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IIComputing™

FOR APPLE II USERS

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PREMIERE ISSUE

Look!
Up in the sky
It's Halley's Comet
plot the orbit

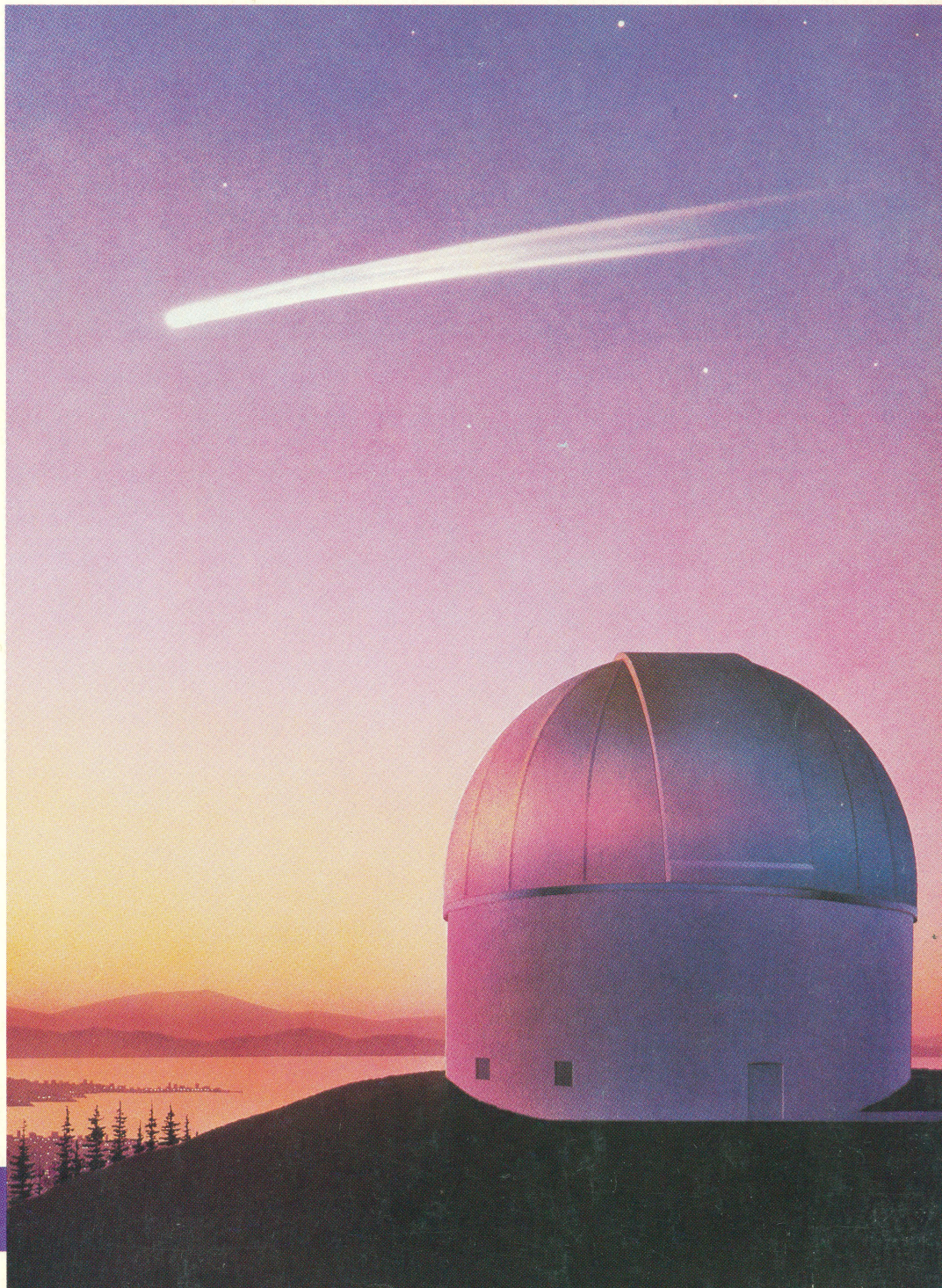
Z-RAM for the *IIc*

Pro Football Prognosticator

College Credit On Line

Spreadsheet Horrors
How to avoid them

Computer Frontiers



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Why every kid should have an Apple after school.

Today, there are more Apple® computers in schools than any other computer.

Unfortunately, there are still more kids in schools than Apple computers.

So innocent youngsters (like your own) may have to fend off packs of bully nerds to get some time on a computer.

Which is why it makes good sense to buy them an Apple IIc Personal Computer of their very own.

Send them home to a good school system.

The IIc is just like the leading computer in education, the Apple IIe. Only smaller. About the size of a three-ring notebook, to be exact.

Of course, since the IIc is the legitimate offspring of the IIe, it can access the world's largest library of educational software. Everything from Stickybear Shapes™ for preschoolers to SAT test preparation programs for college hopefuls.

In fact, the IIc can run over 10,000 programs in all. More than a few of which you might be interested in yourself.

For example, the best-selling, AppleWorks™ 3-in-1 integrated software package. Personal finance and tax programs. Diet and fitness programs.

Not to mention

fun programs for the whole family. Like "Genetic Mapping" and "Enzyme Kinetics."

One Apple that won't leave them hungry.

The Apple IIc is easy to set up and learn. And it comes complete with most everything you need to start computing in one box.

Including a free, easy-to-use 4-diskette course to teach you all about the IIc—when your kids get tired of your questions.

As well as a long list of built-in features that would add about $800 to the cost of a smaller-minded computer.

The features include: 128K of internal memory—as powerful as the average office computer.

The ImageWriter II prints high quality color graphics.

A built-in disk drive that could drive up the price of a less-senior machine considerably.

And built-in adaptors for adding accessories, like our new ColorMonitor IIc, ImageWriter™ II printer and the Apple Personal Modem 300/1200.

A feast for their eyes.

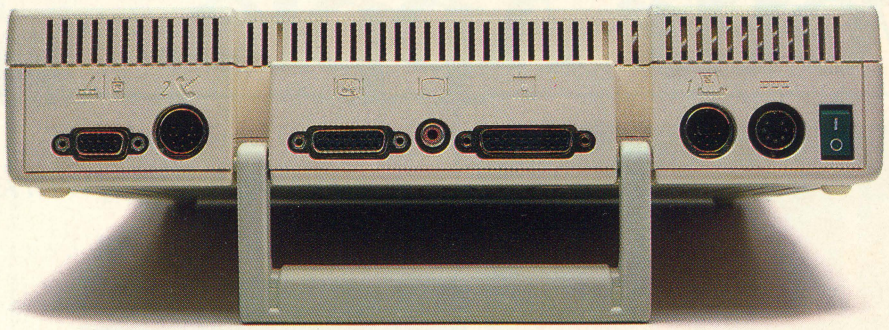
The big 14-inch ColorMonitor IIc displays crisp, color graphics or a high resolution 80-column monochrome text for word processing.

You can print sharp color graphics, too, with our new ImageWriter II. It also prints

And speaking of high quality color, introducing ColorMonitor IIc.

near-letter-quality text in black and white, quickly and quietly. And, with its new SheetFeeder, you can switch to single sheets without removing the sprocket paper.*

If local color isn't enough, you can talk to the rest of the world through our new wall-mounted Apple Personal Modem 300/1200. With it, you can do your banking at home, check your stocks, gain access



The most popular peripherals plug right into the back of the Apple IIc.

to all kinds of information libraries and much more.

Which would all add up to a very impressive list of expandable accessories if it weren't for all the others. Like an AppleMouse. And an extra disk drive when the time comes.

Avoid growing pains.

So while your children's shoe sizes and appetites continue to grow at an alarming rate, there's one thing you know can keep up with them. Their Apple IIc.

To learn more about it, visit any authorized Apple dealer. Or talk to your own computer experts.

As soon as they get home from school.

How to get the most bytes out of your Apple.

Read why Steve Wozniak recommends RamWorks™ expansion cards.

The machine that Woz built is a powerful business computer. AppleWorks gave it a potent 1-2 combination. Now, RamWorks has added the knock out punch. With RamWorks expand the total memory of your IIe up to an incredible 2.5 MEG. Your AppleWorks will no longer be limited by the amount of factory supplied RAM. And you'll be able to perform virtually any application you want with far greater speed and ease.

How AppleWorks works best with RamWorks.

RamWorks plugs into the IIe auxiliary slot and acts just like Apple's extended 80 column card. If you buy a 256K or larger card, AppleWorks will automatically load itself into RamWorks. This dramatically increases AppleWorks' speed because it effectively eliminates time required to access disk Drive 1. Now, switch from word processing to spreadsheet to database management at the speed of light. AppleWorks responds the moment your fingers touch the keyboard.

But AppleWorks has certain internal limits, independent of available memory. Fear not. Only RamWorks removes those limits with a proprietary, easy to operate program that "patches" onto the boot disk in seconds. Only RamWorks increases the maximum number of records available to you from 1,350 to over 5,000. And only RamWorks actually increases the number of lines permitted in the word processing mode.

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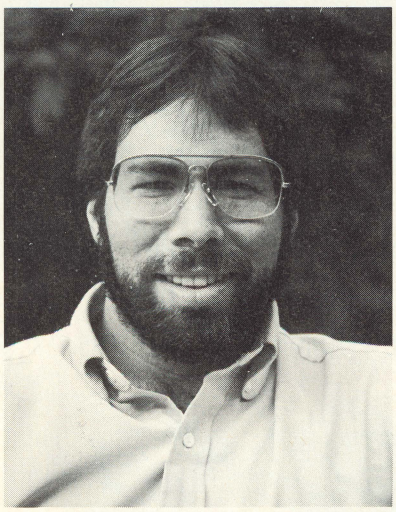
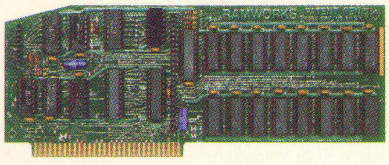
The most friendly, most expandable card available.

RamWorks is compatible with more off-the-shelf software than any other RAM card. Popular programs like Magic Office System, Flashcalc, The Spread Sheet, Diversi-DOS, Supercalc 3A, Magicalc, etc. (And hardware add-ons like Profile and Sider hard disks.) Fact is, RamWorks is 100% compatible with all software written for the Apple 80 and extended 80 cards. In addition, RamWorks can emulate other RAM cards, so you can use programs written for them without modification.



"I wanted a memory card for my Apple that was fast, easy to use, and very compatible; so I bought RamWorks."



RamWorks was designed so you could take full advantage of future developments in 16 and 32 bit microprocessors. As your needs grow, so can RamWorks. A handy expansion connector allows the latest and greatest co-processor cards to access RamWorks' memory. And allows you to piggyback another 2 MEG. Clear instructions show you how to plug in more memory.

For only $129 you can add an RGB option to your RamWorks and get double high resolution color graphics. All with a super sharp brilliance that's unsurpassed in the industry.

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II COMPUTING

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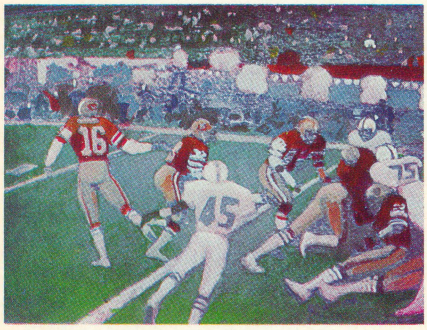

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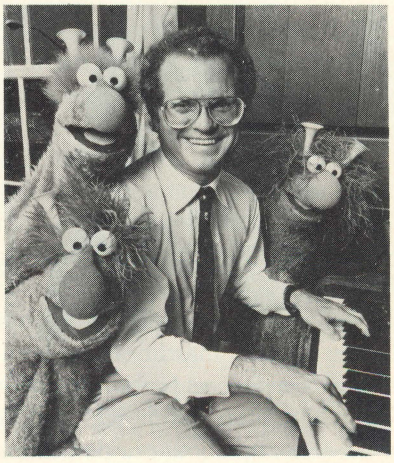

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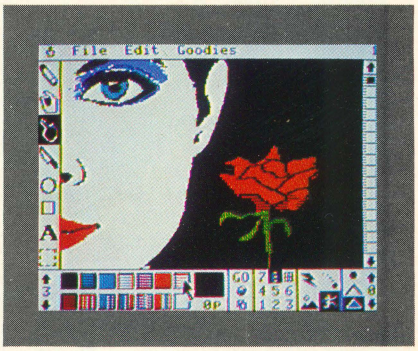

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EDITORIAL

Brave New Words

Thanks for giving us a chance to introduce ourselves. ***II Computing*** is a new magazine specifically for those of us who own or use some type of Apple II computer. That includes the II, II+, IIe and IIc and all future computers built around the II design. We'll also cover the peripherals, software and firmware for Apple II machines.

Browse through this issue and you will see a mix of informative articles and useful, entertaining programs. We are especially proud to offer you the work of two prestigious authors, astronomer Donald Tattersfield (Halley's comet program) and computer scientist Caxton Foster (on cryptanalysis), plus two old friends of yours, Margot Comstock Tommervik (of *Softalk*) and Neil Shapiro (SYSOP of CompuServe's MAUG).

Our program lineup also includes "Pro Football Prognosticator," which we hope will be more than useful to you. If you prefer not to type in the programs by hand, we offer an attractively priced companion disk with the programs already on it. Ask your retailer for details, or call our toll-free number listed on the enclosed subscription order form.

You may be curious about our bravery (or foolhardiness) in launching a new computer magazine when computer mania seems to be at an ebb, and about our dedication to machines from a company so recently buffeted by internal strife.

Well, it is a gamble, but we believe a sound basis exists for taking the chance. Our most important premise is that the computer revolution isn't over, it has hardly begun! Maybe the fad days are over, but for substantial numbers of us, working and playing with our computers will remain an integral part of our daily lives for years to come.

LORRAINE CAPPARELL

As for supporting Apple II computers, why not? You have one, I have one, and so do a couple million other people. The II's are fine, versatile machines, well supplied with software and peripherals, and still in production from the company that virtually invented personal computing.

We have confidence in Apple, but even if the company were to falter, that doen't mean your computer would self-destruct. In some ways, trouble at Apple makes a magazine like ours even *more* valuable to you.

Valuable to you—that's what we must be to succeed. If we give you your money's worth each issue, I think we will have a long, pleasant association. What does value in a magazine mean to you? We think it means: useful, stimulating, challenging, helpful, convenient, economical, informative, pertinent, at-

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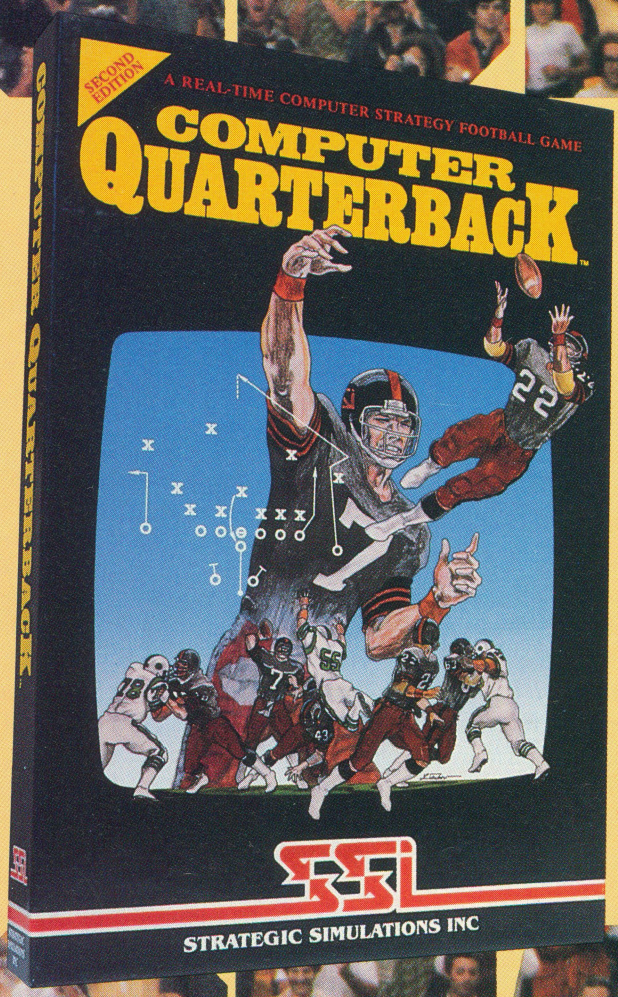
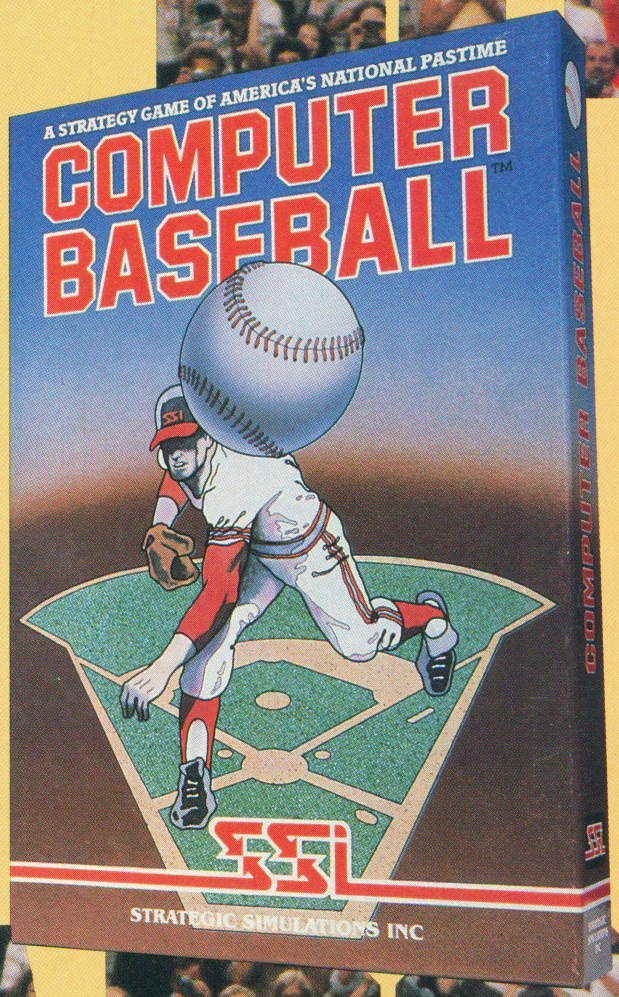
SUPER STARS





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BRAVE NEW WORDS
continued from page 6

tractive, amusing, profitable, pleasurable, clear, accurate, diverse, and personally enhancing. These are the attributes we strive to achieve in ***II Computing***.

That's a tall order. We know your standards are high, but we are determined to meet them. We want ***II Computing*** to be your most welcome companion at your Apple keyboard. We are not competing with other magazines, we are serving you. If you get what you want from us, the competition will take care of itself. Your ideas and suggestions are always welcome. //

DeWitt Robbeloth

DeWITT ROBBELOTH,
EDITOR

Whither Apple?

by DeWITT ROBBELOTH, EDITOR

The computer world was stunned in June when Apple Computer, Inc. announced, in effect, that cofounder and Chairman of the Board Steven Jobs had been unhorsed in a corporate joust with Apple's President and Chief Executive Officer, John Sculley.

Sculley convinced the Board of Directors to reorganize the company in a way that removed Jobs from his executive role as general manager of the Macintosh Division. The new "functional" organization did not include a managerial job for Jobs. Of course, he remains as Chairman and major stockholder, and is now characterized as "chief visionary" for the company.

Most industry savants agree the move was good for Apple, or even crucial. Why? There were serious, fundamental differences between the two about what Apple products should be like, how they should be marketed, and how the company should be run. (What else is there?)

Jobs and cofounder Steve Wozniak epitomized the boy-genius entrepreneurial style. In Apple's 1984 Annual Report, Jobs appears conspicuously coatless amid his sartorially staid executive staff. Having achieved the American dream, Jobs was seen as "cocking a snoot" at corporate traditions, according to Apple-watcher Paul Evans of the securities firm S.G. Warburg, Rowe & Pitman, Akroyd.

Seemingly at odds with the concept that had made the Apple II such a success, Jobs advocated the closed-box approach to products, with most resources backing the Mac as a business machine to challenge the IBM PC. Sculley favored open, expandable product lines like the Apple II, aimed at soaking up sales where IBM's corporate clout wasn't devastating—in education, small businesses and the home.

With Jobs in the Macintosh saddle, Sculley apparently had little control over half the company. Finally, the failure of the Mac to significantly dent IBM's armor resulted in losses that gave Sculley a good business reason to challenge Jobs' control by reorganizing.

Apple's former organization divided the company along product lines—Apple II on one side, Macintosh on the other. It was really two companies running side by side, with some glaring duplication of services. The new organization is functional, with sales and marketing on one side, and product operations, including new product development, on the other.

Now what? At his first public appearance since the coup (at Future Computing's MacForum in San Francisco), Sculley assessed the situation. Apple is still healthy, he said, and will be trimmer after the reorganization. A more disciplined approach to business enacted by Apple's many good managers and some new outsiders will concentrate on selling all Apple's existing products primarily through dealers (as opposed to direct sales by the Apple sales force).

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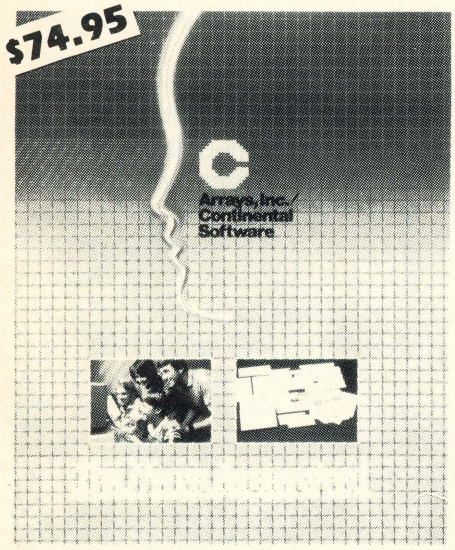
There's More to Managing Your Money Than Dollars & Cents



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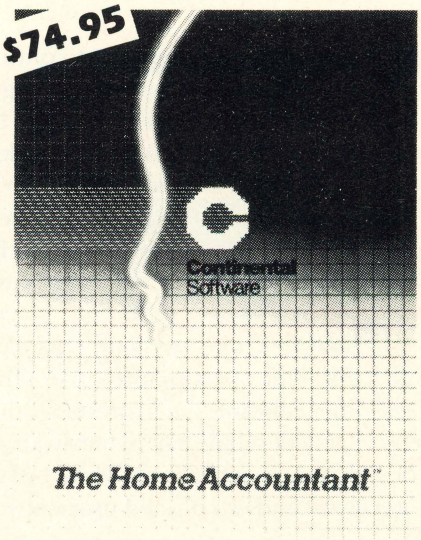

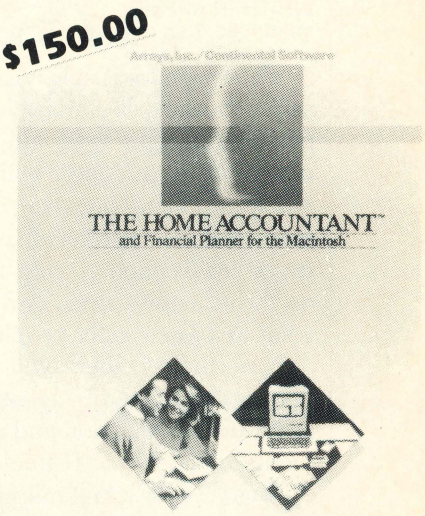

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WHITHER APPLE
continued from page 8

The vision for Apple remains the same, Sculley said. "Apple builds personal computers for individuals, not institutions." There will be new Apple products, but their development will be "market driven." He urged his listeners to stop focusing on "what comes next, and look at what we have to offer people today."

Nevertheless, there will be new products. Sculley firmly supported continuing production and development for the Apple II line and encouraged other companies to jump on Apple's bandwagon. He specifically instructed Apple's legal and marketing groups "to Build bridges with outside software and hardware developers, to make it easier for them to work with Apple."

One widely rumored direction is towards the 65C816 chip. This microprocessor from Western Design Center operates in either of two modes. In emulation mode it works identical to the 6502 or 65C02 chip, so it could maintain compatibility with existing Apple II software. In native mode it operates as a 16-bit (or 8-bit) processor and will need new software, but can directly address 16 megabytes of memory (about the same as most mainframes). An operating system for this chip's native mode is being designed that will do for it what CP/M did for the Z-80.

The Apple II market continues strong. Future Computing, a research firm, pegs IIe sales in 1984 at about 500,000 units and holding steady, with IIc sales expected to surpass that number in 1985. Even if demand is only half that much, it would still indicate substantial interest in this venerable line of computers. There are good reasons for this. The open architecture of the II line continues to stimulate third-party development of hardware and firmware, while a vast library of software and established user networks help retain the loyalty of Apple II owners.

It seems the furor has settled down, but there are still doomsayers. Robert Lydon, publisher of *Personal Computing* magazine, predicts that Apple Computer, Inc. will not last as a separate company for another two years. As for the home market, "It never really existed," he says. "It was a fad. Just about everyone who was going to buy a computer for their home has done it. And my guess is that most of the computers actually used at home tie in with some business use."

Paul Evans, on the other hand, thinks Apple will make it. "It's a big company, and now it's going to be run like one. It has viable products and a great reputation. There's room in the market for Apple. It's going to take a bad quarter or two and write off a lot of problems, then come back strong this Christmas. No question in my mind, Apple will be around a long time." //

COMING NEXT ISSUE:

Charles Rubin on
"The IIc As A Business Machine"
Muppet Key Software Round-Up
High-Tech Toys
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More From our columnists:
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CHRISTOPHER CERF, CREATIVE CATALYST

Moves Muppets into software

by MICHAEL CIRAOLO

Christopher Cerf is a joy to be around. He's a bright, bubbling man who's always in motion—not with manic energy, but with the enthusiasm of someone who can't stop having a good time.

It isn't easy to capture Cerf on paper. It would be easy to simply say he helped launch the *National Lampoon*, designed award-winning software, earned wide acclaim as a writer and editor and won two Grammy awards, one for "The Electric Company" score. Nor would it do justice to his creativity, genius and energy to blithely describe his latest contributions to the **Muppet Learning Keys, Kermit's Electronic StoryMaker**, or other software reflecting a 16-year association with the Muppets.

Christopher Cerf defies conventional description because he transcends conventional levels of energy and enthusiasm. More than anything else, he likes to have fun.

Fortunately, for Apple computer owners, the 42-year-old "Renaissance Kid" has brought his sense of fun to software, in the guise of Jim Henson's familiar Muppets. The teams of Henson Associates (HA!) and Christopher Cerf Associates, both of New York, jointly produce software considered educational, though it is far removed from traditional drill-and-practice software.

The association started shortly after the beginning of "Sesame Street" in 1969. Cerf was already "hopelessly hooked on doing things that were funny. . . and useful—a little bit of music, education and humor." At the time, he worked for Random House's Beginner Books division, publisher of Dr. Seuss. Excited by the potential of "Sesame Street," Cerf joined the multimedia division of Children's Television Workshop (producers of "Sesame Street") the following year. It was there that he met Jim Henson. They collaborated on many successful projects in a variety of media: books, games, toys. "We wanted to do something unusual, unique, useful and state-of-the-art. We wanted to be at the cutting edge in something we enjoyed."

Cerf and Henson started, among other projects, M.I.T., the Muppet Institute of Technology, where the motto is "Learnum est Funum." One of the first M.I.T. products was the Muppet Learning Keys, a colorful, oversized keyboard with numbers,

continued on next page

letters in alphabetical order, and Stop, Go, Erase and Oops functions. The keyboard plugs into Apples or other computers and is now being supported by other software adapted to work with the Learning Keys. The Learning Keys, named one of the products of the year (1984) by *InfoWorld*, sold an impressive 60,000 units during its first year.

THE BEST PEOPLE

When you talk to Cerf about his contributions, he stresses not his accomplishments, but the nature of the team to which he lends his talents as coordinator and catalyst. That team is composed of the best people available, according to Cerf. "You don't teach someone new. You go to the best." This group of Henson Associates, Cerf Associates and individuals from various publishers is one team—"you can't tell who's working for whom, when it's working."

There are two ways to produce software, according to Cerf. The first, traditional approach, is to come up with an idea, write a program to represent that idea, and then sell the package.

Cerf prefers a second approach, which helps define his role in creating and developing software. Cerf describes his role as that of coordinator, supplying creativity and acting as a catalyst. Making excellent software products is akin to producing a movie or a children's book, wherein, for example, "The writer doesn't do everything. You need an illustrator, who can communicate with the author, a cover illustrator and someone to keep all this from becoming too expensive."

Similarly, he says, "A good educational program has clear and well-written text, animation that is effective and a good sense of movement. You want entertaining pacing and the best music the computer can support. Bring all this together with education on the top. The general rules are that you take the best people available who have fun working together, people who are goal-oriented, and you end up being funny and silly and creative."

Since few people are top-notch at all the aspects involved in producing state-of-the-art software, Cerf's team includes writers, animators, artists and programmers. It also includes pioneering computer educators, some of the original Muppet illustrators, ex-Disney animators and former *National Lampoon* staffers.

None of these people are confined to the bounds of their professions—each team member must understand how the group fits together and understand the process, so that each request to other members is realistic.

Christopher Cerf Associates have made some in-house developments that contributed to the larger Henson/Cerf team. One such effort was a technique for digitizing illustrations into Apple programs. This enabled them to bring in illustrators who didn't necessarily have computer experience.

COMMITTED TO HAVING FUN

Cerf believes that "if you can do something entertaining and educational, kids will learn. Products have to be entertaining—people have to choose to use the software.

"You should be able to explore what you want in the computer, not what the programmer wanted... Early educational software would ask 'Johnny, what's the capital of Pennsylvania?' and if he couldn't answer, he'd be there all day. Programmers should keep computers from being aggravating."

Explorable software lets you change one variable at a time, so that you can understand what your command did. The change, according to Cerf, should change both a sentence and the animation on the screen (in a typical Muppet program). "The ability to change one variable and see the result gives children a sense of total control and power over the program." Cerf's understanding of kids comes not from parenting—he hasn't—but from understanding his own sense of fun and curiosity.

The entertaining nature of Cerf's software does more than teach. It also sells programs in a sensible, old-fashioned way. "You can't just throw money at something to have it sell—products have to sell themselves. It has to be word of mouth between kids and parents."

A QUIET TIME?

Some would say it is foolish to design software and even introduce products when the entire industry is approaching a standstill. But Cerf has no patience for those who claim the home-computer market is dead or software sales are "flat." "I just want them to go away! All the gadget freaks bought computers, and the industry produced 411 nearly identical programs, all with the same ads. We're growing naturally, and that may be slow."

A slow market doesn't bother him. "It's nice to have some quiet time. We're in a quiet time right now." Indeed, Cerf is looking beyond the quiescence to things he'd like to see in educational software. "The next big breakthrough in educational software is sound. Imagine a program that could read a sentence (from StoryMaker) to you. I'd love to hear a character say the letter or word, as it appears on the screen, in the voice of Kermit, not in conventional speech-synthesizer noises."

Although Cerf won't discuss his long-range plans,

he is willing to talk about some of his upcoming projects. Collaborating with author, humorist and ex-bodyguard Douglas Adams, who wrote the *Hitchhiker's Guide to the Galaxy* (as well as related books, radio show and software), Cerf is working on a conversation program that lets you "talk" with Ronald Reagan. This program would add artificial-intelligence techniques to an updated Eliza-like program. Eliza was a program that could carry on a conversation with you, asking questions and making comments much like a psychiatrist might. In addition, Cerf asks, "What if parody, satire and good writing are added?" He calls the process of bringing artificial intelligence to Reagan "challenging."

In time for Christmas, Cerf's team will probably have more products for the Learning Keys. The addition to the Muppet Discovery Disk will be a multipurpose program covering most of the kindergarten curriculum, according to Cerf. One part will focus on numbers, the structure of words and putting words together. Another part will involve classifying shapes and colors, similarities and differences. The package will come on two disks in the school version from Sunburst, and on three disks for the home market from Koala.

Another upcoming product is The Mystery of the River of Song, the first in a series of Fraggle Rock adventures. These adventures will let you become a Fraggle, in situations where the graphics and text change dynamically: the same situation isn't always accompanied by the same graphics. CBS will release the Fraggle adventures.

