASCAL PATH

By Jim Merritt

Tools of the Craft, Part 9

Functions. By now, it should be reasonably clear that procedures are somehow analogous to program statements. In fact, procedures and statements are interchangeable. Anywhere you can put a statement, you can put a procedure call, and vice versa.

I hinted last time about the existence of functions. These are objects that look very much like procedures but take the place of data expressions, rather than statements. As an example, let me reintroduce the Chr function. In calling it, you must supply a single parameter: an Integer expression that should evaluate to a number in the range 0 through 127, inclusive. The value that Chr assumes is that of the ASCII character associated with the given number. For instance, Chr(65) is the same value as capital A, Chr(97) corresponds to lower-case a, and Chr(33) is the exclamation point (!).

Here is a small program that uses Chr in several places. One use is incorrect; can you spot it? (You can always check your answer by compiling the program.)

```
PROGRAM
  TestChr;
  CONST
    Int=     34;
    Ch=      '"';
BEGIN (* TestChr *)
  Write(Ch,' is ');
  IF (Ch <> Chr(Int))
    THEN
      Write('not ');
  Write('equal to Chr(', Int:1, ').');
  Chr(Int);
END     (* TestChr *).
```

If you try to compile ChrFn, the compilation will fail on line 11, at the point where Chr is used as a statement. The compiler reports "Error 150" ("Assignment to standard function is not allowed.") and, soon after, "Error 51" (":= expected."). To understand why these particular messages are given, you must, once again, put yourself in the role of the compiler. The final semicolon in line 10 primes the compiler for the start of a new statement. Proceeding to line 11, it finds an identifier ("Chr"). Only in assignments or procedure calls will an identifier ever be the first item in a statement. Since Chr is not a procedure, the compiler concludes that the statement in question must be an assignment. However, the compiler knows right away that it is not possible for a program to assign any value to the built-in function Chr, hence the first error message.

The second error is indicated because the compiler, once having noted that assignment to Chr is illegal, proceeds to "look the other way," and treat Chr as if it was a variable, or other object to which a value may be assigned. By doing this, the compiler makes the best of a bad situation ("recovers from the error condition," in the language of computer scientists). It attempts to continue analyzing the program for further errors, even though the presence of previous errors means that it cannot generate the executable P-code version of the program. Continuing, on the assumption that the current statement should be an assignment, the compiler fails to find the assignment operator (:=) and so complains of "Error 51."

If you remove TestChr's erroneous line, you will have a correct program, which you can use to determine whether or not a certain character corresponds to a certain integer. As shown, TestChr will indeed verify that Chr(34) and the quotation mark (") are equivalent data. If Int were 49 and Ch were 'A', however, TestChr would deny any relationship between the two. (Just to satisfy your curiosity, Chr(49)='1', and 'A'=Chr(65).) By changing the values of the constants Int and Ch, then recompiling, you can determine the ASCII relationship between other pairs of integers and characters. If you would like to look at the complete ASCII correspondence, see Table 7 in the *Apple Pascal Language Reference Manual.*

General Characteristics of Functions. Chr, along with all other Pascal functions, behaves as a "magic" expression, in that it acquires a different value according to each different input parameter value but otherwise fills the same niche as a more conventional data expression. A function is like a variable, too; it has a name, represents just one value at a time, and must be declared as having a certain data type. Chr is a function of type Char; it returns a single character as its value. Other functions may be of type Integer, Boolean, or Real. User-defined functions may also be given user-enumerated types, or subrange types, provided that such types have been declared and named in the program prior to the function definition.

Finally, a function is also like a procedure, since it has a body (invisible, in the case of built-in functions), that contains the statements used to compute, obtain, or derive the function value. This aspect of functions will become clearer below.

Writing Your Own Functions. As you can see in the syntax diagram of figure 1, the structure of a user-defined function is much like that of the user-defined procedures you have already studied. Of course, the heading is different. For one thing, the keyword FUNCTION is used, instead of PROCEDURE. For another, every function must be given a type, just as if it were a variable. As you might expect, this is done by following the function name (and any parameter list) with a colon and a type name. The same restriction that applies to parameter types also applies to function types—they must be named, not specified explicitly. Both FUNCTION and PROCEDURE headings terminate with a semicolon.

Below is a program that defines and uses Power, a function that returns the value of the integer parameter base, raised to the power of the integer parameter exponent. It illustrates both a proper function heading and the method by which functions acquire the values that they return to the calling program.

```
PROGRAM
  TestPower;
    (* Display the results of Power(TestBase, Expo), for several sequential values
       of Expo, and constant value of TestBase. *)
```

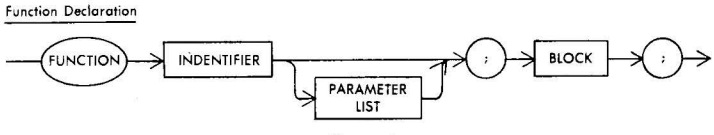
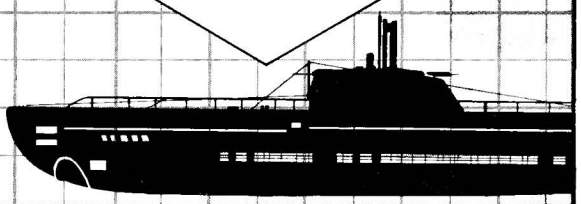


Figure 1.

2 FROM HORIZON

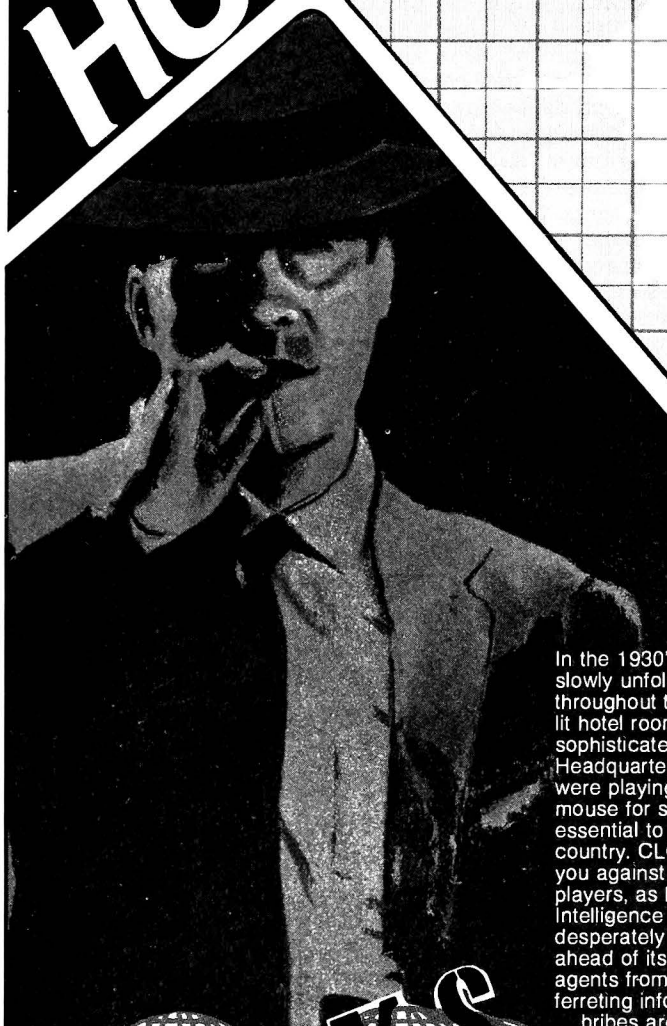
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```
CONST
  TestBase=     10;
  (* Define the exponent sequence *)
  StartExp=     -2;
  EndExp=       4;
VAR
  (* Will hald the exponent os it is incremented through the ronge [StartExp ..
     EndExp]. *)
  Expa
    :Integer;
FUNCTION
  Power (Base, Expanent
          :Integer)
    :Integer;
(* Pawer (Base, Expanent) = Base raised ta the Expanent power. *)
  VAR
    I,
    TempVal
      :Integer;
BEGIN (* Power *)
  (* If Power returns with this value, expanent is aut of ronge. *)
  Pawer := 0;
IF (Expanent >= 0)
    THEN
      BEGIN (* Exponent in range *)
        TempVal := 1;
        FOR I := 1 TO Exponent DO
          TempVal := TempVal * Bose;
        Power := TempVol;
      END (* Exponent in ronge *);
END     (* Power *);
BEGIN (* TestPawer *)
  FOR Expo := StartExp TO EndExp DO
    WriteLn('Power(', TestBose:1, ',', Expo:1, ') = ',Power(TestBose, Expo):1);
END (* TestPawer *).
```

Assigning a value to the function name within the function body gives the function itself that value. The statement "Power := 0" gives the Power function the value zero. The statement "Power := TempVal" gives the Power function the value that is in TempVal at the time the statement is executed. (This doesn't establish a relationship between Power and TempVal, however. Subsequent statements could alter TempVal, but Power's function value will remain frozen until such time as another assignment to Power is made.)

Notice that, if the Exponent parameter is a value less than zero, the body of the IF statement will never be executed, and the function value of Power, as seen by the caller, will be zero. When the Exponent is nonnegative, however, the IF body is executed, and the original function value of zero is superseded by the final value contained in TempVal. The value that the function has at the time its body ceases execution is the function value that the caller "sees," regardless of how many times the function value may change during the execution of the function body. Also, if NO value is assigned to the function name during function execution, the function value that is returned to the caller should be considered as undefined garbage. (The moral is: Please be careful! Incredibly bizarre program bugs are often traced to poorly written user-defined functions that, under some circumstances, return such garbage values.)

Because we can assign a value to a function name as if it were a variable, you might be wondering whether or not we can, within the body of a function, use the function name in expressions as if it were a variable. To be specific, you might be curious as to why we bother to use the local variable TempVal to accumulate intermediate values for Power. Perhaps, you believe, we could have saved time and space by using Power's function value itself as the accumulator, like so:

```
FUNCTION
  Power (Base, Exponent
          :Integer)
    :Integer;
(* Power (Base, Exponent) = Bose roised to the Exponent power. *)
(* NOT LEGAL PASCAL, DUE TO IMPROPER USE OF IDENTIFIER "POWER" *)
  VAR
    I
      :Integer;
BEGIN (* Pawer *)
  (* If Power returns with this value, expanent is out of range. *)
  Pawer := 0;
  IF (Expanent >= 0)
    THEN
      BEGIN (* Expanent in range *)
        Pawer := 1;
        FOR I := 1 TO Exponent DO
          Power := Power * Bose;
        (*
            WRONG!! You con't use the identifier "Pawer" in on expression
            within the function body of Powerl *)
      END (* Exponent in range *);
END (* Power *);
```

It's tempting to wish that the declaration above were possible. Unfortunately, the Pascal compiler will not accept it. Although you may assign a value to the function and therefore use the function name on the left-hand side of an assignment statement within the function body, you may not, in general, use that same name within the body on the right-hand side of an assignment, or in any expression.

Whenever the compiler sees a lone function name on the left-hand side of an assignment, it views that name as a physical destination for some value. (In other words, for purposes of assignment, it treats the function name as a variable name. This makes sense, since similar memory storage is used to hold the values of both variables and functions.) Whenever the compiler sees a function name in an expression, however, it wants to treat that name as a function call. Thus, to use a function's name in an expression within the function body itself is to indicate that the function should call itself!

A function that calls itself—a "recursive" function—is not so strange (or rare) a beast as you might at first assume. Recursion is used often by advanced Pascal programmers, and will be the topic of at least one future column. At this point, though, we're not concerned with recursion, and do not want Power to operate that way. Fortunately, any and every function call—even a recursive one—must be complete, and include an actual parameter list if the function requires parameters. In trying to process the second version of Power, the compiler will encounter the function name as part of a data expression (Power * Base), assume that you intend a (recursive) function call, and complain when it doesn't find an actual parameter list after the function name. In short, Pascal does not, when scanning the erroneous function above, recognize any recursive function calls. Rather, it notes, and informs you of, your abuses of Power.

Some Built-In Functions. Now that you understand a little bit about how to write and use functions, you should become familiar with several built-in functions that Apple Pascal provides to you. You don't have to define these handy functions—you can use and benefit from them immediately.

FUNCTION Abs(Number: Real): Real;

FUNCTION Abs(Number: Integer): Integer;

Abs returns the "ABSolute value," or magnitude, of Number. In other words, when Number is negative, Abs(Number) = −Number, and when Number is positive, or zero, Abs(Number) = Number. The function value returned is Real when Number is Real, Integer when Number is Integer. Of course, there is actually only one Abs function, but, like many built-in functions (and unlike any user-defined functions), it can accept parameters of different types, and will return a function value that reflects the type of its parameter. Abs, having powers and abilities far beyond those of ordinary functions, is therefore an "anomalous" function, in the same way that Write and WriteLn are "anomalous" procedures.

What is Abs(−39)? How about Abs(−39.0), Abs(0), Abs(0.0), Abs(3,1415), and Abs(3)? What is the data type of each function value in these examples?

FUNCTION Chr(Number: Integer): Char;

As we've seen, Chr returns the character that is associated with Number, according to the ASCII correspondence. ASCII defines only Chr(0) to Chr(127), but Chr will accept any nonnegative integer expression as its parameter. (We'll discuss

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the reason for this in a future column.) In general, you should write your programs to ensure that only proper, ASCII-range integers are fed to Chr.

FUNCTION MemAvail: Integer;

This function takes no parameters. It returns the number of words (two-byte units) that are not currently being used for Pascal programs or data in your Apple's RAM memory. Note that the number of words is half the number of bytes; you can see how many words are available for your programs and data by compiling and executing this (nearly) empty program:

```
PROGRAM
  HowMuch;
(* Displays the number of free RAM WORDS ovoiloble for user programs/doto.
   (one word = two bytes.) Number is opproximote—accurote to within twenty-
   five bytes or so (the size of this progrom!). *)
BEGIN (* HowMuch *)
  WriteLn(MemAvail);
END (* HowMuch *).
```

You may be tempted to see how many bytes are available, by displaying "MemAvail*2" instead of just "MemAvail." Go ahead, try it. Then try to explain the negative number you receive! This happens because MemAvail (at 18824, on this Apple) is greater than 16383, so MemAvail*2 is certainly greater than 32767. The expression MemAvail*2 thus represents a value that is outside the range of Apple Pascal's Integer data type. The displayed value of this expression is negative, and you may consider it a garbage value, even though it does, indeed, bear a mathematical relationship to the correct value. (For the moment, we leave it to the stout-hearted reader to determine what this relationship is—we will, however, explore it in a future column.)

FUNCTION Odd(Number: Integer): Boolean;

If Number is odd, True is returned as the function value, otherwise False is returned. For practice, try evaluating Odd(0), Odd(5), and Odd(−2). If you need to check your answers, write a small program to do so.

FUNCTION Ord(Value: ScalarType): Integer;

Ord is another "anomalous" function. There is no type "ScalarType," of course; this is just a way of indicating the wide range of data that Ord accepts as its parameter. Value may be from any fundamental type except Real, or from any user-defined enumerated type, or subrange type. Within the computer, *all* such values are represented by integers. Ord gives you Pascal's internal integer representation for Value. Ord(32) = 32. Ord(False) = 0. Ord(True) = 1. Ord('A') = 65.

Note that, when speaking only of Char values, Ord and Chr are inverse functions. For example, Chr(Ord('A')) = 'A', and Ord(Chr(65)) = 65. Ord is most often used to permit a program to determine the integer value that corresponds to an arbitrary ASCII character. (We'll do this shortly.)

FUNCTION Pred(Value: ScalarType): ScalarType;

Another anomalous function, Pred accepts exactly the same types of parameters as Ord. Moreover, the function value of Pred is the same as its parameter. Pred returns the value that precedes its parameter (that is, the PREDecessor of Value). For instance, Pred(33) = 32, Pred(True) = False, Pred('B') = 'A', and so on. If Value has no predecessor (which is true, for example, of the Boolean value False), then Pred's function value is undefined. (What "being undefined" entails is too complicated a subject to go into just now. Use of "undefined values" can lead to strange program behavior, including program abortion, and should be avoided by all but experienced—and very brave—Pascal programmers.)

FUNCTION PwrOfTen(Exponent: Integer): Real;

The Real number 10, raised to the power of Exponent, is returned as this function's value. To illustrate, PwrOfTen(3) = 1000.0, PwrOfTen(0) = 1.0, and PwrOfTen(−2) = 0.01. Exponent may not be less than −37 or greater than 37. (In other words, Abs(Exponent) must be less than or equal to 37.) To my knowledge, PowrOfTen is rarely used, except by systems programmers. A discussion of why it exists and why it is useful for system programming would be a suitable topic for another column; let me know if you're interested!

FUNCTION Round(Number: Real): Integer;

Round "rounds" Number to the nearest Integer, and returns the result as its function value. Here are some examples that characterize Round's behavior: Round(0.0) = 0, Round(0.4) = 0, Round(0.5) = 1, Round(0.6) = 1, Round(−0.4) = 0, Round(−0.5) = −1, and Round(−0.6) = −1.

Note that the rounded value of Number must not be greater than 32767, nor less than −32767.

FUNCTION SizeOf (<Any Variable Name or Type Name>): Integer;

You can see right away that SizeOf is anomalous. It returns either the number of memory bytes that are occupied by the specified variable, or the number of bytes that would be occupied by a variable of the specified type. The following examples send type-name parameters to SizeOf: SizeOf(Real) = 4, SizeOf(Integer) = 2, SizeOf(Boolean) = 2, and SizeOf(Char) = 2.

SizeOf is another function that is most often used by very advanced programmers. It may be fun to play with at this point, but we don't yet have any good uses for it. (We will find some, however, in future columns.)

FUNCTION Sqr(Number: Integer): Integer;

FUNCTION Sqr(Number: Real): Real;

Sqr returns "Number*Number," and is simply a convenient shorthand for that expression, in the same way that the user-defined procedure Inc(Number), as presented in our recent discussion of procedures, was a convenient shorthand for "Number := Number + 1." Sqr(0) = 0, Sqr(1.4) = 1.96, and Sqr(−2) = 4. Like the Abs function, Sqr is "anomalous," and returns a value, the type of which agrees with that of Number. Thus, Sqr(1) = 1, an Integer, but Sqr(1.0) = 1.0, a Real value.

FUNCTION Succ(Value: ScalarType): ScalarType;

Succ is the inverse of Pred, and returns the value that follows—that is, the SUCCessor of—Value. Succ(1) = 2, Succ(False) = True, Succ('A') = 'B', and so on. As with Pred, the type of Succ's function value depends on, and matches, the type of Value. Also, Value cannot be a Real number. Finally, if Value has no successor (which is true, for example, of the Boolean value True), then Succ(Value) is undefined.

Because Pred and Succ are inverse functions, Pred(Succ(Value)) = Value, and Succ(Pred(Value)) = Value.

FUNCTION Trunc(Number: Real): Integer;

Number's fractional part is removed (that is, TRUNCated), and the resulting quantity, converted to an integer, is returned as Trunc's function value. Thus, Trunc(0.123) = 0, Trunc(2.718) = 2, Trunc(−0.5) = 0, and Trunc(−10.8) = −10. Contrast Trunc's behavior with that of Round. Note, for instance, that while Round(0.5) = 1, Trunc(0.5) = 0. In particular, Round may be defined in terms of Trunc, as follows:

```
FUNCTION
  Round(Number
          :Real)
    :Integer;
(* Returns Number, rounded to nearest Integer *)
BEGIN (* Round *)
  IF (Number >= 0.0)
    THEN
      Round := Trunc(Number + 0.5)
    ELSE
      Round := Trunc(Number − 0.5);
END    (* Round *);
```

The truncated value of Number may not be greater than 32767, nor less than −32767.

Although we're about to use a couple of built-in functions in order to tie up some loose ends from last month's discussion, I don't have space to present relevant usage examples for every function listed here. This shouldn't stop you from experimenting with them while you await the next issue of *Softalk*!

Functions vs. Procedures. Last time, we gave you the heading, but not the body, for a procedure called Capitalize. Here is the entire procedure:

```
PROCEDURE
  Capitalize(VAR
               Ch
                :Char);
(* If Ch contains a lower-case letter, transform its value to upper-case (capital) *)
BEGIN (* Capitalize *)
  IF ((Ch >= 'a') AND (CH <= 'z'))
    THEN (* It's a lower-case letter—transform it! *)
      Ch := Chr(Ord(Ch) - Ord('a') + Ord('A'));
    (* Otherwise, it's not a lower-case letter, so leave it alone. *)
END     (* Capitalize *);
```

In writing Capitalize, we've made some crucial assumptions about the ordering of values in the Char type. Specifically, it's assumed that alphabetic characters are ordered alphabetically, in an unbroken (contiguous) sequence. In other words, A immediately precedes B, which immediately precedes C, which immediately precedes D, and so on to Z, with the same being true of the lower-case alphabet. (This means that Ord('A') is one less than Ord('B'), which is one less than Ord('C'), and so on.) Given these assumptions (which are valid for the ASCII character set), let's consider how Capitalize works.

If Ch1 and Ch2 are Char values, then (Ch1 = Ch2) only when (Ord(Ch1) = Ord(Ch2)). Similarly, (Ch1 < Ch2) only when (Ord(Ch1) < Ord(Ch2)), and so on for all the other relational operators. All the relational operators apply to values of type Char, and yield True or False depending upon the relationship between the Ords of the values involved. A character Ch is lower case if ((Ch >= 'a') and (Ch <= 'z'))—that is, when ((Ord(Ch) >= Ord('a')) AND (Ord(Ch) <= Ord('z'))).

If you subtract Ord('a') from the Ord of any lower-case letter, you get a number from 0 to 25, where 0 corresponds to 'a', and 25 corresponds to 'z.' If you then add this number to Ord('A'), you get a number that falls in the inclusive interval [Ord('A') .. Ord('Z')]. Taking the Chr of this number, you get the capital version of the original lower-case letter.

Because Capitalize was written in this way, the conversion from lower case to capitals is independent of the exact values of Ord('A') and Ord('a'). We could have used the number 65 for Ord('A') and 97 for Ord('a'). In fact, this has been done many times by other programmers. But I'm lazy and hate to remember obscure numbers like Ord('A'). Not only that, but my memory might someday lapse, and I could specify the wrong number—perhaps 64 or 66, instead of 65—when writing a program! Then where would I be (not to mention the unfortunate individual who encounters that bug while using my program)? It's far easier (and safer) for me to use Ord('A') and Ord('a'), thus letting the computer do the work of remembering what those numbers are.

Written as a procedure, Capitalize exhibits a couple of minor weaknesses. First, its actual parameter must be an individual Char variable, since the corresponding formal parameter is prefaced with the keyword VAR. Thus, everything you want to capitalize must be put in a variable before Capitalize can affect it—you cannot provide Capitalize with a Char expression as parameter.

Secondly, Capitalize can (and often does) change the value of its parameter. For instance, if you hand Capitalize a variable that contains a lower-case 'q,' the procedure destroys that value, and replaces it with a capital 'Q.' Unless a program has taken steps to remember that the value in the variable was once lower case, all traces of the original value are lost forever. (Capitalize, then, is like the novice stage magician, who asks you for a ten-dollar bill, proceeds to tear it up as part of a trick, and then can't remember how to reassemble it. If you can make do with a shredded bill, everything's fine; otherwise, tough luck!) If you want to retain your original data, you must send Capitalize a copy of that data on which to work. It's easy enough to make that copy—just assign the original value to a spare variable that you have declared precisely for this purpose—but the extra statements involved are tedious to write, especially if you use Capitalize frequently. (Again, my laziness shows.)

Now, let me show you how Capitalize would be rewritten as a function, named Capital:

```
FUNCTION
  Capital (Ch
             :Char)
    :Char;
(* Return Ch, converted to upper case (capital) if Ch is lower case. *)
BEGIN (* Capital *)
  Capital := Ch; (* No change unless lower case *)
  IF ((Ch >= 'a') AND (CH <= 'z'))
    THEN (* It's a lower-case letter—transform it! *)
      Capital := Chr(Ord(Ch) - Ord('a') + Ord('A'));
    (* Otherwise, it's not a lower-case letter, so leave it alone. *)
END     (* Capital *);
```

Capital can accept any Char expression—not just a variable—as its actual parameter. If you do specify a variable as an actual parameter, Capital cannot affect (obliterate) its contents. Also, Capital's function value can be assigned directly to variables or used in expressions. Finally, supposing you do want to replace the contents of a Char variable—for example, ChVar—with its upper-case equivalent, then "ChVar := Capital (ChVar)" is all that you need write.

How I Name Procedures and Functions. To conclude this month's discussion, let me tell you why I named the capitalization procedure "Capitalize" but called the capitalization function "Capital."

Procedures replace statements—they do things, and therefore correspond to verbs in a natural language (such as English or German). Good procedure names, in my opinion, are command-tense verbs (such as "Write," "Capitalize," and "Create"). "Write('a')" is, again in my opinion, a succinct and understandable rendering of the English "Write a (lower-case) 'a'!" The procedure call "Unlock(FrontDoor)" is self-explanatory and also fits the mold.

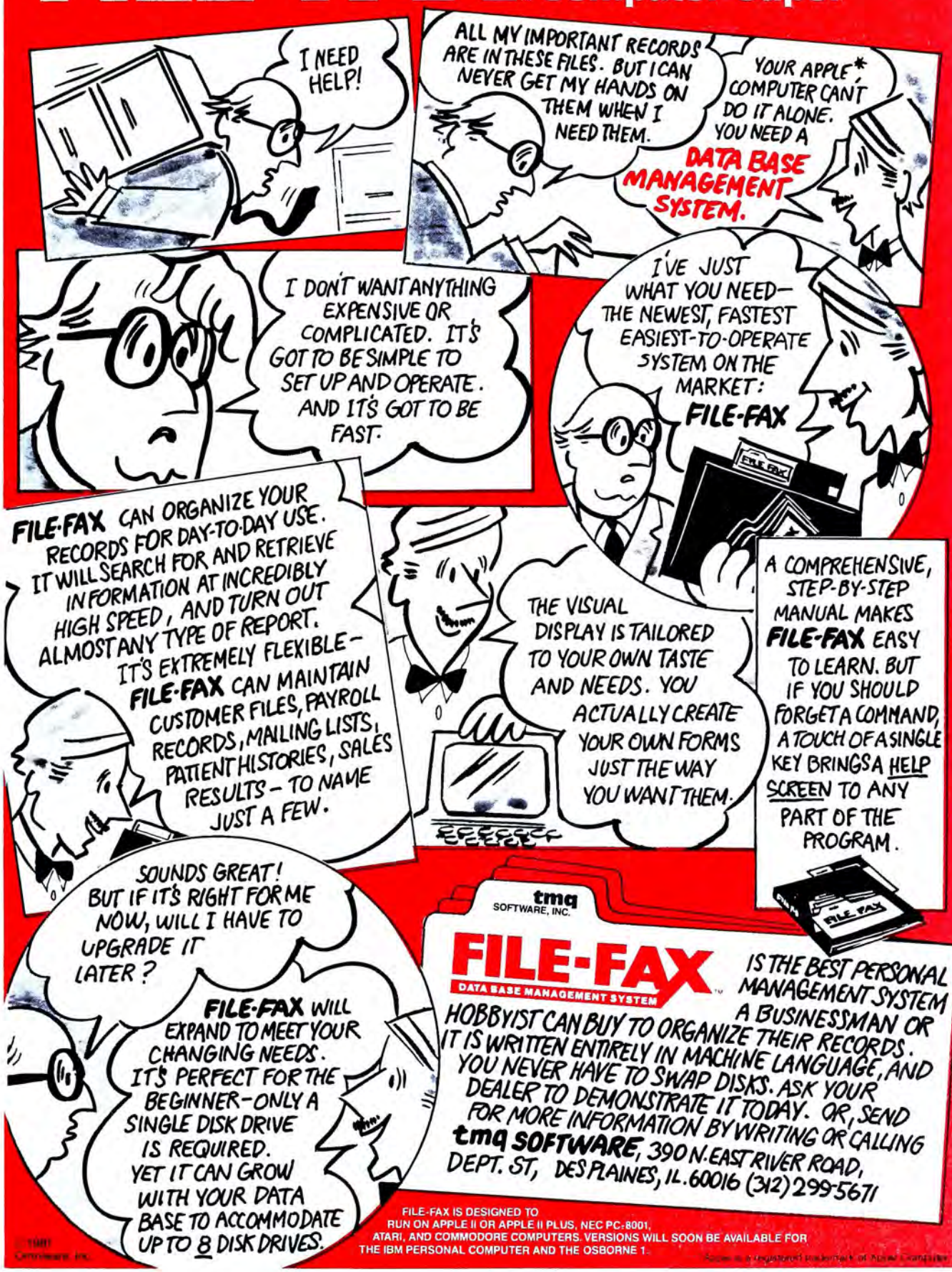
Functions replace expressions—they are things, and so correspond to nouns in a natural language. Consequently, functions should be named with a part of speech that, in combination with the function's parameter list, completes a noun phrase, as perceived by a human reader. (About now, you are probably wishing you had paid more attention to the grammar school English teacher, but, believe me, the concept is much more easily grasped and applied than described!) The functions "Capital" and "SizeOf" are good examples. The Pascal expression "Capital ('a') = 'A' " is a very good Pascal rendering of the English sentence "The capital of 'a' is 'A'," while "SizeOf (Real) = 4" is a passable translation of the English "The size of Real (objects) is four (bytes)." "Capital" is an adjective. In combination with the "noun" represented by the parameter, it gives a complete noun phrase. In other words, "Capital('a')" describes, or names, something. "Of Real" is a genitive phrase. In our example, it follows the noun "size," and indicates which size is being described. Again, the complete phrase—"size of Real"—describes or names something. In contrast, "Write(Number)" doesn't describe anything. It implores action.

To go into greater detail about how to choose procedure names that "complete the verb phrase" or function names that "complete the noun phrase," we'd have to mention a few more parts of English speech, and perhaps run the risk of putting you to sleep. There's probably no need to run this into the ground—you get the idea. Nevertheless, it's good to dwell on these issues of programming style from time to time. The time you spend considering such "niceties" will lead to clearer, more readable programs, and, in the end, will help you to become far more expert in the art and science of programming and even more productive than those who "have no time to waste on such trivial matters."

"Too much thinking, and not enough doing," say they, "never accomplishes anything."

"On the other hand," say I, "sometimes the more thinking you do, the less hard labor you have to do." And the less work I have to do, the better I like it. ◨

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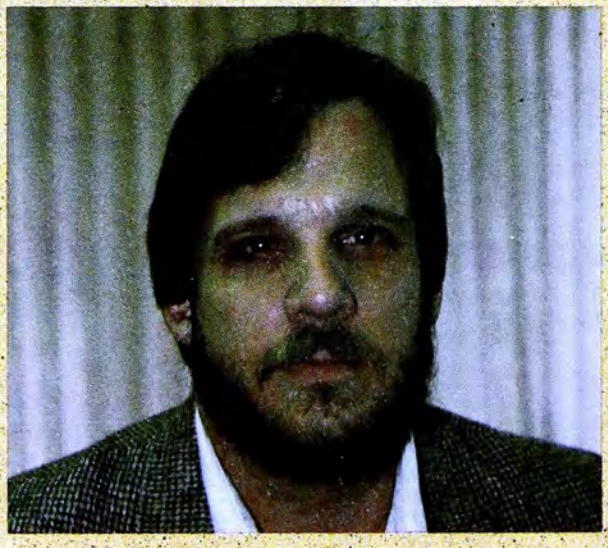
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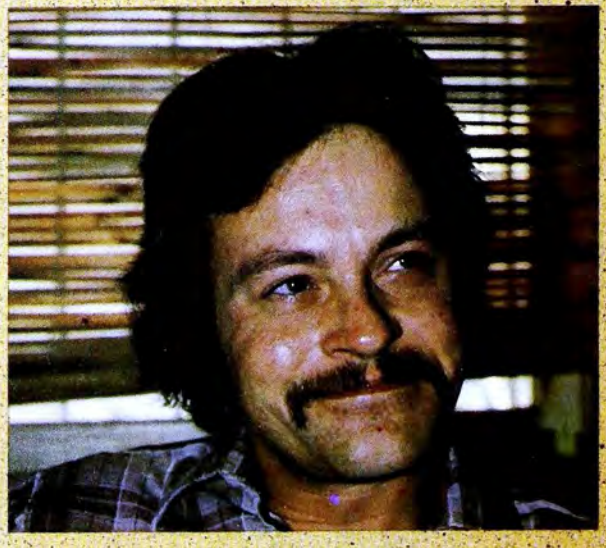
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EXEC STONE









BY DAVID HUNTER

THEY TRY HARDER

Anybody who has read Kipling knows that freemasons will go to the ends of the earth together, facing all obstacles. Like Daniel Dravot and Peachy Carnahan in "The Man Who Would Be King," people who are almost instinctively drawn together in a fellowship often attempt to conquer unknown territory and set themselves up as its masters.

Freemasonry still exists today in its most traditional form; in addition, its spirit takes on various forms throughout the world. If one stretches the definition to include masonry as practiced by a stonemason, it's not hard to conceive of a fellowship of artisans, bound together by their art.

It's no accidental flight of fantasy that the Stoneware, Inc., logo has a little man chipping away at it, painstakingly using hammer and chisel to fashion the final E. Software authors can be compared to stonemasons and artisans of old, skilled workmen who build by laying up units of material. Programmers frequently spend hours laboring over one little piece of a highly technical product.

Beginning a Tradition of Quality. Some software publishers throw a product on the market and let it go. This is not the case with Stoneware and its best selling *DB Master*.

From the top down, Stoneware tries to live out the idea that software is the work of artisans. Ken Klein, vice president and chief operating officer of Stoneware, is adamant in his position concerning user support, going far beyond the usual standards in making sure a product is understood and used to its utmost. His belief is that the attention given during the creation of a product should continue after it is out in the world.

Legend has it that the little guy chipping away at the Stoneware logo is Barney Stone, founder and chief programmer of the company. The likeness may be somewhat lacking, but the thought is what counts.

Stone is a small man with a dark beard; he's confident, funny, and friendly. Stone first heard of microcomputers while he was working for an industrial video company in Philadelphia. He built his first computer out of a kit and after that set out to become a programmer, beginning with Basic.

In the late seventies, Stone worked for a small chain of electronics stores. When he left his job, he received an Apple as severance pay. Soon after, he moved out West to go to school. Numerous distractions and other interruptions had affected Stone's education before; coming to the San Francisco Bay area and Berkeley didn't alter this pattern.

Stone's fascination with computers won out over the academic life; he left school to work full time at Computerland of San Francisco. In his year-long tenure there, he gained a tremendous amount of knowledge about computers. Sometime in late 1978, Stone met Mike Belling and Ken Klein, the two future business associates who would be instrumental in making Stoneware what it is today.

Up From the Stone Age. It was early in 1979 that Barney Stone finished writing his first software product for sale. His creation was *Micro Memo*, a calendar program that remains usable to this day. Having

Clockwise from upper left: vice president and chief executive officer Ken Klein; founder and DB Master coauthor Barney Stone; general manager Lou Long, and president Mike Belling. Softalk Photos

WARE

caught the business bug, Stone wanted to start a company—software publishing with distribution.

In order to make the company a viable entity, Stone also obtained the rights to Bill Budge's first game, *Tranquility Base*, a top lunar lander program. This marked the start of Stoneware Computer Products. Stone also picked up two games by Arthur Wells, *Bloody Murder* and *Micro League Baseball*, along with *Aristotle's Apple* by Scott Kamins.

Working out of a post office box and his car, Stone soon found that too much of his time was being swallowed up by the business. In early spring 1980, he realized that he would either have to give up the company or give up programming.

Friends in Need. At this point, Stone turned to Ken Klein and Mike Belling, owners of a retail computer store in the San Francisco Bay area, and his good friends. In April of that year, Belling and Klein bought Stoneware, agreeing to retain the original name.

Ken Klein, a big man with a serious face, was born in Brooklyn and raised in Texas. Before becoming involved in the microcomputer software industry, Klein was in the army for three years and then a photographer for six. The desire to eat three meals a day caused Klein to seek out a more lucrative career. His uncle advised him to look into computers.

Klein attended technical school on Saturdays, and was soon programming mainframes. He liked this enough to spend most of the next fifteen years as a programmer and systems analyst for seven or eight different companies on the East Coast. From 1977 to 1979, Klein worked as a consultant; it was toward the end of this period that he got wind of micros through a retail store in New Jersey.

To backtrack a little, Klein's sister, Sue, got married in March 1978 to Mike Belling. Bucking the odds in brother-in-law relations, Belling suggested that he and Klein might become partners, should they find a business they'd like to start.

The idea of a computer retail store fascinated Klein, so he asked around the stores he frequented on the East Coast, and learned that he could either set up an independent computer dealership or operate a franchise. The name Computerland popped up as one worth investigating.

Klein contacted Belling, who lived in San Francisco. One of them would have to make the cross-country move; Klein won the honor, and Klein and Belling opened their first store in San Rafael, California, in April, 1979.

Origin Story. Not too long after Klein and Belling bought Stoneware, Stone, eager to get back to some serious programming, asked Klein what kind of program was most needed for the Apple. Klein uttered the fateful words: "A good database management system."

Stone went to work. He found that he was able to do much of the designing on his own, but came up against some obstacles that seemed insurmountable. The file handling system was crucial and he turned to Apple Computer for help.

Apple recommended Stanley Crane and Jerry Macon of Alpine Software, who had developed a file handling system that they wanted to market. Stone flew out to California and spent a month of all-nighters incorporating Crane and Macon's program into the growing *DB Master*. But this was just the beginning; about nine months of hard work would go into the development of *DB Master*.

Stone, Klein, and Belling formulated the concept of *DB Master* at a time when there really wasn't anything like it on the market. Stone found that he had time to tackle the task of developing the product properly, while Klein and Belling had the software publishing business to market it.

Teamwork Counts. The first edition of *DB Master* shipped in November 1980. About a month before this, Lou Long, a friend of Mike Belling's joined the Stoneware staff as marketing manager. This USC graduate assumed responsibility for product marketing. Since coming on board, Long has been promoted to general manager and has done a superb job. In the rapid-fire world of business software, *DB Master* has had unqualified success, due largely to the efforts of Long.

Mike Belling's background in business has also been a tremendous help to the company. Packaging and marketing—things that weren't Barney Stone's forte despite lots of hard work— were Belling's specialties. In Belling's capable hands, Stoneware's growth has been well managed, especially when you consider that the initial production projections for *DB Master* were exceeded by 250 percent.

The enthusiasm and expertise of other Stoneware employees has also contributed to the company's success. Marian Clerc, the administrative coordinator, was Stoneware's first outside employee. Other principals in the Stoneware roster include Frank Diffley, another friend of Belling's whose job is international marketing; Frank Colin, head of technical support; and Bruce Herbert, who handles all the inhouse machine maintenance.

Overall, they are a hardworking, likable bunch.

Their Hit Parade. Barney Stone no longer owns Stoneware, but he does maintain a close working relationship with the company that bears his name. Living now in Colorado Springs, Colorado, Stone has his own software development firm, DB Master Associates, which he formed with Crane and Macon of Alpine. Stone plans to develop more *DB Master*-related products, as well as a few items characteristically shrouded in mystery for now.

Stoneware originally made the Top Thirty of *Softalk*'s first bestseller poll (October 1980) with *Tranquility Base* (ranked twenty-eighth), but *DB Master*, which first made the list in March (ranked twenty-seventh) would come to be one of the longest-lived bestsellers on *Softalk*'s list. In the months that followed, except August and September, the ranking would rise: April—twelfth, . . . May—eleventh, . . . June—fifth, . . . July—fourth . . . October—sixth . . . November—fourth . . . December—second . . . January—second.

Even more telling of *DB Master*'s success is its dominant position among the top ten business programs; it's generally

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maintained a position second only to *VisiCalc*. *Softalk* first addressed the business ten in the February 1981 issue and *DB Master* placed ninth. It went to fourth and then to third. In May, *DB Master* placed second in the business ten, and it held that spot all the way through January of this year. Its lesser showings in last month's poll are more than likely due to the huge rush of Christmas releases and the inclusion of several software packages in the Apple family pack.

Since its original release, *DB Master* has undergone several updates and been enhanced by various add-on packages. Already on the market and soon to be released are *DB Master Utility Pak #1, DB Master Utility Pak #2, DB Master Hard Disk Version,* and *DB Master Stak Pak.*

Back to the Well. As we enter perhaps the most important year yet in the microcomputer industry, Stoneware has two new products on the market: *Compucube*, a program by Richard Stauduhar that simulates the mathematical puzzle created by Erno Rubik; and the *Illustrator,* a graphics program for the Apple, to be followed soon by the *Illustrator II.*

The smallness of Stoneware's product line should not be taken as their riding the success of *DB Master.* Klein is quick to make clear that he will not stand for mediocre software. He reviews all potential products and won't allow anything to go onto the market with the Stoneware name on it unless it meets his high standards.

One of the keys to Stoneware's success has been its user-support system. Every day, three or four people sit by the phone solely to answer users' questions and help solve their problems. Although *DB Master* has sold some thirteen thousand packages to date, it's not an easy program to learn. Belling and Klein say their worst problem is convincing people to read the manual.

This relationship between the software company and its customers is a mutually satisfying one. User feedback on the *DB Master* manual has resulted in a new version of the manual due sometime this summer. Much of the content of the utility packs was also inspired by user feedback. Ken Klein realizes that running a support group can be expensive but feels that it more than pays for itself. A satisfied customer is the best kind of advertisement.

The Best Mousetrap. Much of Stoneware's marketing strategy stems from Klein's and Belling's involvement with the retail end of the business. They know of the pressures and concerns that attend this part of the process. Some retail stores like to sell a product and never be bothered with it again; Klein boasts that when a call comes in to Stoneware, it's usually turned around within twenty-four hours.

Klein admits that dealing with the public can be difficult at times, but software publishers have a responsibility. If they don't live up to that responsibility, it's a disservice to everyone—users, dealers, and themselves. Stoneware is in business for the long run and wants all its customers to feel like winners.

Located fifteen miles north of San Francisco, Stoneware is in the middle of what they hope is the never-ending process of development and expansion that characterizes a vital and successful business. Twenty-six employees inhabit three buildings within one block of each other on Belvedere Avenue. During the recent torrential rains that pelted the Bay area, the street disappeared and water was lapping at the door. Work ceased for two days as people found it impossible to get to and from work.

The Secret. Almost everyone at Stoneware has one of life's saving graces—a sense of humor. Led by the almost larger than life Mike Belling, Stoneware radiates good humor, though their business is very serious. There's this thing called success, but it's so much sweeter when you're having a good time.

The attitude of looking upon software publishing as an art may not be original with Stoneware, but it ensures the company's reputation, respected position, and continued presence in the marketplace. The people at Stoneware are trying harder all the time to make their products better so that everyone concerned will come out a winner. ◨

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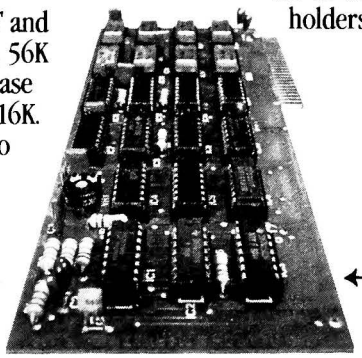
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TRADETALK



☐ **Steven W. Pederson** and **Sherwin A. Steffin,** president and chairman of the board of Edu-Ware Services (Agoura, CA), have been named as defendants in a suit filed against Edu-Ware by **Game Designer's Workshop,** alleging that "defendants have jointly and individually infringed . . . copyrights by publishing and placing upon the market computer games entitled *Space* and *Space II* which were copied largely from Workshop's copyrighted books . . . (the *Traveller* series) and have thereby been engaging in unfair trade practices and unfair competition with Workshop to Workshop's irreparable damage." Edu-Ware has denied the allegations; the case will go to court April 1. ☐ **David G. Mullich** has been promoted to the position of vice-president of software development, after two years of programming systems for Edu-Ware. He will be coordinating the development of the company's Edu-Ware and Interactive Fantasies software.

☐ **Personal Software** (San Jose, CA) has changed its name to **VisiCorp.** Chairman and founder **Dan Fylstra** took the move to establish a closer identification with *VisiCalc* and the company's line of related programs. Said Fylstra: "Our name change is part of a high visibility and aggressive marketing program to establish brand recognition, and includes a major advertising campaign and dramatic new product packaging."

VisiCorp's 1981 revenues increased fivefold over 1980, placing the company at the $20 million revenue level.

☐ **Japan Economic Journal** confirms that **Hitachi Ltd.** (Tokyo, Japan) will ship samples of its 256K RAM chip to subsidiaries this fall, gearing up for volume sales beginning in the spring of 1983. Industry analysts believe that Hitachi's high-density chip will beat all other manufacturers to the market by two years, thereby further increasing the Japanese semiconductor industry's share of the memory-component market beyond the present 69.5 percent and cutting the price of microcomputers by as much as 15 percent.

☐ **Programs Unlimited** (Jericho/White Plains, NY), the computer center that developed the "software supermarket" computer store concept, has been granted franchise authorization by government regulatory bodies in thirty-six states. They are now accepting applications for franchises. Franchises will receive assistance in site location and lease acquisition and will benefit from a national advertising program and participation in trade shows. The company provides on-site management training, inventory training, and financing to qualified applicants to assist with the required capital investment, estimated at between $162,000 and $241,000.

☐ Following the acquisition last fall of all outstanding stock in **Dynacomp** (Rochester, NY) by Dr. Frederick Ruckdeschel, reorganization and expansion of the firm has resulted in the appointment of Ms. Beverly Rivers to the position of secretary-treasurer, her election to the board of directors, and the election to the board of Dr. Janet Bernstein. Dr. Arthur Gleiner has been named software review manager, and Charles Meyers is software development manager.

☐ *Sourcecable,* a consumer information service of **Source Telecommunications** (McLean, VA) is being offered in community franchise packages from Cox Cable Communications, Cross Country Cable, Storer Cable Communications, and United Cable Television. The service will include general, sports, and business news, educational exercises, home shopping, a library of home and consumer information, and electronic games. It can be tailored to fit the specifications of the system operator and the information needs of the community. The first active marketing of the service will begin in Omaha this spring.

☐ **SSM** (San Jose, CA) has promoted **David J. Wertzberger** from director to the new position of vice president of marketing and sales. Wertzberger joined SSM in May 1981, bringing to the company fifteen years of end-user applications and OEM experience. He will be responsible for marketing and sales programs involving *Transend* data communications software, and board-level products for the IEEE 696/S-1000 bus and Apple II.

Preparing for its push in OEM and end-user markets under Wertzberger's guidance, SSM has expanded its San Jose offices, doubling the plant's manufacturing and warehousing capabilities.

☐ **Software Distributors** (Culver City, CA) has announced the appointments of **Linda Johnson** as vice president of administration and **David Dorsey** as sales manager. Johnson previously worked in the sales and marketing division of a distributor for consumer electronic products. Dorsey served for three years as national sales manager for a wholesale distributor.

☐ **Software Design Associates** (New York, NY), currently involved in the manufacture of a line of productivity tools for Fortune 500 companies, has appointed **Michael S. Ornstein** director of technical development. He will be responsible for identifying and developing new marketing opportunities and overseeing the expansion of SDA products in technical and management services. Ornstein began his career at IBM, where he spent nine years in marketing and technical functions, and was most recently assistant vice president at Blue Cross/Blue Shield of New York.

☐ Structured for system houses, computer consultants, and OEMs, the new software dealer distribution program introduced by **Microcon SoftwareCenters** offers a selection of fifteen hundred products at competitive prices. According to **Barry J. Passen,** president, "Our program affords independent consultants the opportunity to establish their business without the typical heavy initial investment of hardware and software. Additionally, consultants can be more objective in analyzing their clients' needs as they can demonstrate software on a variety of microcomputers."

☐ *Robotics Age* magazine, formerly

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published by **Robotics Publishing Corporation** (Tujunga, CA), is now published by the newly formed company **Robotics Age** (Peterborough, NH). Under the editorial leadership of **Carl Helmers**, founder of *Byte*, the magazine will "provide a forum for ideas about the design, implementation, and application of intelligent machines: applied computer systems that range in complexity from inexpensive toys and home appliances, to the complex industrial robotic systems with arms, vision, and large data bases."

Information relevant to personal experimentation and custom design by engineers, designers, and technologists will continue to form a major portion of the magazine's content.

☐ **Dakin5** has announced the appointment of **Randy McDonald** to the position of director of sales and marketing. He will be responsible for marketing and distribution and their line of business application packages and arcade and adventure games, in addition to overseeing the company's expansion into the home/hobby and educational markets. McDonald was previously a consultant specializing in the establishment of effective sales and distribution networks.

☐ **ALS**, the company formed from Advanced Logic Systems and Omega Microsoftware, has moved into new, larger headquarters in Sunnyvale, California. According to vice president of sales **Dick Ribas**, the new facility will be used to fill $1.8 million in orders for the *Synergizer*, introduced at the Comdex show in Las Vegas.

☐ **Peelings II** magazine (Las Cruces, NM) has appointed **Rebecca Winecup**, chosen for her background in design and public relations, as director of marketing and communications. She replaces president John Martellaro as contact for dealers and advertisers.

☐ **Penguin Software** has moved to 830 40th Avenue, Geneva, Illinois 60134. Their new phone number is (312) 232-1984.

☐ **Thomas A. Jackson,** former director of marketing for Muse Software, has been appointed marketing director for **Eastern Software Distributors** (Baltimore, MD). He will be responsible for the expansion of the company's national dealer base of computer retailers and will help implement Eastern's policy of full-service support to dealers.

☐ **Frank Scott Enterprises** (Aptos, CA) a holding and management service company, has provided funding for the formation of two new companies. **Interactive Data Communications Systems** has been created to develop advanced computerized interactive financial planning systems to meet the needs of the new financial planning service industry. IDCS will offer the new systems on a contract basis to banks, investment advisors, and other financial planning service professionals. The principal components of the systems will allow financial planners to keep pace with escalating demand for financial planning services.

The company's new vice president is **Dr. Paul Michell.**

Ultra Magnetics Technology will manufacture a full line of flexible magnetic media for the computer industry. **Robert Dilworth** is president of the new corporation; **William Cooper** is founder and senior vice president for engineering and operations. Ultra Magnetics will act as OEM supplier to major computer manufacturers and offer disk users quality and end-service performance improvements based on a proprietary manufacturing process developed by the company.

An automated plant facility will be in production by mid-year, with sales of $20 million expected in 1983.

☐ **Digital Equipment Corporation** (Maynard, MA) has named **David W. Bucknam** worldwide operations manager of its word processing/small systems product group. He will be responsible for implementation of the group's marketing strategies and achievement of its business goals. Bucknam was most recently market development manager for the firm's commercial OEM product group and has held positions as its marketing manager and sales support manager.

☐ **James C. Dillon** has been named vice president of manufacturing for **OSM** (Santa Clara, CA). He was previously director of material for Millenium Systems and director of operations of Digital Products of California Microwave, Inc. He is a member of the American Production and Inventory Control Society and the American Management Association. ■

Come and See Us at The Computer Faire!

Rumar has it that March is a gaad manth ta visit San Francisca and the Bay Area. It's just a matter af caincidence that the West Caast Camputer Faire is the same manth.

Last year Saftalk was at the fair, but we didn't have a boath. This year things will be different.

If yau attend the fair in San Francisco, March 19-22, stop by aur booth and we'll make it warth yaur while.

The first capies af Rager Wagner's Assembly Lines: The Baak will be on display and far sale. The first issue af Dema Disk, a new magazine an diskette that features demas af current saftware fram majar publishers, will be available free af charge ta anyane passessing a blank disk.

We will alsa be affering a special intraductary price an Saftdisk Magazette, the successful user ariented publicatian cantained entirely an a flappy disk. Bring a blank disk and yau can get the latest issue af Saftdisk far the law price af $5.

There will alsa be an appartunity ta purchase Saftalk's August '81 caver art in paster farm. This beautiful painting by Rabert Zraick af a rabat halding a rainbaw calared apple makes for a handsame additian ta any Apple laver's camputer raam.

We'll alsa have capies af Saftline, aur gamer magazine, far free distributian ta anyane with a burning desire ta see what is new and happening in game software.

If that isn't enaugh, then we'll alsa tell a few jakes and da same card tricks.

The West Caast Camputer Faire is an exciting event and Saftalk wauldn't miss it. If yau feel the same way, then stap by aur baath and let us shaw you the warld af Softalk Publishing.

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INTRODUCTION

This edition the THE BOOK OF APPLE COMPUTER SOFTWARE – 1982 combines previous editions (some re-written) and new articles, reviews and evaluations. Judging from the response accorded the first edition, which immediately sold out, there is a great need for a guide to the hundreds of programs that compete for the Apple owner's dollars. With the introduction of the Z80 card, choices get even harder concerning what to purchase; therefore, we dedicate this book to you, the consumer. We hope you will use it for a guide and as a reference to assist you in making intelligent and informed decisions when purchasing software.

Currently, the Apple Computer owner is presented with a bewildering selection of software from which to choose. On the one hand, this should please you in that, as the owner of probably the most popular micro-computer in the world, you have a wide and rapidly growing selection of software from which to choose. On the other hand, this wide and growing selection presents some problems. The vast majority of retail computer store staff people simply just do not have the time to adequately review each new piece of software that comes in their store. The problem is compounded if the new program is an extensive or complicated one, such as an accounting package or a word processing system, or a comprehensive data base management program. This does not mean that store personnel do not want to give you the best service possible; it's just that it is an almost impossible task. If you purchase software through the mail, the risks that you assume, without a reliable guide to assist you should be apparent.

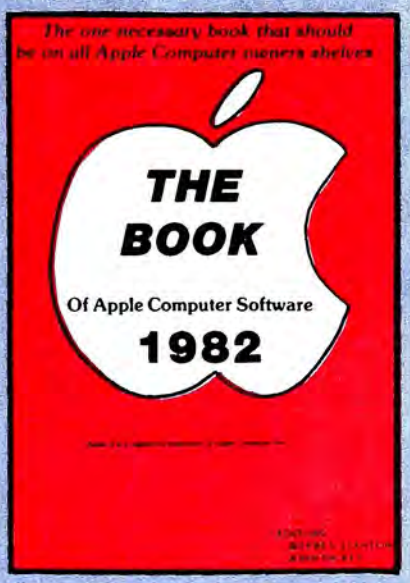
Other pitfalls await the uninformed buyer. For instance, in too many cases you cannot by the appearance of the package whether the program requires Integer Basic or Applesoft Basic or whether it needs 16, 32 or 48K of RAM. It is also often difficult to tell when you purchase a program on tape whether it can be transferred to disk or, if a disk program is purchased, whether it can be copied or not.

Another area that can present problems to the buyer is the similarity of software. A well-stocked computer store may possibly offer five different word processing packages, four assemblers, ten different adventure type games and/or several mail list programs, (the choices seem endless); all of which have obvious advantages and disadvantages as well as different prices.

The goal of "The Book" is to eliminate as many of these potential problem areas for the software buyer as possible.

We welcome any comments or criticisms from readers that will help us in reaching this goal

*Obviously, Apple and Apple Computer Co. is mentioned many times throughout "The Book." Apple II is a registered trademark of Apple Computer Inc.



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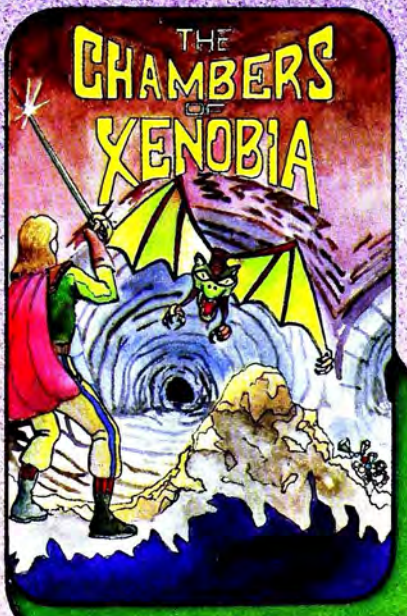
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GO AHEAD AND INTERRUPT YOUR APPLE

Part 1 of an Interrupted Article

BY DAN FISCHER AND MORGAN P. CAFFREY

It's a rare free evening and you're deeply involved in a good book. You're barely aware of the music you have playing in the background, and you're totally oblivious to the load of laundry you put in the washer before you sat down.

Occasionally, favorite passages in the music draw you out of the book for a moment; later on, a buzzer summons you to tend to the wash, transfer it to the dryer, and set another buzzer, after which you return to your book.

Asked later what you did this night, you'll say you spent the evening reading. But your ability to respond to interruptions, such as particularly pleasurable musical passages or the necessary laundry manipulations, enabled you to accomplish more than one activity virtually at the same time.

What if your Apple could respond to interruptions in a similar way? Naturally, it would do so at thousands of times the pace you do—if it could do it at all. And, thus, it would perform more than one task while apparently fully concentrated on one.

Well, your Apple can do this, and it does it by means of what are called, logically, *interrupts*. If you'd like to be playing *Wizardry* while your Apple prints your entire budget from *VisiCalc*, take heart and read on.

During 1981, we wrote a program that teaches the Apple to do two things at once. *Doubletime Printer*, which includes an enhanced F8 ROM chip, allows the Apple to print text files at the same time as it is running another program. A person using this program could be printing one file while editing another.

The techniques we used and the lessons we learned can be useful in many other applications, most of which involve interrupts. The only requirement is that the programmer understand something about the internal workings of the Apple II. This article is an attempt to provide such explanatory information, starting with the basics so the novice won't be overwhelmed. Also included, however, is information that should offer some meat for the expert programmer as well.

A Bit of Background. The heart of any personal computer (or rather its brain) is, of course, a device called a *microprocessor* chip. In the case of the Apple II, the microprocessor chip is the 6502, the big, forty-pin rectangle in row H of the motherboard.

Until just a few years ago, it would have taken a whole roomful of equipment to do what the 6502 does. Relative to the central processing units (CPUs) of the early computers back in the forties and fifties, the 6502 is fast, reliable, and sophisticated.

The 6502 microprocessor has several features that aren't used in the Apple II. One feature that hasn't been taken advantage of much is the interrupt. An interrupt forces the microprocessor to stop whatever it is doing and go do something else. Then when the "something else" is completed, the microprocessor picks up where it left off in its former task.

Before we talk about interrupts, let's take a few minutes to discuss how the 6502 knows what to do and then how it does it.

When you remove the top from your Apple and look inside, the chips you see inside the white box painted on the outside of the Apple motherboard are memory chips. There's room here for three rows of eight chips; each row provides storage space for 16,384 characters or numbers. Multiplying 16,384 by 3 produces 49,152. Oddly enough, this is referred to as a 48K memory system. If you have a language or RAM card in slot 0, you have an additional 16K of memory, giving you a 64K system.

What Shall Be Done with Memory? Each location in memory may serve either as coded instructions to tell the computer what to do (a program) or data for the program to act on. Few programs use all the memory available, so some memory locations may have no meaning to a particular program.

The part of memory that contains the instructions for the microprocessor is organized so that the instructions are lo-

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cated one after the other, head to tail. Although some instructions break the sequence by jumping backward or forward to a distant (nonsequential) memory location, generally instructions are executed in sequence.

Sequential processing works just fine; for many purposes, it is the only way to go. You are reading this page sequentially, just as it was written. It would not make much sense if the same words were spread randomly around the page or if you read one word at a time from randomly selected lines.

Suppose you write a program to deal with events outside the computer that are happening at random. Suppose it's a program to record the times when a light switch is turned on and off. One way to do this would be to tell the computer:

"Read the switch setting.

"If the switch is open, go back to the previous instruction.

"If the switch is closed, read and print the time.

"Read the switch setting.

"If the switch is closed, go back to the previous instruction.

"If the switch is open, go back to the original instruction."

This little program would print the time that the light switch operated each time it operated.

Unfortunately, a light-switch monitoring program such as this one would tie up the whole computer. With the program written this way, the sole function of the computer would be to keep tabs on the state of that one switch and report activity. If you have nothing else to do with your computer, this is fine. But what if you have another program you want to run?

That's where interrupts come in. Interrupts allow the computer to do other things while waiting for the switch to operate. Through the use of interrupts, the switch can be operated to tap the computer on its electronic shoulder and say "Hey, mark the time. I just closed."

Go Ahead—Interrupt Me. The 6502 was designed to permit external events to interrupt its processing sequence. It does this in such a way that it is transparent to the program that is running, which means that the main program never really knows it's been interrupted.

A few paragraphs back, we said that the 6502 executes instructions that it finds in memory in the sequence that they are stored. Suppose you're sneaking in another chapter of that book you were reading when we began and someone calls out to you. You stop where you are and carry on a conversation. Then when the conversation is over, you continue reading as if there had been no interruption.

Or do you? You do if you marked your place before shifting your attention. If you didn't mark your place—if you slammed shut the book and tossed it in a desk drawer to avoid being caught—you have to page through the book until you find where you were. Marking where you were would have allowed you to restart easily.

In the Apple, there are two *registers*, memory cells within the microprocessor chip, that are important to the process of dealing with interruptions.

The *processor status register*, or P register, keeps track of conditions that programs want to test through the use of a set of flags. *Flags* are actually on/off markers showing such esoteric statuses, known only to your Apple, as a zero result, positive result, negative result, carry from addition, borrow from subtraction, and several other pieces of information that you need not deal with directly. Some microprocessor instructions can test these flags and change the operation sequence (jump forward or backward) based on the result of the test. One of these flags is dedicated to showing whether or not an interrupt has occured.

The second register is known as the *program counter*, or PC. This register is a memory pointer that tells the microprocessor where to go to get its next instruction. Any jump instruction just changes the contents of this register to the address of the desired location.

If the processor status register and the program counter are saved and later restored, all the information the microprocessor needs to continue a program will be retained. This

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50   If You Need Immediate Access To Over 2000
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makes it possible for an interrupt to change the microprocessor's activity without causing it to get lost when it comes back to its original task.

The Physical Interrupt. When the 6052 senses an interrupt signal, it marks its place by storing both its processor status register and its program counter in a known location. This location is in a special memory area designated as the *stack*. This area is especially designed to help return the program counter to a previous program area.

Once the interrupted location and status are saved, the interrupt processing mechanism transfers the address of the program to handle interrupts into the program counter. This is effectively a jump instruction.

When the interrupt handling program is finished, it retrieves the saved values (they were placed automatically on the stack) to restore the processor status register and the program counter to the status they had before the interrupt. The main program continues executing without ever being aware that the interrupt occurred. It wouldn't matter to the foreground program whether the interrupt processing program used a number of hours or only a few microseconds.

Interrupt Handling "Overhead." In addition to the processor status register and the program counter, the 6502 uses an *accumulator register* (A), two *index registers* (X and Y registers), and the *stack pointer* (S). Upon return from an interrupt, all these registers must have the same values they had at the time of the interrupt.

If these are not properly handled, the operating program may get confused and bomb out. We've seen already how the P register and PC are returned to their proper values. The programmer has the responsibility to return from the interrupt handling program with the stack pointer (S), accumulator (A), and X and Y registers exactly as they were when the interrupt occurred. However, the A, X, and Y need be restored only if the interrupt routine changed them.

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More Than One Type of Interrupt. The 6502 recognizes four distinct types of interrupts. The first, an interrupt request (IRQ), is one that the foreground program may ignore if it sets the right processor status flag. The second, what's known as a *nonmaskable interrupt* (NMI), may never be ignored, but can be processed in the regular way.

The third type of interrupt is called a *break* (BRK) or *software interrupt*. This kind of interrupt, which does not depend on external events, must be planned by the programmer in advance; it is a debugging tool that will assist the programmer in locating program logic errors. The fourth kind of interrupt is the *reset*, an interrupt that attempts to return the microprocessor to near its original state (its state when the power was first turned on). This interrupt is used when the logic of a program has been hopelessly jumbled and the system has hung up. In the Apple II, this often leads to a reboot situation.

The 6502 allows only three different program routines to process the four interrupts, and it demands that the addresses for these routines be stored in the last six memory locations (FFFA–FFFF hexadecimal or 65,629–65,535 decimal).

That's right; three routines to handle four types of interrupts. NMI has its own routine address; so does reset. But IRQ and BRK double up on one routine.

This doesn't pose too much of a problem, though, because it's easy to distinguish between BRKs and IRQs. The Apple II uses nine memory locations to inspect the processor status register flags and make the distinction.

Both the Apple's Monitor ROMs—the autostart and the old Monitor ROM—have a routine that the 6502 jumps to when it gets a BRK or an IRQ. This routine saves the A register (to get a register to work with) and then inspects the P register to determine whether it is processing a software BRK or a hardware generated IRQ.

If an IRQ interrupt is what occurred, this program passes program control (by a simple jump instruction) to the user program whose address is stored by the user at memory locations $3FE and $3FF.

If no user routine address has been stored here, the 6502 gets confused. Apple alleviates the confusion by returning to the Monitor, bombing out whatever program is running at the time.

Break and Reset Don't Count. Technically, BRK and reset operate like interrupts in that they interrupt the running program and pass control to a special handling routine. But reset and BRK handling don't fall within the scope of this article because they are not normal operating conditions. Both have a catastrophic effect on a running program.

Now that we've limited the scope of this discussion to NMI and IRQ, what's the difference between the two?

One bit in the P register disables the curcuitry that responds to IRQs. One simple instruction sets this mask, which has the effect of making the microprocessor ignore this interrupt. Thus, the IRQ is often referred to as a *maskable interrupt.*

By contrast, there is no bit that allows the microprocessor to ignore an NMI event. That's why such an event is called a *nonmaskable interrupt.* When the NMI interrupt line is tapped, the computer stops whatever it was doing and goes to see what it is supposed to do now. Use of the NMI line in the Apple II is usually disastrous; it conflicts sharply with the operation of the disk operating system.

Interrupting the Interrupt Article. Now you know what kind of interrupts there are and which the Apple can deal with if it's prepared to. Next month, we'll talk about limitations and dangers that arise from interrupting too rudely. Finally, we'll discuss just how your Apple can learn to accept interrupts graciously.

In the meantime, you can go back to that book you were so eager to read: tonight there'll be no laundry to worry about; you could unhook the phone and spend an uninterrupted evening reading.

Well, that will have to do it. I've got to answer the door. ■

Sirius Tools

E-Z Draw

E-Z Draw is a graphics editing package for Apple II BASIC with simple one character commands so it can easily:

- Draw dots, lines, parallelograms, triangles, circles and ellipses on the screen,
- Move any area of the screen to any other area,
- Transform any area of the screen into its mirror image while expanding or compressing its width or height or rotating it 90 degrees,
- Draw text on the screen using any of 20 original and imaginative type styles using the Higher Text Character Generator by Ron & Darrell Aldrich,
- Save images and complete pictures to the disk for use within BASIC programs, and
- Draw using any of the Apple BASIC colors.

This program has been used by professional programmers to generate spectacular hi-res pictures for use with their games, professional packages and educational software. It can be used to create professional illustrations, graphs and slides in addition to adding hi-res graphics to BASIC programs. E-Z Draw requires a 48k Apple II or II+ and one disk drive.

Audex

Audex is a collection of utility programs that allow you to create sounds, shape them, edit them and play them back in your own Applesoft BASIC programs. The only tools required are an Apple II computer with Applesoft BASIC, 48K of memory, one or more disk drives with DOS 3.3 and an optional tape player. Included with this disk are:

- DRAW-A-SOUND, a program for creating and editing sound pulse patterns using the keyboard and hi-res screen. These sounds can be tones, squalks, thumps or anything you choose.
- EXCERPT-A-SOUND is a program for getting sounds from the cassette port and excerpting portions of this audio data for use as sound effects. Excerpting produces more uniform tones and uses less memory.
- BUILD-A-SOUND is a program to connect sounds and tones together into extended patterns to form or emulate speech.
- AUDIO OPCODES is a collection of relocatable machine language routines that allow you to easily reproduce in your own Applesoft programs any sound effects, music, speech, etc. created using the above utility programs.

A user manual is provided that includes many programming examples and complete instructions for using all the utility programs.

PGE

The Pascal Graphics Editor is a complete graphics editor with command and menu structures modeled after the Pascal text editor. It Features:

- Commands for drawing dots, lines, rectangles, parallelograms and circles
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- Easy moving, rotating, inverting (upside down and/or mirrored), crunching, expanding (horizontally or vertically), color separating and saving to disk any portion of the graphics screen
- A built in font generator which can be used to define fonts with cell sizes ranging from 1 x 1 to 16 x 16. Fonts can be drawn onto the screen in any of 16 different DRAWBLOCK display modes with optional proportional spacing.

Return of the included license agreement entitles you to a free back-up diskette and Pascal utilities package which includes two library units that expand TURTLEGRAPHICS:

- The GEOMETRIC UNIT simplifies the drawing and filling in of simple geometric shapes and aids in creating DRAWBLOCK arrays and saving pictures to disk with commands: PROCEDURE TRIANGLE, PARALLELOGRAM, ELLIPSE, PFILL, COPYBLOCK; FUNCTION PICREAD AND PICWRITE.
- The TEXTWRITER UNIT allows you to load and use multiple fonts including all fonts defined by PGE with commands: PROCEDURE WFCHAR, WFSTRING, FONTYPE, PROPORTION; FUNCTION FONTREAD.

The Pascal Graphics Editor requires a 64K Apple II or II+ and one disk drive.

The Joyport

The Joyport is the most significant new input device for the Apple computer since the keyboard. A wide variety of software is rapidly being developed to take advantage of the Joyport's features:

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- 2 Switches to select between Apple type paddles and Atari joysticks
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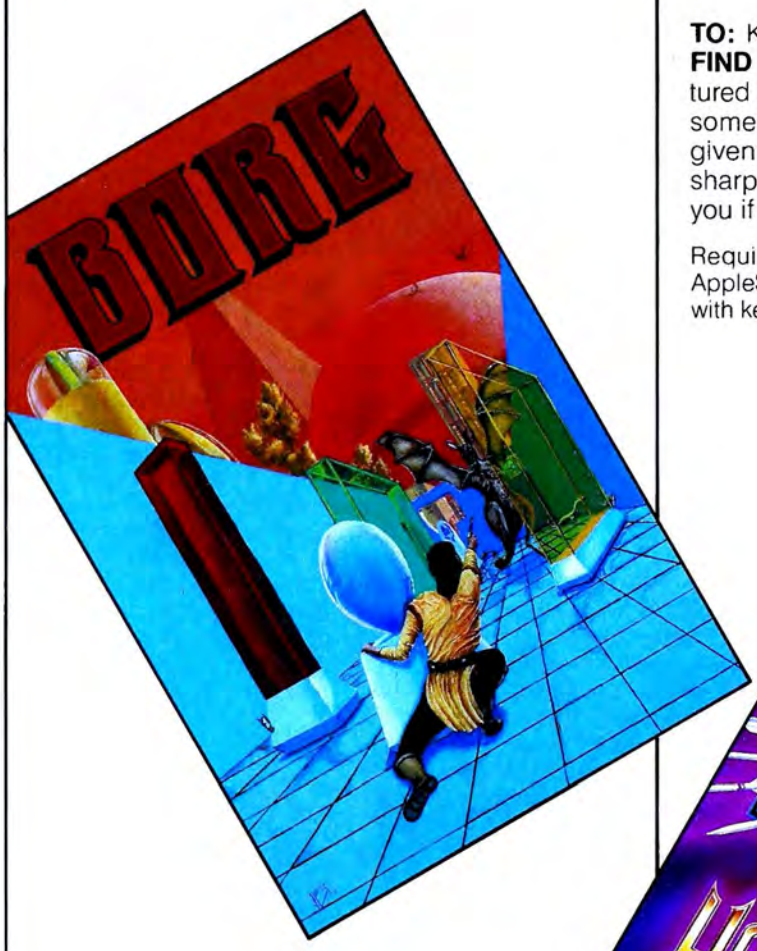


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Requires and Apple II or II+ Computer with 48K, AppleSoft and Apple disk drive. Kabul Spy is playable with keyboard.



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Exploring Business Basic, Part 7

Last month we explored some of Business Basic's unique formatted output and arithmetic capabilities. There is a good more to say on those topics, but such exposition will be left to some future month. This month we'll undertake a journey through some of the thickest jungles found in the Apple III: the infamous .GRAFIX driver and its faithful Indian companion, BGRAF.INV (the preceeding collection of mixed metaphors was just a sample of what some enterprising explorers have encountered on their own trips).

The new Business Basic manual (which everyone who purchased Basic should have received by now), contains a sixty-page section in volume two that describes the programming possible with the BGRAF.INV invokable module. In addition, the *Standard Device Drivers Manual* contains a section on .GRAFIX. Rather than repeat all of that material, this column will briefly describe the functions of BGRAF.INV and then take up a subject that's not mentioned at all: how to draw a circle.

Drawing a circle may sound easy, but given that BGRAF allows only dots and lines, and given that none of the graphics modes have equal horizontal and vertical resolution, and given that monitors distort images because of *aspect ratio* differences, drawing a circle of arbitrary radius with an arbitrary center that actually looks like a circle and doesn't take forever to finish is non-trivial. Non-trivial is a favorite word of mathematicians and engineers, principally because it allows them to assert that a task is difficult without requiring that they figure out how difficult.

Well, enough cheap shots at mathematicians. We will discover later that some handy mathematical principles will serve us well in our quest for the perfect circle.

The BGRAF Invokable Module. As has been discussed before, Business Basic is almost infinitely extensible by the use of *invokable* assembly language routines. These routines can be loaded into memory only when needed, and have the effect of adding extra commands to the language. Furthermore, as many invokables as will fit into memory can be used at once, with Apple III's SOS operating system responsible for making sure that there are no conflicts. BGRAF.INV is one of the most useful of the invokable modules. It is supplied on the Business Basic program disk, and is loaded into memory with the command:

```
INVOKE "bgraf.inv"
```

Those of you who have Apple II's, or who have used Applesoft in emulation mode on the Apple III, know that there are several commands in that language to manipulate color graphics. Among these are *gr* and *hgr*, *color* and *hcolor*, *plot* and *hplot* that permit initializing graphics modes, changing colors, and plotting points and lines. In addition, Applesoft has special commands that permit the manipulation of shapes based on special tables that describe the bit patterns of the images.

The BGRAF invokable has commands for all these capabilities, and a great deal more besides. Unlike Applesoft, which has a fixed high-resolution page for drawing, the Apple III graphics modes permit plotting points within a range of −32768 to 32767. The concept of a *viewport* (like the window in text mode) is what defines which dots actually get plotted on the screen. Only the dots within the current viewport are actually plotted, and the viewport is limited to the maximum resolution of whatever graphics mode is selected.

We'll see shortly how handy this is, because it permits plotting generally without regard to whether the physical screen limits are exceeded. Exdeeding the valid range in an Applesoft program causes an error. In addition, setting the viewport to an area smaller than the physical screen permits us to draw without worrying about overwriting other areas outside the

Initgrafix	Initializes the viewpart, cursar pasitian, calar table and transfer aptians
Grafixmode	Sets the current graphics made. The faur mades are: 0 - 280 x 192 black and white 1 - 280 x 192 calar (sixteen calars with limitatians) 2 - 560 x 192 black and white 3 - 140 x 192 calar (sixteen calars with na limitatians)
Grafixon	Displays the current graphics screen
Viewport	Sets the baundaries far graphics aperatians
Pencolor	Sets the calar af the pen far draws, plats ar characters
Fillcolor	Sets the backgraund calar far filling and erasing
Fillport	Fills the current viewpart with the fill calar
Moveto	Maves the cursar ta a specified paint
Moverel	Maves the cursar relative ta the current paint
Dotat	Plats a paint at a specified paint
Dotrel	Plats a paint relative ta the current paint
Lineto	Draws a line fram the current paint ta a specified paint
Linerel	Draws a line ta a paint relative ta the current paint
XYcolor	A functian that returns the calar af a specified paint
Xloc,Yloc	Functians that return the current pasitian af the cursar
Newfont	Defines a new character fant far printing text an the screen
Sysfont	Restares the default system fant
Gsave	Saves a graphics screen ta disk as a PIC file
Gload	Laads a PIC file fram disk ta the current graphics screen
Release	Gives graphics memary back ta Basic

Command Table

viewport. To keep track of where the plotting operations are to take place, an invisible cursor is maintained, to which all draw and print operations relate.

There are two capabilities of the Apple III graphics driver which are not well understood but can be extremely powerful. These come under the heading of the color table and transfer option. Used properly, they can save an incredible amount of programmer effort.

The color table allows you to set the priority of a given color. Imagine that you want to draw some blue lines on a screen that contains some yellow squares. Suppose, furthermore, that you don't want to cross the yellow squares (in effect, you want to draw the line behind the squares). If the color table is set up properly, the graphics driver will automatically change any blue dots you plot to yellow if you try to plot them over a yellow dot. In any other system, your program would have to check the color of each dot before plotting, thus grinding everything to a virtual halt. Imagine what this capability could mean if you wanted to animate shapes of various colors over a background.

One additional capability in Apple III graphics is really convenient. At any time you can print text directly to the .GRAFIX driver and it will be written at the current dot position. Since you can also change the definition of the character set with the *newfont* procedure, hi-res animation tricks of the sort found in the Apple II *DOS Toolkit* package are essentially built-in!

To give you an idea of the functions of the BGRAF module, the command table lists the commands available, along with a brief description of each. Remember that to use these in Basic, the module must first be *invoked*, and the word *perform* prefixed to each command. Quite a collection of goodies, right?

As was said earlier, there is really too much here for one article; indeed, a whole book could be written about the Apple III graphics. Rather than tackle that task, let's start with something seemingly simple. As you noted from reading the list of functions above, the major component that's missing is anything to do with curves. Rather than throwing you a curve (groan!), we'll try drawing some.

Getting Around in Business Basic. To start, some quick math is required. You can think of the Apple III screen as a coordinate system, with x and y locations depending on the mode. In all cases, y (vertical) values are displayable between 0 (bottom) and 191 (top). X (horizontal) values range between 0 and 139 (lowest resolution) up to 0 to 559 (highest). Circles are nothing more than sets of points with a common attribute; namely, they are of equal distance from a single point called (surprisingly enough) the center. There are formulas for determining the points that lie on a circle, generally derived from the formula below:

$$x^2+y^2=r^2$$

This formula works for circles starting at a center of 0,0, but since we want to draw circles anywhere, and since the general form of the circle equation is more difficult to solve, we'll rely on another fact about circles. The trigonometric functions sine and cosine define x and y values for the unit circle, and it is possible to obtain values for any circle by multiplying these values by the radius and adding the center coordinates; that is, to find a point on a circle of radius 30 at an angle of 30 degrees from horizontal, when the center is at x=70 and y=96, these formulas can be used:

```
x = COS(30 degrees)*30+70
y = SIN(30 degrees)*30+96
```

These simple formulas suggest that we might be ready to write a program.

Program 1 is a relatively straightforward program, except that the trig functions (*sin, cos*) work in radians, of which there are 2 x pi in a full circle. That value is approximately 6.2832, which is further approximated in line 100. One other thing of note: Since this graphics mode is not "square," some adjustment must be made for the fact that there are more points proportionately in one axis than in another.

For simplicity, we have scaled the x-axis value (since that is the only one that varies in the different modes) by multi-



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```
10 OPEN#1,".grofix"                          Open the grophics driver
20 INVOKE"bgrof.inv"                         Lood BGRAF into memory
30 PERFORM initgrofix                        Initialize the grophics screen
40 PERFORM grafixmode(%3,%1)                 Set mode 3 (sixteen-color)
45 INPUT"step value: ";stepvol               Ask for an increment for plotting
50 PERFORM grofixon                          Turn on the grophics disploy
60 PERFORM pencolor(%13)                     Set the color for drowing (yellow)
70 PERFORM fillcolor(%3)                     Set the background color (purple)
80 PERFORM fillport                          Fill the viewport with purple
100 FOR i=0 TO 6.28 STEP stepvol             Step oround the circle (2pi=6.28)
110  x=COS(i)*30*(140/192)+70                Colculote x (center=70, rodius=30)
120  y=SIN(i)*30+96                          Calculote y (center ot y=96)
130  PERFORM dotot(%x,%y)                    Plot the resulting dot locotion
140  NEXT i
150 INPUT o$                                 Pouse when finished
160 TEXT                                     Switch to text mode
170 PERFORM RELEASE:PERFORM RELEASE:CLOSE
180 INVOKE                                   Cleon up the grophics memory
190 END
```

Progrom 1

plying by the constant 140/192, the ratio of horizontal to vertical dots. This is done in line 110. The other factor in lines 110 and 120 is the constant 30, which represents the radius. Note also that line 170 cleans up the graphics memory and closes the driver. This is *very* important. If you don't release the memory, it will stay around, unusable by Basic. Also, doing the *invoke* in line 180 removes the BGRAF module from memory. If you have other invokables normally resident, you should delete this statement.

Run this program several times, with different values for the step. You will notice that in addition to being pretty slow, it takes a step size of about .1 to draw a good circle. You'll probably also notice that this program can't draw a very good circle. Depending on the aspect ratio of your monitor, the circle will probably look like a flattened circle, that is, an ellipse. This is so because all monitors differ in the relationship between horizontal and vertical resolution and size. We will see a little later that this is an easy problem to correct.

As was just mentioned, this routine suffers from being very slow. The main problem stems from the fact that it takes a large number of dots to create a circle, and that number of dots translates into a large number of steps to draw a circle. In the example above, it took approximately sixty-four dots to draw a filled-in circle of radius 30 units. Had we tried to draw a larger circle, or had we used a higher resolution mode, the problem would have been even worse. The solution to this problem lies in understanding the real nature of the task at hand.

Mathematics and mathematical physics is sometimes called the realm of the perfect. Energy truly is exactly related to mass times the speed of light squared (Einstein's famous formula). But in the world of measured events, nothing is ever exact and perfect.

The same is true of circles. Geometry allows us to dream of perfect circles, but the realities of trying to draw even one (especially freehand!) are such that we are willing to settle for reasonably good representations as long as they are not too lumpy. In fact, the resolution of any graphics screen—no matter how good—is a far cry from the perfection of a real circle. Therefore, when we set out to draw a circle on the screen, we should first ask, "How good a circle do we want?"

A quick lesson from geometry will help with the answer. As you may know, a circle can be approximated as a polygon (a figure with many sides). The more sides the polygon has, the more it looks like a circle. Since the resolution of the graphics screen is limited, at some reasonable point a polygon will be indistinguishable from a circle.

The advantage of this approach is that the Apple III has graphics commands available for drawing lines. Since a polygon has sides that are all straight lines, we can use the line drawing commands to represent a circle, finding the number of sides in each resolution which make reasonable looking circles. The number of sides necessary to make a good circle will also vary according to the radius of the circle, since large circles will be more likely to show the lines as straight segments.

Program 2 will let you play with the number of sides necessary to make good circles and to experiment to determine the aspect ratio that is correct for your monitor. Modify this program to try other graphics modes and see how the different resolutions affect the results.

```
10 OPEN#1,".grofix"
20 INVOKE".d1/bgrof.inv"
30 PERFORM initgrofix
40 PERFORM grofixmode(%3,%1)
45 INPUT"step volue: ";stepvol
46 IF stepvol<=0 THEN 170
48 INPUT"ospect ratio: ";ospect
49 ospect=1/ospect
50 PERFORM grofixon
60 PERFORM pencolor(%13)
70 PERFORM fillcolor(%3)
80 PERFORM fillport
85 scole=140/192
90 PERFORM moveto(%30*scole*ospect+
   70,%96)
100 FOR i=stepvol TO 6.28 STEP stepvol
110  x=COS(i)*30*scole*ospect+70
```


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```
120  y=SIN(i)*30+96
130  PERFORM lineto(%x,%y)
140  NEXT i
150 INPUT o$
160 TEXT
165 GOTO 45
170 PERFORM RELEASE:PERFORM RELEASE:CLOSE
180 INVOKE
190 END
```

Program 2

Several new things are done in this program 2. Notice that we invert the aspect ratio because we are adjusting the x-axis only. Further, we have named the ratio between the *x* and *y* resolution *scale* for use in the repetitive calculations. Next, because we are drawing lines this time, the program uses the *moveto* procedure to move the graphics cursor to the initial point on the circle (in this case, the horizontal point to the right of the center (origin) of the circle).

Once a starting point is established, subsequent *lineto* commands will draw the circle as a series of line segments. Try experimenting with widely varying numbers of steps, from 1 to .02 as an example. You will find that at some point the circle looks the same, no matter how many line segments make it up. By choosing the fewest steps that still produce a decent circle, you can speed up the drawing process considerably. Don't forget to experiment with values for aspect ratio as well. For the Monitor III, a value of 1.3 usually works pretty well. Try several values until you are happy with the results.



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The next technique for speeding up this routine is even more interesting. Notice that we keep calculating the sine and cosine of each angle, no matter how many times we run the program. Furthermore, it should be apparent that it's possible to draw a circle of any reasonable radius by just varying the multiplication factor. Further, it's obvious that steps of less than .05 for any reasonable radius do not produce better circles. All that suggests program 3, an enhanced version of the original program:

```
10 OPEN#1,".grofix"
20 INVOKE".d1/bgrof.inv"
25 DIM xcos(63),ysin(63)
26 FOR i=0 TO 63:xcos(i)=COS(i/10):
   ysin(i)=SIN(i/10):NEXT i
30 PERFORM initgrofix
40 PERFORM grafixmode(%3,%1)
46 INPUT"ospect rotio: ";ospect
47 ospect=1/aspect
48 INPUT"radius: ";r
49 IF r<=0 THEN 170
50 PERFORM grafixon
60 PERFORM pencolor(%13)
70 PERFORM fillcolor(%3)
80 PERFORM fillport
85 scole=140/192
90 PERFORM moveto(%r*scole*ospect
   +70,%96)
100 FOR i=1 TO 63
110  x=xcos(i)*r*scale*ospect+70
120  y=ysin(i)*r+96
130  PERFORM lineto(%x,%y)
140  NEXT i
150 INPUT o$
160 TEXT
165 GOTO 48
170 PERFORM RELEASE:PERFORM RELEASE:CLOSE
180 INVOKE
190 END
```

Progrom 3

Notice that this time two arrays have been set up, both with sixty-four values each. Rather than recalculate the *sin* and *cos* functions, the program does them once at the beginning and stores them for use later in lines 110 and 120. If you intend to do a great deal of this kind of work, or if you want to expand the number of steps significantly, you may want to create another program that calculates the values and writes them to a data file. Then your circle program could simply read the values in at the beginning.

Notice, too, that these routines are essentially identical to the previous ones, except that this time you may experiment with circles of different radii. After experimenting with this routine, you should see that a general purpose routine can be written that will satisfy all circumstances. It's most practical to express this as a subroutine, with the variables being the circle diameter, the mode, the scale factor and the center coordinates. The result might look like this program 4.

```
10  OPEN#1,".grofix"
20  INVOKE".d1/bgrof.inv"
25 DIM xcos(126),ysin(126),xdot(3)
26 FOR i=0 TO 126:xcos(i)=COS(i/20):
   ysin(i)=SIN(i/20):NEXT i
27 xdot(0)=280:xdot(1)=280:xdot(2)=
   560:xdot(3)=140
30 PERFORM initgrofix
35 INPUT"Mode: ";mode
37 IF mode<=0 THEN 180
40 PERFORM grafixmode(%mode,%1)
50 INPUT"pencolor,fillcolor: ";pen, fill
60 PERFORM pencolor(%pen)
70 PERFORM fillcolor(%fill)
75 INPUT"cleor screen? ";a$
80 o$=MID$(o$,1,1):IF o$="y" OR a$="Y" THEN
   PERFORM fillport
81 INPUT"rodius: ";r
82 oratio=1.3
83 xcen=xdot(mode)/2:ycen=96
85 PERFORM grofixon
87 scolefoc=(1/oratio)*(xdot(mode)/192)
90  GOSUB 900
150 PERFORM moveto(%0,%8)
160 PRINT#1;"Press RETURN:";
165 INPUT"";a$
170 TEXT
175 GOTO 75
180 PERFORM RELEASE:PERFORM RELEASE:CLOSE
190 INVOKE
200 END
900 xscale=r*scolefac
905 xcen=xcen+.5:ycen=ycen+.5
907 density=(mode=2)+2*(mode<2)
   +3*(mode=3)
910 firstx=xcos(0)*xscole+xcen
915 PERFORM moveto(%firstx,%ycen)
920 stepamt=INT(20*(5-density)
   /r)+density
930 IF stepomt>6 THEN stepamt=6
940 FOR i=1 TO 126 STEP stepomt
950  PERFORM lineto(%(xcos(i)*xscole
   +xcen),%(ysin(i)*r+ycen))
960  NEXT i
970 PERFORM lineto(%firstx,%ycen)
980 RETURN
```

Progrom 4

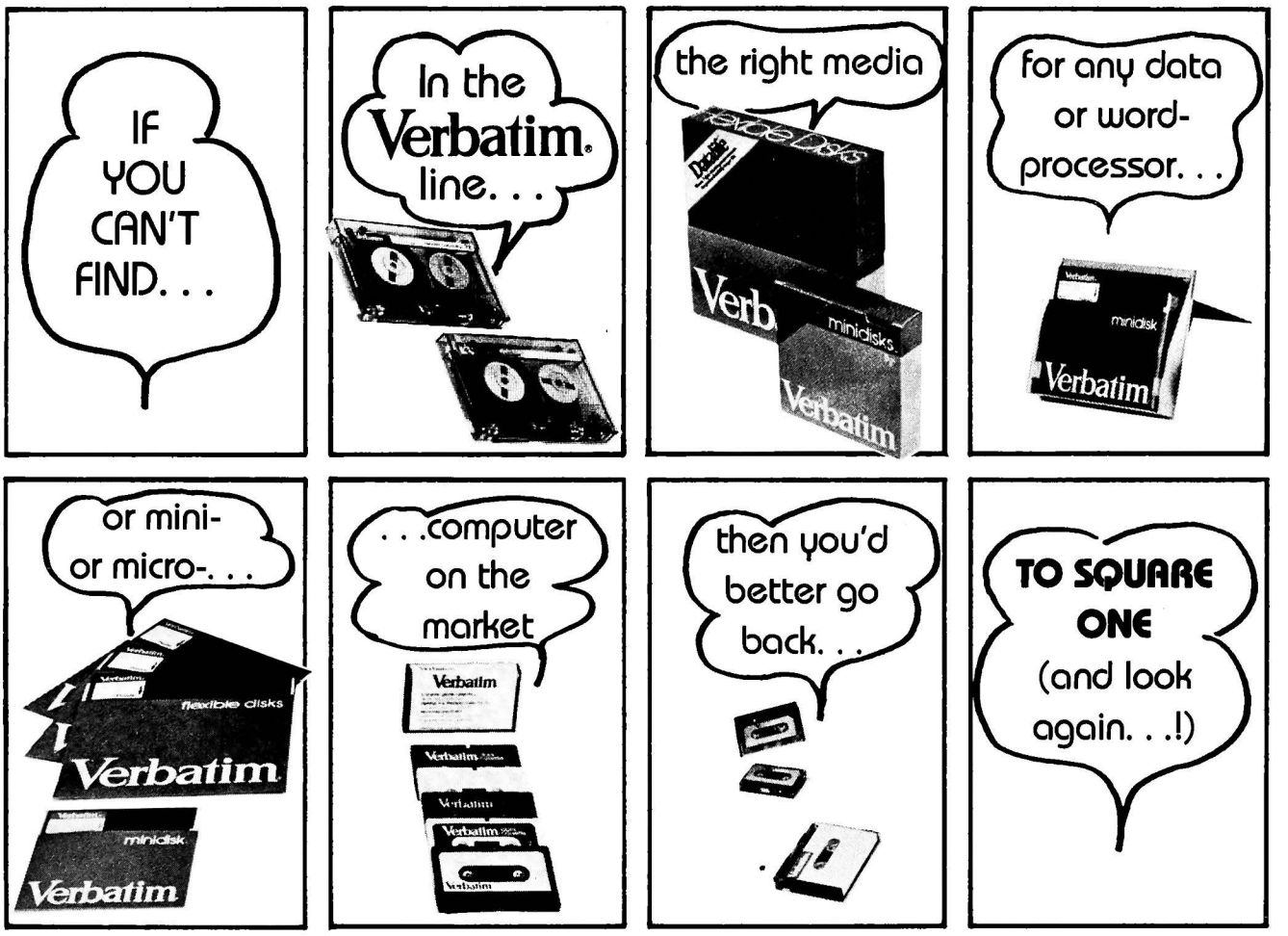
Program 4 is a considerably enhanced version. Notice that we have doubled the number of points that can be used, as well as introducing the capacity to change modes and colors. Since we now have different possibilities for the mode, we introduce the xdot array, which contains the horizontal dot density required to figure the center and the scale factor. The actual drawing routine is now a subroutine at line 900, in such a form that you could incorporate it into other programs.

To speed up the subroutine for the various graphics modes, the concept of *density* is introduced. This factor varies between one and three depending on whether the horizontal resolution is 140, 280 or 560 (modes 3, 0 and 1, and 2 respectively). Note the use of the logical statements in line 907 to replace a lot of *if* and assignment statements. Be sure you work through that program line in your mind to assure yourself that the assignments work as intended.

The other thing to note is that the density factor is used in line 920 to calculate a reasonable step value for drawing the circle. You might want to substitute a few values to see just how this works. Line 930 makes sure the program uses a reasonable number of steps even if the circle is extremely small.

Notice also that in line 905 the value .5 is added to the center coordinates. This

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has the effect of rounding the values when they are passed to the *lineto* procedure in line 950, ensuring more accurate plotting. Another new feature is that in line 970 an additional *lineto* is added to draw a line back to the original point. This ensures that if the step value is such that the circle is not fully completed, the last point drawn will be connected to the beginning point.

Line 160 presents another new concept. By simply printing to the .GRAFIX driver file, you may write text on any graphics screen. Furthermore, the text can begin on any dot boundary anywhere on the screen. That requires some pretty tricky software on the Apple II, but is a built-in feature of the Apple III graphics modes.

Many more enhancements could be added to this program, but instead of going on and on, here's an example of how the program and routines could be modified to draw circle segments (arcs) and pie slices, using essentially the same techniques. The new program (program 5) looks like this:

```
3 REM orc draw subrautine
10 GOSUB 1000:REM initiolize
20 PRINT"Arc drower pragrom"
35 INPUT"Graphics made: ";mode$
36 IF mode$="" THEN 180
37 mode=CONV(mode$)
40 PERFORM grafixmode(%mode,%1)
50 INPUT"pencolor,fillcolor: ";pen,fill
52 drow.rodius=0
55 INPUT"draw the radii? ";a$
56 a$=MID$(a$,1,1):IF a$="y" OR o$="Y" THEN
   draw.radius=1
60 PERFORM pencolor(%pen)
70 PERFORM fillcolor(%fill)
75 INPUT"cleor screen? ";o$
80 o$=MID$(a$,1,1):IF a$="y" OR o$="Y" THEN
   PERFORM fillport
82 horiz=xdat(mode)/192
85 scalefac=(1/orotio)*hariz
87 PERFORM grafixon
88 FOR loop=1 TO 25
90  r=INT(50*RND(1)+30)
91  xcen=INT(192*horiz*RND(1))
92  ycen=INT(192*RND(1))
93  stort.rod=3.14*RND(1):end.rad=
    stort.rad+3*RND(1)
95  GOSUB 1100
100  NEXT loop
150 PERFORM maveto(%0,%8)
160 PRINT#1;"Press RETURN:";
165 INPUT"";o$
170 TEXT:GOTO 35
180 PERFORM release:PERFORM releose:
    PERFORM releose
190 CLOSE:INVOKE
200 END
1000 OPEN#1,".grofix"
1010 INVOKE".d1/bgrof.inv"
1020 DIM xcos(126),ysin(126),xdat(3)
1030 FOR i=0 TO 126:xcos(i)=COS(i/20)
     :ysin(i)=SIN(i/20):NEXT i
1040 xdot(0)=280:xdot(1)=280:xdot(2)=
     560:xdot(3)=140
1050 aratio=1.3
1060 PERFORM initgrofix
1070 RETURN
1094 REM r=rodius, scolefoc=ospect rotio *
     relative density
1095 REM xcen= x coordinote of center
1096 REM ycen= y coordinote of center
1097 REM stort.rod= storting point of orc in
     rodians
1098 REM end.rod=ending point of arc in radians
1099 REM drow.rodius=1 meons drow the radius
     lines ta the endpoints
1100 xscole=r*scolefac
1105 xcen=xcen+.5:ycen=ycen+.5
1110 density=(mode=2)+2*(mode<2)
     +3*(mode=3)
1115 IF draw.radius THEN PERFORM moveto
     (%xcen,%ycen):PERFORM
     lineto(%(COS(start.rad)*
     xscale+xcen),%(SIN(start.rod)*r+
     ycen)):ELSE:PERFORM moveto(%(COS
     (start.rod)*xscole+xcen),%(SIN
     (stort.rad)*r+ycen))
1120 stepamt=INT(20*(5-density)/r)+density
1130 IF stepomt>6 THEN stepomt=6
1140 FOR i=INT(stort.rod*20+.5) TO end.rod*20
     STEP stepomt
1150  PERFORM lineto(%(xcos(i)*xscale+xcen),
      %(ysin(i)*r+ycen))
1160  NEXT i
1170 PERFORM lineta(%(COS(end.rod)*
     xscole+xcen),%(SIN(end.rod)*r+ycen))
1175 IF drow.rodius THEN PERFORM
     lineto(%xcen,%ycen)
1180 RETURN
```

Progrom 5

Program 5 is set up to use lines 88 through 100 to create random centers, radii and arc lengths (in radians) and to use the subroutine at line 1100 to draw the resulting arcs. This routine and the one above for drawing circles should equip you to do most of the interesting tasks in graphics. It's likely that these routines will also give you ideas on how to approach other specific projects you might wish to tackle.

Normally, when you run the arc program you'll get some arcs that are partially off the screen. Notice that the .GRAFIX driver handles such a situation perfectly because it treats its graphics area as a space of points from −32768 to 32767, with the screen as a window into the total space. This eliminates immeasurable amounts of bounds checking within programs, a process that usually ends up slowing down the drawing. In addition, as was mentioned already, the graphics window can be set to anywhere on the screen, with any values outside the window automatically clipped.

There are a thousand more topics to be covered in exploring the graphics capabilities of the Apple III. Next month we will tackle a few biggies, *area fill* (especially for the circles and arcs we have been drawing) and the whole area of user-definable character sets. With luck, we'll get to some animation examples. Until then, dig into your device driver manual documentation on .GRAFIX and the writeup on BGRAF.INV in the Business Basic manual. There's a whole world inside this system!

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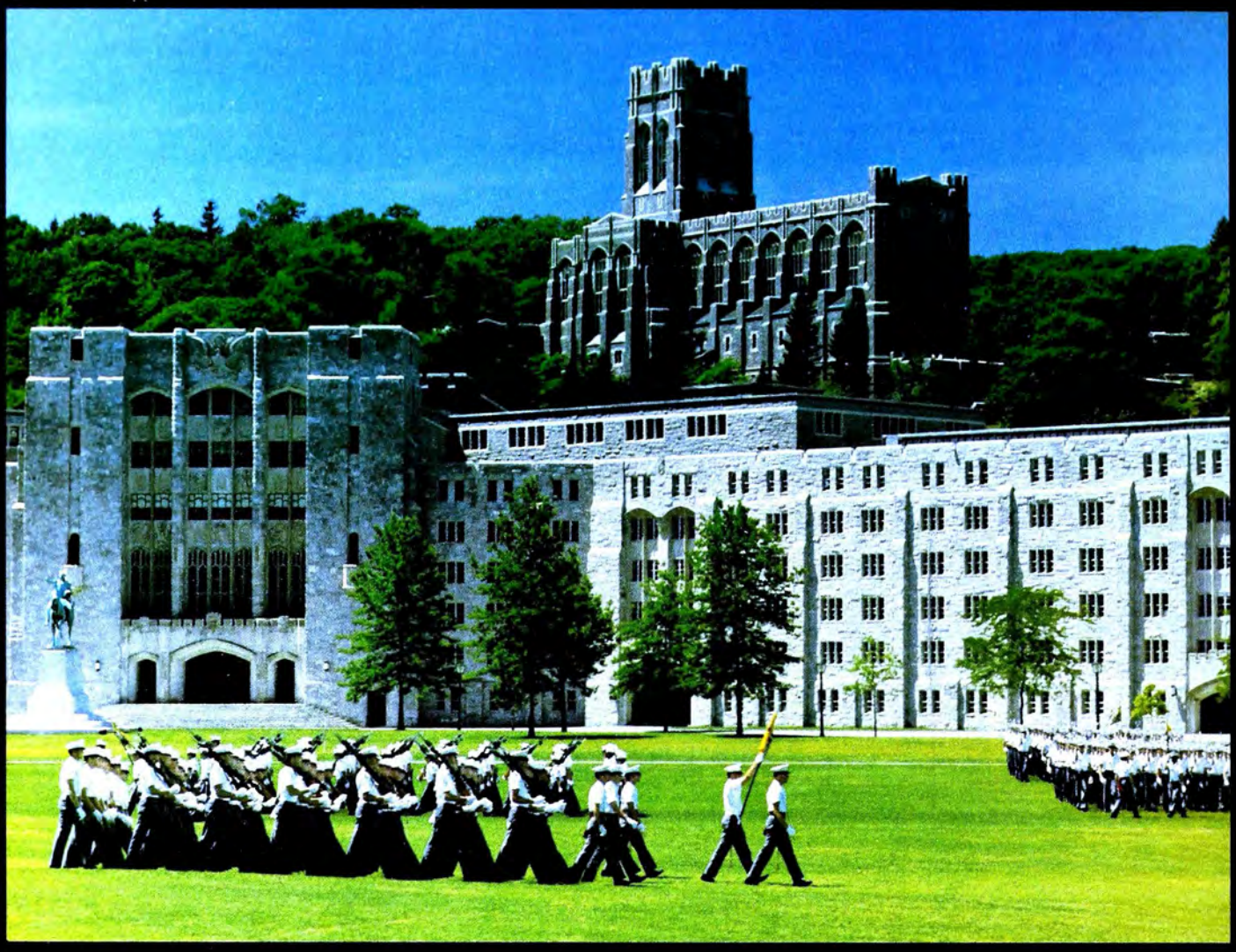
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Apples in the Front Lines

BY ROBERT COMSTOCK

at West Point

Tradition is an overwhelming presence at the United States Military Academy. It is evident from the Civil War regimental colors in the chapel and stringent honor code to the hazing of plebes and captured Mexican cannon surrounding the Battle Monument.

But there are some decidedly untraditional activities behind the massive gray stone walls towering above the plain at West Point. And Apple computers play an increasingly important role in several of them.

Inside Thayer Hall, erected in 1911 as a cavalry riding hall, faculty researchers work on a project designed to put an Apple in the hands of intelligence analysts on the battlefield with tactical units.

Four Apple II computers perform a wide variety of functions for members of the Cadet Computer Seminar, an increasingly popular extracurricular club.

A new Apple Users Group was launched in February by fifteen Apple owners drawn from the cadet corps, staff, and faculty alike.

And the cable TV bulletin board that serves as a principal source of local news for the West Point community boasts an Apple as its nerve center, determining which message is shown when.

Marching as to War. Cadets will pack a couple of eight-bit Apples along with their rifles and folding shovels when they embark on field maneuvers at nearby Camp Bruckner this summer.

"We'll take them out and operate in a tent," explains Colonel Gilbert W. Kirby, Jr., head of the department of geography and computer science. "We'll use them for land navigation work, fire planning for the artillery, determining what weapons to deploy against potential targets, picking out locations, and getting elevations."

Major Francis J. Monaco, systems manager at the Academy, explains how the program is to work:

Field commanders will no longer have to draw upon personal experience or manual calculations to determine where to place weaponry. They'll just tell an Apple what they want to hit or, as the Army puts it, to defend from enemy aggression. The computer will respond with an oblique view of the terrain showing hills, streams, and villages as they might appear from a low-flying helicopter.

After selecting a likely gun position, a commander will keyboard its location and be rewarded with a contour plot showing precisely what targets would be accessible from that position and which would be blocked by forests or hills. If coverage is inadequate, the commander will pick another position and try again.

To help make a final choice, the Apple will generate a perspective view of what the terrain actually looks like from the weapon position.

The Apples assigned to do all this are configured with dual 5.25-inch floppy disk drives, a digitizing tablet, and a color monitor. The operating language is UCSD Pascal and the software was developed at West Point under Colonel Kirby's leadership. The power will come from generators on military vehicles.

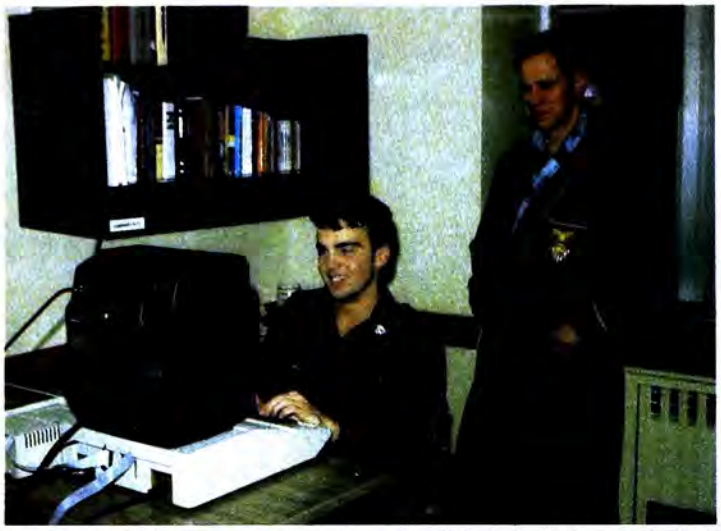
The maps and plots are generated from topographical data for a very limited area of operation in the Apple memory. Mass storage of data for wider fields of operations is provided by a Corvus central disk drive equipped with twenty-megabyte Winchester disks each offering 160 times the memory of an Apple disk.

Friendly Touch around the World. Why, then, did the Army select the Apple with its limited memory for this crucial work on the battlefield?

"They're so available and user oriented," is the succinct rationale offerred by Colonel Gerald E. Galloway, Jr., deputy head of the department. He said the Apples with their Amdek Color I display screens are two of thirty-three assigned by the Army to intelligence units at Fort Bragg, North Carolina, Fort Hood, Maryland, and in West Germany for field trials similar to those being planned at West Point.

While the computers involved are small, the weaponry is apparently not. The venture was undertaken in cooperation with the Defense Nuclear Agency.

In the field, maps and plots must be generated individually from digital data. Back at the computer center, Monaco dem-

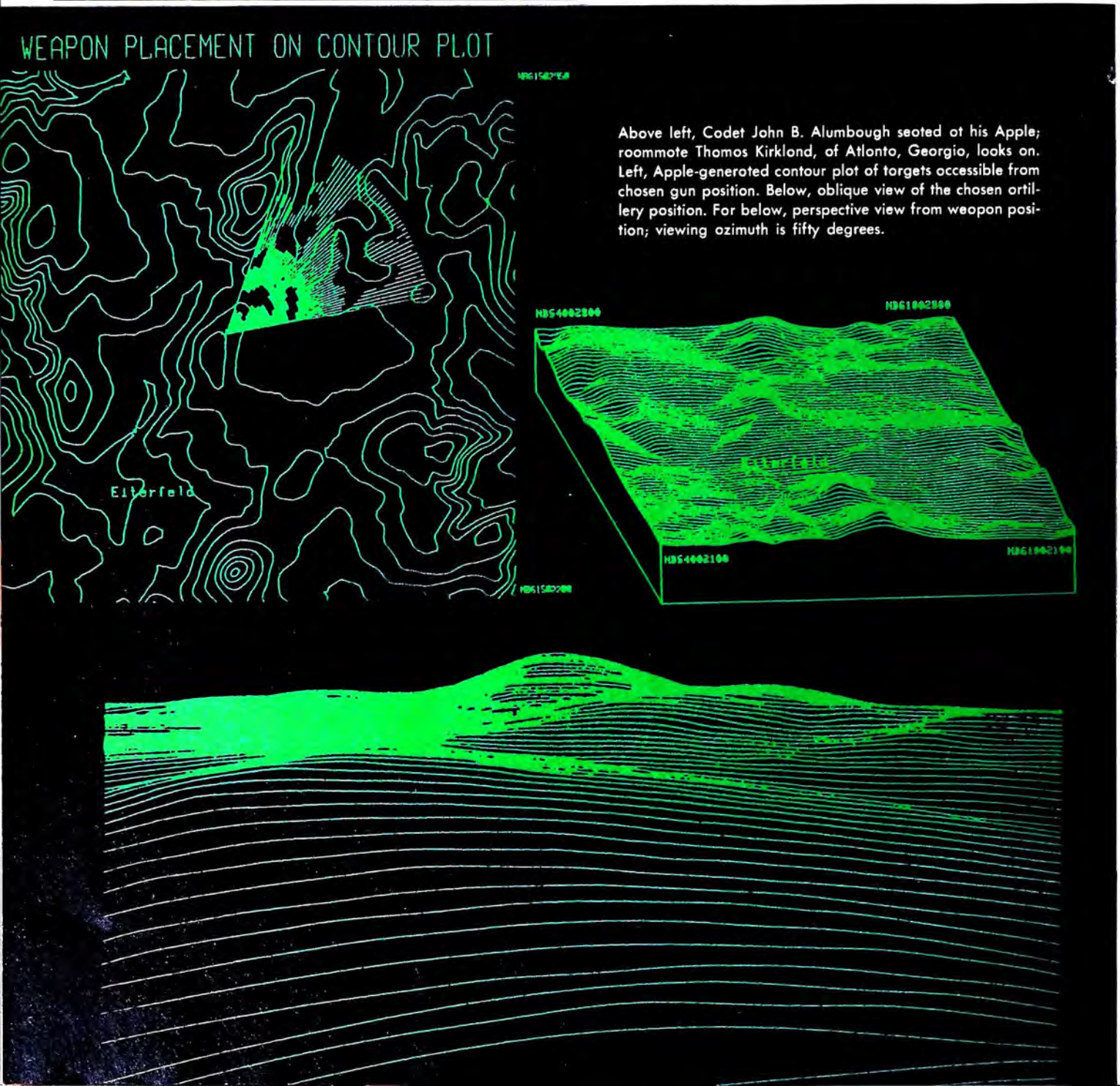


onstrates how time and storage capacity are saved through use of a video cassette recorder. Completed maps are copied from the display screen and stored on video disks, each of them holding 54,000 map sheets in far less space than the generating data can be stored on mag tape.

Kirby has seen enrollment in computer science elective courses more than triple since the 1976-1977 academic year. "The Army would come to an abrupt halt should its computers suddenly be withdrawn," he notes. "No pay, no food, no supplies, no personnel, no nothing! The ability of the Army to move, shoot, and communicate would vanish."

In such a climate of growth and burgeoning capability, petty annoyances sometimes seem even more frustrating. The day we visited his office, Kirby was impatiently awaiting delivery of a joystick for his new Apples. "Then I'll get rid of these damn paddles," he grumbled after a minor coordination failure.

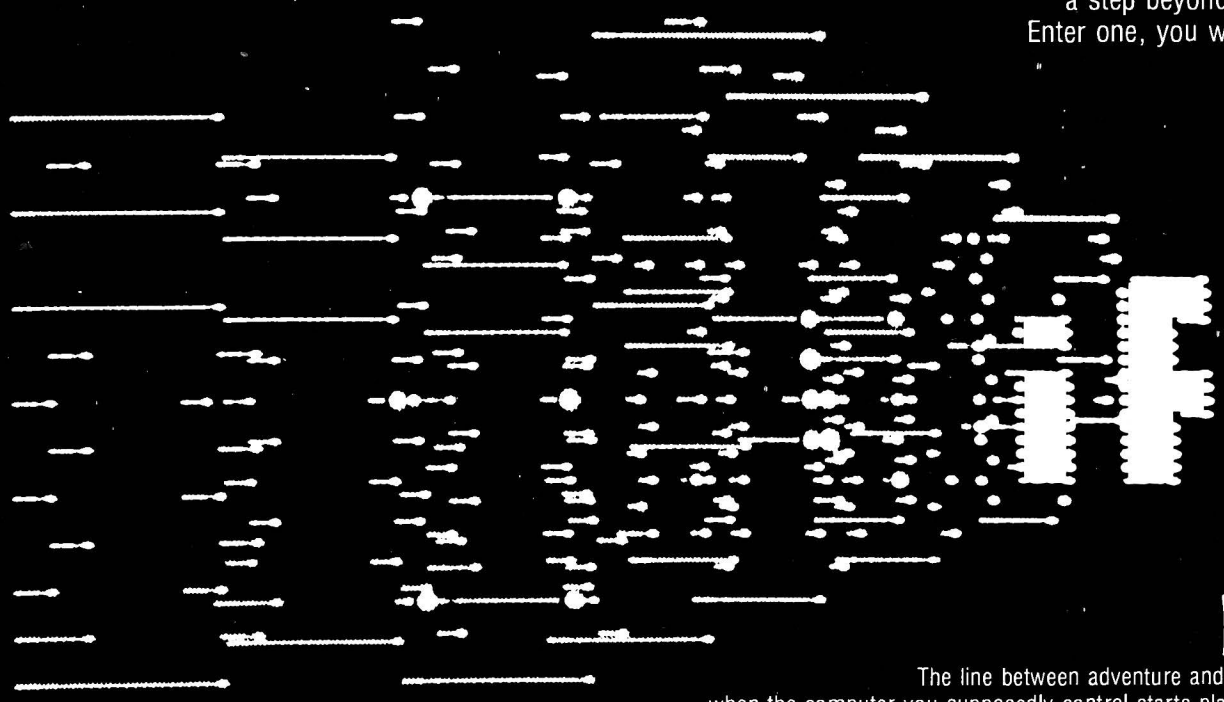
Cadet Apple Group Works for a Living. Conversion to Pascal programming language was, of course, essential to enable



Above left, Codet John B. Alumbough seoted ot his Apple; roommote Thomos Kirklond, of Atlonto, Georgio, looks on. Left, Apple-generoted contour plot of torgets occessible from chosen gun position. Below, oblique view of the chosen ortillery position. For below, perspective view from weopon position; viewing ozimuth is fifty degrees.

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Major Francis J. Monaco.

the map-making Apples to interface with the Corvus multiplexer. But most of the Apples at West Point continue to operate in Basic. This is true of four Apple II processors in daily use by the Cadet Computer Seminar under Monaco's guidance.

And there's another important difference between the battle Apples and the seminar Apples: there's nothing in the academy budget to buy computers for extracurricular activities such as the cadet group.

So Monaco, demonstrating some old Army ingenuity, worked a series of deals to finance hardware for the seminar through grants from varied sources. In return, the Apple-minded cadets keep the books and produce mailing labels for other student organizations ranging from the swim team and Judo Club to the Jewish Chapel Choir.

The cadets' first venture into programming their Apples in Pascal came through a similar arrangement with officials of the National Collegiate Bicycle Race, held annually at West Point.

"We set up an interactive registration program with rosters for each school, structured ten heats, sorted all finishing times, and provided placement results," notes Monaco proudly.

Race officials responded with a grant to help add to the seminar's hardware arsenal. "We add a component or two each year," adds Monaco. "A line printer and speech synthesis equipment are high on our list."

Meetings Wind Up with—What Else?—Games. The fifty cadets in the program pick up hands-on experience with the Apples whenever they can manage the free time. And they meet together every other Thursday evening for a formal presentation by a seminar member or faculty guest, followed by some spirited competition at football, battleship, or other computer games.

"We try to take some of the pressure off them," says Monaco, a 1970 graduate of the academy who recalls the psychological burdens of time and academic demands that shape the cadet's life.

The night we attended a Seminar meeting, we entered a darkened room to the decidedly unmilitary sight and sounds of *Musical Kaleidoscope*, a six-color light show program that keys off the sounds of a tape recorder.

After ten minutes of that, Joseph Moravec, a fourth termer and president of the seminar, presented an equally light-hearted demonstration of lo-res graphics. His subject matter: a Snoopy calendar. "I'll show you how to do it, not how it works. I haven't checked that out yet," he confided.

The main item of business was a carefully planned, illustrated explanation by Moravec of how to program shape tables and load them from memory to disk. The other cadets were attentive and full of questions. And Moravec volunteered his own assessment of Apple's major strength: "Easy inter-

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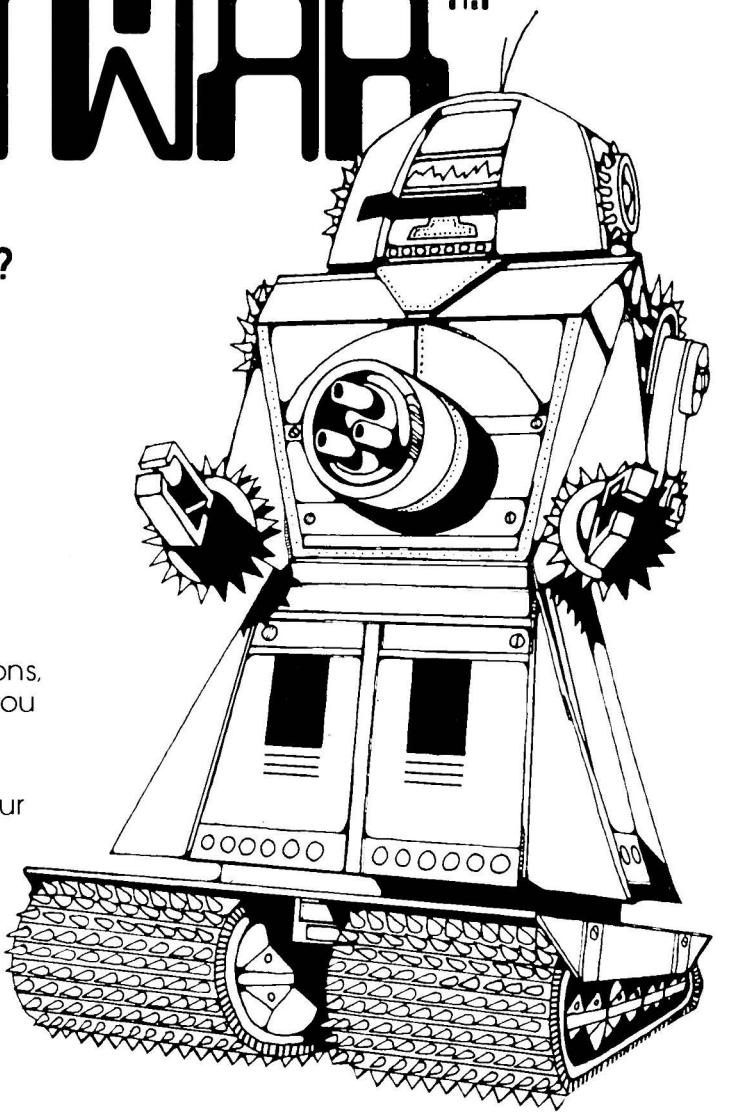
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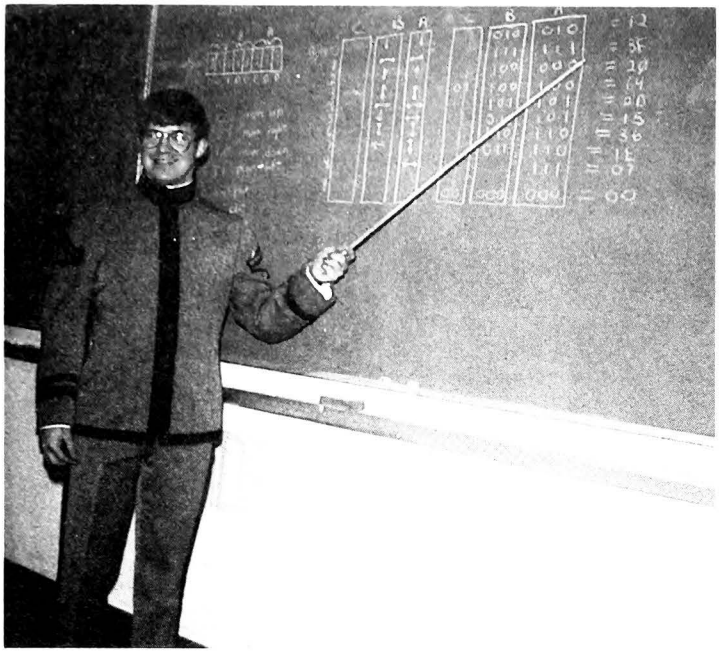
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Cadet Jaseph Maravec leads the Cadet Computer Seminar.

face with the user—that's what made Apple such a success."

Stringent Rules for Private Apples. A few cadets have special permission to keep personal Apples in their rooms, no small accomplishment at an institution where tradition yields as reluctantly as it does at West Point.

A pioneer in this effort is Alex E. Tetreault, a fourth termer or senior from Las Vegas. Turned onto computers for some time, Tetreault bought his Apple and a Sprinter 40 miniprinter in November 1980 and began seeking approval to bring it to the academy. He got approval on a couple of conditions:

1. No audio on his monitor. Cadets cannot have television in their rooms.

2. No computer games except on weekends. "I keep my paddles locked in the drawer during the week," says Tetreault. "But I have lots of company on weekends."

His Apple doesn't sit idle on weeknights. He uses it as a character generator to write papers for class. "And I use it for little functions in calculus. It's a big help in finding curves," he adds.

John B. Alumbaugh, a second termer or yearling from Matton, IL, knew next to nothing about computers when he arrived at West Point, but he's turned on now. He's even taken his Apple to class with him, a first at the Academy.

Like Mary's little lamb? Not quite. He used it to present a demonstration in military science class.

Alumbaugh found the cost of paper for his Epson MX-80 printer was becoming a burden, so he borrowed a page from Monaco's book and negotiated a deal. The Protestant Sunday School keeps him in paper and he maintains its records and keeps it in mailing labels.



Major Manaca with the two Apples slated for on-site training this summer.

"I'm working on a program so I can call into the main frame," says Alumbaugh, "I hope by spring. And I'm writing programs for my dad's ice cream store, for check writing and keeping his books."

What To Expect from Apples Who've Been to Boot Camp. The academy operates an electronic bulletin board over channel 3 of the local cable television system. It carries calendar items, announcements, and other news of general interest to Academy personnel and residents of the surrounding community. And it is programmed by an Apple II Plus.

Clearly, Apple's role is expanding all the time at West Point. In January, the Cadet Seminar added a Hayes Micromodem II computerized bulletin board to serve as a resting place for information about the computer scene. This new component, donated by the Mr. Computer store in nearby Wappingers Falls, was put into immediate action.

Apple users interested in buying, selling, or exchanging equipment or merely trading ideas with the computer minded cadets can do so easily. Just call 914-938-2044 and put your Apple on the line. But you'd better warn it first not to be startled by being addressed as "sir." ■

Bob Comstock is executive editor of the Record, *a major daily newspaper in northern New Jersey. Formerly director of information for the state of New Jersey, Comstock pursued journalism at the expense of a promising future as an out-of-work actor.*

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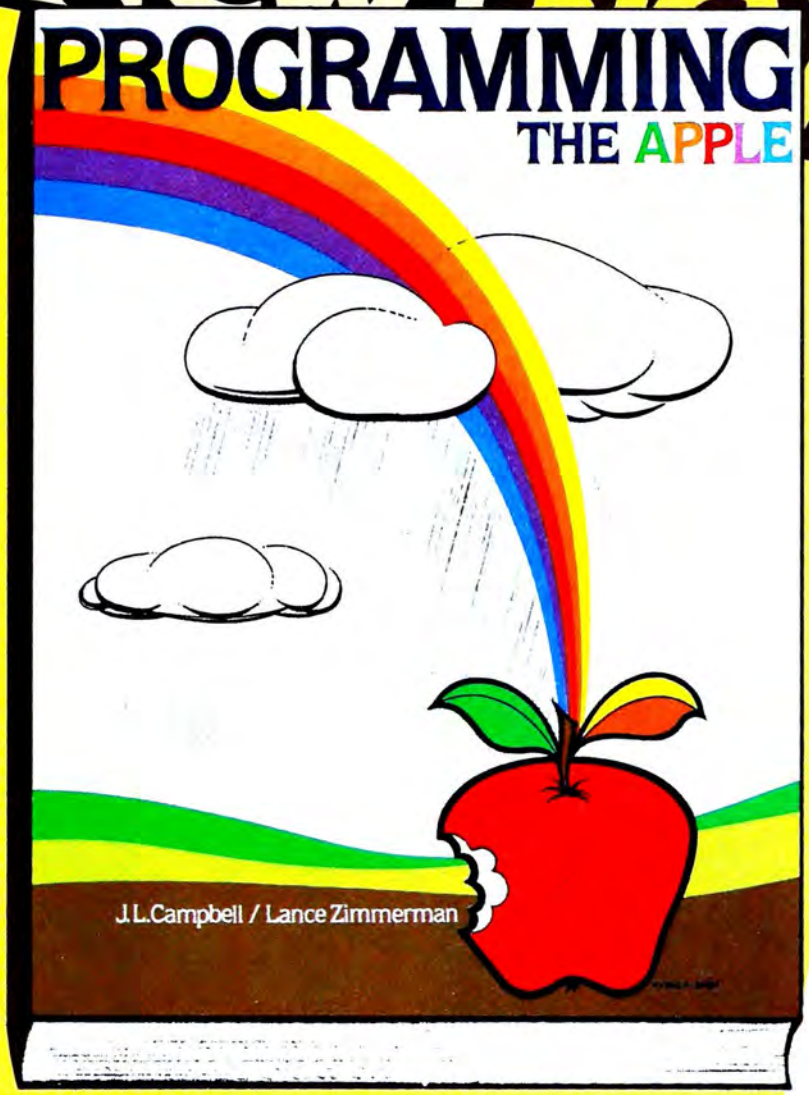
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MARKETALK News

Unless otherwise noted, all products can be assumed to run on the Apple II, Apple II Plus, and Apple III in the emulator mode and to require 48K and one disk drive. The requirement for ROM Applesoft can be met by RAM Applesoft in a language card.

☐ The new *Vision-40* upper/lower case character generator from **Vista Computer** (1317 East Edinger Avenue, Santa Ana, CA 92705; 714-953-0523) will create arbitrary character sets in addition to standard symbols and characters. Various character fonts; on-screen presentation of exactly what will be printed by a special character daisy wheel. $195.95. ☐ The *Vision-80* is a video display card allowing the use of lower-case text with Basic, Pascal, Fortran, CPM, and Assembly language. Includes full ASCII character set; nine-by-ten dot matrix. $395. ☐ The *PROM Development System* simulates PROM from RAM, allowing any new code to be tested within the system before a PROM is burned. Programs 2708, 2716, 2532, 2732, and 48016 EPROMs. On board memory loadable from assembler or disk. $495. ☐ The *Model V1000* dual eight-inch enclosure houses one or two eight-inch single or double-sided disk drive units; will accommodate twenty megabyte streaming tape cartridges and forty megabyte Winchester disk drives; allows sliding extension of inner chassis for access to drives for configuration of options or preventive maintenance. Desk-top or Retma rack mount included. Single side, $1,595; double side, $2,295.

☐ The second annual *Eighty/Apple Computer Show* will be held from April 2 to April 4 at the Statler Hotel in New York City, with over one hundred exhibits of hardware, software, books, magazines, and accessories for TRS-80 and Apple systems on view. IBM, Sinclair, and Atari will also be featured. For information, contact **Kengore Corporation** (3001 Route 27, Franklin Park, NJ 08223; 201-297-2526).

☐ *Micro on the Apple, Volume 2,* including floppy disk with over thirty programs, is the second in a series of books of applications for the Apple from **Micro Ink** (Box 6502, Chelmsford, MA 01824; 617-256-5515). Articles selected from *Micro: The 6502/6809 Journal,* grouped under headings Machine Language Aids, I/O Enhancements, Runtime Utilities, Graphics and Games, Hardware, and Reference. 224 pages. $24.95.

☐ A Pascal database management and reporting system designed for file maintenance and reporting from large databases has been developed for the Apple II and III by **Pascal Systems** (830 Menlo Avenue, Menlo Park, CA 94025; 415-321-0761). *The Data Machine* features maximum file size of 32,767 records, one key field for updating, up to twenty levels of possible subtotalling, batch loading to allow mass update from a sequential input file, more. $750.

☐ *Rendezvous,* a space shuttle flight simulation by JPL senior research scientist Wesley Huntress, will be available in April from **Edu-Ware** (Box 22222, Agoura, CA 91301; 213-706-0661). Features earth liftoff, orbital rendezvous, approach, and alignment and docking with a space station; a precisely timed operation rendered in *3-D Solid Structure Graphics.* Gravitational forces and engine burn govern flight and orbital calculations. $39.95.

☐ *The Index* is an information resource compiling twelve thousand articles, columns, and editorials from nine hundred issues of personal computer magazines of the last six years. Thirty thousand index entries, separate indices for Apple, Atari, TRS-80, and ten others, plus a general index of over five thousand entries. From **Missouri Indexing** (Box 301, Saint Ann, MO 63074; 314-997-6470). $14.95.

☐ A compilation of all articles and program listings from each issue of the twenty major monthly personal computer magazines, *COMPendium* reviews and catalogs by title, author, length, difficulty, computer, computer language, and content. "Adwatch" section lists advertised products by machine and type, and refers reader to magazine containing the full ad. From **Epicurious** (Box 129, Lincolndale, NY 10540). Twelve issues for $18.

☐ *Pegasus* is a user oriented Pascal database management system being marketed by **Powersoft** (Box 157, Pitman, NJ 08071; 609-589-5500). Insert, delete, and modify records, view database, format and print reports, select subset to print or write files to disk files, or perform global editing functions. Allows definition of database; subsets can be used as input to applications programs; all sorting done upon entry of data. 64K, two disk drives, printer. $199.95.

☐ **Instructor Magazine** (757 Third Avenue, New York, NY 10017; 212-888-3400) has put together a direct-mail package by arrangement with **Market Data Retrieval.** *Ad-Vantage* offers advertisers fifteen thousand MDR labels of identified computer users with any one-third or one-sixth page ad throughout the spring purchasing period. $1,280 for one-third page; $875 for one-sixth page.

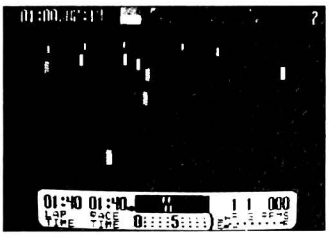
☐ **SSM Microcomputer Products** (2190 Paragon Drive, San Jose, CA 95131; 408-946-7400) has introduced the *I05,* a combination serial/parallel input/output board, offering two asynchronous RS-232 serial interfaces and header selectable

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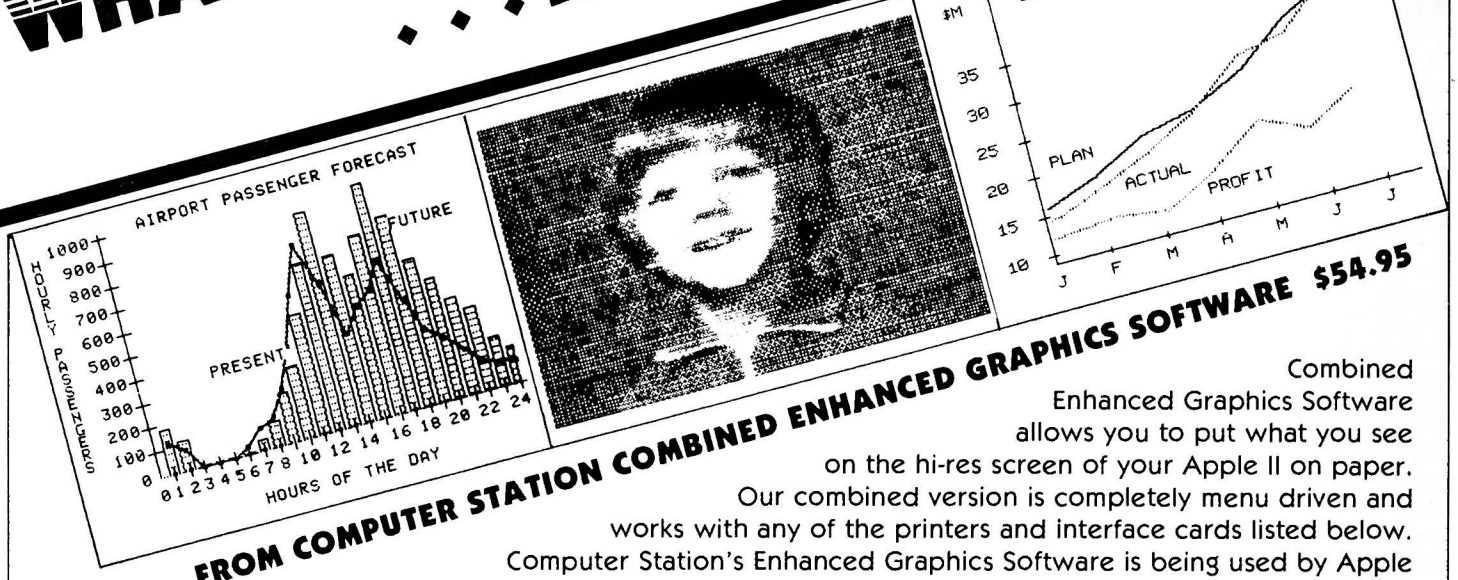
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Anadex 9501/9500
Data South DS 180
Centronics 739
Epson MX-80/MX-100
NEC Spinwriter 5510/5520
NEC Spinwriter 5530
Malibu 200
Diablo 1640
Qume Sprint 5
NEC Spinwriter 5515/5525
NEC PC 8023

INTERFACE CARDS

Apple parallel
Apple Centronics
Apple Serial
Apple Communications
CCS 7720A
CCS 7720B
CCS 7728
CCS 7710 (asynchronous)
MCP - CPS (parallel only)
Epson parallel (with Epson printer)

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variable baud rates, supporting a variety of high-speed serial data transmission devices. Features three parallel ports; data activity monitored via send/receive LED indicators. Multiple interrupt modes, including priority, vectored, daisy chain, and maskable. $329.

☐ *Filewriter,* a menu-driven text and file manipulation system, is now available from **Plum Software** (23492 Belaire Court, Los Gatos, CA 95030; 408-353-4486). Can create data statements in Applesoft, enter and delete records; editing, disk access, alphabetization, more. $24.95.

☐ **Garbo** (1205 West Riverside, Carlsbad, NM 88220; 505-885-6146) is introducing three financial programs. The *Auto Insurance Rating* Program, used with an insurance company rating manual, figures total premium costs based on vehicle and operator information. Computer will enter all rates from each company and give the semiannual payments in the order of lowest priced company to highest. Enter change rates, secondary classifications, limits and bases, and additional charges. Price to be announced. ☐ The *Amortization* program takes principal and interest of monthly payments and prints out installment liquidation. Printer. $50. ☐ *Job Cost II* figures job costs by category, allows multiplication of input for the purpose of checking extension on invoices or number of hours times hourly rate, or allows direct input of single cost. Can estimate new job cost, entering estimated cost for each menu item. Printer. $100.

☐ Designed to aid farmers and small businessmen in figuring depreciation, investment credits, and tax write-offs, *Asset Management and Summary* from **Salba Software** (206 East Cypress, Elmwood, IL 61529; 309-742-8123) adjusts calendar year entires to fiscal year data output, allows setting of percent, dollar limit, and minimum years allowable for special first year depreciation, handles new investment credit, depreciation, and elect to expense laws, with options to adjust to future tax law changes. Up to ten user established basename files to departmentalize filing of schedules. Two disk drives. $140.

☐ **Soft CTRL Systems** (Box 599, West Milford, NJ 07480; 201-728-8750) has released *Format ROM,* an Applesoft word processing system which will ensure that print statements are formatted to predefined requirements before Applesoft outputs to monitor or printer. Will right and left justify, indent and outdent, center text, pause, skip lines, and redefine characters. Print statement formatting and print using routines added permanently to Applesoft commands. Requires ROM board. Either DOS. $49.95.

☐ **Lobo Drives** (354 East Fairview, Goleta, CA 93011; 805-683-1576) has developed a CP/M system for the Apple. *Lobo CP/M* supports all drive types on line simultaneously; can set a specified eight-inch floppy drive in single or double density mode, making the Apple II compatible with the industry standard CP/M. Includes controller interface for the Apple II. Floppy systems from $1,600; hard systems from $3,600.

☐ **Microsette** (475 Ellis Street, Mountain View, CA 94043; 415-968-1604) is adding the *MD-5,* a 5¼-inch disk, to its line of computer and audio cassettes. Features reinforced hub and twenty silver write protect tabs and color coded labels. Ten disks per box. $3.95 per disk.

☐ In *Word Processing, Second Edition,* from **Prentice-Hall** (Englewood Cliffs, NJ), Arnold Rosen and Rosemary Fielden outline the merging of data processing and word processing technologies with networking, projecting the incorporation of user-friendly work stations into more office designs. Productivity tips used by specialists and executives; critical evaluations of equipment, examination of the nature of input/output in word processing systems, and advice for setting up personnel and training guidelines. 416 pages. $18.95.

☐ Designed to give small to medium insurance agencies mainframe data processing capabilities with the cost efficiencies of a microcomputer, the *Series 9000 Insurance Agency Management* system is being distributed by **Lifeboat Associates** (1651 Third Avenue, New York, NY 10028; 212-860-0300). User can code up to 999 types of coverage, store carriers with agency commission for each coverage type, and maintain agency and

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producer files with month, year, and last year-to-date commissions earned. Includes files for claim history and coverage code, and ability to provide detailed or summarized reports. CP/M card. $950.

☐ **Micro-Sparc** (Box 325, Lincoln, MA 01773; 617-259-9710) announces the release of *Directory Master,* a machine language utility allowing direct customizing of disk catalog. Disk headers and titles may contain normal, inverse, flashing, and/or control characters; files may be sorted alphabetically, reordered, locked, unlocked, or deleted; deleted files recovered. All changes written directly to disk, eliminating need to *init* new disk and create extra *poke* files. Specify DOS. $39.95. ☐ *LexiCom* is a word processing utility that converts Supertext files to Applewriter and vice versa, Supertext or Applewriter files to standard Apple text files, and standard sequential text files to Applewriter or Supertext format. $49.95. ☐ *AmperSoft,* a system for Apples with RAM cards, moves DOS into the RAM card, increasing usable program memory by approximately ten thousand bytes. Utility packages accessed with ampersand (&) include *print using, sort, store/recall, matrix,* and *directory.* Includes relocated version of Integer Basic; patches to popular utilities. $59.95.

☐ Allowing a wide range of users to handle mathematical applications without the need for programming or computer knowledge, *MatheMagic* is a software product that transforms the Apple into a programmable calculator with the power and facilities of a computer. Free-form entry up to two hundred forty characters, formulas within formulas, built-in mathematical functions, disk storage of user-defined formulas and variable sets, chain calculations, full hard copy support including trace function, more. From **ISM** (Suite 421, University Building, 120 East Washington Street, Syracuse, NY 13202; 315-474-3400). $69.95.

☐ Giving readers a historical perspective on the development of computer-related curricula in higher education, the **Association for Computing Machinery** (1133 Avenue of the Americas, New York, NY 10063; 212-265-6300) has published *ACM Recommended Curricula for Computer Science and Information Processing Programs in Colleges and Universities,* an anthology of eight curriculum reports prepared since 1968 by various curriculum committees of ACM. The individual reports provide suggested texts and references, representative career paths, and specialization tracks. 192 pages. $15 for ACM members; $20 for non-members. ☐ Also available: *Recommendations and Guidelines for Vocational-Technical Career Programs for Computer Personnel in Operations;* 120 pages. $16. ☐ *A Model Curriculum for Doctoral-Level Programs in Health Computing;* 88 pages. $12. ☐ *Recommendations for a Two-Year Associate Degree Program in Computer Programming;* 30 pages. $10.

☐ **International Resource Development** (30 High Street, Norwalk, CT 06851; 203-866-6914) has published *Software Intensive Portable Products,* a report on marketing strategies in the future development of electronic clipboards, educational toys, hand-held computers, and related products. Ten-year forecast, market elasticity and catalysts for expansion, economics of software development, distribution, protection and maintenance. 189 pages. $1,285.

☐ *Plexa-Lok* is an acrylic snap-on keyboard protector from **Last Electronics** (Box 1300, San Andreas, CA 95249; 209-754-1800). Leaves air vents free. $19.95.

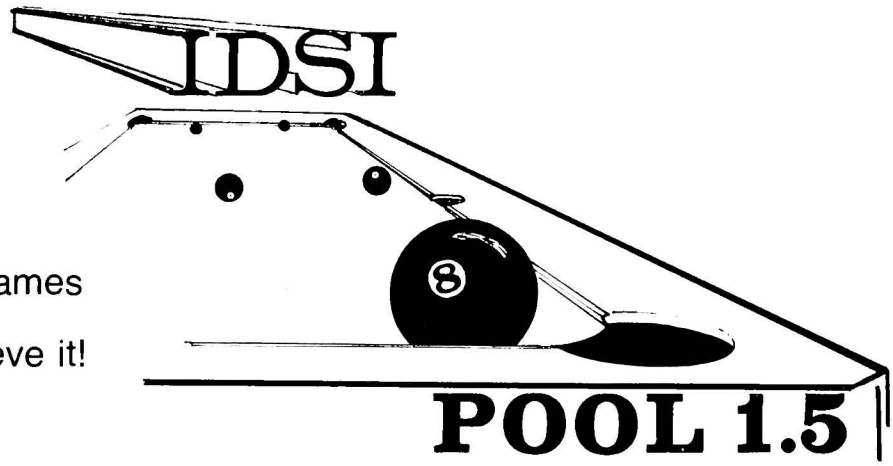
☐ A new family of hi-res in-line color CRTs is now available from the electronic components division of **Panasonic** (One Panasonic Way, Secaucus, NJ 07094; 201-348-5278) in nine-inch, twelve-inch, thirteen-inch, fifteen-inch, and nineteen-inch sizes. New overlapping field lens decreases separation between the three electron beams in the gun, increasing effective resolution. Standard B-10-277 base, pre-converged CRT/deflection yoke, internal magnetic shield, high-density shadow mask for graphic or alphanumeric display; custom phosphors available for special display color requirements. $300 to $600.

☐ **Southwestern Data Systems** (Box 582, Santee, CA 92071; 714-562-3670) has initiated a *First on the Block* program for its

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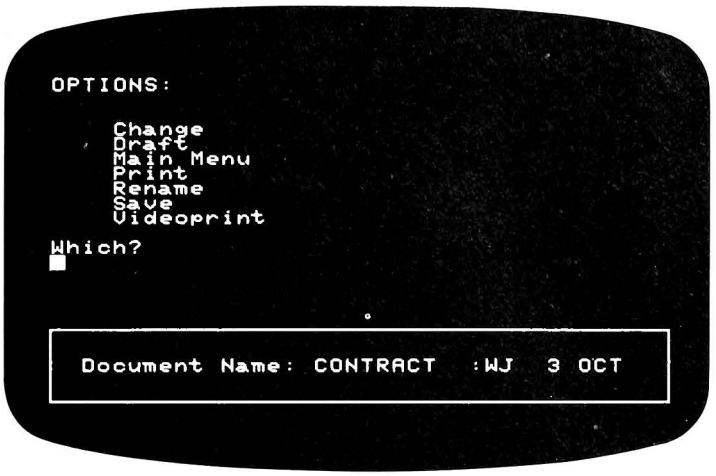
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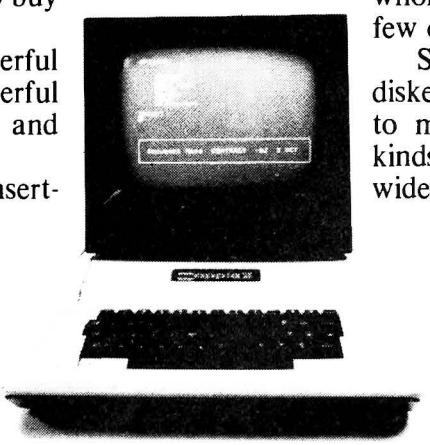


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dealers, featuring priority shipping on all new product releases in keeping with their no-charge return policy, and discounts allowing purchase of the first copies at greater discounts than usual. ☐ Among these new products is Bill Blue's *The Professional* series, an update of his original *Z-Term* communications package. The new *Professional* series consists of *Z-Term,* designed for the CP/M environment, *P-Term,* a Pascal version of *Z-Term:Pro,* and *ASCII Express.* All support originate and answer modes and eighty-column boards, and feature interactive macros. *Z-Term* users will be notified of prices; ASCII users inquire. ☐ Also from **SDS:** *Mastertype,* a typing tutorial that is also a hi-res game. Waves of enemy words attack throughout seventeen lessons. $34.95. ☐ *Norad* requires you to defend the continent against a high speed, hi-res nuclear onslaught. $49.95. ☐ *Merlin* is a macro-assembler for the novice and experienced programmer. Editor supports eighty-column and RAM cards. Package includes *Sorcerer,* generating pseudo-source code from raw binary object files, plus labeled and commented Applesoft source listing. $64.95. ☐ *Munch-A-Bug* is a full-feature assembly language programming utility featuring many new options to aid in the task of debugging. $49.95. ☐ *Doubletime Printer,* the first true print spooler, enables the Apple II to print files while simultaneously performing a program. Prints text and binary files, as well as Applesoft listings. Includes modified F8 ROM and an interrupt driver interface card. $149.95. ☐ *The Printographer,* a hi-res printing utility, includes picture cropping, inverse inking, horizontal or vertical printouts, and multiple magnifications. Works with any graphic printer. $49.95.

☐ *MiniMega,* a 5 ¼-inch hard disk and floppy backup, is the latest hard disk subsystem from **Santa Clara Systems** (560 Division Street, Campbell, CA 95008; 408-374-6972), enabling Z80 CP/M on the Apple II. Includes error correction coding and an onboard microprocessor allowing Apple's cpu to function independently. Includes controller, host adapter, operating software, power supply, cable, cabinet, and instructions. Stand-alone 5 megabyte, $3,495; with 1 megabyte floppy backup, $4,224. Stand-alone 10 megabyte, $3,995; with floppy, $4,495.

☐ *MIT Logo* is now available for the Apple II from **Krell Software** (21 Millbrook Drive, Stony Brook, NY 11790; 516-751-5139). Features Beaver Graphics and Instant Logo Tutor Package. 64K. $179.95. Memory expansion board, $130.

☐ *Computicker* is an electronic communications board and a set of software programs that allow the user to harness the Apple to the New York Stock Exchange's Network "A" tape. Set of commands controls format and content of real-time ticker display. Broad tape of all recent trades; focused tape updates chosen stocks; selective tape allows active trading and queries for current trading information on selected stocks. From **Wall Street Software** (71 Murray Street, New York, NY 10005; 800-221-2486). $490.

☐ *Micro Golf* is a multiplayer, three-course golf simulation from **Creative Computing** (39 East Hanover Avenue, Morris Plains, NJ 07950; 201-540-0445). Built-in handicap system; course editor allows user to design own course. $19.95.

☐ Three programs—a textile utility, a subroutine library system, and a blackjack tutor—have been introduced by **Pear Software** (407 Terrace, Ashland, OR 97520; 503-482-8122). *The Manipulator* is a database tool enabling the user to print custom documents and labels or read and write random access or sequential text files. File search; data in memory may be read, switched, added to, subtracted, fixed, changed, and written. $34.95. ☐ *The Liberator* features single keystroke selection for add/delete routines, change routines, or select routines; catalog/program transfer interface and full calendar function. Programmer's aids and charts. $29.95. ☐ *The Count* teaches basic strategy for playing, betting, and card counting in blackjack. Minimizes the house edge; modifiable for different game conditions, double downs, pair splits, and insurance rules. One to six decks. $24.95.

☐ **Computer Town Barrington** (322 West Lake Street, Barrington, IL 60010; 312-658-4710) is sponsoring *The Computer*

Micro Co-op

Information about Apple software

Over a thousand Apple owners already belong to the largest software co-operative in the world. In Micro Co-op's bi-monthly newsletter our experts review and compare the latest software packages available for the Apple, keeping you up to date on the newest developments in applications, simulations, utilities, education, and gaming. In addition to our opinions, compilations of member surveys let you know how others rate software AFTER they've purchased and used it; information that will help you save money. You can also buy almost all your software through the co-op at special member prices, because we purchase in quantity as a group. The co-op has also just installed a toll-free ordering number for members. Some of the publishers whose products we regularly keep in stock for immediate service are Adventure International, Aurora Systems, Automated Simulations, Avalon Hill, Brillig Systems, Broderbund, Budgeco, California Pacific, Cavalier, CE Software, Continental, DataTransforms, Datamost, Datasoft, Delta, Denver, Edu-Ware, Gebelli, Hayden, Highlands, Howard, Infocom, Innovative Designs, Information Unlimited, Interactive microware, Lazer Systems, Link, LJK, Masterworks, Micro Lab, Micro Pro, Microsoft, MUSE, Nikrom, On-Line Systems, Penguin, Personal, Picadilly, Phoenix, Progressive, Quality, Riverbank, Sensible, Sentient, Sierra, Sirius, Sir-Tech, Softape, Software Publishing, Southeastern, Southwestern Data, Stoneware, Strategic Simulations, Sub Logic, Synergistic, TG Products, United, and Voyager.*



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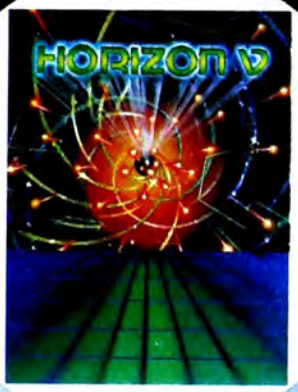
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Introducing a new concept in computer games . . . the real-time adventure. As a secret agent working for the DIA, you must recover the stolen LX missile plans before foreign agents can smuggle them out of the country hidden in a duck. By Eric Knopp and Alan Merrell, requires 48K Apple II or II+ with disk drive.



FIREBIRD

An exciting new arcade game by the master of Apple animation: NASIR. PIGGO, the fearless firefighter, battles blazes left in the fiery wake of the incredible FIREBIRD. Requires 48K Apple II or II+ with disk drive.

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Challenge: A Revolution in Classroom and Home, March 13, 1982, at the Barrington High School. Speakers, demonstrations, and exhibits will be featured, emphasizing educational topics and home-use subjects. Registration fee deadline March 5. $15.

☐ **Software Distributors** (9929 West Jefferson Boulevard, Culver City, CA 90230; 213-204-6620) has inaugurated a quantity one pricing policy for dealers purchasing professional, business, or entertainment software packages, allowing them a greater profit margin than near-retail prices. Return/refund guarantee.

☐ Providing the equipment interaction isolation and power line protection of their line cord series, *Isolator,* from **Electronic Specialists** (171 South Main Street, Box 389 Natick, MA 01760; 617-655-1532) is a direct unit that plugs directly into the wall socket. Two channels; maximum 1,875 watt load, 1,000 watts per socket. $96.95.

☐ The *Smart Anagraphics,* or *Securities Market Analysis, Reporting and Transaction* system, designed to perform analytical, graphic, account monitoring, and decision support tasks in a desk top system, is available from **Software Resources** (186 Alewife Brook Parkway, Cambridge, MA 02138; 617-497-5900). Anagraphics consists of an analysis and graphics section, with communications, statistics, and account monitoring optional. Graphics module creates charts, overlays plots on the same graph with separate scaling, and shows two graphs on the screen simultaneously; statistics section calculates maximum, minimum, mean, and standard deviation statistics, variance of a data series, and correlation and variance/covariance matrices of a number of series. Communications mode allows daily updating of files, retrieving market and price data over phone lines. Account monitoring maintains account positions in portfolio and links them to market/price data. Features one-button computational functions, automatic charting, and macro control to reproduce a chart using other variables. Modem, printer, and two disk drives required for communications option. First year license fee, $1,400; annual fee, $850.

☐ **High Technology Software** (Box 14665, 2201 N.E. 63rd Street, Oklahoma City, OK 73113; 405-478-2105) has announced *The Tool,* programming software that streamlines the validating, formatting, user input storing, and screen editing aspects of Basic programming. Features entry screen generator, database manager, and report formatter. Fifteen field validations and formats; files may span multiple disk drives. $395.

☐ In response to the health concerns arising from extended exposure to cathode ray tubes, **I-Protect** (301 North Prairie Avenue, Inglewood, CA 90301; 213-673-1587) is marketing a tinted six-millimeter sheet of leaded acrylic for home computer users, video game players, and professional terminal operators. Attaches to TV or monitor with custom velcro fastners; reducing glare and putting invisible sheet of lead in front of CRT. On-site installation and customizing, various sizes and quantities. From $49.95.

☐ **Hewlett-Packard** (1820 Embarcadero Road, Palo Alto, CA 94303; 415-857-1501) signals its entry into the small-format plotter market this month with the release of the *HP 7470* pen plotter. The plotter utilizes low-inertia pen- and paper-moving technology to give hard copy capability to small computers and control systems. Features two-color capability, hi-res plotting, and plotting speed of fifteen inches per second. Business, scientific, and technical applications; conversational graphics software available to drive the plotter. $1,550.

☐ An integrated accounting system with inventory, accounts payable and receivable, general ledger, payroll, and database, *Systems II EX* is now available from **Westware** (2455 S.W. 4th Avenue, Ontario, OR 97914; 503-881-1477). Generates balance sheet and income statement with percentages, general ledger report with date, reference number, debits and credits, and general journal listing with a thirty-character description field for manual entries. 5¼-floppy, $1,495; 5 megabyte Corvus, $1,595; 10 megabyte Corvus, $1,695.

☐ *Station Master* is a universal parallel card with printer

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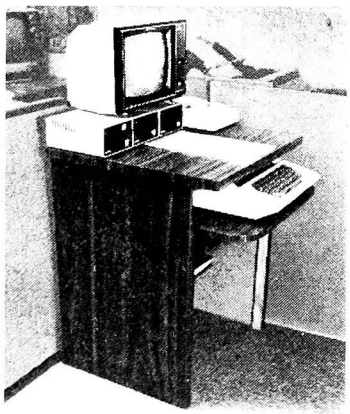
A computer has a knack for speeding the hands of the clock. It's also true, those hours of concentration at the keyboard are most of the fun. But an aching back resting on a tired "*" could reduce your creativity and enjoyment.

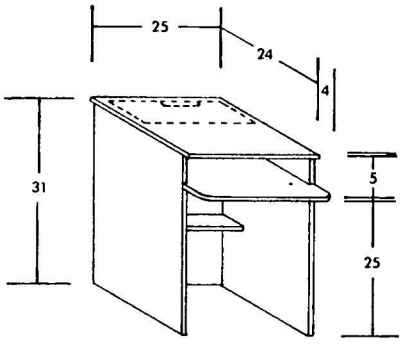
The solution...the new Basic Comfort II computer desk. Designed by a dedicated computer hobbyist, the Basic Comfort II was built to be a pleasurable workhorse. The top accepts the usual peripherals — disk drives, small printer and CRT — and leaves about two square feet (15"x25") in front of you for read'n and writ'n and all those good things. The keyboard shelf is 25" above the floor and that places your "left arrow" where your fingers like to be. At about 3 in the morning, just slide your Apple forward taking advantage of the "dust cover" feature.

Proper venting is built in, and your tangled web of ribbon and wires has its own "rat's nest" area. There's also an inconvenient shelf (actually a structural-support-turned-shelf) in the knee hole for those items you don't mind storing in an awkward but accessible location.

Finished in woodgrain (walnut or light oak) high pressure mica laminate, Basic Comfort II is rugged (70 lbs.) and it looks so good that your Apple may find itself in a place of honor.

Slip into something comfortable for computing. Send $169.00 check or money order, today. (Fla. residents add $6.76 tax.) Mastercharge or Visa accepted, card customers may phone for prompt shipment. Shipped motor freight, collect, fully assembled. FOB Daytona Beach, Florida.





NOTE: BASIC COMFORT II IS NOT FUNCTIONAL WITH APPLE III OR OTHER UNITS OF INTEGRAL KEYBOARD-CRT STYLING. NEW APPLE II DISK DRIVES HAVE SHORTER (13") RIBBON CABLE. THIS WILL REDUCE YOUR UTILITY SURFACE (WRITING DESK) TO APPROX. 12" x25".

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☐ **Gryphon Microproducts** (Box 6543, Silver Spring, MD 20906; 301-946-2585) has whelped a litter of *PUPs*, user friendly Pascal utility programs for the Apple. *Pup 1* moves Basic files to Pascal disk, produces printer-formatted listings of Pascal text files, and sets the system date at boot; *Pup 2* moves Pascal text files to Basic disk, displays and modifies any byte from a Pascal or Basic disk; *Pup 3* moves CP/M files to Pascal, displays and modifies any byte from a Pascal or CP/M disk; *Pup 4* is a collection of subroutines, including source code. Collectively will allow use of Pascal editor with Apple Basic or CP/M programs and use of Basic modem to transfer Pascal files. Each, $39.95.

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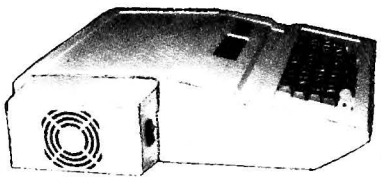
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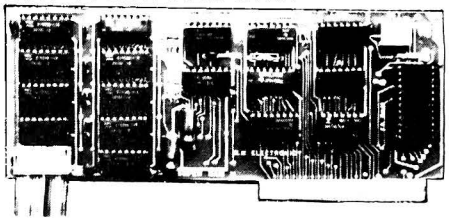
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☐ *The Spooler,* software for *The Pascal Speedup Kit* from **Stellation Two** (Box 2342, Santa Barbara, CA 93120; 805-966-1140), allows the user to continue using the Pascal system while concurrently producing printed reports. Disk and printer must be in "ready" status while program is executed. Works with any printer or interface card; printing task can be killed and restored or monitored for pages remaining to print. Requires the Mill. $45.

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When you turn your computer on, the speaker beeps, the screen shows the Apple II logo, the disk drive comes to life, the disk operating system gets loaded into RAM from whatever disk happens to be in your drive, and some program—the so-called boot or greeting program on your disk—gets run. What does all this mean? In particular, what do we mean when we say that the computer "runs a program"? What's a program and how do you run one?

The next few columns are going to be devoted to general concepts about programs and programming. We're not going to get into programming techniques, since there are several columns in this magazine that do a superb job of teaching programming in various languages. Instead, we'll describe the different languages available on the Apple and deal with notions that apply to programming in any language.

When your computer is on but apparently in idle, when you're looking at that familiar right-hand bracket and your Apple appears to be waiting for instructions from you, you're actually running a program. That program is called the Applesoft Interpreter or the Basic Interpreter.

There are a good many things you can do while running the Basic Interpreter. For example, you can type *print 42*3.79-sin(.5/tan(.75))* and as soon as you hit return you'll see the product of 42 and 3.79 raised to the power of the sine of half a radian divided by the tangent of three quarters of a radian, expressed to a precision of seven decimal points. From the perspective of human experience, this response from the computer occurs instantaneously.

But you could accomplish the same thing with many pocket calculators. It might be a little more awkward—you might have to go through several distinct steps and look at intermediate results—but still you could get the same answer in almost the same amount of time. So what distinguishes a computer from a calculator?

Putting Three and Three Together. Well, while running your Apple's Basic Interpreter, you could also type *print "My name is Jonathan Apple."* In a flash when you hit return, you'll see that sentence—the letters between the quote marks—repeated on your screen. That's something you couldn't do on many calculators.

You could also ask your Apple to *print* 3 = 3 and you'd get a one in reply. The number one in this case is the Basic Interpreter's way of telling you that it has evaluated the proposition 3 = 3 and found it true. If you typed *print 3 > 3*, you'd get a zero on your screen, meaning 'tain't so.

The numbers zero and one in response to a proposition like 3 = 3 are called *Boolean values.* Your computer has the ability to evaluate the truth or falsity of propositions according to the rules of what's called Boolean logic, and this capacity enables it to make judgments and vary its behavior according to whatever exigencies arise.

What if you type *10 print 3 = 3* and hit return? Nothing at all happens except you get another Applesoft prompt. When you type *run* and hit return, however, you'll get a one again.

When you type commands that are not preceded by a number, you are said to be using your computer in immediate execution; and you get an immediate response from the computer. When you precede your order with a number, you are said to be operating in the deferred execution mode, so named because the order doesn't get carried out until you type *run.* If, before you type *run*, you have entered several instructions preceded by different numbers, they'll all get executed, in ascending order according to the numbers you've given them.

This activity—typing numbered instructions and executing them in sequence with the *run* command—is what's called programming. Or rather, it's one kind of programming.

The Proper Ambience. Remember we said that when you were looking at the Applesoft prompt you were actually running a program called the Applesoft or Basic Interpreter. When you run a program in Basic, like our humble little *10 print 3 = 3,* you're still running the Basic Interpreter. Actually, you're running an applications program within the context or environment of a systems program. The Basic Interpreter is a systems program; the programs you write in Basic and the ones you buy on disk to do all sorts of useful, entertaining stuff for you are applications programs.

The Basic Interpreter falls into the general category of systems programs called programming languages. That means it's a special kind of systems program designed to facilitate the writing and execution of applications programs. Other kinds of programming languages that can be run on an Apple II include Integer Basic, Pascal, Forth, Pilot, Cobol, Microsoft Basic, Fortran, Logo, and Lisp. There are others, too. Some of these languages require that additional hardware be added to the standard Apple II Plus. We'll describe the more popular languages and discuss their hardware and software requirements eventually.

Languages are not the only kind of systems programs. Disk operating systems, like DOS 3.2 or DOS 3.3, constitute another important category. DOS 3.3 is the system most widely used by Apple owners at the moment, although the UCSD Pascal System is becoming more and more popular and there's a fair-sized contingent who run their Apples primarily in an operating system called CP/M.

The function of the disk operating system is to control any kind of functioning involving the floppy—or hard—disk drive. That includes such things as interpreting and executing commands to show what files are on the disk, arranging the physical layout of data on the disk, creating or deleting files, moving files from one place to another, and so on.

A Basic Working Relationship. If your turn on your machine with the DOS 3.3 System Master disk—or another disk initialized with DOS 3.3—in the drive, a body of code making up the operating system gets loaded from the disk into memory. There it cooperates with the Basic Interpreter.

Once DOS gets into memory, it acts like a censor reading the mail addressed to the Basic Interpreter. It scans everything you type at the keyboard to see if your messages are intended for it instead of for the interpreter. So, if you type a command like *catalog* that DOS recognizes as one of its own, the Interpreter never sees it; DOS just goes ahead and executes the command.

DOS and the Basic Interpreter could be said to work cooperatively. DOS gets first priority, but passes on to Basic any messages it doesn't recognize. If you don't happen to have a disk drive, or if DOS doesn't happen to be in memory, Basic will get along fine. It just won't know how to do anything involving the disk. Type *catalog* in that situation, for example, and you'll be charged with a syntax error.

As a side point, if you have DOS in memory and you type *catalogit*, you'll get a syntax error message from DOS. The operating system will find in the first seven letters of your message a match to its own vocabulary, so it will nab the command; then it will complain about those extra keystrokes. If, on the other hand, you type *catalarge*, DOS will look at the sixth character, say, "Nope, this ain't mine," and pass the word to Basic. Basic will look at it and say, "No friend of mine, either" and issue its own error message. When you make a syntax error, you can tell who's complaining because Basic puts a question mark before the error message and DOS does not.

The situation that prevails with Applesoft or Integer Basic and DOS, where the operating system and the language essentially sit side by side, although the operating system gets the first look at incoming mail, is a little unusual. It's more common that the operating system is so essential to the language that the language won't perform without it. You might say that the operating system creates the environment in which the language can function, much as the language creates the environment in which your application program can be written and run.

This is one of two reasons why the choice of an operating system has so important a bearing on the things you can do with your computer. If you want to run Pascal or Apple Fortran, you have to have the Pascal operating system. If you want to run Microsoft Basic or Microsoft Fortran, you have to have CP/M.

The other reason is that the operating system governs the way data is stored on disk. If you want to read a program created under CP/M—in the CP/M environment, as they say—and your Apple is expecting to find data on disk laid out in the manner of DOS 3.3, you're going to get a plague of I/O errors. That's also the reason why the stuff written for Brand X computer won't run on your Apple. The program for that foreign devil may be written in a version of Basic very similar to Applesoft, and if you could get it loaded into memory you could modify it easily enough to run, but the difference in operating systems makes the alien disk unreadable.

The Power Behind the Throne. There's one other important systems program that affects your everyday activities with the Apple, and that's the System Monitor. Most of what the Monitor does happens behind the scenes, in a sense; you don't interact with it in quite the same way you do with DOS or the Basic Interpreter, unless you happen to write your programs in assembly language.

The Monitor controls your machine from the moment you turn it on. It's responsible for that first beep from the speaker, the appearance of the Apple's name on the screen, and the booting of DOS. Once all that has been accomplished, the Monitor passes control over to the partnership of DOS and the Basic Interpreter, but it remains at the ready, available on command. All you have to do is execute a *call -151* command from Basic and the Monitor's asterisk prompt will appear.

The Monitor's functions can be broken down roughly into two categories. First, it provides a tool for manipulating memory. When you're talking to the Monitor—that is, when you're looking at that asterisk prompt—you can inspect the contents of any location in the Apple's 65,536-byte range of memory addresses. You can put any value between 0 and 255 into any of the first 48K of addresses (you can't alter the upper 16K because those addresses are located in ROM), and you can move large sections of memory from one set of addresses to another.

So the Monitor provides a tool for the direct manipulation of the contents of memory. You can also inspect and manipulate memory from Basic, via *peek* and *poke* statements, but it's

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less convenient to do it that way; in Basic you can only read or write to one address at a time.

The other aspect of the Monitor's function is the introductory one; it provides a library of routines that perform rudimentary operations—things like beeping the speaker, putting characters on the screen, clearing the screen, and so on. If these routines were not available as a prepackaged body of instructions permanently stored in the Apple, a programmer would have to re-create the code every time he wanted to do one of these fundamental operations. Even the Basic Interpreter uses the Monitor; when you execute a Basic command like *home*, the Interpreter momentarily passes control of the machine over to a certain portion of the Monitor program, which clears the screen and returns control to the Interpreter.

