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FOR APPLE II USERS

II COMPUTING™

U.S.A. $2.95 CANADA $3.50 DECEMBER / JANUARY 1986

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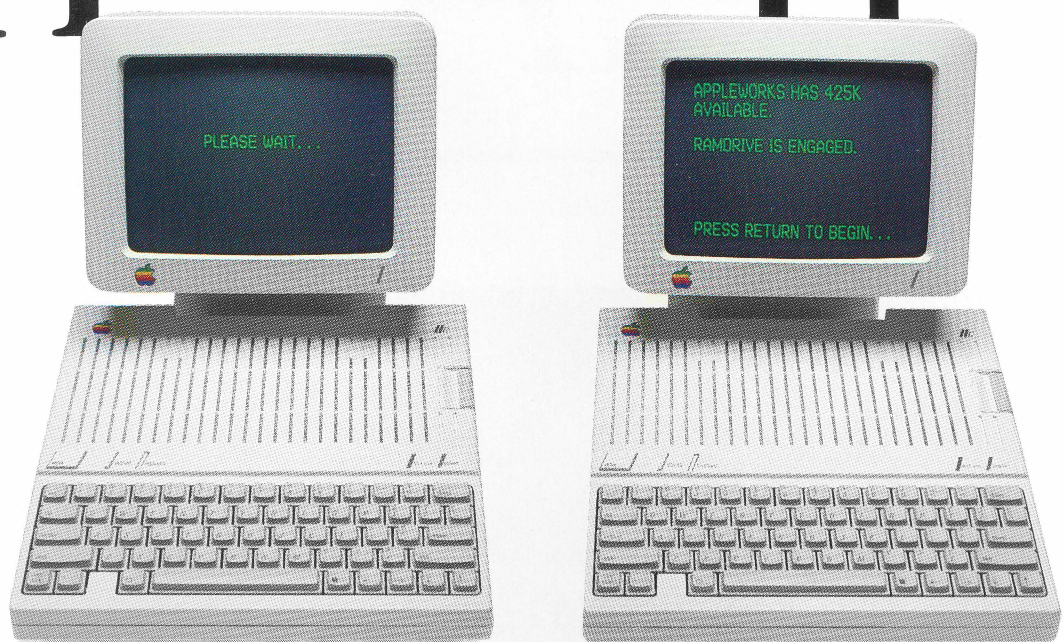
Let's compare Apples™ to Apples.™



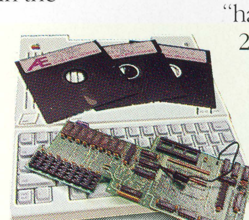
An Apple IIc *An Apple IIc with Z-RAM*

The Apple IIc on the right works exactly the same as the Apple IIc on the left. Almost. The Apple on the right has a powerful memory expansion coprocessing card called Z-RAM. From Applied Engineering. Which means the Apple on the right can completely load AppleWorks into RAM—and then run it up to thirty times faster than the Apple on the left.

Z-RAM also acts as a solid-state disk drive. Which means the Apple on the right will load and store programs up to 30 times faster. And, our included RAM disk is compatible with Applesoft, PRO-DOS, DOS 3.3, PASCAL and CP/M.

Turbo Charged AppleWorks.

Even a 256K Z-RAM can completely load AppleWorks into RAM. With Z-RAM, the moment your fingers touch the keyboard AppleWorks responds. A 256K Z-RAM lets your IIc run AppleWorks up to 30 times faster, increases available desktop to 235K and maximum number of records from 1,350 to over 16,000, doubles the number of lines allowed in the word processor, provides a print spooler, and auto-segments large files so they can be saved on two or more disks. A 512K Z-RAM boosts AppleWorks desktop to an incredible 425K.



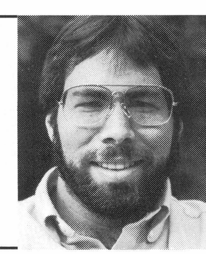
Take a closer look.

There's more. Z-RAM has a built-in high speed Z-80B microprocessor that allows you to run CP/M programs. Which means you now have access to the single largest body of software in existence, including popular packages like WordStar, dBase II, Turbo PASCAL and Microsoft BASIC. A 16 bit option is also available.

And still more. Z-RAM is compatible with all IIc software and hardware, installs easily in just ten minutes with a screwdriver (slightly longer without), is available with 256K or 512K of additional memory (a 256K Z-RAM can be upgraded to 512K at any time). Z-RAM is easily handled by the IIc power supply with our patent pending power saving design.

The only thing better than that would be a recommendation from Steve Wozniak.

> *"I recommend Applied Engineering products wholeheartedly." (Of course, Steve's IIc has a Z-RAM installed.)*
>
> *Steve Wozniak, the creator of Apple Computer*



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Z-RAM comes complete with simple instructions, RAM disk software, Z-80 operating system, CP/M manual. And a five year "hassle free" warranty. Make a good Apple great. With 256K Z-RAM "384K total" ($359); with 512K "640K total" ($419); 16 bit option may be added later ($89).

If you want to run CP/M software, but don't need more memory, we suggest our Z-80c card. The Z-80c has no memory expansion ports and is priced at only $159.

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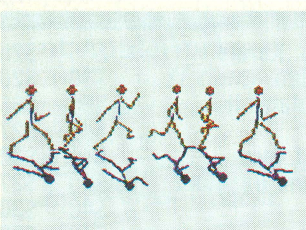

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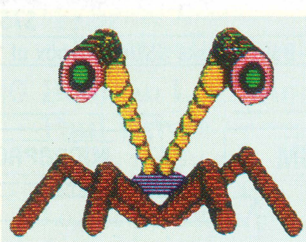
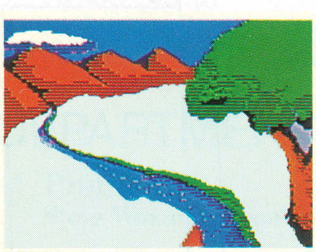


YOU CAN create weird monsters by simply dragging circles around the screen, and using one of the special effects modes.



YOU DON'T HAVE TO be an artist to create vivid Backgrounds for your movies. Fantavision's automatic features make it easy.

IMAGINE how much fun it would be to take a simple drawing and make it come alive, dancing across the screen of your computer.

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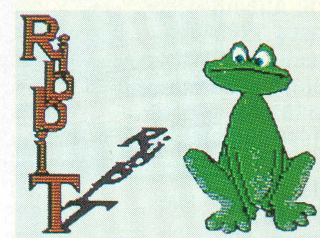
WHEN YOU SEE THE MAGIC of Fantavision, you won't believe it. When you play with it, you won't be able to stop.



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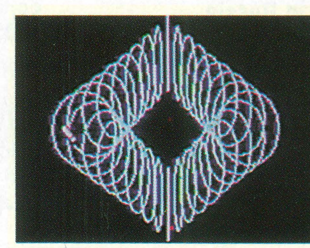

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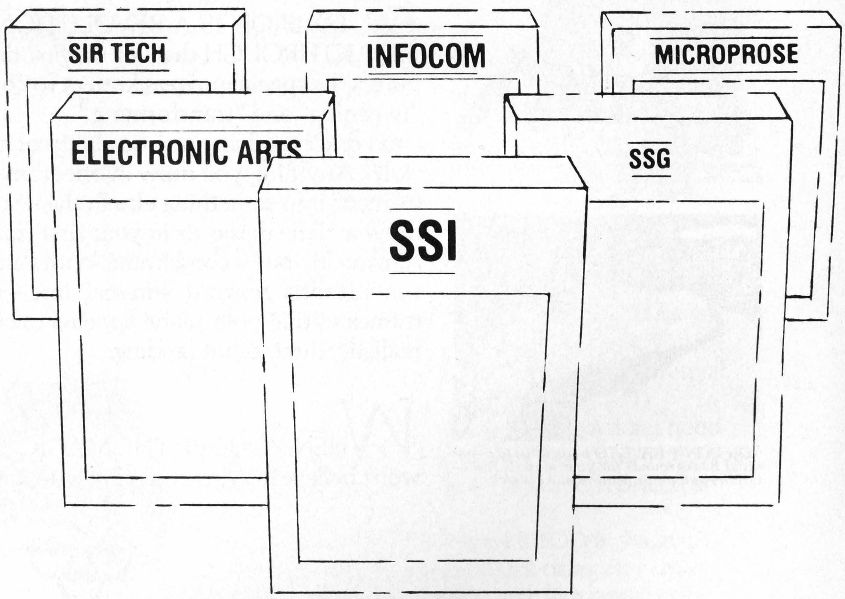