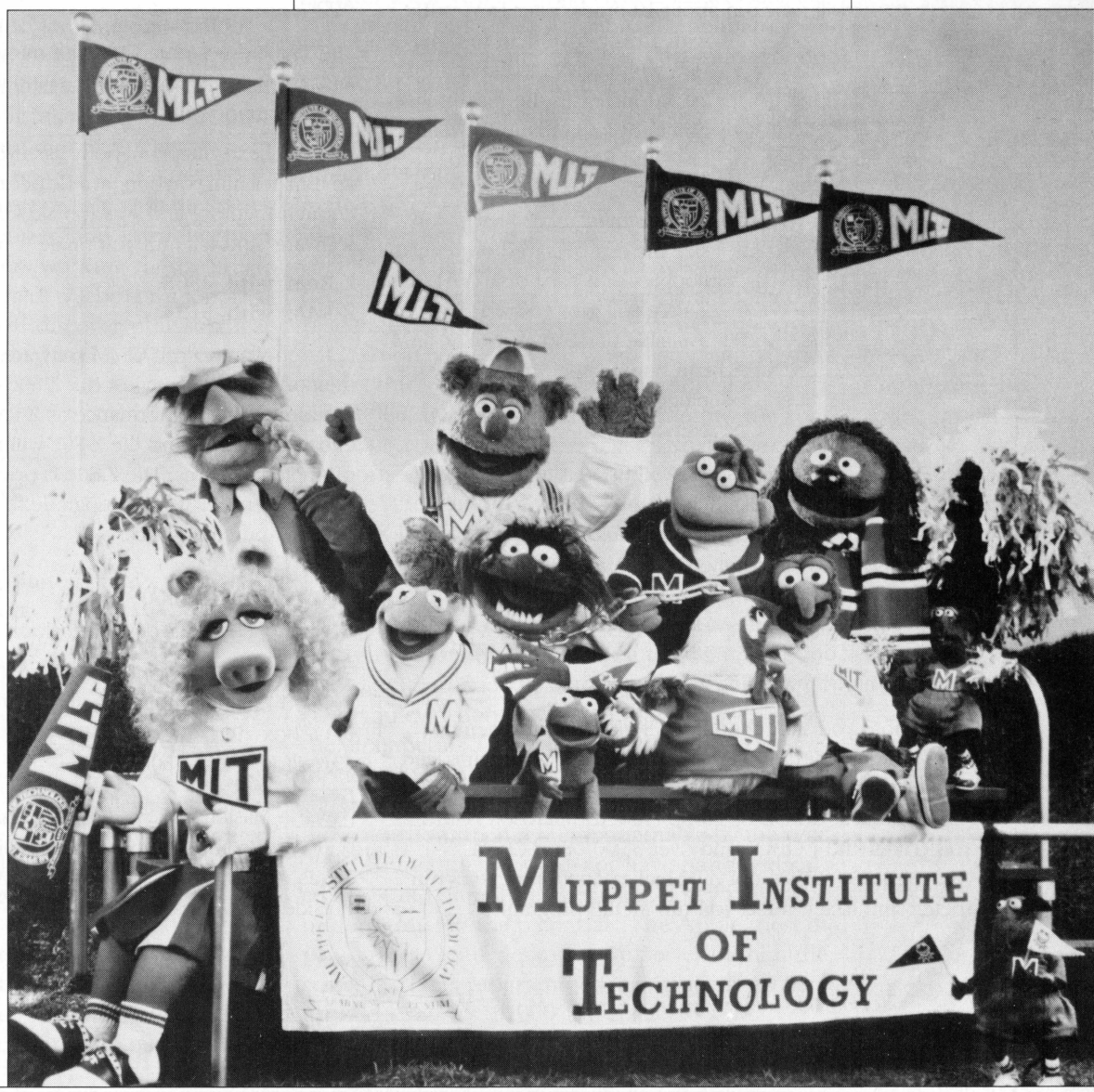
Looking further, you can expect to see the fruits of collaboration between Lucasfilm and Cerf in conjunction with the upcoming movie *Labyrinth*. Beyond that, Cerf won't say. //

Michael Ciraolo is a researcher for the Boston-based Yankee Group when he's not honing his skills as a part-time dilettante. His most serious concern is the impact of modern science and technology on our society.

PRODUCT INFORMATION

Muppet Learning Keys
Koala Technologies, Corp.
3100 Patrick Henry Drive
Santa Clara, CA 95052-8100
(408)946-4483

Kermit's Electronic StoryMaker
Simon & Schuster, Inc.
1230 Ave. of the Americas
New York, NY 10020
(212)245-6400



Expanding Your IIc Is Easy With Z-RAM

Z-RAM for the IIc is available with 256K or 512K of additional memory and a powerful Z-80 microprocessor for running CP/M software.

Z-RAM fits neatly inside the IIc. Installation is easy, clear instructions show you how. You'll need a screwdriver and about 10 minutes (if you can change a light bulb you can install Z-RAM).

Z-RAM and Appleworks will knock your socks off.

A 256K Z-RAM will give you a 229K available desktop and Appleworks will be completely loaded into memory. Appleworks will now run about 10 times faster in your IIc with 1 disk drive than in other IIc's with 2 disk drives. And only Z-RAM increases the maximum number of records in the data base and lines in the word processor. And only Z-RAM will auto segment large files so any size file can be saved on regular floppies or a hard disk. A 512K Z-RAM will give you a 413K available desktop. A 256K Z-RAM can be upgraded to 512K by just plugging in more memory chips.

Z-RAM is also a high speed solid state disk drive. With Z-RAM, your programs will load and save over 20 times faster. Z-RAM's RAM disk is compatible with Applesoft, Pro-DOS, DOS 3.3, PASCAL and CP/M. And with Z-RAM, you can copy a disk in one pass. Just insert the original, remove the original, insert blank disk! That's it! Z-RAM is another disk drive, only 20 times faster, 4 times larger capacity, and no whirring, clicking or waiting!

But before you start panting over all that extra memory, don't forget that the Z-RAM card has a built-in high speed Z-80 processor chip that allows you to run CP/M programs like Wordstar, dBASE II, Turbo PASCAL, Microsoft BASIC, FORTRAN and COBOL and over 3,000 other CP/M programs. So Z-RAM not only makes Apple programs run better and faster, it lets you run MORE programs.

With the Z-RAM card installed, your IIc is still your IIc only now you'll have that extra memory that Appleworks and other programs need. And you can run all that great CP/M software that others can only dream about.

Z-RAM is 100% compatible with all IIc software and hardware including the mouse, 2nd disk, modem and printer. Z-RAM is easily handled by the IIc power supply as power consumption is kept very low by using two custom integrated circuits and a patent pending power saving design. And Z-RAM is from Applied Engineering, the acknowledged leader and innovator of accessories for the Apple.

Z-RAM comes complete with manual, RAM disk software, Z-80 operating system, CP/M manual and a 5 year no hassle warranty.

So the next time somebody asks you why you didn't get an IBM, tell him you bought a IIc because the IBM didn't have enough memory and was too slow and couldn't run CP/M software. And tell him you made it past the 8th grade.

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Z-RAM with 512K	**$479**

If you want to run CP/M software, but don't need more memory, may we suggest our Z-80c card. The Z-80c offers the same CP/M performance as Z-RAM but has no memory expansion ports. And the Z-80c will not affect the running of Apple programs. The Z-80c is priced at only $159.00 and should you ever want to upgrade to Z-RAM, we'll refund your full purchase price.

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APPLIED ENGINEERING
"We Set the Standard"

TO BOLDLY GO

by JAMES CAPPARELL, ***PUBLISHER***

"Computers—the final frontier, these are the voyages. . ." An unusual introduction to a new column perhaps, but as an old Star Trek fan, I remember it was an invitation like this that opened the door to "strange new worlds." The impossible became real. I loved it.

Similarly, I invite you to join me on a bold expedition, one that should be every bit as exciting and challenging to your imagination. This column, to run in every issue, will take you on your own mission to the edge of computer technology, where the impossible becomes real.

I intend to bring you face to face with the issues and problems of this frontier, and introduce you to the scientists and others working there. Much of what I will write about here will be commonplace within five years. You will discover philosophical implications, new vocabulary, and new professions. Among these are:

knowledge engineering
artificial intelligence
expert systems
fuzzy set logic
knowledge representation
language translation
cybernetics
speech recognition
robotics
computer-enhanced learning

The current level of software development is primitive compared to what is coming. Integrated products and fancy word processors notwithstanding, software has a long way to go before *I* will be satisfied.

The current buzz word is "user friendly." I would like to replace that with "mind-amplifying" or "ability enhancing." After all, this equipment we are so pleased with should amplify our ability to perform. It should act synergistically with the motivator behind it, and that's you.

Software should adapt to your particular style of language and comprehension. A more verbal person would access the same software differently than someone visually-oriented and still feel satisfied with the outcome. The system would adapt to your skills, preferences and goals. This may sound somewhat farfetched, but I hope to show you that such programs are only a beginning.

As you will see, terms like word-processing and integrated software describe very limited, unimaginative interactions. What can be enhanced on a word-processor? Counting words and spelling them correctly? That's not the stuff I envision. Perhaps because I've been an inveterate Science Fiction reader, I have always expected more.

Can you recall the time when you could not say "xerox this?" Xerox, the company, only flourished since 1960. It quickly took its place among the Fortune 500 companies. The next "xerox" is around the corner, and it may be a typewriter that you talk at. What verb will come to mean "talk-typing" a letter? Will most of us still refer to this equipment as a typewriter? How about a command writer? "Here, co-write this." If any of you come up with some good verbs, let me know.

I am sure many of you recall the famous computer in the movie "2001." It was the H.A.L. 9000 (Did you ever notice whose initials follow h-a-l in the alphabet?). Stanley Kubrick, the director, interviewed many computer specialists of the time. This was about 1966 and he embodied in H.A.L. those functions then thought attainable by the year 2001. Remember, we did not have handheld calculators and digital watches then. They may have underestimated the potential. The Apple most of you have on your desk is more powerful than the computer I first programmed in engineering school in 1964, and it's 1/1000 the size.

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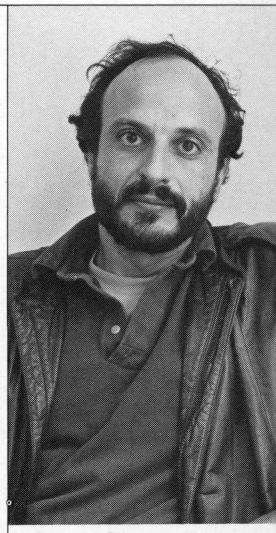

James Capparell, publisher of ***II Computing*** *and* ***Antic, the Atari Resource,*** *formerly worked as a programmer at NASA's Ames Research Center and for Ford Aerospace.*

PHOTOGRAPHY LORRAINE CAPPARELL

TRACK HALLEY'S COMET

Where to look, when to look

by DONALD TATTERSFIELD

HALLEY'S COMET 1985-1986

By now you must know—via newspapers, television and scientific journals—that Halley's comet approaches. It last appeared in 1910. In the intervening time it has followed an elongated elliptical orbit around the Sun, out beyond the orbit of the planet Neptune, and back again to the vicinity of the Earth. We know that it has been doing this every 76 years or so since 239 BC, and possibly for the last 3000 years.

This once-in-a-lifetime event has aroused great interest worldwide. But the coming apparition, unfortunately, will not be as spectacular as it was on some previous occasions. So this program will help you to locate the comet at any time—when you are able to see it and even when you cannot.

WHAT THE PROGRAM DOES

Here is a line breakdown, explaining the program for you. You will be prompted to enter your latitude (line 280) in degrees. Enter a positive value if you are north of the equator, or a negative value if south. Before entering your local time (300-350), adjust to normal local time if daylight saving time is in effect.

The display will inform you how far the comet is from the Sun and also from the Earth (590, 820). The unit used is the astronomical unit (AU), or 150 million km. A display of the current coordinates of the comet will follow (subroutines 5000-5070 and 4000-4030). The former gives right ascension and declination, used by astronomers to describe the position of a heavenly body. Of more immediate use to the layman, the latter subroutine gives the altitude (angle above the horizon in degrees) and the azimuth (bearing measured eastwards from north in degrees).

Similar information for the position of the Sun is also displayed using the same subroutines. See below why we need to involve the Sun. If you then opt for a pictorial representation of the position of the comet (reply Y at 1260), the vertical axis represents the altitude from your horizon (0 degrees) to your zenith (90 degrees), and the comet is shown in the correct quadrant of the compass horizontally (subroutines 6000-6210, 7000-7070, and 9000-9070). The program then gives you the opportunity to repeat the calculation, either for a different latitude(1310) or for a different time (1340), or both.

WHAT ABOUT THE SUN THEN?

The predicted brightness of Halley's comet at this appearance is about that of an average star. Although the comet will be in the sky during the daylight for some of the time, it is most unlikely that you shall see it then because it will be masked by the brightness of the Sun.

The sky is dark when the Sun is more than 18 degrees below the horizon. The program will warn you (1300) if the sky is not dark at the time you have selected. Furthermore, as the comet approaches the Sun, a tail will develop from the head, or coma. This might spread over an arc of tens of degrees in the sky.

The tail always points away from the Sun, so you need the position of the Sun to help calculate the predicted direction (6000-6020) of the comet's tail.

MORE ABOUT THE PROGRAM

For the comet, variable AA is the semimajor axis and C is the eccentricity of the orbit. JD(1) is the Julian date of the time when the comet is nearest the Sun (at perihelion)—look up Julian date in an astronomy book. A(I), B(I) are also constants of Halley's orbit. For the Sun, you can find the data of 260 in the *Astronomical Almanac* (in this case page C24 of the 1984 edition), as well as the formulas for calculating the coordinates of the Sun (640-770). Your selected time is converted to Julian date (370-430).

The determination of the position of the comet involves an iterative solution of Kepler's equation, for which there is no known classical solution (440-570). The remainder of the calculations needed for the position of the comet will be found

continued on page 18

ILLUSTRATION DAVE JENSEN

in (840-1070) and for the position of the Sun in (1080-1240).

Finally, throughout the program there are various safeguards to put calculated angles in the correct quadrant of the circle. In particular, note that since azimuth is measured from 0 to 360 degrees of the compass, and you are displaying the comet in one quarter of the compass, you must bring the azimuth ZC of the comet into the range 0 degrees to 90 degrees (6080-6090). Proper scaling for the computer screen takes place in (6100-6120).

The color of the displayed comet and its tail was acceptable on my monitor, but either or both can be changed at (160) and (170) respectively.

WHAT HALLEY'S COMET WILL NOT DO

Halley's comet will not flash across the sky like a shooting star, nor move even at the apparent speed of an artificial Earth satellite. It should be visible in binoculars by November of this year, and without any optical aid by December—before, if you have a good telescope. It will still be visible in May 1986 in the southern hemisphere. You have plenty of time to see it, but do not expect to see it around February 9, 1986—it will be behind the Sun.

Donald Tattersfield, former head of the Dept. of Mechanical and Production Engineering at North Gloucestershire College of Technology in England, is the author of Halley's Comet *(Basil Blackwell Publishers),* Orbits for Amateurs *and other writings on astronomy and astronautics. He is a member of the British Astronomy Association and a Fellow of the Royal Astronomy Society.//*

Giotto Sees Halley, Halley Sees Giotto

by TANYA KUCAK

In 1310, Giotto saw Halley's Comet. Next year, Halley's Comet will see Giotto.

The first Giotto is the Florentine painter Giotto di Bondone (1266?-1337), who saw the comet from Padua, Italy. He depicted the comet as the Star of Bethlehem in his famous fresco *Adoration of the Magi,* which is in the Scrovegni chapel in Padua.

The second Giotto is a space probe launched by the European Space Agency (ESA) to photograph and analyze the comet. One of the most important goals of the Giotto mission is to determine the exact chemical composition of the comet. Astronomers believe comets consist of primordial debris—dust and frozen gases—left over from the formation of the solar system more than 4.5 billion years ago. As such, comets may preserve the material from which the solar system formed.

Sir Edmond Halley, in studying the comet that now bears his name, was the first person to determine that its periodic sightings were returns of the same object. He theorized that comets orbit the Sun in elongated ellipses. As a comet approaches the Sun, its frozen gases vaporize, thus liberating gas as well as dust particles and pushing the comet's lengthening tail away from the Sun.

Near the Sun, the intense solar ultraviolet light causes the comet's tail to glow. Moreover, the comet grows in size as its density decreases, thus lessening the effect of the Sun's gravitational pull and enabling the comet to swing back toward Neptune. The comet's nucleus grows denser as its frozen gases condense once again as it moves from the Sun. The attenuated dust-and-gas tail eventually spreads along the entire orbit of the comet, and when the Earth passes through this dust trail, a meteor shower results. Halley's Comet is responsible for two meteor showers: the Eta Aquarid of early May and the Orionid of late October.

Indeed, scientists expect that cometary dust, traveling with velocities over 50 times faster than a speeding bullet, will destroy Giotto shortly after its closest approach—within 500 km of the 5- to 10-km-diameter nucleus of Halley's Comet—on March 13, 1986. The craft may last a few hours to a few days, during which time it will transmit information from ten scientific instruments, including a multicolor camera (image resolution of 50 meters anticipated), a photopolarimeter, dust detectors, and several plasma experiments.

Fifteen subcontractor companies from ten European nations developed Giotto. The $52 million craft was built at British Aerospace Dynamics Bristol factory; tested at the Centre Spatiale de Toulouse in France; sent to ESA's Space Technology Center in Noordwijk, Holland, for final adjustments; and launched in July from the Guiana Space Center in Kourou, French Guiana.

At the time of launch, scientists could estimate the position of the comet's core to within 30,000 km. Data from two Soviet space probes, also en route to Halley's Comet, enable Giotto scientists to make midcourse corrections. The two Soviet crafts, Vega 1 and Vega 2, launched December 1984, will pass within 10,000 km and 3,000 km (respectively) of the comet's core in March 1986. Since the U.S. chose not to launch a probe to investigate the comet, the Vega craft carry American experiments as well, making the Halley's Comet missions a model of international cooperation.

Altogether, five space probes will rendezvous with Halley's Comet. Besides the European and Soviet missions, Japan launched a test vehicle, MST5, in early 1985 and its scientific probe, Planet A, in August 1985. Planet A carries only two instruments, an ultraviolet camera and a solar wind analyzer.//

Listing on page 59

A CHANGE OF HEART

New instructions grace the 65C02

by MORGAN P. CAFFREY

The heart of any computer is its Central Processing Unit (CPU). In a microcomputer this is a chip, usually referred to by its number. The revolution in personal computing was built largely on the back of a workhorse chip called the 6502, which was used in Apple II computers and in several other brands.

The 6502 chip is a capable CPU, but it could be better, and now it is. Apple Computer is currently installing a more powerful version, called the 65C02, in all new Apple IIc and Apple IIe computers. The 65C02 bestows several new options on assembly language programmers—for whom the balance of this article is written.

But don't go away, beginners. Though technical, this article includes concepts and language you will confront again.

OPCODE: An executable instruction for the microprocessor such as add, substract, read, store, AND, OR, shift-left, shift-right, and so on.

OPERAND: The data or location being acted on by the opcode. An immediate value, the content of a location.

MODE: A method of using an opcode that differentiates between accessing the operand from an absolute location, from a location pointed to by another location, and so on. Modes provide flexibility to the microprocessor, and it is usually nicer to have a smaller number of opcodes with a variety of modes than a large number of different opcodes.

The 65C02 is a pin-compatible replacement for the 6502 in all Apple II-type computers. It is part of the "enhancement" upgrade for older IIe's. It offers lower power consumption and some deft extensions to the parent processor's instruction set. The advantages are very real.

The improvements consist of 27 new opcodes made up of ten new instructions and two new addressing modes. (See box for explanation of terms.) Some things have become much simpler, some faster; some more elegant, requiring less code.

Let's look first at those instructions that are essentially extensions of existing instructions, but with different or augmented modes.

SIMPLIFIED BRANCHING

Was I waiting for this one? You bet! A Branch Always (BRA) instruction. It has no flags to control or predict or manipulate, no faked comparison; you need only branch relative to the present position +127 or -128. It does not change the state of any processor flag. This change adds simplicity and legibility, but I still wish for a signed, 16-bit branch for additional ease in writing relocatable code.

INCREMENT AND DECREMENT ACCUMULATOR

I sometimes need to add one or subtract one from the accumulator. Compare the sad methods I have used to the new, simpler version.

Table 1

6502			
ADDITION		SUBTRACTION	
TAX	STA ZPDEST	TAX	STA ZPDEST
INX	INC ZPDEST	DEX	DEC ZPDEST
TXA	LDA ZPDEST	TXA	LDA ZPDEST

65C02	
ADD OR SUB	
INA	DEA

It is nice to substitute one instruction for three, even if I don't use the instruction often.

continued on next page

Morgan P. Caffrey is a programmer/analyst concentrating on expert systems, databases and telecommunications software. He was an early Apple II owner and former technical editor for Apple Orchard *magazine.*

PUSHING THINGS AROUND

Similarly, there are new push instructions. Now, stacks are nice. I like stacks. The stack keeps track of subroutine calls and saves register values that must be restored. The 6502 offers a quick stack (you need to look at other processors to appreciate the speed), but restricts the programmer to 255 bytes. Let's look at the old and new methods to save the processor status and *all* the registers.

Table 2

6502	65C02
PHP	PHP
PHA	PHA
TXA	PHX ; new
PHA	PHY ; new
TYA	JSR DOSOMETHING
PHA	PLY ; new
JSR DOSOMETHING	PLX ; new
PLA	PLA
TAY	PLP
PLA	—
TAX	—
PLA	—
PLP	—

13 Instructions versus 9

This difference might seem trivial, but if you examine code that extensively uses registers, you'll see this is frequently done. The old processor's need to channel registers through the A-register is time-consuming and not elegant. The newer method is better.

ZERO

Zero is so useful. It clears the high-resolution screen to black. It sets my numeric arrays to naught. The 65C02 offers the following simple saving and doesn't bother a single flag:

Table 3

6502	65C02
PHA	—
LDA #0	STZ DEST ; store a zero
STA DEST	—
PLA	—

4 Instructions versus 1

In both cases the contents of the A, X and Y registers are the same after as before the operation. This is not always necessary, but frequently it is. The new instruction supports ABS, ZPG, ABS,X and ZPG,X modes.

ABSOLUTE INDIRECT ADDRESSING

A sweet feature of the 6502 is the indirect addressing. If you use the Y-register with a single byte location in the zero page, you can reference any location in memory. It's great for accessing and maintaining tables and also for various memory moves. Viewed this way, the 6502 has 128 16-bit memory pointers, any of which you can access with a simple two-byte instruction.

The trouble is always that you have had to use the Y-register, which at times is awkward. Frequently it is easier and defter to leave Y=0 and manipulate the zero-page pointer directly.

The 65C02 has *absolute* indirect addressing: for example, LDA (ZPG). You don't have to be concerned with the Y-register. A single two-byte instruction can now load, store, add, subtract, compare, AND, OR, and EOR anywhere in memory.

EXTENDING THE USE OF TABLES

The following instructions make a widened use of tables:

```
TABLEBASE EQU * ; symbolic pointer to base
                  of table of routines
          DA  NATIONALDEBT
          DA  BASEBALLAVERAGE
          DA  SUBTRACTION
          DA  DIVISION
          DA  INSERT
          DA  LOWERCASE
```

The construction above creates a table of two-byte execution addresses. You can do something similar with most assemblers; that is, if the program executes at the location pointed to by any table entry, the described function is performed. The 6502 provides a slightly awkward method to jump to any one of these addresses, but the 65C02 more elegantly indexes the Jump Indirect by X.

The problem with the 6502 Jump Indirect is that if, by chance, the assembler that stores the code locates the table entry such that the two-byte value crosses a page boundary (bytes 0, 256, 512, and so on, throughout memory), the low byte would be taken properly but the next byte would be taken from 256 bytes lower. You would execute code at the wrong address. A sharp programmer learns to watch for and avoid these problems. A better processor avoids the problem, and the 65C02 fixes it at the cost of just one cycle—a good trade.

TABLE JUMPS

When preparing the equivalent of a CASE statement in assembler, the 6502 has a slightly split personality: nice architecture, but awkward in use. The user presses a key and the code "vectors" to the right routine for the key pressed. In the 65C02, utility is about the same but the routine is simpler.

TABLE 4

A = 0,1,2,3,4 . . . 127—returned from keyboard

6502	
ASL A	; mult by 2
TAX	; make index
LDA TABLEBASE,X	
STA LOC	
INX	
LDA TABLEBASE,X ;	
STA LOC+1	; high byte
JMP (LOC)	; jump indirect

65C02	
ASL	A
TAX	
JMP	(TABLEBASE, X)

8 Instructions versus 3

This new construction saves both space and time.

READ/WRITE INSTRUCTIONS

Some of the instructions indexed by X that do both a read and a write in a single instruction have been speeded up.

ASL LOC,X—arithmetically shift left the byte
LSR LOC,X—arithmetically shift right the byte
INC LOC,X—read, increment, store
DEC LOC,X—read, decrement, store

These can be used for bit manipulation and for multiplication and division. A savings of one cycle may not seem like much, but if the cycle is repeatedly saved all day long, or at a critical juncture, the savings become noticeable. (In processing every bit on a high-resolution screen—57,344 bits—you generate some time savings if the image changes frequently.)

BIT FLIPPERS' DELIGHT

Bit manipulation can seem like Greek even to seasoned assembly language programmers. The idea is to isolate and process a bit (in a number, on the graphic screen, in a controller device). Once again the 6502 seems a little too hard to use, although programmers have coped with and even triumphed over it in various machines.

There have been a couple of changes in the bit manipulation capabilities. I'll start with the bad news, which isn't very bad.

A good method for testing individual bits in a memory location, the BIT instruction has lost one rarely used ability. If you perform the BIT instruction in the immediate mode (the same result each time the code is executed), the 6th and 7th bit are not reflected in the processor status flag. If the immediate operand is a zero, the Z-flag is set, so the instruction may still be useful.

In the 6502 the bit is frequently tested by shifting the byte left or right until a processor status flag is altered, then you branch appropriately. The 65C02 design simplifies this read-manipulate-store sequence.

The TRB (Test and Reset Bit) does an AND with the present contents of the A-register (usually the "mask"), sets the new value of the bit(s), and automatically stores the results back.

TSB (Test and Set Bit) does an OR of the A-register and the memory location contents and stores the results back.

The only processor flag affected is the zero-flag. The addressing modes are somewhat limited; only absolute and zero-page is provided (no indexing).

CONCLUSION

Notwithstanding all the wonderful upgrades, the 65C02 could be improved even more. I would like a real 16-bit register. When I increment a zero-page location, I want an increment instruction that can detect a carry and automatically increment the next sequential location. I also want the same thing in reverse for the decrement. I don't suppose I'll get them soon, but there's no harm in mentioning it.

Finally, the new chip has a few drawbacks. If you use this nice extended set of instructions, the software written won't be compatible with a lot of the existing earlier Apple II computers, unless the owners individually decide to upgrade. This makes commercial application of the processor's features somewhat more complicated. Also, the exisitng monitor in ROM does not disassemble the new mnemonics, nor can the old mini-assembler in ROM assemble the new instructions.

Most of the existing assemblers won't be able to compile the new instructions. I'm sure most assembler manufacturers will upgrade, and some have already. These include Merlin PRO from Roger Wagner Publishing, Lisa 2.6X from Lazerware, and Big MAC.C from Call A.P.P.L.E. //

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"We Set the Standard"

ECTO BLASTER

Works with DOS 3.3 and ProDOS.

by STEPHAN SCHWIRZKE

The house is dark, and worse, it's haunted! Ghosts appear out of nowhere and rush about trying to drive you away. You have been called in to rid the house of these ectoplasmic interlopers, which you can only do by de-energizing them as they come towards you.

You are armed with the latest anti-ghost weapon. Its laser-driven sight projects a "prohibited" sign wherever the joystick directs. When you press the joystick button, a gout of entropy juice squirts out from your position at the bottom of the screen towards the place marked by your sight. If the juice hits a ghost, the ghost shrivels and disappears.

Every time you successfully blast a ghost, a candle lights on the chandelier so you can see a bit more of the room you are in. When all ten candles are lit, you win the game. But every time a ghost gets past you, a skull is added at the bottom of the screen. Collect ten skulls and you lose.

Those of you without a joystick can play from the keyboard by using the alternative lines 320-400 (see listing), and by changing line 4050 to read GET A$: GOTO 60. Keys I, J, K and M control direction of your sight, and the space bar substitutes for the trigger button. There is no TYPO II table for the keyboard alternative. To use TYPO II, enter the entire program for joystick, verify its accuracy, then carefully replace the joystick lines with the keyboard lines.

Some Important Variables:

S=	number of current shape being drawn
A(S)=0	shape not being drawn
A(S)=1	shape being drawn
X=	horizontal position of sight
Y=	vertical position of sight
S4=	speed adjustment in line 5005 to increase difficulty
G(S)=	horizontal position of ghost
U(S)=	vertical position of ghost
J(S)=	scale of ghost
U(S)=	speed of ghost
Q(S)=	previous scale of ghost (used to erase)

Explanation of Program Lines:

80	draws bullet and explosion
90-140	checks for hit
150-170	adjusts difficulty (speed, rate of scaling)
180-200	lights candle
210-270	explodes ghost
280-300	clears room to brightest color, gets rid of any leftover ghost
320-410	reads joystick (or keyboard)
430	erases and draws laser sight
440-550	erases and draws ghosts, adjusts scale, moves ghost left or right, determines if ghost has escaped
1000-1050	resets variables for new ghost
2000-2190	resets variables to draw room
3000-3040	sets up collision values
3050-3100	values used to check for collisions, plot room colors, and POKE machine language sound routine
3110-3140	shape tables
4000-4040	"you lose" message
4050-4060	awaits button press for new game

Listing on page 62

Stephan Schwirzke is a college student studying computer science. He's currently writing an arcade game in assembly language.

B. BENJAMIN

OF JEWELS AND GHOULS AND BUTTERFLIES AND STRATEGIES OF WAR

by NEIL SHAPIRO

Neil Shapiro is editor-in-chief of MacUser Magazine *and is also chief sysop of the MAUG Apple Group on CompuServe.*

The world of gaming on the Apple II is as varied as the people who own the machine. Creating software ranging from dazzling graphics and animation to complex brain-wrenching games of strategy and tactics, programmers on the Apple II are constantly striving to achieve new goals and more exciting products.

Here are some games that demonstrate this wonderful ability of the Apple II to amaze and entertain anew.

CHAOS AND ORDER RETURN

Archon II: Adept from Electronic Arts is a follow-up to its game **Archon**. That first game was played on a chessboard-like field with pieces moved by joystick. When one piece attempted to take another, the two pieces would engage in fast, arcade-like action to contest ownership of the square. Archon quickly became a classic, with its ingenious combination of chesslike strategy and arcade tactics. Well, Adept is even more challenging than its predecessor, and features exciting innovations.

In Adept, the Master of Order must struggle against the Mistress of Chaos on a battlefield of the four elements of Earth, Water, Air and Fire. The battlefield screen is a bright, almost dazzling display of the four elements arranged in concentric rectangles. The bright-red outer area represents (of course) Fire and features animated flames. In the inner Water area, waves move. Juxtaposed with the rocky green Earth and the calm violet Air, the animated elements make the battlefield screen a visual feast.

The players each control the Adepts of Order or the Adepts of Chaos. One of the players may be the computer opponent, as the computer can play either side. Two people may play each other, but that requires either the special equipment needed to hook two joysticks to an Apple or keyboard control by one of the players. Unfortunately, the quick action in the game makes the keyboard fairly impossible to use. So figure that most of your play will be against the computer, but that's okay because the computer plays a most respectable game.

Each Adept shown on the screen may cast spells, summon an army of demons and monsters, or simply move and fight. The object is to capture six flashing power points that, from turn to turn, move about the outermost corners of each of the four elements.

An Adept who casts a spell may summon one of eight varieties of demons or monsters, may heal an ally or weaken an enemy, release an ally or imprison an enemy, or (not very often) banish one enemy from the board. An aptly named Apocalypse spell decides everything in one immense battle.

In most moves, the Adepts summon the creatures of Order or Chaos to serve them in subsequent turns. The creatures all have different modes of fighting and different amounts of life force (staying power), depending on which element they are fighting in. The Firebird, for example, can take more blows before dying if it fights in the domain of Fire than in Water.

When one creature or Adept challenges another, the battlefield screen clears to a tactical display. This tactical display may feature various obstacles or terrain, depending on the element field. But the action can be fast and furious, as the fighters are controlled by joystick. Some fighters, such as Giants, throw rocks; others, such as Sirens, have more innovative ways of close-in fighting. Learning how the various occult soldiers fight is one of the game's most attractive features.

It's good to see a sequel to a successful game that is not only as good as the first but extends the boundaries of that game's system. Adept is such a success.

FOR THE FUN OF IT

OF JEWELS, BUTTERFLIES AND AMOEBAS

Finding a new idea in arcade games that is both different and playable is like finding a jewel in the rough. And no one knows more about finding jewels than Rockford, the personably animated main character of **Boulder Dash** from MicroFun, a rock-and-rolling excursion into fantasy and tactically governed reflexes.

Featuring 16 caves, this game can satisfy the most jaded arcader. At first glance it seems to resemble the **Dig-Dug** school of games: a joystick-controlled little guy who tunnels about underground. As he tunnels, he can undermine various boulders, causing them to fall through tunnels already dug and crush his enemies—or himself. But whereas Dig-Dug depends on a shoot-em-up philosophy (or at least blow them up), Boulder Dash demands that you think almost as fast as you can scream, madly yanking the joystick back and forth.