So now it appears that when you run a program in Applesoft you've got an applications program running in the context of a language program with the cooperation and support of both a disk operating system and a system Monitor. All of these things—applications program, language, operating system, Monitor—can properly be called programs. So what's a program?

A program is a set of instructions to the 6502. So what's an instruction?

What 6502 Means to You. While your computer is on, the 6502 is constantly scanning its range of memory addresses, fetching the contents of memory locations into its own internal registers—holding areas—and examining those contents. Each memory location holds an eight-bit binary number. Some of those binary numbers have the effect of causing the 6502 to perform some action; these numbers are called *opcodes, operands,* or just instructions.

The fact that a certain binary number—a certain pattern of ones and zeros held by a memory address—causes the 6502 to do something it wouldn't otherwise do is determined by the structure, or architecture, of the microprocessor. To say it another way, the instruction set of the microprocessor is hard-wired into the chip.

The kind of things that the opcodes tell the 6502 to do are very elementary—things like load a certain value or the contents of a specified memory location into one of the internal registers, add the contents of two registers, or compare two values. Nothing here so complicated as the Basic print statement.

All the simple things, in fact, that we take for granted from our computers have to get broken down into myriad rudimentary steps. The 6502 only does one miniscule thing at a time; of course, it does those things in a great hurry, and that's its principal value to us.

Adding two and three and putting the results on the screen would be done in something like the following manner: the value two would be loaded into one of the 6502's registers. Then the value three would be loaded into another register. Then the contents of the two registers would be added, and the sum would be deposited back into one of those two registers. Finally the contents of that register would be copied into the appropriate address in the area of memory that governs text output to the screen.

Each of these steps would have to be ordered up by its own opcode. And the values two and three would also have to be somewhere in memory where the 6502 could find them.

This raises another question. Memory contains both instructions and the values upon which instructions are carried out—both operands and data. How does the 6502 distinguish between them?

It tells by context. When the processor reads the instruction 00100000 (hex 20), for example, it knows that the following two bytes of memory will hold not another instruction but, rather, the data on which opcode 00100000 is to be carried out. Those next two bytes are sometimes said to comprise the argument for opcode 00100000. Some opcodes require no argument; others take one byte, and still others, like 00100000, require two. The processor knows which is which. It also knows—by keeping track of what it's doing—when 00100000 is not an opcode at all, but a datum or argument for some other opcode.

Getting back to the question of what a program is, one way to answer would be to say that a program is the sum of all the opcodes and arguments in memory at any given time—in other words the entire contents of memory. By this kind of definition there could be only one program in memory at a time, and, in fact, from the 6502's point of view, that's exactly the case.

Class Distinctions. Since the Monitor, the operating system, the interpreter, and your applications program are functionally and conceptually—to human minds—distinct, it's customary to consider them as separate, cooperative programs. And, in normal speech, the word is used only to designate your applications program—the set of code that's actually doing some useful work for you.

Instructions and data that are put into the computer's memory by you, either by your writing a program or by your loading one in from disk or tape, are called *software.* The implication is that they are temporary residents of memory and are not essential to the functioning of your computer. DOS is also a piece of software, since you have to load it in from disk.

The System Monitor and Applesoft Interpreter, on the other hand, belong to a different class of programs, called *firmware*. What's firm about them is that they are permanent residents of memory, so long as you don't pull out or physically alter the eight ROM chips on your motherboard. It's possible to have other programs in firmware as well; you can buy a ROM card to sit in one of your peripheral slots, and you can get equipment that will burn your favorite programs into ROM chips that you can then plug into that board.

The term *hardware* is reserved for the physical components of your system—the chips and connecting circuitry. By extension you could also refer to the processor's microcode—the set of primitive instructions that govern its activity—as hardware, since those instructions are determined by the physical architecture of the processor chip. ■

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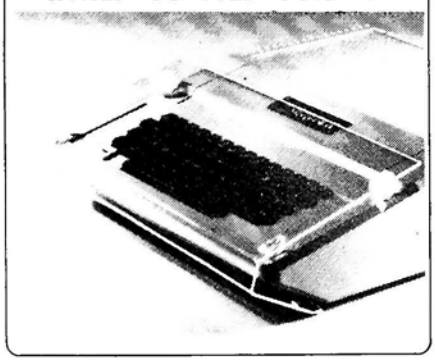
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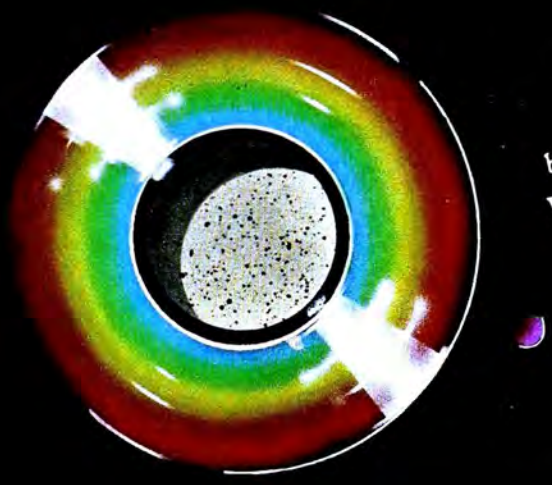
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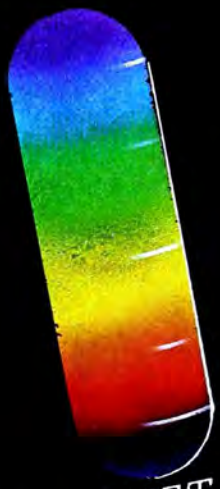


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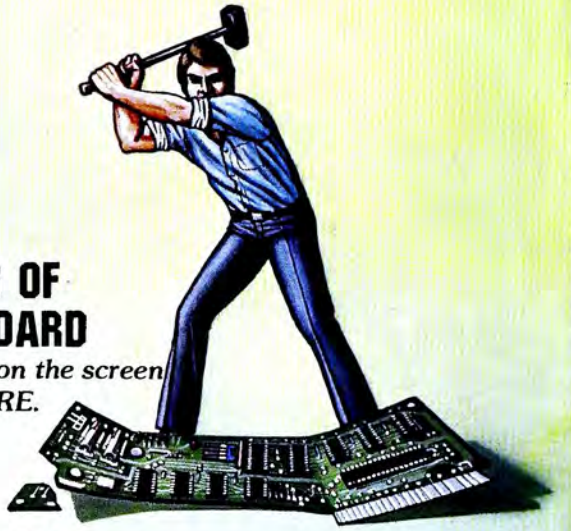
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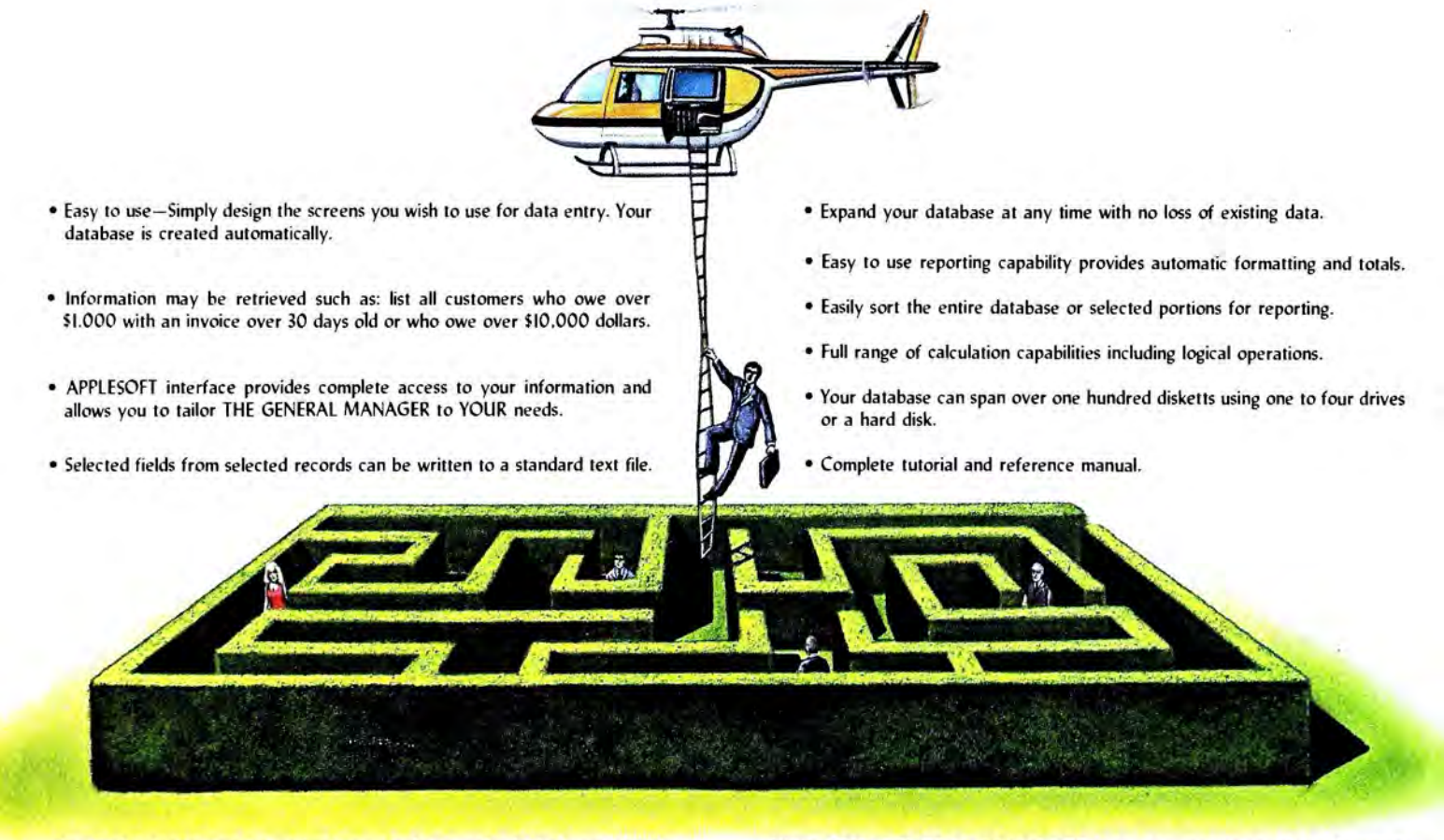
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MARKETALK

Reviews

Unless otherwise noted, all products can be assumed to run on the Apple II, Apple II Plus, and Apple III in the emulator mode and to require 48K and one disk drive. The requirement for ROM Applesoft can be met by RAM Applesoft in a language card.

Zork II. Sequels in microcomputing entertainment have, for the most part, escaped the fate of their counterparts in film and literature. Perhaps the relevant question about *Zork II,* however, is not how it managed to equal and possibly even surpass its predecessor, but how either *Zork* or *Zork II* managed to stand alone.

That's because *Zork, Zork II,* and the expected *Zork III* are children of the mainframe *Zork,* a single adventure that's been cleverly cleavered by Infocom into three parts in order to fit on the microcomputer.

Regardless of its past or its predecessor, *Zork II* is a delight to play. A text adventure, it is of the high quality, logic-loyal wing of that genre, populated only by such gems as the original *Adventure, Zork,* and *Cyborg*. Where *Cyborg* reached—and retains—the mountaintop in terms of plot and integration of player with adventure, *Zork II* joins *Zork* as the ultimate in text adventuring technique and communication.

The people at Infocom clearly do not like to speak in monosyllables and two-word phrases, and they don't expect you to either. Both *Zorks* will listen to anything you have to say, and, as long as you obey one or two Zorkal rules of grammar (no complex sentences, no conditionals, for example), they're likely to understand you.

You can tell *Zork,* "Get the box, the bucket, the pearls and the globe then open the box then examine the box and the bucket. Walk north then tell the robot 'Push the round button then walk south.' Walk south. What is a grue?" You'll end up with all the things you requested, in the same room where you started, having been north to fetch the robot, who will have pushed the proper button. And you'll know what a grue is, for whatever that's worth.

Little things are convenient in Infocom's games. For example, the Apple editing diamond has not been disabled, so if you want to repeat a command or correct one, you simply escape-I J or K to the spot and arrow over what you want to repeat. Saving is easy in any case, but if you're using two drives it's extremely quick and laborless. And you can save eight different games at once; default is always the last one you saved. Disk access is so well done that you'll never notice it.

The plot in *Zork . . .* isn't. Or at least it's peripheral. A story it's got, but it's mostly a series of loosely connected events. Some relate to each other, but many are there just for the puzzles they afford and the general flavor they add to the adventure. None is out of place, and they're superior puzzles yet all very logical.

Where *Zork*-the-first was very reminiscent of the original *Adventure, Zork II* somehow escapes the mold. It is fresh and interesting. Yet the conquerer of *Zork* will recognize landmarks from time to time. As in *Zork,* the adventurer can't depend entirely on shank's mare. There's no raft in *Zork II;* look for a means of travel far more esoteric.

You do not need to have played *Zork* to play *Zork II*; but, if you haven't, you're apt to want to pick up the first *Zork* after the fact. MCT

Zork II, Infocom (55 Wheeler Street, Cambridge, MA 02138; 617-492-1031). $39.95.

Photar. By Steve Baker. It's been a very long time in microcomputer industry terms since Softape, one of the first two publishers of software for Apples, published a really good game. In the old days, Softape had Bob Bishop, whose experimental games seemed eons ahead of anyone else graphically. But Bishop left Softape, and technique caught up with Bishop, and Softape faded. Bill Depew's *Apple-21* kept them going; then the word processor *Magic Window,* from their sister company Artsci, made them well. But new games died and old ones, well enough executed, just weren't what people wanted anymore.

Steve Baker had published much through Softape. His *Microgammon 2.0* is still one of the two best backgammon games on the market by far and the most fun to manipulate, but backgammon is not the rage it was a year or two ago. Now, gamers want fast action, arcade-style, in the home-type games. Baker began trying, but the extra spark that makes a hit was never quite there. He kept trying, and so did Softape, never quite giving up on each other.

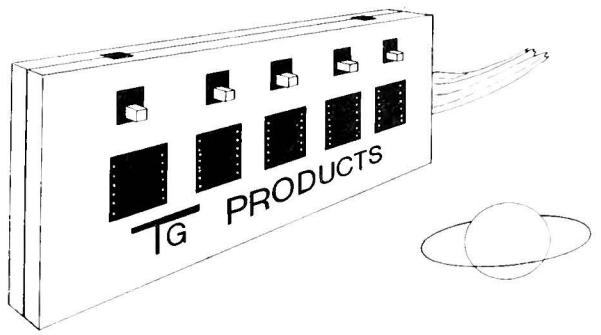
Photar may be the payoff. It's fast, it's active, it's varied, it's fun.

The game is best played with a joystick, letting your space ship move throughout the bottom third of the playing area. Throughout the area are stationary meteorites that you can destroy with several shots. Groups of—what? stars? Saturn's rings? who cares?—enemies float in, breaking formation to weave down one row at a time to collide with and kill you. These are little, pesty creatures who can hide behind the meteors and appear from behind new, low-hanging meteors just above you. If they do make it to the bottom, move up—they'll

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*Applesoft is a registered trademark of Apple Computers, Inc.

turn around and start weaving toward the top in the same way. When you shoot them, they become meteors.

Far more dangerous are the black holes that fly in erratic patterns at crazily varying speeds, always in the same area you're limited to. They are after you, one at a time, and they're very hard to avoid. They're also worth good points if you can get them. From time to time, what appears to be the mothership of the meteors streaks down from the top, always at an angle. If you don't shoot it, it's apt to leave a path of meteors behind it all the way to the bottom.

Finally, a harmless object crosses the upper screen every so often, usually well guarded. This fellow is worth 1,000 points; but paying attention to shooting him often results in wipeout by black hole.

With all this going on, *Photar* is a very active game. The graphics are well animated color hi-res, and the sounds, which can be turned off, are loud and brassy and appropriate.

Photar has only one fault, and it's a quality the author and publishers thought of as a feature. You get only one ship per game. When you're hit, you're killed. That's that.

If you can live with having only one ship per, and you like home-arcade shoot-'em-ups, you're apt to have a good time with *Photar*. MCT

Photar, by Steve Baker, Softape (10432 Burbank Boulevard, North Hollywood, CA 91601; 213-985-5763). $29.95.

Conglomerates Collide. By Paul Mason, Louis R. Mayne, and Robert E. Siegling. As a first product from a new company, *Conglomerates Collide* is outstanding; the care and quality that obviously went into its making promise good things from the Arizonans whose name sounds like a Scottish thane.

A game of business simulation, *Conglomerates* is more simply executed than many similar board games and than Strategic Simulations' *Cartels and Cutthroats*. Each turn represents a full year, for instance, and the only influence you have over the sort of company you control is its name. This doesn't matter, however, since the product of your imaginary company is irrelevant anyway.

What you do control are mergers and acquisitions, whether to accept offered loans, when to pay off loans, and the purchase and sale of your company's stock. Factors are the prime interest rate, rate of interest on investment, and price-earnings ratio of the company.

All these things affect your personal equity. For instance, if your company acquires a subsidiary, the stock value rises and so does your equity. But to become truly rich, you'll have to sell stock so you can acquire more valuable subsidiaries, thus raising the stock value sharply. But, when you sell stock, you lose personal equity. Consequently, you can have the most successful company by far and lose the game because it ends before you've bought back your stock—or because you can't afford to buy it back.

Random events affect the world situation—the prime interest rate most obviously. Individualized, apparently random events affect individual players.

Don't let the simplicity fool you. This is a difficult game to win, at least against the opponents provided on computer by RockRoy in the computer-play mode.

There are two other modes: Solitaire and Collide. Solitaire actually allows as many as four players, but it is limited to fifteen year-turns and is designed for trying out strategies and learning.

Collide requires two players and can have as many as four. Here the game is limited only by the number of companies available to be acquired. The game ends at the end of the round during which the last company is claimed.

Conglomerates Collide excels among games of this genre in its visual bells and whistles. It opens with a full color hi-res screen of a businessman with briefcase rushing from a helicopter on a rooftop. Along with gathering players' names and company names, it asks each player to choose a headquarters location from a list of twenty world cities. Then, as each player's turn begins, a city skyline appears with the appropriate

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The artist and *Softalk* are sharing in the profits from the poster. *Softalk* will distribute its proceeds to individuals developing Apple tools to help the handicapped. *Softalk* guarantees 100 percent distribution of its monies.

In addition to the posters, which are being sold at $6.00, (plus $1.50 to cover shipping and handling), two hundred artist's proofs, signed by Robert Zraick, are available at $75 each.

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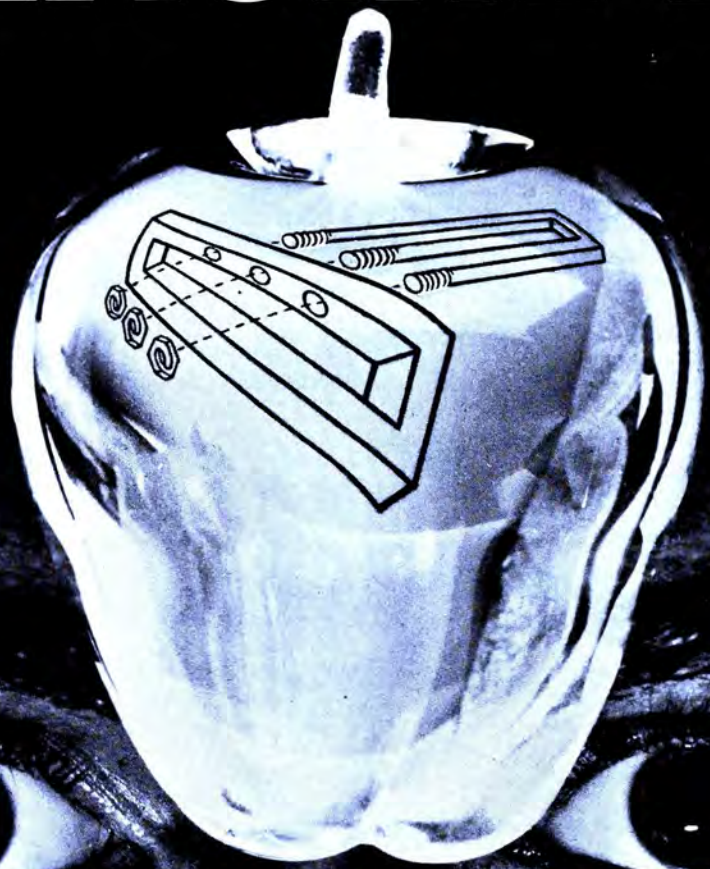
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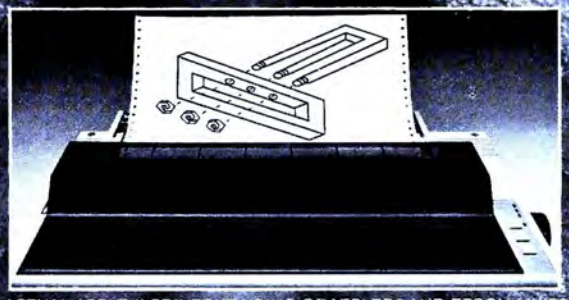
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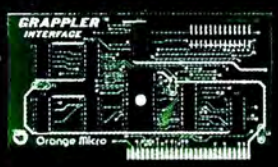
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trade center in front. An animated helicopter flies in and lands on the trade center roof, with sound effects; a minute person gets out and, with coattails flying, runs across the roof to the access door, slamming it behind. It's very nicely done. MCT

Conglomerates Collide, by Paul Mason, Louis R. Mayne, and Robert E. Siegling, RockRoy (7721 E. Gray Rd. Suite 103, Scottsdale, AZ 85260; 602-998-1577). $39.95.

Bez-MX. The theory of deterrents has held off a nuclear holocaust to date and allowed for costly defense projects in this country like the MX missile system and B-1 bomber. Many people wonder if the complex guidance systems in modern missiles would perform properly in the event of an actual war. Many people also wonder if the proposed MX deployment plan, involving underground silos with interconnecting transportation rails, is really a good way to fool the enemy.

Games are never meant to mimic reality completely and war games are no exception to this rule. Nonetheless, in a good war game you can at least partially make the decisions that might face a general or commander in real combat. Usually this involves laying down a strategy against an opponent and watching that strategy succeed or fail, as the case may be.

Bez-MX can be played in several different ways, mostly limited by whether or not you have game paddles. In the solitaire version, it's you against the computer as you try to defend your country against attack while attempting to destroy the enemy's ability to wage war.

You start with eight MX missiles deployed in silos around your country. During each round, you can either move them or launch them. You are given two B-1 bombers and the option of one mission per round. The B-1 can either defend your territory or bomb your opponent's territory. After each round, you are given two bonus MX missiles, if your factory is still intact enough to make them.

Bez-MX comes with a playing map that is a grid with x and y coordinates. You enter the coordinates of the enemy territory you want bombed or hit by a missile. The missiles tend not to be as accurate as the B-1 bomber, unless you launch several at a time, blanketing an area. In the solitaire version, after entering the strategy commands you just sit back and watch the battle unfold. A quick eye and good memory are needed, since the battle itself might be over in fifteen seconds. During the battle is the only time you can see the effect your missiles and bombs are having on the enemy.

In the solitaire version of *Bez-MX*, the computer makes for a tough but not unbeatable opponent. Getting through more than ten rounds is an indication that you are getting good at it, though this is truly a game where you can win the battle and lose the war. It's a good warm-up for the advanced two-player version.

In the advanced version of *Bez-MX*, it's possible to make real-time changes in your strategy through the use of game paddles. You do this by controlling the precise instant that missile launches occur by using the paddle button to launch them. With the paddle you can also vary the flight of your B-1 bomber along the y coordinate when it is defending. This makes it possible to intercept missiles and enemy bombers.

Similarly, being able to launch the missiles when you choose allows you to intercept enemy bombers (or at least try to, since the B-1 destroys 85 to 90 percent of all missiles it comes in contact with).

In the advanced version, you also have the headache of determining how to utilize the population. You have to delegate so many people to farming, working in the cities, working at the airfield, working at the MX missile site, and, most important, working in the factory where the MX missiles are manufactured. If you misjudge the percentage of population that should be working at a given task, you find yourself in trouble.

There is scoring in *Bez-MX* to determine who wins, though a low score does not necessarily indicate a badly played game. It is easy to rack up points bombing cities and farms, but destroying the more crucial things like the runway and factory are what help you win the game.

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The hi-res graphics are interesting but not very spectacular; although crucial to the two-player version, they are not the chief attraction of the game by any standards. The sound effects are also negligible and don't add much to the game.

If you can find someone who doesn't mind pretending they're Dr. Strangelove, the two-player version of *Bez-MX* makes for a pretty good game. It is not as long or involved as a board game like Risk, but it provides the same kind of thrill. You risk all to gain everything and, if you lose, all you've really lost is an hour or two.

Unfortunately, real life is rarely so innocuous. It would be nice if there were only games, but the sad truth is that we all live in very dangerous times. If only the leaders of great nations could solve their differences with the help of a computer game, instead of with the lives of real people.

Bez-MX comes complete with a twenty-four-page instruction book and requires an Apple II plus with 48K and one 13 or 16 sector disk. DH

Bez-MX, Bez (4790 Irvine Boulevard, Suite 108B, Box 19633, Irvine, California 92714). $29.95.

Suicide. By Steve Hawley. In the beginning, there was Newton's Third Law of Motion. Then there was video *Pong*. This evolved into *Breakout*, but that got buried beneath the thundering herd of *Pac-Man/Asteroids/Space Invaders* progeny that have since shaped the course of computer arcade game history.

But now there is a game that goes back to the beginning, takes the basic *Pong* concept, and actually does something unique with it, turning the attack-and-destroy arcade gestalt into one of defense and protection. *Suicide* involves no lasers, phasers, blasters, alien hordes, or threats to one's continued existence. Instead, the gamer must prevent an inexhaustible population of little pink lemminglike beings from leaping happily to their deaths. Intent on making little pink lumps of themselves at the bottom of the screen, they are manifestly annoyed when you save them with your paddle and bounce them back to the top, from which they immediately try again.

There are tricks: if you save a single-antenna creature you lose a lot of points: they are defectives—they're *supposed* to die. (Here, the issue of selective breeding and genetic selection presents the potential for some lively discussions around the keyboard.) Make sure never to miss the ones falling headfirst; they were evidently pushed, and are not happy. Saving them rewards you with bonus points.

Paddles offer more control, but the joystick is faster, a factor you will appreciate at the higher levels. Scoring factors are intricate and interdependent; you are timed, with a maximum allowable casualty count at each level. Each little pongperson you save is ten points; each one who goes splat is minus ten.

The expressions on their faces are the most intriguing part of the game. The rudiments of character (happy/sad), the moral ambiguity of the whole situation (these guys *want* to die), the tension inherent in having responsibility for so many lives; of having to choose between plummeting bods on either side, knowing you can save one but never reach the other in time . . . this, rather than more meanies and bigger explosions rendered in greater detail, is the kind of sophistication that arcade-type games should now strive for.

The game is interesting. And different. It figures that it would take a return to the roots, arcadewise, to produce a unique and involving game from the most simple physical premise. AC

Suicide, by Steve Hawley, Piccadilly Software (89 Summit Avenue, Summit, NJ 07901; 201-277-1020). $29.95.

The Count: A Winning Blackjack System. By Max McKee. This program teaches a simplified version of the card-counting system for beating blackjack devised by Edward Thorpe in his book *Beat the Dealer*. McKee's system is to count minus one for any ten or face card, nothing for aces, and plus one half for all other cards. In this manner the player keeps a running score of all cards played and varies his betting and play of the

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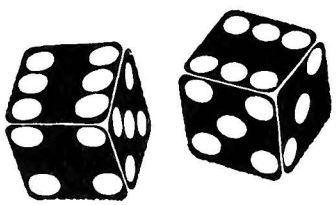
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hand accordingly.

Where McKee parts company with Thorpe and most of Thorpe's followers is that he doesn't advocate the correlation of the running count with the number of cards remaining in the dealer's hand or shoe. Thus a count of +5, say, has the same implication for strategy whether there are twenty cards remaining to be played or five and a half decks. Since a true measure of the deck's eccentricity—its favorability or unfavorability for the player—has to consider the number of cards remaining, and since most casinos now play multiple-deck games, this seems like a crucial point.

The Count offers a single-player hi-res game of blackjack, with a number of rules options. You can specify the number of decks, whether the dealer deals to the bottom card or shuffles after 75 percent of the cards have been played, the permissible hands for doubling down, and so on. If you like, the program will coach you on the counting technique and strategy. At your discretion it will reveal the current count value and the appropriate play.

The program will also teach a beginning player the basic strategy of the game—the best possible play without counting cards. If you master the basic strategy you've got almost even odds against the casinos.

There's an automatic mode in which the computer plays against itself. This feature allows you to run the program all night or longer and test the effectiveness of its counting approach. In auto mode, *The Count* modulates its betting by the following scheme: at zero or negative counts, it bets one unit; from zero to +1.5 it bets five, from +2 to 2.5 it bets 25, and at higher values it goes to 50, 75, and 100 betting units. Here again, the tactics advocated seem a little unrealistic. Such huge betting increases run the risk of disastrous short-term losses, even though they pay off big if the bankroll holds out.

One appealing feature of the automatic mode is that it keeps a record of how the player has fared at various count levels; it keeps a running score of the number of bets won or lost at unfavorable, even, and favorable conditions. It also keeps track of the total number of hands played in a given run. It would be nice if it also recorded the high and low values of the player's stake for a given run; that way, you could test the probability of your going broke on a streak of bad luck. ()

The Count: A Winning Blackjack System, by Max McKee. Pear Software (407 Terrace, Ashland, OR 97520; (503) 482-8122). $24.95.

Fantasyland 2041 A.D. By John Bell. Crystalware's leader John Bell has a superior imagination and a true knack for seeing the potential for a game where others have overlooked it. Many must be the fantasy gameplayers whose eyes have grown bright with anticipation while leafing through Crystalware's catalogue-qua-magazine.

Imagine a fantasy adventure neither in space nor in medieval times, and not the amorphous present of *Mystery House* either. Come to think of it, it could be a million times and places, couldn't it? John Bell thought of it. Among his titles are *Oregon Trail* (American pioneers lived true adventures—and we don't pay enough attention to them, to paraphrase Bell) and *Fall of the House of Usher,* which promises, according to title and blurb, to be a pre-Victorian gothic horror mystery. *Usher* is not what it promises—the graphics were state of the art two years ago and the mystery is meaningless—and *Oregon Trail* is not available yet. But the ideas are terrific, and they are Bell's forte.

John Bell has another forte. His full-color, full-scene hi-res graphics are computer paintings, not cartoons. Coming upon one will startle and delight you. They are so well done that you soon cease to mind that the majority of screens contain only indicative outline hi-res graphics and that some places—such as desert—are indicated by lack of graphics altogether.

In Crystalware's most ambitious offering to date, *Fantasyland 2041 A.D.,* Bell shows yet one more exciting quality: the ability to think big and be undaunted by the scope of the task of implementing his thoughts. *Fantasyland* consists of three two-sided disks, one side for each place you need to traverse to finish the game; and each place comprises around sixty-four screens, six to ten of which are Bell's full-screen art work.

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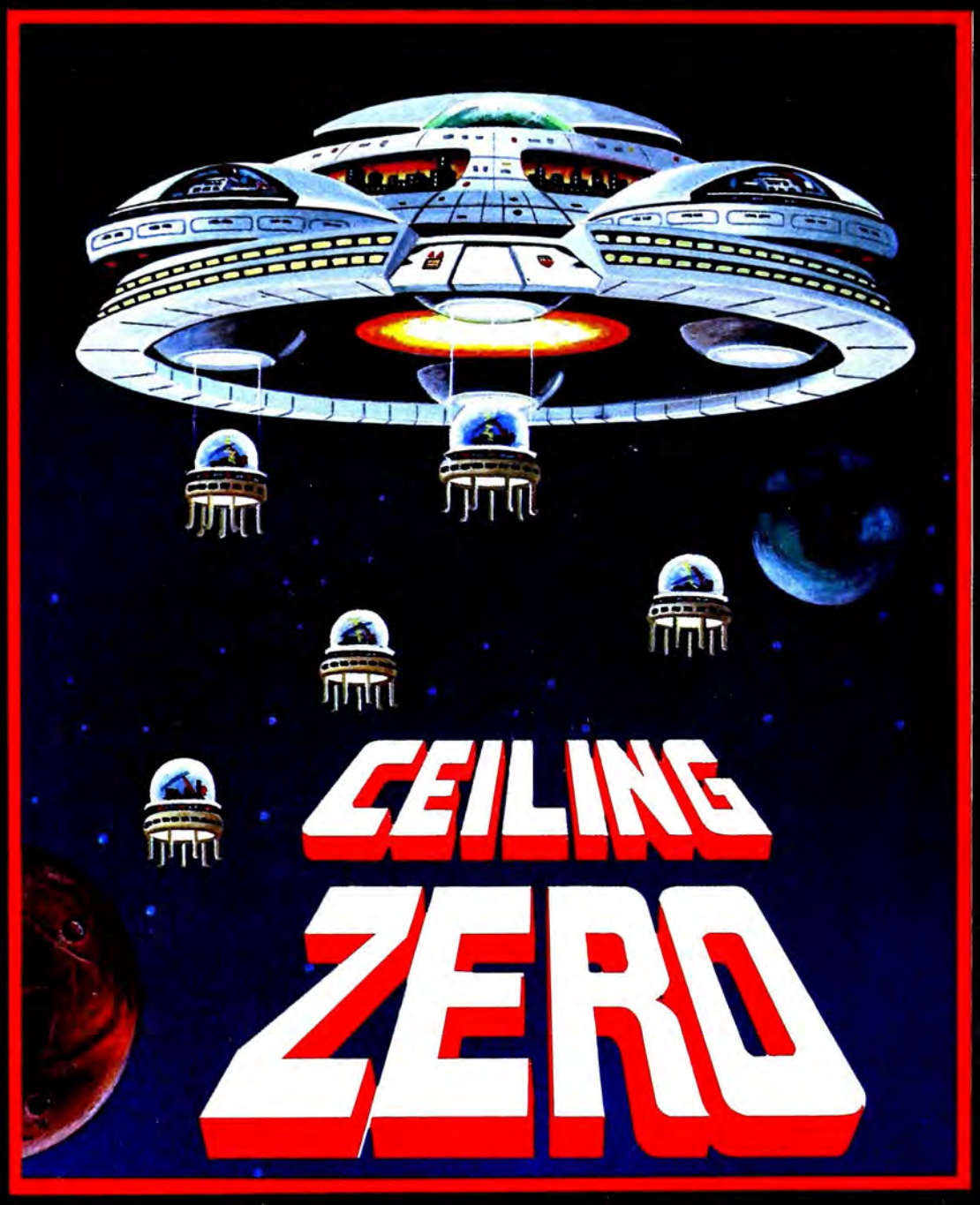
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All that talent and creativity would seem to be a good basis for superior software; but somewhere along the way, something has gone wrong. Attention to detail appears not to have existed in the programming cycle. Where detail was considered in gaming values, it has not always been weighed carefully against playability. For example, while most screens have only the barest indications of the kind of terrain you're in, your character's ease of movement varies according to the terrain, so that crossing the desert is fast, but moving through a screen on which mountains are indicated is drudgery, because acceptance of keyboard input is delayed.

In our numerous attempts to play *Fantasyland,* the 3.2 Apple version currently available at this writing, the game found numerous ways to end. It variously went off into space with frozen keyboard, froze the player character in one screen where he could move freely within that screen and everything else worked but he could not move to another location, and aborted in the midst of saving.

Within play, some bugs hinder and some help. Hostile characters blocking the way occasionally disappear in spirit only, while their images become inanimate obstacles on the screen. Although it's suggested that you speed up movement by holding down the repeat key, the occurrence of random events is not equipped to stop your extra input from being read and thus takes the keystroke ahead that repeat gives you as rejection of whatever was being offered. Inputting a minus figure in the buying sequence in the market enables you to sell goods at full price instead of at the partial price you would get in the selling sequence.

The 3.3 version Crystalware sent *Softalk* turned out to be a preliminary set of disks, seemingly not yet tested. Bell blamed industrial sabotage as the cause of their unfinished state.

John Bell's programs hold the promise of being larger-than-life games of the Clardy/Automated Simulations genre. What Bell needs is a patient, benevolent, detail-oriented Apple-programming partner who is willing to hone and polish Bell's rough creations.

Until he gets such a person or the equivalent, *Fantasyland 2041 A.D.* remains an appetizing but undigestible fruit. MCT

Fantasyland 2041 A.D., by John Bell. Crystal Computer (17429 Bluejay Drive, Morgan Hill, CA 95037; 408-778-2966). DOS 3.2; 3.3 version to be released. $59.95.

Impressions

Special Effects, by Mark Pelczarski and David Lubar, Penguin Software (Box 432, West Chicago, IL 60185; 312-231-0912). As if the *Complete Graphics System* were not complete enough, Penguin has augmented that earlier utility with this new bag of tricks. Actually, while *Special Effects* can be used as a complement to the *Complete* system, it also has a great deal to offer as a standalone item.

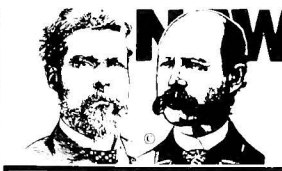
The painting module allows you to make pictures by manipulating a set of "brushes" with game paddles or joystick. Joystick is recommended, since diagonal movement is hard to control with the paddles. The brushes are shapes that can be edited with a subprogram of the *Complete Graphics System*, should you have that package as well.

Like its predecessor, *Special Effects* offers a set of 108 composite hi-res colors. At any point while drawing, you can step out of the painting module and examine the palette; the program uses the second hi-res page to display the color options, sixteen at a time. The painting module also has routines that allow you to double or quadruple a portion of your drawing and edit it point by point.

The second major program subdivision, called appropriately the graphics tricks module, lets you flip your picture upside down or flop it left to right. Or, you can produce a mirror image of half of it onto the other half. There are also routines to

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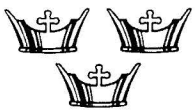
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transfer some or all of a picture from one hi-res page to the other, or to copy a portion of a picture from one screen location to another.

Like those of the *Complete* system, the *Special Effects* tricks are designed to be available to your own programs, and the documentation offers sample code to show you how to use them.

Particularly handy in that regard are the packing and unpacking routines. These permit the saving of pictures on disk in less than the usual thirty-four sectors. The compaction is made possible by a storage technique that codes patterns in the picture instead of saving the screen bit by bit.

Finally, *Special Effects* includes a conversion facility that will rename pictures to match the conventions of the *Complete Graphics System* and—handier still—will let you translate character fonts from Apple's *DOS Toolkit* or various Synergistic Software products into the format employed by Penguin's *Complete* package. For paddles or joystick, $39.95; for graphics tablet, $69.95.

☐ **Neutrons,** Level-10 (Box 21187, Denver, CO 80221; 303-426-6090). *Neutrons* is the latest entry in the pinball category of games for the Apple. Played with a keyboard or paddles, it incorporates some elements of bumper pool, with the added challenge of a moving trap that swallows the ball.

Hitting the return button covers up the trap for a few seconds, while controlling the bumpers is accomplished by pushing the buttons on the paddle or using the A key and the left arrow key. You've got ten neutrons in a game and if you keep one on screen long enough it splits in two, making it doubly difficult.

Neutrons is not a hard game to master; after an hour of playing, it should not be hard to get a score in the hundreds of thousands. The color graphics and animation are fairly standard as are the sound effects. *Neutrons* allows up to four players, taking turns. $29.95.

☐ **Roach Hotel,** by Mike Livesay, Micro Lab (2310 Skokie Valley Road, Highland Park, IL 60035; 312-433-7550). Keep telling yourself: "It's only a computer game. . . ." They know you're alone . . . don't go in the kitchen . . . and all manner of other potential subtitles which present themselves to the imagination.

Yes, the bugs are back. There probably isn't going to be much middle-ground of opinion on *Roach Hotel.* Past or present residents of aging apartment buildings may take a sort of vicarious satisfaction from it, or they may grow pale and turn away, shaking uncontrollably. Anyone who has experienced a midnight encounter with a hardy representative of the planet's oldest surviving species suddenly spotlighted on the linoleum knows that the experience carries with it a unique and primal sensation, which one may not care to repeat voluntarily.

Roach Hotel voluntarily repeats it. Your foot is located at the top of the screen, poised to discourage the roach incursion from reaching the hotel in the center. The hotel is a multi-story A-frame, which allows for some nifty bank shots as you drop your shoe on the roof, letting it slide out and down to your intended target below.

The foot/roach interface is the major "effect" of the game, and it was obviously a programming labor of love. Love takes many forms.

You have several species to contend with, each worth different point scores, but all proceeding inexorably toward their single goal, bringing to mind, in manner and appearance, an enemy aircraft silhouette identification drill. Most are neither fast nor dangerous. The spiders go for your foot but are easily avoided if you don't want to try for extra points. This, however, gives you virtually no chance of ultimately prevailing. Taking out ten spiders debugs the hotel, bestows bonus points, and advances you to the next level.

The real difficulty, in authentic pest control simulation style, is that there are eventually many more of them than there is of you. After they completely occupy the hotel, they raise their flag, bring down the house, and end the game.

Alternately, a quicker finish comes after the second time a spider has managed to bite your foot. This makes for some pretty short games, which some may consider to be a bit disappointing.

Others, however, may not. $34.95. ◨■

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NEWSPEAK



☐ **Putting a Whole New Face on Things.** Three marketing professors have devised a new application for Herman Chernoff's computer-generated faces, according to a recent *Wall Street Journal.* Vijay Mahajan of the University of Pennsylvania's Wharton School, David Huff of the University of Texas, and William Black of the University of Arizona use faces as a way of expressing visually complex business data about the financial health of organizations.

Chernoff, a mathematician at the Massachusetts Institute of Technology, first developed his technique in 1973. His aim was to come up with a way of making large amounts of interrelated information understandable to people at a glance. He decided that a computer-drawn face on which relevant information was plotted would be more meaningful to people than would endless graphs and charts.

In their new application of Chernoff's technique, professors Mahajan, Huff, and Black take financial information from a company's annual report and assign it to facial features. Such things as the length and angle of the eyebrow, the diameter of the ear, and the contour of the mouth become significant indicators of cash turnover, inventory turnover, the ratio of current assets to current liabilities, and so on. Facial features change as variables change.

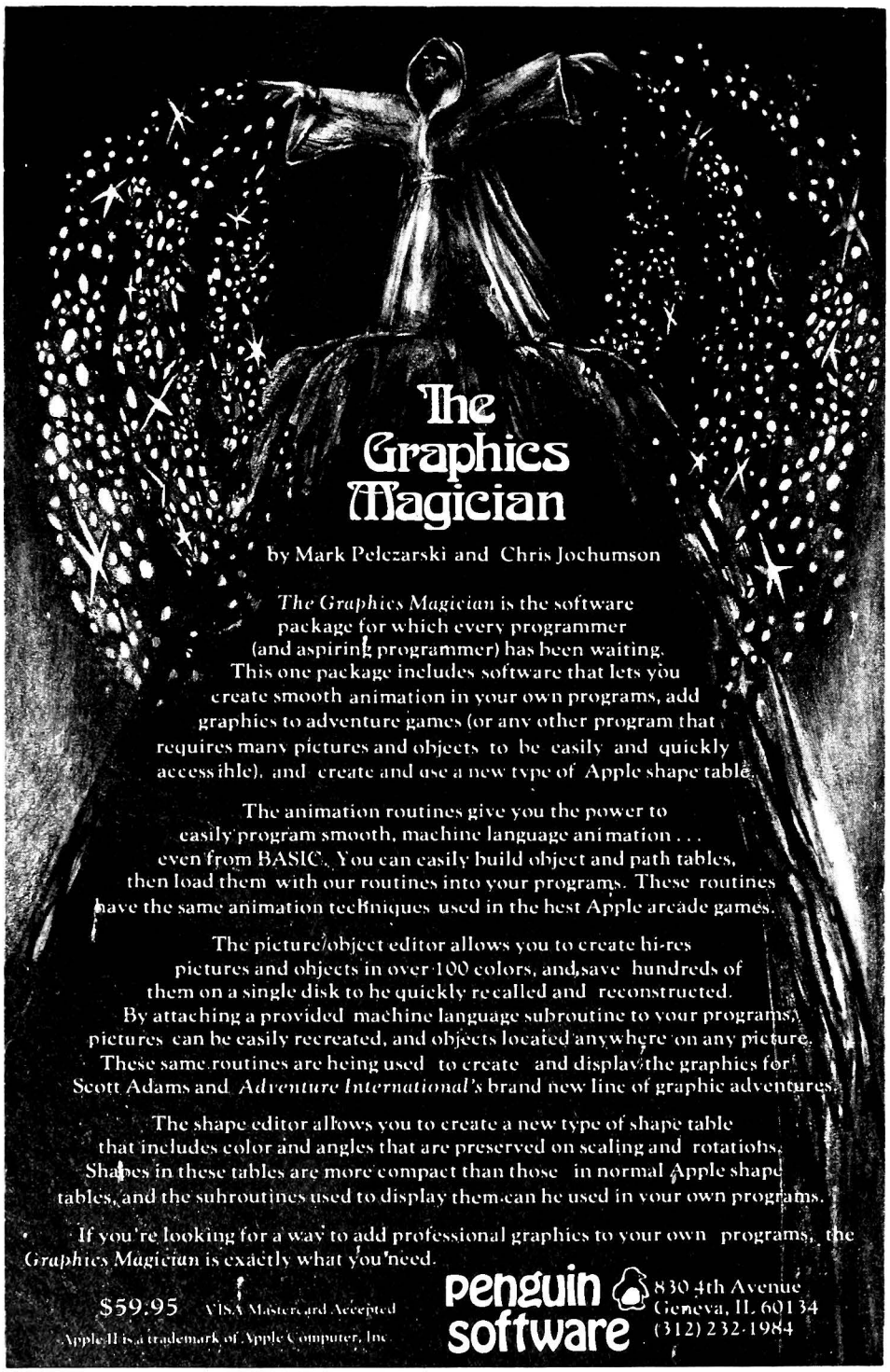
Their technique serves well as a means of comparing the health of two different companies over a period of time. Certainly, various people interpret facial expressions differently, and the professors concede that their technique needs further refinement. But when people say that the outlook for a particular company is cheery—or grim—don't be surprised if they don't ply you with complicated graphs and charts to support their views. They may be basing their assessment on the information they get from computer-generated faces.

☐ **Rent a What?** Want to fight a computer? Call **Rent-A-Kvetch** and let their trained staff do it for you. *Kvetch* is a Yiddish word, the meaning of which can't adequately be described in English, but which refers to a person who's good at complaining. **B. L. Ochman** is such a kvetch, and she founded this organization dedicated to artful, legitimate complaints. Ochman says she'll handle just about any complaint, and a good percentage that come through her office are computer snafus that originated in department stores and mail-order houses.

Ochman's favorite involves a man who received a bill from a large store informing him that he owed a balance of "$00.00." The man ignored the bills that came month after month that requested he pay this outstanding amount—always "$00.00." Letters continued to come, threatening him with a collection agency unless he paid the amount of "$00.00" in full. Finally a warrant came for his arrest.

Totally at a loss as to what to do, the man called Rent-A-Kvetch. B. L. Ochman advised him to write the company a check for the amount of $00.00.

"It worked," she laughs. "He was never bothered again."



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But don't take our word for it, *Wizardry* received reviews in the May issue of *Creative Computing*, the April issue of *Popular Mechanics*, page 38, and the August issue of *Softalk* magazine.

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Another Rent-A-Kvetch customer was billed twice for a vacuum cleaner she had bought from a large store. She wrote letter after letter explaining her case to the company, but she always received replies signed by a Mr. Hamilton who suggested she pay her bill immediately.

When Ochman entered the case, she first tried to contact Mr. Hamilton. It didn't take her long to discover that no Mr. Hamilton existed—just a computer using the name.

"I kind of find this work challenging," confesses Ochman. "I guess I like being a detective.

"I also understand the business structure. Although I don't know much about computers, I know when they make an error, they won't undo it. A person has to do that."

And Ochman doesn't see any reason for micro owners to worry. Most of the computers she becomes involved with are large mainframes—like Mr. Hamilton.

☐ **Computer Alarm.** If your wake-up call sounded particularly sexy or friendlier than usual the last time you stayed in a hotel—think back. It could have been a computer you were listening to. Several hotels around the country are taking advantage of computer technology to solve the problem of how to wake up their guests. It was just too big a job for telephone operators in some of the larger establishments who sometimes had more than one hundred guests request a wake-up time of eight a.m. exactly. Invariably, the sleepers who received the later of the hundred phone calls weren't being awakened in time, so a computer was assigned the job.

International Micor Systems in Phoenix, Arizona, is currently revamping their old computerized system that awakens hotel guests with a recorded "Good morning" message, available, incidentally, in just about any language. When the hotel operator receives a call from a hotel guest requesting this service, the operator punches in the room number, the date, and the specified wake-up time on the computer keyboard. If the guest requested a wake-up call at seven-thirty the next morning, the phone in that guest's room would ring at exactly seven twenty-five. The computer makes a notation if nobody on the other end picks up the phone, and calls back at exactly seven-thirty-five.

"It's very dependable." explains Chuck Nasziger of Micor. "It tries five minutes before the hour and five minutes after the hour." The company works closely with Craig Recording Studios in Jenkintown, Pennsylvania; Craig provides the sound effects for the tape recording, which range from a foreign greeting to a rooster crowing. The tape is triggered by the computer.

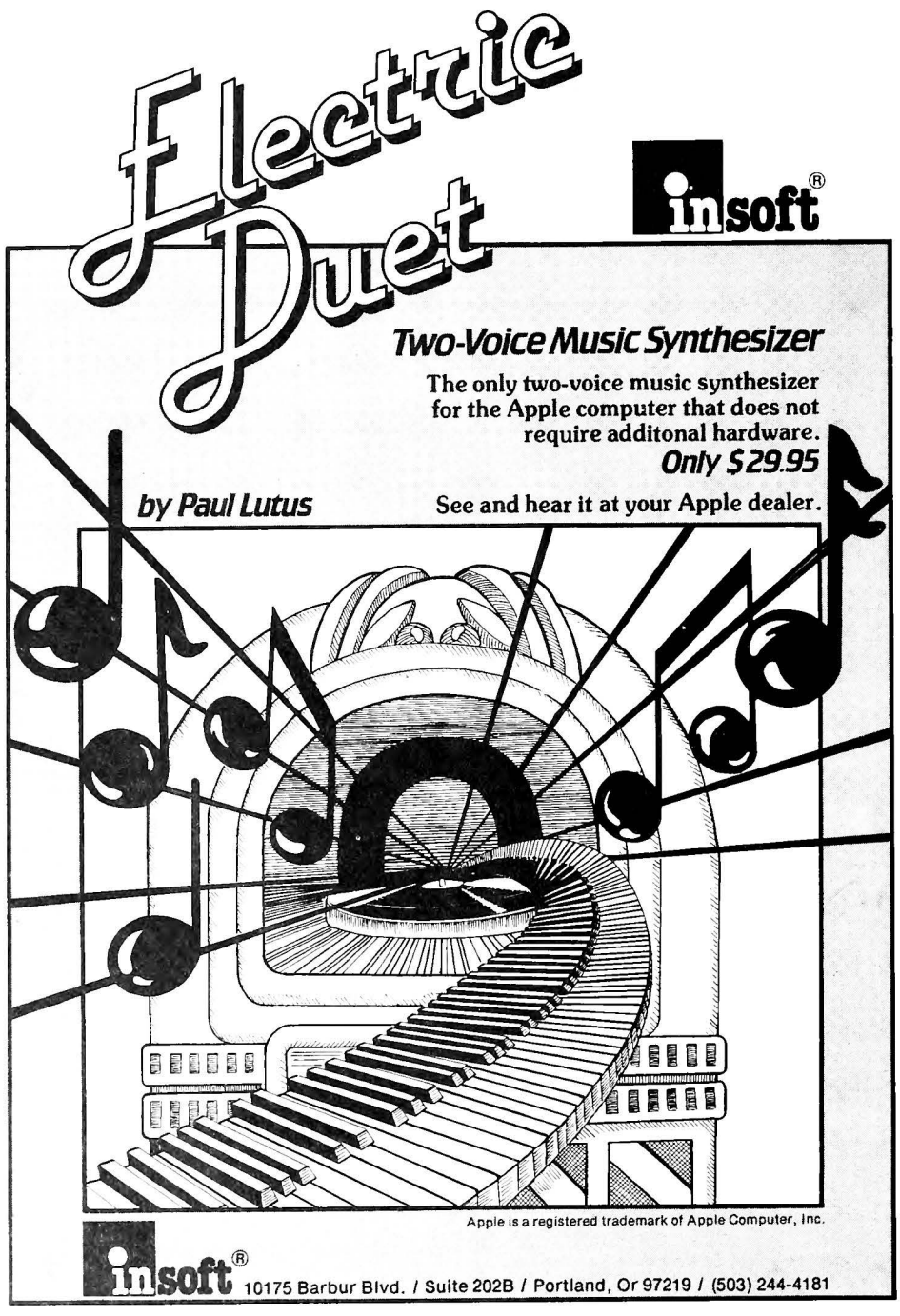
In case the room occupant complains he missed his appointment and questions whether his wake-up call was overlooked, the computer also prints out hard copy—written proof that an attempt was made to rouse him.

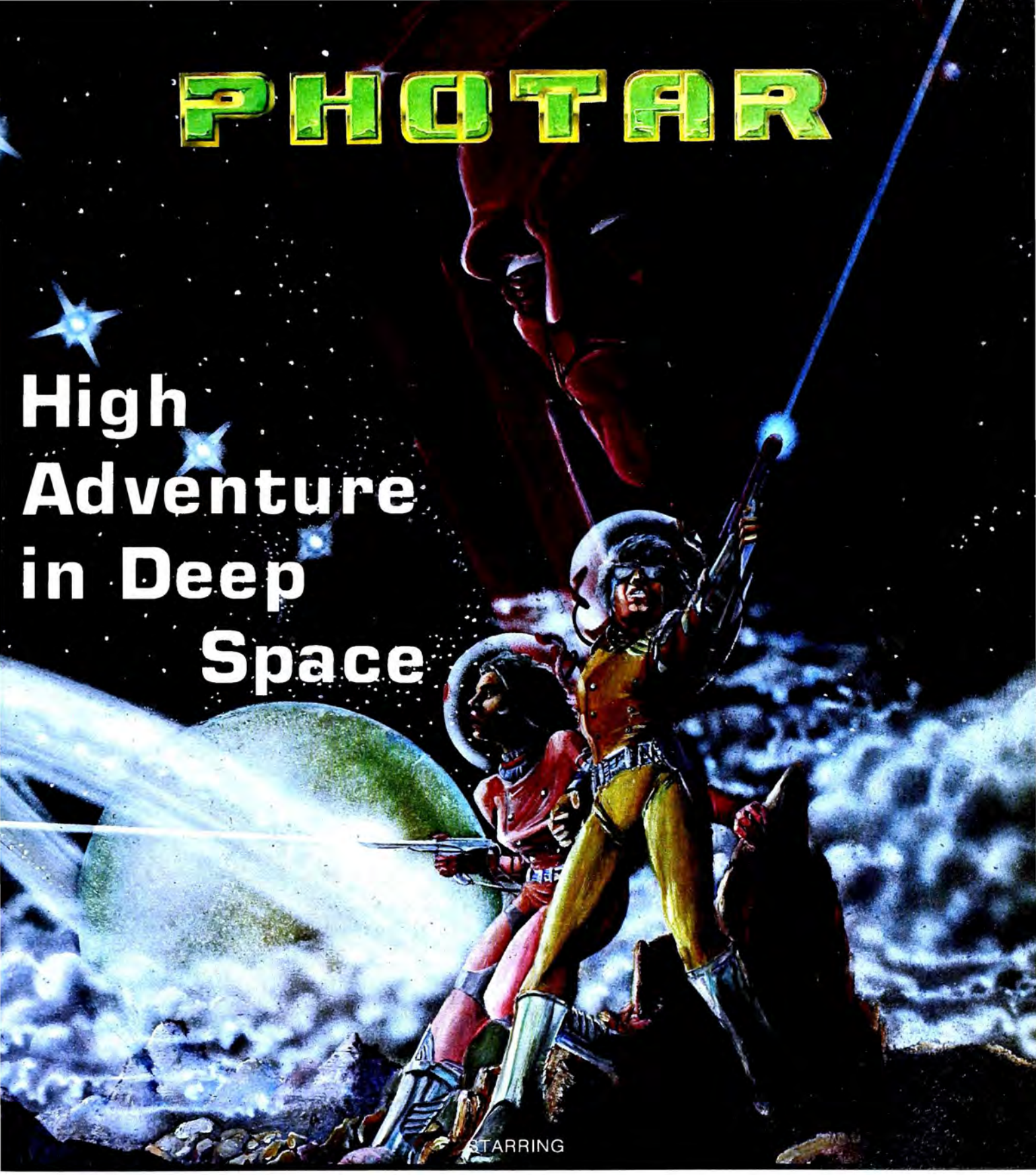
According to Nasziger, Micor is currently working on a new version of the system that will be more streamlined and cost efficient. One of the main differences is that hotel guests will no longer be listening to a tape recorded message. Instead, they will be talking directly with a computer.

"And it won't even sound like a computer. You can tell tape recordings—they hiss—I can't stand listening to them. But hearing the same message from a computer isn't much different from talking to either you or me."

The old system is currently in use at Ramada Inns, Marriotts, and Hyatt Regencies. Other hotels have their own system, like the Fontainebleau in Miami Beach. There a thermometer on the roof gives the current temperature along with a recorded wake-up call. The computer pulls out the appropriate voice track based on the temperature reading from the roof.

The Beverly Hilton in Los Angeles also has a computer that activates wake-up calls. However, some of their guests stipulate that morning calls come from a human and not a machine. "And they are accommodated," says a spokesman for the hotel. ❑■





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HARD TALK

BY JEFFREY MAZUR

Last month, we discussed various standards for interfacing peripherals to the Apple II. In particular, we defined the RS-232 serial and Centronics-type parallel standards with which almost all printers, modems, and terminals are connected. This month, we'll describe some of the interface boards on the market. Although all of these boards conform to one of the standards just mentioned, their operation and features are quite varied. Therefore, we will first examine the factors upon which evaluation of these boards can be based.

Parallel Boards. As you'll recall from last month, the Centronics parallel standard specifies the signals, voltage levels, and timing necessary for the proper transfer of data. However, this standard leaves several parameters undefined. Some printers stray even further by using a modified "Centronics-type" standard. This usually means that the data and/or handshake signals are inverted from the normal standard. Furthermore, many powerful features can be incorporated into a parallel board by using the Apple's I/O ROM expansion.

One of the undefined parameters mentioned above concerns the high-order bit of the transmitted data. Since most data is transferred using the seven-bit ASCII code, the eighth bit is left unspecified. Most of the older printers ignore this bit anyway and, in fact, some printer cards don't even send it. However, many of the newer printers do use this bit to select alternate character sets or print graphics.

Therefore, if you're going to use one of these printers, it's important that you know how a printer card handles this bit. If the card always keeps the bit low, that card will work fine for text but cannot be used for graphics. If this bit is transmitted unmodified via the Apple's Monitor routines, then it will always be high when text is being sent. This is so because of the way ASCII characters are stored in the Apple's memory (high bit on, also known as negative ASCII). If this is the case with the printer you use, then you may have to adjust your printer (usually by changing a dip switch) or modify the cable to avoid the unwanted character sets or graphics. Full feature boards will allow this bit to be changed via software either by *poking* or with a control sequence.

Several boards simplify the Centronics standard down to the minimum ten-wire interface. This deletes *busy, select, paper empty, fault,* and other such signals to and from the printer. Although these signals are seldom used, some older printers require that the *busy* line be connected. Most printers manufactured today, however, can provide full handshaking with the *acknowledge* signal and thus work with the simplified interface. Considering the way things progress in the computer field, it probably is a good idea to have the full interface; future software or printer features may require the use of these extra lines.

Probably the simplest nonstandard to deal with is the *line feed on carriage return.* Some printers automatically provide a line feed (moving the paper to the next line) whenever they perform a carriage return (moving the printhead back to the left margin). Note that while a typewriter performs these operations simultaneously, they are two separate functions on a printer. If the printer does not supply its own line feed, the computer must send the appropriate ASCII code (0A in hex) following each carriage return code.

Most printer cards can be configured to work with either kind of printer. Many printers today have an option that allows you to select for the line feed or not. If both your printer and interface card give you a choice, then it doesn't matter what you use as long as the two agree. If the printer is not getting line feeds when it should, it will print everything on the same line over and over again. If things are the other way around, you'll get double-spaced printing. All things being equal, it's probably better to let the printer generate the line feed, especially if you have a print buffer.

All of the boards we tested contained some driver software in PROM. This makes it possible to call them up from Basic using the familiar PR# command. Aside from providing simple parallel output, on-board firmware can also add many printer-related features, such as line and page length control, tabbing, left and right margin setting, and screen dumps. The default values for many of these features are also contained in the firmware or are possibly selectable through dip switches or jumpers. Most boards allow the values to be changed via software.

To allow screen dumps of the hi-res graphics pages, a software routine customized for your printer is needed. Several such routines are available on disk, but the more elaborate printer cards include this in their firmware. Along with dumping either hi-res page, one can usually change the size of the image, rotate it, or invert it (change black to white and vice versa) and any combination of these. If your printer has selection between bidirectional or unidirectional printing, you may wish to use the latter for graphics. It will take twice as long to complete a picture, but the detail should be cleaner as a result of the more accurate printhead alignment.

Finally, if you hate waiting for the printer to finish before regaining use of the computer, consider one of the new buffered printer cards. The specs to look for here are: buffer size, ability to disable the buffer (for test purposes), ability to clear the buffer (in case you make a mistake), and text compression. This last feature can make a small buffer seem much larger by reducing the number of bytes it takes to store a given portion of text. In a formatted program listing or columnar data printout, for instance, there will usually be many places where several spaces in a row are to be printed. Normally, each such space would take up one byte in the buffer. Text compression, however, might reduce this in the following manner.

As each character to be printed comes in, it is checked with the preceding character. If the two match—meaning that you have at least two of the same characters in a row—then a counter is started. Instead of placing the subsequent characters (all the same) into the buffer, the counter keeps track of how many times the character repeats.

When the first new character appears, the result in the counter is placed into the buffer in some unique way, such as with its high-order bit set. At the other end of the buffer, this code being retrieved will cause the printer to repeat the last printed character the appropriate number of times. If such a technique is used, any number of repeating characters (in this case, up to 127) can be represented in the buffer by only two bytes. With typical printouts, this can effectively increase the buffer size by 20 percent to 60 percent.

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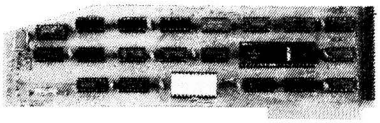
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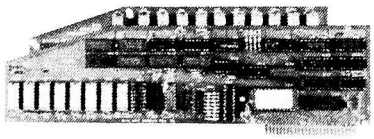
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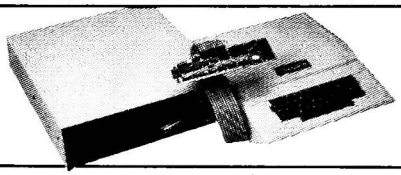
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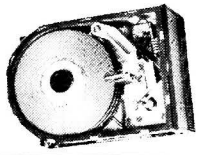
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Serial Boards. With serial boards, all the criteria for parallel interfaces apply (except the simplified ten-wire standard). Furthermore, there are several other factors with which to rate a serial board's capabilities. First is *baud rate*, the speed at which the data transfer takes place. Some printers and modems operate at only one baud rate. If that is the case with your peripherals, you only need be concerned that the serial board you select can be used at that particular rate. For general use, the more flexible the baud rate is, the better.

Keep in mind that modems and external terminals require duplex operation (two-way communication) while a printer is generally treated as a receive-only device. Some printer/serial card configurations, however, may require the return data link for handshaking information.

When your printer or other external device can operate at several baud rates, it is desirable to have an interface board that can match the highest speed available. Higher speeds usually require that the handshaking be done very carefully.

The several forms of hardware handshaking presently in use have subtle differences that may be either good or bad for you; all interface cards may not work equally well with any given printer.

After you've considered baud rate, you're ready to make choices regarding word length (five to eight bits), parity control (odd, even, or none), and number of stop bits. Again, these settings should match those specified for the equipment to be connected. If in doubt, eight bit/no parity/one stop bit usually works.

If the complete RS-232 standard is implemented, you may find it necessary to add certain jumpers inside the cable between the computer and the other device. Some boards allow this jumpering to be done on the board itself along with pin selection for the handshaking signal. Look for as much flexibility here as possible. All "RS-232 standard" devices are not equal and some can be very hard to interface.

On to the Boards! To set the pace for the other interface boards, we'll examine the three cards currently available from Apple Computer. These have been around a long time now, and, although they do not represent the state of the art, they have set the standard with which other boards need to be compatible. In particular, the control command sequences have become entrenched within many programs. Therefore, to allow software compatibility, most interface cards recognize these standard control codes.

Apple Parallel Printer Interface Card. In terms of our previously described criteria, this board stacks up as follows. The on-board firmware sets the high-order bit low, but all eight bits can be accessed with user-written software. The simplified ten-wire interface is augmented by a configuration block. This allows selection between positive or negative going signals. Line feed control, line length, and printer command character are set easily, thanks to the parallel card's firmware. These commands are all signalled by first sending the printer command character (usually control-I):

Control-I n N—Turns off printing to the video monitor and sets the line length to n columns.
Control-I I—Restores printing to the video screen.
Control-I K—Disables automatic line feed generation.
Control-I control-letter—Changes the printer command character to the designated letter.
Control-letter control-I—Changes the printer command character back to control-I.

To activate any of these commands, just print the corresponding sequence of characters as shown above. This can be done either from the keyboard, in the immediate mode, or from within a program. The following Basic line, for example, will turn on the printer card and set the line length to eighty columns:

```
100 PRINT "ctrl-d PR#1" : PRINT "ctrl-i 80N"
```

Most programmers dislike the use of control characters within the *print* statements. For one thing, they do not show up on the video screen. Another problem is that when listing the program, these commands will be executed by the printer card. A better approach would be to use the CHR$ function:

```
10 D$=CHR$(4):I$=CHR$(9)
100 PRINT D$"PR=1" : PRINT I$"80N"
```

Integer Basic, however, does not support the CHR$ function.

Therefore, it would be nice to have some way to make the printer card ignore the embedded control commands. This can be accomplished using the last two commands above. Typing a control-I followed by any control letter changes the printer card's command character to that letter. Thus, the control-Is found within the program no longer have any effect on the card. The program can now be listed to the printer without any side effects. When you are ready to run the program, the command character can be changed back to control-I. This feature is even more important on other cards that have many more commands. Price of the Parallel Printer Interface Card is $180, including cable.

Apple Communications Interface Card. This card provides full-duplex serial communication at either 110 or 300 baud. For this reason, it is used mainly for connecting modems or external terminals. It can be used to drive a serial printer, but its slow speed and lack of handshaking make it a poor choice (it is possible to correct these deficiencies, but this requires making hardware modifications).

Full control of the data word format is available by *poking*, and lower-case input can be optionally converted to upper case for display on the Apple's screen. The Comm Card's firmware permits Basic control with a PR# statement for output and In# statement for input. It further supports the following commands:

Control-A control-H—Selects half-duplex terminal mode of operation.
Control-A control-F—Selects full-duplex terminal operation.
Control-A control-1—Sets baud rate to 110.
Control-A control-3—Sets baud rate to 300.
Control-A control-X—Cancels terminal mode.

The Communications Interface Card sells for $225 and comes with a DB-25 connector that mounts on the back of the Apple.

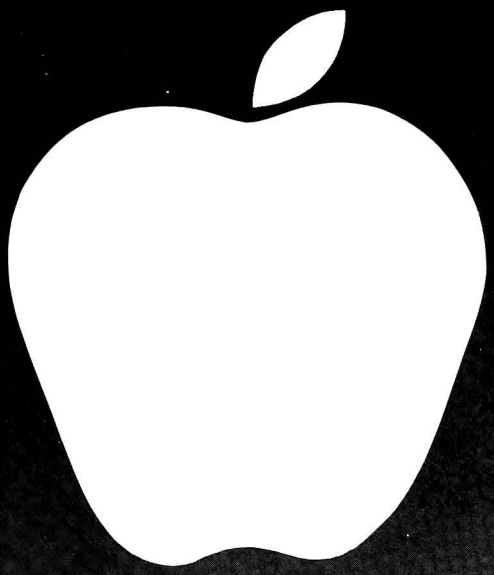
High-Speed Serial Interface Card. This was Apple's answer to the need for a serial card that could run at higher speeds to drive printers or terminals. In many ways, it's probably one of the worst boards Apple made, but it does have some features not found on other serial boards.

To begin with, there are no provisions for handshaking. As a band-aid fix when duplex operation is not required (for example, use with a printer), it is possible to send the handshake signal over the receive data line. This requires a software patch or replacement of the card's firmware.

The High-Speed Serial Card also performs its data translation via software (as opposed to the usual hardware UART). This can present some other problems, especially if interrupts are being used.

On the positive side, this board supports communication at rates from 75 to 19,200 baud. Data format, lower-case conversion, baud rate, line length, and line feed are all software controlled through *pokes*. A very nice feature of this board is the use of seven dip switches to set the default values of several parameters. Three of the switches set the baud rate; one allows for a carriage return delay; two more set the default line length to 40, 72, 80, or 132 characters; and the last switch controls the line feed generation.

The carriage return delay is used in lieu of handshaking when connecting to some printers. It causes the computer to wait about one-fourth of a second after every carriage return. This compensates for the time needed by the printhead to return to the left margin. Apple's High Speed Serial Interface Card goes for $195, including a rear-mounted connector.



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SSM Microcomputer Products. SSM was one of the first independent companies to offer interface boards for the Apple. They make a serial board (ASIO), a parallel board (APIO), and a dual serial/parallel board (AIO). These boards are well designed, but the firmware included with them originally was rather weak. No command codes were implemented and all parameter changes had to be made by *poking*.

Recently, however, SSM has revised all of its firmware and added a new board—the AIO-II. With the new firmware, the APIO now emulates Apple's parallel card. This board can also be used for general purpose parallel interfacing, providing two bidirectional programmable eight-bit ports. The standard firmware works with Centronics-type printers but optional PROMs are available to handle other printer standards. The PROMs can even be replaced with RAM chips to allow loading a custom driver onto the card from disk.

The ASIO board provides serial communication at 110 to 19,200 baud with full handshaking. Two connectors on the board allow it to act as either a DTE or DCE device, eliminating the need for special cable wiring. The standard firmware emulates a parallel card for printer compatibility. For use with modems or terminals, the optional communications firmware can be installed. This makes the ASIO board look like an Apple Communications Card, including its "dumb terminal" operation.

The AIO board combines the functions of both the APIO and ASIO. The firmware can support only one interface, however, so extra software must be written to use both ports. Although still available, this board will eventually be replaced by the AIO-II.

The AIO-II sports several firmware options and seven jumper-selectable controls. These jumpers configure the board for line feed generation, DCE/DTE operation, serial/parallel operation, and positive or negative strobe, data, and acknowledge. This should provide the user with enough flexibility to connect any printer. Although simultaneous operation of both ports is possible, extra software must be supplied for them to work independently.

Optional driver software is also available for using the SSM boards with Pascal and CP/M. Pricing on the boards is as follows: APIO, $109; ASIO, $149 including cable; AIO, $195 including parallel and serial cables; and AIO-II, $225 (cables cost extra).

Tymac Controls PPC-100. Offering a little bit more than the average parallel card, the PPC-100 allows the high-order bit to be set high or low by simple *poke* commands. Aside from this, the board performs exactly like the Apple parallel board. No configuration block is used, so the printer must conform precisely to the Centronics standard. The PPC-100 board sells for $139 including cable.

Orange Micro Grappler. The Grappler interface combines an enhanced parallel card with on-board graphics dump routines. The enhancements include treatment of the full set of status lines and the following additional commands:

Control-I B—Enable bell. Allows Control-Gs to be passed to printer ringing its bell if it has one.
Control-I H—Allows high-order bit to be sent to printer.
Control-I nL—Set left margin to the nth print position.
Control-I nP—Set page length to n lines per page. After every n lines, six line feeds will be outputted to start a new page.
Control-I nR—Set right margin to nth character.
Control-I S—Dump present text screen to the printer.
Control-I X—Turn off high-order bit to the printer.

These new commands are impressive enough, but the real power of the Grappler is in its graphics capabilities. Following a control-I with a G instructs the board to print out a hi-res picture subject to the following optional parameters:

2—Print hi-res page 2 instead of page 1.
D—Print the graphics image double size.
I—Invert the image (reverse black and white).
L—Print image at the left margin previously set.
R—Rotate the picture 90 degrees. Allows several pictures to be shown adjoining. Can simulate a chart recorder.

As an example of these commands, if you typed control-IGDI2R, you would receive a printout of the hi-res page 2 double size, inverted, and rotated ninety degrees. Since there is no standard for graphics printing, the firmware in the Grappler must be matched to the particular printer you are going to use. If you change printers, the card will still be good for printing text, but the graphics commands will probably not work.

Orange Micro deserves credit for advancing the state of the art in Apple printer boards. Several new boards have appeared with Grappler-compatible features. If imitation is indeed a form of flattery, then Orange Micro should be pleased. Price of the Grappler is $165, including cable.

Olensky Bros. Smart II. Touting a 3K print buffer with text compression, this board also adds margins and tab setting to the basic parallel board. Two dip switches allow the buffer and/or extra features to be disabled; with both switches on, the board emulates an Apple Parallel Card. Most of the new commands are accessed with a control-V as follows:

Control-V S aaa,bbb,ccc,...—Sets up to sixteen tab stops at the absolute print positions specified.
Control-V T—Tab to next stop.
Control-V Ln—Set left margin.
Control-V Rn—Set right margin.
Escape K—Sets pass-through mode on.

The pass-through mode allows special text to be transmitted without interference by the Smart II firmware. It turns off text compression, margins, and tabbing. This was the only board tested that passed text out with the high bit set. This required us to change our printer settings to use seven-bit code, giving up its alternate character set capabilities. The Smart II also has an LED to indicate when the buffer is full. Price of the board is $225 including cable.

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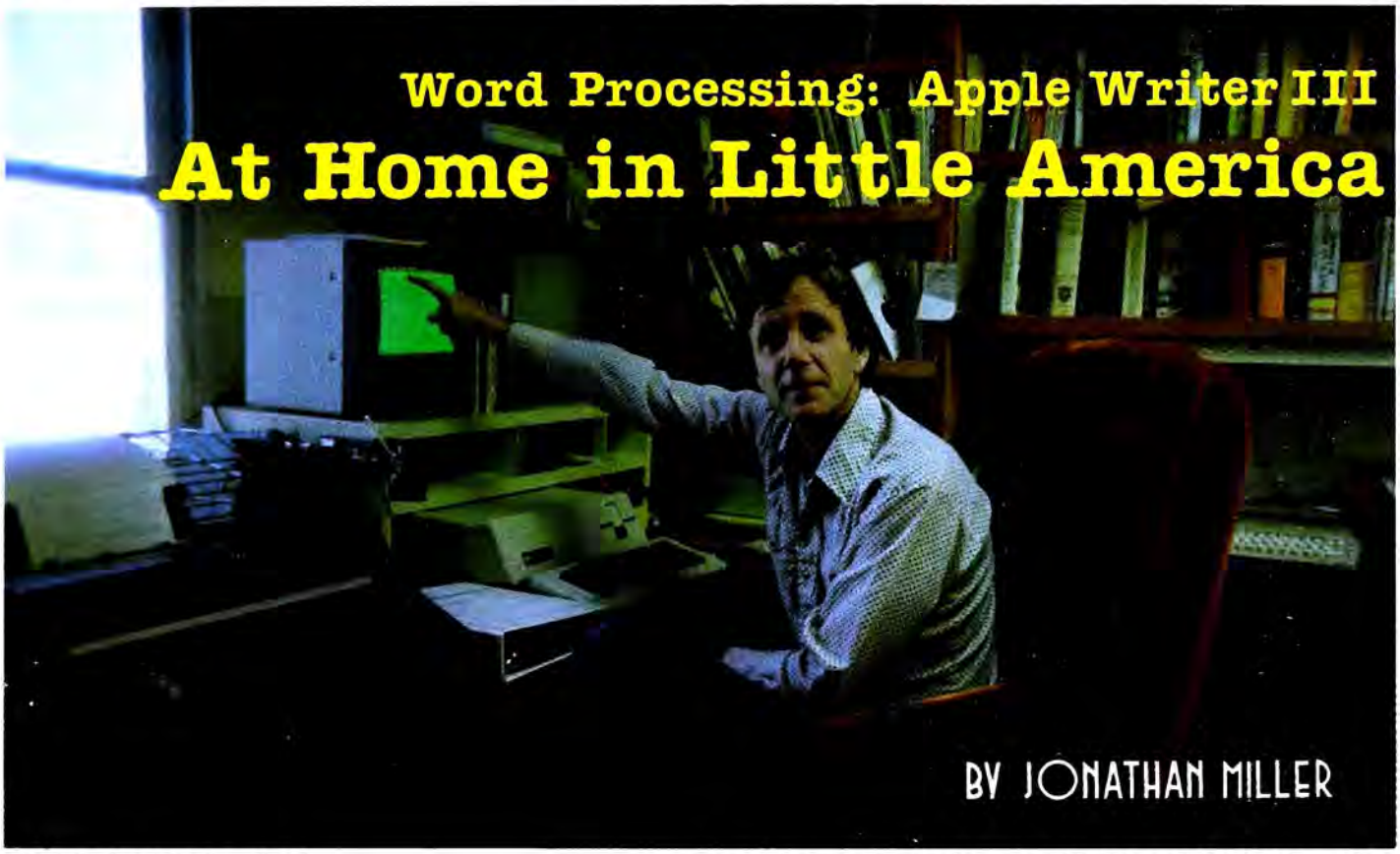
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BY JONATHAN MILLER

Rob Swigart had arrived.

Within moments, the science fiction writer from Northern California would be meeting with Ingo Preminger, the Hollywood producer (*M*A*S*H*) who would later commission him to write the screen adaptation of his most successful book, *Little America.*

This was the big time, the big bucks, and Swigart, the Silicon Valley satirist, stood outside the PSA commuter terminal watching the wealth wheel by. A Cadillac, a Rolls, a Cadillac, another Rolls—on and on just like the idiot recording, made popular by the movie *Airport*, droning overhead about the white zone for loading and unloading of passengers only.

This was Los Angeles, land of hype and hypocrisy. No place for an upstater and certainly no place for a writer. Swigart had heard the stories. About the studio heads who gave great meetings and wouldn't know a screenplay if it fell on them. You came here to remind yourself that evil was not an abstraction. You came here for all the money those chauffeured movie moguls paid their writers.

Only where was Ingo, brother of Otto, the Austrian with a voice like a twenty-one gun salute? Why, standing at our pilgrim's feet, giving greeting and ushering Swigart to the parking structure across the street. For there, in a common stall, surrounded by Hondas, Capris, and Chevettes, stood Ingo's Hollywood limo: a blue, '71 Volkswagen Beetle.

Swigart laughs as he recalls his rendezvous with Ingo "Three Homes" Preminger, the mogul who mauled his Hollywood preconceptions. For Ingo is Swigart's kind of guy and this, on a small scale, a Swigart kind of story—a free spirit in a cock-eyed world rising above the banalities and incongruities to make a game of life.

We are gathered in Swigart's cozy office cottage behind his tree-shaded home in Redwood City, the one that has followed the Silicon Valley's soaring fortunes by appreciating from $42,000 to $350,000 in ten years. Swigart, hands behind his head, is rocking in a high-backed swivel chair upholstered in shockingly decadent and unwriterly red velveteen. Behind him, on a long table, the tools of his solitary trade: an Apple III, a Sony CRT, and a Diablo Printer, which moments before whipped out the final pages of his *Little America* script.

Here is a man at peace in two language worlds—the fictional cosmos he creates using English and the literal world he manipulates with his *Apple Writer* word processor. "Push a button and in one and a half hours a whole script, one hundred seventeen pages, is typed. Push another button and you can move huge files around. You feel so powerful."

The power inherent in technology, in those sublime gadgets we call computers, fascinates Swigart both in fact and in fiction. In his novel, *The Time Trip*, Swigart's computer programmer hero harnesses a bank of government computers, into which he has illegally tapped, to the linear accelerator at Stanford University to travel 4,000 years back in time. His purpose? To retrieve his deceased wife from the hereafter, the little woman having checked out by sticking her comely Midwest head in a microwave oven.

It's a neat trick, but in Swigart's absurdist world neatness doesn't count. There are limits to technology and languages that attempt to order the crazy universe. Ultimately, our hero learns, all life is fiction, a play on words. Winning isn't as important as having fun in the game, in valuing language for itself. "I've always felt that the language of science and technology is very romantic, particularly when you get into the esoteric aspect of basic research, such as high-energy physics," observes Swigart. "They'll talk about subatomic particles as having strangeness and charm, even a romantic streak."

Swigart is intrigued by the notion of crossover, of the increasing power of electronic machines to simulate the real world. They may never bridge the gap, but brother Swigart relishes the prospect. "I'm really interested in the unification of East and West, in the right and left hemispheres of the brain," he explains. "Science is interested in the why, technology in the how, but traditionally there's been a split between them. I'm concerned about the creation and wholeness, which means understanding technology in a spiritual as well as a manipulative sense."

All this is very serious thought food for a guy who claims to be nontechnical, but the way Swigart tells it, it's perfectly natural. Computers are as much a part of the natural environment as trees in the forest. That certainly was true in Swigart's neck of the woods. Back in the seventies, every whiz kid in San Mateo County was turning the family garage into a computer laboratory. You could no more ignore that incredible activity

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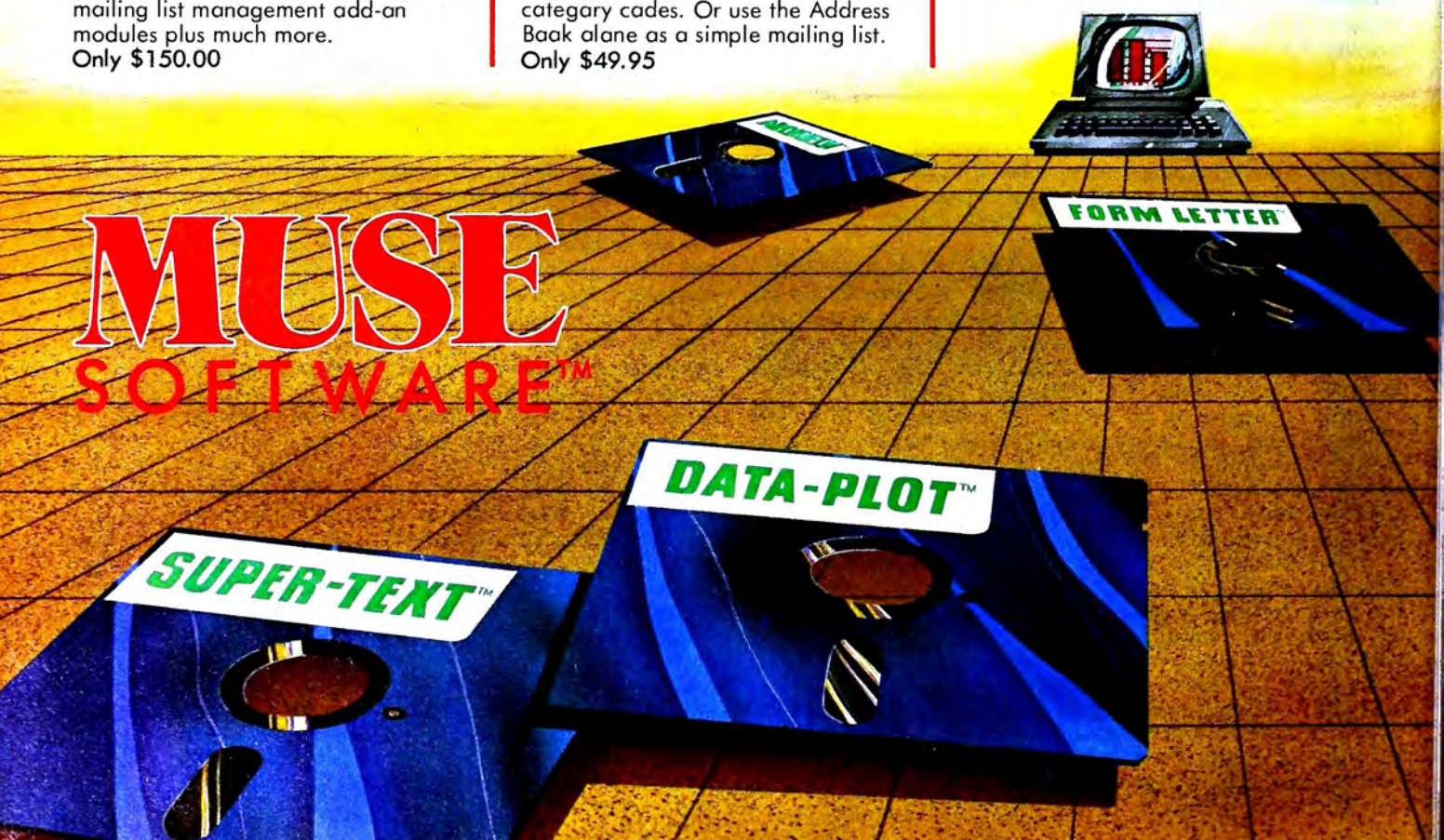
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than you could the psychological impact of technology on man, long a Swigart preoccupation. "It affects the way you think and creates certain limitations. Like phones," he deadpans. "They're always ringing when you're in the bathroom, the importance of the call always being inversely proportional to the urgency of nature's."

Yes, at times there does seem to be some machinelike conspiracy against man—from sadistic laundromat washers that tear families of socks asunder to larcenous vending machines that goad you to kick them. Such tension between the animate and inanimate worlds bore looking into. It was time for Swigart—teacher, poet, cello player, and screenwriter—to bite the Apple, to taste of the forbidden fruit.

The Agony and the Ecstasy. Writing is not by nature a pleasurable occupation, but Rob Swigart is enjoying it more now that he has an Apple III. He loves its superb keyboard and the way his fingers fit the scalloped keys. He marvels at its speed, the capacity of its memory, and the flexibility of its operating program. But mostly, he just likes playing with it. When you're a gadget freak, your tools are your toys.



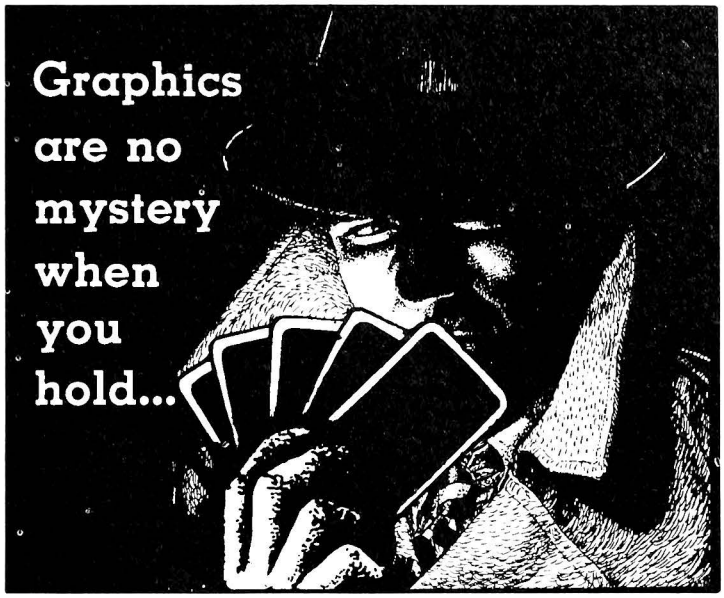
"To tell you the truth, I'm not even sure I'm saving more time using a word processor instead of a typewriter," he says of his *Apple Writer* program. "I know I do a lot more editorial tinkering because it's so easy to make changes, but I don't know about my productivity. I just have a lot of fun playing with it."

Playing, of course, has its serious side, as Swigart discovered when he started hammering out Ingo's script. Scripts present certain formatting problems because dialogue blocks and scene directions employ margins of varying widths. "Basically, I was dealing with four different margin settings," he explains. "Because you don't get on the screen what you eventually get on the page, you have to format the stuff as you do it so that when it prints, it prints the script."

Another problem was not as easily solved. Because scripts are constantly undergoing revision—with scenes being moved from one place to another—scene numbering is customarily left to the last moment. To cope with this, Swigart spent two taxing days writing a utility subprogram that consecutively numbers scenes during the final print run.

The printing itself, however, created another headache for Swigart, though the prescription was easily filled thanks to the Apple's flexible operating system. "Due to the printer's age, it required certain handshaking routines, but I was able to configure the system in a way to make it work," Swigart explains. "With another computer, you would have had to exchange hardware to get it to work. It's nice to know the Apple is software-driven rather than hard-wired, so that if some dazzling feature comes along you can reconfigure your system to accommodate it."

It's also nice to know, he adds, that this new word processing program features a glossary that stores frequently used names and phrases. And that his files contain 58,000 characters as opposed to the 12,000 on his old *Easy Writer* program. Now he keeps his entire script on four files (two disks) instead



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of seventeen. Mention of the *Easy Writer* program evokes a nightmare recollection: the transfer of his script files from *Easy Writer* to *Apple Writer*. And it does sound horrible.

"I had to boot up *Easy Writer* on the Apple II, then get an *Easy Writer* file disk, take a file off of it, put in another *Easy Writer* file disk, turn off the machine, boot up this program, put the *Easy Writer* file disk in drive one and the Apple DOS file disk in drive two and run this program transferring the *Easy Writer* file from the *Easy Writer* file disk to the *Apple Writer* disk, turn off the machine and boot up *Apple Writer*, transfer the file from the DOS disk to an *Apple Writer* disk, turn off the machine, boot up *Easy Writer*, delete the *Easy Writer* file from the *Easy Writer* disk, and put another file on it. I had to do that with seventeen files to get the script transferred over," says Swigart, gasping for breath. Then triumphantly: "But it worked." Is this a man happy with his *Apple Writer*? In the main, yes, but he does have a few bones to pick. As currently configured, there's no way to know where the page breaks are, so you don't know where to place a script's headers, footers, and continued lines. An optional page line, and a decent bunch of utility programs in word processing language, says Swigart, would eliminate the system's few bugs. He figures they'd be easy to write, but he'll leave that housekeeping chore to others. "A programmer I'm not," says Swigart.

Lust For Life. If not a programmer, who is this nontechnical man who plays the cello, cheats at computer games, and writes science fiction based loosely on Greek tragedy? A man of many parts.

In his forty-one years, this Princeton alumnus has been a police reporter, a poet, a textbook salesman, a documentary filmmaker, a teacher, a California think tank futurist, and the author of four books. Now, as they say, he are a screenwriter.

It's been a learning experience, with Swigart apprenticing under one of the best, Preminger's co-producer, J. P. Miller (*Days of Wine and Roses*). "I thought I knew all this stuff," says Swigart. "I wrote the first draft based on a course in film comedy I taught. What I did was Xerox the book, cut the chapters out, and then restructure and paste. They said throw out the book, keep it moving, and dramatize everything."

Screenwriting not only calls for a different technique, it requires a new mindset, says Swigart. "When you write a novel, every word you write down they get, but when you write a script nobody's going to read it. Maybe a couple of executives and the director, but that's it. Scripts are not movies. They're packaging, designed to sell a bunch of lawyers who wouldn't know a movie if it fell on them."

Books are another story, and the eclectic Swigart is experimenting here as well. His latest, *The Book of Revelations*, explores ecological questions and represents his most serious and political work. "It's easy for me to be sort of goofy and absurd," Swigart confides. "It's much harder to be serious."

But why, Rob?

"Scared," he says. "When you're reading to people—which I like to do—and they're laughing, you're getting feedback. When you read something serious and there's no visible, audible response, you don't know whether they're asleep."

At the moment, though, Swigart is more concerned with the sleep state of his interviewer. He's afraid he hasn't been quotable. This, after all, is the self-promotional age of the writer celebrity, the pugnacious Norman Mailer and the dapper Tom Wolfe. It's part of the hype borrowed from the painterly arts, from Dalis and the Pollocks. The quotable prospects are looking dismal when suddenly, gratefully, Swigart brightens with inspiration. "Yes," he wryly observes, "you can't get by with just cutting your ear off anymore." ◼

Jonathan Miller edited several magazines from time to time at East/West Network, a publisher of in-flight magazines in Los Angeles, and there distinguished himself as a nonpareil author of office memos. Formerly with the Los Angeles Herald Examiner, *Miller had recently joined the ranks of starving writers when* Softalk *offered to let him string for his supper, which he'll be doing regularly.*

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Inverse Lower Case	N	N	rev 7 only	N	—	Y	N	N	Y	—
Font Size	5 x 7	5 x 7	5 x 8	5 x 8	—	5x7, 7x8	5 x 7	5 x 7	5x7, 7x8	—
# of on-board character sets	1	1	1	1	—	up to 4 (2 std)	1	1	up to 4	—
Pseudo-descenders	Y	Y	N	N	—	Y	Y	Y	Y	—
True descenders	N	N	Y	Y	—	optional	N	N	optional	—
Optional fonts avail. (ROM, disk)	N	N	N	Y	—	Y	N	N	Y	—
2716-compatible character generator compatable with fonts created by HIRES character generators	N	N	N	N	—	Y	N	N	Y	—
On-board graphics character set	N	N	N	N	—	Y	N	N	Y	—
Software provided on diskette	$5 extra		N	N	—	Y	Y	Y	Y	Y
Single board works with all Apples	N	N	N	N	Y	Y	N	N	Y	Y
Expandable System	N	N	N	N	N	Y	Y	Y	Y	Y
Extensive user Documentation	N	N	Y	N	N	Y	Y	Y	Y	Y
High quality PC board	N	—	Y	Y	Y	Y	—	Y	Y	Y
Reset key disable	N	N	Y	Y	N	N	N	Y	Y	Y
Shift key mod	N	N	Y	Y	N	N	N	Y	Y	Y
All 128 characters available from keyboard	—	—	N	N	—	—	—	Y	Y	Y
Type ahead buffer	N	N	N	N	Y	N	N	Y	Y	Y
# of characters in buffer	—	—	—	—	40	—	—	64	64	64
Ability to clear or turn off buffer	—	—	—	—	N	—	—	Y	Y	Y
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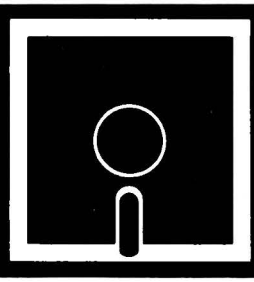
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All About Applesoft

by Doug Carlston

Before getting into this month's topic (yes, folks, we really are going to do graphics this time!), there is a little housecleaning left over from the first two columns. First of all, you can use all the commands given to date in deferred mode, to wit:

```
10 LIST
20 RUN
```

Try it. You'll like it. Second, you can use *peek* and *poke* to look at almost any area of memory or to modify it. Try the following little routine:

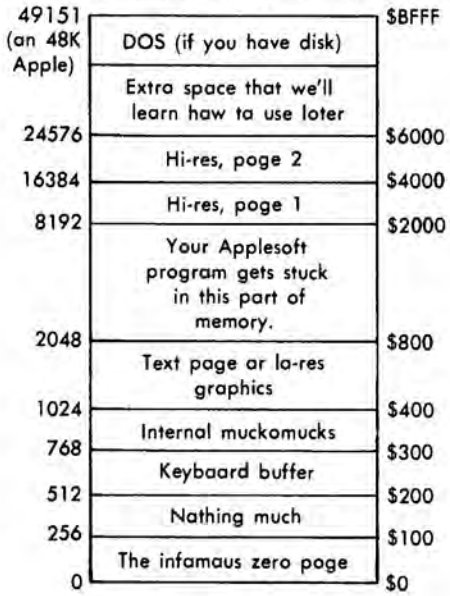
```
10 POKE 1024 + X, 193
20 X = X + 1: IF X < 1024 THEN 10
```

You might want to try numbers other than 193 in line 10 and then examine the effect.

So much for loose ends. Here is this month's vocabulary list:

TEXT	GR	HGR	HGRZ
HCOLOR	HPLOT	RND(1)	COLOR
PLOT	HPLOT...	TO	TAB(10)
VLIN	HLIN	AND	

This month we promised to explore the Apple's graphics capability. To understand how the Apple can switch between text mode and graphics mode we are going to have to bite the bullet and take at least a cursory look at how the Apple's memory is organized. When Steve Wozniak ("the Woz") and other early explorers first mapped out the memory of the Apple, they placed boundaries between regions at nice even numbers to make them easier to remember. Unfortunately, they were not using the decimal numerical system at the time, so much of the beauty of this arrangement may be lost on the casual observer. The numbers on the left side of this map are decimal; the ones on the right, hexadecimal (which is just like decimal if you have sixteen fingers). Hexadecimal numbers are indicated by the dollar sign placed in front of them.



The numbers on both sides of this diagram are addresses. When we *poked* 193s into memory a short time ago, we *poked* them into the area between 1024 and 2048. This is the area of memory that is displayed on your television when you are in text mode (which you are right now unless you have looked ahead).

Now try adding the following line to your program:

```
5 GR
```

The command *gr* puts you in graphics mode. If you *poke* this area of memory now, instead of A's you'll see rows of colored stripes being plotted on the screen. We are not going to get into why the rows don't load in order or what causes the stripes to be different colors—these would lead us pretty far afield. But this little demonstration is important because it shows that the same area of memory can represent text or graphics.

Apple graphics come in two flavors: low resolution (*lo-res* to those in the trade) and high resolution. Lo-res graphics can plot up to forty blocks in forty rows, in sixteen different colors. Hi-res gives you 280 dots horizontally and 192 vertically, in eight different colors (although two of them are black and two are white, which is another way of saying you really get white plus four other colors). In addition, in hi-res, you have an opportunity to draw on either of two different screens.

Those screens come from a different area of memory than the part we just *poked*. If you look at the memory map above, you will find two areas side-by-side, one marked "Hi-res, page 1" and the other marked "Hi-res, page 2." A little quick subtraction will show that these areas are far larger than the lo-res area we have been fooling with up to now, which makes sense when you think about it, since there are 280 by 192 dots to keep track of rather than 40 by 40.

You can display any of these screens on your television. Type *text* and then *list* your program. Now change line 5 to read:

```
5 HGR (remember how to edit?)
```

Run it. The screen clears, and for a while nothing happens. Then four rows of A's appear at the bottom of the screen. At least that's what happened at this computer.

Hgr is a composite command, which means that it tells the computer to do a whole lot of things. First, it tells the computer to take the video output from the area of memory called hi-res page 1. Then it tells it to clear this area of any accumulated garbage, so the screen is blank. And finally, it tells it to open a four-line text window into the *text* page at the bottom of the screen, presumably so you can put a title on whatever picture you are about to draw.

Let's take another look at our program. Type *text* and then *list* to retrieve it. To prove that *hgr* redirects the television's attention to a new area of computer memory, let's rewrite our program so that it *pokes* into the area called hi-res page 1 on our map. The new program should look like this:

```
5 HGR
10 POKE X + 8192, 193
20 X = X + 1: IF X < 8192 THEN 10
```

Does everyone understand why line 20 uses the number 8192? Because when x equals 8192 then x + 8192 (from line 10) will equal 16384, which is the end of hi-res page 1. Now *run* the program and be patient. After all, this will take eight times as long as filling the lo-res page.

If all went well, the screen should be filled with color (except for that window into the text page) and you should all now believe that hi-res page 1 is located where it's supposed to be. We can do the same thing with hi-res page 2, by the way. The command to direct video output from page 2 is *hgr2*, which is pretty logical when you think about it. *Hgr2* differs from *hgr* in only two respects. First, it won't work if you only have a 16K Apple (since your memory doesn't extend up that far—16K means 16 × 1024, which equals 16384, the top boundary of page 1). Second, it doesn't automatically open a text window at the bottom of the screen (you can open one yourself with a well-placed *poke*, but we won't get to that until a little later in this episode).

You may at first question the value of having two hi-res screens available to you, when you don't even know what to do with one yet. Well, we'll write a little "page-flipping" program next time that should convince even the most skeptical that two is better than one.

But let's get on with the business at hand first. Try entering the following program:

```
5 HGR
10 HCOLOR = 1
20 X = RND(1) * 279
30  Y = RND(1) * 159
40  HPLOT X,Y
50 GOTO 20
```

We have a whole mess of new commands here. As you recall, *hgr* stands for hi-res graphics. *Hcolor* sets the hi-res color. *Hplot* plots a dot on the hi-res screen. (The equivalent commands on the lo-res screen are *gr, color,* and *plot.*) *Hcolor* can be set to any value from 0 to 7. The values 0 and 4 are always black, 3 and 7 are white. The others vary a great deal depending on your television but are usually green (1), blue (2), orange (5), and violet (6).

Hplot must always be followed by two values, separated by a comma. The first value represents the X coordinate (that is, the column) of the dot to be plotted. The second value is the vertical row or Y coordinate of the dot. The X coordinate can range from 0 to 279 (if the value ever is less than 0 or greater than 279, the Apple will stop with a beep and print "?Illegal quantity eror in. . . ." You may have to type *text* to read this message, since all errors are printed on the *text* page). The Y coordinate can range from 0 to 191. (We cut it off at 159 in line 30 up above because there was no reason to plot dots on the part of the screen that is overwritten by the text window.)

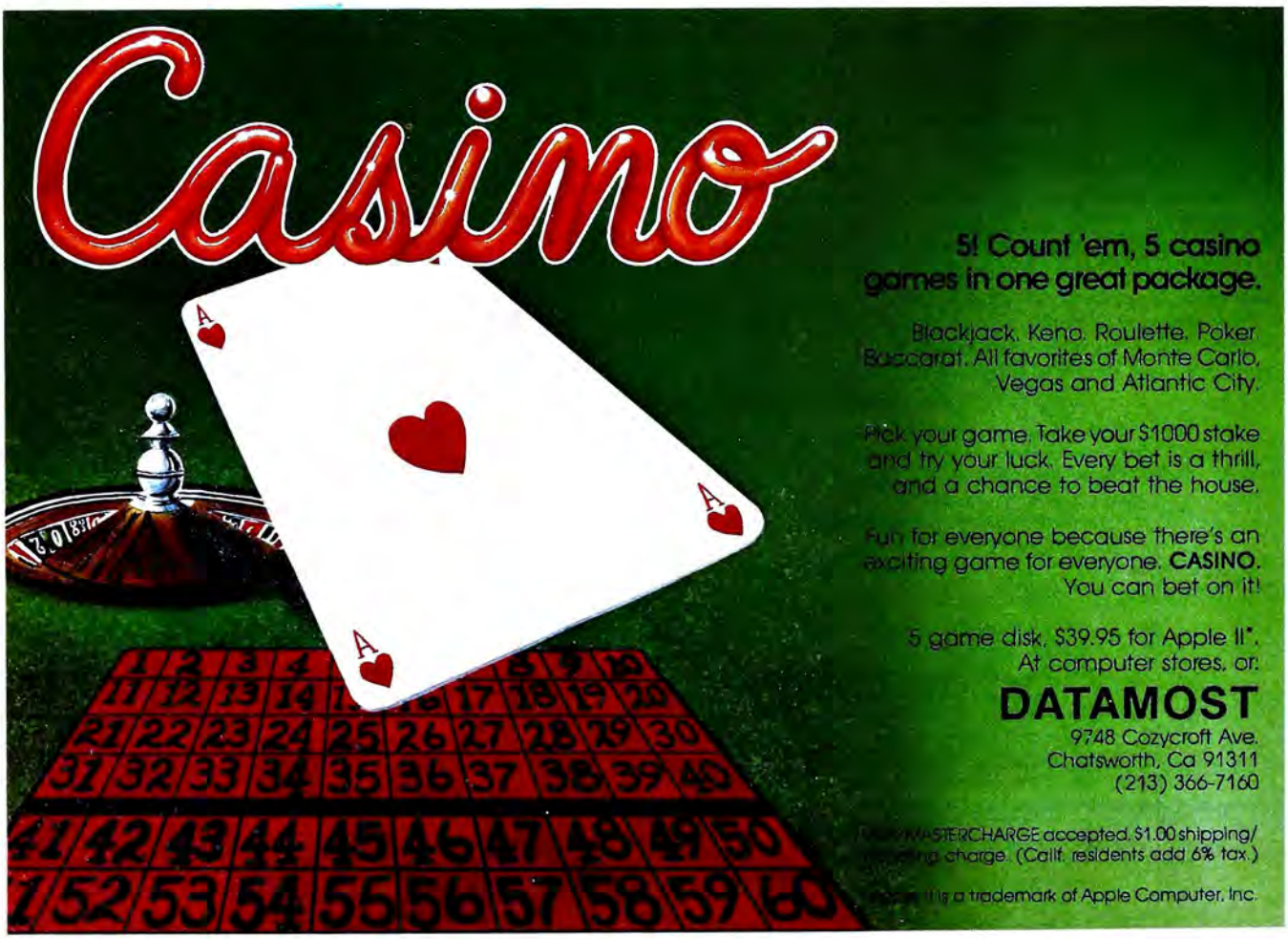
Rnd(x) is the Applesoft random number generator. As long as the x is a positive number, *rnd(x)* will return a random value between 0 and 1 each time it is used. Therefore, if you want a random number between 0 and 279, you just take *rnd(x)* and multiply it by 279. *Rnd(x)* is a useful way of getting nonsense on your computer screen.

Just for the fun of it, try modifying line 20 to read as follows. Then try to predict what will happen before you *run* it.