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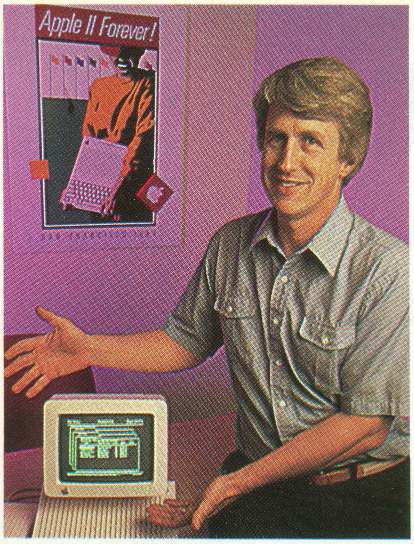

Lissner on AppleWorks . . . page 26

FOR APPLE II USERS

II COMPUTING

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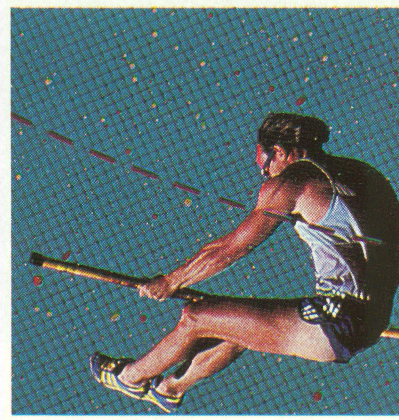

Up and over .... page 16

Perry Mason returns .... page 87

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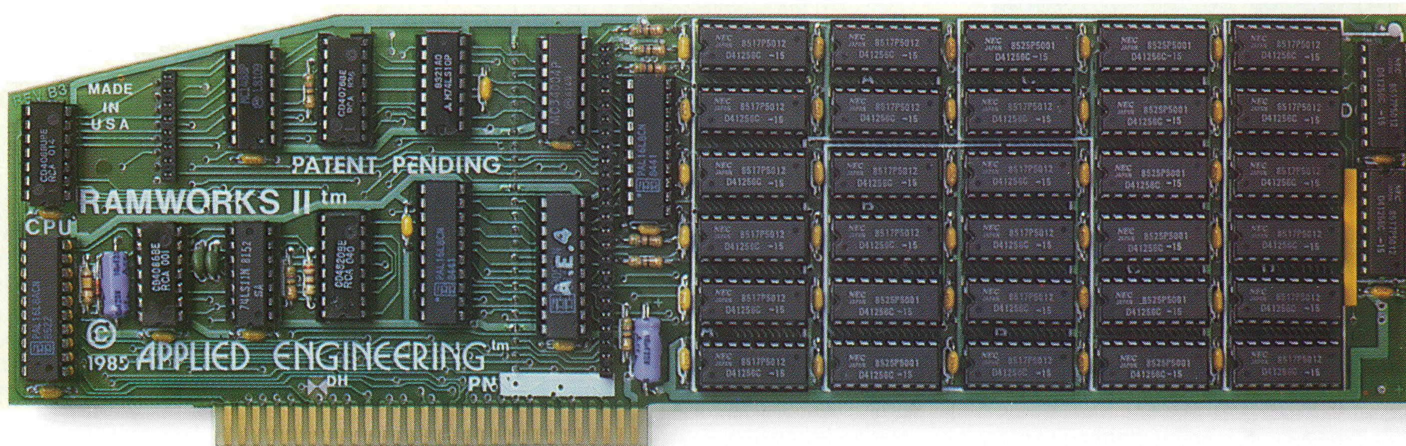


RamWorks II. A Generation Ahead. Again.

The best selling expansion card for the Apple IIe just got even better. With RamWorks II, expand your IIe to an incredible 3 megabytes of usable RAM.

Turbo Charged AppleWorks.

RamWorks II plugs into the IIe auxiliary slot and acts just like Apple's extended 80 column card, only better—because if you buy a 256K or larger card, AppleWorks will automatically load itself into RamWorks II. This dramatically increases AppleWorks' speed and power because it effectively eliminates the 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 II (and the original RamWorks of course) removes those limits. Only RamWorks II increases the maximum number of records available from 1,350 to over 16,000. Only RamWorks II actually increases the number of lines permitted in the word processing mode. And only RamWorks II features a built-in printer buffer, so you no longer have to wait for your printer to stop before going back to AppleWorks (256K or larger RamWorks II required).

With RamWorks II, you won't have to split your data into 2 or more separate files because you'll have the necessary memory to access ALL your data ALL the time, quickly and conveniently.

RamWorks II	AppleWorks Desktop
128K	101K
256K	188K
512K	378K
1 MEG	758K
1.5 MEG	1136K
3 MEG	2277K

The Most Friendly, Most Expandable Card Available.

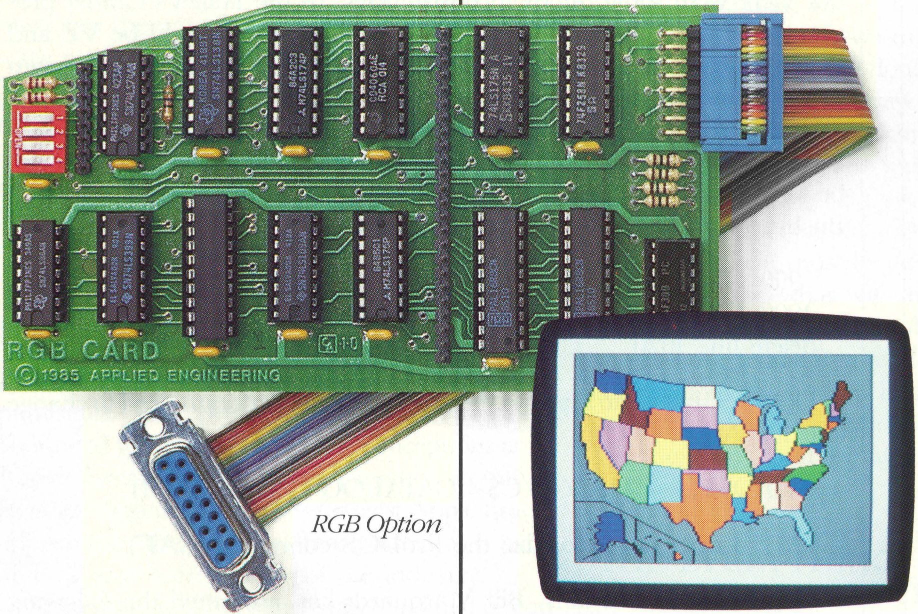
RamWorks II is compatible with more off-the-shelf software than any other RAM card. Popular programs like Advanced VisiCalc, Magic Office System, Flashcalc, The Spread Sheet, Diversi-DOS, Supercalc 3A, Magicalc, etc. (and hardware add-ons like Profile and Sider hard disks). Fact is, only RamWorks is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

RamWorks II was designed so you could take full advantage of future developments in 16 and 32 bit microprocessors. As your needs grow, so can RamWorks II. A handy coprocessor connector allows the latest and greatest coprocessor cards to access all 3 MEG of RamWorks II memory. And speaking of more memory, RamWorks II has a memory expansion connector on board so a low profile (no slot 1 interference) memory expansion card can add another 512K or 2 MEG of memory.