You see, scattered about in the caves are both jewels to grab and strange enemies that you must overcome. For example, the amoeba, a green amorphous blob, inexorably advances on Rockford from behind and begins to fill the tunnels as Rockford digs them. But wait, the deadly butterflies hover and glide about in the dangerous caverns—and their very touch is death to Rockford. But if you drop boulders just right, you can guide the butterflies to impact the sides of the growing amoeba. When that happens, a quick flash lights the screen as the butterfly explodes from its brief amoeba contact and turns into a scintillating jewel for Rockford to try to pocket.

Bright, colorful animation coupled with a breezy story line make this game more than just a momentary diversion.

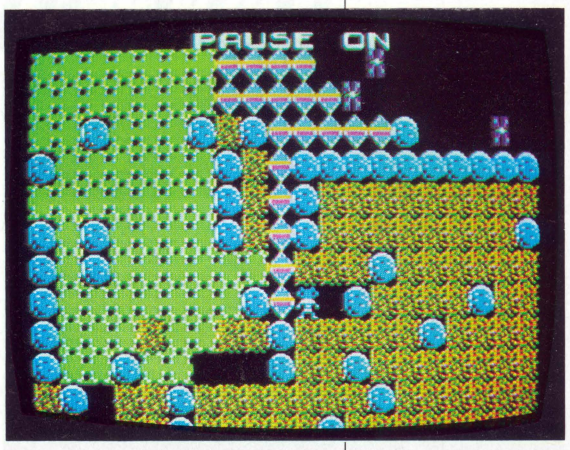
TWO GAMES: TWO THEATRES

Simulation gaming used to require a person who wasn't afraid to learn a lot of complex rules and do hundreds of calculations, could find up to twenty square feet of floor on which to place a map and juggle thousands of tiny cardboard pieces, and also knew at least one other person who shared all these traits and skills. That is no longer true.

The Apple II can bring complex, historical simulations to its screen in a way that makes such simulation games easier than ever to learn and play. Although these simulations do require thought and concentration, they bring a feeling of reality and veracity to gaming.

Carriers At War from Strategic Studies Group (SSG) and **Kampfgruppe** from Strategic Simulations Inc. (SSI) both simulate various World War II actions at a tactical level. Rather than the bold, strategic action of moving entire armies and divisions, these games simulate the multitude of smaller events and movements that make up a battle.

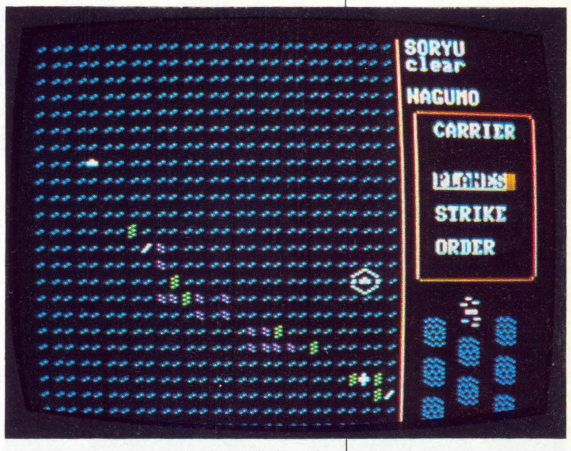
Carriers At War magnificently simulates the war in the Pacific fought by naval fleets. But even though the rules are complex and tightly interwoven, it uses command menus that make it easy to enter into play and to keep track of hundreds of different items.



BOULDER DASH

The on-screen display switches from menus to a strategic map that shows the Pacific islands and the fleets present. You may overlay the map with a weather map, which also indicates the wind or storm velocity. Furthermore, you may zoom in for a closer look at any part of the strategic map.

You can keep track of every plane aboard every aircraft carrier—individually—as well as each plane and ship present at various bases. The amount of detail would be truly staggering but for the text screens of multiple-choice menus that quickly become second nature to you. By using these screens, you can arm aircraft and send them out on their missions. You can also control the movement and the mission ability of every ship in all the fleets you command.



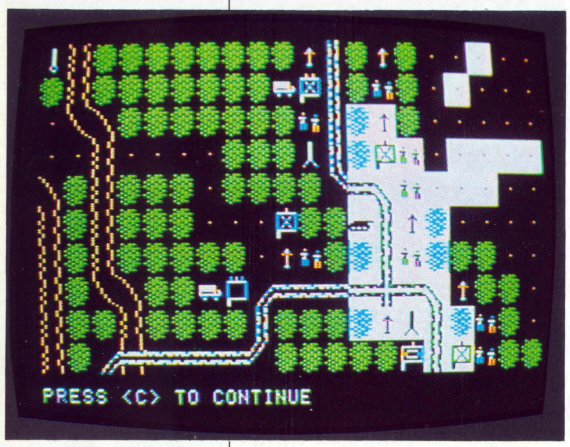
CARRIERS AT WAR

Many details are taken into account—how long it will take the planes to clear the runways, how long it takes to arm them, the distance to the target, and so on. And because the computer is doing the calculations, you need only sit back and see how your decisions have turned out.

Once you have played the six scenarios covering Pearl Harbor, Coral Sea, Midway, Eastern Solomons, Santa Cruz, and Philippine Sea (and you may take any side in each action, or even play opposing subsidiary commands!), you can design your own dramas. Using keyboard control to move an on-screen cursor, you can first design a map

continued on next page

of water, islands, airports, and bases. Although a joystick might have been more useful here, you can draw maps quickly once you have the hang of it. Then you can design the individual characteristics of planes, ships, and carriers, and even program the weather. It's no wonder that the Design Manual that comes with the game has 24 pages and the Player's Manual only 16.



KAMPFGRUPPE

Besides its historical accuracy, Carriers At War is the best-playing simulation of naval warfare I have seen on either tabletop or video monitor.

Kampfgruppe from SSI recreates the fire and movement of the bitterly contested Eastern Front campaigns. For two-player action, each player may take the Russian or German side; solitaire play is also allowed, as the computer can take either side.

Of all the computer simulation games on the market, Kampfgruppe gives the most realistic feel of tactical, armored combat. Although played on the video screen, the game brings to mind tabletop armies of small lead models of tanks and men favored by many so-called miniaturist war gamers as well as by the more serious folk in the Pentagon.

On the battlefields of Bryansk, Stalingrad, Kiev, and Berlin (as well as random terrain), the German and Soviet commanders in the game have to face many of the same strategic decisions made historically as well as taking a hand in the minute-by-minute tactical maneuvering of tanks, artillery, armored guns and infantry.

ARCHON II: ADEPT

Each grouping of units is shown on the screen as a small silhouette. The game takes into account details such as whether infantry has disembarked, what direction a tank is facing, and the terrain. But what makes this game innovative is that it implements sight or LOS rules.

In noncomputerized gaming, line-of-sight rules often add realism at the expense of playability. Many tabletop players rue the day they started a game that required long rulers, protractors, pieces of string, and the patience of Job. But add an Apple computer to such a brew and the LOS rules come alive.

In Kampfgruppe, all you have to do is to move the cursor atop a unit, press V for view and—presto!—the territory that the unit can see and fire into lights up. There's no longer any doubt as to whether you can spot a particular unit or if the corner of a wooded area blocks your view.

Kampfgruppe is not an easy game, but this new method of showing LOS calculations makes it attractive to the computer war gamer. //

PRODUCT INFORMATION

ARCHON II; ADEPT
Electronic Arts
2755 Campus Dr.
San Mateo, CA 94403
(415)571-7171
Requires 64K; $39.95.

BOULDER DASH
MicroLab, Inc.
2699 Skokie Valley Rd.
Highland Park, IL 60035,
(312)433-7550
Requires 48K; $40.00.

CARRIERS AT WAR
Strategic Studies Group TTY. Ltd.
336 Pitt St.
Sydney, Australia 2000
Requires 64K; $59.95.

KAMPFGRUPPE
Strategic Simulations, Inc.
883 Stierlin Rd.
Building A-200
Mountain View, CA 94043
800-772-3545 X335
Requires 48K; $59.95.

ACTION DISK OWNERS!
See page 77 for instructions on DOS 3.3 conversion, if necessary.

CRACKING CIPHERS WITH YOUR COMPUTER

An Introduction

by CAXTON C. FOSTER

Cryptography is the science of writing messages that no one but the intended receiver can read. Cryptanalysis is the science of reading them anyway.

Both sciences date back to antiquity. One of the earliest ciphers, known to the Greeks, is called the *skytale* (Figure 1).

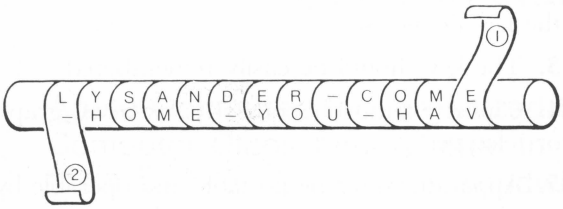


Figure 1

The sender took a straight rod, and around this he wrapped a long, narrow strip of parchment, spiral fashion, with the edges of the spiral touching. Then he wrote his message on the parchment along the length of the rod, with successive lines around the rod (like on a typewriter platen.) The parchment, when removed from the rod, read like gibberish. It was sent to the recipient whose duplicate rod served to recover the message.

Politics and romance have generated the long history of secret writing, and indeed, much of the best work in cryptology was done before the computer was invented. However, because the computer is so good at detailed routine work, it makes a perfect tool for those of us devoted to reading ciphered messages.

The computer can't do all the work, of course. You have to program it to do your dogwork while you use your trained intuition. Training your intuition will be the purpose of this column, both in terms of cryptology and of applying your computer to the problems that arise. I'll supply sample crypts and programs as we go along. Solutions will appear in following issues.

As you become proficient, our problems will get harder, and eventually we may jointly put our minds to solving the most difficult codes that exist today. They say it can't be done, but never underestimate curious minds served by a computer!

I will assume you do know the fundamentals of BASIC and have some kind of Apple II computer system. A printer is very helpful, but not necessary. I won't assume you know anything about cryptanalysis, so we'll have to spend some time learning fundamentals.

In the "big picture" (Figure 2), Alphy wants to send a message to Betty so that Charlie can't read it, even if he can intercept it.

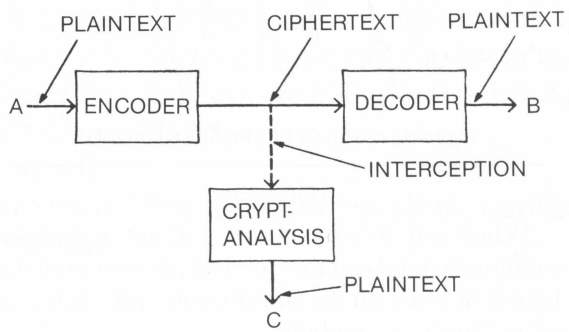


Figure 2

Alphy composes the message in *plaintext*, a language he and Betty know, which we will assume is English. Alphy puts the message through a process known as *encipherment*. The result, *ciphertext*, is sent to Betty. Betty then puts the ciphertext through *decipherment* and recovers the plaintext.

Meanwhile, Charlie intercepts the ciphertext. He can't read it unless he can solve the cipher. This process is called cryptanalysis.

continued on next page

Caxton C. Foster, a Ph.D. in Electrical Engineering, was a Computer Science professor at University of Massachusetts. Presently he is a consultant to Mount Castor Industries of E. Orleans, MA, which designs computer programs for school administrative use. Dr. Foster is the author of five books and numerous technical articles.

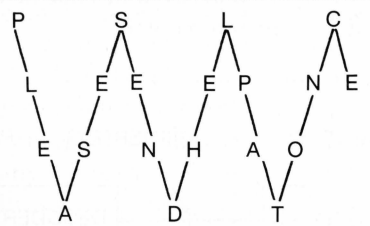
Even if Charlie can solve the cipher, he must do it in time to use the information. With enough time virtually any cipher can be broken, provided there is enough ciphertext to work on.

But consider Paul Revere's code. We all know what two lights in the steeple meant, but the British could never have figured it out because of lack of data.

Notice I called Revere's lights a *code*. A code deals with symbolic substitution of whole words or phrases, whereas a cipher deals with individual letters. In the computer world, one meets codes in the guise of *passwords*, for example, those used to log onto CompuServe. A computer could conceivably discover a password by trial and error if the host system did not reject repeated attempts, but usually breaking codes requires much more memory than your Apple II provides.

Therefore, we will stick to ciphers. These come in two kinds: *transposition ciphers* and *substitution ciphers*. In a transposition cipher the plaintext stands for itself but the letters are arranged in an unusual order. In a substitution cipher, other letters stand for the plaintext letters. Here are two examples.

Suppose you found a strip of paper with the following series of letters: **PSLCLEEEPNEESNHAOADT**. It's obviously ciphertext of some kind. You may want to wrestle with it a bit before looking at the solution below.



Ciphertext: PSLCLEEEPNEESNHAOADT

Figure 3

When you do solve it, you will notice that the solution depends on the physical placement of the letters, and not on the substitution of the letter by other letters or symbols.

This is the *railfence* cipher, a simple form of transposition cipher. The letters stand for themselves, but the plaintext message is written in a series of V's, while the ciphertext reads in a single horizontal row. We will devote considerable attention to transpositional ciphers.

Here is an example of a substitution cipher: **KDYLQJ D ZRQGHUIXO WLPH.** Can you discover its meaning, knowing that in this case letters have been systematically substituted for other letters? The single D is a big clue. This is known as a *Caesar* cipher because it is of a kind used by Julius himself. Actually, a BASIC program could test for the premise of this substitution, but it's easy enough without a computer.

Give up? Each plaintext letter has been replaced by the letter that occurs three positions later in the alphabet. The single D is a clue because the article "a" is one of the few one-letter words in English. The peculiarities of the plaintext are very important in solving substitution ciphers.

Substitution ciphers can get very complex. In addition to letter-for-letter substitution, there is a *polyalphabetic* substitution in which several substitution alphabets are used in rotation (or otherwise), and *polygraphic* substitution where two or more plaintext letters form the unit for encipherment. The U.S. National Bureau of Standards' "Data Encryption Standard" consists of 16 stages of substitution, each followed by a transposition.

Almost a century ago, Auguste Kerchoffs laid down six general rules for military cryptography which still hold true today:

1. The system should be unbreakable in practice, if not in theory.

2. Assume the enemy knows the system except for the key being used.

3. The key should be easily remembered.

4. Ciphertext must be transmittable by telegraph or teletype.

5. Apparatus must be portable and operable by one person.

6. The system must be easy and uncomplicated.

Several of these rules have implications for our work, for example, "transmittable by teletype" implies use of letters and symbols belonging to the character set of our computers. But an important additional concept here is the notion of *key*.

The key to a cryptic system is a piece of information that determines how the system will work in a specific instance. Knowledge of the system is (almost) useless without it, and the key can be changed as often as needed, even at the moment, as long as both sender and receiver have it. Often the key is a single word (easy to remember) whose inherent characteristics determine procedure.

Consider the following ciphertext:

```
L MV S L   S N S N A   A I A T A
E I P L I  T C P S B   L S D A D
O E U U A  R Y S
```

Suppose you know we are using a transposition system in which the plaintext is written out horizon-

TALES FROM THE CRYPT

tally in rows of six letters each, and that each column formed by this process is "read" into the ciphertext format (horizontal groups of five letters) one column at a time. The order of the columns, first to last, is determined by a six-letter key word.

A key word can dictate procedure in many ways, but a common way is by the precedence of the various letters in the alphabet. If the key word were HAYDEN, the first column of plaintext to be read out would be the second, or "A" column, next would come the fourth, or "D" column. The third column to be taken would be the fifth, or "E" column of plaintext, etc. The last column would be the third, or "Y" column.

Of course, HAYDEN is not the key word in this cryptogram. But knowing this much, you can solve this cipher by hand, or with a computer program, even if you don't know the key word.

To make it interesting I challenge you all to come up with a BASIC program to accomplish this solution. The winners (in our subjective judgment) will receive an appropriate reward yet to be determined (at least their name in print). The key word and how it works will be described in the next installment of "Tales from the Crypt."

Send your program to: CRYPT #1, Antic Publishing, Inc. 524 second St., San Francisco, CA 94107. //

HI-RES LABELER

Small caps character set for HGR

by WM. V.R. SMITH and STEVE KOEPKE

Bill Smith is president of Artsci, a software company specializing in business products for the Apple II, and a former participant in Softalk *where this program first appeared. It has been enhanced by Steve Koepke.*

Hi-res graphics is one of the most versatile features of the Apple II computers. Here is a BASIC program that puts small cap text at your disposal for labeling hi-res screens.

Several commercial products now facilitate drawing or "painting" in hi-res, and a few give custom character sets to superimpose on pictures (See NOTES.) The machine language character generators in some of these programs are so sophisticated that the simulated text acts exactly as you would expect real text to behave.

This program is not as fast or fancy as commercial ones, but it works, and it shows you one way to accomplish this task. You will be able to load and save hi-res pictures, write labels using capital letters, numbers and selected symbols, position them on the screen, put optional borders around them, and put optional pointers from them to any area on the screen. Once you understand the program, you may be able to design different custom characters of your own.

The characters generated by this program are limited to 70 per line. This is because the hi-res screen can display a maximum of 280 pixels (points of light) from left to right. Divide 280 by 70 and you get a width of four pixels per character. Each character needs at least one pixel for horizontal separation, leaving an absolute minimum of three pixels to define the character.

Note that these characters are quite small. They look best on a monochrome monitor or printout. On a color monitor some letters lose definition due to artifacting (unintentional color resulting from the position of the pixels relative to the phosphors on the screen).

The routine is efficient and adaptable to your own programs. The section at the end, beginning with line 1060, is the first part that runs. It sets up an array, B$(X), and stores the data for creating the characters. Then it builds two shapes: cross hairs for positioning the pointers and brackets for positioning your labels. We put these functions at the end because they are used only once.

Data in lines 1150-1230 defines 61 characters from ! through] (ASCII 33-93). Each is three pixels wide and five pixels tall. Another way to say this is that each character is composed of five rows of three pixels each. Each pixel is either on or off, lit or dark, so there are only eight possible combinations for any row. Let's represent this in standard binary form as shown below. A dot means the pixel is off, an asterisk means it is on.

```
. . . = 0
. . * = 1
. * . = 2
. * * = 3
* . . = 4
* . * = 5
* * . = 6
* * * = 7
```

Perhaps you can see how these eight possibilities can be stacked in five rows to create the shape of a character, for example, the letter A.

```
. * . = 2
* . * = 5
* * * = 7
* . * = 5
* . * = 5
```

Each row of three pixels can be thought of as a binary number for which the decimal equivalent,

a single digit, is shown to its right. String the decimal equivalents of the rows together to create a code from which the program can reconstruct the character. For example, 25755 represents the letter A.

All the five-digit numbers in the DATA statements were determined this way. Each represents one character. You can change the appearance of the characters by changing the codes, but there are limitations to this scheme—size of character, for example.

The program works in stages. We'll break the program down into component parts and describe them sequentially. The first chore is to set up variables and data tables, so line 70 jumps to to the end of the program to do this. Then lines 80—140 establish overall functional structure. Lines 160 through 290 load or save a hi-res picture for you to label.

Lines 300—340 accept your input from the keyboard and put it in ANSR$. Notice GET is used instead of INPUT becauseApplesoft BASIC will not accept the comma and colon characters as input. The label can be up to 70 characters long (one line). There is no limit to the number of labels per picture.

Lines 350—480 position the label. Use the four keys I, J, K, M as up, left, right, and down, respectively to move the positioning brackets around the screen. Lines 490—520 darken the area where the label goes. This makes the characters more visible.

At line 530 the program begins to plot the individual characters of the label. It takes the string in ANSR$ and breaks it into individual characters. The program then translates each character into an ASCII code (See box, page xx), and puts the value into the variable C.

Then the program looks up the character in the array B$(x) and determines from the code how each of the five rows should look. It puts the number code for each row into variable PL and plots it on the screen in lines 840—920.

Option for the border is in lines 610—640; option for the pointer begins at 650.

CHALLENGE: Can you redesign the characters in lower case?

CHALLENGE II: Can you make the character set taller and wider?

ASCII Values for this Program

33 = !	48 = 0	64 = @	79 = O
34 = "	49 = 1	65 = A	80 = P
35 = #	50 = 2	66 = B	81 = Q
36 = $	51 = 3	67 = C	82 = R
37 = %	52 = 4	68 = D	83 = S
38 = &	53 = 5	69 = E	84 = T
39 = '	54 = 6	70 = F	85 = U
40 = (	55 = 7	71 = G	86 = V
41 =)	56 = 8	72 = H	87 = W
42 = *	57 = 9	73 = I	88 = X
43 = +	58 = :	74 = J	89 = Y
44 = ,	59 = ;	75 = K	90 = Z
45 = -	60 = <	76 = L	91 = [
46 = .	61 = =	77 = M	92 = \
47 = /	62 = >	78 = N	93 =]
—	63 = ?	—	—

NOTES:
Some commercial hi-res drawing programs: Fontrix (Data Transformers); Apple Mechanic (Beagle Bros.); Flex Text (Beagle Bros.) //

Listing on page 65

SPREADSHEET HORRORS

And how to avoid them...

by ROBERT M. FREEMAN

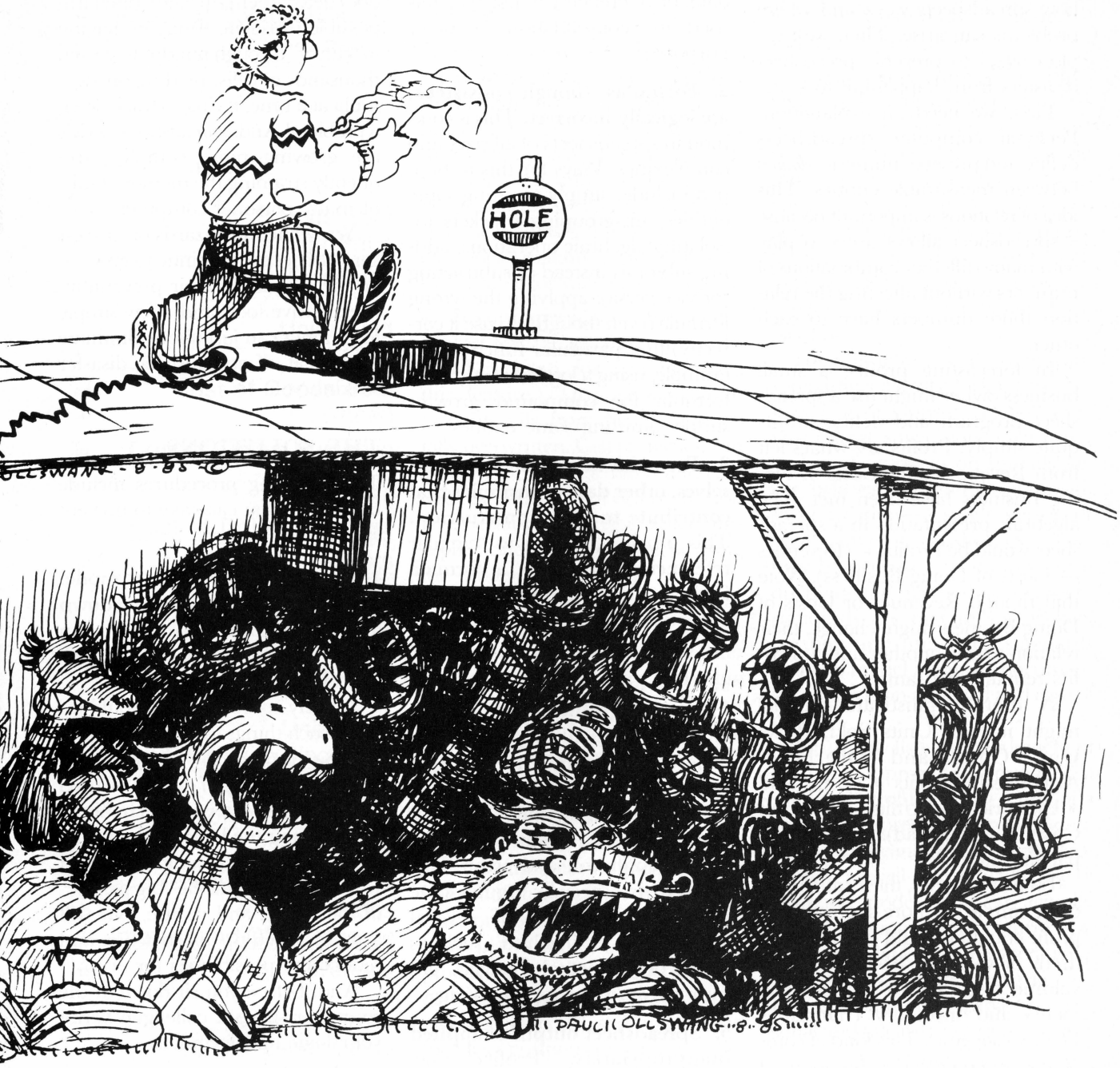
Spreadsheet horror stories. No these aren't the ones where Visicalc swallows New York, or Multiplan is kludged to a mutant surge suppressor.

Spreadsheet horror stories are the recent revelations showing the risks and hazards of careless spreadsheet use. Thousands of would-be analysts are setting up computerized spreadsheets to assist them in business or personal decision making. They expect the computer to chew up their data and spit out the right answers. So confident are they that they often don't recognize wrong answers when they see them.

If a person uses a calculator, for instance, to compensate for weak math skills, chances are this person's math conceptual skills are weak as well. When this conceptual weakness is applied to spreadsheet design, you can imagine what the potential for error might be.

Don Valentine, a venture capitalist quoted in *Inc.* magazine, said of some entrepreneurs who didn't make it: "Their thinking is hindered by their reliance upon computers. Since the advent of electronic spreadsheets, projections are no longer written out by hand and really thought about, with the result that many people have no personal understanding of the numbers they're projecting."

The Wall Street Journal recently reported an acquisition blunder that cost a Texas oil and gas company millions of dollars—and several executives their jobs. The error was



traced to a faulty financial analysis done with a personal computer spreadsheet model.

A marketing manager at a Silicon Valley computer firm, *Business Week* reported, made an eight-million-dollar mistake on forecasts for a new line of computers. The manager used the wrong formula for a price discount on components which resulted in underestimating costs.

In Chicago a novice real estate investor used a spreadsheet program template to forecast expenses and returns on a small office building. Encouraged by the analysis, he bought it. But while the building was an open architecture design, the template formulas for allocating overhead space reflected traditional closed-office design. As a result, the investor seriously overestimated potential revenue growth and suffered a much lower rate of return than he had expected.

More people are using spreadsheets than ever before; more business and personal applications are being programmed using spreadsheets. In addition to the above examples, typical applications include accounting, inventory management, sales forecasting, budgeting and a host of others.

Experienced spreadsheet users will understand how blunders occur. Most, in fact, could recount their own horror stories. And, what they might agree upon is that certain common problems relate to the very essence of spreadsheet functions.

continued on next page

ILLUSTRATION PAUL OLLSWANG

WHAT SPREADSHEETS DO

Let's look briefly at an example of how spreadsheets work and where problems can arise. Then we'll explore ways to prevent spreadsheet disasters from happening to you.

First, we need an explanation. Personal computer spreadsheets define and preserve numeric *relations* between measurable entities. This idea of relations is important because a spreadsheet allows users to play with many different combinations of numbers without affecting the relation those numbers have to each other.

In forecasting profits, a small business owner might use a spreadsheet program and define profits quite simply: Profits are what's left from Revenues after Costs of Doing Business have been met. The algebraic presentation in a spreadsheet would be Profits = (Revenues − Costs of Doing Business). Note that though Revenues or Costs of Doing Business might change, their relation to one another and to Profits remains the same.

A more sophisticated model might include Units Sold, Price, Unit Costs and Overhead. Algebraically, Profits = (Units Sold * Unit price) − (Units Sold * Unit Cost) + (Overhead). (See accompanying figures.)

Even at this level, the formulas are quite simple. A more sophisticated profit equation could include hundreds of variables from trade and volume discounts to interest payments and inventory charges as Figure 3 suggests. This kind of complexity and repeated elaborations of the spreadsheet model open up enormous possibilities for spreadsheet error and, unless discovered, spreadsheet disaster.

THE PROBLEMS

Specific problems can take many forms: here are several examples.

1. Formulas are inconsistent. The profit equation for one month or quarter is different from other similar periods. This can occur in a variety of ways including simple mistakes in construction, overwriting formulas with other formulas or data, or referencing a field which is used for consolidation or other purposes.

2. Formulas, though consistent, are logically incorrect. This is common in spreadsheets of all sizes and complexities. Ways for this to happen include: simply omitting some entities; misgrouping brackets for isolating algebraic operations; adding subtotals instead of subtracting (or vice versa); applying the wrong formula (even though you use it correctly) to a particular function, for example, using a logarithmic growth formula for compound growth; simply omitting some entities.

3. Formulas may reference themselves, other data or formulas that contribute to their construction. This problem, known as "circular referencing," leads to a formula feeding on itself, producing even larger or smaller results as you repeat calculations.

4. Data may be reported in conflicting magnitudes. Spreadsheet analysts commonly represent millions as thousands. Reconversion (using the thousand figure literally in other parts of the spreadsheet) or misinterpretation by other users may lead to confusion and error. This problem is especially troublesome when consolidation of several spreadsheets is involved, such as when departmental budgets are summed into a company budget.

5. Spreadsheet output is applied inappropriately. "Profits" may mean one thing for financial accounting and something entirely different for tax accounting or budgeting purposes. Similar amounts entered into the wrong spreadsheet or wrong spreadsheet cell could prove difficult or impossible to reconcile. Gross errors resulting from these problems usually stand out quickly. The real hazard comes when errors are subtle or when proven spreadsheets are modified without the user being aware of their changed structure or functioning.

In these cases, errors frequently go unnoticed. Even when someone does detect them, they are often impossible to isolate. Imagine having to "cursor" through hundreds or even thousands of cells, reading one formula at a time, trying to track down a problem! And, spreadsheet models are growing more complex, frequently straining the memory limits of many personal computers.

Yet, while the hazards of careless spreadsheet use continue to grow, so do the means for their prevention. Inexpensive tools and a few simple techniques can just about eliminate the threat of spreadsheet disaster striking you.

THE SOLUTIONS

The following procedures include basic steps you can take to prevent spreadsheet misery.

1. Plan your spreadsheet model on paper before ever sitting down at the computer. A basic plan should include a sketch of the model's logical flow and contents.

A fairly complete plan would include such things as formulas representing numerical relationships, sources and types of data to be used for input, and internal mechanisms for checking the logical integrity of the models. By planning ahead, you will not only define the "big picture" of the model and its use, but will actually speed up construction and reduce the possibilities for error.

And, before you sit down at the computer, have a colleague verify your logic and formulas.

2. Include in the model a brief narrative of the model's purpose. Explain how it accomplishes this task and indicate rules for its use as well as cautions or hazards to avoid. Also, include the author's name.

Too often, labyrinthine models become undecipherable even to their authors after a month or so of not using them. Imagine the problems confronting uninitiated users on applying such models for the first time!

Worse, think of the situation a company finds itself in when the author leaves the company without

Figure 1:

```
          Revenues
-         Cost of Doing Business
=         Profits
```

Figure 2:

```
          Units Sold
*         Unit Price
=         Revenues

          Units Sold
*         Unit Cost
=         Cost of Goods Sold
+         Overhead
=         Cost of Doing Business

          Revenues
-         Cost of Doing Business
=         Profits
```

Figure 3:

```
          Unit Sales
*         (Unit Price-Trade Discounts)
=         Gross Receipts
-         Volume Discounts
=         Gross Sales
-         Rebates and Returns
=         Sales
+         Interest and Other Income
=         Revenues

          Material Costs
+         Labor Costs
+         Inventory Costs
+         Interest Costs
=         Cost of Production
-         Scrap Return
=         Cost of Goods Sold
+         Sales and Administrative
=         Cost of Operations
+         Outside Services
=         Cost of Doing Business

          Revenues
-         Cost of Doing Business
=         Profits
```

having produced usable documentation. Attention to this rule will protect both the spreadsheet author and user.

3. In constructing the model, separate the data entry areas from the formula areas. Not only will this procedure reduce the likelihood of "overwriting" critical formulas with numbers, but it provides a concise document for verifying data entry. Also, it increases the "modularity" of models, making them more easily reusable for varying sets of data.

4. If your spreadsheet has a cell-protect feature, use it. (Appleworks and Multiplan, for example, have this feature.) This allows you to prevent cells from being accidentally overwritten. Cell protection can be used for both formulas and critical cell data. Use of cell protection is especially important when unsophisticated personnel will be using the model.

Advanced spreadsheet programs now even offer a cell "password" feature with which a user must enter a password before being allowed to change the cell's contents. If your program offers this feature, use it to prevent tampering or even accidental changes to the model.

5. Once your model is constructed, "audit" it with a spreadsheet documentation tool. The best known of these is The Spreadsheet Auditor 1.05 from Consumers Software in Gilroy, CA. The Auditor produces a two-dimensional printout of the formulas that make up a spreadsheet model, showing them in the exact positions they have on the screen. The benefits of such a tool are considerable. Using the spreadsheet without one, a user must cursor from cell to cell examining formulas. This makes error detection extremely difficult and big-picture appreciation almost impossible. By contrast, users who have never worked on a particular model before can use the spreadsheet "map" feature of the Auditor to quickly spot errors and easily decipher a model's logic and flow.