```
20 X = RND(1) * RND(1) * 279
```

It would take a long time to get anywhere if all you could do is plot dots. Fortunately, it isn't. *Hplot* can be used to draw lines as well. Add the following line to your program:

```
6 HCOLOR=3: HPLOT 0,0 TO 279,0: HPLOT 279,0 TO 279,159: HPLOT 279,159
TO 0,159: HPLOT 0,159 TO 0,0
```



Hcolor=3 sets the color of the border to white. Then each of the next four commands draws a straight line from the first set of coordinates *to* the second. Actually, it wasn't necessary to write four separate commands like we did. The following line would work equally well:

```
6 HCOLOR=3: HPLOT 0,0 TO 279,0 TO 279,159 TO 0,159 TO 0,0
```

Hplot can be used to draw diagonal lines as well. After you have *run* the program above to your heart's content, try adding the following line:

```
7 HPLOT 0,0 TO 279,159: HPLOT 0,159 TO 279,0
```

Run it. Now we're cooking. Perhaps you would like to title this work of art. You could add the following lines to your code:

```
1 HOME
8 VTAB22:HTAB10:PRINT"GLYCOL STUPOR"
9 PRINT TAB (10)"BY ANN BYE"
```

Now *run* it one more time. Ain't that grand! A classic cross between dynamic art and genetic drift. You may not have noticed the very subtle way in which we snuck in another formatting command. *Tab* differs from *htab* in that it can only be used inside a *print* statement (and *htab* can never be used inside a *print* statement).

Anyone mad enough to want to save the above creation can do so by typing: *save Stupor* (if on a disk system) or just plain *save* (if you have a cassette based system).

Now, we are not going to ignore lo-res graphics utterly. However, most of our examples from now on will be on the *hi-res* screen. The lo-res equivalents to the hi-res *hplot . . . to* command are *vlin* and *hlin*. They are used like this:

Vlin 0,39 at 3 means draw a vertical line from row 0 to row 39 in column 3

Hlin 0,39 at 5 means draw a horizontal line from column 0 to column 39 in row 5

A table of the lo-res colors can be found in Appendix O of your Applesoft manual. Once you have absorbed all this, try to write a lo-res version of *Glycol Stupor*. Then compare it with the listing at the end of this column. The diagonal lines should be a real challenge.

Now that everyone has had a chance to play with the graphics some, let's go back to basics for a while. The video display of the Apple is controlled by four sets of switches. These switches are located in the Read Only Memory (ROM) of the Apple and are so sensitive that they can be toggled merely by looking at them. Here they are:

Set	Purpose	Address
1o	Displays screen in graphics mode	49232
b	Displays screen in text	49233
2o	Closes text window at screen bottom	49234
b	Opens text window at screen bottom	49235
3o	Displays page 1 on screen	49236
b	Displays page 2 on screen	49237
4o	Displays $400 area (text/lo-res)	49238
b	Displays one of the hi-res screens	49239

You can look at any of these locations by *peeking* them, like this: **X=*peek(49233)***. So if you want to use *hgr* to turn on page 1 of the hi-res screens but you *don't* want the little text window to appear at the bottom of the page, you would add a line like this to your program:

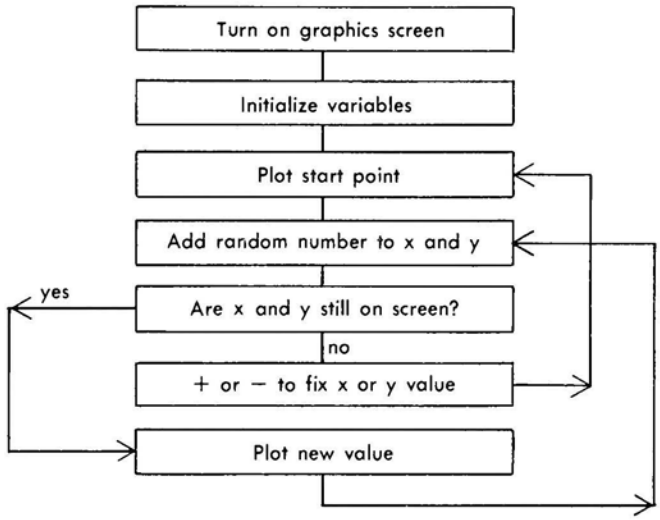
```
10 HGR: X = PEEK(49234)
```

That should do it. Now let's see if you can turn on the *hi-res* page 1 using only *peeks*. (First type *text* or press reset to get back to your normal text page.) Go to it. Your finished effort should look something like this, although not necessarily in this order:

```
1 X = PEEK(49232)
2 X = PEEK(49234)
3 X = PEEK(49236)
4 X = PEEK(49239)
```

Hgr is a lot simpler, isn't it?

The Softalk Random Walk. Let's try one last problem using some of the new commands we have learned. Let's write a program to draw a random walk. The first thing to do, as we have learned, is to flowchart the problem. A flowchart of this problem might look like this:



Our listing might look something like this:

```
10  HGR:X = PEEK (49234)
20 X = 140:Y =96
30  HCOLOR= 3
40  HPLOT X,Y
50 X = X - 5 + RND(1) * 10
60 Y = Y - 5 + RND(1) * 10
70  IF X > 0 AND X < 279 and Y > 0 AND Y < 179 THEN 130
80  IF X < 0 THEN X = X + 280
90  IF X > 279 THEN X = X - 280
100  IF Y < 0 THEN Y = Y + 192
110  IF Y > 191 THEN Y = Y - 192
120  GOTO 40
130  HPLOT TO X,Y
140  GOTO 50
```

There are a couple of new ideas in here as well as the Applesoft *and* command and a new way to use *hplot . . . to*. But pay closest attention to the way the **X** and **Y** values are altered in lines 50 and 60, and to the tests in lines 70 through 110. To figure out what each part is doing here, try omitting parts of the program. For example, place a *goto130* at line 65 (which will cause the program to skip all the tests). Or eliminate line 120 altogether. What happens in each case when the wandering line hits the edge of the hi-res screen?

We'll examine this program a little more closely next time. We'll also start using the game paddles to control our video output.

Finally, as promised, here is a lo-res version of *Glycol Stupor*:

```
1  HOME
5  GR
6  COLOR= 15: VLIN 0,39 AT 0: VLIN
   0,39 AT 39: HLIN 0,39 AT 0: HLIN
   0,39 AT 39
7 X = 0:Y = 0
8 PLOT X,Y: PLOT 39 - X,Y: X =
  X + 1:Y = X: IF X < 40 THEN
  8
9 VTAB 22: HTAB 10: PRINT "GLY
  COL STUPOR": PRINT TAB( 10)
  "BY ANN BYE"
10  COLOR= 2
20 X = RND (1) * RND (1) * 40
30 Y = RND (1) * RND (1) * 40
40  PLOT X,Y
50  GOTO 10
```



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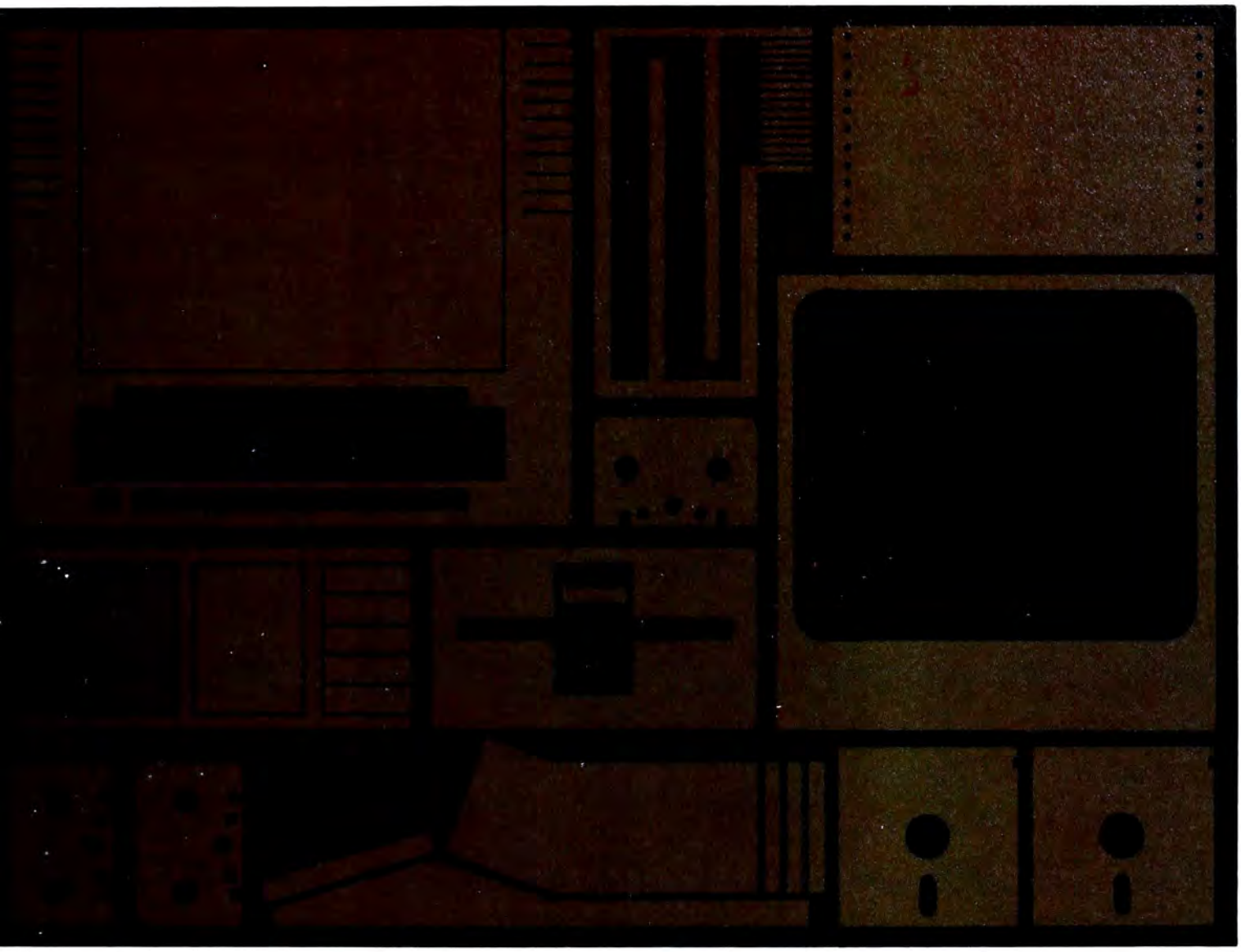
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SOS to the Rescue



TAMING YOUR APPLE III

BY JOHN JEPPSON

How Does the Program Talk to the Printer? Consider a program happily working away, its subroutines recurring, its logic circuits looping, until, in a twinkling, it has computed an Important Result. Imagine its excitement, its syntax all aquiver. The program must tell the world its Important Result. But how? . . . Aha! It knows. It will tell that notorious blabbermouth, the printer. That will spread the word quickly enough.

But wait. The printer lives in a rough neighborhood. The program mustn't be seen there. What to do?

In Boston, where the Lodges speak only to the Cabots, and the Cabots speak only to God, the solution is well known: send a servant to tell someone else to find someone to do the job. The solution's much the same in the Apple III. One just has to know where to find the right middlemen.

SOS Brings Help. Programming the Apple III is really quite smooth and simple, once you get by some initial complexities of the operating system. In fact, the Sophisticated Operating System (SOS) greatly increases the computer's power and versatility and, in the long run, simplifies many programming tasks. But, when you first encounter the Sophisticated Operating System, it may seem alarmingly complex.

How, then, is information transferred from program to printer in the Apple III? Not directly. Information goes through middlemen, and the principal middleman is the *driver*. There are, in fact, many different drivers, each one associated with a *device*.

There are all sorts of widgets you can connect to your Apple III. Most people tend to focus on the central processor itself, the main section of the computer where the fancy stuff is done. After all, that's what you really bought. But without all the attached gadgets, your computer would be deaf, dumb, blind, and helpless. These attached thingamagigs are called devices.

Some devices live up to the name pretty well. A printer is obviously a device. And it doesn't greatly stretch the imagina-

tion to call the monitor screen and disk drives devices, too. But how about the keyboard, or the audio capability, or the graphics department? It's not quite so obvious that graphics is a device. Graphics seems more like a program, since it's all in software. But in the Apple III, graphics is a device, and it's handled just like all the other devices.

A Basis for Comparison. Some devices are mostly software, like graphics; others are mostly hardware. But most devices are really a mixture of hardware and software. Consider for a moment an Apple II with attached Silentype printer. The Silentype connects to the Apple II with a cable that ends in a circuit board, and the circuit board is installed in one of the slots inside the Apple II. So what the Apple II does is send information to a particular slot. The circuit board in that slot then picks up the information and sends it on. The circuits and software on that attached circuit board are really an integral part of the Silentype printer. Information is processed for a while on the circuit board before being sent on to the printheads. The circuit board, in effect, functions as a software-type intermediary between the Apple II and the printer.

Now what happens in the Apple III? In this case, the Silentype plugs directly into the back of the computer. The circuit board is gone, but you can't eliminate the software middleman. The Silentype still isn't any smarter; it still needs to have that information processing done. But, instead of using a plug-in circuit board, the processing in the Apple III is done by a special program in the main computer memory, the driver. This driver program is written specifically for its associated device and functions only with that device and no other.

The printer driver is stored on the boot disk, along with other drivers for other devices. When the disk is booted, the special driver program is loaded into memory right along with, and as part of, the rest of the operating system. The driver program is not part of the user program; it's hidden away where you can't find it or look at it, even if you want to. It's the perfect middleman, silent and not too expensive, although it does take up a couple thousand bytes of RAM. Fortunately, the Apple III has quite a lot of RAM.

The best approach to understanding all of this is to think of a driver as being actually part of the device it's associated with. Consider it to be a sort of (soft) connecting arm by which the device attaches to the computer. And that's really what it is—a software plug-in board. Don't be confused by the fact that the driver comes on the boot disk and is loaded into RAM. Functionally, it's really part of the device. It is even purchased with the device. If you buy a Winchester hard disk, or a clock, or some other goody, it must come with its own driver. Part of the job of plugging in a new gadget is plugging in its driver.

Thus each separate device has its own driver. If an Apple III has six devices attached, then it must have the corresponding six drivers in its memory. If a device's driver isn't in place, the Apple III considers that device not to exist. Without an appropriate driver program to go with it, a device is useless.

On the other hand, it's equally pointless to have a driver program in memory, using up available RAM, if you don't own the corresponding device or if you don't plan to use the device for the program at hand. It's desirable to plug in only those drivers needed at the time and to remove others, just as you might remove an unused connecting circuit board from its slot to make room for another. This is one of the jobs accomplished by the System Configuration Program, which we'll talk about shortly.

Name That Driver. So how, then, does a program get in touch with a driver? That's simple; it calls the driver by name. Since all contact with the outside is done through the various drivers, the program can use the very same method for all. This is a great simplification. With the Apple III, the program never needs to worry about where a device is located, what slot it's attached to, how it likes its data cooked, or anything else. That's for the driver to worry about. The program just calls whichever driver it wants, by name.

Okay. So what name? Well, the program must use the appropriate *pathname*. "Aha!" you say, "and what is a pathname?" Well, a pathname is an elaborate sort of a *filename*, which is . . . Why don't we just start with a *file*?

What the computer does all day, when it's not just waiting around, is process chunks of information. It stores a lot of these collections of information right in its main memory. These chunks of information are *not* files. They have names like arrays, stacks, and variables. And since they are in memory, they are all immediately available to the central processor. They are already inside.

But certain other collections of information are stored outside the computer, on disks, tapes, and whatnot. These are files. To deal with these outside collections, the central processor must arrange to have them brought inside. Later on, after processing, such a collection may be returned outside to its storage area. This is "intake and output" (I/O). A file is any external collection of information that might get involved in I/O.

The usual way one encounters files is to see them listed by name in a disk catalog. We usually tend to think of a file as a specific chunk of information stored on a disk.

If we think a little harder, though, we can also picture a file as a string of data bytes, a linear or one-dimensional array, similar to a long train of cars on a railroad track. The essential point is that all the small pieces of data are arranged one after another in a succession. And, being human, we can also visualize the train from above; that is, we can see the train (or file) as a whole. Because of this ability to picture a file's length and composition, we tend to think of a file as an object.

The View from the Middle. Computers have no such ability. They process information one byte at a time. In some larger computers a byte may have 16 or 32 or more bits. But even this byte size is still a very small amount of data. Generally speaking, computers hack away one very small slice at a time. Of course they hack very rapidly.

When the central processor receives input from a file, the data comes pouring in one byte after another. It's like standing in the mouth of a railroad tunnel as a train comes forth, car after car. The computer's viewpoint is always from the middle of the track. It doesn't see the whole train as an object. It just sees the next car in line. The different tunnels (or files) all look much alike; they just have different names, the filenames. So the computer sees all files the same way.

From the computer's point of view, anything is a file if it is a hole in the outside wall through which a stream of data pours in or into which a stream of data can be made to disappear.

Thus they keyboard is a file—data comes from it. And the screen is a file—data goes out to it. And disks and printers and speakers are also files. All the computer sees is a hole, with data flowing in or out. And in the Apple III, as we have seen, all I/O takes place through middlemen, the drivers. So in the Apple III, the drivers also are files.

Since a file is just a collection of information, it's perfectly possible to make a collection of collections. And this larger collection is also a file. In this way it's possible to construct a branching family tree of files, sub/files, and sub/sub/files. The slash is used here to separate the various levels because that's the way Apple III likes it written. An example of such a hierarchy of files might be:

Disk Catalog	File type (for humans only)
DISK1	Volume or device
FRUITS	Directory
ORANGE	File
PEAR	File
APPLE	Subdirectory
RED	File
GREEN	File
VEGETABLE	Directory
POTATO	File
SQUASH	File
MEAT	File

In the Apple III a file's name is its complete name: /DISK1/FRUITS/APPLE/RED. This is a compound name

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The latest addition to this list of all-stars is Mark Pelczarski, author of the popular Complete Graphics System and Special Effects. He'll delve into the mysteries of Basic and instruct those present on how to program their own datahase.

For those not in the seminars, Cheryl Pelczarski has graciously offered to teach water color painting.

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constructed of the *local* name at the rightmost end, preceded by the names of each successively larger collection of which it is a part. The leftmost name is the name of the root of the tree. Thus the complete (compound) name of a file forms a pathway to the file through the family tree. So it is called a *pathname.*

Organizationally Speaking. To make things easier for humans, the leftmost component of the pathname is often referred to as a volume name or a device name. The rightmost component is the local filename. And the names in between, if any, are directories and sub/directories and sub/sub/directories. This makes the organization of a floppy disk more obvious to humans. But to the computer they are all files.

There are rules for constructing the separate component filenames: Length must be no more than fifteen characters. Only digits, letters and periods are allowed. Lower case is automatically capitalized. No blanks are allowed. Filenames must start with a letter. A filename standing alone is preceded by a slash if it is a volume name (a particular disk), a period if it is a device name (really the driver, of course), and nothing if it is a local filename. When filenames are put together into a pathname, successive names are separated by slashes, and the leftmost name is preceded by a slash (volume name) or a period (device name).

To contact the printer, for example, the program would use the name .PRINTER (note the initial period). The name *.AUDIO* will direct output data to the speaker, and /RECIPES/DESSERTS/APPLE.PIE refers to the local file APPLE.PIE in the directory DESSERTS on the floppy disk named RECIPES.

Human nature being what it is, most of us immediately attempt to invent impossible pathnames, such as .PRINTER/SUBDIR/LOCFILE. This doesn't work. Printers, keyboards, speakers, and so on are character devices. That is, they send or receive one character at a time but do not store blocks of data that we humans recognize as separate entities. So it makes no sense to talk about a subdirectory of a printer. Only block devices are allowed directories and subdirectories. But those clever folks who designed the system knew you would try it anyway, so they armed SOS with a whole arsenal of error messages.

Apple III does, of course, have block devices: the floppy disks. It comes with one floppy drive built into the box, and it only takes about two seconds (and some cash) to add as many as three more. These floppy disk drives are obviously devices and are addressed, using the usual pathname conventions, with the device names *.D1, .D2,* and so on. Presumably the disk drives also have a software driver program in SOS just as all the other devices do. But this driver is unremovable, always present, and transparent. This means it can be ignored (which is a good thing because the imagination staggers at the confusion of names in a disk drive driver).

Just as one can address .PRINTER, so one can address .D1 and get whatever disk is currently in that disk drive. If you can't remember the disk's volume name but know that there is a file on the disk called GOOD.STUFF, you can get to it with the pathname .D1/GOOD.STUFF. Or you can list all the contents of a disk in drive 2 with the Business Basic command: *cat .d2.*

A more common occurrence might be that you want a program to talk to GOOD.STUFF on the disk named /MYPROGRAMS, but you don't know which drive that disk will be in during future program runs. No problem. Just use the name /MYPROGRAMS/GOOD.STUFF and the operating system will search through all the disk drives to find it. In other words, when communicating with disks you can begin the pathname with either a device name (.D1) or a volume name (/MYPROGRAMS), whichever is more convenient.

Prefix Paves the Way. In its never-ending effort to make things easy, the Apple III has yet another handy feature for pathnames. This is the *prefix* (or in Business Basic, the PREFIX$). The prefix consists of some or most of the beginning of a pathname. The user sets the prefix to part of the route. Then you need type only the local filename, and the operating system will insert the prefix. Suppose, for example, you want to talk to /FOODS/FRUITS/APPLES/RED and also to /FOODS/FRUITS/APPLES/BAD.

Just set the prefix (from Basic):

```
)PREFIX$ = "/FOODS/FRUITS/APPLES"
```

Now you just use the local filename RED or BAD and SOS will automatically add the prefix (and the necessary slash for a separator). The rule is: If the given name starts with a slash or a period, it is taken to be a complete pathname. Otherwise the prefix is added. Although the prefix is not strictly necessary, it is certainly a great convenience, and, once you've got a grip on pathnames, the prefix is very easy to set and use.

In the Apple III, every disk has a volume name. It is named during the initial formatting process, although the name can subsequently be changed if desired. Whenever a disk is booted, the prefix is initially set to the volume name of that particular disk. So the prefix is always set to something, unless, out of appalling perversity, you set it to nothing with:

```
)PREFIX$=""
```

The prefix is among those ultimately convenient features that are terribly confusing to the newcomer. One can suffer considerable frustration before it is clear why THISFILE is acceptable on one occasion and .D2/THISFILE is required on another. Finally one realizes that the system is adding this mysterious prefix, which is set correctly on the first occasion but inappropriately on the second.

You may have noticed that we have gradually stopped talking about driver names and started talking about device names. They are really the same thing. Drivers are named for the devices they serve and can, in practice, simply be ignored. One just pretends to talk to the device. This is okay because a driver is functionally transparent. Its services are needed but are not readily apparent. Only when you want to make changes in drivers—to add or delete or modify a driver—do you need to deal directly with the drivers themselves. And that job is accomplished by means of the System Configuration Program.

The System Configuration Program (SCP). The Apple III comes with a variety of goodies, one of which is a floppy disk labeled *System Utilities* that contains a variety of housekeeping facilities. With this disk, you may easily format (initialize) disks, copy disks, rename volumes and files, and transfer or delete individual files and groups of files. All these things are done in a very straightforward manner. But the utilities disk also contains the System Configuration Program for manipulating drivers.

The SCP is not quite so simple to deal with as the rest of utilities disk, especially for an Apple III novice. It has gone through several revisions intended to make it friendlier and easier to use. The latest version comes with "System Software 1.1" and is the version discussed in this article. While the SCP seems complex, in reality, it is difficult only if you have not yet mastered the rules for pathnames or you don't clearly view the driver as a software "plug-in board" that belongs to the device. When pathnames and drivers are clearly understood, the SCP is quite easy to use.

As we have already seen, every device has associated with it a driver program that is used by the central processor as a middleman for contacting the device. These driver programs are stored on the boot disk, and when the disk is booted, they are loaded into memory along with, and as part of, the operating system (SOS). If six devices are to be used, then the corresponding six driver programs must all be available on the boot disk and be successfully loaded into the operating system portion of memory.

A Collection of Drivers. The various drivers are not, however, stored on the disk as individual files. They are gathered together in a single basket, a file whose name is SOS.DRIVER. When one catalogs a boot disk, SOS.DRIVER must appear somewhere on the list, although it doesn't matter where. But a file of that name must be present if a disk is to boot suc-

cessfully. The collection of drivers contained in this basket will then be loaded into memory and the drivers made available for use.

The name SOS.DRIVER is a bit unfortunate because it is not immediately obvious that this is a collection of drivers rather than something which somehow drives SOS. SOS.DRIVERSET might have been a happier choice.

It's important to realize that SOS.DRIVER is a typical disk file. It can, for example, be copied to another disk or to the same disk under another filename. Or it can simply be renamed. Thus you can have two separate copies of the same driver collection on the same disk at the same time. Whichever is named SOS.DRIVER is the collection that will be loaded and brought into service when the disk is booted. Drivers are loaded only at boot time.

The System Configuration Program is a means—the only means—of restructuring the driver collection, SOS.DRIVER. All changes are made to the disk file, not to the drivers presently functioning in the computer. One can add, delete, or modify drivers and thereby generate, on the disk, a new and different SOS.DRIVER file. Subsequently, when the Apple III is rebooted, this new system configuration will be loaded into memory and will begin to function.

To start the System Configuration Program one merely boots the utilities disk and selects S from the main menu. The SCP menu soon appears, and the first item on this menu is "Read a Driver File." At this point, a further word of explanation is in order.

Operating System Memory versus Program Memory. When you boot the utilities disk, some drivers—used by the utilities disk programs—are loaded into the computer. But these drivers are placed in the operating system portion of memory, which is separate from program memory. Program memory is the storage area for strings and arrays and other data used by the program. As a rule, programs can access only the data in program memory, not areas reserved for the operating system. Thus when the SCP starts running, there are, initially, no drivers in the program memory. They are still on the disk, or scattered around on several disks. So the first step in customizing a new SOS.DRIVER file is to read into program memory all the drivers you want to have in your new system.

When you select "Read a Driver File" from the SCP menu you are asked to give the pathname of a file containing drivers. This can be the SOS.DRIVER collection from one of the boot disks, or some other file containing one or more drivers. The utilities disk itself, being a boot disk, has some drivers in its SOS.DRIVER file. The following table shows the drivers present on various (unmodified) Apple III disks:

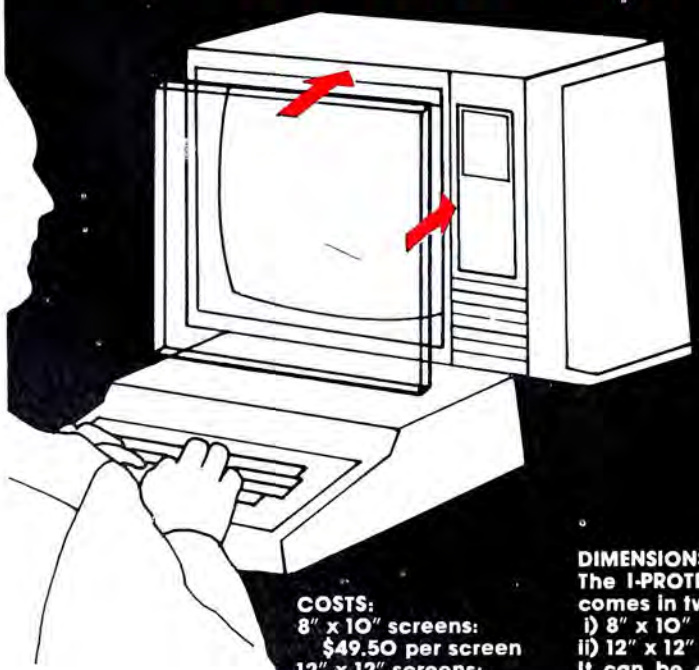
/BASIC/SOS.DRIVER	/PASCAL1/SOS.DRIVER	/UTILITIES/SOS.DRIVER
.SILENTYPE	.GRAFIX	.FMTD1
.AUDIO	.SILENTYPE	+.FMTD2
.PRINTER	.AUDIO	+.FMTD3
.GRAFIX	.PRINTER	+.FMTD4
.CONSOLE	.CONSOLE	.SILENTYPE
.RS232		.PRINTER
		.CONSOLE

The .FMTD1..4 drivers on the utilities disk are really all one unit. They are used to format disks in the respective drives. The .CONSOLE driver controls both keyboard and video screen, so it's difficult to imagine any useful configuration without it. In addition to these collections of drivers, the utilities data disk contains each of the above drivers as an individual file (CONSOLE.DRIVER, and so on).

The Silentype printer comes with a disk that contains two different Silentype drivers: BIG.DRIVER and SMALL.DRIVER. The big driver can type in three different type fonts but occupies some fifteen hundred bytes more memory.

Any other devices you may purchase come with their own drivers. The Apple ProFile hard disk, for example, comes with a disk containing a file named PROFILE.DRIVER.

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If you answer the "Read a Driver File" prompt with an appropriate pathname, such as (.D2/SOS.DRIVER, /BASIC/SOS.DRIVER, /MYDISK/CONFIGUR.1) the drivers contained in that file will be copied into program memory and listed on the screen. Additional files are then successively read, as desired, and their contents will be shown added to the list. If two or more collections of drivers are read, there will undoubtedly be duplications. Use the "Delete a Driver" option to remove duplicates and other unwanted drivers from the list. In this way, by adding and deleting drivers, you end up with a list containing only those drivers you wish to have in the new system configuration.

System Parameters. A complete and proper SOS.DRIVER package also contains one other set of data that is not a driver but is similar. It does not appear on the screen in the list of drivers. This set of data is the *System Parameters* and contains information for the Apple III operating system:

System Parameters:

1. Number of Disk III drives
2. Peripheral slot assignments (for those devices using cards installed in the expansion slots)
3. Character set (several different sets available)
4. Keyboard layout (which keys shall be where)

The information in System Parameters can be changed by selecting that option from the menu and following subsequent instructions. The parameters will then automatically be included in the new SOS.DRIVER package being constructed.

When you read various drivers into program memory, at least one of the files used will probably be a previous SOS.DRIVER file. In that case, a set of System Parameters will already be present. They are read in from the first SOS.DRIVER file selected, and can then be modified using the "Change System Parameters" option. On the other hand, if all the drivers have been read in individually (from the Utilities Data disk, for example), then you must also separately load a character set and a keyboard layout, specify slot assignments, and specify the number of disk drives in the system. All of that is done via the "Change System Parameters" option.

Drivers themselves may also be modified, and that is done with the "Edit Driver Parameters" option. All drivers, of course, have names. That's how they are contacted. But the name of a driver can be changed to almost anything you desire, as long as it begins with a period and follows the usual filename rules. Whatever name you assign is the name your program must then use to contact the driver (and its corresponding device). If you get tired of typing .SILENTYPE you can change it to .SIL or even .S. Remember, however, that in the long-run, the most convenient name is one whose meaning will be as obvious a month from now as it is today.

Some drivers have other modifiable features. The printer driver, for example, can be set to transmit data to the printer at a variety of speeds (baud rates). This, along with other options, allows the printer driver to service printers from various manufacturers. Such options can be changed by altering information in the "Configuration Block Data" via the "Edit Driver Parameters" option. Configuration block data is stored in hexadecimal code, and you must follow the instructions in the manuals for that device.

Generating a New Driver System. When the new SOS.DRIVER package is properly configured, it needs to be stored on the boot disk to be ready for use. From the SCP menu, select "Generate New System." The new system is validated to be sure all necessary steps have been carried out. Then you're asked for a pathname where the new file should be stored.

The whole point of creating a new driver system is to have it function. And in order to function it must be on a boot disk, and it must be named SOS.DRIVER. If, at this point, there is no such file on the destination disk, the next step is easy. Just type /volume/SOS.DRIVER and you're in business. On the other hand, the new system is most often a replacement for a previous SOS.DRIVER. In that case, the destination disk already contains the previous file named SOS.DRIVER. If it's in drive 2 and you type .D2/SOS.DRIVER, the disk drives whirr for a while and you are asked:

.D2/SOS.DRIVER already exists. Delete? [Yes/No]

An affirmative reply deletes the old file and stores the new one in its place. If all goes well, you should be able to reboot the Apple III with the new system, and it will begin to work.

There's one danger in the above procedure. In order for a boot disk to function, a properly constructed SOS.DRIVER file must be present. If, for any reason, the new system you have constructed fails to work, you'll no longer have the old SOS.DRIVER file to fall back on. Since you are undoubtedly a sensible person, you'll have been working with backup disks all along, so you'll still have the originals with which to begin again if need be.

Another sensible precaution is to store the new system temporarily under some other filename. When the "Generate New System" prompt asks you where to put it, type .D2/NEWDRIVER. Now you'll have both systems on the disk. Use the "Quit" option to leave the SCP, and select "File handling commands" from the main menu. Rename:

SOS.DRIVER -> OLDDRIVER and NEWDRIVER -> SOS.DRIVER

You're now ready to try booting the new system, and if it doesn't work, you can always use the utilities program to change the names back again.

Does it all seem terribly complicated? Well, even so, it's worth it. Once your new system is up and running, you can just concentrate on programming and the Sophisticated Operating System will work for you, silently and efficiently. And if you should buy some marvelous new gadgets, you can quickly revise your system to include them. The energy you devote to working through the initial complexity of pathnames and drivers and the System Configuration Program is amply compensated by the power and versatility of the Apple III. Once you're over the initial bumps, it's smooth sailing from then on.

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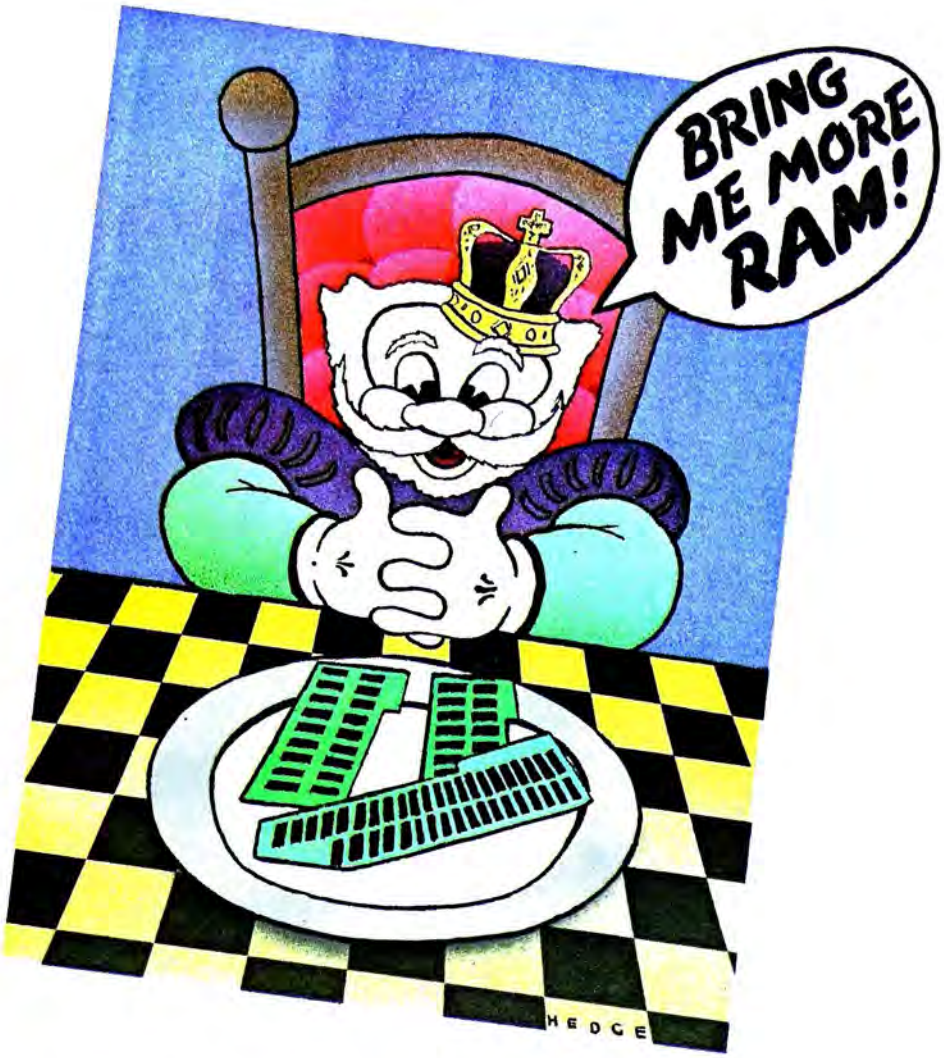
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The II Vies with the Big Guys



The Huge-Memory RAM Boards

BY JEFFREY MAZUR

Several months ago we examined various RAM expansion boards for the Apple II. Since the appearance of the original 16K language card from Apple, a slew of lower priced 16K boards with better features have found their way into the marketplace. And if 16K was good, then 32K or 64K must be better—witness the ads for several boards in this range.

As predicted, however, the race to see who can cram the most memory onto one card has not stopped there. The following is a report on two new RAM boards: the 128K Soft Disk from Legend Industries and the 256K App-L-Cache from Sorrento Valley Associates.

Double Density. Legend Industries, manufacturers of the 64K board previously reviewed in this column, has pulled off a neat trick with the 128K Soft Disk. By rearranging things a bit, they have been able to fit all 16 RAM chips plus the associated circuitry on a board no larger than their 64K version. In keeping with the usual procedure, this board is installed in the computer by removing one RAM chip and moving it onto the board. A short ribbon cable is then inserted into the empty socket on the motherboard.

From a software standpoint, the Soft Disk appears to the system as eight separate 16K language cards. Selection of the active bank is accomplished by writing or *poking* the appropriate number into memory location $C084. This is identical to the operation of the 64K board. Of course, each 16K bank further divides the $D000-$E000 block into two sub-banks, as per the language card.

All this bank switching increases the amount of time it takes to read or write to the card; however, since we are dealing with RAM and accessing it via machine language routines, response is still relatively fast. In fact, as its name implies, the most significant use of the Soft Disk is as a disk emulator. With the software provided, it is possible to load an entire floppy disk into the Soft Disk. Information can then be read, modified, sorted, or whatever at three to ten times the normal disk access speed. If necessary, the new information in the Soft Disk can then be downloaded back onto floppy disk with one simple command.

There's one catch, however. While you're working with the RAM image of the disk stored in the Soft Disk, a power failure or computer glitch can wipe out any changes you made since you last saved the information to disk. The moral of this, as always: update often.

Installation and operation of the disk emulator is similar to that described for Legend's 64K board, except that now an entire disk worth of information fits onto



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a single card. Previously, this required either two 64K boards, taking up two slots, or specially formatted "half-disks." Up to four Soft Disk cards can be installed in different slots, each emulating a disk drive with any given slot and drive number.

The Soft Disk comes with the disk emulator software, *Memory Master* (a utility that moves DOS onto the RAM board), and a 44-page manual. A firmware selector program is also included that allows Applesoft or Integer ROM card owners the option of installing their ROM board into any slot of the Apple. In this way, one can have both languages in ROM without having to give up some of the RAM board to hold the alternative language. Price of the entire system is $750; this includes Disk Emulator software for either DOS 3.3, Pascal, or CPM. The other operating system emulators can be purchased for $50 extra.

Oink Oink. Cramming 256K of RAM (that's 32 chips!) onto a single Apple-sized peripheral board would seem to be an impossibility. However, Sorrento Valley Associates has done the impossible by designing a piggyback, two-board system that plugs into slot 0.

The main board contains 64K of RAM plus all of the associated circuitry necessary to interface it to the Apple's memory space. You'll also find 2K of EPROM on this board that contains some useful routines for controlling the RAM selection (interesting indeed, as this is the only RAM board to contain such firmware; in fact, it is the *only* board we know of that resides in slot 0 and uses the 2K ROM expansion space between C800-CFFF).

The main board itself is fairly large, extending almost to the keyboard. Attached to the back of this board, just to the left, is the piggyback expansion with the remaining 192K. Together they make a nice, neat package, taking up only one slot. Since the App-L-Cache must be installed in slot 0, it would appear that you are restricted to only "one per customer." Installation of the board is similar to the installation of other RAM boards except that two IC's are removed from the motherboard and replaced by jumpers.

By the way, if you're wondering where they got the name "App-L-Cache," it comes from a term used in

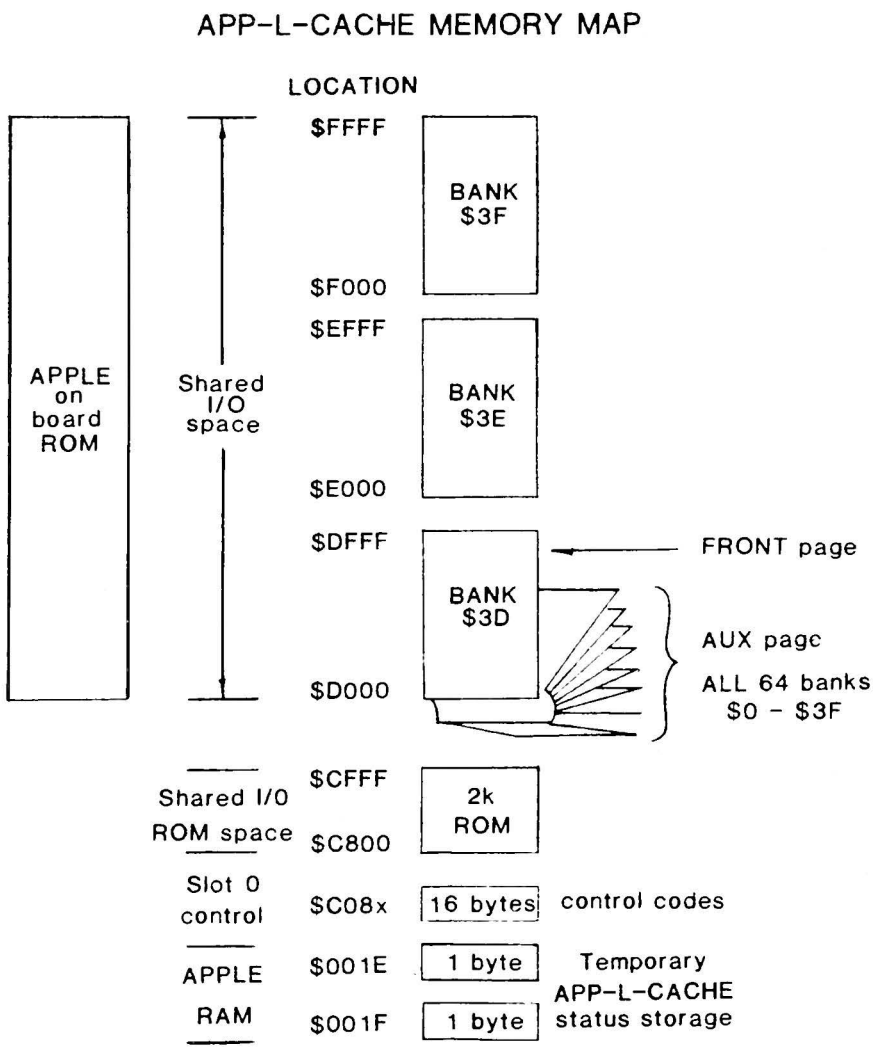


Figure 1.

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LJK DISK UTILITY — APPLE $29.95

This menu driven program allows the user to manipulate a variety of different file types. Binary, Text, and Source files may be easily converted into each other. The program may be used with **APPLESOFT*, VISCALC*,** and other programs. These program files may be readily adapted for multiple use including editing with **LETTER PERFECT** word processings.

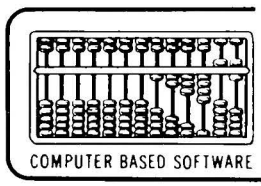
MAIL MERGE/UTILITY — $29.95 ATARI

This menu driven program combined with **LETTER PERFECT** allows user to generate form letters and print mailing labels. With the Atari, you may **CONVERT ATARI DOS FILES,** or Visicalc files compatible for editing with **LETTER PERFECT.** Utility creates Data Base files for Letter Perfect.

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Lower Case Character Generator for the Rev. 7, Apple II or II+ computers. When installed, this Eprom will generate lower case characters to the video screen. Lower case characters set has two dot true descenders. Installation instruction included. Manual includes listing of software for full support and complete instructions for shift key modification. Compatible with **LETTER PERFECT.**



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larger mini and mainframe computers—"cache memory." Cache memory refers to a block of very fast memory that is used as a buffer between the speedy cpu and other slower memory devices. True cache memory handles this buffering automatically, coming into play whenever the slower memory is accessed. The App-L-Cache, however, will most probably be used as a disk emulator that requires the manual transfer of data between disk and RAM. At present, this software is available for all Apple operating environments—DOS 3.3, Pascal, and CP/M.

SVA has also taken a different approach in the mapping scheme used by the App-L-Cache. They've divided the 256K of memory into sixty-four banks of 4K each. Referring to Figure 1, you can see that the top three banks occupy the space normally used by a language card, namely $D000-$FFFF. Note, in particular, that the top two banks ($3E and $3F) are always mapped into the top 8K of RAM. The lower 4K then becomes a window through which any of the 64 banks can be accessed. Bank $3D is the default, or front page, while the selected bank is referred to as the AUX page. In this manner it can be made to resemble the language card. Figure 2 gives a complete description of how the RAM and ROM on the App-L-Cache is controlled.

In terms of software, SVA has done an elaborate job of interfacing the App-L-Cache to Pascal (1.0 and 1.1). This is achieved by adding a special SYSTEM.STARTUP and associated files to the boot disk. When the Apple is powered up, it can then load Pascal, link in the App-L-Cache, and automatically copy the contents of a selected disk into RAM. In fact, there's even an option by which to delete those files that are only used for booting, thus freeing up an extra forty-seven blocks. To the Pascal operating system, the App-L-Cache appears as a 480-block floppy disk drive designated as volume #12. Consideration has also been given to the reset key on the Apple; although pressing reset requires you to reboot the system, all information in the RAM card remains intact.

DOS 3.3 support is not as integrated as Pascal. First, it requires that the system be booted with a special DOS. Then a Basic program must be run to install the emulated disks. The App-L-Cache ap-

CONTROL CODE
Bit Pattern Breakdown

```
CONTROL ADDRESS:                $C08x

SLOT 0 CONTROL ----------------------

BIT PATTERN OF LEAST
SIGNIFICANT DIGIT               A3  A2  A1  A0

                                                  APP-L-CACHE STATUS
                                                  RAM(*)   WRITE PROTECT(+)
PAGE SELECT ------------------------
 0 - FRONT                       0   0    on          on
 1 - AUX                         0   1    off         off
                                 1   0    off         on
                                 1   1    on          off
IGNORED ----------------------------
EXCEPT FOR $C08F                 1   1   1   1    Dual purpose address
                                                  (see table below)

(*) RAM -  'on': APP-L-CACHE mapped to $D000 - $DFFF
           'off': APPLE on board ROM mapped to $D000 - $FFFF

(+) WRITE PROTECT - Two sequential reads are required
```

Functional Table

```
$C080   0000   Selects RAM, FRONT page, and WRITE PROTECT
$C081   0001   Selects ROM, FRONT page, and WRITE ENABLE if accessed twice
$C082   0010   Selects ROM, FRONT page, and WRITE PROTECT
$C083   0011   Selects RAM, FRONT page, and WRITE ENABLE if accessed twice
$C088   1000   Selects RAM, AUX page, and WRITE PROTECT
$C089   1001   Selects ROM, AUX page, and WRITE ENABLE if accessed twice
$C08A   1010   Selects ROM, AUX page, and WRITE PROTECT
$C08B   1011   Selects RAM, AUX page, and WRITE ENABLE if accessed twice

$C08F   1111   READ - Switches on the 2k ROM and
                      READS card status with the format of:
                       BITS
                       0-5 bank selected
                         6 page (0-FRONT,1-AUX)
                         7 APPLE 12k ROM or APP-L-CACHE selected
                           (1-ROM,0-RAM)
               WRITE - Selects the bank

$CFFF          Switches off all peripheral card ROMs

Note: RAM - APP-L-CACHE RAM mapped into I/O addresses
      ROM - APPLE on board ROM mapped into I/O addresses
      WRITE ENABLE - if address is accessed twice consecutively
```

Figure 2.

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pears as two drives in slot 1. Drive 1 is a full thirty-five tracks for 140K of storage; drive 2 is only twenty-five tracks or 100K. The upper 16K of the RAM board acts like a language card. To move files from a floppy disk into RAM, either *Fid* (for selective copying) or Apple's *Copy* utility (for an entire disk) can be used. It takes about twenty-nine seconds to load in an entire disk using *Copy*.

At press time, SVA announced that they will soon support full disk transfer to and from the App-L-Cache in DOS 3.3.

To get some feeling for the speed of App-L-Cache, we copied the DOS 3.3 System Master from Apple into it. Then we compared the time it took to verify all of the files on this disk using *Fid*. This is a good test since it requires a lot of disk access. For the floppy disk version, this task was accomplished in about fifty seconds. When the same command was issued to the emulated disk, it finished in less than five seconds—ten times faster! The only thing lacking with DOS operation is a utility to download the entire RAM image back onto a floppy disk. If *Fid* is used, it will take forever because of having to stop at each file to answer the prompt lines. *Copy* can be used, but that entails the overhead of initializing the disk again. Presumably, other copy programs could also be used, but a fast, simple update utility would be welcome.

The App-L-Cache is available from Sorrento Valley Associates. Price of the entire system including 256K board, disks for all operating systems, and a loose-leaf style manual is $1,345. The main board (64K) is also available separately and can be expanded later on to the full 256K.

A Bug Uncovered. While some of the RAM boards were being tested for this series of articles, a peculiar problem was discovered. Several manufacturers claim that it is possible to use more than one RAM or ROM board in any combination of slots. This becomes important when both languages are desired along with full disk emulation. While at first this idea may seem reasonable, certain boards may not work.

Take for example the Apple Language System Card. In addition to being a 16K RAM board, it also contains an autostart Monitor ROM. Therefore, whenever the RAM is not active, this ROM takes over the $F800-$FFFF space. In fact, because of this, the Monitor ROM on the motherboard is never used and can even be removed. From this discussion, it is obvious that the language card cannot be completely "turned off" from the $F800-$FFFF space and therefore will conflict with any board in another slot that tries to use this space.

Our first attempt to run such a combination of cards was unsuccessful; the computer would just hang up whenever the RAM card was accessed. Because we had a modified language card (see "Make Your Apple More Flexible," *Softalk*, December 1981), it was possible to disable the language card's ROM, at which point the problem disappeared. Since no mention of any incompatibility was made in the instruction manual, we contacted the manufacturer about this. The company was unaware of any problems and insisted that their board could be used simultaneously with a language card. We tried their board in several other Apples and found that it worked in every machine except the original one.

After scrutinizing both the hardware and software, we came to the following conclusion: Although technically speaking the memory conflict described above does exist, it appears that the RAM board is capable of overriding the language board's PROM. This is probably so because the RAM board drives the data bus through a high-current bus driver IC. Simply stated, this chip has more power to put its information on the bus while swamping out the signals coming from the language card.

Although this answers the question of why this arrangement works on almost all Apples (we may have the *only* Apple on which it doesn't), it also indicates that there may be a reduction in the computer's reliability and/or component life. Therefore we recommend that you eliminate this condition.

Fortunately, the solution is quite simple. For the language card, it involves the addition of a single switch as outlined in the aforementioned article. Applesoft

GOTO 152

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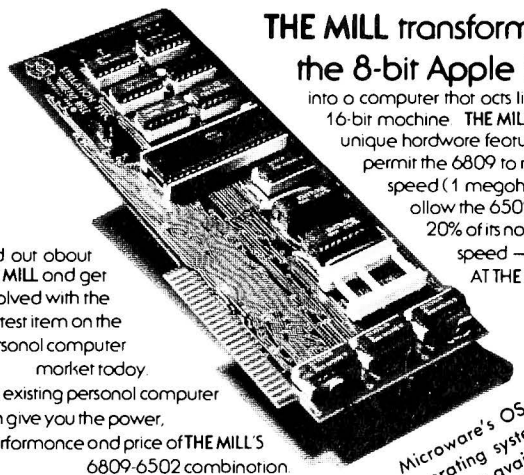
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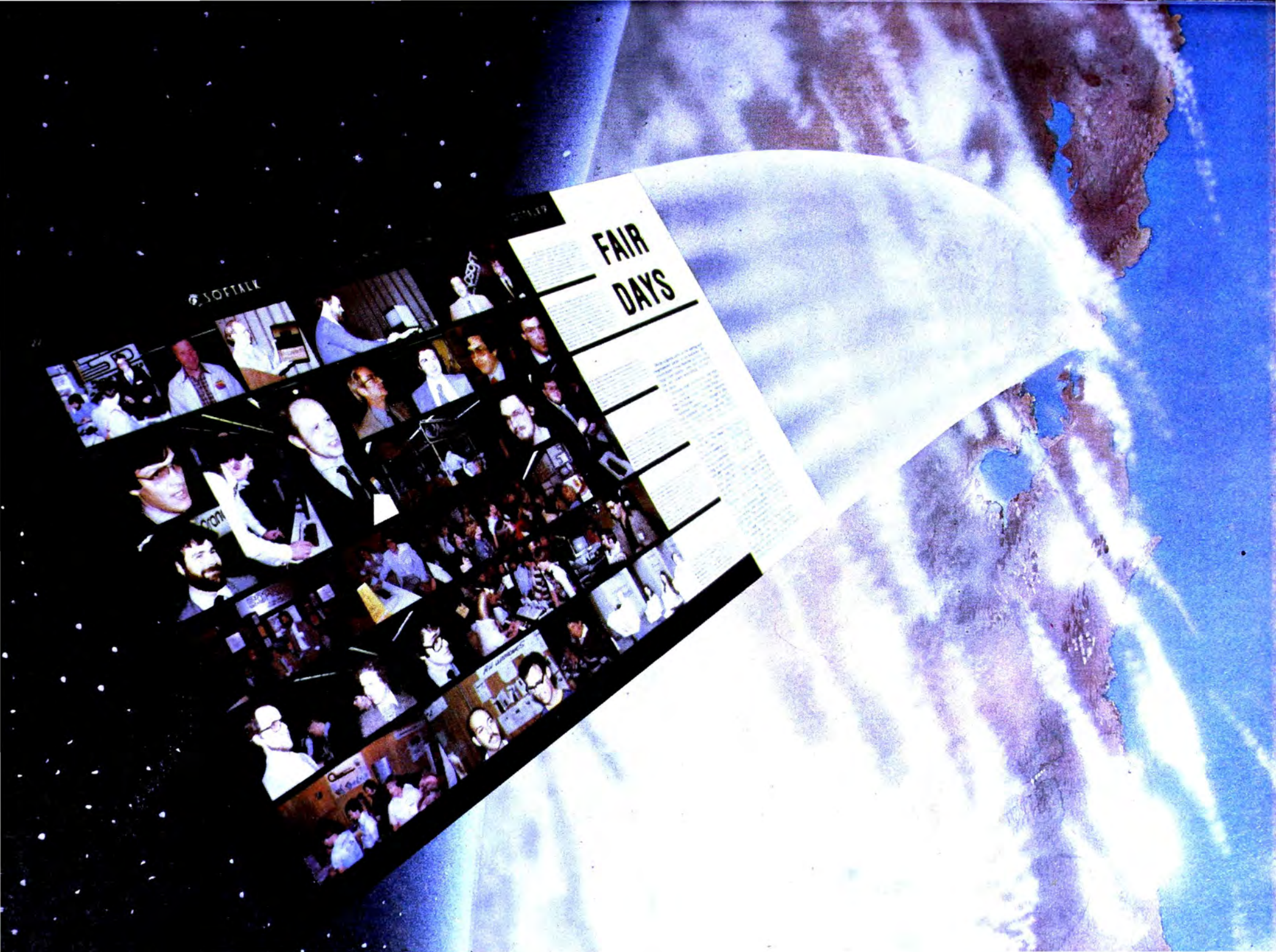
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MARCH MICRO MAGIC

For some, the annual West Coast Computer Faire in San Francisco is a unique educational opportunity with hundreds of conferences to attend and exhibits to study. For others, it is a place to meet with the top minds in the microcomputer industry and exchange new ideas. Still others attend the fair just to get a sneak preview of new products soon to be released onto the market. And many, no matter which they come for, also claim the fair to be the social event of the year in the microcomputer world.

The Seventh West Coast Computer Faire seems to be all that and more, with everything from tutorials for novices to state of the art technical presentations for the expert. Held the third weekend of March at the San Francisco Civic Auditorium, the West Coast Computer Faire is the largest trade exhibit of microcomputers for end users in the United States.

This year's fair boasts more than one hundred conference speakers and about six hundred auditorium exhibits. "And with that many presentations and demonstrations, you cover everything in sight," says Jim Warren, the creator and yearly coordinator of the event.

Warren's hardly exaggerating. Just for starters, some of the topics to be discussed include "Biomedical Applications of Computers," "Micros in Local Government," "Legal Issues," "Software Protection," "Inexpensive Expansion of Your 6502," "Computers in Speed Reading," "Enhancing Your Apple II," "Bionic Speech Processing as an Alternative to More Traditional Forms of Speech Recognition," "Computer Networks in the United Kingdom," "Micro Based Geographical Informational Systems," and "How To Use the Computer To Design Tiffany Lamps."

Approximately six hundred booths will display computer applications in music, preschool education, agriculture, home, business, and much more. There will be booths selling everything from computer systems and computer components to computer T-shirts.

Warren expects between twenty-five thousand and forty thousand visitors to the fair from all over the United States as well as large groups of enthusiasts from Australia, Canada, Japan, and South America.

The average West Coast Computer Faire attendee, according to Warren, may be from any of a wide range of careers and interests. "We usually attract the serious hobbyist, computer or electronic professionals, and people who are using the computer as an information processor in their profession or avocation. A lot of people also come because they realize computers are the future and they'd better learn about them."

Warren, who is himself a computer professional, first conceived the idea of the West Coast Computer Faire back in 1976, about the time when microcomputers were first coming into existence. He originally intended it to be a swap meet and considered Stanford University as a possible site. When his request to use Stanford's facilities was turned down, Warren briefly considered taking over a nearby field, but he settled for the San Francisco Civic Auditorium, which had, among other things, electrical outlets. And when thirteen thousand people crowded into the first show during the spring of 1977, Warren knew he had created much more than the average swap meet.

"People are interested in learning all they can about their micros," Warren explains. "If computerists with good ideas just knew about the other people doing similar things in the same fields, they could get together, learn from each other, and do things that much better.

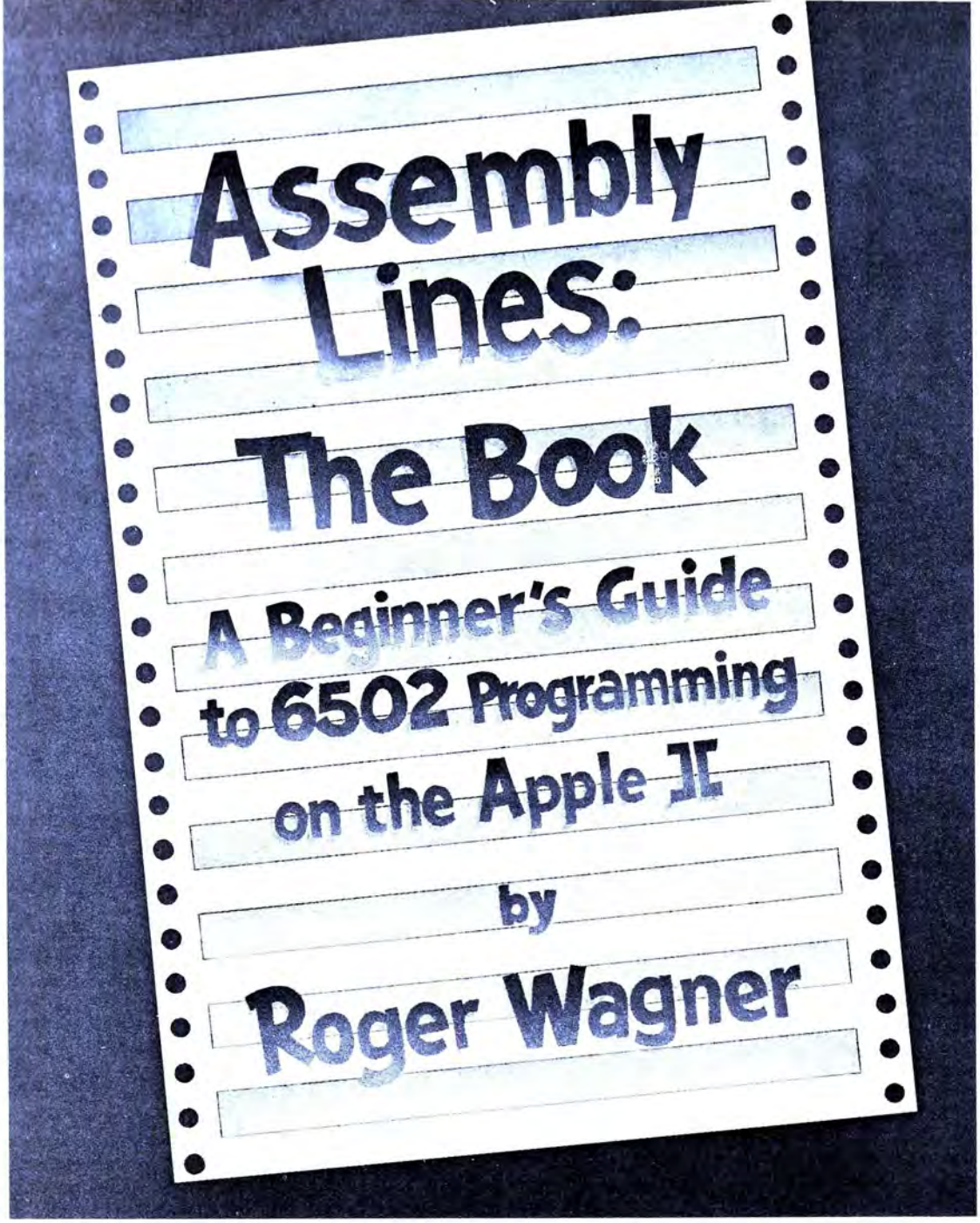
"The conference program is the value of the fair. The major feature is an opportunity to exchange significant technical information."

And what does Warren see in the future? The Eighth Annual West Coast Computer Faire, of course!

"The only thing larger is the National Computer Conference in Illinois," admits Warren. "It's the largest in the world, but it's about big computers only—the Univac, IBM, PDP. My show is for owners of micros—the real computers."

The Seventh West Coast Computer Faire is being held March 19, 20, and 21 at the San Francisco Civic Auditorium in San Francisco. A $15 pass covers admission to all three days of the show. ◨

Previewing the West Coast Computer Faire



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If you held off until you could actually see a copy of Wagner's book then the wait is over. Of course you still can't exactly see a copy, not unless you go to the West Coast Computer Faire in San Francisco, March 19-21, where there will be advance copies for display and sale.

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Everyone's Guide to Assembly Language, Part 18

Last month we examined the techniques for passing data back and forth between Applesoft and machine language in the form of standard Applesoft variables. This was greatly facilitated by the use of the already existing internal Applesoft routines. A natural extension of this idea is to use other internal Applesoft routines as may be appropriate to our given task. One of the most interesting applications of this is in the area of hi-res graphics, as indicated by recent correspondence to this magazine.

There are two main reasons for doing hi-res graphics from machine language. The first and most obvious is speed. By doing many of the operations directly in machine language, the basic overhead (so to speak) of Applesoft is avoided, thus producing a noticeable speed increase in the overall program. Be aware however, that since we are still ultimately calling Applesoft routines, the speed increase has a certain limit. Greater speeds are obtained only by creating specialized and dedicated routines that perform only a specific function. The normal Applesoft routines are designed to be flexible and to occupy a minimum of space. Faster routines will do less and possibly be larger in terms of memory use. The trade-off must be weighed.

The second reason is simply the convenience of being able to do the same things, including graphics, from machine language, that you are able to do from Basic. To this end, the techniques presented in this article should be quite adequate. In future issues, we'll explore the creation of specialized routines that give higher speed and independence from the Applesoft routines.

Ground School. Before jumping into the intricate details of the various routines, we'll impose upon your patience long enough to describe briefly the model of Apple hi-res graphics used for the current discussion. This may seem unnecessary, but it will provide the common ground for the points to be made in this particular presentation. As you'll see in later issues, there are a number of different ways of looking at the total screen environment.

For the time being, we'll use an approximation of what is usually viewed as the "classical" explanation of the hi-res screen in figure 1.

The array of possible points to be plotted consists of a field of 192 lines, each of which is made up of 280 points. If a mixed mode of graphics plus text is selected, only 160 graphics lines are displayed. On the majority of Apples, six colors are available: black, white, green, violet, orange, and blue.

The colors have been assigned to eight numeric values, as follows:

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

White is created by plotting two color points right next to each other (green/violet or orange/blue). Black, when specifically plotted, is done by turning off two adjacent color dots.

The model gets shaky when we have to tell you that things like "odd colors" (green or orange) can only be plotted at odd x-coordinates (1,3,5...), and that "even colors" (blue or violet) can only be plotted at even x-coordinates (0,2,4...). It gets even worse, but we'll save the horror stories for next month. For the time being, you'll have many fewer headaches if you limit yourself to using the colors from only set 1 or set 2. Even better, stick to black and white for the time being, and fewer mysterious things will happen.

Landmarks. A number of the fundamental hi-res routine entry points are more or less documented in various publications relating to the Apple. A brief summary is given here:

Routine	Address	Description
HGR	$F3E2	Initializes to hi-res page 1, clears screen.
HGR2	$F3D8	Initializes to hi-res page 2, clears screen.
HCLR	$F3F2	Clears current screen to black1.
BKGND	$F3F6	Clears current screen to last plotted HCOLOR.
HCOLOR	$F6F0	Sets HCOLOR to contents of X register (0-7).
HPOSN	$F411	Positions hi-res "cursor" without plotting. Enter with X,Y (low,high) = horizontal position, accumulator = vertical position.
HPLOT	$F457	Identical to HPOSN, but plots current HCOLOR at coordinates given.
HFIND	$F5CB	Returns current "cursor" position. Useful after a DRAW to find where you've been left. Coordinates returned in: $E0,E1 = horizontal (low,high), $E2 = vertical.
HLIN	$F53A	Draws a line from last plot to point given.

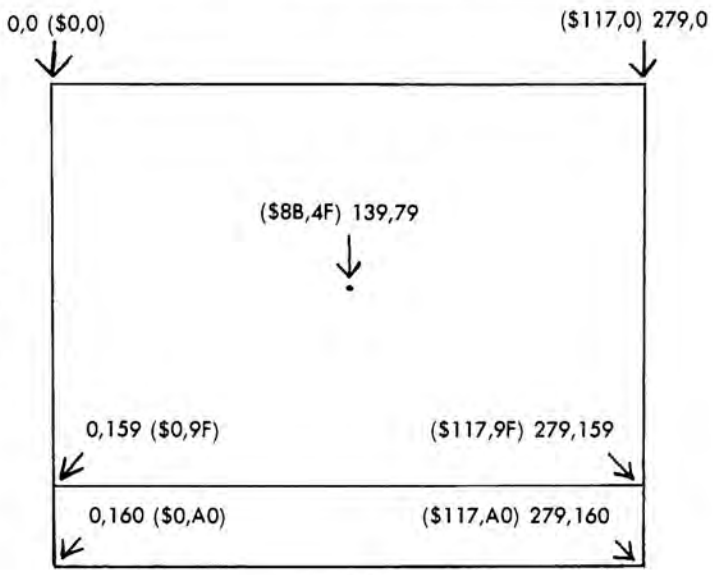


Figure 1.
Hi-res screen coordinates.

Routine	Address	Description
		A,X (low,high) = horizontal, Y = vertical position.
SHNUM	$F730	Puts address of shape number indicated by X register into $1A,1B; returns with X,Y (low,high) also set to address of that shape table entry.
DRAW	$F601	Draw shape pointed to by X,Y (low,high) in current HCOLOR. Note: X,Y point to specific entry, *not* the beginning of the table. Call SHNUM first.
XDRAW	$F65D	Erases shape just drawn (if there) by doing an exclusive *or* with the screen data. Load X,Y (low,high) with address of shape to XDRAW or call SHNUM first with X register = shape number.

A Test Flight. To illustrate how these are actually put to use, assemble and run the following program:

```
1   ********************
2   * HIRES DEMO - #1 *
3   ********************
4   *
5   *
6             OBJ  $6000
7             ORG  $6000
8   *
9   PREAD     EQU  $FB1E
10  WAIT      EQU  $FCA8
11  PBO       EQU  $C061
12  HCOLOR    EQU  $F6F0
13  HGR       EQU  $F3E2
14  HPLOT     EQU  $F457
15  HPOSN     EQU  $F411
16  HLIN      EQU  $F53A
17  ROT       EQU  $F9
18  SCALE     EQU  $E7
19  SHNUM     EQU  $F730
20  DRAW      EQU  $F601
21  PTR       EQU  $E8
22  *
6000: 4C 11 60  23  ENTRY   JMP  E2
6003: 01 00 04  24  TABLE   HEX  010004
6006: 00 12 3F  25          HEX  00123F
6009: 20 64 2D  26          HEX  20642D
600C: 15 36 1E  27          HEX  15361E
600F: 07 00     28          HEX  0700
                29  *
6011: 20 E2 F3  30  E2      JSR  HGR ; CLR SCRN
6014: A2 03     31          LDX  #$03 ; WHITE = 3
6016: 20 F0 F6  32          JSR  HCOLOR
                33  *
6019: A9 00     34  BORDER  LDA  #$00 ; Y = 0
601B: A8        35          TAY
601C: AA        36          TAX      ; X = 0
601D: 20 57 F4  37          JSR  HPLOT ; PLOT 0,0
6020: A9 17     38          LDA  #$17 ;
6022: A2 01     39          LDX  #$01 ; X = $117
6024: 20 3A F5  40          JSR  HLIN ; HLIN TO 279,0
                41  *
                42  *
6027: A9 17     43          LDA  #$17
6029: A2 01     44          LDX  #$01 ; X = 279
602B: A0 9F     45          LDY  #$9F ; Y = 159
602D: 20 3A F5  46          JSR  HLIN ; HLIN TO 279,159
                47  *
6030: A9 00     48          LDA  #$00
6032: A2 00     49          LDX  #$00 ; X = 0
6034: A0 9F     50          LDY  #$9F ; Y = 159
6036: 20 3A F5  51          JSR  HLIN ; HLIN TO 0,159
                52  *
6039: A9 00     53          LDA  #$00
603B: A2 00     54          LDX  #$00 ; X = 0
603D: A0 00     55          LDY  #$00 ; Y = 0
603F: 20 3A F5  56          JSR  HLIN ; HLIN TO 0,0
                57  *
6042: A9 03     58  SET     LDA  #$03
6044: 85 E8     59          STA  PTR
6046: A9 60     60          LDA  #$60
6048: 85 E9     61          STA  PTR+1 ; SET TABLE TO $6003
                62  *
604A: A2 00     63  READ    LDX  #$00 ; PDL(0)
604C: 20 1E FB  64          JSR  PREAD
604F: 98        65          TYA
6050: D0 02     66          BNE  R1
6052: A9 01     67          LDA  #$01;FIX '0' -> '1'
6054: 85 E7     68  R1      STA  SCALE
6056: A9 18     69          LDA  #$18
6058: 20 A8 FC  70          JSR  WAIT
605B: A2 01     71          LDX  #$01 ; PDL(1)
605D: 20 1E FB  72          JSR  PREAD
6060: 84 F9     73          STY  ROT
6062: A9 18     74          LDA  #$18
6064: 20 A8 FC  75          JSR  WAIT
                76  *
6067: A2 8B     77  DSPLY   LDX  #$8B
6069: A0 00     78          LDY  #$00 ; X = 139
606B: A9 4F     79          LDA  #$4F ; Y = 79
606D: 20 11 F4  80          JSR  HPOSN
6070: A2 01     81          LDX  #$01 ; SHAPE #1
6072: 20 30 F7  82          JSR  SHNUM ; FIND SHP ADDR.
6075: A5 F9     83          LDA  ROT
6077: 20 01 F6  84          JSR  DRAW
                85  *
607A: AD 61 C0  86  CHK     LDA  PBO
607D: 30 92     87          BMI  E2     ; BUTTON PUSHED
607F: 10 C9     88          BPL  READ ; NO PUSH
                89  *
```

When run, this routine will draw a border around the hi-res screen, and then draw the shape defined by the table in the center of the screen. Scale and rotation values may be changed

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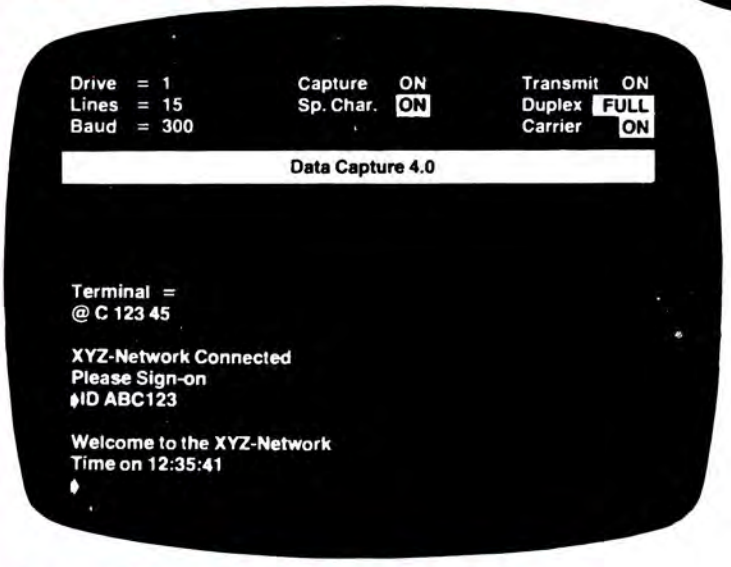
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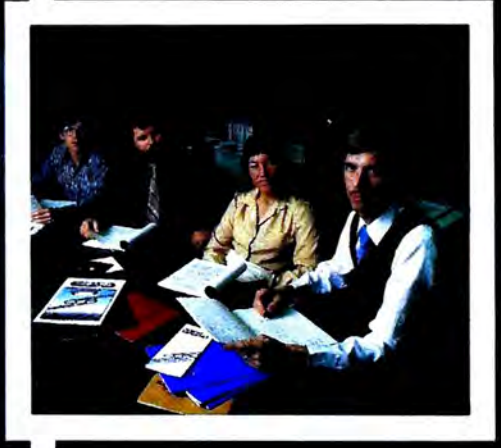
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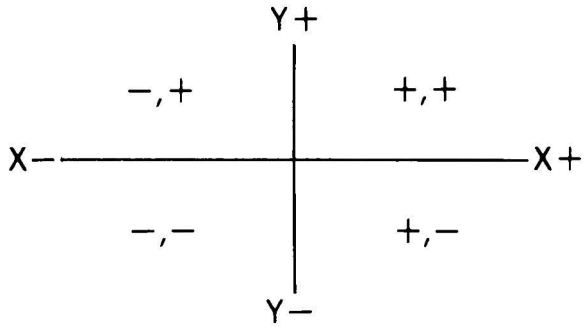
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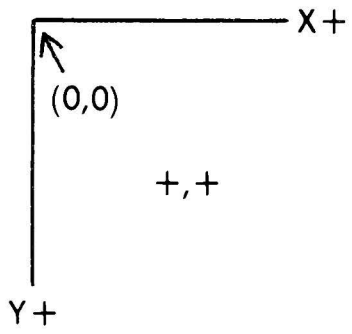
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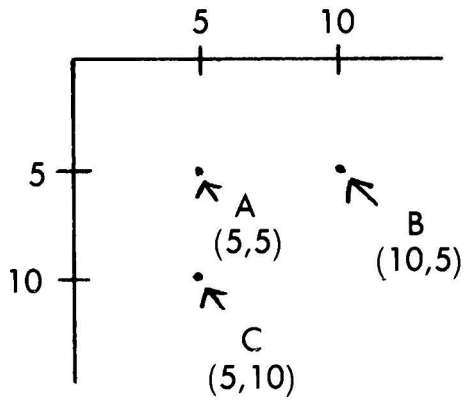
binations of positive and negative numbers are shown in the four quadrants:



Even this, though, is more than we need to do Apple graphics, because the screen is done entirely in positive values, with the origin (0,0) in the upper left corner:



The location of objects can always be given by the number pair associated with the X and Y (horizontal and vertical) axes.



Motion. So much for discussions of elementary graphing. If you understood the first example of drawing the border on the screen, all this is already known to you. The reason we mention it is to prepare you for the next idea, the one of motion.

When something is moving, we say it has a velocity. Velocity has only two components, direction and magnitude. That is to say that the only things we have to worry about when simulating a moving object are its speed and direction of travel. Speed is measured in units of distance per unit of time. In the case of our screen display, something moving from point A to point B in one second would have a speed of +5 units per second. Likewise for something moving from A to C. Negative values are used to indicate something moving in a direction opposite the given coordinate system. An object moving from B to A in one second would have a speed of −5 units per second.

Now at this point you may find yourself tempted to throw up your hands and say, "I can tell where he's going and it doesn't sound fun!" You might think you're going to plunge deeper into the esoteric and rather uninteresting ramblings of a

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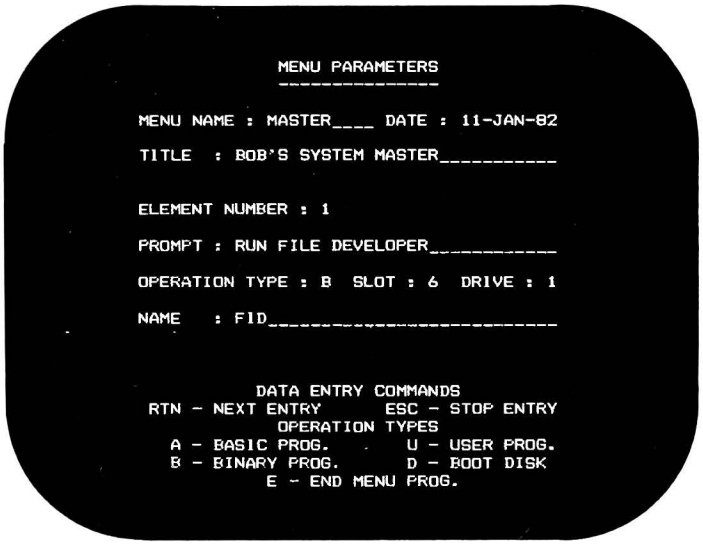
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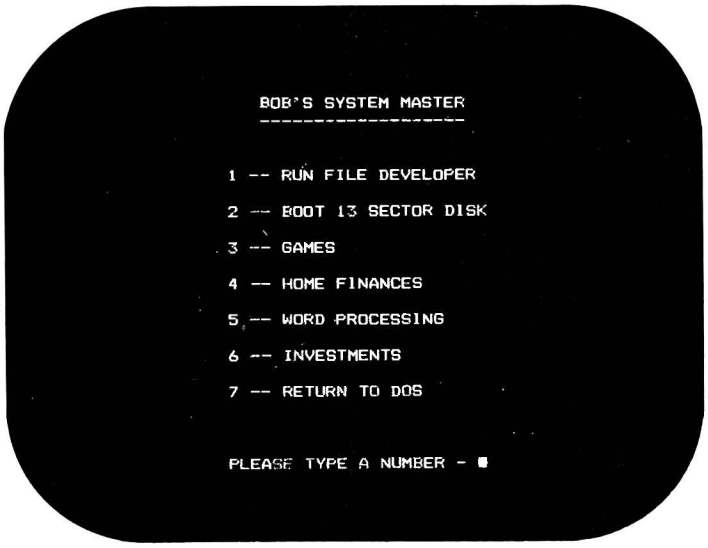
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physics teacher and end up who-knows-where and for what good reason anyway?

Well, first of all, you're only going to have to wade in a very little bit deeper (the scary part comes when we try to do negative numbers in binary!). And second of all, the point of all this will be the simple goal of bouncing a little ball around on the screen. As it happens, we must know a little of how the universe works if we are going to simulate it on our TV screen. And if you really intend to end up with spaceships careening wildly about, you'll have to show a little determination now to get the basics under your belt. So much for the half-time pep talk.

The sticky question is how to handle objects that are moving from, say, point C to A. As a case of extremely good fortune, it turns out we can consider the *components* of the motion quite easily, and achieve the same end result we want, without even having to know the objects' real diagonal speed.

What this means is that we can give an object both a horizontal and vertical component to its motion, and then do the appropriate calculations separately.

Speed can be rephrased as "a change in position with respect to time." On the screen, what this means is that something will appear to move consistent with the real world as long as we keep replotting its position in a regular manner. The timebase of the operations ends up depending on how fast we cycle through the replotting pattern. Since an example can work wonders, let's take a moment to examine a program in (oh no!) Applesoft:

```
10   HGR
20   X=0: Y=80
30   V=1
100  REM DRAW LOOP
110  HCOLOR = 3: REM WHITE
120  HPLOT X,Y : REM DRAW OBJECT
130  HCOLOR = 0: REM BLACK
140  HPLOT X,Y : REM ERASE IT
200  REM MAKE IT MOVE!
210  X = X + V
220  IF X > 278 THEN V = V * (-1)
230  IF X < 1 THEN V = V * (-1)
240  GOTO 100
```

This program will bounce a tiny spot off the left and right sides of the screen. The important things to note are that 1) motion is simulated by adding a constant velocity factor V to the position of each cycle, 2) the object is erased from its old position before being redrawn at the new one, and 3) a bounce is basically a complete reversal of the velocity factor, that is, the value is multiplied by minus one. The speed with which everything is executed depends on the inherent speed of the programming language and how fast we can cycle through the service loop. If for some reason the loop shown was too fast, you could put a *for-next* delay loop in anywhere along the line. If it was too slow, you could increase the speed factor, V, from 1 to a larger number. Larger numbers produce more jerky motion, however. The other option would be to write it in machine language!

Before doing that, though, let's make it two-dimensional by giving the ball both horizontal and vertical components to its motion:

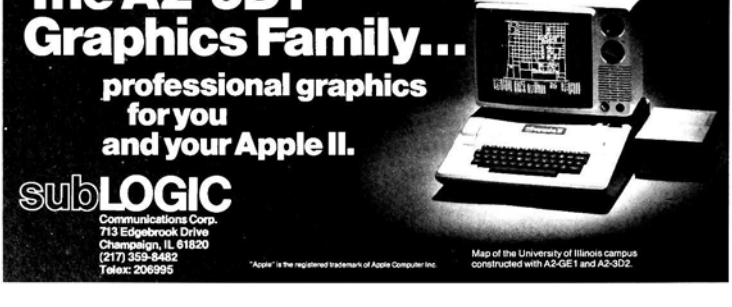
```
10   HGR
20   X=140:Y=80
30   XV=1:YV=1
100  REM DRAW LOOP
110  HCOLOR = 3: REM WHITE
120  HPLOT X,Y : REM DRAW OBJECT
130  HCOLOR = 0: REM BLACK
140  HPLOT X,Y : REM ERASE IT
200  REM MAKE IT MOVE!
210  X = X + XV: Y = Y + YV
220  IF X > 278 THEN XV = XV * (-1)
230  IF X < 1 THEN XV = XV * (-1)
240  IF Y > 158 THEN YV = YV * (-1)
250  IF Y < 1 THEN YV = YV * (-1)
260  GOTO 100
```

In this program, we watch both components of motion, vertical and horizontal. Again, a bounce consists of taking the negative value of the component we are reversing. The flicker is caused by erasing the dot so soon after we draw it and also by the scanning nature of the TV or monitor. It can be smoothed out by adding a line:

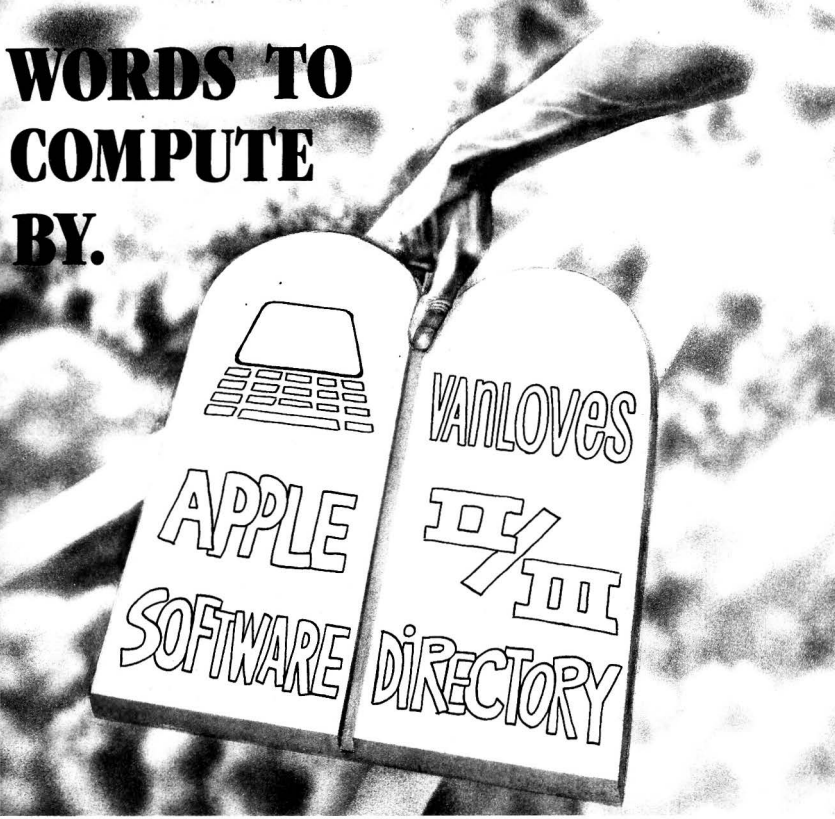
```
125  FOR I = 1 TO 5: NEXT I
```

This will also slow down the speed of the ball a bit, but it does help the overall screen appearance. You are advised to watch this fascinating program run for a while, meditating on the nature of the programming steps occurring throughout the travel, and particularly at each bounce. This concept is essential to any further animation efforts on your Apple.

We'll continue this discussion next month. ■



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HARDTALK

from page 120

For starters, it has a 16K buffer expandable on board to 32K. It supports all of the Grappler-type text and graphics commands, and it can even dump mixed text and graphics screens. Microbuffer II uses a CMOS microprocessor to conserve the Apple's power supply and keep the heat down. It has a self test mode, 40/80 column default select, bypass mode (to emulate an Apple Parallel Card), and a reset disable switch. This last switch allows the printer card to continue sending, even when the Apple's reset button has been pressed.

Another nice feature is the buffer zap command, control-I Z. This allows you to clear out the buffer in case you don't want the rest of it printed out. Although the unit we tested used the simplified 10-wire connector, we were informed that an improved version has already been designed. It will carry the full standard and have several other new features.

Practical Peripherals seems to have a very judicious policy about updates—anyone purchasing an earlier board will be allowed to exchange it for the improved version. The Microbuffer II can be purchased with either a 16K buffer for $259 or with 32K for $299.

Another way to get serial and parallel interface capabilities is with one of the multi-function cards on the market. We will evaluate several of these in the May issue.

As you can see, we've come a long way from the simple parallel interface board. What we are also starting to see is a prime example of what is called *distributed processing*. We can now have the Apple's cpu executing the desired program, sending data to an intelligent pinter card. The microprocessor there takes the data in at the Apple's speed, and then handles transmission to the printer. In most cases, there will be one or more microprocessors in the printer to handle all of its various functions.

Looking back the other way, we can also have a co-processor board like the SoftCard, Mill, 8088, or even 68000 board handling all the data processing, using the Apple's 6502 for simple I/O handling. In a future column we will examine other interface standards such as the IEEE GPIB and local networks.

■

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See you at the fair and don't forget that blank diskette!

OLIVERI'S INQUISITION

By now, you are probably convinced, as we were, of what a nice person *Softalk* business columnist Peter Olivieri is. Few of us suspected the streak of secret voyeurism that revealed itself when he demanded that we molest you with the nosy questionnaire you'll find on the attached card.

Oh, he tried to cover it up. "The results could be very interesting to *all* our readers," he proclaimed. "After all, it doesn't ask our readers to give their names. . . . Wouldn't you like to know what sort of folks our fellow Apple owners are?" Then came the giveaway: "Send them to me. The results will be fun to analyze. . . ." Fun, Peter? Hmmmm.

Nevertheless, *Softalk* likes to keep its writers happy, and, well, maybe it would be kind of fun . . . and interesting . . .

We've paid the postage already, so all you need to do is fill out the card, tear it out—it's already perforated—and stuff it . . . in a mailbox. It'd be ideal if you could do all this by April 15, but if you don't think of it until you're reperusing the magazine in September 1996, send it then anyway. Your info may not make the first roundup, but a wizened, crotchety *Softalk* staff will have a good laugh.

Help us humor everyone's favorite business writer, the cute little guy in the Mind Your Business logo. Send in your Inquisition Questionnaire today.

Fill in and mail your questionnaire before April 15, 1982.

About You

Age _____ State of residence _____ Occupation _____

Sex _____ Highest education level _____ Annual income _____

About Your Apple

How many Apples have you? _____ Disk drives? _____

Circle configuration:

Model: II II Plus III DOS: 3.2 3.3

Memory: 16 32 48 64 128 256

Circle the peripherals you have:

Printer (brand and model? _____)

Hard disk (storage? _____)

Communications card _____ SoftCard _____

Language card _____ Graphics tablet _____

Other _____

How many disks do you own? _____

What percent of your computer time do you use your Apple for:

Home use _____ Business use _____

About Software

	Package Type	Own Now	Brand Name	Buy Soon	Not Interested
DBMS					
Finance					
Taxes					
Accounting					
VisiCalc					
Statistics					
Copier					
Word Processor					
Plotter					
Graphics Package					
Games					
Games					
Games					

Some General Questions

Do you write any of your own programs? . . . If so, would your programming leve be: Beginner . . . Intermediate . . . Advanced . . . When you buy a piece of software, what are the most important characteristics for you? List as many as you wish in order of preference. _____

What are the major drawbacks for you in using your system?

What do you like most about your system?

Any comments you'd like to share with other readers?

Please fill out this card, pull it out, fold it along the dotted line, fold it over, and staple it closed. It needs no envelope or stamps.

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Mind Your Business

BY PETER OLIVIERI



One of the first questions prospective microcomputer owners ask is "What is the best personal computer?" The second question is usually "What can a microcomputer be used for anyway?" Most readers of this column have already found their answer to the first question, so in this month's installment, we'll provide some answers to question number two.

Homing In. A personal computer is often used for games. Indeed, after its introduction into the home, the primary role of this new resident may be as an entertainer. After all, some of those games are great, and besides, applications for the home have not yet matured. As packages begin to appear that really tap the potential of the personal computer in the home, it's very likely that we'll see an increase in microcomputer sales, particularly as related to educational applications. In addition, the microcomputer seems to be making a real place for itself in small businesses. Well tested applications in accounting, finance, data management, and so on, make the Apple a natural additional employee.

Another setting in which the personal computer is making its presence felt is in businesses that are run from the home. Such businesses may be the primary means of support for an individual or family or may be the source of additional income.

It's a good bet that as soon as people in the home begin to realize the microcomputer's potential, this market will develop rapidly. We'll begin to see an enormous growth in applications, as well as an increase in the number of small businesses. Home-based businesses will emerge to provide word processing/report preparation, mailing list maintenance, income tax preparation, graphics design, letter writing and many other services. With this in mind, we'll be devoting a future column to a review of the potential applications of that personal computer of yours.

Certainly, whether you're thinking of using your Apple in your current business or of going into business because you have an Apple, a guide that provides some help along the way is likely to be useful to you. Next issue will mark the beginning of a four-part series that will ultimately become A Guide for Planning and Using a Computer in a Small Business. The original plan had been to start the guide in this month's column, but readers are probably more interested right now in timely tax information, so the guide will begin next month instead. It will be well worth the wait (or the weight).

Tax Time Draws Nigh. After the "Ides of March" comes the "IRS of April." If you're like most of us, you dread assembling all the documents and paperwork, struggling through the calculations, and then wondering in the end if you could have saved more money by doing your taxes some other way. You may have thought about income averaging, or about filing separately instead of jointly, only to decide against these methods when you realized that they can sometimes require three times as much work as your usual methods.

Let's face it. Doing taxes is a pain!

Computers can help. After all, they're designed to perform routine, repetitive, boring, calculation-oriented tasks. (How better to describe doing taxes.) But there aren't a lot of tax programs available. Such programs are difficult to write, and even more difficult to maintain, particularly with so many changes in tax law each year. Because a variety of supplemental forms may be chosen by particular taxpayers, it is difficult to design a complete package.

Tax Packages—Who Needs 'Em? Your first step in determining whether a tax package might be of use to you is to assess your needs. If you don't itemize, if you file the shortest form possible, or if you evade taxes altogether, it's obvious that you don't need a tax program. And if you have several businesses, a multitude of tax shelters, and 140 tax preparation books, it's wise to stick with your professional advisor.

But if you do your own taxes, have one or two reasonable incomes, itemize, use some of the additional forms, or have a small business, it's well worth it to consider obtaining and using one of the tax preparation programs.

Of course, these packages don't tell you how to do your taxes. They don't advise you about what deductions to take, and they can't provide you with receipts that you don't already have.

A tax program will, however, do all of the calculations for you. It will allow you to try different methods (that is, filing jointly, separately, and so on), and to store all of your results on disk for comparison. In fact, if you're one of those really organized people, you can use a tax package at the end of each month throughout 1982 to keep your records up to date and have most of the work done by the time tax season rolls around next year.

Who's Got What? Various software companies offer tax packages for the Apple. Among the ones we know of are two tax planning packages from Aardvark Software: *Individual Tax Plan,* designed for use by CPAs and other professionals ($300), and *Personal Tax Plan* ($130). Both programs are intended as aids in tax planning, rather than as tax preparation tools.

Microlab offers a tax preparation package called *Tax Manager* (see Marketalk Reviews). This program is meant for use by individuals who are filling out Form 1040. An extensively reworked version of a program formerly available from Taso, *Tax Manager* retails for $150. A $30 extended update fee provides current users with information on any changes in rates or tax laws on a yearly basis.

Other manufacturers have programs that will run on CP/M-based systems or an Apple with a language system. If you're an accountant or have very complex or detailed tax needs, you'll want to look carefully into what forms and options are provided by the various software vendors.

One excellent tax package we're acquainted with is *Tax Preparer* from Howard Software. Priced at just $150, *Tax Preparer* is worth every penny (and of course, as is the case with any tax program, its cost is deductible). This package takes you through Form 1040 line by line and stores the information you fill in on the form. If a line on 1040 requires an entry that's the result of filling out another schedule (for example, Schedule A for deductions), you can exit Form 1040 and go to the appropriate schedule. After you've completed that schedule, the result of your labors is automatically posted in the proper position on Form 1040.

At any time while you're completing a form, you may exercise an option that allows you to spell out what may have led to the entry of a particular figure. For instance, if a line item on one of the forms equals $1,598, you can store a list (including alphabetic descriptions and dollar amounts) that backs up this figure. Lists of this sort can contain up to 1,000 items and can be added to or modified at your choice. In addition, lists can be printed along with the forms. The manual is well done, easy to use, and takes you through a sample set of forms to familiarize you with the program's features.

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new disk that contains the latest tax law updates and the newest tax tables. In addition, new forms and options are always being added to the package to make it as complete as possible.

The IRS is very particular about how forms are filled out or printed. Several options that conform to IRS guidelines are provided within the package, but even if you had to recopy the numbers by hand, this package would have saved you a great deal of time and effort.

Resource Corner—Expanding Your Professional Library. If you're doing some of your own programming, you'll need to get involved at some point with using data files. If you haven't learned all about them already, you'd be well advised to pick up a copy of *Apple Basic for Business* by Alan J. Parker and John F. Stewart (Reston Publishing Company, $17.95 hard, $14.95 paper). This book is one of the better introductions to the use of Basic for writing programs on your Apple for application in your business.

The book covers the components of Basic, and does so by using examples from a business setting. Chapters include material on data entry, using sequential files, adding and deleting records from files, using direct access files, and principles of designing programs. Information about graphics, editing, and data base management is also provided. The many listings of Basic programs that are included in the book make it even more valuable.

Basic Training. *The Basic Handbook* by David Lien (Compusoft Publishing, $19.95) is actually an encyclopedia of the Basic programming language. It was designed as a reference for Basic. Thus, it contains a wide range of Basic statements (that is, those for Apple, TRS-80, Digital, and so on). The book is attractively laid out, and the pages contain all of the statements in the language in alphabetical order.

Each page begins with a short explanation of the function of a particular statement, followed by a test program that illustrates its use and allows you to determine how the statement will work on your computer. A sample run of the test program is also provided. Next, alternative spellings and variations in usage are presented, along with another test program, if appropriate, to demonstrate a particular feature.

The reader is then directed to any statements that might be related to the one being examined. If you're already familiar with programming but need to look up the syntax of a particular statement every once in a while, this book should be on your bookshelf. And if you happen to work in an environment where several versions of Basic are used, you'll find this reference invaluable.

If you're interested in using your personal computer in starting up your own business, you may be interested in a book called *INC. Yourself* by Judith McQuown (Warner Books, $5.95). This book has nothing at all to do with computers but it is a very readable and reliable reference for setting up your own corporation. It includes discussions about how to incorporate, selecting an office site, dealing with your employees, obtaining insurance, handling medical benefits, developing tax shelters and profit sharing plans, and preparing tax returns for your new business. Those of you who have been tempted to start your own business, perhaps from your home, should find this book quite useful.

Special Reports. You may at some point want information about what printers are available for micro and minicomputers. Or you may be interested in learning more about word processing. Datapro Research Corporation offers a wide variety of unbiased reports on the latest information processing products and methods.

These reports include specifications, prices, characteristics, user ratings, product comparisons, selection guidelines, and so on. Reports cost $15 apiece; among the most recent titles are "Glossary of 263 Word Processing Terms," "Management Guidelines for Office Automation," "User Ratings of Computer Systems," "How to Select and Install a Small Busi-

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The Axlon RAMDISK™ 320K Memory System for the Apple II and Apple II Plus* provides access speeds never before available. The Axlon memory system is designed to interact with Apple DOS 3.3* and Apple Pascal 1.1* like two standard floppy disk drives while delivering the lightning fast access speeds of RAM memory. This also leaves 32K of RAM for advanced programming techniques. The interface board is slot independent and draws no power from your Apple. The rechargeable battery system built into the unit provides three hours of backup in the event of a power loss. Drop by your local Apple dealer or contact Axlon, Inc. for more information.

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ness Computer," and "All About 149 Microcomputers." A listing of available reports can be obtained by writing to the company directly (or visit your local library and see what they have from Datapro).

A Helpful How-To. If you already have your own business and are considering using your computer in it, you should also consider getting a copy of Jules A. Cohen's *How to Computerize Your Small Business* (Prentice Hall, $7.95). (This paperback will also be useful to you if you have not yet decided on what computer or computer components you want or need in your business.) The book is easy reading and contains some good advice.

The opening chapters cover data processing and computers. In subsequent chapters, the author presents a plan for selecting the best system for your particular needs. He traces the steps necessary to evaluating what your needs are, and then provides checklists for you to follow in actually documenting your needs. Sample forms are also provided, along with actual examples of many of the principles and steps suggested.

New Perspective. This next recommendation is geared toward those of you who would like to know more about computers, not from the electronic or design points of view, but from the user's or manager's perspective. The volume in question is a hardcover text entitled *Information Processing Systems for Management* by Hussain and Hussain (Richard D. Irwin $24.95). It is not for or about the Apple, but addresses instead what managers need to know about computers and how they can be applied to a firm's operations.

This very readable book includes chapters on software, hardware, input and output equipment, storage devices, teleprocessing, design of a database, database management systems, developing an information system, conducting a feasibility study, designing a system, implementing a system, quality control, security, computer applications, and many other topics.

Again, this book is not specific to the Apple, or even to microcomputers. But it's a thorough and well organized text, neither too technical nor too light. If you're thinking seriously of taking the next step toward expanding your horizons about computers, this book may be for you.

The Readers Speak. "Of course, I like *Softalk*. However, are there other magazines that I should be reading or that might be valuable for me?" E. N., Columbia, South Carolina.

I am certainly not biased when I say that I think *Softalk* (even with its new subscription policy) is the best reference of all for the Apple user. It's well written, more thorough in its coverage than any other magazine, and the best one-stop-shopping guide for the Apple that exists anywhere.

Of course there are other magazines that are well written and valuable, although I don't think I'd necessarily subscribe to them just because I owned an Apple. As I said, *Softalk* is the only definitive Apple resource. While other magazines may have articles on Apple applications, or even a regular department that covers Apple applications, other magazines also cover many other machines.

I look to other magazines for information or articles that are of particular interest to me. To answer your question (I feel like Santa Claus in *Miracle on 34th Street* telling you to shop at Gimbel's instead of Macy's), I like *Creative Computing* (Morristown, NJ). It has a lot of equipment reviews, as well as articles about computing and artificial intelligence, and I find it interesting reading. Occasionally I purchase copies of *Byte* and *Personal Computing* (both Petersborough, New Hampshire).

So long, and have a great month. ◨

Howard Software, 8008 Girard, Suite 310, La Jolla, CA 92037; (714) 454-5079. Aardvark Software, 783 North Water Street, Milwaukee, WS 53201; (414) 289-9988. Micro Lab, 2310 Skokie Valley Road, Highland Park, IL 60035; (312) 433-7550. Datapro Research Corporation, 1805 Underwood Boulevard, Delran, New Jersey 08075; (609) 764-0100. CompuSoft Publishing, 1050-E Pioneer, El Cajon, CA 92020; (714) 588-0996. Prentice Hall, Englewood Cliffs, NJ 07632; (201) 592-2000. Richard D. Irwin, Homewood, IL 60430; (312) 957-5800. Warner Books, New York, NY 10001; (212) 484-8000. Reston Publishing, 11480 Sunset Hills Road, Reston, Virginia 22090; (703) 437-8900.

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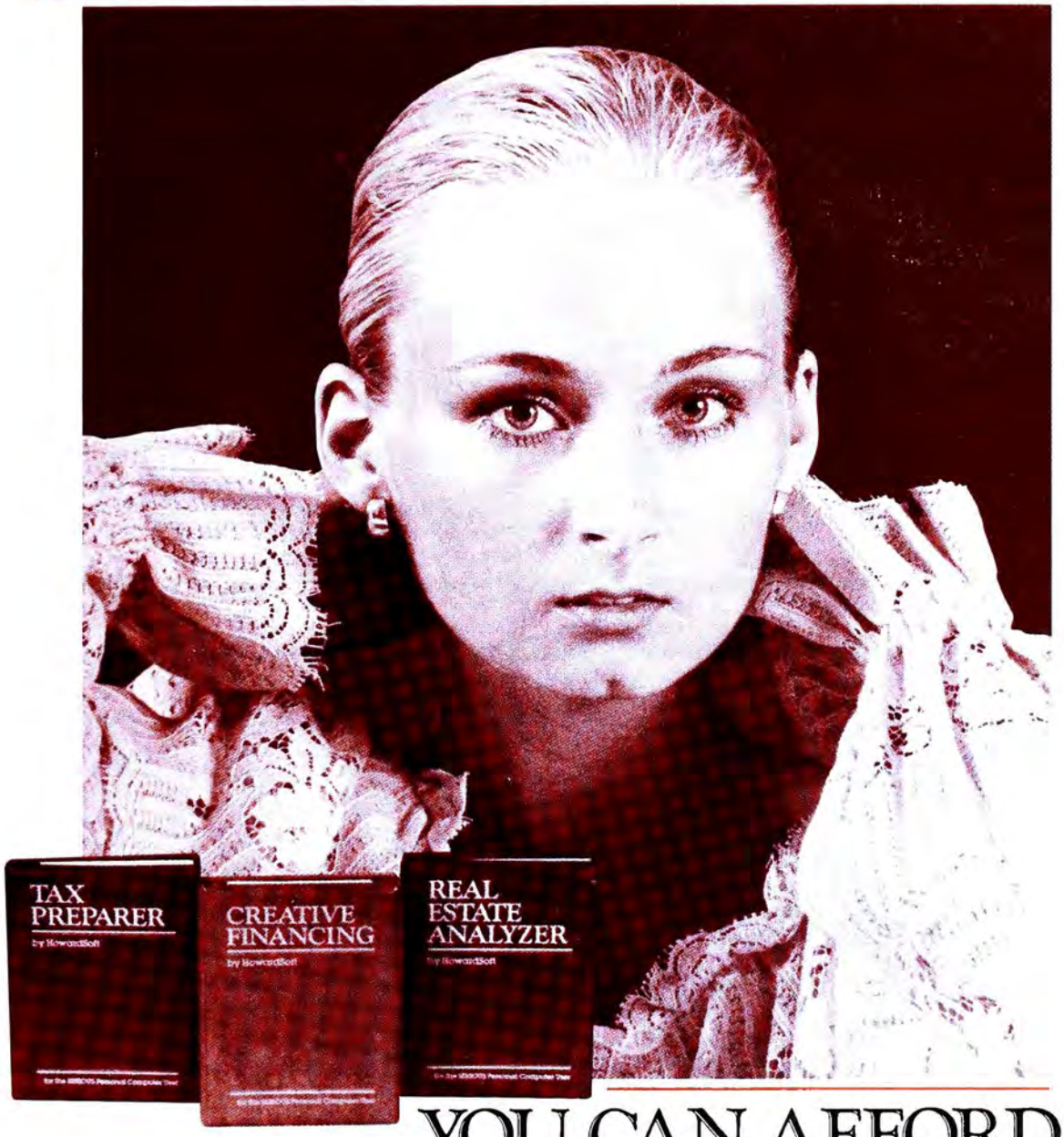
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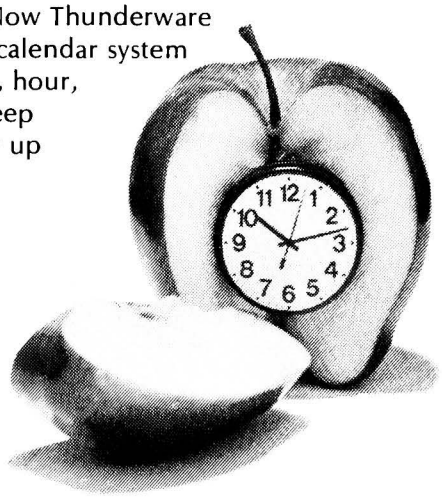
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DISK VOLUME 254

*A 006 HELLO                07/07 16:37
*A 006 CLOCK                06/08 09:07
*A 004 FRAME                06/08 09:08
*A 004 DISK.INFO            06/17 16:13
*B 003 BACKOFF              06/17 16:13
*B 005 SCREEN               07/24 17:32
*B 002 TCPUTIL              06/17 16:13
*B 004 SDTIME.O             06/17 16:13
*A 007 ADIGCLK              05/19 08:05
*A 011 SET TIME             06/08 09:08
*I 009 IDIGCLK              05/19 08:05
*A 007 TIME                 06/08 09:08
*A 003 SLOTFINDER           07/07 16:56
*A 014 DEMO                 06/17 16:14
```

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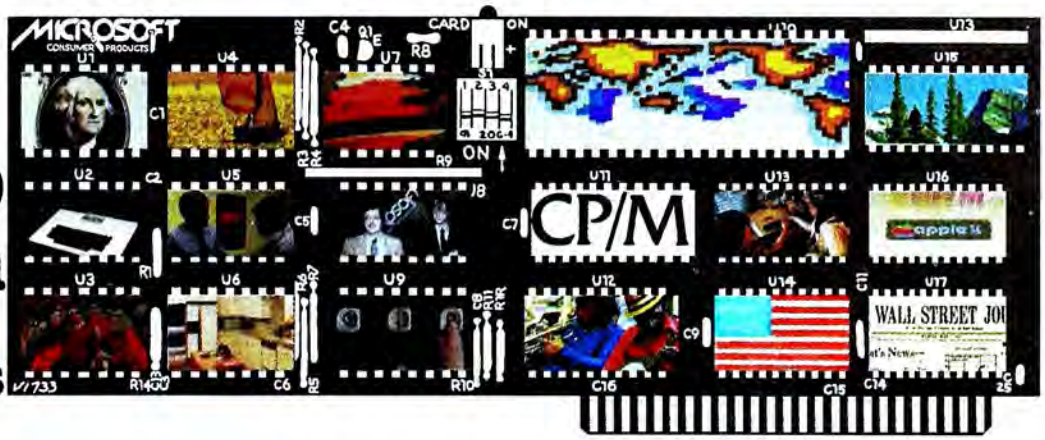
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SOFTCARD Symposium

by Greg Tibbetts



Last month we discussed the utility program STAT.COM, and in relationship to that program we discussed the manner in which CP/M handles the interaction between itself (the system) and the outside world (the peripherals). Typically, this is set up in one of two ways—either by the manufacturer of the system for those systems that are sold with all peripherals in place and functioning or by the CP/M user in those systems whose components are supplied separately or who may have purchased CP/M separately from Digital Research or one of its agents. In the latter case and occasionally in the former, the user is required to write his own BIOS, or at least modify a sample BIOS supplied with the system. While this is not terribly difficult in most cases, it is by no means a trivial task, and a firm understanding of both CP/M and the system to be interfaced to would be required.

In Apple CP/M, the task is doubly difficult because of the fact that the CP/M Apple is a dual-processor system. For this reason, the BIOS was preconfigured by Microsoft for the most standard peripherals, and a means was provided to alter the BIOS to handle any special peripherals the user might wish to install. The means for making these alterations—and the subject of this month's column—is the utility program CONFIGIO.BAS.

CONFIGIO, unlike the utilities we have dealt with before, is not a standard Digital Research program. In fact, no direct method of BIOS alteration is normally provided in most other CP/M systems. This is either because all configuration possible has been done by the manufacturer, or because the user himself, having written or rewritten the BIOS in the first place, is in a position to alter it. The Apple CP/M user however, is not in a position to alter the BIOS directly, nor is he the owner of a nonexpandable system. Consequently, Microsoft implemented the BIOS with a special area they called the I/O Configuration Block, or IOCB, that allows changes to be made easily to the BIOS I/O control arrangement. Thus the Apple is something of a special case, and we hope all the better because of that singularity.

CONFIGIO as a utility is also unique in another way. It is comprised of 185 lines of Basic code (that's right, Basic) and contains several Z-80 machine language subroutines stored in the program as *data* statements. Using Basic routines and calling these Z-80 subroutines, CONFIGIO is able to alter directly the IOCB and thereby allow the user to customize a system for specific peripherals. Before we take a closer look at what CONFIGIO does however, we need to know a little more about the structure of the IOCB, so we're going to take some not inconsiderable space to examine its physical structure.

Each Apple CP/M system disk contains an IOCB that defines the way that CP/M system, if it's running in your Apple, will communicate with the outside world. Perform a cold boot with that disk, and you load that IOCB into memory. You may perform any number of warm boots or disk changes after that and you will not change the IOCB that was loaded from the original boot disk—until and unless another cold boot is performed. The IOCB is loaded into memory at Z-80 addresses F200H through F3FFH. Several items are located within this range of memory. Those items and their addresses are listed in table 1.

The three user patch areas, located from F200 to F37F, are specific areas of RAM allocated as free space for the user to place peripheral driver routines that may be needed for nonstandard peripheral cards or special filter-type routines that perform some operation on data either going to or coming from the peripheral.

Next, the I/O vector table is simply a series of two-byte addresses that are vectors into the standard BIOS routines handling the function to which the vector is assigned. For example, we described *list output vector #1* last month as the location of a two-byte address of the general-purpose printer driver located in the BIOS. It is these vector contents that you must alter to point to your routine in the patch areas listed in table 1, when you wish to substitute your own driver for the standard one. More on this later.

The next two areas in the IOCB are the software and hardware screen function tables. Basically, screen functions can be described as macro operations performed by the CRT display (usually referred to as the terminal, regardless of whether it's truly an external terminal or part of the computer itself). For example, if you wanted to clear the terminal's current line of unwanted characters and your cursor was at the beginning of the line, you could simply print sufficient spaces to erase the unwanted characters. Or you could issue sufficient carriage returns to scroll the display off the screen. Most terminals, however, have certain built-in operations that perform such

IOCB STRUCTURE

Address Range	Function
F200 to F27F	user patch area—slot 1
F280 to F2FF	user patch area—slot 2
F300 to F37F	user patch area—slot 3
F380 to F395	I/O vector table
F396 to F3A0	software screen function table
F3A1 to F3AB	hardware screen function table
F3AC to F3B7	keyboard redefinition table
F3B8	number of system disk drives
F3B9 to F3BF	slot types table
F3C0 to F3DA	the 6502/Z-80 mode switching routine and miscellaneous vector locations
F3DB to F3DD	not used
F3DE to F3DF	Z-80 address of the SoftCard
F3E0 to F3EF	not used except as miscellaneous locations to store temporary data
F3F0 to F3FF	Apple 6502 reset, NMI, and other vectors

Table 1.

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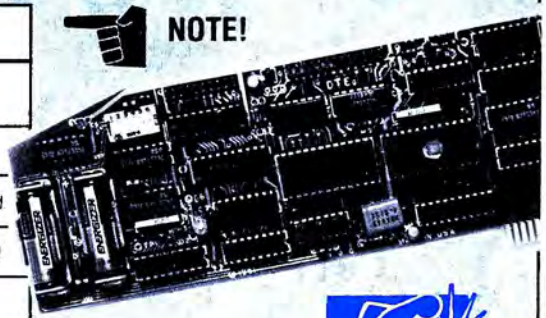
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functions automatically. Things like *clear screen, clear to end of line, clear to end of page*, and so on, are done in hardware for the most part and as such are much faster than the primitive methods we just described. Each type of terminal supports a certain number of functions—some more than others—and each has its own character or sequence of characters that it recognizes as being a function command rather than characters to be displayed. If all the various computer system and external terminal manufacturers used the same sequence of characters for these functions, or at least for the more common ones, things would be much simpler. Unfortunately they do not, and therefore the problem of screen-function protocols arises.

Since CP/M systems are usually found on computers requiring external terminals, there is no way for the software producers to know in advance what sort of terminal functions their programs will be dealing with. It's common, therefore, for them to set up their programs to output screen functions in a common protocol, identify the protocol used, and leave it to the user to make a translation to the protocol used by his hardware if that protocol is different.

This is where the screen function tables in Apple CP/M come in, and they are a very important interface between the system and the hardware. They take the output of the software, examine it against a table of function calls of the protocol the software is using, and, if a screen function is being sent, translate it to the characters required by the protocol of the hardware. If that seems like a lot of work, it is, since every character output is examined in just this way. You may be wondering just how the terminal determines whether a character or sequence of characters is a function or just something to be displayed. It can be done in several ways, but the most common way is by the use of a lead-in character.

The lead-in character is usually a nonprintable character, such as an escape or control character, that tells the terminal to examine the character immediately following it. If the following character matches one that the terminal recognizes as a screen function character, then the terminal performs the function; if not, then the character (and sometimes the lead-in character as well) is displayed normally. There are nine screen functions in Apple CP/M; they're shown in table 2.

Consequently, there are eighteen bytes in the table, nine for software protocol and nine for hardware protocol, that represent the identifying characters for each screen function. There are also two bytes that represent the lead-in characters required by the protocols used for software and hardware, and finally, there are two additional bytes representing the address-coordinate offset and the order of coordinate transmission.

To see how it works then, let's take the typical example of a system using *WordStar* with one of the standard eighty-column boards. The software table in this case would have to be set for Soroc protocol, since this is the protocol used by *WordStar* when it commands screen functions. The hardware side would be set up for Datamedia, since this is the protocol used by both the Videx and M & R Sup-R-Term boards. When *WordStar*, during its normal output, decides to clear screen, it sends an escape followed by an asterisk. CP/M sees the escape, which is the lead-in character for the software side of the table, and doesn't output it, but instead waits for the next character. If that character matches an entry in the table, as it does in the case of the clear screen entry, CP/M looks on the hardware side for the corresponding entry and finds the FF or form-feed character, which is an ASCII 12 (decimal). It also looks to see if the hardware requires a lead-in character, finds that it does not, and simply outputs a decimal 12 to the eighty-column card. If it had received an escape character from *WordStar* and could not find a corresponding table entry matching the next character, that next character would be sent to the screen and the lead-in character discarded.