Should you ever run low on memory with RamWorks II (unlikely) you can add these expander cards to your RamWorks II at any time. And of course, these expander cards are compatible with original RamWorks too.

It's In Color.

The same slot that's used for memory expansion is also the slot that's used for RGB color display. RamWorks II lets you decide later to add RGB color. For only $129, an RGB option can be added to RamWorks II to give you double high resolution color graphics and 80 column text. All with razor sharp, vivid brilliance that's unsurpassed in the industry. The RGB option does not waste another valuable slot, but rather plugs into the back of RamWorks II with no slot 1 interference (works on the original RamWorks, too) and attaches to any Apple compatible monitor. And remember. You can order the RGB

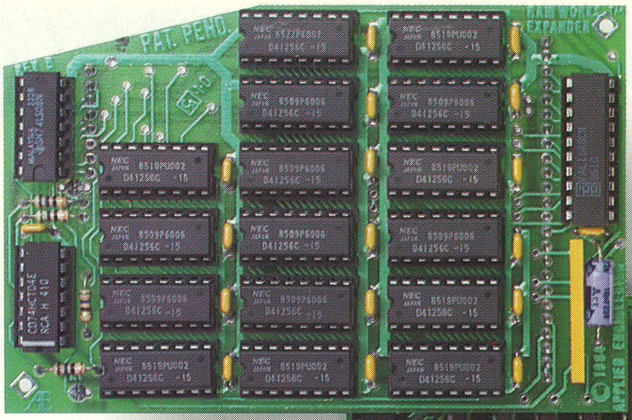


RGB Option

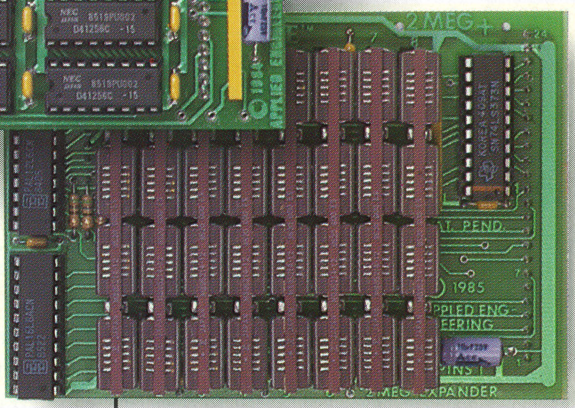
option with your RamWorks II. Or add it on at a later date.

It Corrects Mistakes.

Let's say you bought some other RAM card (and that's a mistake) and your RAM card is not being recognized by AppleWorks, Advanced Visicalc, Flashcalc, Supercalc 3A, or other programs, and you want RamWorks II.



512K Expander



2 MEG Expander

No problem. The memory chips on the card that you now have, which is where most of the money is, can be unplugged and then plugged into the expansion sockets on RamWorks II.

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EDITORIAL

II Err Is Human

by DeWITT ROBBELOTH, Editor

One of the constant problems for computer magazine editors, at least those who publish programs, is the inevitable bug or error in a listing. To prevent this we test all our programs on our Apples, and then prepare them for presentation in the magazine. This includes editing, renumbering, generating checksums and codes (see Typo II, page 58), formatting, generating printouts, pasteup and proofing. But as careful as we try to be, some problems do escape our scrutiny.

So, we take this occasion to introduce a new "reader service" we call ***II Err is Human***. Under this heading in each issue you will find corrections and enhancements to programs from past issues.

Fortunately, the programs in our premiere issue were remarkably clean, but there were some minor inconsistencies. In the Halley's Comet program, line 120 is correct but the Typo II code for it should be VZ and the checksum should equal 3895206. Also, users of the Halley program probably have discovered that the program requires a 24-hour clock, i.e., 23 instead of 11 p.m. Similarly, the date must contain the century digits as well as the decade, i.e., 1985 instead of 85 or '85. The program can be very slow for certain dates. The following changes submitted by Ronald Bushyager of Paoli, PA, will speed things up:

```
990 GS = GS/360
1000 GS = (GS-INT(GS)) * 360
delete line 1020
```

DOS 3.3 users who typed in the Hi-res Labeler program need to change line 1080 to :

```
1080 DS$ = CHR$(4): C$="CATALOG" : DIM B$(61)
```

(DOS 3.3 does not recognize the ProDOS command 'CAT')

And for our NFL fans, Bill Marquardt has submitted the following enhancements to his Football Prognosticator program:

```
820 GAME = 0: MV = 0: IF W < 5 GOTO 880
1080 IF MV THEN GOTO 1240
3880 PRINT LEFT$(BL$,5-LEN( STR$ (SD(I))));SD(I)
3890 NEXT : GOSUB 4500: PRINT D$;"PR#0": GOTO 3910
4510 FOR R = 1 TO 67-LP
4520 PRINT : NEXT R: LP = 0: RETURN
4870 FOR J = 1 TO GAME: PRINT PRED$(J): NEXT J: LP =
GAME + 3
```

continued on page 76

The Beguiling Brilliance of Bill Budge

by MARGOT COMSTOCK

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

Early Apple owners who used their machines at all were aware of Bill Budge. At a time when other programmers' identities were unknown—at best picked up when users listed a program to resolve a problem—Bill Budge's name was part of the title of every commercial product he wrote.

The credit for this, incidentally, belongs to Budge's publisher at the time, Al Remmers, whose rise-and-fall story might be a column in itself. Remmers saw the potential of the star system in software practically before Trip Hawkins learned to input a-p-p-l-e, and Budge was his first star. As a result, Bill Budge's Trilogy, Space Games, 3-D Graphics System, and Raster Blaster, the first realistic pinball simulation, created—or revealed—a legend.

GRAND ILLUSION

Before the press introduced the public to software publishers and programmers, misconceptions abounded where there were any conceptions at all. Budge, because of his strong presence seemingly from the beginning of time—at least Apple time—appeared in the minds of many users as a patriarch, a gray-haired pillar of the industry.

Sometime in 1981, when *Softalk* had just begun, we learned that Bill Budge was in Los Angeles and planned to visit our offices. We were terribly excited, and quite nervous, about meeting this much admired and revered old-timer. When Budge arrived, much later in the day—and much earlier in his life—than we had expected, he apologized for the delay by explaining how nervous he'd been about meeting the people who wrote *Softalk*. He seemed barely out of his teens, a young man of dewy good looks and warm, if shy, manner.

BEING AND NOTHINGNESS

No longer dewy nor shy, Bill Budge remains good-looking, warm, benevolent and brilliant. Never a prolific product-maker, Budge hasn't entered the market with a new individual package since early 1983, when he introduced Pinball Construction Set, which continues to sell as one of the five or six most popular programs ever. (He did Mousepaint for Apple Computer, Inc.— hardly a simple task—but grinned at the news that David Snider had saved him the effort of a double hi-res version with Broderbund's Dazzle Draw.)

But Budge is hardly forgettable; and consumers and industryites alike are frequently asking, what's Bill Budge working on these days? What's Budge doing? The clear implication in their tone is that whatever it is, it must be good, it must be desirable, it must be what will show us the next state of the art. And everyone already wants it.

All those people frequently ask, but apparently they seldom ask Budge. Their intuition, however, is right on. What Bill Budge is working on is very good, exciting, and it may indeed lead the way to a new state of the art.

THE EVERYTHING CONSTRUCTION SET

"Making whatever you want on the computer shouldn't have to be a big programming task," says Bill Budge. "I want to do a construction set that makes it easy for anyone to build whatever program he wants—from pinball pieces for a pinball game to little spheres a physics teacher might use to simulate tiny worlds or an atomic nucleus."