These automatic documentation tools have been common for years in the world of mainframe and minicomputer data processing. Now that they are available for personal computers, users can take good advantage of their power.

6. Create and enforce an audit trail. As data, printouts or diskettes move beyond their source this procedure becomes critical. The audit trail should include the author's name, the name of the manager who approves changes, baseline copies of the model and audited version both in paper and on diskette, as well as a log of all authorized changes from baseline.

For companies with significant spreadsheet activity Jack Grushcow, president of Consumers Software, has a final suggestion. Grushcow, author of six books on spreadsheet use, believes that centralized spreadsheet creation—a single person or even team of spreadsheet experts—may be necessary to improve productivity and insure that consistent standards are met in spreadsheet creation and use. Such standards relate to model integrity, documentation, revision approval and ease of use.

Grushcow lists another benefit of such an approach: it provides a single point of reference for all of a company's spreadsheet-related data needs. This can prevent model duplication as well as conflicting use of data and models, and can actually improve management control of a company's data-oriented operations.

Personal computers have already had a revolutionary impact on personal and business decision-making. And, they still offer exciting, untapped potential.

The steps I've detailed can help insure that as the presence of personal computers—and spreadsheets—grows, these tools will continue to make a positive contribution to business and to help eliminate unnecessary pitfalls.

Robert Freeman, a consultant in Mountain View, CA, writes frequently on personal computer topics. His articles have appeared in The Wall Street Journal, Computerworld, Input/Output, *and other publications.* //

COLLEGE CREDIT ON LINE

Graduate by baud rate!

by PAUL COHEN

Paul Cohen is a free-lance writer specializing in business and technology. He is former editor of Atari Connection *magazine.*

More than 100 years ago, the first correspondence schools brought the opportunities of an emerging industrial society to those who never had a chance to learn much academically. For people in remote locations, often bound to farms or factories, getting an education through the mail became a practical, if unglamorous, alternative to attending school full-time.

Today, as well, millions who would like to continue their schooling are stuck at desks or at home with day-to-day responsibilities. Although the problem is much the same, we have the advantage of twentieth century technology. Now, educators are using computers to reach people who want to learn in their own time and place.

A GROWING ONLINE SERVICE

Anyone with an Apple computer and modem can sign up for classes from one of several colleges around the country. These innovative programs allow you to master California cuisine, participate in business management seminars, or earn a fully accredited graduate or undergraduate degree. The concept was pioneered by the Electronic University (EU), a "university without walls" opened two years ago by San Francisco-based TeleLearning Systems, Inc. EU has designed a full curriculum to take advantage of the information processing power of the computer. At the heart of the program is an advanced telecommunications system that makes long distance learning personal and interactive.

Once you have purchased an Electronic University software package ($149.95 for Apple II+, IIe or IIc), you can consult with EU's counselors and enroll online in one of seven degree programs. EU will send your course material through the mail—a course diskette, containing a semester's worth of lessons and assignments, a study guide and course outline, and a list of required textbooks. You'll also be assigned an electronic mailbox to exchange messages with your instructor. Students progress at their own pace, one lesson at a time. EU also offers its own electronic library—a database of news reports, business abstracts, book index and complete encyclopedia—available on a cost-per-minute basis.

The disk-based courseware is designed as an "electronic blackboard," with on-screen diagrams and explanations. At the end of each lesson is an assignment for you to complete and save to disk; you send some of these assignments, along with any questions, to your instructor's electronic mailbox for review. In two or three days, you hear back from your instructor with answers, comments, evaluations and perhaps further reading or a revised assignment.

"The way you go about teaching via computer is very different from the way you teach in a classroom," says Dr. Tom Copley, a former Antioch College professor now developing and teaching business courses for the Electronic University. "In the classroom, you can prepare for a class the day or week before. Here you have to take the time to structure the entire course in advance. And it's interesting to see how people respond. I put a lot of time into responding to each student's work. It's possible to establish the kind of rapport you get with a pen pal."

School officials point out that the Electronic University itself does not issue degrees; it is essentially a network delivery system that allows students access to college-level instruction. You can, however, earn a degree from two fully accredited schools affiliated with EU. The four undergraduate degrees in arts or sciences are offered by Thomas A. Edison State College of Trenton, New Jersey; the three graduate MBA degrees are from the City University of Bellevue, Washington. As at any college, you pay for each course you take; a typical three-credit course costs $185 for undergrads, $285 for graduates. After completing your courses at home,

you take final exams designed and graded by the degree-giving school and administered in person at a local college. But you're not limited to degrees from Edison or City University. You can transfer credit from these schools to most other accredited institutions, or you can apply for credit at the college of your choice by using EU courses to prepare for the College Level Examination Program (CLEP). These standardized equivalency tests are accepted by 1800 colleges and universities for degree credit. Each EU credit course is designed around CLEP requirements. A wide range of noncredit self-improvement courses is also available.

USER-FRIENDLY SOFTWARE

TeleLearning considers the real breakthrough to be its powerful communications software. The menu-driven program allows for simple, single-keystroke commands and eliminates complicated log-on procedures by linking directly to local Tymnet or Telenet networks. So far 1,700 students have enrolled in the Electronic University, according to university president and TeleLearning chairman Ron Gordon. And since all members of a household have lifetime access to the system, there's no telling how many people actually use the network. "Our goal is to provide accredited college education to people who can't otherwise continue their education. Over the next three years, we hope to reach more than a million students all over the world and become the world's largest private teaching system," says Gordon. Meanwhile, TeleLearning is expanding in other directions. Pacific Bell and other corporations offering tuition-refund programs to employees attending school have arranged for EU to deliver its courses to employees' homes and offices. And, says Gordon, companies wanting to save the travel and expense of organizing training seminars around the country will provide new markets for the electronic educational network in the future.

THE IDEA CATCHES ON

Although TeleLearning is the only private company offering this kind of service, several schools and universities around the country are picking up on the idea. New York Institute of Technology (NYIT), a private, accredited school based in Old Westbury, New York, offers undergraduate degrees through its American Open University(AOU) program, designed to give high school graduates college credit for prior experience and training. AOU, located at NYIT's Central Islip campus, operates like many correspondence schools, sending course assignments through the mail. But in a program started last year, students can augment their course work with use of the school's computer teleconferencing system. Called Participate, AOU/NYIT's system allows 24-hour access; you can send and receive comments to and from the instructor and other students, contribute to an open online discussion, or use an electronic mailbox for personal dialogue with the instructor. "The system brings students an intimacy you don't get in a large lecture," says AOU provost Don McNeil. "Rather than being an inhumane machine, the computer becomes a tool for personal, one-on-one interaction." It costs $25 for six hours of connect time in addition to normal fees and tuition ($75 per credit for students outside the New York City area). Accessed through local Telenet networks, the Participate system is also available to special interest groups such as writers, physicians and professional organizations that want to open their own teleconferencing board. For more information online, you can log onto the system by dialing your local Telenet number and typing C [SPACE] 51630; use COLLEGE [RETURN] as your user name.

Personal computers are also an integral part of a degree program at Purdue University in West Lafayette, Indiana. For two years Purdue's Graduate School of Management has offered an Executive Education Program in which business people can earn a master's degree in management while on the job. Executives spend six weeks a year on campus, two weeks at a time. In between, they use computers at work or home to fulfill assignments, take tests and send or receive lessons and messages. Purdue also uses its telecommunication system in a special training program for General Electric executives.

Anyone with an Apple computer can sign up for classes from one of several colleges around the country.

Other schools are developing educational networks. John F. Kennedy University(JFK), an accredited adult-learning institution in the San Francisco Bay Area, is putting its curriculum online through TeleLearning's delivery system. Starting this spring with its graduate and undergraduate business programs, JFK hopes to expand its enrollment in distant Western communities. School president Donald J. MacIntyre hopes to take the Electronic University concept one step further. "We're looking for a way to get distant students into a campus setting at least once per quarter," he says, "either

continued on next page

through local businesses or community colleges. Direct, human interaction is very important."

Buffalo State College, part of the State University of New York, also plans to go online through the TeleLearning system this spring. The 9,000-student college is developing a program to transmit an English composition preparatory class to new students. Eventually, this course may be offered to all incoming freshmen prior to their arrival on campus, according to Dr. Robert Stephens, director of Lifelong Learning at Buffalo State. If all goes well in this year's pilot program, says Stephens, the school plans to expand its electronic curriculum next fall. In Alaska, where the public schools' 5,000 Apples give the school system the highest computer-to-student ratio in the nation (1/23), the University of Alaska is about to go online. By spring semester, students at remote locations who enroll at the Fairbanks campus will be using a statewide computer network—along with audio conferencing and written correspondence—to communicate with teachers and classmates in selected courses.

The Fulcrum Network, on the Telenet system, offers professional level, noncredit seminars in business systems and the social sciences. System operator Saul Eisen, of the Department of Management at Sonoma State University in Rohnert Park, California, describes Fulcrum as "a multidisciplinary, research and development network for developing human systems." Fulcrum seminars allow for computer conferencing and private messaging and cost about $125 per seminar. Eisen is also working on online credit courses he hopes will be offered by Sonoma State.

Meanwhile, schools such as Penn State, Ohio State and the universities of Maryland and Nebraska are considering similar programs. Dozens of other universities have on-campus systems or plans for systems to allow faculty and students to communicate by computer. Educators are moving beyond the rote drill-and-practice routines that characterize much computer-based learning as they discover the incredible potential of computers as a medium for interactive learning. //

SIGNING ON

The following institutions are offering degree programs using personal computers:

American Open University of the New York
Institute of Technology
Central Islip, NY 11722
800-222-6948

Electronic University
TeleLearning Systems, Inc.
505 Beach Street
San Francisco, CA 94133
800-22LEARN, or
800-44LEARN (in California)
(Contact EU for information regarding Thomas A. Edison State University and City University of Bellevue.)

John F. Kennedy University
12 Altarinda Road
Orinda, CA 94563
(415) 254-6960

Purdue University
Executive Education Program
Krannert Graduate School of Management
West Lafayette, IN 47907
(317) 494-4397

For information on noncredit seminars on the Fulcrum Network, contact:

Dr. Saul Eisen
Department of Management
Sonoma State University
Rohnert Park, CA 94928
(707) 664-2377 //

REVVING THE 1986 BANDWAGON TURBO AC II

by MARGOT COMSTOCK

Not even ten years have passed since Steve Wozniak put together the very first Apple II. The industry that has grown up supporting it and its successors has gone through just as many stages as a child of the same age. But, for the analogy to work, the child shall have to have been one of several centuries past; the mortality rate in the computer industry reflects more closely the infant mortality of the Dark Ages.

On the other hand, the incidence of brilliance, genius and astonishing progress also reflects better another time than our own: the Renaissance. The world of Apples abounds with "Renaissance people." Maybe that's why its programmers, publishers and manufacturers fascinate Apple owners. Or maybe having a touch of the Renaissance spirit in them is what moves people to choose Apples in the first place over IBMs and sundry other pepperoni-only machines.

EVERYTHING BUT ANCHOVIES

In fact, the world of Apples, its producers and consumers, is a very unique and special one. The industry was begun by pioneers: people who were not established leaders elsewhere, but who were often castoffs, malcontents and, well, misfits in the so-called normal world. Their focus was on the fun of what they were doing, the excitement of discovery, the amazement of success. Thoroughly thrilled with what they might just have accomplished, they nevertheless immediately began trying to do it ten times better. And achieved that too. They pushed their computers, they pushed their minds, they pushed their endurance.

The results were breakthroughs at an astounding pace. When the establishment finally took notice and tried to jump on the bandwagon, it found that the pioneers were constantly changing the model, and most of the otherwhere renowned newcomers eventually fell off.

A RUBBER TREE PLANT

The pioneers were falling off, too. Or at least dropping out. Many weren't too good at business or didn't care about money; others got greedy; and some simply hadn't the patience to perfect their products commercially, but preferred to go on to new challenges. It was called the Great Shakeout, and it made everything not quite as fun as it used to be.

But the survivors (and some of us casualties) are carefully picking up the best pieces and moving ahead. It won't be the same for the producers, but it will be good again. And it will be super for the consumers.

BUT NO WHIMPERS

Sotto Voce (which translates to "soft voice," or more roughly to—well, whatever) is simply a place to chat about what's happening in the Apple industry that's important to its future and, consequently, to Apple users; and what's just interesting—or heroic or funny or evil or exciting. It's a place to talk about what the movers and shakers are doing and the ideas they're toying with (next year's products?); a place to share anecdotes that amuse and delight; and to get into discussions such as what directions computers are going in the world, discussions that will come to life with your contributions as well as those of industry leaders.

LOOKING FOR THE WAY

Five years ago this month, *Softalk* said, "Look up from your monitor, look out from your software den and see the world that is welcoming your computer, that is growing and glowing and turning with your computer. And you were there first! So take up your mouse and lead the way." (well, the mouse-for-the-rest-of-us wasn't quite out yet. . . .) That short a time ago, having a personal computer was weird and somebody needed to light the way to general acceptance.

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Margot Comstock was cofounder and editor of Softalk. *It was great fun, but it was just one of those things.*

PRO FOOTBALL PROGNOSTICATOR

Beat the spread with your Apple

by DAVID COWLES and BILL MARQUARDT

Works with DOS 3.3 and ProDOS

When the Miami Dolphins met the San Francisco 49'ers in the Superbowl last January, the "Vegas line" favored the Niners by three points. This "spread" meant that an even-money bettor on the Dolphins would still win unless Miami were beaten by four points or more. Would you have taken that action? On which side?

Football Prognosticator picked San Francisco by eleven points, and the real final score was 38-16 Niners. If you had had Prognosticator working for you, you might have won a bundle. Over the season last year, Prognosticator beat the spread 65 percent of the time, and did even better late in the season.

Dave Cowles wrote the original version of this program for the IBM PC. It has been tested during the 1984 NFL season and the 1985 USFL season. The version published here for Apple II computers is set up for the 1985 NFL season. We don't guarantee the future accuracy of Prognosticator, but it's better than guessing.

There are two basic ground rules to keep in mind when comparing our spread to the Las Vegas line: **1)** Do *not* place any credence in the Prognosticator's results until at least four weeks of data have been gathered. **2)** Give yourself a "fudge factor" of, say, three points between the results of the program and the official line. In other words, if the program says Team A will beat Team B by 10 points but the line says Team A will beat Team B by only 6 points, go with Team A.

USING THE PROGRAM

It's easy to use the program. ProDOS users can type in and run the program listing as is. DOS 3.3 users need to type in the program as listed and verify with TYPO II, and then make these changes: in lines 2310, 4010 and 4370, any occurence of PRINT D$;"FRE" should be changed to X+FRE(0).

Once you have a working copy on disk, SAVE it as the only program on its own disk. This will be your working disk. Use the remainder of the disk to store the many files that the program calls for. Store your master copy in a safe place and back up your working disk every week so that you won't lose any weekly data files.

ITEM 1

Your daily newspaper carries all the data you need in the box scores. Make sure you get all the box scores; remember Monday nights and those games on special days.

RUN the program, select the Menu **Item 1**, and enter the data as prompted. You absolutely *must* have all the data the first week, but later in the season you have the option of entering a team's season averages when the real data is not available. Use this option only when necessary, or the validity of the statistics will suffer.

Each week you need to know yards gained rushing and passing, points scored, yards given up rushing and passing, and points given up by each team for each week of the season. During the playoffs, use the "unavailable this week" option for eliminated teams.

ITEM 2

Once you have entered data and saved it to disk, you can access the other menu items. To predict the outcome of the following week's games, select **Item 2** from the Main Menu. Use the space bar to cycle through the team names until you find one of two teams in a particular game. Type "S" to select the team, then repeat the process for the opponent. The expected results will be displayed on the screen.

You can predict only 14 games at a time, so if you want to "what if," you must go through the process

continued on next page

ILLUSTRATION ALAN OKAMOTO

again. You can print out the results any time after at least one game has been predicted, but you must do it before you leave this section of the program. After the fifth week of data has been entered, you have the choice of using either the entire season's averages or the averages of only the last four weeks. Use either or both, but the four-week moving average should be a bit more accurate late in the season, at least according to Dave.

ITEM 3

Item 3 allows you to call back data from any week already recorded, and to correct any bad data. The season totals will be adjusted automatically for you, but remember that the disk will spin for a long time if it is late in the season, because every week's data is being re-added.

ITEM 4

Item 4 is similar to Item 3, except that no revision is possible directly. Both Items 3 and 4 allow a printed report to be made.

You may use this program for the USFL simply by changing Line #5220 to reflect the correct number of teams (an even number), and by putting the team names in the Data statements at the end of the program. Team names are limited to twenty characters.

I believe the program is sufficiently error-protected and friendly so that you will encounter no problems. But one last disclaimer, please. This program is based on a statistics averaging method that has been successful, but there is no guarantee that it will work in any given contest.

David Cowles, a former president of a computer users' group, is a programmer for the IBM PC and Commodore machines.

Bill Marquardt works as an electronics technician for the U.S. Postal Service. His hobbies include personal computing, programming for the Atari and Apple and amateur radio work. //

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VISIBLE PASCAL

by DALE. A. ETHERIDGE

VISIBLE PASCAL; John Wiley & Sons, 605 3rd Ave., New York, NY 10158, (212) 850-6788; Requires Apple II Family, language card or equivalent needed for II and II+, 64K; $59.95.

Interpreted languages like BASIC have a major advantage for beginners: It is easy to test programs quickly in the programming environment in which they are written. Many educators have recommended Pascal as a beginner's language because its structured form encourages good programming concepts. However, the UCSD version of Pascal does not allow the easy-test capability. Charles Hughes and Michael Moshell of the Gentleware Corp. recognized this problem and set out to create an interpreter-based programming environment for beginers learning Pascal. On the whole with **Visible Pascal** they succeeded in producing a learning tool appropriate for students.

Since there are extensive color graphics, Apple //c users are at a slight disadvantage without a high resolution color monitor. Game paddles, or a joystick, are very desirable but not necessary. The Apple mouse is not supported.

Visible Pascal comes on two disks (three sides). The Manager Disk loads files necessary for the PASPAL Pascal interpreter. It contains sample programs and utilities. The second disk is the PASPAL user's disk. The Manager Disk is copy protected (it will back itself up once), but has routines for creating and copying the PASPAL disks. You must always start with the Manager Disk and then use the PASPAL disk from that point on. The PASPAL interpreter environment includes an easy to use editor similar to the UCSD editor.

A variety of execution modes facilitates learning. You can "walk" through a program slowly while the commands that you execute display at the bottom of the screen. The "visible" mode is the same but faster. This display, of course, is the first thing that makes this Pascal unique. Then, you can "fly" through the program without displaying the commands. Finally, there is an immediate execution mode that lets you test from the keyboard the effect of commands.

Visible Pascal features a well-written, 350 page programming tutorial on Pascal. The authors proclaim that the tutorial is designed for people, from age 10 and up, who are not technically inclined and who wish to learn the fundamentals of programming.

The tutorial itself will entertain you: It shows you how to set up a simple adventure game in which a knight jousts with a dragon. Extensive special procedures added to the Pascal language make graphics and animation easy. In fact, Visible Pascal comes with about fifty pieces of multi-colored art you can use in the software you program, another unique mark of Visible Pascal. These features are both the strong and weak points of the entire package.

The special PASPAL commands that make learning Pascal fun outnumber the real Pascal commands by nearly three to one. For the casual programmer this may not be a problem. But, for anyone using this as an introduction to extensive application of Pascal, the transition to UCSD Pascal may be traumatic. None of the PASPAL commands, procedures or programs can be transferred into the UCSD environment.

The final drawback, a minor one, is that PASPAL executes slowly. Although interpreters are generically slow, PASPAL is slower than most. For many applications this is not a problem. Eventually, however, most users will want to graduate into the UCSD environment where they can write programs that will run more rapidly.

In conclusion, for the price, this is a good way for anyone to learn fundamental programming in the Pascal language. Not only is the software well designed, but the documentation is entertaining and well-written for the beginner. For most people new to programming, the few limitations of Visible Pascal are not serious.

Dr. Etheridge teaches astronomy and computer science at Clark County Community College, N. Las Vegas, NV. He is the Coordinator for Computer Based Education for the College. //

Sneak Previews: Hardware

Z-RAM FOR THE IIc

by DeWITT ROBBELOTH, ***EDITOR***

"I thought the IIc was a closed system."

"Not if you've got a screwdriver." Dan Pote, president of Applied Engineering, was about to demonstrate the powers of his **Z-RAM** board for the Apple IIc computers.

"This adds half a megabyte of RAM to the 128K already there, plus a Z-80 co-processor so you can run CP/M. But the really wild thing is the way it soups up **AppleWorks**. Watch," he said.

INCREASED MEMORY

He booted his modified AppleWorks startup disk, and there it was, 413K available. "There are other products that will add RAM to the AppleWorks desktop but this is the only one that lets you use the RAM beyond the design limits of the program. That's because we got into the code and patched AppleWorks."

Specifically, the old limit of 1,350 database records is raised to 5,000, and the word processor limit of 2,250 lines per document also goes to 5,000. Spreadsheet cells are not increased, but the extra RAM makes more complex calculations possible. "We made it run faster too," Pote continued, "about 20 times faster in some respects, especially when climbing out from deep in the program."

It took a minute to sink in, but the man was saying that here is a match for the 640K IBM PC. More than a match, here is a friendly and handsome business machine that can run Wordstar, or Lotus 1-2-3, or dBASE II, or Microsoft BASIC, as well as its own excellent software.

Another advantage is that with Z-RAM you don't need an external disk drive. It acts as a RAM-disk with DOS, ProDOS or CP/M, and with AppleWorks it loads the whole program (except printer functions), eliminating most disk swapping chores. What if your file in RAM exceeds the capacity of a disk? Z-RAM divides the file into as many disks as needed and links them for you.

INSERTING THE BOARD

What unknown gremlins might lurk in the seldom trodden recesses of specialty boards? You can't tell just by looking.

continued on page 46

Sneak Previews: Software
FANTAVISION

by DeWITT ROBBELOTH, ***EDITOR***

Animation—to bring to life, to imbue with movement—is the fantasy of everyone who ever made a doll's limbs move or a toy truck race across the rug. Maybe it's the divine spark in us that wants to make our own creations move and act in the world.

Something of the sort must have motivated Scott Anderson to develop **Fantavision**, a full-featured animation program for Apple II computers, to be offered by Broderbund Software this October.

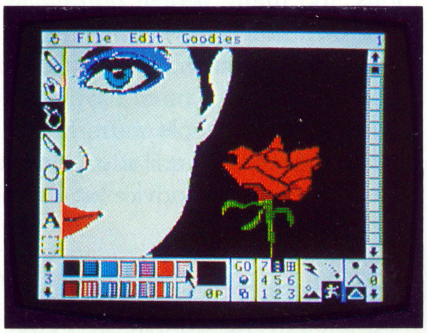
Scott demonstrated his almost-finished brainchild to ***II Computing*** at his home/workplace in the sun-baked hills north of San Francisco.

The program, after two and a half years of tenacious development, had just made its first public appearance at the Consumer Electronics Show in Chicago. There Scott showed off a small selection of Fantavision's tricks.

What can Fantavision do? Taken to the extreme, it can produce a cartoon movie of about an hour's length by linking "clips," each clip running for several minutes. Each clip can display eight animated objects superimposed on a background of your choice. The objects can be as simple as a geometric figure or as complex as an octopus and can appear in any of 56 colors.

The working area of Fantavision has a Macintosh look, with iconic commands and "pull down" menus. It works with a mouse, a joystick or a touch tablet. "Apple insisted that we use mouse-screens and be ProDOS compatible. That's one reason it took so long," Scott explained.

"It can accept as background any picture you can make with any Apple II hi-res art program. We decided to forgo double hi-res, so it only needs 64K to load and run. This keeps it accessible to virtually the entire spectrum of Apple II computers."



Nothing like Fantavision exists for any other home computer, mainly because of memory limitations, not to mention the programming problems. What's the secret? Scott, with a B.S. in physics and assisted by his math-major wife, Candice, has developed some extremely compact and effective algorithms. These allow the program to create "in-between cells" on the fly, so they don't have to be retained in memory.

Animation, whether on film or television, depends on presenting a series of static images, or cells, at such a fast rate that the eye cannot distinguish them individually. The brain merges the cells into an illusion of continuous action. TV presents about 30 frames per second. Scott designed Fantavision to produce anything from zero to 64 in-between cells for each "key" cell drawn by the human animator. This approximates the way commercial animation studios work. Keycell artists define the extremes of movement changes, and in-betweeners perform the drudgery of the transition cells. With Fantavision, your Apple is the drudge.

Actually, much commercial cartooning is now done with very expensive computers, and Broderbund considers Fantavision to be so good it intends to market a version to TV stations for special-effects work. Even on the Apple, the program is a powerful tool for the professional artist.

A full-length clip can have as many as 128 key cells. If the computer creates 64 in-between cells for each, the resulting 8,192 cells would play for four and a half minutes at TV speed. Normally, a clip would

continued on next page

not last so long nor have so many key frames. Scott estimates you get about a minute of display for 2K of data.

The nice thing is that each clip is on disk, so after a very short pause while it loads, the movie continues. The pause is short because of the special DOS, written by Ken Rosen, that Scott uses for the program. During the load, a creative user could display text to advance the story line.

"Our goal was to do real, full-screen animation of our favorite cartoon characters, not necessarily little rocket ships rushing around the screen," Scott said.

Among the demo clips Scott showed us was a Kermit the Frog that blinked its eyes and moved its mouth and arms. Another was an erupting volcano with lava spewing from the top and rolling down the side of the mountain. In another, a man caught a fish, then the fish caught the man. But the most impressive clip was a representation of a DNA strand as it rotated, unzipped, disintegrated, and recombined.

One special feature is that you can hook Fantavision up to a video cassette recorder via the Apple's RF output and tape your creations. It is even possible to overdub your VCR movies with cartoon images, but this requires a special interface board.

To show how easy the program is to use, Scott loaded a background picture of a pool ball, then drew eight key cells of a rudimentary rocket ship orbiting it in space. The process took about a minute. "This tool's so powerful, there's no telling what we'll see when people get their hands on it," Scott said.

"Our demos are nothing compared to the potential. I'd like to play with the program myself, but Broderbund won't let me. They are hiring artists to do the demos. They want me to program. The important thing is that this is an open-ended general purpose tool—visual silly putty."

Fantavision is not Scott Anderson's first commercial program. He wrote **Supermap**, published by Apple and later licensed to Softsmith, and **Datadex**, a database program published by Information Unlimited Software (now Sorcim IUS). How does he feel about programming as an occupation?

"It's a lot of work, and it takes a lot of time to get good work done. It's more perspiration than inspiration, but you are at home, you are your own boss. What you do is very creative—all your own work. For the renegade artist type of person that's just the thing, to have right here the means to produce and get something out to market, right from your own home.

"Fantavision is the kind of thing that could never have emerged from an office cubicle. Too many distractions, too many people putting in their own little pieces, until finally you have a pasteurized product. My product may have more flavor and character than people want, but at least it will be an individual one."

Does he have any advice for aspiring programmers?

"Find an honest company like Broderbund, and stick with them. And get a strong math background. It's nice to think you won't have to, but you will, to go beyond a certain point." For more information contact Broderbund Software, 17 Paul Drive, San Rafael, CA 94903, (415) 479-1170. //

Z-RAM FOR THE IIc
continued from page 44

"Does this board cause any incompatibility for any software the IIc could otherwise run?" I asked. "Absolutely not," Pote guaranteed. "It's 100% compatible with all IIc software and hardware including the mouse, second disk, modem and printer." For this I had to rely on the reputation Applied Engineering has earned over the past seven years.

The company makes boards for Apple II computers, and that's all it makes. These include RAMWORKS for the IIe (does the same as Z-RAM, but gives one megabyte of memory), an extended 80-column card, a Z-80 card, a clock card, a music synthesizer, and two analog/digital cards. Its commitment to Apple computers is total and fierce. "We've got to do a better job than our IBM counterparts, because their customers aren't as smart as our customers. After all, they bought the wrong computer," Pote declares.

He booted his modified AppleWorks startup disk, and there it was, 413K available.

The only drawback I see is installation. You must take your IIc apart to install the new board, and relocate two chips from the original one. This is not a difficult task, but it does void the warranty, and any kind of tinkering inside my computer makes me uncomfortable. Any competent computer serviceman can do the work quickly if you prefer.

The Z-RAM board comes in two memory sizes; 512K for $549, and 256K for $449 (upgradable). For more information contact Applied Engineering, P.O. Box 798, Carrollton, TX, 75006. //

THE SPELLER

by MARD NAMAN

THE SPELLER; Hayden Software Company, 600 Suffolk Street, Lowell, MA 01854, (800) 343-1218; Requires Apple II+ (with a language card), IIe, IIc, 64K; $49.95.

The Speller provides a valuable tool for writers: It helps you find and correct spelling errors in your documents. This being said, it is important to realize that The Speller is not a cure-all for those looking for an electronic copy editor and proofreader.

Perhaps it would be best to begin with what The Speller does *not* do. It cannot check for grammatical, syntax or word usage errors.

What The Speller does very well is to point out misspelled words and typos. It also gives you an exact word-count on your document. Here's how it works. The Speller maintains a primary dictionary with over 20,000 of the most commonly used English words. Unlike many other spelling checkers, The Speller includes several variations of words, i.e., open, opened, and will not attempt to create a word from a commonly used root. Words in your document are checked first against this primary dictionary.

The Speller considers words to be any series of two or more letters. Then, the program presents you with a list of "suspect" words: those not found in its dictionary. However, these words may not be misspelled. They are just not in the dictionary. If you don't know whether a word is spelled correctly or not, you're still going to have to look it up. The Speller asks you to either accept or replace the word with a new spelling (or, you can postpone action). If you do replace a word, you can save the corrected spelling on your original document.

You can review your suspect words either in context (where it scrolls your document and stops at each questionable word) or simply view them in lists. The latter method is, of course, much quicker.

What The Speller does very well is point out misspelled words and typos. It also gives you an exact word-count on your document.

The Speller's primary dictionary, by itself, is inadequate. In checking a recent document, I was told that the following words were suspect: limo, dwindling, outrageous, mall, stunning, mediocre, seventies, infestation and pasta. In other words, some pretty common words are suspect. This, however, presents no major problem. One of The Speller's best features is that it lets you build your own dictionary to complement The Speller's primary one (you cannot add words to the primary dictionary, a feature to prevent misspelled words from creeping in). You can also create individual dictionaries with the same names as particular files. This option is for saving words which apply only to one document or others like it. Now The Speller checks all words against both its primary and your personal dictionaries.

Normally, this cross-check of a 3,000 word file takes less than 60 seconds (you boot up The Speller disk and instruct it to check a certain file). But you must still go through the suspect words one by one, looking up any words you're not sure about. Give yourself half an hour for the job.

Another important limitation is that The Speller supports DOS 3.3 text files *only*. If you're using ProDOS files, you must convert them to DOS 3.3 before using The Speller. But all in all, The Speller is a handy tool. Even though you should still proofread your documents, The Speller will catch many errors you could easily overlook.

Mard Naman has a name only his mother spells correctly. He has added his name to his personal dictionary on The Speller. //

THE PRINT SHOP AND THE NEWSROOM

Dot-matrix printers come alive

by DEBORAH KOVACS

THE PRINT SHOP; Broderbund Software, 17 Paul Drive, San Rafael, CA 94903, (415)479-1170; Requires Apple II+, IIe, IIc, 48K, printer; $49.95; Print Shop Graphics Library, Disks 1 & 2, $24.95 each.

THE NEWSROOM, Springboard Software, Inc., 7807 Creekridge Circle, Minneapolis MN 55435, 1-800-328-1223 or (612)944-3912; Requires Apple II+, IIe, IIc, 64K, printer; $49.95.

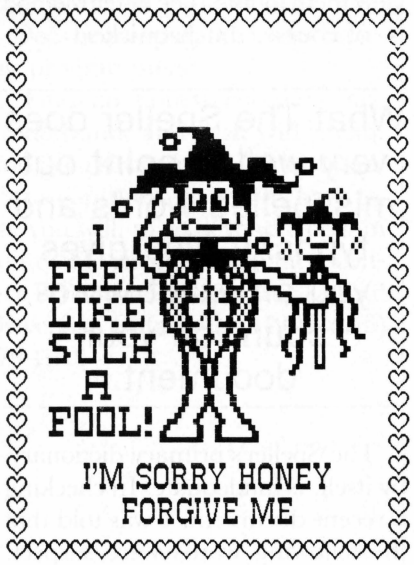
With the introduction of Apple's Macintosh computer and Imagewriter printer, a new universe of applications for dot-matrix printers was born. Apple showed that this kind of printer could output interesting and varied graphic images (remember the tennis shoe in the first Macintosh ads?). At the time, many users assumed that this type of fancy footwork was for Macintosh owners only.

Enter Broderbund. In June, 1984 they published **The Print Shop** for the Apple II family, an extremely simple and straightforward graphic-arts-studio and printing-press-on-a-disk.