The next area in the IOCB is the keyboard redefinition table. This table was designed to make available to Apple CP/M users certain characters that their software may require, but that the Apple keyboard is incapable of generating. It is set up so that, as the screen function table does with output, every character of input is examined as it is received to see if it matches one of the entries in the table. If it does, the character you have designated to replace it is transmitted instead. If it doesn't, the character is passed on as is.

Certain characters used with the eighty-column boards cannot be redefined, however, as perhaps you have found out. CP/M comes with control-K translated to a right square bracket. If you tried to redefine this to something else or even to eliminate it when using an eighty-column card, you found that it seemed not to work. This is because CP/M never saw the control-K in the first place. The eighty-column card, which also handles input, made the translation to a bracket before giving the character to CP/M. If you wish to make control-K really be control-K, the only way to do it with your present hardware configuration is to use the translation table to translate the bracket back into control-K. Once you've done that, you'll find that when you type control-K it appears as control-K, even though it is going through two separate translations. Each translation entry requires two bytes, one for the existing character and one for the new one. There are twelve bytes used for

1 . . . cleor screen
2 . . . cleor to end of page
3 . . . cleor to end of line
4 . . . set normol text mode, (noninverse; olso known os low light)
5 . . . set inverse text mode (high light)
6 . . . home cursor
7 . . . oddress cursor (meoning send cursor to position based on X, Y coordinotes)
8 . . . move cursor up one line
9 . . . nondestructively move cursor forward

Toble 2.

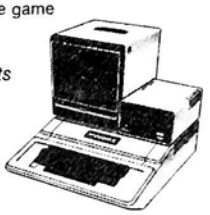


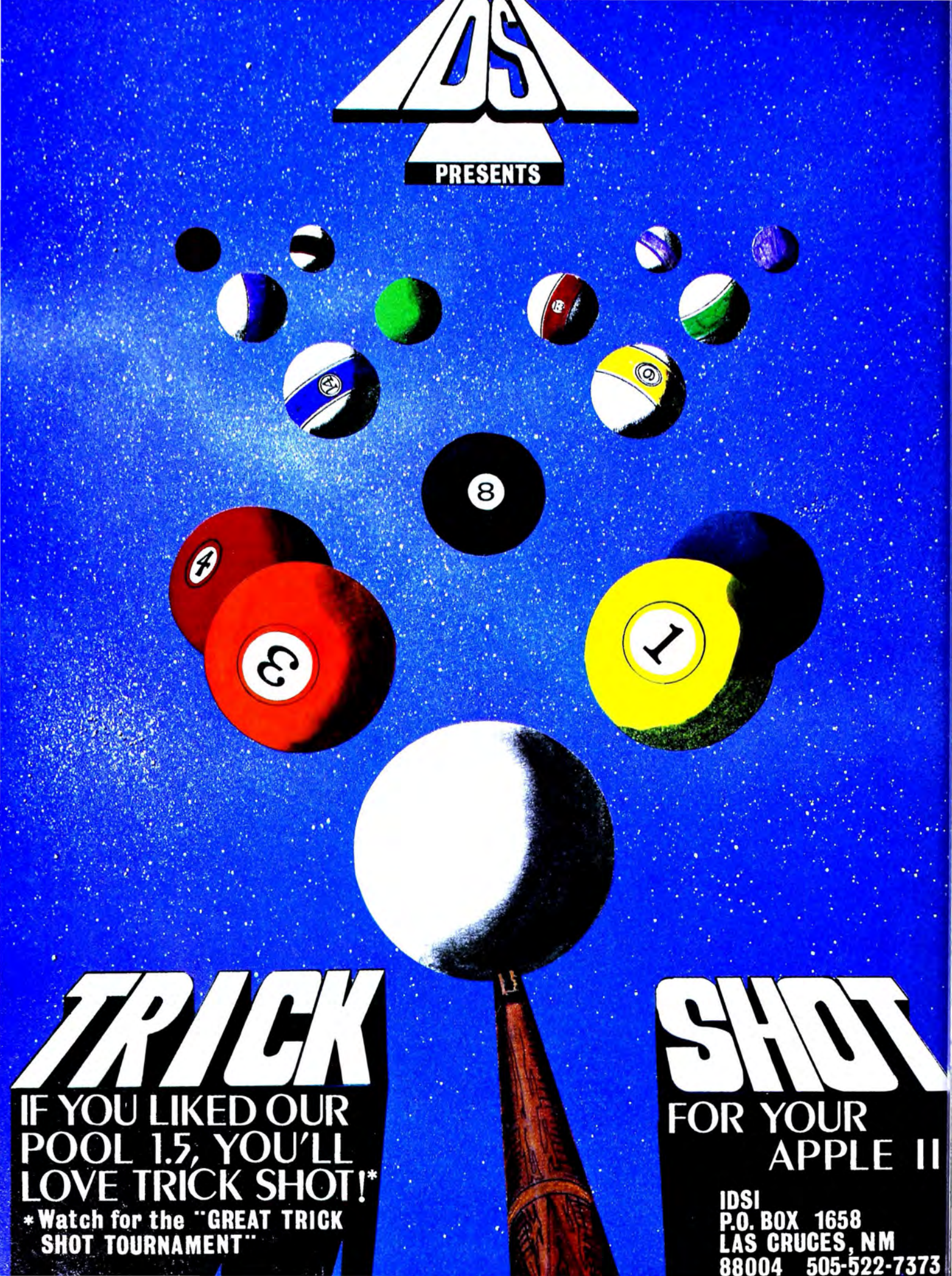
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VALUE	CARD TYPE
0	No card detected in that slot
1	Card of unknown type
2	An Apple Disk II cantroller card
3	Apple COM card or CCS 7710A serial
4	Apple high-speed serial card, Videx Videoterm, M & R Sup-R-Term, or Apple Silentype Printer card
5	Apple parallel printer card

Table 3.

this table, so a maximum of six characters can be redefined.

The byte immediately following the redefinition table is used by CP/M to keep track of the number of disk drives available to the system. It's not necessarily a true count, since it's simply the number of disk controller cards in use times two. CP/M has no way of determining if there are two drives on each card, so this number may not be correct. It is originally set on cold boot and changed only on subsequent cold boots.

The next area of the IOCB is the slot types table. This table is also created during the boot process and not updated until a subsequent cold boot sequence. In this table, which consists of seven bytes, one each for slot numbers 1 through 7, is contained a value that corresponds to the type of card CP/M thought it recognized in the specified slot during the boot sequence. To identify cards, CP/M looks at two bytes of the ROM on the card, 6502 addresses $CN05 and $CN07 (where N is the slot number), and compares them to a table of values for cards it supports. Because of the nature of the hardware, it is possible for CP/M to mistake an unknown card for one of those it recognizes, but most common cards will be recognized properly. The card values and types it will recognize are listed in table 3.

This information can be put to use in applications programs, for example in programs that automatically configure for forty or eighty column output by examining the value in the byte for slot 3.

The next area of the IOCB is the 6502/Z-80 control-transfer loop routine between F3C0 and F3DF (which also includes some miscellaneous temporary storage and vector locations). This loop, on 6502 code, is a recursive means of constantly transferring control between the 6502 and the Z-80. The first nine bytes, which are first executed during the boot sequence, set up any RAM board that might be in the system and then enable the Z-80 by writing to the address of the SoftCard. The 6502 is placed in a "hold" condition at this point, but when it is reactivated by writing again to the address of the SoftCard, it will pick up where it left off with the instruction at $03C9. At this point, the 6502 again resets the Ram board and then performs a subroutine at $FF3F that restores its registers from the register-save area. Its next action, at $03CF, is to execute a subroutine whose address is stored obviously at $03D0 and $03D1. When that's completed, the 6502 executes another subroutine at $FF4A that saves its registers in the save area; and finally it goes back to $03C0 to activate again the Z-80 and put itself on hold until the next time it's "turned on."

While this seems unnecessarily complex, it allows you to do some interesting things, such as easily calling 6502 subroutines from Z-80 mode. All you have to do in 8080 or Z-80 assembly language is store the address of the 6502 subroutine you wish to call in the address field at $03D0 (low-order byte), and $03D1 (high-order byte) and write to the address of the SoftCard (which, as we said, is found in Z-80 location F3DE and F3DF). The control-transfer loop will do all of the dirty work for you and leave you back in Z-80 mode when your routine does an RTS. The 6502 control vectors all point to this routine also, so that if, for example, a reset is encountered during the execution of your subroutine, Z-80 recovery will take place.

Actually, the control transfer loop occupies only the Z-80 address locations from F3C0 to F3DA. The remainder through F3DD is not used, and the addresses F3DE and F3DF are used by the BIOS to store the address of the SoftCard during the cold boot sequence for future reference and use by the system.

The last area of the IOCB, F3F0 to F3FF, contains the Apple break, reset, Applesoft, &, Monitor control-Y, nonmaskable interrupt, and interrupt request vectors (see page 65 of the *Apple II Reference Manual* for more information). The actual vector addresses have all been changed to point to the beginning of the control-transfer loop so that resets, for example, will always leave the Apple in Z-80 mode.

Now that we've seen what the IOCB is and does, we can now look at why and how CONFIGIO alters it.

When you run the CONFIGIO utility, you will notice that it first initializes itself. By looking in the program listing, you can see each of these initialization steps in detail, but for our purposes, suffice it to say that they consist of setting up the machine language subroutines and informing CONFIGIO of existing system parameters. At this point, the main menu will be displayed, and from this menu you can determine the four functions that CONFIGIO can perform. They are: redefining the software and hardware screen function tables for the display device, redefining the keyboard translation table, and loading and patching in user peripheral driver routines. The last item in the menu simply allows an original IOCB to be read in from a specific disk and a restructured IOCB to be written out to disk.

Now that you understand the structure of the IOCB and how it functions, the first two items, screen function and keyboard redefinition, are pretty self-explanatory. In these cases, CONFIGIO simply is a means to alter easily the character values in the tables, using words and methods that are easier for us humans to understand. For that reason, we'll not discuss these further.

What seems to confuse many SoftCard users is the concept of patching in peripheral handling routines, and that will be our topic for the remainder of the column.

In last month's column we covered the concepts behind user handling routines in some detail. So for our current pur-



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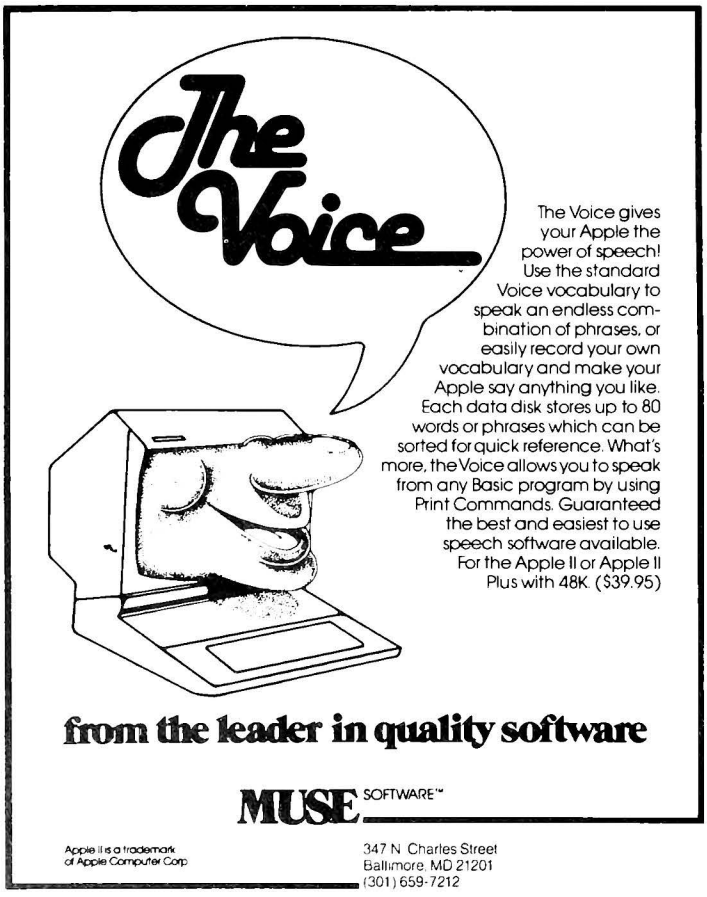


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poses, we'll simply highlight the important points. There are occasions, such as the case of nonsupported peripherals, where the user needs to force CP/M to recognize the peripheral or cause output to and input from the peripheral to be in a form different from the way the BIOS normally handles it. For want of a better term, we'll call these *substitution* patches, since they're complete in themselves and do not depend on the standard BIOS routines. Also, there are occasions when it is desirable to use a routine simply to alter the I/O traveling to or from a peripheral device before sending it on to the standard BIOS routine. These we'll call *filter* patches, since their job is to act as a filter through which the I/O must pass. In both cases with Apple CP/M, it is necessary to place in memory your routine to perform this function and then alter the normal vector that CP/M uses to send output or receive input via the BIOS to point instead to your routine. If your routine is a substitution patch, no further action need be taken. If, however, your routine is a filter-type patch which somehow alters the I/O before letting it go on its way, then the normal BIOS vector will have to be saved and placed in your routine. In both cases CONFIGIO is capable of handling most of this drudgery for you. To see how, we'll take a look at a typical case.

A good example for us to use is the problem that occurs with some printers (mostly Centronics), regarding extra linefeeds. As we've seen in earlier discussions on file handling, CP/M in its normal operations automatically places a linefeed at the end of every carriage return. Unfortunately, these linefeeds also get transmitted whenever output is sent to the printer. Since the Apple does not store or transmit linefeeds, printers designed primarily for use with it usually insert them automatically. The result is unwanted double-spaced output.

Early in the SoftCard's history, users brought this fact to Microsoft's attention and a means was devised to circumvent the problem using a filter-type patch named NOLF (for NO Line Feed, of course). We'll now examine NOLF in detail to see just what is happening. While this column is not aimed primarily at assembly language programmers, it is assumed that those readers interested in patching CP/M have some knowledge of assembly language and ASM.COM. Those of you without such specific knowledge would probably benefit from following through the discussion below with a friend who has such knowledge. An assembly language printout of the patch is included here, and when we make references to it, we'll use the addresses running down the left margin to identify where we are.



If we were a typical user faced with the problem above, our first step would be to design a machine-language filter that would be able to strip linefeeds from character output. Assuming that we have only ASM.COM to work with, we'll design the routine in 8080 code. The process will be as follows: All linefeeds following carriage returns will be ignored; any linefeeds not following carriage returns will be output normally; and finally, carriage returns that are output immediately following a carriage return character (extremely rare), will also be ignored, since the printer would then issue two linefeeds. The actual routine that performs this begins in the listing with the label NOLF: at 010B and ends with the label NOTCR: at 011C. This is not all we have to do, however, to create a patch file that CONFIGIO can use.

First, our assembler in this case—made up of ASM.COM and LOAD.COM—will not be able to create a loadable COM file that is assembled at any place other than address 0100 hex. On the other hand, since the program will need to be located and run in the patch area in high memory, we need to establish its true origin (in this case F26A near the top of the slot 1 patch area) and define an offset that is the difference between the two. By adding the offset in every memory reference we can resolve this problem. The origin is defined with the label ORIGIN and the offset with the label OFF$ at the beginning of the listing. You will notice then that in all branch instructions and data fetch instructions we have added the value of OFF$.

The second thing we need to do is establish the information CONFIGIO will need when loading the file. Referring to the SoftCard manual on CONFIGIO, we see that the first eleven bytes of any patch file need to be in a certain format. They are fairly well commented in the listing, so we'll highlight them only briefly here.

Bytes	Address	Purpose
1	0100	This byte is the number of potches to be mode in this operotion.
2-3	0101	These two bytes ore the ploce where CONFIGIO is to instoll the potch. We use the ORIGIN volue here.
4-5	0103	These two bytes ore the length of the progrom set by using the LENGTH value estoblished neor the end of the listing.
6	0105	This byte tells CONFIGIO whot type of potch to moke; 1 if it is o substitution potch, 2 if it is o filter-type potch. NOLF is o type 2 potch.
7	0106	This byte is the number of the IOCB vector to be potched. In this cose, since we ore using the LST: device, which itself uses List Output Vector #1, the SoftCord monuol tells us this is vector #10.
8-9	0107	Used only for type 2 potches, these two bytes ore the oddress in our routine where CONFIGIO is to ploce the existing contents of vector #10 so thot our routine will go on to the BIOS to complete its output. We specify the lobel NOTCR plus one, so the two bytes will reploce the zeros in our listing.
10-11	0109	These two bytes ore the oddress thot we wont CONFIGIO to place in the IOCB vector, so thot it will point to our routine. We use the lobel ORIGIN here since thot is olso the entry point of our routine.

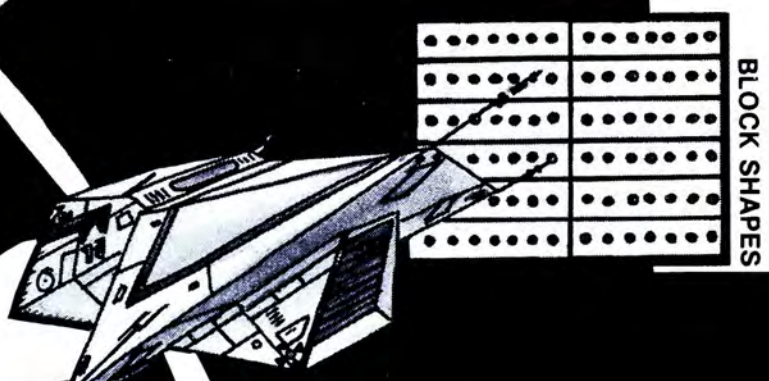
Now that we've done all the hard work, all that remains to install our routine in memory is to assemble it with ASM.COM and create a COM file using LOAD.COM. It is usually best to rename these files so that they have a .PAT extension. This is

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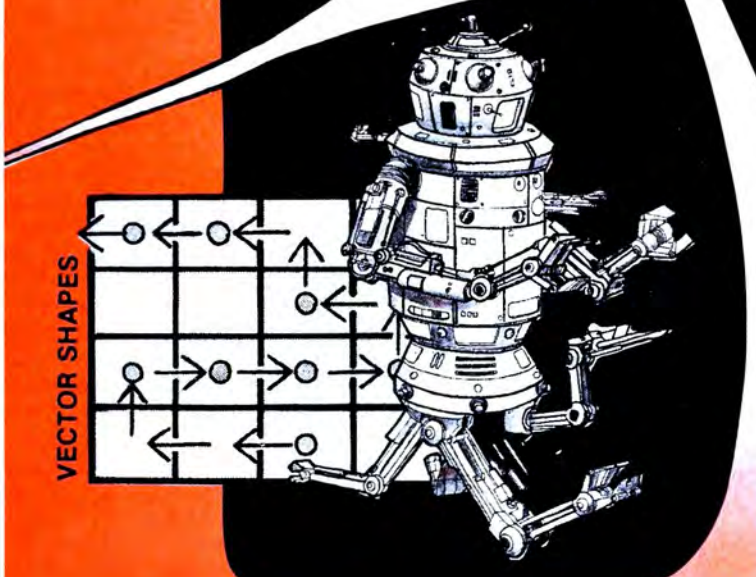
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so that you will always recognize them as patch files and the chance that someone may try to execute them will be minimized. The listing that follows is the print file result of this process.

```
                        NOLF—ELIMINATING EXTRA LINEFEEDS

                ;
                ;               NOLF.ASM
                ;
                ;THIS PROGRAM STRIPS LINEFEEDS FROM A
                ;CR-LF SEQUENCE SENT TO THE PRINTER.
                ;
                ;THIS VERSION ALLOWS MULTIPLE LINEFEEDS TO PASS
                ;THROUGH. ORIG BY N.K. MODIFIED 5/1/81 BY G.T.
                ;MODIFIED 1/12/82 BY G.T.
0100                    ORG   0100H             ;ORIGIN FOR ASM'S BENEFIT
                ORIGIN  SET   0F27FH-LENGTH     ;TRUE ORIGIN: END OF SLOT 1
                                                ;PATCH AREA MINUS PROG LENGTH
                OFF$    SET   ORIGIN-NOLF       ;ESTABLISH PROGRAM OFFSET
                ;
                ;11 BYTES OF INFORMATION FOR CONFIGIO
                ;
0100  01                DB    1                 ;NUMBER OF PATCHES TO MAKE.
0101  6AF2               DW    ORIGIN            ;PLACE TO PUT PROGRAM CODE.
0103  1500               DW    LENGTH            ;LENGTH OF PROGRAM CODE.
0105  02                DB    2                 ;TYPE OF PATCH (1 OR 2).
0106  0A                DB    10                ;IOCB VECTOR # TO CHANGE.
0107  7CF2               DW    NOTCR+OFF$+1      ;PLACE TO PUT EXISTING IOCB
                                                ;VECTOR CONTENTS.
0109  6AF2               DW    ORIGIN            ;NEW VECTOR CONTENTS TO PLACE
                                                ;IN IOCB.
                ;
                ;ACTUAL PROGRAM CODE FOR PATCH
                ;
010B  217EF2    NOLF:   LXI   H,CRFLAG+OFF$     ;POINT TO CR FLAG
010E  7E                MOV   A,M               ;GET LAST CHAR SENT
010F  71                MOV   M,C               ;PUT CURRENT CHAR. IN CRFLAG
0110  FE0D              CPI   13                ;WAS LAST CHAR A [RETURN]?
0112  C27BF2            JNZ   NOTCR+OFF$        ;NO? THEN PRINT CURRENT CHAR.
0115  79                MOV   A,C               ;GET CURRENT CHAR.
0116  FE0A              CPI   10                ;IS CURRENT CHAR A LINE FEED?
0118  C8                RZ                      ;YES?, RETURN WITH NO OUTPUT.
0119  FE0D              CPI   13                ;IS CURRENT CHAR A [RETURN]?
011B  C8                RZ                      ;YES?, RETURN WITH NO OUTPUT.
011C  C30000    NOTCR:  JMP   0000              ;INSTRUCTION THAT SENDS CHAR.
                                                ;0'S ARE WHERE EXISTING VECTOR
                                                ;CONTENTS ARE PUT BY CONFIGIO.
011F            CRFLAG: DS    1                 ;LAST CHAR SENT, GOES HERE
0015  =         LENGTH  EQU   $-NOLF             ;LENGTH OF PROGRAM CODE
0120                    END
```

There are a couple of final points to recognize in making patches to the IOCB. First of all, the breakdown of the patch area into three slot-dependent areas is arbitrary, and was done so that different patches for different peripherals would be less likely to conflict with one another. In actuality, NOLF could be placed anywhere in the three blocks and no difficulties would be noticed. There is, however, one area of the IOCB that should be avoided, and that is the upper portion of the slot 3 patch area, from F34A to F37F. This area has been used by Microsoft in placing code to take care of problems found in the early releases of CP/M. This still leaves considerable space at the user's disposal for his own purposes.

The second important point to consider is the fact that for each vector there can only be one type-1 patch by definition. This is apparent because a type-1 patch, being a substitution, ends within itself; that is, it doesn't store the current vector contents within itself and use them to branch back into the BIOS. Each new installation of a type-1 patch, therefore, will simply replace the old vector contents with the new one.

In type-2 patches, however, extreme care must be taken when installing a second patch to the same vector. We can see why by examining what CONFIGIO does in this case. Remember that the current vector contents already point to a routine in the patch area. CONFIGIO first loads your routine into the patch area, either writing over the old one or not, depending on where you have set it up to run. Next, CONFIGIO places the start address of your routine into the appropriate vector, saving the old vector contents. So far, so good. Next it takes these old vector contents and places them into your routine as the place to go when it exits, and this is where the problem can occur. Since they point not into the BIOS, but into the patch area, if the new patch is in the same place as the old one, then when your routine goes to exit, it will branch back into itself with undefined, but probably nasty, consequences. Of course, if the new routine does not overwrite the old one, then it will exit to the old routine when done, and the old routine will exit to the BIOS when it finishes. This may or may not be a problem, depending on whether or not you wanted to replace the old one with the new one or have two filters for the I/O.

For this reason, when replacing one type-2 patch with another, start with a fresh copy of the IOCB in memory by using CONFIGIO to read it in off your original Microsoft master disk. On the other hand, when you want to install two type-2 patches you will have to make sure that they do not overwrite each other; in practice it is usually better simply to rewrite the patch to perform both functions. CONFIGIO is designed to tell you if you are patching a specific vector a second time and ask you if you wish to patch anyway. This gives you a safety check on this potential problem. As a final note on this problem, some vectors have been patched by Microsoft, with the patches in the area from F34A to F37F that we mentioned earlier. There should be no conflict with your patch routines, however, so long as you avoid this area; but be aware that CONFIGIO will report prior patches made with some vectors. This simply points up the fact that you must keep track of what routines you've installed and their locations.

As has been said many times, the simplest things usually are the ones forgotten. So with that in mind, be sure that when the patch has been successfully installed you remember to use option 4 to write the new IOCB out to the disk you wish to alter. If you don't, you'll find yourself at best repeating the process and at worst examining your routine to find the bug that's causing it not to work.

This discussion of the IOCB has been somewhat lengthy and esoteric. Even at that, we may not have covered all of the points of confusion. If this should be true in your case, you are urged to write and let us know. The column will reflect what you as its readers want to hear, and further discussion of any of the subjects covered so far and those to be covered in the future will be made at your request. Until next month . . . ◨



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THE BASIC Solution

By Wm. V. R. Smith

Last month's Basic Solution contained a new input routine for Applesoft Basic that would perform automatic math functions transparent to the rest of the program. Those of you who didn't get a chance to look at that subroutine may wish to go back to last month's issue and review it. Many of the programs we'll be supplying in upcoming issues will use that subroutine.

In this month's installment, we'll discuss a function for the Apple that software alone cannot handle adequately. Many people have attempted to create software capable of handling this function, but it cannot be done adequately without additional hardware.

How many times have you been running one of the programs you use quite often and found yourself waiting for the program to enter an input statement before you could begin typing? If you were to go ahead and type, the Apple would remember only the last character you typed when the program finally entered the input routine. Some sort of input buffer is needed to hold many characters transparent to the software until they are needed.

Many programmers have attempted to *peek* at the keyboard location to test whether a character is waiting. If a character is present, it is placed in a buffer zone and normal processing resumes. While this system serves the needs of most beginning typists on the Apple, the moment a proficient typist enters this system, the program usually can't view the keyboard fast enough to catch every character typed.

Many computer systems, including the Apple III, have a special kind of keyboard that is interrupt driven. If any key is pressed at the keyboard, the program is immediately halted. The computer places the keyboard character into a RAM buffer and then returns to the program, which continues as though nothing had happened. The Apple II keyboard, however, is not an interrupt system, so this method is impossible.

A number of companies have created front-end hardware for the Apple that will buffer the keyboard automatically, even if the programs are busy. To take advantage of this capability, you must remove the bottom of your Apple to gain access to the keyboard and attach the necessary hardware.

We have reviewed three such systems: the Keyboard Plus System by Lazer Micro Systems, the Keyboard Buffer by Vista Computing, and the Keyboard Enhancer by Videx. The systems from Videx and Lazer also hook up the shift key for those of you who require upper and lower case input.

Visit your local computer dealer and find out which of the systems are available for your review. Bring in copies of whatever software you use on a regular basis and make sure there is no problem running your software with the keyboard buffers in place.

When looking for a keyboard buffer, make certain that it has some means of clearing the buffer out. If you happen to make a typing error, you don't want it to result in a syntax error. Some of the keyboard buffers available also allow the Apple to generate a number of the keystrokes that were previously unavailable, such as the underline, the open bracket, and others.

Just for fun, here is a subroutine that will create a small keyboard buffer so you can see how one works.

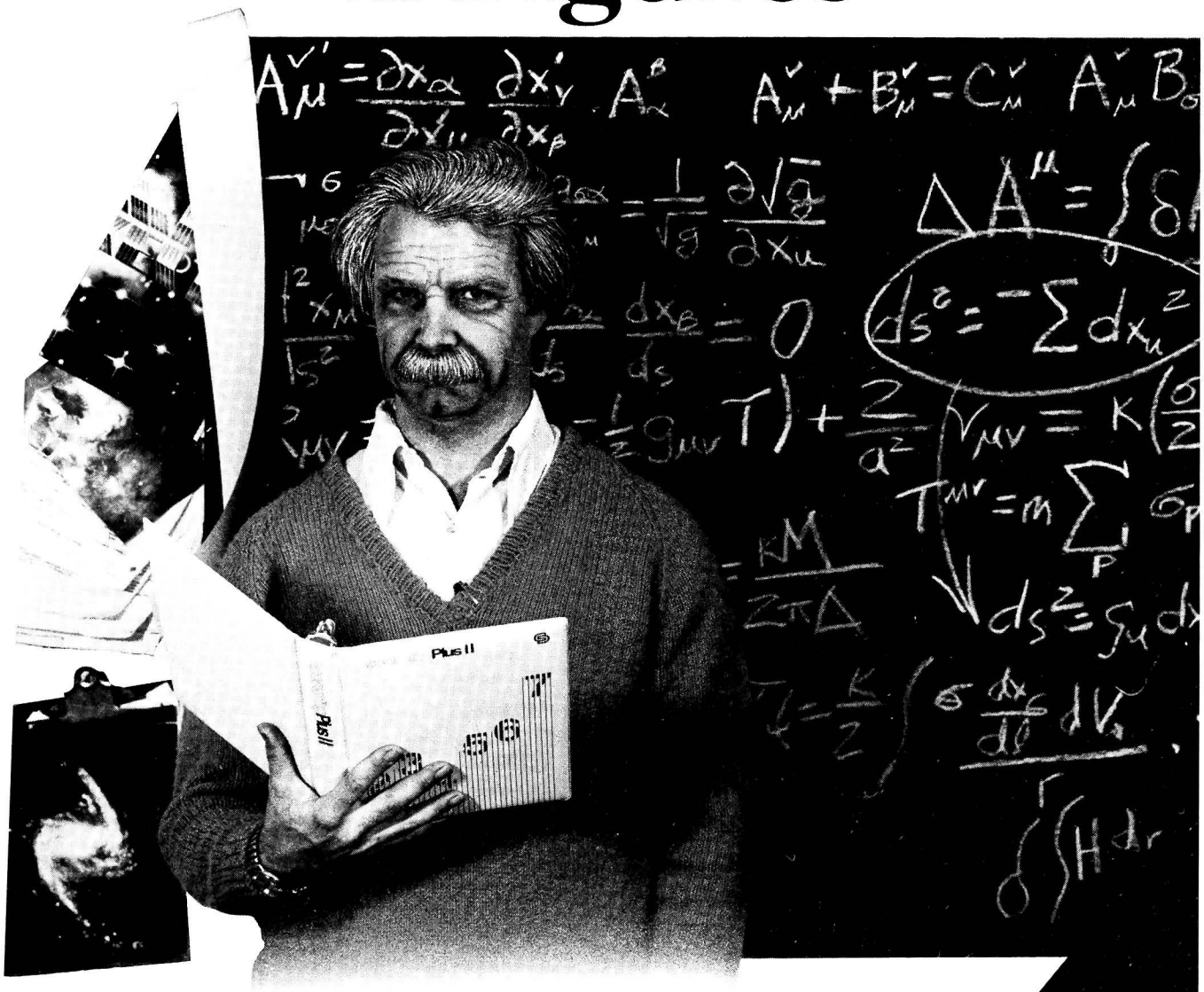
```
1 HOME:TEXT
2 PRINT "AS SOON AS YOU'VE READ THIS
  MESSAGE,": PRINT "BEGIN TYPING
  SOMETHING. YOU WON'T BE": PRINT "ABLE TO
  SEE WHAT YOU'RE TYPING. A": PRINT
  "GRAPHICS SCENE WILL APPEAR ON THE"
3 PRINT "SCREEN, FOLLOWED BY A PROMPT.
  WHEN": PRINT "YOU SEE THE PROMPT, STOP
  TYPING AND": PRINT "HIT RETURN TO SEE
  WHAT YOU TYPED INTO": PRINT "THE
  KEYBOARD BUFFER.": PRINT
4 PRINT "START TYPING *NOW*. ": GET T$:
  PRINT T$
```

```
5 GOTO 400
10 REM ****************
20 REM **
30 REM ** KEYBOARD BUFFER
40 REM **
50 REM ****************
100 IF PEEK ( - 16384) < 127 THEN RETURN
110 GET A$
115 IF BUFFUL = 1 THEN A$ = "": RETURN
120 IF A$ < > CHR$ (8) THEN 200
130 IF LEN (B$) < 2 THEN B$ = "": RETURN
140 B$ = LEFT$ (B$, LEN (B$) - 1): RETURN
200 IF A$ = CHR$ (13) THEN BUFFUL = 1:
  RETURN
210 B$ = B$ + A$
220 RETURN
250 REM **********
260 REM **
270 REM ** END OF ROUTINE
280 REM **
290 REM **********
400 REM **************
401 REM **
402 REM ** SAMPLE PROGRAM
403 REM **
404 REM **************
410 BUFFUL = 0:B$ = "": REM START NEW
  BUFFER
420 HOME
425 GR: G=INT(RND(1)*15)+1: COLOR= G
430 FOR X = 1 TO 39
440 Y = INT ( RND (1) * 100)
450 GOSUB 10
460 IF Y > 35 THEN Y = Y - 20: GOTO 460
470 VLIN 38 - Y,38 AT X
480 NEXT X
500 PRINT TAB (10) "THIS IS THE PROMPT ";
510 FOR PAUSE = 1 TO 300: NEXT PAUSE
520 IF BUFFUL = 0 THEN INPUT "";A$
530 B$ = T$ + B$ + A$
540 TEXT : HOME : VTAB 10
550 PRINT "YOU TYPED IN: ": PRINT: HTAB 8:
  PRINT B$
```

The Basic Solution welcomes your comments and ideas on future articles and subroutines. If one of your subroutines is used in a future Basic Solution, a $10.00 credit toward your next software purchase will be available at your local computer store. Send your letters to Softalk Basic Solution, 11021 Magnolia Boulevard, North Hollywood, CA 91601. ■

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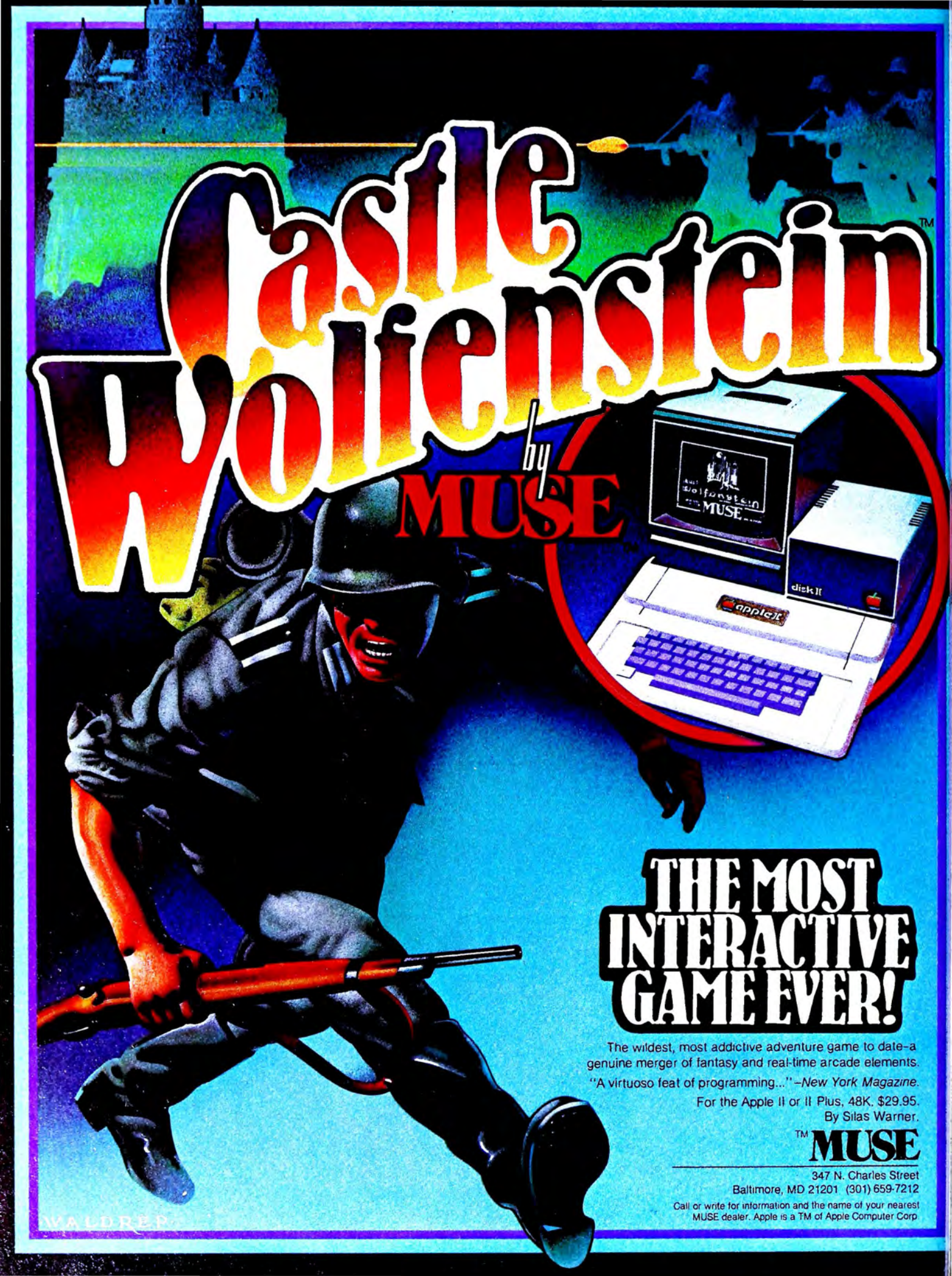
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Softalk Presents The Bestsellers

The microcomputer marketplace, and specifically the Apple market, continues strong in the face of worsening economic news. In early February, when White House officials were making a daily routine of making bleak economic pro-

Strategy 5

This Month	Last Month	
1.	1.	**Castle Wolfenstein,** Silas Warner, Muse
2.	2.	**Flight Simulator,** Bruce Artwick, SubLogic
3.	4.	**Dark Forest,** Tom Mornini and Jerry Jewell, Sirius
4.	—	**Space Adventure,** Alick Dziabczenko, Sierra Software
5.	5.	**Hi-Res Computer Golf,** Stuart Aronoff, Avant-Garde Creations

Adventure 5

This Month	Last Month	
1.	3.	**Hi-Res Adventure #4: Ulysses and the Golden Fleece,** Bob Davis and Ken Williams, On-Line Systems
2.	4.	**Zork II,** Infocom
3.	—	**The Prisoner,** David Mullich, Edu-Ware Services
4.	1.	**Hi-Res Adventure #3: Cranston Manor,** Harold DeWitz and Ken Williams, On-Line Systems
5.	—	**Cyborg,** Michael Berlyn, Sentient Software

Fantasy 5

This Month	Last Month	
1.	1.	**Wizardy,** Andrew Greenberg and Robert Woodhead, Sir-tech
2.	2.	**Ultima,** Lord British, California Pacific
3.	3.	**Empire I: World Builders,** David Mullich, Edu-Ware Services
4.	5.	**Alkemstone,** Level-10, Dakin5
5.	4.	**Crush, Crumble and Chomp,** Automated Simulations

Business 10

This Month	Last Month	
1.	1.	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston, Personal Software
2.	2.	**Personal Filing System,** John Page, Software Publishing Corporation
3.	5.	**VisiFile,** Creative Computer Applications/Colin Jameson and Ben Herrman, Personal Software
4.	3.	**DB Master,** Alpine Software/Stanley Crane and Jerry Macon; and Barney Stone, Stoneware
5.	4.	**VisiTrend/VisiPlot,** Micro Finance Systems/Mitch Kapor, Personal Software
6.	6.	**BPI General Ledger,** John Moss and Ken Debower, Apple Computer
7.	7.	**PFS: Report,** John Page, Software Publishing Corporation
8.	8.	**VisiDex,** Peter Jennings, Personal Software
9.	—	**BPI Accounts Receivable,** John Moss and Ken Debower, Apple Computer
10.	9.	**Accounting Plus II General Ledger,** Software Dimensions, Systems Plus

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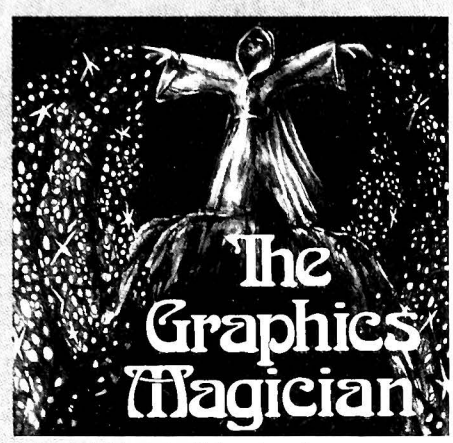
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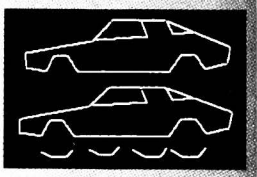


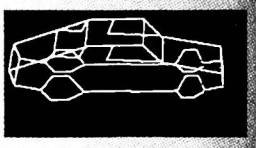
by Chris Jochumson and Mark Pelczarski

Now anyone can put professional graphics into their own programs. *The Graphics Magician* contains machine language animation routines that use the same techniques as most of the popular Apple arcade games. Three animation editors let you design your figures, their paths, and assemble animation with up to 32 independent objects. Also included is a hi-res picture/object builder that lets you store hundreds of 100-color pictures on a single disk and recall them quickly from your own programs. These exact routines are being used in the new graphic adventure games from Scott Adams' *Adventure International*. Plus, a new shape editor greatly extends the capabilities of Apple shape tables with multicolors and angles that are preserved on scaling. All design of graphics is done through menu-driven editors; to use in your programs, just attach our machine language routines. Extensive documentation makes this package easy to use for the beginning programmer, yet flexible enough for the most advanced.

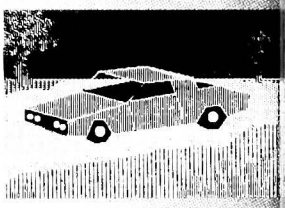
THE COMPLETE GRAPHICS SYSTEM II

by Mark Pelczarski





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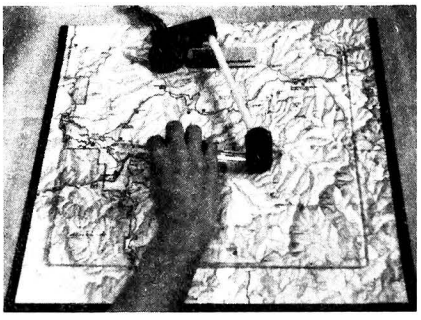
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by Mark Pelczarski

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nouncements, Apple dealers were describing their business in such glowing terms as: "our best January ever" or "the second best month in our history."

Many observers thought that Apple's "Welcome IBM" ad was a case of sheer bravado; what now seems clear is that whoever has been hurt by IBM's entry into the marketplace, it hasn't been Apple. Oddly enough, the product that's benefitted most from the competition is the Apple III, which many thought might be blown away by the Personal Computer.

Nevertheless, it's still the Apple II that fuels the marketplace, and January was a month when the Top Thirty underwent its most significant revision yet at its upper levels. *VisiCalc, Personal Filing System,* and *Snack Attack* held their respective positions of first, third, and fourth. But seven new companies joined them in the first ten.

Leaping into second place is On-Line's hard-luck word processor, *Superscribe II*, a remarkable achievement for a product with such a checkered past. First introduced as *Superscript*, the software was full of bugs. Just as the product was starting to gain acceptance. On-Line was forced to change the name because of a potential infringement with a competing product. Now, even as it's finally reached the zenith of the Ap-

Home 10

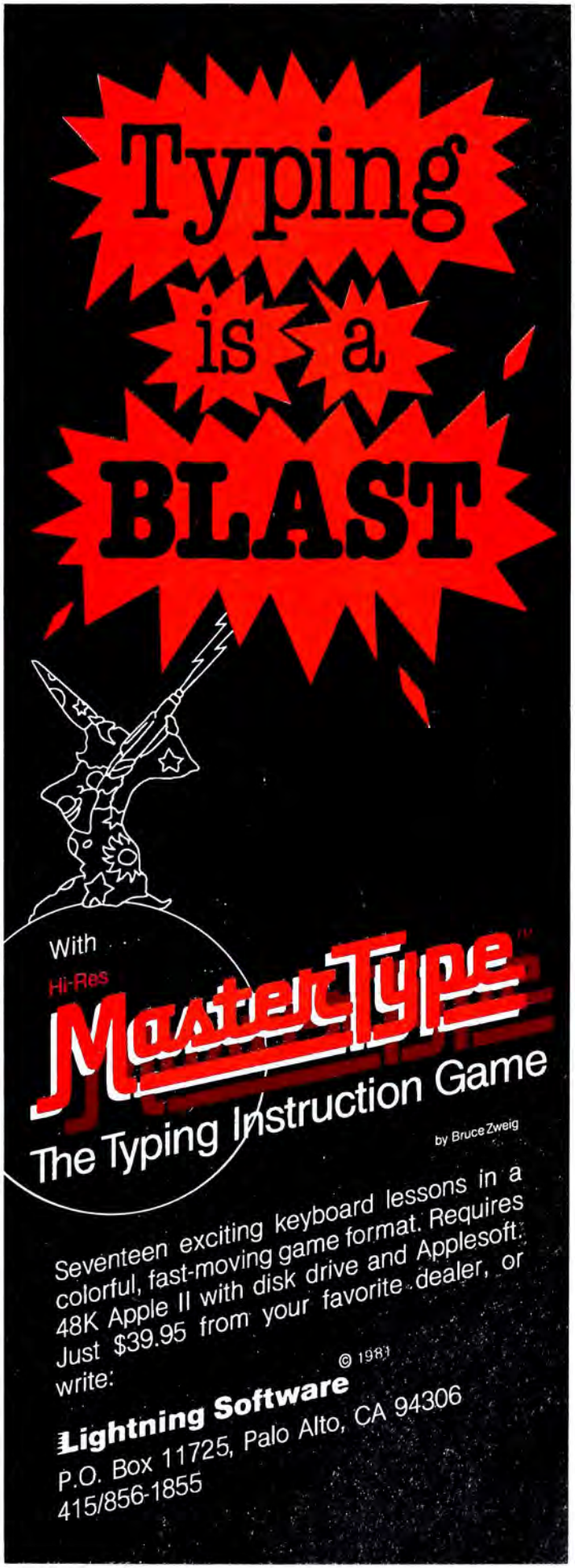
This Month	Last Month	
1.	7.	**Home Accountant,** Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software
2.	2.	**Personal Finance Manager,** Jeffrey Gold, Special Delivery Software, Apple Computer
3.	3.	**Tax Preparer,** James Howard, Howard Software
4.	1.	**Typing Tutor,** Image Producers, Microsoft
5.	4.	**Home Money Minder,** Bob Schoenburg and Steve Pollack, Continental Software
6.	—	**Tax Manager,** TASO, Micro Lab
7.	8.	**Mastertype,** Bruce Zweig, Lightning Software
8.	9.	**Dow Jones News & Quotes Reporter,** Apple Computer
9.	—	**Tax Beater,** Jack and Carol Lennard, Datamost
10.	—	**ASCII Express,** Bill Blue, Southwestern Data Systems

Hobby 10

This Month	Last Month	
1.	—	**Utility City,** Bert Kersey, Beagle Brothers
2.	1.	**DOS Tool Kit,** Apple Computer
3.	3.	**DOS 3.3,** Apple Computer
4.	—	**DOS Boss,** Bert Kersey and Jack Cassidy, Beagle Brothers
5.	4.	**Locksmith 4.0,** Omega Microware
6.	6.	**Zoom Grafix,** Dav Holle, Phoenix Software
7.	—	**A2-3D1 Graphics Package,** Bruce Artwick, SubLogic
8.	—	**Alpha Plot,** Bert Kersey and Jack Cassidy, Beagle Brothers
9.	8.	**TASC,** James M. Peak and Michael T. Howard, Microsoft
10.	—	**Graphtrix,** Steve Boker, Data Transforms

Word Processors 5

This Month	Last Month	
1.	2.	**Superscribe II,** David Kidwell, On-Line Systems
2.	1.	**Apple Writer,** Apple Computer
3.	4.	**WordStar,** MicroPro
4.	5.	**Easy Writer,** John Draper, Information Unlimited Software
5.	—	**Letter Perfect,** LJK Enterprises



ple word processor world, its name will again undergo change because of possible infringement problems. Under what *nom de guerre* David Kidwell's program would next appear was unknown in mid-February.

Jumping into the first ten from nowhere on the list were *David's Midnight Magic*, Broderbund's answer to *Raster Blaster*; and *Home Accountant*, Continental's answer to its own *Home Money Minder*.

Reaching the top ten from lower echelons of the Top Thirty were *Wizardry*, fifth; *VisiFile*, sixth; *DB Master*, ninth; and *VisiTrend/VisiPlot*, tenth.

There were also a number of oldcomers to the Top Thirty—programs that had been there before but had dropped off the list. In this category were *BPI General Ledger, Flight Simulator, Ultima, Ulysses and the Golden Fleece, Falcons*, and *Zork II. Utility City* from Beagle Brothers made the Top Thirty for the first time.

Personal finance is becoming a foremost consideration among Apple owners, with seven of the Home 10 programs reflecting this interest. *Home Accountant* bested *Personal Finance Manager* and *Home Money Minder* in one category, while Howard's *Tax Preparer* fended off challenges from Micro Lab's *Tax Manager* and Datamost's *Tax Beater. Dow Jones News and Quotes Reporter* also made the Home 10.

Utility City displaced *DOS Tool Kit* as leader of the Hobby 10. It was one of three Beagle Brothers programs on that chart—*DOS Boss* was fourth and *Alpha Plot* was eighth.

The Business 10 remained relatively stable. *BPI Accounts Receivable* was the only new entry to the list. *VisiFile* moved from fifth to third, while *DB Master* dropped from third to fourth and *VisiTrend/VisiPlot* dropped from fourth to fifth. *Personal Filing System* maintained its position as the bestselling database program for the second month, but both *VisiFile* and *DB Master*, the former king, were closing ground.

Other than *Superscribe*'s leap into first place among word processors, the biggest news was a new face in fifth. *Letter Perfect*, LJK's versatile entry, finally cracked the list after hovering nearby for several months. ◨

Apple-franchised retail stores representing approximately 9.0 percent of all sales of Apples and Apple-related products volunteered to participate in the poll.

Respondents were contacted early in February to ascertain their sales leaders for the month of January.

The only criterion for inclusion on the list was number of sales made—such other criteria as quality of product, profitability to the computer retailer, and personal preference of the individual respondents were not considered.

Respondents in February represented every geographicsl area of the continental United States.

Results of the responses were tabulated using a formula that resulted in the index number to the left of the program name in the Top Thirty listing. The index number is an arbitrary measure of relative strength of the programs listed. Index numbers are correlative only for the month in which they are printed; readers cannot assume that an index rating of 50 in one month represents equivalent sales to an index number of 50 in another month.

Probability of statistical error is plus-or-minus 4.5 percent, which translates roughly into the theoretical possibility of a change of 3.11 points, plus or minus, in any index number.

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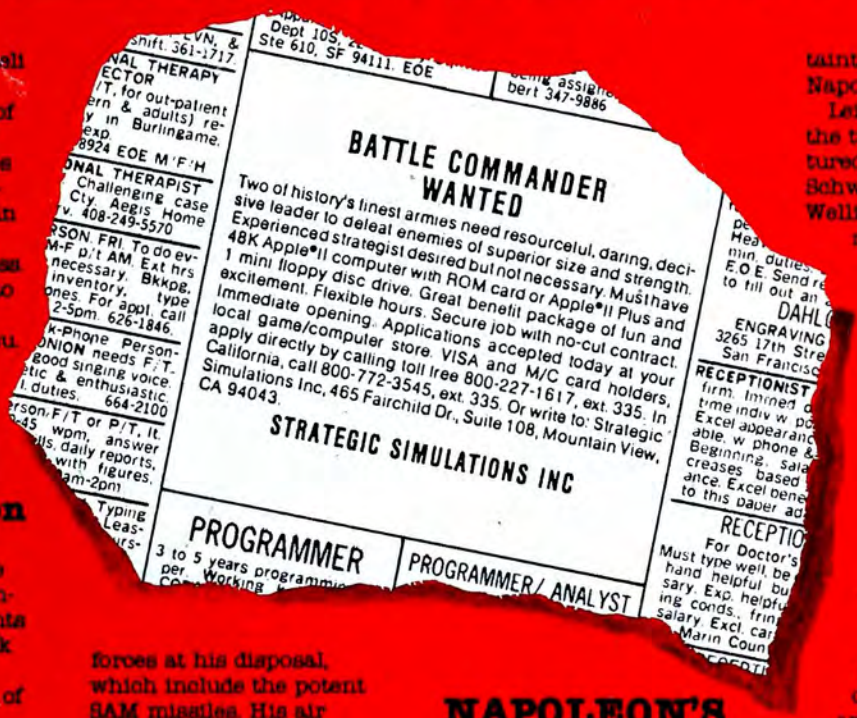
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The Top Thirty

This Month	Last Month	Index	
1.	1.	185.81	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston, Personal Software
2.	14.	89.74	**Superscribe II,** David Kidwell, On-Line Systems
3.	3.	86.81	**Personal Filing System,** John Page, Software Publishing Corporation
4.	4.	84.86	**Snack Attack,** Dan Illowsky, Datamost
5.	15.	76.57	**Wizardy,** Andrew Greenberg and Robert Woodhead, Sir-tech
6.	22.	72.18	**VisiFile,** Creative Computer Applications/Colin Jameson and Ben Herrman, Personal Software
7.	—	68.77	**David's Midnight Magic,** David Snider, Broderbund Software
8.	—	68.28	**Home Accountant,** Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software
9.	12.	61.45	**DB Master,** Alpine Software/Stanley Crane and Jerry Macon; and Barney Stone, Stoneware
10.	21.	59.01	**VisiTrend/VisiPlot,** Micro Finance Systems/Mitch Kapor, Personal Software
11.	18.	54.13	**Apple Panic,** Ben Serki, Broderbund Software
12.	9.	53.65	**Sneakers,** Mark Turmell, Sirius Software
13.	7.	51.70	**Castle Wolfenstein,** Silas Warner, Muse
14.	10.	46.82	**Apple Writer,** Apple Computer
15.	8.	43.41	**Personal Finance Manager,** Jeffrey Gold, Special Delivery Software, Apple Computer
16.	—	38.53	**BPI General Ledger,** John Moss and John Debower, Apple Computer
17.	—	38.04	**Flight Simulator,** Bruce Artwick, SubLogic
18.	5.	35.60	**Gorgon,** Nasir, Sirius Software
19.	11.	33.65	**Raster Blaster,** Bill Budge, BudgeCo
	—	33.65	**Ultima,** Lord British, California Pacific
21.	—	33.16	**Hi-Res Adventure #4: Ulysses and the Golden Fleece,** Bob Davis and Ken Williams, On-Line Systems
22.	17.	31.70	**Tax Preparer,** James Howard, Howard Software
23.	2.	31.21	**Olympic Decathlon,** Tim Smith, Microsoft
24.	19.	30.24	**Bug Attack,** Jim Nitchals, Cavalier Software
25.	—	28.77	**Utility City,** Bert Kersey, Beagle Brothers
	—	28.77	**Falcons,** Eric Varsanyi and Thomas Ball, Piccadilly Software
27.	15.	28.29	**DOS Tool Kit,** Apple Computer
28.	27.	27.31	**WordStar,** MicroPro
	13.	27.31	**Beer Run,** Mark Turmell, Sirius Software
30.	—	24.39	**Zork II,** Infocom

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