The premises upon which Budge's construction set is based would allow the building of such pro-

continued on next page

grams as word processors or spreadsheets, given the appropriate primitive commands to work with. But Budge wants the most possible expandability, and that still resides in the kinds of programming that first gave us games and graphics.

"I want it to make toys," Budge says, "but maybe I mean something a little different from what people will think." To Budge, a toy is anything that's fun to tinker with, play with, learn through; toys arouse curiosity, inspire experimentation—lots of very good things.

That, too, is where progress has traditionally come from in software. New and exciting changes come through pushing the frontiers of versatility, simplicity of use through graphics, and simulation. With that in mind, the Universal Construction Set will provide the primitive commands suitable for designing any sort of video games and any kind of simulation.

THE ART OF THE STATE

"All it really is is a state machine," Budge explains. *State machine* is a term used in computer science to describe a system of discrete points within a prescribed area that interact according to given rules. You can picture such a system to look like a network connecting numerous points, or states. The point that can move around among the other states is the current state; it can output or assimilate input at each state. How you arrange the network and what rules you give for moving among the states determine what kind of a program you end up with. "I want to expand the state machine beyond the finite examples traditionally used in computer science. My machine will have broad states and transitions so that what you define is a space with infinite points. Then you set its dimensions, define its parts, and set rules so it can run.

"It's like being able to build little synthetic machines that you can play with. The games provide the model—simulations like the atomic nucleus. Anything mechanistic—you can build a model of any machine."

Discrete state machines can define animation—or play music. Any video game, Budge says, is just a state machine, with collisions, inputs, outputs. It's also an example of cellular automata.

The game of Life* is a two-dimensional example of the same thing. Each point, object, cell, has two possible states: on or off, being or not being. And which state a point is in depends on simple rules. In the game of Life, the rules are usually that a living point dies of crowding when three or more adjacent points are on and dies of loneliness if alone or if only one adjacent point is on.

With the Universal Construction Set you could produce Life in this form or create a similar simulation in one-dimensional form.

Life in one dimension consists of a row of points with left and right neighbors only. Each point might have four states of being, such as different colors, determined by a set of rules. So the simulation would draw one row, then determine the next row by the rules applied to the first row, and the next row, getting a sequence and potentially very interesting results.

FLY ME TO THE MOON

"You can get very complex behavior or very simple depending on the rules you set," Budge says. And this is the way computer simulation can be used to attack complex math problems, called chaotic systems. For instance, mathematical analysis fails when it comes to defining the behavior of water coming from a tap when it's neither dripping steadily or flowing with some consistent force. That's an example of a chaotic system, and computer simulation can define it far more workably than math has been able to. The computer makes it possible to search for automata that have similar behavior. The universe of mathematics greatly expands by including these machines.

So, no, the Universal Construction Set is not just a fancy video-game generator.

"It could be called the Simulation Construction Set. You create a discrete number of objects in a world, give them rules, and watch what happens." Who knows what you might be so inspired to create or design.

"Leonardo was the first to see that machines could be designed for specific tasks. Then he went to work designing machines for everything he could think of," Budge says, sounding as though Leonardo were a personal friend, rather like, well, Woz. The helicopter and the diving bell are just two of the machines whose first design and concept are attributed to da Vinci.

With Bill Budge's Universal Construction Set, people won't have to be programmers to design machines for any task they think of, and maybe some they don't.

Budge has an interesting perspective on programming ability, however. He believes that eventually almost everyone will be able to program; programming will be similar to reading today. The Universal Construction Set will make it easy for everyone to get started by doing things that won't even seem like programming as we now think of it.

"Like programs such as *1-2-3*, the set will have

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PROFILE

Steve Wozniak Speaks Out

by MIRIAM LISKIN, LYNNE VERBEEKE and STAN POLITI

Steve Wozniak, the young engineer who designed the original Apple computers, and who teamed up in 1976 with friend Steve Jobs to start Apple Computer, Inc., left the company in February 1985 and shortly began a new venture, Cloud 9. This interview was conducted in August, 1985, and first appeared in longer form in Computer Currents, *a biweekly publication serving the San Francisco Bay Area. It appears here courtesy of* Computer Currents' *publisher Stan Politi and the other interviewers.*

PHOTOGRAPHY RICK BLAIR

Interviewer: *How did you get involved with Cloud 9?*

Wozniak: I started this company because it has a real neat product that had to get done, and I wanted to do anything I could to help a couple of other people start up a company for it. Then I got so intrigued by the product that I wanted some input into how it was designed, based on what I'd learned at Apple about the human interface. I wanted it done so well that rather than hire somebody to do the circuit design and the microcode, I wound up doing it myself.

Int: *What are you working on at Cloud 9?*

Woz: Programmable remote control. A versatile unit that you can program to control all of your equipment by pushing one button. If you have a satellite receiver, and a million people do, you could need up to seven remote controls to operate your TV. Life wasn't made to be that difficult. You should have just one piece of equipment that lets you push one button to turn on three things, and set them all so you're watching NBC.

Int: *Did you get tired of computers?*

Woz: Yes. I mean, I use them day in and day out, and I love them, but I just got tired of working with them intensely. I could get interested in some type of computer, but not what computers are today, and only for my own interest, not as a new product. Of course, now I am theoretically designing a computer, because this new product is programmable, but it doesn't do any of the same things that computers today can do. It could be expanded into a computer, because it's got a programming language which is very powerful, even though it has no variables. But I will point out that we made this product open. You can unplug the infrared input and output, and there's a 12-pin connector that connects right to a built-in 6502-equivalent processor, with 8K of CMOS RAM. We put a little mini-jack on the side so you can actually connect it to any terminal and have a 6502 monitor up and running, to write your own test programs. You've got an LCD display to work with, and it's a real neat development system.

Int: *What do you think is the future of home computers?*

Woz: I think we've got to admit to ourselves that it's intriguing, that it's fun and entertaining to use a clean, modern technology to do something. I can honestly say that the computer is so much better

continued on next page

than the typewriter I had before, but it's dishonest in a way to say it's so productive, or that it's changing me as a person. In the end, it's really a more modern tool for doing the same work.

Int: *Can you visualize what the ultimate computer for the home market would be like? Would it be tied in with a home entertainment system?*

Woz: Mmm, everybody would pretty much say the same things, you know, it would be tiny, with a flat backlit LCD screen, and it would plug into every TV and control all your appliances, and have huge amounts of memory, and a hard disk built in, and it would be the size of a book...

Int: *Who should have a Mac, who should have an Apple IIe and who should buy a IIc?*

Woz: Well, anybody who's going to be using the computer to help them in a hardware lab should have an Apple IIe. I designed the IIe for basically two things, and that was one of them, because that's what I did in my life. To write BASIC programs, or write assembly language programs to solve engineering problems, plug in cards to burn EPROMs, test out microprocessor circuits, there is no better alternative, period, in the world. The IBM PC is much more difficult to use for those things.

I wouldn't recommend the IIc for any use other than at home, where you'd want to save space. I designed all the desks here to give huge amounts of desk space so you have a working desk and a separate desk for your computer. But a IIc takes up less of your life, it takes less of your space away.

If you're going to be doing the normal business work, spreadsheets, word processing, a little bit of graphics and telecommunications, Macintosh is the place to start. The only reason for any other computer is that you've already got one that you're familiar with and you like, which is a good reason. It's not as if you can say somebody is wrong to get almost any computer that exists. I'm probably more productive to this day on an Apple II than on anything else, even though Macintosh is better.

Int: *What's the morale at Apple after reorganization?*

Woz: Right now they're going through a lot of changes, and whenever there's a change there's an upset in morale. After a while it gets back to normal. What I hear from a lot of departments at Apple right now is real rapport with the reorganization, and I think it'll become stable.