A triumph of timing and design, The Print Shop has caught on—in a big way. Since its release, hundreds of thousands of copies have been sold, rapidly elevating it to the status of a software classic.

Another innovative program inspired by the dot-matrix printer renaissance is Springboard Software's **The Newsroom**, a program that lets you create your own newsletters and newspapers, complete with graphics and a variety of text fonts.

Both programs offer exciting creative opportunities, produce printed work with a finished, professional look, and are compatible with a surprising variety of dot-matrix printers. Which program is right for you? It depends on what you want to do.



PRINT SHOP

THE PRINT SHOP

The Print Shop is designed for any Apple II owner who would enjoy creating original greeting cards, banners, letterheads and signs resplendent with a variety of interesting and amusing graphics. A snap to learn, it demands neither artistic ability nor computer sophistication.

Clear and simple onscreen prompts abound, and the program's well-constructed error messages gently and clearly correct all user blunders. The program's documentation is thorough, complete and very well-organized.

The program offers a lot of variety. Many type styles and border designs, and a large number of pictures are on the disk. If you're an experienced Print Shop user and eager for additional graphics, it's possible (though a little slow-going) to create your own using the program's graphics editor. It's also possible to load in pictures created by other graphics programs. If you're STILL hungry for more, Broderbund has published two additional graphics libraries, each containing 120 pictures.

Purchasers of the program can make one legal back-up of the program, a sensible gesture on Broderbund's part.

Many users of the program have gone "Print Shop crazy," refusing to communicate with the outside world in any other way. For those so afflicted, there is actually a *Print Shop Users' Newsletter*, published quarterly, and sent free to owners of the program.

Some aspects of the program may frustrate you a bit. A rigidity to the way in which the page may be set up gives a certain sameness to the output. In addition, it's not possible to see a graphic rendering of what you're designing on the computer

screen—you have to print it out, instead.

PRINT SHOP

Those criticisms aside, The Print Shop is truly "a graphics utility for the rest of us," encouraging creativity and self-expression. If you run a small business, teach in a classroom or are involved in a community organization; whether you're a kid or you just feel like communicating with friends and family, you'll want to use this program over and over again.

THE NEWSROOM

Creating a newspaper is a task of no small proportion. You must create copy and edit it, then lay it out to fit in allowable space. Photos and illustrations have to be produced, selected and cropped. The whole product is then printed. Amazingly enough, there is now a single computer program you can use for all these tasks: The Newsroom.

Designed for anyone who has a need to publish a "semi-professional" newspaper, The Newsroom packs an astonishing variety of activities into one package, including a simple word processor, a graphics editor, a program that lays out the newspaper pages and, in an exciting and innovative twist, a "wire service," making it possible to send completed newspapers, via modem, to other owners of the program.

Like The Print Shop, The Newsroom comes with a very large graphics file, which you can use to illustrate the newspaper. You can modify the pictures with a fairly easy-to-use graphics editor and mix text and graphics at will on the newspaper page, allowing for designs both varied and flexible. Unlike The Print Shop, The Newsroom displays your stories onscreen as you create them.

The Newsroom is indispensable for preparing newsletters or simple newspapers on a regular basis. It may be most useful of all in classrooms, a fact supported by Springboard's recent decision to publish an educational edition of the program in conjunction with Scholastic Inc.

The immense flexibility of the program is not without some cost in frustration, unfortunately. Learning to use it is a challenge, and the program's confusing documentation doesn't help. Both onscreen and printed directions often leave you in a quandary. The printer I used was not on the list of compatible ones and I found no instructions on how to configure the program for my Okidata 192. (Presumably the new educational edition will improve that situation.)

NEWSROOM

There is a "hand" icon which moves illustrations around on the screen—extremely slowly when using the keyboard and erratically when using a Koala pad. You must do quite a bit of disk-swapping at the layout stage. In fact, there are four data disks you must deal with and swap at one time. It's very easy to get lost (and run the risk of losing data) amidst all the swaps. But these objections are surmountable, and the uniqueness and usability of the program make the effort well worthwhile.

NEWSROOM

When you think of the time and trouble it takes to prepare a newspaper or newsletter, the extra time it takes to master The Newsroom is a good investment. No other program performs so many tasks related to these activities so simply or so well.

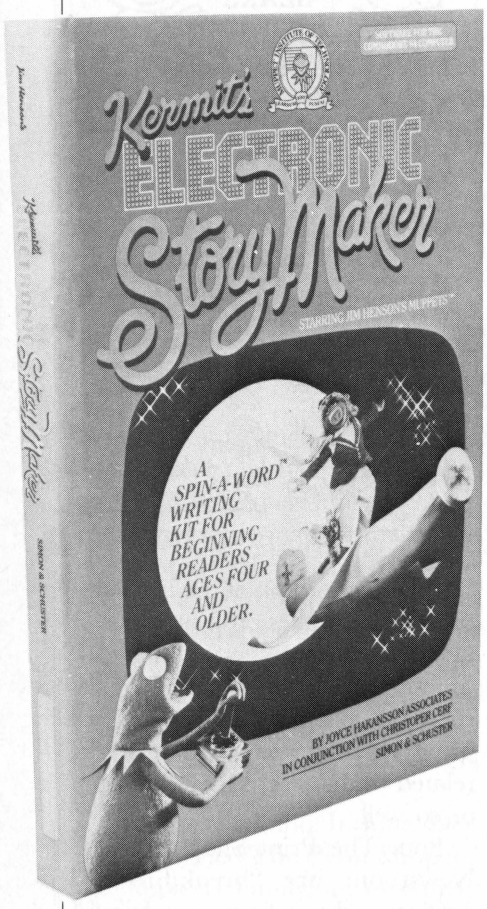
Both The Print Shop and The Newsroom are "breakthrough" products—they offer new and useful ways to use your computer. Their innovative qualities and inherent flexibility will make either one fun to own. Both have a place in any well-rounded software library, though choosing between one and the other depends on your specific needs.

Deborah Kovacs is a founder and former Creative Director of Scholastic Inc.'s software division. She now works as a software designer and freelance writer. //

KERMIT'S ELECTRONIC STORYMAKER

Muppets teach kids to write

by INA TABIBIAN



KERMIT'S ELECTRONIC STORYMAKER; by Joyce Hakansson Associates, Inc., published by Computer & Software Division, Simon & Schuster, Inc., 1230 Avenue of the Americas, NY, NY 10020; (212)245-6400; Requires 64K; $34.95; Ages 4 and older.

With this writing program, young children take control of a colorful, zany world where almost anything can happen. **Kermit's Electronic StoryMaker**, which features Jim Henson's Muppets, is designed to help beginning readers make the connection between words and concrete objects or actions; children can create stories and, with the delightful visuals this program provides, see the words come to life. Kermit's Electronic StoryMaker can provide a colorful entree to the word of stories, but may not live up to all of its educational goals.

HOW IT WORKS

A child can alter each sentence simply with the push of a button. For instance, a child can make Fozzie fly in a bathtub through the jungle.

With this writing program, young children take control of a colorful, zany world where almost anything can happen.

Then, with a push of a button it can be Gonzo who's flying. Appropriate sound effects accompany most actions. Children can change characters, settings and actions independently and as often as they like to create outlandish tales or perfectly simple ones.

The story screen contains four icons with which to animate the graphics, hear sound effects and get to the menu to save a story, start it from the beginning, and so on. An arrow, controlled by joystick or keyboard, allows the child to move from option to option and from word to word. Words appear in blanks above the icons. By pressing the joystick button children may scroll through a list of words for each blank until they reach the one they want to keep. A crisp, colorful graphic appears with each word. Wait till you see Fozzie bouncing in a banana, in the library of all places!

The program, packaged like a book, comes with a picture word dictionary that features every word and action within the program. Children will enjoy reading this colorful item and modeling some of their own sentences on it. However, some of the words in the dictionary aren't in the program. Program instructions are clearly written and easy to follow, but beginning readers will need help from parents.

EDUCATIONAL CONSIDERATIONS

As with any educational item, there are drawbacks to this program. There is no way to print out the story the child has created. In addition, children may ignore the words they generate by randomly pushing buttons and simply concentrate on the animation. It would be great if a voice read each word as it appeared (the technology isn't affordable yet) to direct the child's attention more to reading and writing and less to manipulating buttons. *(See the Christopher Cerf profile on page 11—*

EDITOR.) Another flaw is the ease with which you can lose a partially completed sentence if you accidentally backspace to a previous screen before completing the present one.

The lack of an automatic carriage return for two-line sentences is another problem: the young writer might get the impression that you must write backwards. When you drop down to the second line, you must either write the word on the far right first or proceed backwards through the flashing blanks to the proper starting place on the left.

The program, packaged like a book, comes with a picture word dictionary that features every word and action within the program.

The note to parents is misleading; non-readers will not necessarily learn to write or read with The Story-Maker. The potential for trial-and-error learning strategy here, which is often useful in many situations, will probably not help beginners strengthen writing and reading skills.

The program, however, does introduce children to numerous words most engagingly and provides them with an introduction to how stories are made.

Ina Tabibian is Editorial Director for Fearon Teacher Aids, a division of David S. Lake Publishers. She is responsible for the publication of educational materials for students in grades pre-k through 6. //

BEST SELLER CHARTS

TOP SOFTWARE

A List of Favorites

by MICHAEL CIRAOLO

"Best sellers" interest everyone. The willingness of other people to spend their money seems to be a criterion of quality that many of us respect, and often it proves reliable. ***II Computing*** will regularly present a list of best selling software for Apple II computers, a compilation of information supplied by IMS America's "National Computer Retail Report."

However, this first list goes beyond current best sellers to include favorite past titles as well. Using *Billboard's* "weeks on the charts" information and other research, I devised a special formula that takes into account the nature of the large IMS list, the market share Apple commanded six months ago, Apple's market share now (projected), and the number of Apple II computers in use.

The result is not a current best-seller list, nor is it an all-time best-seller list. It is a list of what appears to be the overall top Apple II software. I did not list language software due to insufficient information. If all categories were considered together, the top four would be: Home Accountant, Visicalc, Applewriter, and Zork.

GAMES

1. Zork I (Infocom)
2. Sargon III (Hayden)
3. Wizardry (Sir-Tech)
4. Zaxxon (Datasoft)
5. Ultima III (Origins)
6. Hitchhiker's Guide to Galaxy (Infocom)
7. Choplifter (Broderbund)
8. Ghostbusters (Activision)
9. Flight Simulator II (Sublogic)
10. PacMan (Atarisoft)

EDUCATION

1. Typing Tutor III (Simon & Schuster)
2. Math Blaster (Davidson)
3. Music Construction Set (Electronic Arts)
4. Apple Educational Classics (Apple)
5. Applesoft Tutorial (Apple)
6. Early Games (Springboard)
7. Mastertype (Scarborough)
8. Muppet Learning Keys (Koala)
9. Rocky's Boots (Learning Co.)
10. Stickybear Software (Xerox)

OTHER APPLICATIONS

1. Home Accountant (Continental)
2. Visicalc (Paladin)
3. Applewriter I & II (Apple)
4. PFS: File (Software Publishers)
5. PFS: Write (Software Publishers)
6. Dollars & Sense (Tronix/Monogram)
7. Print Shop (Broderbund)
8. Bank Street Writer (Broderbund)
9. AppleWorks (Apple)
10. ASCII Express Prof. (Roger Wagner)

Michael Ciraolo is a frequent writer on computer topics and works for The Yankee Group, a high-tech research firm. //

TYPO II (TYPE YOUR PROGRAM ONCE)

Nothing is more frustrating than typing in a long program, only to find it doesn't work. At ***II Computing*** we are careful to test each program listing before publication, and all listings are computer generated, so they should be accurate.

Therefore, if your typed-in program doesn't work, you probably made a typing error. Fortunately, if you use TYPO II, it's easy to find and fix most of those mistakes.

TYPO II is a program that verifies your typing accuracy after you enter BASIC listings from our magazine. TYPO is an acronym for "Type Your Program Once." We will use this program to help you with BASIC listings in all future issues of ***II Computing***.

With TYPO II, you have two ways to check your work. (1) It generates a two-letter code for each program line. This protects against misstrikes, transpositions, dropouts and extra characters. (2) It generates a total checksum for the whole program that requires all lines to be correct and in the correct order.

```
PROGRAM: SAMPLE CODES

CODE LINE#    CODE LINE#    CODE LINE#

 SI  10        SF  40        SH  70
 MS  20        GV  50        DS  80
 RA  30        SI  60        NV  90

TOTAL CHECKSUM = 315162
```

When you use TYPO II on your program, you should get the same line codes and checksum that appear for that program in the magazine. If you don't, there is a typing error in the line or lines where your codes and ours do not agree.

IMPORTANT: TYPO II works with Applesoft BASIC running with DOS 3.3 or ProDOS. It does not work with Integer BASIC. Correct spacing is very important. Applesoft automatically inserts one space after each REM or DATA command, so keep this in mind when entering your lines. Check spacing first when lines codes do not agree.

HERE'S WHAT YOU DO

1. Load DOS 3.3 or ProDOS into memory, then insert a formatted disk in your disk drive.

2. When you see the symbol], you are in Applesoft BASIC. Proceed to type in the TYPO II MAKER program from this magazine (see listing). You only need to do this once; thereafter you load TYPO II from your disk. Note: ProDOS does not permit spaces in file names, so enter TYPO II as TYPOII, and TYPO II MAKER as TYPOII.MAKER.

3. Verify this program carefully the old way. It is possible to use TYPO II to check itself, but this would cause more problems than it's worth.

4. Now, run the TYPOII.MAKER program. This saves a text "command" file named TYPOII on your disk. Your Apple executes this command file just as if you entered it from your keyboard. Also, the "maker" program creates a binary file for its assembly language routine. For protection, make an extra copy on a different formatted disk by running TYPOII.MAKER again.

5. Type in any BASIC program from our magazine, including spaces as indicated and complete REM statements for all lines requiring them.

6. Remember: Always save your typed-in program to disk before you run it. This backup file helps protect you against mistakes, power loss, misunderstood instructions, computer lockup, and so on.

7. Then type EXEC TYPOII (return). You have now loaded the TYPOII command file from disk. The letter codes are displayed vertically on the screen next to their corresponding line numbers. You can see them again by typing the command RUN 63000 (return). To pause and restart display, type (control)-S simultaneously.

8. Compare your line codes and checksum to those in the magazine. If your line code is different from the code in the magazine, you have made a typing error on that line. The final checksum will not agree until every line code in the program matches those printed. There is a remote possibility that all line codes will agree, but the final checksum will not. This can happen when errors occur in a line that generates the same letter codes as the correct line, and the two errors cancel each other out.

9. To correct a specific line, type LIST (line number) (return). You can then edit and correct that line. Occasionally, the line may appear to be absolutely correct, but the line codes will not agree. This is probably due to typing a control character that does not appear on the screen. Retype the entire line and try again. When you have made all corrections, type RUN 63000 (return).

10. Repeat the process of comparing and correcting until all the codes and checksums agree.

11. Delete TYPOII from your now corrected program with the command DEL 63000,63150 (return).

12. SAVE your program to disk, and delete the uncorrected backup file from your disk.

To use TYPO II with subsequent programs, call TYPO II from disk after typing in your program by entering the command EXEC TYPOII (return). This appends TYPO II to your program and runs it on all program lines lower than 63000.

Listing on page 59

LADYBUG

An easy-to-use drawing program

by STEVE KOEPKE

Works with DOS 3.3 and ProDOS

Ladybug, an inexpensive drawing program (you bought it when you bought this magazine!), can introduce some youngsters to computer graphics. It also provides others who already know they like electronic drawing with a means to more creative expression.

This easy, colorful program lets children doodle, sketch and draw pictures on a computer monitor. A color monitor is best, but the program will work in monochrome too. Ladybug draws lines in three widths and can change those lines into six different colors. Children aged four and up can enjoy this; a lot of fine motor coordination is not required. Yet more skilled "artists" may come up with some intriguing designs.

With Ladybug, you can find out how well your kids take to graphics without making a $30-plus investment. If Ladybug creates a spark, you can then explore (and feel comfortable buying) the many advanced graphics programs on the market.

This easy, colorful program lets children doodle, sketch and draw pictures on your computer monitor.

An additional bonus for you is that the program itself is fairly simple; if your children—or you—are interested in learning to program, Ladybug offers a BASIC listing that can immediately involve you in the programming process. An analysis of the listing follows. you will find the listing itself on page 75 in our special listings section.

HOW TO GET LADYBUG READY:

1. Type in program.
2. After the program is SAVEd to disk, type the command RUN LADYBUG.
3. A ladybug appears in the middle of the screen. You guide the ladybug to draw.
4. You can operate this program with either joystick or keyboard, or both. FOR JOYSTICK: Draw lines by moving the joystick. Change the color of the lines by pressing button "0" (the side button). The screen border changes immediately to let you know what color you are now using. When you get to a black, or invisible border, you are in Erase mode. Any previously drawn line that Ladybug crosses is erased. To change the width of the line, press button "1." FOR KEYBOARD: The arrow keys move the ladybug so that she can draw lines. The space bar changes the colors. The " - " key changes the width.
5. To erase everything, press the Return key.
6. Press the Escape key to exit Ladybug.

TYPING IN LADYBUG

If you are typing in Ladybug, here is some information that explains the programming features.

Variables used in Ladybug:

C	= color being drawn
I	= used for reading keyboard, also as a local variable (FOR/NEXT loops, etc.)
PAUSE	= used in delay loop
RT	= rotation direction, used in drawing shapes
SHP	= shape number used for different line widths, also for POKEing data into memory.
X	= Ladybug's horizontal position
XPS	= joystick horizontal reading
Y	= Ladybug's vertical position

continued on next page

Steve Koepke is a 6502 programmer and frequent contributor to computer magazines.

YPS = joystick vertical reading Line by line description:

70 Sets up for drawing first shapes, initiates variable.

80 Draws initial Ladybug shape (shape 1) and antenna (shape 3). Shapes are XDRAWn so that the picture under its path is not erased.

90 PEEKing-16384 will give you the numeric value of the last key pressed on the keyboard. You must always reset this location by either POKEing or PEEKing locations-16368. A 141 means the Return key was pressed.

100 A 151 is the value for (escape). This exits the program.

110 MODE is set to 1 if either a joystick or paddle is hooked up to your computer. If you do not have this hookup, MODE equals 0. (See lines 230-240.) Using MODE this way is a little faster than using "IF MODE = 1 THEN."

120-150 These lines are the heart of the Ladybug program. Each line is basically the same, except that each is for a different direction or movement. The first two statements in each line inside the parentheses check to see if either the keyboard or joystick indicates a movement request. The next statement ensures that if the ladybug is moved, it stays inside the screen boundaries.

continued on next page

SPECIAL ACTIVITY JUST FOR KIDS

Ladybug, ladybug fly away home. Your house is on fire and your children may burn . . .

Quick! Can you save Ladybug's house by drawing it with a pail of water next to it? Actually, Ladybug herself can help you.

You see, this ladybug can draw. She draws lines—skinny lines, not-so-skinny ones and fat ones. And she can make those lines change colors — six times. But, it is up to you to turn those lines into real pictures. She *cannot* draw curves, though.

1. Get Ladybug ready (Your mom or dad may help).

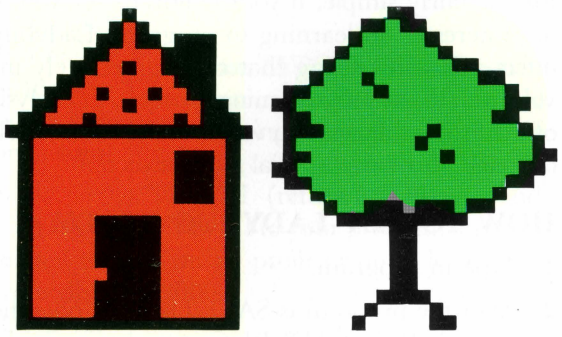
2. Is there a ladybug on the screen in front of you? If so, you are ready to go!

3. Move the joystick or the ↑ and ↓ keys. Watch Ladybug draw lines. But remember, you are the one telling her what to do.

4. Want to make a line thinner or fatter? Press the " - " key or the top button on your joystick.

5. Feel like changing colors? Press the space bar or the side button. The border around Ladybug lets you know what color the lines will be. Did the line disappear? Don't worry. That just means Ladybug erases anything she touches.

6. Here are some things you can try to draw.// **-AM**



Next, the antennae are erased (shape 3), and the ROT value is changed (ROTation controls which direction the shape is facing). Shape 2 is then drawn over the present ladybug image. Shape 2 draws a new front on the ladybug and erases the very back end. The middle is left the same, thus giving a smoother animation effect. Finally, the antennae are redrawn.

160 Draws on the screen in color C, the variable SHP controls line width.

170 Checks to see if joystick button 1 or the " - " key was pressed; if so, SHP is changed.

180 If joystick button 0 was not pressed, or if the joystick is not connected, and if the space bar was not pressed, then the color change routine in 190-220 is skipped.

190 Cycles through the six available colors.

200 The ladybug is XDRAWn as it moves, which prevents the picture underneath it from being erased. The problem with this is that the color drawn in line 160 is not the color that will show up after the ladybug moves on (XDRAWs over it). Line 200 adjusts C so that when the border is redrawn in line 210, it matches the color behind the ladybug.

210 Redraws the screen border.

230-240 If a joystick or paddle is present, the variable MODE is set to equal 1. If they are not present, MODE defaults to 0.

250-500 Sets up the shape table data. See the AppleSoft Reference Manual for more information on shape tables. //

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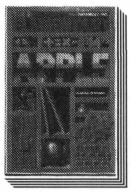
games that will entertain and intrigue you – and soon – productivity software that will aid you in completing most any task! Whatever you need, Datamost has the answer!

COMPUTER BOOKS



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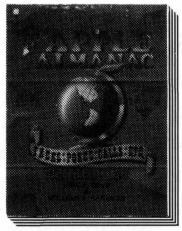

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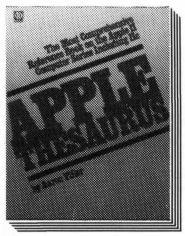

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This 900 page compendium examines the Apple from every angle possible from the Apple I to the Apple //c. Find out just what can be done with your Apple from the complete discussion of available hardware and applications. Includes interviews with Steve Wozniak and John Sculley $29.95

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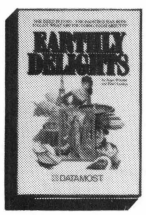

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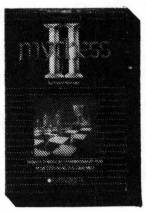

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COMPUTER FRONTIERS

TO BOLDLY GO
continued from page 15

Now, let me give you a preview of a few topics you can expect to read about in future installments of this column. Imagine your car equipped with a hi-res map that shows the best route to your destination and that will locate your car within 50 feet. It's coming, and soon. We will bring you at least part of the story. The device may be available by the time you read this; in fact, GM just purchased exclusive North American rights in the company, ETAK.

Or, plug your Apple into a compact laser disk and access a 20-volume set of encyclopedias. I have already seen this product and felt as if I had touched the future. That company is called Activenture, and you can bet I will be bringing you that story.

And learn about a true expert system for doctors, called MYCIN. This is a program that gives expert medical advice on specific infections. Most physicians would have to call in a specialist to get this type of opinion on drug dosage and differential diagnosis of patients presenting symptoms. This expert system, developed at Stanford, was tested in a double-blind study and it rated higher than trained humans in the accuracy and effectiveness of its diagnoses and prescriptions.

Here is a brief example of a doctor's interaction with MYCIN.

MYCIN: What is the infection?

Physician: Endarteritis (This is an inflammation of the inner layers of an artery and can be caused by a number of agents.)

MYCIN: Is organism-1 a rod or a coccus? (This question will narrow the range of possible agents for the disease.)

Physician: Rod.

MYCIN then asks additional questions about laboratory test results to help determine what organisms might be causing the disease. When it has reached its conclusions, it will recommend a particular drug therapy to combat the organism or organisms involved. So that the physician will trust MYCIN's conclusions, the program is designed to answer questions about its reasoning. For example:

Physician: How did you decide that organism-1 is E. Coli?

MYCIN: I used rule 084 to conclude that organism-1 is E.Coli. This gave a cumulative certainty factor of 0.51. (The physician can question further, either by looking at the text of the rule involved, or by questioning its antecedents.)

I hope I have helped put back some of that excitement you felt when you first bought your computer. It is the stuff of fantasy, but real.

Join me, let me know what you think—The voyage has begun. //

SOTTO VOCE

REVVING THE 1986 BANDWAGON TURBO ACII
continued from page 39

Today, it's perfectly normal to own a computer. But now we're the veterans; we still must lead. People who choose Apples seem to be that kind of people. Maybe we have just enough of Horatio Alger's Mark the Matchboy in us that we can't turn our backs on the wonder of Woz.

A long time ago, Diane Ascher, of Island Graphics, was asked what it was that gave the Apple industry and Apple people such a special feeling for each other and for their work. After a moment Ascher replied, "I think it's that we were here before IBM."

DEFENDING THE UNCARVED BLOCK

A very popular question of computer owners in the early days was, Why did you buy a computer? Many people accepted the implication that they should have a reason; the most popular answer was, for my children's education. But I always said (with a nod to a rather obscure Everest not near), because it was there. And that's the truth—for a lot of us. Because it's fun, because we like it, because we sense

They pushed their computers, they pushed their minds, they pushed their endurance.

an enormous good to come of it; and the only sanction we need is that of our own vision.

In Sotto Voce, we'll keep tabs on each other and encourage one another, with just enough irreverence to keep in hand the Owls and Rabbits. //

SOFTWARE LIBRARY

***II Computing's** type-in listing section includes every full-length program from this issue. We've included them all together for your convenience. It will be easy for you to remove these pages and save them in a binder if you wish.*

NOTE: *If you have the Action Disk version of **II Computing,** you can use all these programs immediately. Just follow the instructions in the corresponding articles.*

TYPO II MAKER

Article on page 52

```
10 D$ =  CHR$ (4):F$ = "TYPOII"
20  FOR I = 0 TO 41: READ A: POKE
    768 + I,A: NEXT
30  PRINT D$;"BSAVE TYPOII.OBJ,A
    768,L42"
40  PRINT D$;"OPEN";F$: PRINT D$
    ;"WRITE";F$
50  PRINT "BLOAD TYPOII.OBJ"
60  LIST 63000,63150
70  PRINT "RUN 63000"
80  PRINT D$;"CLOSE";F$
90  END
100  DATA  160,1,132,30,164,30,1
    66,30,24,177,25,240,28,101
110  DATA  27,133,27,144,15,24,1
    65,28,105,1,133,28,144,6
120  DATA  165,29,105,0,133,29,2
    02,208,227,230,30,208,219,96

63000  REM  TYPO II
63010  REM  BY GERRY VILLAREAL
63020  REM  (C) 1985 ANTIC PUBLI
    SHING INC.
63030  REM  II COMPUTING
63040  TEXT : HOME : PRINT  SPC(
    11);"CODE     LINE NO.": POKE
    34,1
63050 CH = 0:C1 = 256:S =  PEEK
    (103) +  PEEK (104) * C1
63060 S1 = S + 3:N =  PEEK (S) +
     PEEK (S + 1) * C1
63070 LINE =  PEEK (S + 2) +  PEEK
    (S + 3) * C1
63080  IF LINE = 63000 THEN  PRINT
     SPC( 7);"TOTAL CHECKSUM = "
    ;CH: POKE 34,0: END
63090  POKE 25,S1 -  INT (S1 / C
    1) * C1: POKE 26,  INT (S1 /
    C1)
63100  POKE 27,0: POKE 28,0: POKE
    29,0: CALL 768
63110 LV =  PEEK (27) +  PEEK (2
    8) * C1 +  PEEK (29) * C1 ^
    2
63120 CODE = LV -  INT (LV / 676
    ) * 676
63130 HCODE =  INT (CODE / 26):L
    CODE = CODE - (HCODE * 26)
63140  PRINT  SPC( 12); CHR$ (HC
    ODE + 65); CHR$ (LCODE + 65)
    ; SPC( 8);LINE
63150 CH = CH + LV + LINE:S = N:
     GOTO 63060
```