Int: *Do you think Sculley's the one to bring Apple back to its peak again, or beyond?*

Woz: Yes, largely by his understanding of the total operation of the company, how manufacturing relates to engineering, to marketing, and being able to put them all together and keep them working well together. And right now his management team is the finest. His technical leader, Jean-Louis Gassee, is the finest manager I ever knew at Apple, just for common sense thinking about what you need to sell, what will sell, what you need to do to make it sell.

Int: *In some interviews I've read the impression created was that Jobs wanted to build this corporate culture, and Sculley was running it like most bottom-line, straight companies are run.*

Woz: In the end, Sculley is running a business. The owners of the business are the shareholders, and he's going to do everything he can to make them the winners. Jobs had too much of his own ego and personal directions involved that didn't have to do with whether the decisions were good for the business. It was more what was good for what he conceived of as his own image in the world. Sculley probably feels sort of sorry about swallowing a lot of Jobs's bull, because he's so eloquent about speaking it. Sculley started saying exactly the same things as Jobs for the last year, because Jobs always came up with the words that would grab you. It's like a politician saying "trust me," and you believe him. For some reason, if they say it the right way, you believe them.

Int: *Would you care to comment on your relationship with Steve Jobs at this time?*

Woz: Well, when I left Apple to start Cloud 9 I expressed some negative feelings about the market, usage of computers, some of the things I've said to you. Then recently, he went to the plastics outfit we'd selected [to make the case for our new product] and he said, "Look, it's CL9 or it's Apple." They had a contract that said they could not do anything that competes with Apple. We have it in writing from Apple that our product does not relate to anything Apple does, and this outfit knows that, so they were not in violation of any contract. But Steve went there on a weekend and saw that they were doing our product, and he told them, "you cannot do it or you'll lose Apple's business." It was just personally driven. He told us on the telephone that it was because when I left Apple, I had kicked Apple. And my attitude is, maybe I kicked Apple, trying to kick it in a good direction, but the big fat cat didn't even wake up. Anyway, that's what he told us privately, but he would never say it publicly. His reason for doing it was to try and get me, so I really could not phone him or initiate a conversation at this time. I run into him on occasion, and we'll talk peacefully, but it was a very, very wrong case of using power and money to manipulate those who didn't have as much. That's the sort of person he actually is inside. Aside from not being able to trust him, he will use anyone to his own benefit.

Int: *Was this something you were ever able to perceive about him way back when?*

Woz: Yeah. Oh yeah.

Int: *But it was a good marriage at the time?*

Woz: Yeah. We got along, we were great friends. But once he had me design a product for Atari called Breakout, for the arcades, and he said, "I'll split the money with you, 50/50. They're paying us $700, so you'll get $350." And fine, I got my $350. Later I learned, from reading a book, that they'd really paid several thousand. He said similar things to other people at the time. He said, "Well, I buy something for $10, and so-and-so wants it for $100. It's worth $100 to him so I'll sell it to him for $100, without even telling him I bought it for $10." And that's really indicative of what's inside of him. I would not allow that to have control over what I was doing. There are different types of people in the world—there are some that will be very friendly and honest, and you can count on them for what they say, and there are others that use their strength any way they can.

Int: *If you had to do it all over again with Apple, what would you do differently?*

Woz: I'd be very outspoken about what Apple should be doing with its product line relative to the real world, to build the company and build sales. We were going to have very large revenues coming in between 1980 and 1983 from the Apple II, and Apple didn't allow any project at all on the Apple II, especially an expansion, for the sake of one product—the Apple III.

The Apple II was the largest selling computer in the world. I travelled a lot on the outside then, to a lot of user groups and clubs, and I knew what people were doing in the real world. But inside Apple, nobody then knew of any product you could plug into the Apple II to add memory or mass storage. There were no 64K Apple II systems inside Apple, period. No Apple II was allowed to have more than 48K of memory or to have more than one floppy disk, because then it could do the same thing an Apple III could.

Int: *All those businesses that should have been buying Apple III's were buying Apple II's and putting as much other stuff on them as they could---*

Woz: And Apple didn't support them, deliberately, very deliberately. The ProFile was designed for the Apple II, but Marketing said "No, no, we can't have a concept in peoples' heads that an Apple II can do this. We're only going to aim the Apple II towards low-end uses, and we will put the ProFile only on the Apple III." But then to stick with that for three years was wrong. Maybe stick with it fully for a half a year, then they should have started merging the two. To stick with it for a whole year and try to make the III go is reasonable, it's understandable. But three years? There's no way in the world to understand why every ad for three years was Apple III. It was three percent of our business.

Only a few percent of the engineers at any one time were working on Apple II development projects, until products like the IIe had to get phased into production. It's an untold story. The Apple III had a poor introduction, and they could have either dropped it or let it remain very small and supported it at that level forever. They put all the money into making the Apple III compete head to head with the IBM PC for the sales that occurred in 1983. The Apple II should have shared those, and Apple was the only company that absolutely never allowed the Apple II to be expanded. They made enemies—anybody who expanded it in an outside company was an enemy of the system software and the system engineering people inside the company, and we would sometimes turn them off and not talk to them. Apple totally disallowed the Apple II because the Apple III failure was kind of a personal failure to Steve Jobs and Mike Markula, and they tried with hundreds of millions of dollars to buy success for their ideas.

Int: *Do you think there's a place for very small companies, like two guys in a garage, the way you started out, making software or add-on products for computers?*

Woz: Yes, there's always going to be a place for

continued on next page

a couple of people to write a good general-purpose program, with enough sales to support up to a couple dozen people. If you're lucky and happen to come up with a good product, you can make money, but I wouldn't urge anybody to go in that direction. The image that got built up in the last few years was that any two people that had some knowledge of computers and software should start a company related to computers. So all the engineering and software talent went in one direction—PC's—and it took away from other kinds of products. Now, all those companies are wondering if they can make the next payroll, and there's a big vacuum for good products like the one we're doing here, that could have started a few years earlier.

Int: *Can one person design a computer these days, the way you say you like to work?*

Woz: Oddly enough, a lot of it can be done. Nowadays we [Apple] have gotten to the point where Hewlett-Packard was before Apple started. H-P didn't want an Apple, because they knew a complete computer meant various pieces of hardware, operating systems, some languages, applications software. We thought, "We're just going to start up a little company selling computers, and we'll do all these other things eventually." But now to Apple, "computer" means a lot more than just a PC board with a CPU and I/O on it, so one person couldn't do that whole task. One person could do a very tight CPU design and a lot of the ROM code.

Int: *Would it take too much time?*

Woz: No. If you get the right one or two people, very motivated, time doesn't have the same measurement. There's never a way to put a fixed time on how long a computer design takes. For a full computer project that Apple would do, you'd need ten man-years at least, along with everything that they'd have to do to feel they're introducing enough of a product that it will somehow sell. Apple could never go back. It's like H-P—you couldn't go down and start a little hobbyish project that might build into a huge business. Apple could never start with a new technology right now that was only going to be small sales, because they could never justify the cost of managing it, even though it might in a few years be worth billions. Every single new technology promises that in a few years it will be worth billions, but it's hard to show which ones are really going to make it.

Int: *Does it feel strange to have started out that way yourself and now your child grew up and changed completely?*

Woz: Not strange. . . I had designed those computers before there was an idea to start a company, and I demonstrated them for a long time before Steve came by and said, "let's start a company." My motivation was just to design neat products and stuff. It was done as a hobby, in the days when you shared a lot of the technology with other hackers and you went to clubs, and it was the intrigue of your life that you've got something real special. I worked for H-P even when I was designing this stuff at night as my hobby. So, I would say not strange at all. It was unusual to have been so successful so fast—it was a huge success.

Int: *You didn't have any idea that might happen?*

Woz: No, no way at all. And how large is large? A million dollars was large to me when we started—it was so huge it was unbelievable.