TRACK HALLEY'S COMET

Article on page 16

```
10  REM  * HALLEY'S COMET
20  REM  * BY DONALD TATTERSFIEL
    D
30  REM  * (C) 1985 ANTIC PUBLIS
    HING INC.
40  REM  * II COMPUTING  VOL.1 N
    O.1
50  REM
60  TEXT : HOME
70  GOSUB 8000
80  PRINT "HALLEY'S COMET"
90  PRINT "ALTITUDE AND AZIMUTH"
    : PRINT
100  PRINT "BY DONALD TATTERSFIE
    LD": PRINT
110  PRINT "(C) 1985 ANTIC PUBLI
    SHING INC."
120  PRINT "II COMPUTING  VOL.1
    NO.1"
130  GOSUB 8000
140  DIM A(3),B(3),X(3),Y(3),Z(3
    ),JD(1)
150 PI = 3.141592654
160 COMCOL = 3: REM  WHITE
170 TAILCOL = 1: REM  GREEN
180 N$ = "NORTH":E$ = "EAST":S$ =
    "SOUTH":W$ = "WEST"
190 CC = 180 / PI
200  REM  * DATA FOR COMET *
210  READ AA,C,JD(1)
220  FOR I = 1 TO 3
230  READ A(I),B(I)
240  NEXT
250  REM  * DATA FOR SUN *
260  READ EE,RE,MA,RA,LO,RO,RB,R
    C,RD
270  REM  * DATA FOR OBSERVER *
280  INPUT "LATITUDE OF OBSERVER
    (DEG NORTH)? ";LA
290 LA = LA / CC
300  PRINT : PRINT "INPUT CALEND
    AR DATE": PRINT
```

continued on next page

```
310  INPUT "YEAR? ";Y
320  INPUT "MONTH (1 FOR JAN...1
    2 FOR DEC)? ";M
330  INPUT "DAY OF MONTH? ";J
340  INPUT "HOUR? ";H
350  INPUT "MINUTES? ";MM
360  GOSUB 8000
370 J = J + (H + MM / 60) / 24
380  IF M > 2 THEN 420
390 Y = Y - 1
400 JD = 365 * (Y + 1) +  INT (Y
     / 4) + 31 * (M - 1) -  INT
    (Y / 100) +  INT (Y / 400) +
    J
410  GOTO 430
420 JD = 365 * Y +  INT (Y / 4) +
    31 * (M - 1) -  INT (0.4 * (
    M - 1) + 2.7) -  INT (Y / 10
    0) +  INT (Y / 400) + J
430 JD = JD + 1721059.5
440  REM  * KK = GAUSSIAN CONSTA
    NT (AU, DAY UNITS) *
450 KK = 0.017202099
460  REM  * EO = OBLIQUITY OF EC
    LIPTIC *
470 EO = 23.44579
480 EO = EO / CC
490 N = KK / (AA ^ 1.5)
500 M = N * (JD - JD(1))
510 E = M
520 F = E - C *  SIN (E)
530 G =  ABS (M - F)
540  IF G < 0.0000001 THEN 580
550 H = (M - F) / (1 - C *  COS
    (E))
560 E = E + H
570  GOTO 520
580 R = AA * (1 - C *  COS (E))
590  PRINT "DISTANCE HALLEY/SUN
    (AU)",R
600  PRINT
610  FOR I = 1 TO 3
620 X(I) = A(I) * ( COS (E) - C)
     + B(I) *  SIN (E)
630  NEXT I
640 N = JD - 2451545.0
650 L = EE + RE * N
660  IF L < 0 THEN L = L + 360
670  IF L < 0 THEN 660
680 G = MA + RA * N
690  IF G < 0 THEN G = G + 360
700  IF G < 0 THEN 690
710 GZ = G / CC
720 LD = L + LO *  SIN (GZ) + RO
     *  SIN (2 * GZ)
730 R = RB + RC *  COS (GZ) + RD
     *  COS (2 * GZ)
740 LD = LD / CC
750 Y(1) = R *  COS (LD)
760 Y(2) = R *  COS (EO) *  SIN
    (LD)
770 Y(3) = R *  SIN (EO) *  SIN
    (LD)
780  FOR I = 1 TO 3
790 Z(I) = X(I) + Y(I)
800  NEXT I
810 RH =  SQR (Z(1) * Z(1) + Z(2
    ) * Z(2) + Z(3) * Z(3))
820  PRINT "DISTANCE COMET/EARTH
    (AU)",RH
830  GOSUB 8000
840  DEF  FN SN(U) =  ATN (U /  SQR
    ( - U * U + 1))
850  DEF  FN CN(U) =  -  ATN (U /
     SQR ( - U * U + 1)) + PI /
    2
860 DC =  FN SN(Z(3) / RH)
870 AC =  ATN (Z(2) / Z(1))
880  IF  SGN (Z(2)) = 1 AND  SGN
    (Z(1)) = 1 THEN AC = AC
890  IF  SGN (Z(2)) = 1 AND  SGN
    (Z(1)) =  - 1 THEN AC = AC +
    PI
900  IF  SGN (Z(2)) =  - 1 AND  SGN
    (Z(1)) =  - 1 THEN AC = AC +
    PI
910  IF  SGN (Z(2)) =  - 1 AND  SGN
    (Z(1)) = 1 THEN AC = AC + 2 *
    PI
920 P = DC * CC:Q = AC * CC
930  GOSUB 2000
940  PRINT "* FOR COMET *"
950  PRINT
960  GOSUB 5000
970  PRINT
980 GS = 100.5915 + 1.0027379093
     * (JD - 2446066.5) * 360
990  IF GS > 360 THEN GS = GS -
    360
1000  IF GS > 360 THEN 990
1010  IF GS < 0 THEN GS = GS + 3
    60
1020  IF GS < 0 THEN 1010
1030 LS = GS / CC
1040 D = DC:A = AC
1050  GOSUB 3000
1060 BC = B:ZC = AZ
1070  GOSUB 4000
1080 DS =  FN SN( SIN (EO) *  SIN
    (LD))
1090 AS =  ATN ( COS (EO) *  TAN
    (LD))
1100  IF AS > 0 AND LD < PI / 2 AND
    LD > 0 THEN AS = AS
1110  IF AS > 0 AND LD > PI AND
    LD < 3 * PI / 2 THEN AS = AS
     + PI
1120  IF AS < 0 AND LD > PI / 2 AND
    LD < PI THEN AS = AS + PI
1130  IF AS < 0 AND LD > 3 * PI /
    2 AND LD < 2 * PI THEN AS =
    AS + 2 * PI
1140 P = DS * CC:Q = AS * CC
1150  GOSUB 2000
1160  GOSUB 8000
1170  PRINT "* FOR SUN *"
1180  PRINT
1190  GOSUB 5000
```

```
1200  PRINT
1210 D = DS:A = AS
1220  GOSUB 3000
1230 BS = B:ZS = AZ
1240  GOSUB 4000
1250  GOSUB 8000
1260  INPUT "DO YOU WANT A PICTO
    RIAL DISPLAY?";Q$
1270  IF Q$ = "Y" THEN  HOME : VTAB
    23
1280  IF Q$ = "Y" THEN  GOSUB 60
    00
1290  PRINT
1300  VTAB 23: IF BS * CC >  - 1
    8 THEN  INVERSE : PRINT "SKY
     NOT DARK": NORMAL
1310  INPUT "ANOTHER OBSERVER?";
    Q$
1320  IF Q$ = "Y" THEN  HOME : TEXT

1330  IF Q$ = "Y" THEN 270
1340  INPUT "ANOTHER TIME?";Q$
1350  IF Q$ = "Y" THEN  HOME : TEXT

1360  IF Q$ = "Y" THEN 300
1370  TEXT : END
2000 Q = Q / 15:V =  INT (Q)
2010 Q = Q - V:Q = Q * 60
2020  IF P > 0 THEN W =  INT (P)

2030  IF P > 0 THEN 2080
2040  IF P < 0 THEN P = P + 1
2050 W =  INT (P)
2060  IF P < 0 THEN P =  - P + W
     + 1
2070  GOTO 2090
2080 P = P - W
2090 P = P * 60
2100  RETURN
3000 H = LS - A
3010  IF H < 0 THEN H = H + 2 *
    PI
3020 B =  FN SN( SIN (D) *  SIN
    (LA) +  COS (D) *  COS (LA) *
     COS (H))
3030 Z = ( SIN (D) -  SIN (LA) *
     SIN (B)) / ( COS (LA) *  COS
    (B))
3040 AZ =  FN CN(Z)
3050  IF  SIN (H) > 0 THEN AZ =
    2 * PI - AZ
3060  RETURN
4000  PRINT "ALTITUDE",B * CC
4010  PRINT
4020  PRINT "AZIMUTH",AZ * CC
4030  RETURN
5000  PRINT "RIGHT ASCENSION"
5010  PRINT V,"H"
5020  PRINT Q,"M"
5030  PRINT
5040  PRINT "DECLINATION"
5050  PRINT W,"DEG"
5060  PRINT P,"MIN"
5070  RETURN
```

```
6000 TH =  ATN ((BC - BS) / (ZC -
    ZS))
6010  IF BC > BS AND ZC < ZS THEN
    TH = TH + PI
6020  IF BC < BS AND ZC < ZS THEN
    TH = TH + PI
6030  HGR
6040  HCOLOR= 3
6050  HPLOT 0,0 TO 0,159
6060  HPLOT 0,159 TO 279,159
6070  GOSUB 9000: REM  COMPASS L
    ABEL
6080  IF ZC > PI / 2 THEN ZC = Z
    C - PI / 2
6090  IF ZC > PI / 2 THEN 6080
6100 FC = 279 * 2 / PI:GC = 159 *
    2 / PI
6110 X = FC * ZC:Y = GC * BC
6120 YT = 159 - Y
6130 TX = X + (50 / R) *  COS (T
    H):TY = 159 - Y - (50 / R) *
     SIN (TH)
6140  IF TX < 0 OR TX > 279 OR T
    Y < 0 OR TY > 159 THEN 6200
6150  HCOLOR= TAILCOL
6160  HPLOT X,YT TO TX,TY
6170  HCOLOR= COMCOL
6180  GOSUB 7000: REM  PLOT COME
    T
6190  RETURN
6200  PRINT "NOT VISIBLE AT THIS
     POINT AND TIME."
6210  RETURN
7000  REM  PLOT COMET
7010  FOR I = YT - 1 TO YT + 1
7020  HPLOT X - 2,I TO X + 2,I
7030  NEXT I
7040  FOR I = YT - 2 TO YT + 2 STEP
    4
7050  HPLOT X - 1,I TO X + 1,I
7060  NEXT I
7070  RETURN
8000  PRINT
8010  PRINT "==================
    ======"
8020  PRINT
8030  RETURN
9000  REM  COMPASS LABEL
9010  IF ZC >  = 0 AND ZC <  = P
    I / 2 THEN L$ = N$:R$ = E$
9020  IF ZC >  = PI / 2 AND ZC <
     = PI THEN L$ = E$:R$ = S$
9030  IF ZC >  = PI AND ZC <  =
    3 * PI / 2 THEN L$ = S$:R$ =
    W$
9040  IF ZC >  = 3 * PI / 2 AND
    ZC =  < 2 * PI THEN L$ = W$:
    R$ = N$
9050  VTAB 21
9060  PRINT  TAB( 1);L$; TAB( 40
     -  LEN (R$));R$
9070  RETURN
10000  DATA  17.981782,0.967329,
    2446470.9275
```

continued on next page

```
10010  DATA  9.97490763,-3.60475
    971,-14.9326595
10020  DATA  -2.31068276,-0.9281
    06335,-1.56502138
10030  DATA  280.460,0.9856474,3
    57.582,0.9856003
10040  DATA  1.915,0.020,1.00014
    ,-0.01671,-0.00014
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
LA	10	HV	280	DM	550
BR	20	LQ	290	IG	560
JZ	30	YN	300	XV	570
LR	40	CY	310	LH	580
GW	50	NA	320	VB	590
BE	60	OY	330	HE	600
HG	70	ZE	340	NA	610
AU	80	RW	350	ZJ	620
YS	90	HG	360	KQ	630
AF	100	GK	370	RE	640
DH	110	SC	380	UQ	650
CB	120	SB	390	AM	660
HG	130	EQ	400	IM	670
FZ	140	XW	410	IR	680
WQ	150	DW	420	XK	690
YT	160	LP	430	IX	700
SF	170	MA	440	ND	710
DP	180	UJ	450	SK	720
JR	190	FX	460	DR	730
JB	200	YM	470	ML	740
IK	210	OB	480	EW	750
NA	220	SW	490	GS	760
LF	230	LW	500	HD	770
FA	240	BO	510	NA	780
QU	250	VC	520	IQ	790
IO	260	MA	530	KQ	800
IA	270	IQ	540	KS	810
PR	820	ZH	1270	FP	6030
HG	830	HT	1280	JO	6040
SG	840	HE	1290	HF	6050
XD	850	LM	1300	SB	6060
RZ	860	FZ	1310	FS	6070
BY	870	SD	1320	VI	6080
TI	880	WJ	1330	CF	6090
SJ	890	YF	1340	DX	6100
ZZ	900	SD	1350	MG	6110
IC	910	UA	1360	QH	6120
BQ	920	YN	1370	BI	6130
GU	930	NK	2000	EE	6140
IO	940	NW	2010	BO	6150
HE	950	YT	2020	SU	6160
HA	960	KC	2030	FI	6170
HE	970	JE	2040	NI	6180
VE	980	WS	2050	GV	6190
YC	990	IO	2060	JI	6200
DA	1000	HZ	2070	GV	6210
IZ	1010	XZ	2080	KZ	7000
PS	1020	CW	2090	PI	7010
PS	1030	GV	2100	CL	7020
GD	1040	PZ	3000	KQ	7030
GW	1050	HN	3010	NZ	7040
EY	1060	BH	3020	BX	7050
GY	1070	XI	3030	KQ	7060
MR	1080	QV	3040	GV	7070
WP	1090	XH	3050	HE	8000
MI	1100	GV	3060	QF	8010
CW	1110	BE	4000	HE	8020
JU	1120	HE	4010	GV	8030
ME	1130	PY	4020	KS	9000
LM	1140	GV	4030	FV	9010
GU	1150	OU	5000	CI	9020
HG	1160	TU	5010	HO	9030
XR	1170	UJ	5020	UA	9040
HE	1180	HE	5030	PI	9050
HA	1190	VU	5040	JD	9060
HE	1200	ET	5050	GV	9070
OD	1210	IT	5060	AP	10000
GW	1220	GV	5070	IV	10010
KM	1230	AY	6000	JI	10020
GY	1240	QF	6010	EH	10030
HG	1250	QN	6020	UC	10040
CZ	1260				

Total checksum = 3906856

ECTO BLASTER

Article on page 23

```
10  REM  * ECTO BLASTER
20  REM  * BY STEPHAN SCHWIRZKE
30  REM  * (C) 1985 ANTIC PUBLIS
    HING INC.
40  REM  * II COMPUTING  VOL.1 N
    O.1
50  REM
60  CLEAR : RESTORE : HOME : NORMAL

70  HGR2 : HCOLOR= 4: HPLOT 1,1:
     CALL 62454: GOSUB 2000: XDRAW
    1 AT X,Y: GOTO 310
80  POKE 24655,XX * 50: POKE 247
    02,15: CALL 24650: SCALE= XX
    : XDRAW 5 AT X2 + 9,C: RETURN

90  FOR P = 1 TO N
100  IF A(P) = 0 THEN  NEXT : RETURN

110  IF X2 > H(J(P)) + G(P) THEN
```

```
    NEXT : RETURN
120  IF X2 + F < G(P) THEN  NEXT
    : RETURN
130  IF Y2 > I(J(P)) + U(P) THEN
    NEXT : RETURN
140  IF Y2 + F < U(P) THEN  NEXT
    : RETURN
150 D = D + 1: IF D = 2 THEN S4 =
    S4 + 5
160  IF D = 3 THEN N = 2::S4 = S
    4 + 5
170  IF D = 5 THEN S4 = S4 + 5:N
    = 3:L1 = 15:L2 = 45:L3 = 60
    :L4 = 75:L5 = 90
180  ROT= 1: SCALE= 1
190  XDRAW 4 AT 101 + ND,28:ND =
    ND + 8
200  POKE 228,RM(ND / 8): GOSUB
    2140
210 B = 8
220 B = B - 2
230  IF B = 0 AND B2 = 1 THEN A(
    P) = 0:B2 = 0: SCALE= Q(P): GOTO
    270
240  IF B = 0 THEN B2 = 1:B = 8:
    GOTO 220
250  SCALE= B
260  XDRAW 2 AT G(P),U(P): GOTO
    220
270  XDRAW 2 AT G(P),U(P): IF ND
    >  < 80 THEN  POKE 24655,50
    : POKE 24702,105: CALL 24650
    : NEXT : RETURN
280  FOR Z = 1 TO 10: POKE 228,Z
    : GOSUB 2140: POKE 24702,76 /
    Z: CALL 24650: NEXT
290  FOR Z = 1 TO 3: SCALE= Q(Z)
    : IF A(Z) = 1 THEN  XDRAW 2 AT
    G(Z),U(Z)
300  NEXT : POKE 228,255: GOSUB
    2140: GOTO 4050
310  FOR S = 1 TO N
320  IF  PEEK (PK) > T3 AND C =
    0 THEN X2 = X:Y2 = Y + 9:C =
    185:XX = 1
330  IF C - 30 <  = Y2 AND C > 0
    THEN XX = 3:C = Y2
340 Y1 = Y:X1 = X:V =  PDL (1)
350  IF C > 0 THEN  GOSUB 80
360  IF V > I AND Y < T1 THEN Y =
    Y + M
370  IF V < E AND Y > T THEN Y =
    Y - M
380 H =  PDL (0)
390  IF H > I AND X < T2 THEN X =
    X + M
400  IF H < E AND X > T THEN X =
    X - M
410  IF C > 0 THEN  GOSUB 80:C =
    C - 45: IF C = Y2 - 45 THEN
    GOSUB 90:C = 0
420  ROT= 1: SCALE= 1
430  XDRAW 1 AT X1,Y1: XDRAW 1 AT
    X,Y
440  IF A(S) = 0 THEN  GOSUB 100
    0
450  SCALE= Q(S): XDRAW 2 AT G(S
    ),U(S)
460 G(S) = G(S) + W(S): IF G(S) >
    J1 THEN W(S) =  - W(S):G(S) =
    J2:NG(S) =  - 1
470  IF G(S) < J3 THEN W(S) =  -
    W(S):G(S) = J4:NG(S) = 1
480  SCALE= J(S):Q(S) = J(S)
490  XDRAW 2 AT G(S),U(S)
500 L(S) = L(S) + DF
510  IF L(S) = L4 THEN J(S) = 5
520  IF L(S) > L5 THEN A(S) = 0:
    XDRAW 2 AT G(S),U(S): SCALE=
    1: POKE 24655,140: CALL 2465
    0: XDRAW 6 AT 100 + SE,180:S
    E = SE + 10: IF SE = 100 THEN
    4000
530  IF L(S) = L1 THEN J(S) = 2
540  IF L(S) = L2 THEN J(S) = 3:
    W(S) = W(S) + 10 * NG(S)
550  IF L(S) = L3 THEN J(S) = 4:
    W(S) = W(S) + 20 * NG(S)
560  NEXT : GOTO 310
1000  SCALE= 1: ROT= 1:RK =  INT
    ( RND (1) * 100) + 20:R1 =  INT
    ( RND (1) * 190) + 20
1010 H3 =  FRE (1)
1020 A(S) = 1: XDRAW 2 AT R1,RK:
    U(S) = RK:G(S) = R1:W(S) = S
    4:J(S) = 1:Q(S) = J(S)
1030 RK =  INT ( RND (1) * 20): IF
    RK > 10 THEN W(S) =  - W(S):
    NG(S) =  - 1
1040 NG(S) = 1:L(S) = 0
1050  RETURN
2000 X = 141:Y = 80:X1 = X:Y1 =
    Y
2010  HCOLOR= 3
2020  SCALE= 1: ROT= 1:M = 18:S4
    = 10:DF = 15:N = 1
2030 PK =  - 16287:F = 14:I = 20
    0:E = 100:T = 20: GOSUB 3000

2040 ND = 0:T3 = 127:T2 = 260:J1
    = 240:J2 = 205:J3 = 10:J4 =
    40
2050 T1 = 155:CL = 24576:IN = 24
    608:GP = 24609
2060 L1 = 30:L2 = 60:L3 = 90:L4 =
    120:L5 = 150
2070  HPLOT 101,40 TO 175,40: HCOLOR=
    7: HPLOT 137,15 TO 137,0: HCOLOR=
    6: HPLOT 101,40 TO 137,15 TO
    175,40: HCOLOR= 3
2080  FOR Z = 1 TO 80 STEP 8
2090  DRAW 3 AT 101 + Z,40
2100  DRAW 4 AT 101 + Z,40
2110  NEXT
2120  HCOLOR= 7
2130  POKE 228,128
2140  HPLOT 2,1 TO 278,1 TO 278,
    191 TO 2,191 TO 2,1
```

continued on next page

```
2150  HPLOT 100,70 TO 178,70 TO
    178,121 TO 100,121 TO 100,70

2160  HPLOT 2,1 TO 100,70: HPLOT
    278,1 TO 178,70: HPLOT 278,1
    91 TO 178,121: HPLOT 2,191 TO
    100,121
2170  HPLOT 30,60 TO 60,75 TO 60
    ,95 TO 30,110 TO 30,60
2180  HPLOT 140,121 TO 140,101 TO
    152,101 TO 152,121
2190  RETURN
3000  FOR Z = 1 TO 5
3010  READ H(Z),I(Z): NEXT
3020  FOR Z = 1 TO 10: READ RM(Z
    ): NEXT
3030  FOR Z = 0 TO 51: READ S
3040  POKE 24650 + Z,S: NEXT
3050  DATA  10,11,15,20,20,29,30
    ,45,39,55,129,137,139,160,14
    1,156
3060  DATA  157,197,253,255,173,
    126,96,24,105,140,141,127,96
    ,44,48,192
3070  DATA  173,126,96,72,206,12
    6,96,208,251,104,141,126,96,
    44,48,192
3080  DATA  173,127,96,72,206,12
    7,96,208,251,104,141,127,96,
    206,126,96
3090  DATA  240,5,76,74,96,208,2
    14,96
3100  REM  SHAPE TABLES
3110  POKE 232,0: POKE 233,3
3120  FOR Z = 0 TO 159: READ S
3130  POKE 768 + Z,S: NEXT
3140  RETURN
3150  DATA  6,0,14,0,57,0,94,0,1
    06,0,112,0,136,0,146,146,18,
    36,76,104
3160  DATA  64,3,13,104,141,86,1
    13,17,54,215,250,18,159,31,3
    1,128,31,64,3,13
3170  DATA  108,108,108,108,31,2
    48,250,250,250,106,73,64,24,
    72,73,4,0,73,169,255
3180  DATA  31,110,45,45,77,62,3
    1,31,31,119,45,45,45,53,255,
    219,247,205,109,105
3190  DATA  245,63,63,63,175,41,
    13,53,255,191,77,73,4,0,35,3
    6,36,36,5,168
3200  DATA  54,54,54,38,0,49,85,
    62,30,220,36,0,35,44,54,5,32
    ,216,11,23
3210  DATA  54,14,7,192,77,64,15
    0,34,216,27,64,3,150,34,0,64
    ,24,24,45,173
3220  DATA  246,190,63,28,92,28,
    100,54,13,108,62,31,86,3,104
    ,30,64,24,144,0
4000  HGR : XDRAW 6 AT 140,1
4010  FOR Z = 1 TO 150 STEP 2
4020  XDRAW 6 AT 140,Z
4030  XDRAW 6 AT 140,Z + 2: FOR
    F = 1 TO 18: NEXT : NEXT
4040  POKE 24655,200: CALL 24650
    : VTAB (21): HTAB (17): PRINT
    "YOU LOSE"
4050  IF  PEEK ( - 16287) > 127 THEN
    GOTO 60
4060  GOTO 4050
```

KEYBOARD ROUTINE

```
320 K1 =  PEEK ( - 16384): POKE
    - 16368,0
330  IF K1 = 160 AND C = 0 THEN
    X2 = X:Y2 = Y + 9:C = 185:XX
    = 1:K1 = 0
340  IF C - 30 <  = Y2 AND C > 0
    THEN XX = 3:C = Y2
350 Y1 = Y:X1 = X
360  IF C > 0 THEN  GOSUB 80
370  IF K1 = 205 AND Y < T1 THEN
    Y = Y + M
380  IF K1 = 201 AND Y > T THEN
    Y = Y - M
390  IF K1 = 203 AND X < T2 THEN
    X = X + M
400  IF K1 = 202 AND X > T THEN
    X = X - M
4050  GET A$: GOTO 60
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
GJ	10	ZA	210	OO	410
HA	20	OS	220	XH	420
JZ	30	JW	230	WM	430
LR	40	TH	240	SK	440
GW	50	KZ	250	PN	450
VL	60	NQ	260	UB	460
TV	70	ZL	270	LR	470
HF	80	ZM	280	BJ	480
TU	90	KQ	290	LN	490
NX	100	IJ	300	HY	500
EP	110	UA	310	UW	510
LU	120	AS	320	HR	520
NZ	130	UZ	330	SF	530
PQ	140	BT	340	BI	540
RJ	150	VG	350	DG	550
KT	160	PC	360	FO	560
TU	170	QR	370	HG	1000
XH	180	QO	380	PR	1010
XK	190	NF	390	DO	1020
RV	200	ON	400	QA	1030

```
AJ  1040    FA  2080    EE  2180
GV  1050    PN  2090    GV  2190
CJ  2000    PP  2100    OU  3000
JO  2010    FA  2110    FQ  3010
BI  2020    JW  2120    QM  3020
LX  2030    XV  2130    UI  3030
NM  2040    UF  2140    ZU  3040
MH  2050    PX  2150    VT  3050
YI  2060    CS  2160    VU  3060
RH  2070    EU  2170    LN  3070

WY  3080    JS  3150    EP  3220
GF  3090    MG  3160    RP  4000
ZQ  3100    ZG  3170    BA  4010
MY  3110    TK  3180    WU  4020
WQ  3120    BG  3190    BK  4030
KX  3130    HO  3200    ZU  4040
GV  3140    VB  3210    AQ  4050
                        HN  4060

Total checksum = 4142736
```

HI-RES LABELER

Article on page 30

```
10  REM  * HI-RES LABELER
20  REM  * BY WILLIAM V.R. SMITH

30  REM  * ENHANCED BY S.R. KOEP
    KE
40  REM  * (C) 1985 ANTIC PUBLIS
    HING INC.
50  REM  * II COMPUTING  VOL.1 N
    O.1
60  REM
70  GOSUB 1060
80  GOSUB 1120: PRINT "L = LOAD
    A PICTURE   S = SAVE A PICTU
    RE"
90  PRINT "M = MAKE A LABEL
    Q = QUIT TO BASIC"
100  VTAB 24: HTAB 20: GET A$
110  IF A$ = "L" THEN 160
120  IF A$ = "S" THEN 210
130  IF A$ = "M" THEN 300
140  IF A$ = "Q" THEN  TEXT : HOME
    : END
150  GOTO 80
160  TEXT : HOME : REM  LOAD PIC
    TURE
170  GOSUB 250
180  POKE 49232,0: POKE 49234,0
190  PRINT D$;"BLOAD";P$;",A$200
    0"
200  GOTO 240
210  TEXT : HOME : REM  SAVE PIC
    TURE
220  GOSUB 250
230  PRINT D$;"BSAVE";P$",A$2000
    ,L$1FFF"
240  POKE 216,0: POKE 49235,0: POKE
    49232,0: GOTO 80
250  ONERR  GOTO 290
260  PRINT : PRINT D$;C$: PRINT

270  INPUT "NAME OF PICTURE? ";P
    $: IF P$ = "" THEN 240
280  RETURN
290  TEXT : HOME : FOR X = 0 TO
    10: FLASH : PRINT "DISK I/O
    ERROR": NORMAL : PRINT "CHEC
    K DISK THEN TRY AGAIN": NEXT
    X: FOR X = 0 TO 2500: NEXT X
    : GOTO 240
300  REM  INPUT LABEL AND DETERM
    INE CHAR VALUE
310 ANSR$ = "": HOME : VTAB 22: PRINT
    "TYPE LABEL (1 TO 70 CHARACT
    ERS)."
312  VTAB 23: HTAB 1: PRINT  SPC(
    70):LA =  LEN (ANSR$)
314  VTAB 23: HTAB 1: PRINT ANSR
    $;: GET A$: IF A$ =  CHR$ (8
    ) AND LA > 1 THEN ANSR$ =  LEFT$
    (ANSR$,LA - 1): GOTO 312
316  IF A$ =  CHR$ (8) AND LA =
    1 THEN 310
318  IF A$ =  CHR$ (13) THEN 330

320 ANSR$ = ANSR$ + A$: GOTO 312

330 ANSR$ =  LEFT$ (ANSR$,70): IF
    LA = 0 THEN 80
340 OL =  LEN (ANSR$)
350  REM  POSITION LABEL
360 T1$ = "LABEL":T2$ = "PRINT L
    ABEL": GOSUB 1000
370  HTAB 11: PRINT "P KEY TO PR
    INT LABEL"
380 VX = 2:VY = 2
390 RB = 279 - OL * 4: SCALE= 1:
     GOSUB 480
400  GET A$: GOSUB 480
410  IF A$ =  CHR$ (27) THEN  POKE
    49235,0: GOTO 80
420  IF A$ = "P" THEN 490
430 VX = VX + (A$ = "K") - (A$ =
    "J")
440 VX = VX + (VX < 2) - (VX > R
    B)
450 VY = VY + (A$ = "M") - (A$ =
    "I")
460 VY = VY + (VY < 2) - (VY > 1
```

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```
    84)
470  GOSUB 480: GOTO 400
480  XDRAW 1 AT VX,VY: XDRAW 2 AT
    VX + 4 * (OL - 1),VY: RETURN

490  REM  CREATE WINDOW
500  HCOLOR= 0: FOR X =  - 1 TO
    6
510  HPLOT VX - 1,VY + X TO VX +
    4 * OL,VY + X
520  NEXT X: HCOLOR= 3
530  REM  PLOT CHARACTER
540  FOR LO = 1 TO OL
550 C =  ASC ( MID$ (ANSR$,LO,1)
    ) - 32
560  IF C < 1 OR C > 61 THEN 600

570  FOR X = 1 TO 5
580 PL =  VAL ( MID$ (B$(C),X,1)
    )
590  GOSUB 840: NEXT X
600 VX = VX + 4: NEXT LO: POKE 4
    9235,0
610  GOSUB 1120: INPUT "DRAW WHI
    TE FRAME (Y/N)? ";A$
620  IF A$ <  > "Y" THEN 650
630  POKE 49234,0: HPLOT VX,VY -
    2 TO VX,VY + 7 TO VX - (4 *
    OL) - 2,VY + 7 TO VX - (4 *
    OL) - 2,VY - 2 TO VX,VY - 2
640  POKE 49235,0
650  GOSUB 1120: INPUT "DRAW POI
    NTER (Y/N)? ";A$
660  IF A$ <  > "Y" THEN 820
670 T1$ = "+":T2$ = "MARK ENDPOI
    NTS": GOSUB 1000
680  VTAB 1: GET A$: POKE 49234,
    0
690 X1 = 0: GOSUB 790
700  GET A$: GOSUB 790
710  IF A$ =  CHR$ (27) THEN 820

720  IF A$ = "P" AND X1 = 0 THEN
    X1 = VX:Y1 = VY: GOTO 780
730  IF A$ = "P" AND X1 <  > 0 THEN
    800
740 VX = VX + (A$ = "K") - (A$ =
    "J")
750 VX = VX + (VX < 2) - (VX > 2
    77)
760 VY = VY + (A$ = "M") - (A$ =
    "I")
770 VY = VY + (VY < 2) - (VY > 1
    89)
780  GOSUB 790: GOTO 700
790  XDRAW 3 AT VX,VY: RETURN
800  HPLOT X1,Y1 TO VX,VY
820  POKE 49235,0: GOTO 80
830  REM  PLOT ROUTINE
840  ON PL GOTO 860,870,880,890,
    900,910,920
850  RETURN
860  HPLOT VX + 2,VY + X: RETURN
870  HPLOT VX + 1,VY + X: RETURN

880  HPLOT VX + 1,VY + X: HPLOT
    VX + 2,VY + X: RETURN
890  HPLOT VX,VY + X: RETURN
900  HPLOT VX,VY + X: HPLOT VX +
    2,VY + X: RETURN
910  HPLOT VX,VY + X: HPLOT VX +
    1,VY + X: RETURN
920  HPLOT VX,VY + X: HPLOT VX +
    1,VY + X: HPLOT VX + 2,VY +
    X: RETURN
1000  HOME : VTAB 21:S1 = (22 -
    LEN (T1$)) / 2
1010  PRINT  SPC( S1);"I,J,K,M T
    O POSITION ";T1$
1020 S2 = (35 -  LEN (T2$)) / 2:
     PRINT  SPC( S2);"P TO ";T2$

1030  HTAB 12: PRINT "ESC FOR MA
    IN MENU"
1040  HTAB 10: PRINT "PRESS ANY
    KEY TO START";
1050  VTAB 1: GET A$: POKE 49234
    ,0: RETURN
1060  REM  SETUP
1070  HGR : HOME
1080 D$ =  CHR$ (4):C$ = "CAT": DIM
    B$(61)
1090  FOR X = 1 TO 61: READ B$(X
    ): NEXT X
1100  FOR X = 0 TO 33: READ SHP:
     POKE 768 + X,SHP: NEXT X
1110  POKE 232,0: POKE 233,3
1120  HOME : VTAB 22
1130  RETURN
1140  REM  CHARACTERS ! THROUGH
    ]
1150  DATA  22202,55000,25052,27
    672,51245,24257,22000
1160  DATA  12221,21112,27225,02
    720,00212,00700,00033
1170  DATA  11244,75557,22222,71
    747,71717,55711,74717
1180  DATA  44757,71111,75757,75
    711,22022,22024,12421
1190  DATA  07070,42124,71202,35
    742,25755,65656,34443

1200  DATA  65556,74747,74744,74
    757,55755,72227,11157
1210  DATA  56465,44447,77555,57
    775,25552,75744,25521
1220  DATA  75655,34216,72222,55
    557,55552,55557,55225
1230  DATA  55722,71247,74447,44
    211,71117
1240  REM  SHAPE TABLE INDEX
1250  DATA  3,0,8,0,17,0,26,0
1260  REM  SHAPE TABLE DATA
1270  DATA  64,59,55,54,54,54,46
    ,45,0,64,41,53,54
1280  DATA  54,54,62,63,0,32,220
    ,146,109,173,219,54,0
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
GB	10	QO	190	YK	330
KA	20	XV	200	OQ	340
RO	30	HO	210	FE	350
JZ	40	YD	220	YO	360
LR	50	KC	230	GH	370
GW	60	PQ	240	WB	380
HQ	70	RH	250	XJ	390
PU	80	CV	260	XC	400
VL	90	EO	270	IY	410
UE	100	GV	280	UN	420
RK	110	XX	290	AR	430
RL	120	WK	300	QG	440
QA	130	FI	310	BB	450
CX	140	CY	312	CX	460
QL	150	DU	314	QQ	470
CI	160	BW	316	VN	480
YD	170	DB	318	BY	490
PV	180	RI	320	XO	500
FL	510	DY	750	BM	1070
YT	520	BB	760	DY	1080
NR	530	GI	770	YU	1090
UO	540	RU	780	FS	1100
KP	550	DK	790	MY	1110
UG	560	WO	800	UH	1120
OQ	570	XI	820	GV	1130
AE	580	SC	830	JP	1140
LI	590	YF	840	VF	1150
BY	600	GV	850	KG	1160
JU	610	UV	860	RL	1170
DG	620	UQ	870	IK	1180
JJ	630	VG	880	IJ	1190
WB	640	BJ	890	XI	1200
QZ	650	SP	900	XB	1210
CI	660	SB	910	RL	1220
MW	670	VX	920	ED	1230
PH	680	ST	1000	KV	1240
JH	690	BI	1010	OR	1250
YB	700	RS	1020	VI	1260
GF	710	OW	1030	DZ	1270
IS	720	XC	1040	XO	1280
DC	730	KS	1050		
AR	740	IV	1060		