Int: *You've been so successful, have you ever thought of retiring?*

Woz: What I want right now is to make a really good product. Working hard all those nights is not satisfying. A lot of programmers say it is, but you don't really enjoy having to stay up late, always thinking the goal is one hour ahead of you when it's really 20 of those one-hour fixes. Programming forces you to keep very strange hours because of the way the goals set themselves up, and it is one of the hardest types of work during those periods.

Int: *John Dvorak got us on a running joke about the kind of car people drive. What do you drive?*

Woz: I drive a Datsun 300 ZX (not turbo charged), a four-seater for my two kids, with baby seats in them. It's about the greatest car in the world. I also have a new Porsche. But the Datsun is a better car almost every way around except looks, and it only cost half as much.

Int: *Do you have one definitive statement you'd like to make to the world?*

Woz: Always enjoy what you're doing. Businesswise, always be honest with yourself and the world about what someone's going to buy. Not what has value because your special expertise went into it, but what is going to be of value to an end user. Some common sense thinking.//


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Motion Analysis

Every little movement has an X,Y all its own

Text by MIKE FLEISCHMAN

Program by DAVID EMPY

Breath condensing in the frosty air, the skiier springs from the starting house, thrusting poles into the crunchy snow to gain speed for the downhill test of courage and control. The golfer pulls the club into the backswing, elbow stiff, then zzzzzzap, the arcing clubhead smacks the ball into a glorious trajectory. In a froth of spray, the swimmer coordinates a swirl of arms and legs driving through the water.

These images remind us that in competitive sports these days the difference between a winning and losing performance is often miniscule, a subtle advantage of energy, psychology or technique. Athletes and their trainers explore every method to be best prepared for a contest, and one of these avenues is computer-assisted motion analysis.

Everyone, it seems, is familiar with the concept, but few are skilled in the practice. The science, we learned, is known as kinesiology, the study of human movement in terms of time, distance and force. I live in Colorado, not far from the Olympic Training Center and the University of Northern Colorado—another hotbed of this kind of research. At these locales I got a grounding in what's involved in this study, and eventually met with Dr. Jerry N. Barham, author of *Mechanical Kinesiology* (Mosby, 1978), whose book you will find invaluable if you pursue this project.

Dr. Barham does many of his studies with an Apple II computer. Stated simply, the process he uses requires filming the athlete, transferring the data from film to computer, and processing the data. He helped me understand how to make a start in this field, but the programs he uses are far too complex for this presentation. Nevertheless, we do have a program for you (see Listings, page 64) that is at least a starting point for some simple analyses.

Ideally, you should film the subject of your study with two cameras

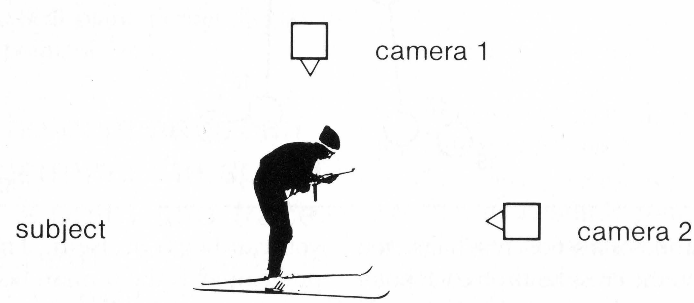


Figure 1 Camera arrangement.

continued on next page

that are 90 degrees apart (see Figure 1). This captures all three dimensions of the movement. The cameras should be synchronized so that each frame from one camera matches the corresponding frame from the other. The subject should wear tight-fitting clothes so that the body joints can be clearly seen. Some method to highlight the joints on the subject's costume eases the later task of data entry. After filming, develop the film normally, and prepare to enter data into the computer.

The professional way to enter data is with a device like the Vanguard motion analyzer. This projects the film on a screen frame by frame, and superimposes a set of cross hairs. You position the cross hairs on each point of interest, read off the X and Y coordinates, and write them down. After doing this laboriously for all frames, you enter the data manually into the computer. This is an expensive and time-consuming process.

Fortunately for the amateur, there is an easier way. One camera is sufficient to give you good images of actions taken essentially in a vertical plane parallel to the film plane of the camera. Project the film frame by frame on a graphics tablet. Touch the points with a stylus in the order the computer asks for them. Of course, this assumes you have an appropriate program, such as ours, to accept the data. The data is entered directly and the computer calculates the points for you.

It isn't necessary to use every single frame in an analysis. Movie cameras normally run at 24 frames per second. Our program will analyze as few as two frames per second, so a reasonable compromise might be four frames per second, or every sixth frame of film.

Once the data is in the computer, you can begin to use it. The computer models the human body as a stick figure with points representing the joints of the body (see Figure 2). These points are used to measure the movement of the different parts of the body relative to other parts of the body. Objects associated with the body, such as skis, poles, bats, clubs, etc. are represented as additional points connected to the body.

The computer can use this data to determine such things as the speed and direction of a point, and can trace the path taken by a point during the period under study. The significance of this information varies. In tennis, for instance, a serve goes fastest when the velocity of all points peaks at the time the racket meets the ball. In bowling, you might want to analyze arm swing for smoothness.

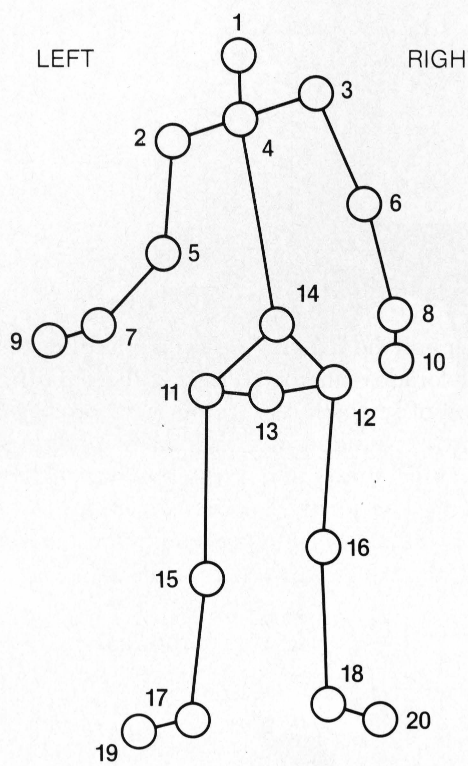


Figure 2

The kind of analysis you will do depends on the sports that interest you, but all such problems boil down to three major components: timing, movement and force. Some guiding principles are: all actions must come in the proper sequence for the result to be optimum; only those movements that contribute effectively to the desired result should be included in the action; the coordination of movements in a time-frame affects the force of actions; in any movement there will be a moment when the force is greatest, after which it declines.

$F=(m*V\wedge 2)/2$ is the equation for force where m = mass and V = velocity. In most sport situations the mass doesn't change, so force depends largely on velocity. Of course, the strength of muscle groups and the linkages of the body parts also affect the points in a movement where maximum force can be applied.

Now that you know a little about motion analysis, you might want to experiment with it yourself. Here is a list of the equipment you will need.

- Apple computer & disk drive
- Graphics tablet (we used Koala Pad)
- Movie camera (16mm is best)
- Movie projector (must have freeze frame)
- Programs listed on page 64

Several difficulties are inherent in this setup. First, the field of the Koala Pad is very small, therefore the image projected on it must be very small, and some projectors will not focus this close. The program can be modified to accept data from a larger touch-sensitive panel, or you can project on graph paper and enter the coordinates manually from the keyboard. Also, with such small tolerances, the points identified for the figure are extremely hard to get right; so both the projector and projecting surface must be secured against movement.

Warning: freezing frames of celluloid film subjects them to unusually high heat from the projection bulbs of many projectors. If this doesn't actually ignite or melt the film, it can warp it, thereby distorting the figure. The Kodak Analyzer projector is made for this work and interposes a heat filter between the bulb and film. Some 8mm projectors also have this feature, but are not intended for continuous freeze-frame work.