Total checksum = 3062111

FOOTBALL PROGNOSTICATOR

Article on page 41

```
10  REM  * FOOTBALL PROGNOSTICAT
    OR
20  REM  * BY DAVID COWLES AND B
    ILL MARQUARDT
30  REM  * (C) 1985 ANTIC PUBLIS
    HING INC.
40  REM  * II COMPUTING  VOL.1 N
    O.1
50  REM
60  GOSUB 5200
100  REM  * MAIN MENU *
110  PRINT D$;"CLOSE": TEXT : HOME

120  PRINT LINE$;"          CURREN
    T WEEK IS WEEK #";W: PRINT L
    INE$
130  IF W = 0 THEN  PRINT "  (NO
     WEEKLY DATA FILES WERE LOAD
    ED.)": PRINT
140  PRINT : PRINT "SELECT BY NU
    MBER:": PRINT : PRINT
150  PRINT "  (1) ENTER DATA FOR
     WEEK #";W + 1: PRINT
160  PRINT "  (2) PREDICT SCORES
     FOR WEEK #";W + 1: PRINT
170  PRINT "  (3) REVIEW-PRINT-R
    EVISE WEEKLY STATS": PRINT
180  PRINT "  (4) REVIEW-PRINT S
    EASON STATS": PRINT
190  PRINT "  (5) QUIT": PRINT
200  ONERR  GOTO 100
210  PRINT LINE$: PRINT "YOUR SE
    LECTION => ";: GET KY: PRINT

220  IF KY < 1 OR KY > 5 THEN 10
    0
230  ON KY GOTO 300,800,1700,220
    0,2300
300  REM  * WEEKLY DATA INPUT *
310 WK = W + 1: HOME : PRINT LIN
    E$;
320  IF W > 0 THEN  PRINT "DATA
    FILES EXIST FOR WEEK 1";: IF
    W > 1 THEN  PRINT " TO WEEK
    ";W;: GOTO 340
330  IF W = 0 THEN  PRINT "
         BEGINNING NEW SEASON";
340  PRINT : PRINT LINE$
350  PRINT : PRINT "    ENTER ST
    ATS FOR WEEK #";WK;" (Y/N) ?
    ";: GET K$: PRINT
360  IF K$ <  > "Y" THEN 100
370  FOR I = 1 TO T
380  HOME : PRINT LINE$;"       E
    NTERING STATS FOR WEEK #";WK
    : PRINT LINE$;
```

continued on next page

```
390  HTAB 9: INVERSE : PRINT TN$
    (I): PRINT
400  IF WK = 1 THEN  NORMAL : GOTO
    460
410  HTAB 9: PRINT "E";: NORMAL
    : PRINT "NTER STATISTICS": PRINT

420  HTAB 9: INVERSE : PRINT "U"
    ;: NORMAL : PRINT "NAVAILABL
    E THIS WEEK": PRINT
430  HTAB 9: GET K$: PRINT
440  IF K$ <  > "E" AND K$ <  >
    "U" THEN 380
450  IF K$ = "U" THEN  GOSUB 460
    0: GOTO 600
460  PRINT "ENTER STATS FOR: ";
470  INVERSE : PRINT TN$(I): NORMAL
    : PRINT
480  ONERR  GOTO 4900
490  INPUT "TOTAL YARDS GAINED R
    USHING => ";RO(I)
500  INPUT "TOTAL YARDS GAINED P
    ASSING => ";PO(I)
510 YO(I) = RO(I) + PO(I): REM
    TOTAL OFFENSIVE YARDS
520  INPUT "TOTAL POINTS SCORED
          => ";SO(I): PRINT
530  INPUT "TOTAL YARDS GIVEN UP
     RUSHING => ";RD(I)
540  INPUT "TOTAL YARDS GIVEN UP
     PASSING => ";PD(I)
550 YD(I) = RD(I) + PD(I): REM
    TOTAL YARDS GIVEN UP
560  INPUT "TOTAL POINTS GIVEN U
    P         => ";SD(I): PRINT
570  PRINT LINE$
580  PRINT "IS THE ABOVE INFO CO
    RRECT (Y/N) ?";: GET K$: PRINT

590  IF K$ <  > "Y" GOTO 380
600  NEXT I
610  REM  * CREATE WEEKLY DATA F
    ILES *
620  HTAB 7: PRINT  CHR$ (7);">>
     SAVING FILES TO DISK <<"
630 F1$ = "WEEKLY.DATA.":F2$ =  STR$
    (WK)
640 F$ = F1$ + F2$
650  PRINT D$;"OPEN ";F$
660  PRINT D$;"WRITE ";F$
670  GOSUB 2700:W = WK
680  PRINT D$;"OPEN WEEK.NUMBER"

690  PRINT D$;"WRITE WEEK.NUMBER
    "
700  PRINT W: PRINT D$;"CLOSE"
710 F$ = "SEASON.TOTALS": GOSUB
    3200: GOSUB 3000
720  FOR I = 1 TO T:MA(I) = 0:MB
    (I) = 0:MC(I) = 0:MD(I) = 0
730 ME(I) = 0:MF(I) = 0:MG(I) =
    0:MH(I) = 0: NEXT
740  IF W > 4 THEN  GOSUB 4000
750  GOTO 100

800  REM  * PREDICT THE WINNERS
    *
810  HOME : PRINT LINE$;"    PRE
    DICTIONS FOR FOOTBALL WEEK #
    ";W + 1: PRINT LINE$
820 GAME = 0: IF W < 5 GOTO 880
830  PRINT "  (1) USE SEASON AVE
    RAGES": PRINT
840  PRINT "  (2) USE LAST 4 WEE
    KS AVERAGE": PRINT : PRINT L
    INE$: PRINT
850  PRINT "YOUR SELECTION => ";
    : GET K: PRINT
860  IF K < 1 OR K > 2 GOTO 800
870  HOME : IF K = 2 THEN MV = 1

880  IF W = 0 THEN  PRINT : PRINT
    "I CANNOT PREDICT THE FIRST
    WEEK!": PRINT : GOSUB 2600: GOTO
    100
890 C = 1: IF GAME = T / 2 THEN
     HTAB 5: VTAB 4: PRINT "I CA
    N ONLY PREDICT ";T / 2;" GAM
    ES!": PRINT : GOTO 970
900  VTAB 1: HTAB 17: PRINT "GAM
    E ";GAME + (GAME < (T / 2))
910  VTAB 12: PRINT "TEAM 1"
920  VTAB 14: PRINT "TEAM 2"
930  FOR I = 1 TO T: HTAB 1: VTAB
    4
940  HTAB 6: INVERSE : PRINT "SP
    ACE";: NORMAL : PRINT " TO S
    CROLL THROUGH TEAMS": PRINT

950  HTAB 8: INVERSE : PRINT "S"
    ;: NORMAL
960  PRINT "ELECT THE ";: INVERSE
    : PRINT TN$(I): PRINT
970  IF GAME > 0 THEN  HTAB 8: INVERSE
: PRINT "P";: NORMAL : PRINT "RIN
    T PREDICTIONS": PRINT
980  HTAB 8: INVERSE : PRINT "Q"
    ;: NORMAL : PRINT "UIT THIS
    SECTION"
990  HTAB 8: VTAB 12 + (C > 1) *
    2: GET K$
1000  IF K$ = "Q" THEN 100
1010  IF K$ = "P" AND GAME > 0 THEN
     GOSUB 4800:GAME = 0: GOTO 1
    00
1020  IF K$ = "S" AND GAME < (T /
    2) THEN TS(C) = I: HTAB 10: VTAB
    10 + C * 2: PRINT TN$(I):C =
    C + 1: GOTO 1050
1030  IF K$ = " " THEN 1050
1040  GOTO 990
1050  IF C > 2 THEN I = T
1060  NEXT : IF C < 3 THEN 930
1070  VTAB 18: FOR I = 1 TO 16: PRINT
    : NEXT
1080  IF MV = 1 THEN MV = 0: GOTO
    1240
1090  REM  * PREDICT USING SEASO
    N TOTALS *
```

```
1100 A1 = (A(TS(1)) + E(TS(2))) /
    2
1110 B1 = (B(TS(1)) + F(TS(2))) /
    2
1120 C1 = A1 + B1
1130  IF D(TS(1)) = 0 THEN D(TS(
    1)) = 3
1140 D1 = C(TS(1)) / D(TS(1))
1150  IF H(TS(1)) = 0 THEN H(TS(
    1)) = 3
1160 E1 = G(TS(1)) / H(TS(1))
1170 A2 = (A(TS(2)) + E(TS(1))) /
    2
1180 B2 = (B(TS(2)) + F(TS(1))) /
    2
1190 C2 = A2 + B2
1200  IF D(TS(2)) = 0 THEN D(TS(
    2)) = 3
1210 D2 = C(TS(2)) / D(TS(2))
1220  IF H(TS(2)) = 0 THEN H(TS(
    2)) = 3
1230 E2 = G(TS(2)) / H(TS(2)): GOTO
    1390
1240  REM  * PREDICT USING LAST
    4 WEEKS *
1250 A1 = (MA(TS(1)) + ME(TS(2))
    ) / 2
1260 B1 = (MB(TS(1)) + MF(TS(2))
    ) / 2
1270 C1 = A1 + B1
1280  IF MD(TS(1)) = 0 THEN MD(T
    S(1)) = 3
1290 D1 = MC(TS(1)) / MD(TS(1))
1300  IF MH(TS(1)) = 0 THEN MH(T
    S(1)) = 3
1310 E1 = MG(TS(1)) / MH(TS(1))
1320 A2 = (MA(TS(2)) + ME(TS(1))
    ) / 2
1330 B2 = (MB(TS(2)) + MF(TS(1))
    ) / 2
1340 C2 = A2 + B2
1350  IF MD(TS(2)) = 0 THEN MD(T
    S(2)) = 3
1360 D2 = MC(TS(2)) / MD(TS(2))
1370  IF MH(TS(2)) = 0 THEN MH(T
    S(2)) = 3
1380 E2 = MG(TS(2)) / MH(TS(2))
1390 F1 = (D1 + E2) / 2
1400 G1 =  INT ((C1 / F1) + 0.5)

1410 F2 = (D2 + E1) / 2
1420 G2 =  INT ((C2 / F2) + 0.5)

1430  REM  * DISPLAY WINNER *
1440 GAME = GAME + 1
1450  HTAB 31 + (G1 < 10): VTAB
    2: PRINT G1
1460  HTAB 31 + (G2 < 10): VTAB
    4: PRINT G2
1470  PRINT : PRINT LINE$: PRINT
    "THE ";
1480  IF G1 = G2 THEN  GOSUB 159
    0: GOSUB 5000: GOTO 1530
1490  IF G1 > G2 THEN  PRINT TN$
    (TS(1));"WILL DEFEAT THE";
1500  PRINT TN$(TS(2));: IF G1 >
    G2 THEN  PRINT " BY ";G1 - G
    2;: GOTO 1520
1510  PRINT "WILL DEFEAT THE ";T
    N$(TS(1));" BY ";G2 - G1;
1520  PRINT " POINTS!"
1530  PRINT : PRINT LINE$
1540  IF G1 > G2 THEN  GOSUB 500
    0
1550  IF G2 > G1 THEN  GOSUB 510
    0
1560  IF GAME = 1 THEN  PRINT "(
    PRINT OPTION COMING UP ...)"

1570  GOSUB 2600
1580  HOME : GOTO 890
1590  PRINT TN$(TS(1));"      VER
    SUS THE";
1600  PRINT TN$(TS(2));" IS A TO
    SS-UP!"
1610  RETURN
1700  REM  * REVIEW PAST STATIST
    ICS *
1710  IF W = 0 THEN 100
1720  HOME : PRINT LINE$;"
      CURRENT WEEK IS WEEK #";W:
     PRINT LINE$
1730  ONERR  GOTO 1720
1740  VTAB 5: PRINT "ENTER NUMBE
    R OF WEEK YOU WISH TO REVIEW
    "
1750  HTAB 17: VTAB 8: PRINT "=>
    ";: INPUT R
1760  IF R < 1 OR R > W THEN 172
    0
1770 F1$ = "WEEKLY.DATA.":F2$ =
     STR$ (R)
1780 F$ = F1$ + F2$
1790  PRINT D$;"OPEN ";F$: PRINT
    D$;"READ ";F$
1800 TEMP$ = " STATS FOR WEEK #"
     +  STR$ (R)
1810  GOSUB 3400
1820  PRINT : PRINT "REVISE THES
    E STATS (Y/N) ?";: GET K$: PRINT

1830  IF K$ <  > "Y" THEN 2160
1840  HOME : HTAB 12: PRINT ">>>
     WARNING <<<": PRINT
1850  PRINT "REVISED STATISTICS
    WILL BE SAVED TO DISK";
1860  PRINT "AND BECOME PERMANEN
    T FILE. THIS OPTION"
1870  PRINT "SHOULD ONLY BE USED
     TO CORRECT BAD DATA"
1880  PRINT "THAT WAS ENTERED EA
    RLIER.": PRINT
1890  PRINT "DO YOU WISH TO PROC
    EDE (Y/N) ?";: GET K$: PRINT

1900  IF K$ <  > "Y" THEN 2120
1910 RV = 1
1920  HOME : PRINT LINE$;"NEW ST
```

continued on next page

```
    ATISTICS -": PRINT IN$(S);"
      WEEK #";R: PRINT LINE$
1930  PRINT : PRINT "CHANGE:"
1940  ONERR  GOTO 4900
1950  PRINT RO(S);" RUSHING YDS
    GAINED TO    =>";: INPUT RO(S
    )
1960  PRINT PO(S);" PASSING YDS
    GAINED TO    =>";: INPUT PO(S
    )
1970 YO(S) = RO(S) + PO(S)
1980  PRINT SO(S);" POINTS SCORE
    D TO         =>";: INPUT SO(S
    ): PRINT
1990  PRINT RD(S);" RUSHING YDS
    GIVEN UP TO =>";: INPUT RD(S
    )
2000  PRINT PD(S);" PASSING YDS
    GIVEN UP TO =>";: INPUT PD(S
    )
2010 YD(S) = RD(S) + PD(S)
2020  PRINT SD(S);" POINTS GIVEN
     UP TO       =>";: INPUT SD(S
    )
2030  PRINT : PRINT LINE$: PRINT
    : PRINT "IS THE ABOVE INFO C
    ORRECT (Y/N)? ";: GET K$: PRINT

2040  IF K$ <  > "Y" THEN 1920
2050  PRINT : PRINT "REVIEW STAT
    S FOR ANOTHER TEAM (Y/N)? ";
    : GET K$
2060  PRINT : IF K$ = "Y" THEN 2
    150
2070  PRINT :RV = 0: POKE 216,0
2080  PRINT D$;"OPEN ";F$: PRINT
    D$;"CLOSE ";F$: PRINT D$;"DE
    LETE ";F$
2090  PRINT D$;"OPEN ";F$: PRINT
    D$;"WRITE ";F$: GOSUB 2700:W
    K = R
2100  FOR I = 1 TO T:A(I) = 0:B(
    I) = 0:C(I) = 0:D(I) = 0:E(I
    ) = 0:F(I) = 0:G(I) = 0:H(I)
     = 0: NEXT
2110  GOSUB 4200: GOTO 100
2120  PRINT "REVIEW STATS FOR AN
    OTHER TEAM (Y/N) ?";: GET K$
    : PRINT
2130  IF K$ <  > "Y" AND RV = 1 THEN
    2070
2140  IF K$ <  > "Y" THEN 100
2150  GOSUB 3560: IF KY = 3 THEN
     PRINT : GOTO 1820
2160  PRINT : GOTO 2120
2200  REM  * REVIEW SEASON TOTAL
    S *
2210  PRINT D$;"OPEN SEASON.TOTA
    LS"
2220  PRINT D$;"READ SEASON.TOTA
    LS"
2230 TEMP$ = "  SEASON TOTALS": GOSUB
    3400
2240  PRINT : PRINT : GOSUB 2120
    : GOTO 2240
2300  REM  * EXIT *
2310  HOME : PRINT D$;"FRE": END

2400  REM  * PRINT STATISTICS *
2410  HOME : PRINT LINE$;
2420  PRINT IN$(S);TEMP$: PRINT
    LINE$
2430  PRINT "OFFENSE:"
2440  PRINT "         RUSHING YAR
    DS GAINED    =>"; LEFT$ (BL$,
    5 -  LEN ( STR$ (RO(S)))));RO
    (S)
2450  PRINT "         PASSING YAR
    DS GAINED    =>"; LEFT$ (BL$,
    5 -  LEN ( STR$ (PO(S)))));PO
    (S)
2460  PRINT "         POINTS SCOR
    ED           =>"; LEFT$ (BL$,
    5 -  LEN ( STR$ (SO(S)))));SO
    (S): PRINT
2470  PRINT "DEFENSE:"
2480  PRINT "         RUSHING YAR
    DS GIVEN UP =>"; LEFT$ (BL$,
    5 -  LEN ( STR$ (RD(S)))));RD
    (S)
2490  PRINT "         PASSING YAR
    DS GIVEN UP =>"; LEFT$ (BL$,
    5 -  LEN ( STR$ (PD(S)))));PD
    (S)
2500  PRINT "         POINTS GIVE
    N UP         =>"; LEFT$ (BL$,
    5 -  LEN ( STR$ (SD(S)))));SD
    (S): PRINT
2510  PRINT LINE$: GOSUB 2600: RETURN

2600  REM  * WAIT FOR KEY *
2610  PRINT "HIT ANY KEY TO CONT
    INUE ...";
2620  GET A$: RETURN
2700  REM  * SAVE STATS *
2710  FOR I = 1 TO T
2720  PRINT RO(I): PRINT PO(I): PRINT
    YO(I): PRINT SO(I): PRINT RD
    (I): PRINT PD(I): PRINT YD(I
    ): PRINT SD(I)
2730  NEXT : PRINT D$;"CLOSE"
2740  RETURN
2800  REM  * READ DATA FILES *
2810  FOR I = 1 TO T
2820  INPUT A(I),B(I),C(I),D(I),
    E(I),F(I),G(I),H(I)
2830  NEXT : PRINT D$;"CLOSE": RETURN

2900  REM  * UPDATE SEASON TOTAL
    S FILE *
2910  FOR I = 1 TO T
2920  PRINT A(I): PRINT B(I): PRINT
    C(I): PRINT D(I): PRINT E(I)
    : PRINT F(I): PRINT G(I): PRINT
    H(I)
2930  NEXT : PRINT D$;"CLOSE": RETURN

3000  REM  * DETERMINE WEEKLY AV
```

```
    ERAGES *
3010  FOR I = 1 TO T
3020 A(I) = A(I) / W:B(I) = B(I)
     / W
3030 C(I) = C(I) / W:D(I) = D(I)
     / W
3040 E(I) = E(I) / W:F(I) = F(I)
     / W
3050 G(I) = G(I) / W:H(I) = H(I)
     / W
3060  NEXT : RETURN
3100  REM  * INPUT SEASON TOTALS
     *
3110  FOR I = 1 TO T:A(I) = 0:B(
    I) = 0:C(I) = 0:D(I) = 0
3120 E(I) = 0:F(I) = 0:G(I) = 0:
    H(I) = 0: NEXT I
3130  PRINT D$;"OPEN SEASON.TOTA
    LS": PRINT D$;"READ SEASON.T
    OTALS"
3140  GOSUB 2800: RETURN
3200  REM  * UPDATE SEASON TOTAL
    S *
3210  IF W > 1 THEN  GOSUB 3100
3220  FOR I = 1 TO T
3230 A(I) = A(I) + RO(I):B(I) =
    B(I) + PO(I)
3240 C(I) = C(I) + YO(I):D(I) =
    D(I) + SO(I)
3250 E(I) = E(I) + RD(I):F(I) =
    F(I) + PD(I)
3260 G(I) = G(I) + YD(I):H(I) =
    H(I) + SD(I)
3270  NEXT I
3280  IF W > 1 THEN  PRINT D$;"O
    PEN SEASON.TOTALS": PRINT D$
    ;"CLOSE SEASON.TOTALS": PRINT
    D$;"DELETE SEASON.TOTALS"
3290  PRINT D$;"OPEN SEASON.TOTA
    LS": PRINT D$;"WRITE SEASON.
    TOTALS"
3300  GOSUB 2900: RETURN
3400  REM  * INPUT STATISTICS *
3410  POKE 216,0
3420  FOR I = 1 TO T
3430  INPUT RO(I),PO(I),YO(I),SO
    (I),RD(I),PD(I),YD(I),SD(I)
3440  NEXT : PRINT D$;"CLOSE"
3450  REM  * SELECTION AND PRINT
    ING *
3460  ONERR  GOTO 3470
3470  HOME : PRINT LINE$;"REVIEW
    ING ... ";TEMP$: PRINT LINE$
    : PRINT
3480  PRINT "  (1) PRINT TOTALS
    FOR ALL ";T;" TEAMS": PRINT

3490  PRINT "  (2) DISPLAY TOTAL
    S FOR SELECTED TEAMS"
3500  IF KY = 3 THEN  PRINT "
       (INCLUDES REVISION OPTION
    )"
3510  PRINT : PRINT "  (3) RETUR
    N TO MAIN MENU": PRINT
3520  PRINT LINE$: PRINT "YOUR S
    ELECTION => ";: GET K: PRINT

3530  ON K GOTO 3550,3560,100
3540  IF K < 1 OR K > 3 THEN 347
    0
3550  POKE 216,0: GOSUB 3700: GOTO
    3460
3560  HOME : PRINT LINE$;"REVIEW
    ING ... ";TEMP$: PRINT LINE$
    : PRINT :S = 0
3570  ONERR  GOTO 3560
3580  FOR I = 1 TO T: HTAB 2: VTAB
    5
3590  HTAB 6: INVERSE : PRINT "S
    PACE";: NORMAL : PRINT " TO
    SCROLL THROUGH TEAMS": PRINT
3600  HTAB 8: INVERSE : PRINT "S
    ";: NORMAL
3610  PRINT "ELECT THE ";: INVERSE
    : PRINT TN$(I): PRINT
3620  NORMAL : VTAB 10: HTAB 8: GET
    K$: PRINT
3630  IF K$ <  > "S" AND K$ <  >
    " " THEN 3620
3640  IF K$ = "S" THEN S = I:I =
    T
3650  NEXT I: IF S < 1 THEN 3580

3660  GOSUB 2400: RETURN
3700  REM  * PRINT STATS FOR ALL
    TEAMS *
3710  PRINT : PRINT "USE SCREEN
    OR PRINTER (S/P) ?";: GET K$
    : PRINT
3720 P = 0: IF K$ = "P" THEN P =
    1
3730  IF  NOT P THEN 3900
3740  PRINT : PRINT "SET UP PRIN
    TER AND HIT ANY KEY"
3750  GET A$
3760  PRINT D$;"PR#1"
3770  PRINT TEMP$: PRINT : PRINT

3780  PRINT  SPC( 29);"OFFENSE";

3790  PRINT  SPC( 23);"DEFENSE":
     PRINT
3800  PRINT  SPC( 23);"RUSH
     PASS       PTS";
3810  PRINT "          RUSH
    PASS       PTS": PRINT
3820 LP = 7 + T: FOR I = 1 TO T
3830  PRINT TN$(I);" "; LEFT$ (B
    L$,5 -  LEN ( STR$ (RO(I))))
    ;RO(I);BL$;
3840  PRINT  LEFT$ (BL$,5 -  LEN
    ( STR$ (PO(I))));PO(I);BL$;
3850  PRINT  LEFT$ (BL$,5 -  LEN
    ( STR$ (SO(I))));SO(I);BL$;
3860  PRINT "   "; LEFT$ (BL$,5 -
     LEN ( STR$ (RD(I))));RD(I);
    BL$;
3870  PRINT  LEFT$ (BL$,5 -  LEN
```

continued on next page

```
    ( STR$ (PD(I))));PD(I);BL$;
3880  PRINT  LEFT$ (BL$,5 -  LEN
    ( STR$ (SD(I))));SD(I);BL$
3890  NEXT : PRINT D$;"PR#0": GOSUB
    4500: GOTO 3910
3900  FOR S = 1 TO T: GOSUB 2400
    : NEXT S
3910  RETURN
4000  REM  * INPUT LAST 4 WEEKS
    STATS *
4010  PRINT D$;"FRE"
4020  HOME :F1$ = "WEEKLY.DATA."

4030  FOR J = W - 3 TO W:F2$ =  STR$
    (J):F$ = F1$ + F2$
4040  PRINT D$;"OPEN ";F$: PRINT
    D$;"READ ";F$
4050  FOR I = 1 TO T
4060  INPUT K:MA(I) = MA(I) + K:
    INPUT K:MB(I) = MB(I) + K
4070  INPUT K:MC(I) = MC(I) + K:
    INPUT K:MD(I) = MD(I) + K
4080  INPUT K:ME(I) = ME(I) + K:
    INPUT K:MF(I) = MF(I) + K
4090  INPUT K:MG(I) = MG(I) + K:
    INPUT K:MH(I) = MH(I) + K
4100  NEXT I: PRINT D$;"CLOSE": NEXT
    J
4110  GOSUB 4700: RETURN
4200  REM  * REVISE SEASON TOTAL
    S FILE *
4210  PRINT : PRINT "RE-TOTALLIN
    G ALL FILES - THIS MAY TAKE"

4220  PRINT " A FEW MOMENTS ..."
    : PRINT
4230  POKE 216,0
4240 F1$ = "WEEKLY.DATA."
4250  FOR J = W TO 1 STEP  - 1
4260 F2$ =  STR$ (J):F$ = F1$ +
    F2$
4270  PRINT D$;"OPEN ";F$: PRINT
    D$;"READ ";F$
4280  FOR I = 1 TO T
4290  INPUT K:A(I) = A(I) + K: INPUT
    K:B(I) = B(I) + K
4300  INPUT K:C(I) = C(I) + K: INPUT
    K:D(I) = D(I) + K
4310  INPUT K:E(I) = E(I) + K: INPUT
    K:F(I) = F(I) + K
4320  INPUT K:G(I) = G(I) + K: INPUT
    K:H(I) = H(I) + K
4330  NEXT I: PRINT D$;"CLOSE"
4340  IF J = W - 3 THEN  GOSUB 4
    400
4350  NEXT J: PRINT D$;"OPEN SEA
    SON.TOTALS": PRINT D$;"WRITE
     SEASON.TOTALS"
4360  GOSUB 2900: GOSUB 3000
4370  PRINT D$;"FRE": RETURN
4400  REM  * REVISE 4-WEEK AVERA
    GE *
4410  FOR I = 1 TO T:MA(I) = A(I
    ):MB(I) = B(I):MC(I) = C(I):
    MD(I) = D(I)
4420 ME(I) = E(I):MF(I) = F(I):M
    G(I) = G(I):MH(I) = H(I): NEXT
    I
4430  GOSUB 4700: RETURN
4500  REM  * SKIP TO TOP OF PAGE
    *
4510  PRINT D$;"PR#1": FOR I = 1
    TO 66 - LP
4520  PRINT : NEXT :LP = 0: PRINT
    D$;"PR#0": RETURN
4600  REM  * SUBSTITUTE AVERAGES
    *
4610 RO(I) =  INT (A(I)):PO(I) =
     INT (B(I)):YO(I) =  INT (C(
    I)):SO(I) =  INT (D(I))
4620 RD(I) =  INT (E(I)):PD(I) =
     INT (F(I)):YD(I) =  INT (G(
    I)):SD(I) =  INT (H(I)): RETURN

4700  REM  * FOUR WEEK AVERAGE *

4710  FOR I = 1 TO T
4720 MA(I) = MA(I) / 4:MB(I) = M
    B(I) / 4
4730 MC(I) = MC(I) / 4:MD(I) = M
    D(I) / 4
4740 ME(I) = ME(I) / 4:MF(I) = M
    F(I) / 4
4750 MG(I) = MG(I) / 4:MH(I) = M
    H(I) / 4
4760  NEXT : RETURN
4800  REM  * PRINT PREDICTION RE
    PORT *
4810  HOME : PRINT "SET UP PRINT
    ER AND HIT ANY KEY ... ";: GET
    A$
4820  ONERR  GOTO 4830
4830  PRINT : INPUT "HOW MANY CO
    PIES? ";K
4840  POKE 216,0: PRINT D$;"PR#1
    ": FOR I = 1 TO K
4850  PRINT " FOOTBALL PREDICTIO
    NS FOR WEEK #";W + 1: PRINT
4860  PRINT "     FAVORITE"; SPC(
    17);"UNDERDOG"; SPC( 11);"SP
    READ"
4870  FOR J = 1 TO GAME: PRINT P
    RED$(J): NEXT J:LP = GAME +
    4
4880  GOSUB 4500: NEXT I: PRINT
    D$;"PR#0": RETURN
4900  REM  * ERROR TRAPS *
4910  CALL 768:ER =  PEEK (222)
4920 LN =  PEEK (218) + 256 *  PEEK
    (219)
4930  IF ER = 6 THEN 100
4940  IF ER = 5 AND LN = 5470 THEN
    100
4950  IF ER = 254 THEN  PRINT "T
    RY AGAIN!": RESUME
4960  PRINT " ERROR #";ER;" AT L
    INE ";LN
4970  GOSUB 2600: GOTO 100
5000  REM  * TEAM 1 IS FAVORITE
```

```
    *
5010 PRED$(GAME) = TN$(TS(1)) +
    BL$ + TN$(TS(2)) + BL$ +  STR$
    (G1 - G2): RETURN
5100  REM  * TEAM 2 IS FAVORITE
    *
5110 PRED$(GAME) = TN$(TS(2)) +
    BL$ + TN$(TS(1)) + BL$ +  STR$
    (G2 - G1): RETURN
5200  REM  * INITIALIZATION *
5210  FOR I = 0 TO 9: READ J: POKE
    768 + I,J: NEXT
5220 T = 28: REM  # OF TEAMS
5230  DIM A(T),B(T),C(T),D(T),E(
    T),F(T),G(T),H(T)
5240  DIM MA(T),MB(T),MC(T),MD(T
    ),ME(T),MF(T),MG(T),MH(T)
5250  DIM RO(T),PO(T),YO(T),SO(T
    ),RD(T),PD(T),YD(T),SD(T)
5260 LINE$ = "----------------
    ----------------------"
5270  DIM PRED$(T / 2): DIM TS(2
    )
5280 D$ =  CHR$ (4):BL$ = "
    "
5290  HOME : VTAB 12: HTAB 8
5300  INVERSE : PRINT " FOOTBALL
     PROGNOSTICATOR ": NORMAL
5310  VTAB 18: HTAB 7: PRINT "(B
    E SURE CAPS LOCK IS DOWN)"
5320  POKE 34,20: HOME : HTAB 5
5330  PRINT "FOR ENTERTAINMENT P
    URPOSES ONLY!"
5340  PRINT : HTAB 5
5350  PRINT "BY DAVID COWLES & B
    ILL MARQUARDT"
5360  FOR I = 1 TO 2000: NEXT
5370  DIM TN$(T)
5380 TEMP$ = "
      "
5390  FOR I = 1 TO T: READ F$:TN
    $(I) = F$ +  RIGHT$ (TEMP$,2
    1 -  LEN (F$)): NEXT
5400  HOME : PRINT "ENSURE THAT
    PROPER DATA DISK IS IN DRIVE
    ";
5410  PRINT "          AND HIT <R
    ETURN>"
5420  GET A$
5430  PRINT : HOME :W = 0
5440  ONERR  GOTO 4900
5450  PRINT D$;"OPEN WEEK.NUMBER
    "
5460  PRINT D$;"READ WEEK.NUMBER
    "
5470  INPUT W: PRINT
5480  PRINT D$;"CLOSE"
5490  IF W < 1 THEN 100
5500  IF W > 4 THEN  GOSUB 4000
5510  GOSUB 3100: GOSUB 3000
5520  RETURN
5600  REM  * ERROR-HANDLING ROUT
    INE *
5610  DATA  104,168,104,166,223,
    154,72,152,72,96
5700  REM  * 28 NFL TEAMS *
5710  DATA  ATLANTA FALCONS,BUFF
    ALO BILLS,CHICAGO BEARS,CINC
    INNATI BENGALS
5720  DATA  CLEVELAND BROWNS,DAL
    LAS COWBOYS,DENVER BRONCOS,D
    ETROIT LIONS
5730  DATA  GREENBAY PACKERS,HOU
    STON OILERS,INDIANAPOLIS COL
    TS,KANSAS CITY CHIEFS
5740  DATA  LOS ANGELES RAIDERS,
    LOS ANGELES RAMS,MIAMI DOLPH
    INS,MINNESOTA VIKINGS
5750  DATA  NEW ENGLAND PATRIOTS
    ,NEW ORLEANS SAINTS,NEW YORK
     GIANTS,NEW YORK JETS
5760  DATA  PHILADELPHIA EAGLES,
    PITTSBURGH STEELERS,SAN DIEG
    O CHARGERS,SAN FRANCISCO 49E
    RS
5770  DATA  SEATTLE SEAHAWKS,ST.
     LOUIS CARDINALS,TAMPA BAY B
    UCCANEERS,WASHINGTON REDSKIN
    S
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
RU	10	GZ	400	NW	700
AO	20	HE	410	RK	710
JZ	30	RE	420	WO	720
LR	40	LR	430	EK	730
GW	50	QA	440	FK	740
HG	60	BW	450	XH	750
WK	100	NT	460	VK	800
LR	110	ME	470	AN	810
NN	120	CP	480	CW	820
AW	130	QJ	490	JQ	830
CJ	140	EW	500	ET	840
UX	150	OF	510	GE	850
HV	160	UM	520	JI	860
MT	170	EU	530	OH	870
PM	180	SH	540	KJ	880
HD	190	DG	550	IK	890
PU	200	QR	560	OR	900
NT	210	DA	570	JL	910
QV	220	ZM	580	KD	920
IT	230	VM	590	GF	930
PL	300	KQ	600	EQ	940
HB	310	DR	610	BI	950
CD	320	OB	620	AA	960
AF	330	VG	630	UE	970
CM	340	IN	640	MV	980
BW	350	UM	650	ZO	990
ZZ	360	JP	660	RA	1000
UQ	370	LJ	670	ZB	1010
SC	380	FT	680	YV	1020
KR	390	IK	690	DZ	1030

continued on next page