I suggest you experiment with the graphics tablet or graph paper before taking any movies. Draw a stick figure like the one above, in several successive stages of possible movement, and enter the data points into the computer. The program accepts X coordinates from 0 through 279 horizontally, and Y coordinates from 0 through 191 vertically. Be sure to give youself some margin room at the top, bottom and sides. This will familiarize you with the features, limitations and potential of the program.

If you decide to actually film some action, set up to get the best continuous view of the significant points of the body, while keeping them approximately equidistant from the lens. You don't want the action to come significantly towards the camera because the program cannot handle perspective.

The animation is slow due to the limitations of BASIC, and the analyses lack sophistication. However, the kernel of the idea is here. Perhaps you can devise ways to improve the program, or tailor it to your own sports interest. ***II Computing*** will gladly receive any improvements to the program and share them with our readers in future issues.

I want to thank Dr. Jerry Barham for his help with this article, and thank the U.S. Olympic Committee in Colorado Springs for their information on current motion analysis projects.//

Mike Fleischman is a programmer/analyst who summers in Colorado and winters in West Palm Beach.

David Empy received a BS in computer science and mathematics from UC-Davis. He programs for the Apple and other computers.

Explanation of Program:

This is a general program, adaptable to many different sports situations. Essentially, it accepts data points for each frame, gives an opportunity to change (edit) any frame, saves sequences to disk, and displays a stick figure for each frame. You tell the program how many frames occur per second (minimum of two), and give it a standard distance by which to scale the activity. Two analyses are possible: the velocity of any given point can be charted or graphed relative to any other point; and the path of any given point can be traced.

In order to leave enough RAM space in 64K machines running under ProDOS, this program is divided into two listings. Listing 1 initializes the variables, allocates array space, sets the "start of program" location pointer to the memory above the two hi-res pages, and sets the input mode (keyboard or Koala Pad). Listing 2 contains a ten-option main menu and the corresponding subroutines.

Under DOS 3.3 the two listings can be entered as one listing by removing the REM statement in line 80 and deleting line 220. Under ProDOS, line 220 chains to Listing 2.

The program does not recognize perspective or three dimensions. All motion is assumed to occur in a single vertical plane perpendicular to your point of view.

The computer can determine the speed of a point and trace the path of a point in motion.

The Koala Pad takes input from a 256 X 256 point grid. The hi-res screen displays 280 points horizontally and 192 points vertically. Therefore, when displaying the animated figure and velocity points, lines extending below row 192 will be truncated.

Each motion sequence is stored as a separate BASIC file on disk, and each frame is stored as a separate record in the file. The program accesses the disk for each record—a slow process. This is not real-time animation.

The velocity plot actually calculates speed. It uses the three-point formula:

$$df(x)/dx = (f(x+h) - f(x-h))/2h$$

This appears slightly disguised in lines 2980 and 2990.

The drawing routines only connect the 20 identified points of the body. Any additional points for poles, bats, rackets, etc. require new program lines of the type seen in lines 1980-2150. Adjust the FOR/NEXT loops in lines 1870, 1900, 1920 to read and plot the additional points.

Listing 1

Line 60 sets up the error-handling routine (lines 470-560).

continued on next page

Line 70 relocates the program above the second page of hi-res graphics so the hi-res pages can be used for animation and velocity plots.

Lines 100-130 set up the array PT$ which labels the 20 points of the body whose coordinates are input for each frame of film. If more points are defined, label them here.

Lines 140-180 set up default values for the scale factor SF and the number of frames per second, FPS.

Listing 2

Lines 80-230 are the main loop of the program. They print a menu of ten options and prompt the user for a choice. The choice causes a branch to one of ten subroutines.

Lines 250-350 create a data file. The program asks for a file name, then creates the file with that name. Data files are random-access text files, with records 280 characters long. Record 0 holds NF%, the number of the highest numbered record in the file, and NP%, the number of X,Y coordinate pairs stored in each record. Each of the other records represents a frame of the file, and can contain up to 35 X,Y pairs.

After this routine is called, data will be read from and written to the file created by it, until the file name is changed by another call to this routine or to 370. The variable FL$ holds the name of the current data file.

Lines 370-480 are like the previous subroutine, but it assumes that the file whose name is input already exists. It reads in the values of NF% and NP% from the data file.

Lines 470-560 are a short error-handling routine. Errors in the append routine (lines 370-480) involving non-existent or misnamed files cause an error message and return to the main loop. Other errors are listed by code number and the line number in which they occurred.

Lines 570-600 are a routine that changes the value of FPS, the number of frames per second assumed by the velocity routine. It prints the current value of FPS and asks for a new one.

Lines 620-940 set a scale factor SF, used in the velocity routine. It asks for two points to be input on the Koala Pad, or the keyboard. To input the points, press a point on the Pad and press the left-hand button (button 0); or if you are using the keyboard, type in the X,Y coordinate values separated by a comma and press RETURN. Then it asks for a distance, and calculates the scale factor, used for finding the 'real' distance between any two points on the pad. Lines 620-790 accept Koala input. Lines 800-940 accept keyboard input.

It all boils down to three components: timing, movement and force.

Lines 950-1440 are the routine for adding data to the data file. For this routine, you must project a still frame from your film on the pad, or if you are using the keyboard, project the frame on a sheet of graph paper. The program checks if the current data file has any data; if not, it asks for a value of NP%, the number of points per frame. Then it asks for the input of that many points. The first twenty correspond to certain joints of the body, the rest are unassigned. After all NP% points have been input, save them in a new record of the data file.

Lines 1450-1570 compute the position of three points: between the shoulders, between the hips, and the top of the pelvis.

Lines 1580-1700 allow the user to reenter a previously entered frame. Line 1640 prompts the user for the frame number, sets the variable E to 1 (enables edit mode), and calls the input routine. Lines 1650-1680 open the file and replace the frame with the new points.

Lines 1730-2160 are the animation subroutine, which displays an animated version of the motion of the figure in the film, as input by the user. The animation proceeds by drawing on one page of hi-res while displaying the other. It is regrettably slow. Lines 1980-2150 are a short subroutine to draw the figure, except for lines which go beneath row 192.

Lines 2180-2210 are a routine to catalog the disk. CNTL-S stops the listing from scrolling and CNTL-C breaks the listing.

Lines 2240-2470 are the subroutine to trace the path of a point. The routine lists the possible points to trace, asks the user to pick one, and displays a trace of its path on the hi-res screen. To end the display, hit any key.

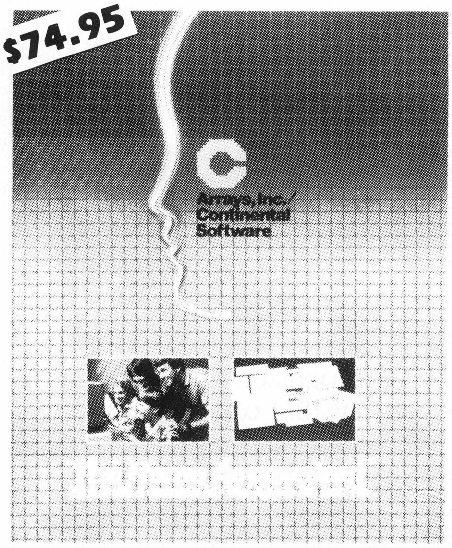
Lines 2510-2900 are a subroutine to plot the speed of any point with respect to any other point. For example, you can plot the speed of the left wrist with respect to the left elbow. The data can be displayed as a table or a graph of speed vs. time. The graph is unlabeled and unscaled, good only for qualitative analysis.

Lines 2940-3020 are a subroutine to find the speed of any point at a specific time, e.g., the 14th frame.

Lines 3030-3080 are a subroutine to find the x, y coordinates of any point at any time. Given CF and P it finds the X%,Y% value of point number P in record CF of the current data file FL$. The coordinates are stored in the variables X%,Y%.