```
YY 1040
XU 1050
QD 1060
EQ 1070
IG 1080
BP 1090
YU 1100
ZO 1110
YU 1120
IF 1130
CW 1140
VN 1150
FN 1160
YN 1170
ZH 1180
ZJ 1190
UE 1200
DZ 1210
WM 1220
BK 1230
TC 1240
JV 1250
KS 1260
YU 1270
ZJ 1280
LK 1290
CD 1300
ON 1310
JN 1320
KK 1330
ZJ 1340
AL 1350
MQ 1360
DF 1370
PI 1380
SD 1390
IR 1400
SC 1410
UM 1420
NC 1430
MJ 1440
RL 1450
IM 1460
MJ 1470
DU 1480
FK 1490
NO 1500
NU 1510
EM 1520
CM 1530
BA 1540
BH 1550
GR 1560
HM 1570
IR 1580
QS 1590
UN 1600
GV 1610
EW 1700
RL 1710
BK 1720
CI 1730
TV 1740
IB 1750
ES 1760
OU 1770
IN 1780
NN 1790
YG 1800
HI 1810
GI 1820
BO 1830
UM 1840
YE 1850
KW 1860
FH 1870
JI 1880
XB 1890
ZS 1900
PI 1910
PO 1920
SR 1930
CP 1940
BK 1950
UL 1960
AC 1970
AK 1980
FB 1990
YC 2000
PY 2010
JJ 2020
ZX 2030
CS 2040
IQ 2050
FW 2060
BG 2070
NY 2080
IJ 2090
YO 2100
MI 2110
YJ 2120
ZI 2130
ZZ 2140
XP 2150
UY 2160
WJ 2200
WK 2210
PL 2220
AH 2230
IA 2240
VK 2300
IN 2310
MX 2400
VO 2410
UM 2420
KE 2430
NP 2440
BB 2450
MG 2460
IT 2470
RF 2480
ER 2490
BC 2500
RQ 2510
QO 2600
IN 2610
HL 2620
VZ 2700
UQ 2710
BC 2720
YJ 2730
GV 2740
YK 2800
UQ 2810
CA 2820
BS 2830
CB 2900
UQ 2910
LG 2920
BS 2930
AI 3000
UQ 3010
ZF 3020
CD 3030
FB 3040
HZ 3050
DX 3060
HN 3100
EU 3110
TI 3120
SY 3130
QI 3140
QL 3200
EZ 3210
UQ 3220
BD 3230
KI 3240
RH 3250
AX 3260
KQ 3270
JV 3280
WW 3290
QW 3300
OR 3400
SM 3410
UQ 3420
XS 3430
YJ 3440
WN 3450
DB 3460
CU 3470
VX 3480
WO 3490
ZN 3500
JE 3510
VK 3520
RV 3530
TH 3540
EO 3550
DO 3560
DA 3570
HA 3580
EQ 3590
BI 3600
AA 3610
XQ 3620
CB 3630
NC 3640
FN 3650
QH 3660
NZ 3700
KP 3710
RM 3720
HY 3730
WF 3740
QM 3750
JN 3760
NP 3770
EP 3780
QY 3790
XO 3800
IO 3810
VU 3820
UU 3830
JY 3840
OF 3850
MC 3860
TL 3870
DC 3880
VO 3890
FV 3900
GV 3910
WM 4000
ZK 4010
WE 4020
HZ 4030
NN 4040
UQ 4050
YE 4060
DG 4070
II 4080
NK 4090
QM 4100
QU 4110
FX 4200
VN 4210
LR 4220
SM 4230
SF 4240
UW 4250
AM 4260
NN 4270
UQ 4280
ZI 4290
EB 4300
IJ 4310
MR 4320
KQ 4330
BO 4340
OF 4350
JR 4360
SP 4370
FU 4400
FO 4410
IU 4420
QU 4430
NE 4500
DU 4510
NJ 4520
IN 4600
DA 4610
BN 4620
XP 4700
UQ 4710
DO 4720
HG 4730
KY 4740
OQ 4750
DX 4760
AK 4800
AD 4810
DA 4820
WS 4830
EC 4840
QQ 4850
KR 4860
HX 4870
EI 4880
SJ 4900
KO 4910
IR 4920
XQ 4930
TX 4940
KE 4950
TS 4960
NB 4970
AY 5000
SP 5010
BI 5100
RX 5110
BM 5200
MV 5210
IK 5220
WW 5230
EC 5240
HU 5250
EW 5260
AV 5270
BD 5280
ND 5290
DH 5300
WZ 5310
YU 5320
CI 5330
LC 5340
HB 5350
EK 5360
MH 5370
PF 5380
UJ 5390
JO 5400
EJ 5410
QM 5420
LQ 5430
CP 5440
FI 5450
YU 5460
VC 5470
GB 5480
RS 5490
FK 5500
IV 5510
GV 5520
OS 5600
IS 5610
FA 5700
SI 5710
RD 5720
IQ 5730
XA 5740
OM 5750
JX 5760
PG 5770

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LADYBUG

Article on page 53

```
10  REM  * LADYBUG
20  REM  * BY S.R. KOEPKE
30  REM  * (C) 1985 ANTIC PUBLIS
    HING INC.
40  REM  * II COMPUTING  VOL.1 N
    O.1
50  REM
60  GOSUB 230
70  HGR2 : SCALE= 1: ROT= 0:SHP =
    4:RT = 0:X = 138:Y = 78:C =
    3:XPS = 100:YPS = 100
80  XDRAW 1 AT X,Y: XDRAW 3 AT X
    ,Y
90 I =  PEEK ( - 16384): POKE  -
    16368,0: IF I = 141 THEN 70
100  IF I = 155 THEN  TEXT : HOME
    : END
110  IF MODE THEN XPS =  PDL (0)
    :YPS =  PDL (1)
120  IF (XPS < 10 OR I = 136) AND
    X > 10 THEN  XDRAW 3 AT X,Y:
    RT = 48: ROT= RT: XDRAW 2 AT
    X,Y:X = X - 2: XDRAW 3 AT X,
    Y
130  IF (XPS > 245 OR I = 149) AND
    X < 268 THEN  XDRAW 3 AT X,Y
    :RT = 16: ROT= RT: XDRAW 2 AT
    X,Y:X = X + 2: XDRAW 3 AT X,
    Y
140  IF (YPS < 10 OR I = 139) AND
    Y > 10 THEN  XDRAW 3 AT X,Y:
    RT = 0: ROT= RT: XDRAW 2 AT
    X,Y:Y = Y - 2: XDRAW 3 AT X,
    Y
150  IF (YPS > 245 OR I = 138) AND
    Y < 180 THEN  XDRAW 3 AT X,Y
    :RT = 32: ROT= RT: XDRAW 2 AT
    X,Y:Y = Y + 2: XDRAW 3 AT X,
    Y
160  HCOLOR= C: ROT= 0: DRAW SHP
     AT X,Y: ROT= RT
170  IF ( PEEK ( - 16286) > 127 AND
    MODE) OR I = 173 THEN SHP =
    SHP + 1: FOR PAUSE = 0 TO 50
    0: NEXT : IF SHP = 7 THEN SH
    P = 4
180  IF ( PEEK ( - 16287) < 128 OR
     NOT MODE) AND I <  > 160 THEN
    90
190 C = C + 1: IF C > 6 THEN C =
    1
200 I = 1: IF C / 2 =  INT (C /
    2) THEN I =  - 1
210  HCOLOR= C + I: FOR I = 0 TO
    1: HPLOT 0 + I,0 + I TO 279 -
    I,0 + I TO 279 - I,191 - I TO
    0 + I,191 - I TO 0 + I,0 + I
    : NEXT
220  GOTO 90
230  REM  CHECK FOR JOYSTICK
240  IF  PDL (0) <  > 255 AND  PDL
    (1) <  > 255 THEN MODE = 1
250  REM  SET UP SHAPE TABLE
260  FOR I = 0 TO 163
270  READ SHP: POKE 768 + I,SHP:
    NEXT
280  POKE 232,0: POKE 233,3
290  RETURN
300  REM  SHAPE TABLE INDEX
310  DATA  6,0,14,0,68,0,122,0,1
    33,0,136,0,145,0
320  REM  BASIC LADYBUG SHAPE
330  DATA  60,54,45,36,60,63,54,
    54,45,45,36,36,60,63,63,54
340  DATA  54,54,45,45,45,36,36,
    36,28,63,63,28,60,190,55,117

350  DATA  54,54,23,55,117,46,10
    0,45,45,14,46,100,37,231,36,
    36
360  DATA  12,37,231,60,62,0
370  REM  SHAPE MASK FOR MOVING
    LADYBUG
380  DATA  192,216,59,39,45,37,5
    9,39,45,36,53,46,46,44,46,44

390  DATA  46,32,44,54,45,62,63,
    42,45,62,55,18,42,53,63,55
400  DATA  41,53,63,54,39,60,60,
    62,60,62,60,50,62,36,63,44
410  DATA  45,56,63,44,45,0
420  REM  ANTENNA SHAPE
430  DATA  64,64,24,63,12,12,12,
    223,115,4,0
440  REM  THIN LINE SHAPE
450  DATA  37,55,0
460  REM  MEDIUM LINE SHAPE
470  DATA  37,63,54,45,37,36,63,
    31,0
480  REM  THICK LINE SHAPE
490  DATA  37,63,54,45,37,36,63,
    63,54,54,45,45,37,36,36,63
500  DATA  63,31,0
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
XZ	10	LR	40	OC	70
SB	20	GW	50	TS	80
JZ	30	XX	60	NV	90

continued on next page

```
KY  100     OK  180     QQ  260
PU  110     PT  190     SC  270
BZ  120     OE  200     MY  280
TA  130     LB  210     GU  290
UU  140     QN  220     KU  300
NU  150     NB  230     QS  310
TF  160     JD  240     TC  320
FK  170     CD  250     AK  330

OL  340     KX  400     KT  460
DJ  350     NR  410     NP  470
TC  360     ML  420     JE  480
KU  370     PT  430     JY  490
FI  380     PM  440     HE  500
YI  390     IZ  450

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```

COLOR WEAVER

Article on page 79

```
10  REM  * COLOR INKLE LOOM
20  REM  * BY GERALD M. HAGOPIAN

30  REM  * (C) 1985 ANTIC PUBLIS
    HING INC.
40  REM  * II COMPUTING, VOL.1 N
    O.1
50  REM
60 D$ =  CHR$ (4): REM  CTRL-D
70 C$ = "CAT"
80  GOSUB 830: REM  SET UP SOUND

90  TEXT : HOME
100  VTAB 8: HTAB 12: PRINT "COL
    OR INKLE LOOM"
110  PRINT : HTAB 8: PRINT "C  C
    REATE NEW WEAVING"
120  HTAB 8: PRINT "S  SAVE PATT
    ERN"
130  HTAB 8: PRINT "L  LOAD OLD
    PATTERN"
140  HTAB 8: PRINT "R  REDRAW PR
    ESENT PATTERN"
150  HTAB 8: PRINT "E  EXIT TO B
    ASIC"
160  PRINT : HTAB 9: INPUT "SELE
    CTION? (C S L R E) ";ANSR$
170  IF ANSR$ = "C" THEN 230
180  IF ANSR$ = "S" THEN 530
190  IF ANSR$ = "L" THEN 660
200  IF ANSR$ = "R" THEN 800
210  IF ANSR$ = "E" THEN 870
220  GOTO 90
230  GR : HOME
240 TEMP$ = "AAAAAABBCCDDEEFFGGH
    HIIJJKKLLMMNNOOPP"
250  FOR X = 4 TO 35: COLOR=  ASC
    ( MID$ (TEMP$,X + 1,1)) - 65
    : PLOT X,38: PLOT X,39: POKE
    768,255 - X * 6: POKE 769,10
    : CALL 770: NEXT
260  HOME : PRINT "    A B C D E
     F G H I J K L M N O P"
270  PRINT "NUMBER OF THREADS PE
    R HARNESS?"
280  INPUT "(LIMIT 1-40) ";ANSR$
    :SIZ =  INT ( VAL (ANSR$)): IF
    SIZ < 1 OR SIZ > 40 THEN 260

290  PRINT "SURE? (Y/N) ";: GET
    ANSR$: HTAB 1: PRINT "
          ";: IF ANSR$ <  > "Y"
     THEN 260
300 TEMP$ = ""
310  FOR Y = 1 TO 2
320  FOR X = 1 TO SIZ
330  VTAB 22: HTAB 1: PRINT "CHO
    OSE COLOR FOR HARNESS #"Y" T
    HREAD #"X" "
340  PRINT "ENTER CHOICE (A-P)?
    ";: GET ANSR$: IF  ASC (ANSR
    $) < 65 OR  ASC (ANSR$) > 80
     THEN 330
350  COLOR=  ASC (ANSR$) - 65: PLOT
    X - 1,Y - 1
360  HTAB 1: PRINT "COLOR OK (Y/
    N) ?   ";: GET T1$: HTAB 1: PRINT
    "                        ": IF
    T1$ <  > "Y" THEN  COLOR= 0:
     PLOT X - 1,Y - 1: GOTO 330
370 TEMP$ = TEMP$ + ANSR$
380  NEXT
390  NEXT
400 H1$ =  LEFT$ (TEMP$,SIZ):H2$
     =  RIGHT$ (TEMP$,SIZ)
410  HOME : COLOR= 0: FOR X = 38
     TO 39: HLIN 0,39 AT X: NEXT

420  PRINT : HTAB 9: PRINT "PRES
    S ANY KEY TO WEAVE"
430  PRINT : HTAB 19: GET ANSR$:
     HOME : GOSUB 450
440  GOTO 90
450  FOR Y = 0 TO 38 STEP 2
460  FOR X = 0 TO SIZ - 1: COLOR=
     ASC ( MID$ (H1$,X + 1,1)) -
    65: PLOT X,Y: NEXT
470  POKE 768,255: POKE 769,3: CALL
    770
480  FOR X = SIZ - 1 TO 0 STEP  -
    1: COLOR=  ASC ( MID$ (H2$,X
     + 1,1)) - 65: PLOT X,Y + 1:
```

```
    NEXT
490  POKE 768,100: POKE 769,3: CALL
    770
500  NEXT
510  HOME : PRINT : HTAB 12: PRINT
    "PRESS M FOR MENU": PRINT : HTAB
    19: GET TEMP$: IF TEMP$ <  >
    "M" THEN 510
520  GOTO 90
530  IF H2$ = "" THEN 90
540  HOME
550  ONERR  GOTO 790
560  PRINT D$;C$
570  PRINT : INPUT "ENTER NAME F
    OR PATTERN? ";ANSR$: IF ANSR
    $ = "" THEN 640
580  IF  VAL (ANSR$) <  > 0 THEN
    570
590  PRINT D$;"OPEN ";ANSR$
600  PRINT D$;"DELETE ";ANSR$
610  PRINT D$;"OPEN ";ANSR$
620  PRINT D$;"WRITE ";ANSR$
630  PRINT H1$: PRINT H2$: PRINT
    SIZ
640  PRINT D$;"CLOSE": POKE 216,
    0
650  GOTO 90
660  HOME
670  ONERR  GOTO 790
680  PRINT : PRINT D$;C$
690  PRINT : INPUT "NAME OF PATT
    ERN TO LOAD? ";ANSR$: IF ANS
    R$ = "" THEN  POKE 216,0: GOTO
    780
700  IF  VAL (ANSR$) <  > 0 THEN
    690
710  PRINT D$;"VERIFY ";ANSR$
720  PRINT D$;"OPEN ";ANSR$
730  PRINT D$;"READ ";ANSR$
740  INPUT H1$: INPUT H2$: INPUT
    SIZ
750  PRINT D$;"CLOSE"
760  PRINT D$;"CLOSE": POKE 216,
    0
770  GR : GOSUB 450
780  GOTO 90
790  FOR X = 0 TO 8: FLASH : PRINT
    "DISK I/O ERROR": NORMAL : PRINT
    "CHECK DISK DRIVE/DISKETTE T
    HEN TRY AGAIN": NEXT : FOR X
     = 0 TO 2300: NEXT : POKE 21
    6,0: GOTO 90
800  IF H2$ = "" THEN 90
810  GR : GOSUB 450
820  GOTO 90
830  FOR X = 770 TO 790: READ Y:
     POKE X,Y: NEXT
840  RETURN
850  DATA  173,48,192,136,208,5,
    206,1,3,240,9
860  DATA  202,208,245,174,0,3,7
    6,2,3,96
870  TEXT : HOME : VTAB 8: HTAB
    4: PRINT "THANKS FOR USING C
    OLOR INKLE LOOM": END
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
PV	10	AH	300	GM	590
WS	20	OA	310	TP	600
JZ	30	QX	320	GM	610
LR	40	FV	330	ET	620
GW	50	BC	340	LM	630
OH	60	NS	350	PT	640
RO	70	SE	360	QN	650
MS	80	VW	370	FV	660
BE	90	FA	380	RW	670
DT	100	FA	390	PF	680
RG	110	RH	400	PN	690
LW	120	KT	410	GA	700
HQ	130	ZS	420	EB	710
NH	140	CB	430	GM	720
EB	150	QN	440	ZN	730
FX	160	DS	450	AC	740
FP	170	US	460	GB	750
MN	180	UG	470	PT	760
MB	190	HI	480	HH	770
MB	200	RD	490	QN	780
LB	210	FA	500	YC	790
QN	220	MV	510	XA	800
BD	230	QN	520	HH	810
WN	240	XA	530	QN	820
CB	250	FV	540	BE	830
XH	260	RW	550	GV	840
BU	270	UV	560	LP	850
CB	280	JE	570	IX	860
SK	290	EI	580	SE	870

Total checksum = 2912673

IMPORTANT NOTICE FOR ACTION DISK BUYERS

II Computing's ACTION DISK runs under ProDOS and boots automatically. All magazine programs appear on the menu. The disk also contains a program to convert programs to DOS 3.3 if desired. To get this program, "break" the menu by pressing the Control key and C key simultaneously. You will see the BASIC prompt] after which type -CONVERT. After this program loads, follow screen instructions. To set direction of transfer, press R. To start the conversion, press T. Be sure your destination disk is formatted for DOS 3.3. To return to menu, after prompt type RUN STARTUP.

COLOR WEAVER

An inkle loom simulator

by GERALD M. HAGOPIAN

Works with DOS 3.3 or ProDOS.

If you're a weaver you know what drudgery preparing your loom can be. Choosing the colors of the yarn is fun; warping it (winding the yarn onto the loom), however, is a time-consuming chore. And what happens if midway through your winding you realize your color scheme is just a little bit off?

Although **Color Weaver** can't prepare your loom for you, it can help you to design color schemes especially for the inkle loom. In weaver's jargon this is a two-harness plain-weave loom.

This program lets you experiment with different color combinations. Sixteen colors are at your disposal and you choose the harness size (number of threads). In several minutes you can see the results of whatever mix of colors your imagination fancies.

Any craftspeople who use color patterns in their work can benefit from this program. Those who crochet, do needlepoint, knit, quilt, and so on, will appreciate not only seeing a preview of their color scheme but also being able to change and modify it with utmost ease.

EXPLAINING THE PROGRAM

Here is a list of variables used in Color Weaver as well as a short program description.

P$	CHR$(4) equals CTRL D. This is used for DOS commands.
C$	"CATALOG" variable. Use "CATALOG" for DOS 3.3 and "CAT" for ProDOS.
ANSR$** **TEMPS$ **T$**	These are three string variables used for inputs and for the initial setup.
H1$	This is the string used to store Harness 1 colors.
H2$	This string stores Harness 2 colors.
SIZ	This indicates the size of the harness.
100 to 220	These lines print the menu and act on the selections.
230 to 440	These lines draw the graphics screen and determine the harness size and the color selection.
450 to 520	This section uses H1$ and H2$ to weave the pattern.
530 to 650	This is the Pattern Save Routine. POKE 216,0 cancels the ONERR command.
660 to 780	These lines load a pattern from disk. If the file is not on the disk, the VERIFY command causes an error and jump to line 800. This prevents the OPEN command from creating a new unwanted file on the disk.
790	This is disk I/O error handling routing; it prints out a message and returns to the menu.
800 to 820	This is the REDRAW PRESENT PATTERN section.
830 to 860	These lines set up sound on the Apple. To create sound, POKE 768, TONE :POKE 769,DURATION:CALL 770. The variable TONE and DURATION must be between 0 and 254.
870	Ending routine //

Listing on page 76

Gerald M. Hagopian is a free-lance consulting designer working with consumer products and interior design.

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compiled by ANITA MALNIG, **ASSISTANT EDITOR**

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Broderbund Software
17 Paul Drive
San Rafael, CA 94903
(415) 479-1170
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X-10 (USA) Inc.
185A Legrand Ave.
Northvale, NJ 07647
(201)784-9700
$150 for interface, software and connecting cable

This interface, with a self-contained microcomputer with its own microprocessor, lets you control via your Apple all electrical devices in your home, store or office. Memory is backed up by a battery so that the interface can run 100 hours without AC power. You program what the interface will do with the accompanying software. After all programming is done, you can disconnect the interface from the computer in order to use the computer for other things. The interface, which plugs into any 120V wall outlet, will continue to run.

Apricord Printer Interface Super Serial Imager

Apricorn
7050 Convoy Court
San Diego, CA 92111
(619) 569-9483
Interface: $79.95;
Imager: $129.95

Here are two practical products for your Apple. The **Apricord Printer Interface** enables you to connect any manufacturer's Centronics-compatible parallel printer to the "closed" serial-interfaced IIc. The **Super Serial Imager** lets users of any Apple II family computer transfer high-res images from screen to printer and communicate with modems without any special communications software.

The Luscher Profile

Mindscape, Inc.
3444 Dundee Road
Northbrook, IL 60062
(312) 480-7667
$39.95

In 1947 Dr. Max Luscher, from Switzerland, developed a psychological test based on analyzing a person's color choices and rejections. Mindscape has cooperated with Dr. Luscher in bringing this test to computer software. The publisher states that with **The Luscher Profile** "a user can reveal his or her basic nature and gain clues to self understanding."

Unidisk

Apple Computer, Inc.
20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010
$329.00
With controller card, $429.

This sleek drive is compatible with the II, II+ and IIe and is basically half of the "Duodisk." It needs the Unidisk controller card to run and is compatible with the older Disk II controller card. You can connect a second Unidisk to the first in a daisy-chain fashion, but one controller card will not support more than two drives. Any software compatible with the old drive will be with this. The drive runs under DOS 3.3 and ProDOS.

APPLEWORKS

Boosting your business with integrated software

By Charles Rubin with a forward by Rupert Lissner, developer of Appleworks
Microsoft Press
10700 Northup Way
Bellevue, WA 98004
(206) 828-8080
$16.95

Here's a most readable, well-organized book created to enhance your AppleWorks use. Some of the very practical information deals with exchange of files: DOS 3.3 to ProDOS, ASCII and DIF files to Appleworks, as well as, of course, internal Appleworks exchanges. You'll also find valuable tips on organizing with a hard disk, and setting up Appleworks to assist in business applications and household paperwork organizing.

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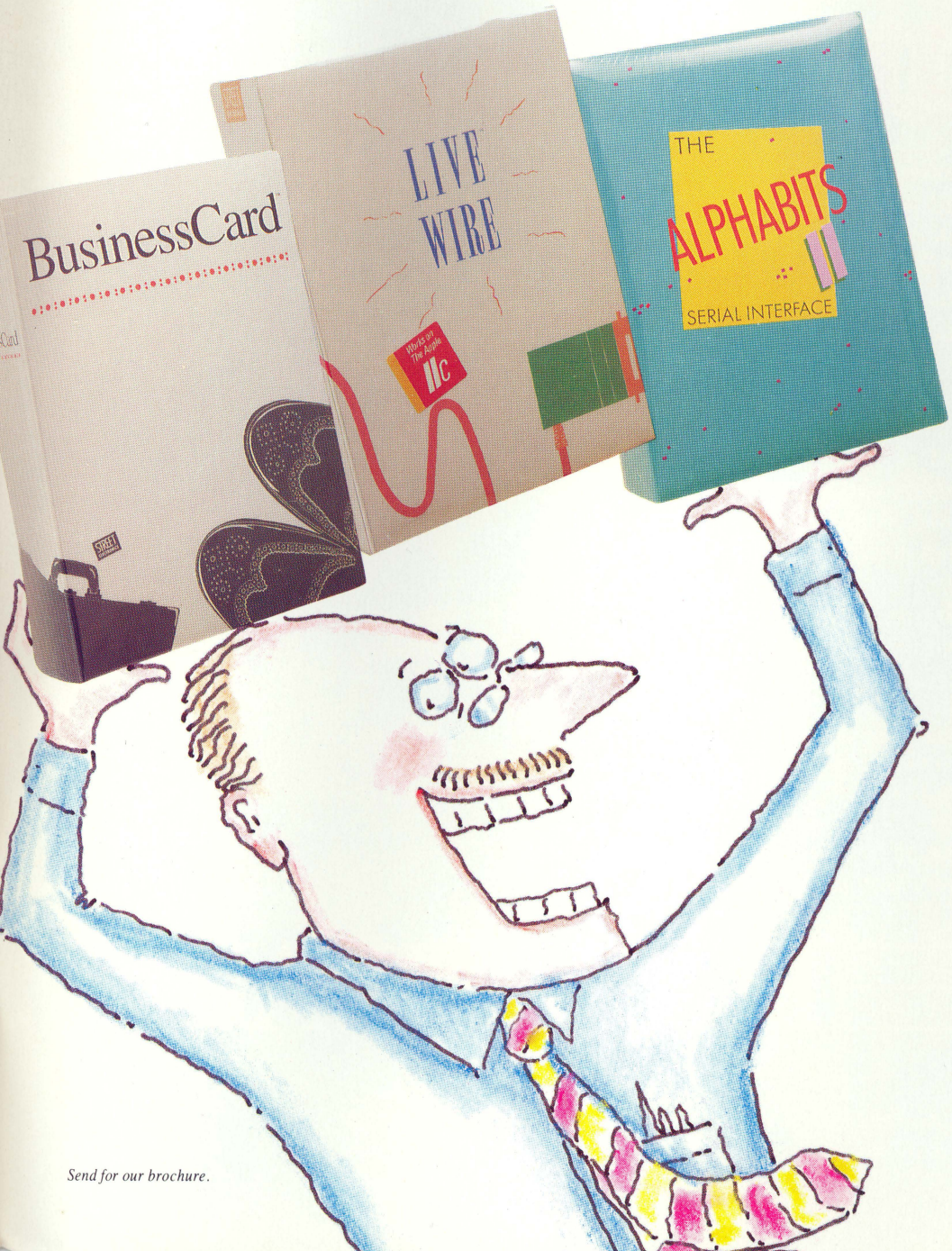

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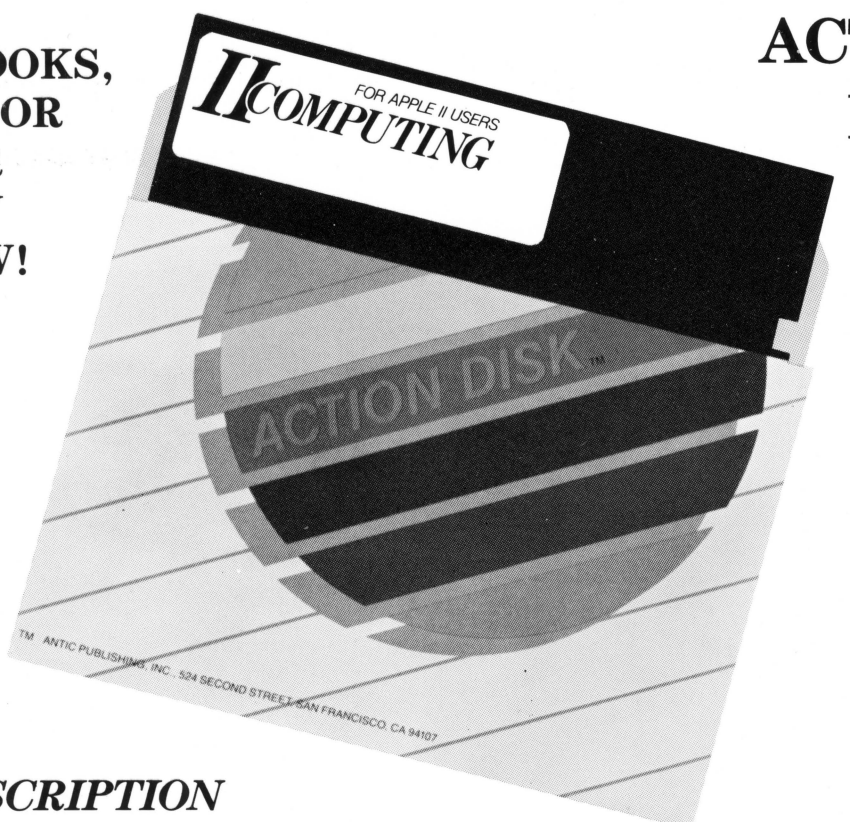

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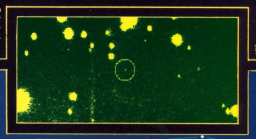
THE RETURN OF HALLEY'S COMET

In this scene from the huge Bayeux tapestry, Englishmen marvel at the bright comet of 1066 (Halley) while King Harold, who has just been told of the bad omen, pictures an invasion.



The faint dot inside the circle is Comet Halley as it appeared on October 16, 1982, when astronomers using the 200-inch Palomar telescope recorded its image for the first time in nearly three-quarters of a century.

CASSIOPEIA
ANDROMEDA
AURIGA
PERSEUS
GEMINI
ARIES
TAURUS
ORION
CANIS MAJOR
PUPPIS
PEGASUS
DELPHINUS
AQUILA
CYGNUS
LYRA
HERCULES
BOOTES
URSA MAJOR
LEO
CANCER
VIRGO
CORVUS
CRUX
VELA
CENTAURUS
SCORPIUS
SAGITTARIUS
CAPRICORNUS
PISCIS AUSTRINUS
AQUARIUS
GRUS
PHOENIX
MILKY WAY
SMALL MAGELLANIC CLOUD

October 16, 1982
Astronomers recover Comet Halley with the 200-inch Palomar telescope. The Comet is over a billion miles from Earth — just beyond the orbit of the planet Saturn — and more than 19 million times fainter than the faintest stars visible to unaided eyes.

November 1, 1985
Although still more than 100 million miles from Earth, Halley is easily visible as a diffuse spot in binoculars.

November 15, 1985

June 1, 1985

January 1, 1985

December 1, 1985

December 15, 1985
The Comet is now bright enough to see without optical aid, but only from dark locations. From now to the end of January 1986, the Comet is best placed for observers at mid-northern latitudes.

January 1, 1986

February 1, 1986

February 9, 1986
Halley reaches perihelion, passing within 55 million miles (89 million km) of the Sun's surface.

March 1, 1986
The Comet is now approaching Earth on the outbound leg of its orbit around the Sun. This marks the beginning of best viewing for observers in the southern hemisphere. By April, Halley is overhead at dawn as seen from mid-southern latitudes.

March 13, 1986

March 13, 1986
The European Space Agency's Giotto spacecraft flies past Halley's icy nucleus.

April 1, 1986

April 11, 1986
The Comet swings closest to Earth — passing only 39 million miles (63 million km) away.

April 15, 1986

May 1, 1986

September 1, 1986

January 1, 1987

April 1, 1987
The Comet lies about 425 million miles (685 million km) from Earth and is 1,300 times fainter than the faintest star visible to unaided eyes.

May 15, 1986
Halley is again too faint to see without binoculars or a small telescope. Anyone with such equipment may be able to view the Comet until late July.

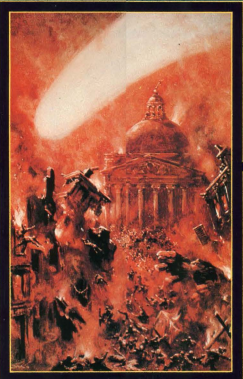
The Comet's Path

Halley swings across three-quarters of the sky in only seven months after spending years moving only a few degrees. Its motion across the sky reflects not only its own motion around the Sun, but that of the Earth as well. As Earth moves around the Sun, the Comet traces a loop because Halley is close to us relative to the very distant stars. Plunging through the inner solar system, Halley makes its closest approach to Earth on April 11, 1986 — two months after it swings past the Sun. Halley's Comet won't be visible again until the summer of 2061.

Map By Francis Reddy

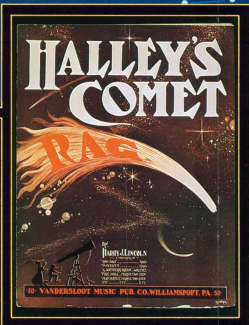
Comet Halley's spectacular display in 1301 inspired Florentine artist Giotto di Bondone to portray it as the Christmas star in his fresco "The Adoration of the Magi." Giotto's rendition was the first naturalistic portrait of a comet.

European Space Agency



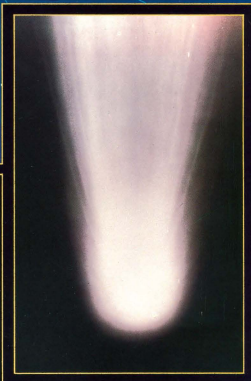
When Halley last appeared, needless concern over the effects of its passage seized the general populace.

Library of Congress



Halley's Comet, The Comet March and Two Step, and *Halley's Comet Rag* were just a few of the musical products of the comet craze of 1910.

Music Division, Library of Congress



Comet Halley as it appeared during its last apparition in 1910. This photograph was taken through the 60-inch telescope on Mount Wilson.

Mt. Wilson & Las Campanas Obs.