Listing on page 64

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



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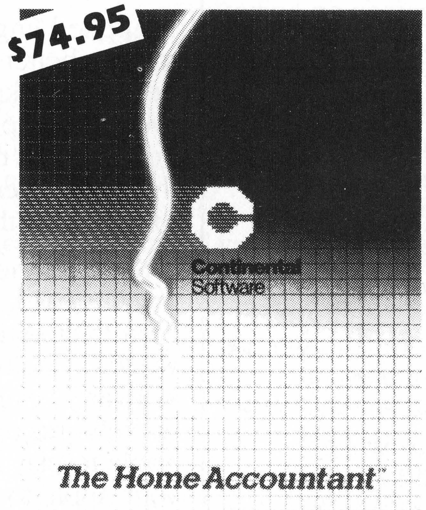
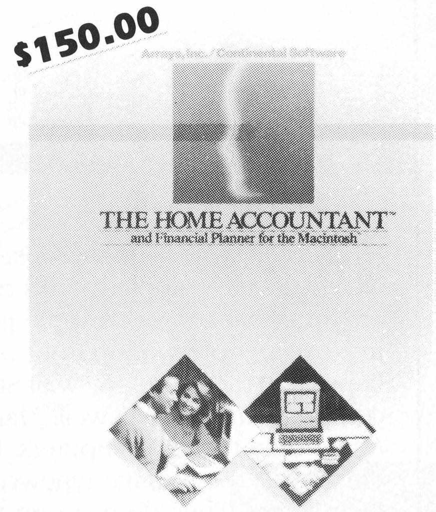
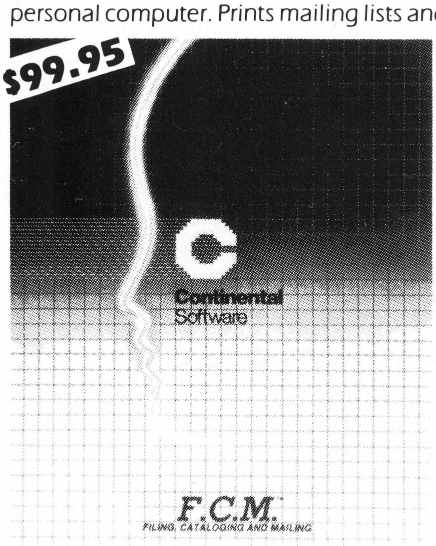


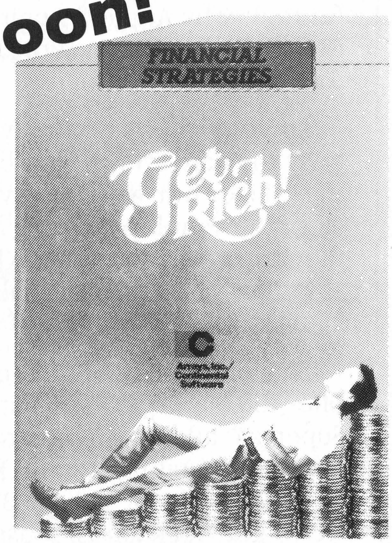


The Home Accountant and Financial Planner for the Macintosh
One of the few programs designed for the Macintosh that fully employs its unique capabilities. It's great for running a small business or for department project accounting in a large business. The Home Accountant and Financial Planner for the Macintosh will enable you to wisely manage your money on a daily basis as well as help you plan your financial future.

FCM
FCM (Filing, Cataloging, and Mailing) is the perfect mailing list manager for your personal computer. Prints mailing lists and labels, and it's terrific for other applications such as organizing your record collection or keeping track of party guest lists.



Coming Soon!



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Sound Light and Now Software

by NEIL SHAPIRO

Good news this month: The Force is with us!

George Lucas, of *Star Wars* fame, has entered the software arena with two games for the Apple. Created by the new Games division of Lucasfilm, both **Ballblazer** and **Rescue on Fractalus** (Epyx) have many of the same cinematic qualities of storyline, action and involvement that have characterized the master director's movies.

Both games push the Apple's animation and graphics abilities in an artistic and state-of-the-art way that can't fail to catch the eye of anyone walking by the computer, and that makes the person lucky enough to be holding the joystick feel enveloped in the play. These are the kind of games that define computer gaming today and point the way to tomorrow's games.

A CHECKERED FUTURE

In Ballblazer, a split-screen technique is designed to let two players compete head-to-head, or for one player to go against the computer. Each horizontal half-screen shows an out-the-windshield view of a huge, green-checkerboard playing field. Each player is inside a high-speed ground vehicle that pushes a ball-shaped playing piece before it, within the pocket of an invisible force field. The player who has the ball attempts to propel it through goalposts that, in turn, move about the field while the player on defense madly tries to steal the ball while blocking all attempted shots.

Although the manual goes into great detail about the history of the Ballblazing sport, the various galactic races who play and why they play, the game is simple. Words cannot capture the flow of the animation. The insanely gyrating, checkerboarded playing field whips by while a sleek-lined opponent's ship tries again and again to slide under your tactical maneuverings to steal the ball bouncing in midair in front of your ship's nose.

There are four built-in Droids or computer opponents. Each one has its own style of play, level of intelligence and challenge. Droid One is a bit of a pushover, but Droid Four can drive all but the best Ballblazers absolutely batty!

The only problem with the game is that players on the Apple II probably have to settle for the computer opponents. Although two human players can compete, the Apple does not support this feature as well as some of the other systems that Ballblazer runs on. The Apple does not (without special hardware or wiring) support two joysticks, so the game's designers have attempted to divide the keyboard into two control panels. But two players of this fast game cannot sit side-by-side and share a keyboard to control the movements of the ships nearly as well as they could individually with a joystick. I hope the next Apple version will support one of the popular and widely available two-joystick interfaces for the Apple!

Meanwhile, the Droid opponents more than make up for the two-player problems. Ballblazer is a visual treat for the jaded senses of any arcader looking for the next long-lasting thrill.

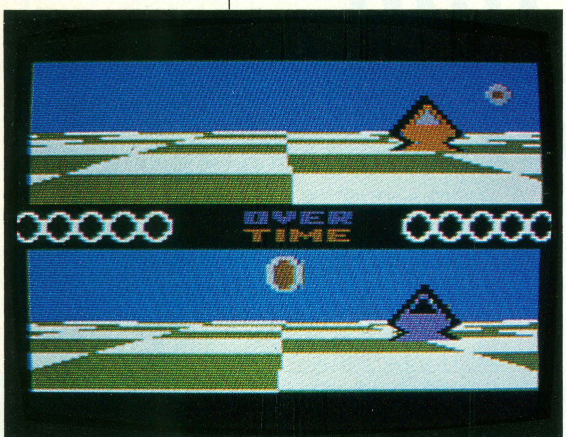
WATCH OUT FOR THE JAGGIES!

The second Lucasfilm game, Rescue on Fractalus, is reminiscent of the atmosphere of the *Star Wars* movies, although the plot is entirely different. An overwhelming sense of good vs. evil, and an aura of bravery and derring-do are attached to this game just as to the *Star Wars* movies. In fact, if you had three hands, this would be a most enjoyable program to play while eating popcorn. Unfortunately, any two-handed player will find that it's all he or she can do just to play!

continued on next page

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

You're an "air pilot" flying a Valkyrie rescue jet. Your mission is to rescue the "Ethercorps" space pilots who have been shot down over the planet Fractalus. Your Valkyrie fighter is equipped with a Dirac Mirror Shield for defense, powerful lasers and a complete control panel.



BALLBLAZER

The star of this show is the planet Fractalus itself. The rulebook bills Fractalus as "the most inhospitable planet this side of the Kalamar system" and, though I've not been to Kalamar, that seems an accurate description. It's bad enough that the enemy (called Jaggies) have hundreds of gun emplacements ready to shoot down the rescue craft; the planet itself is guaranteed to make any pilot long for home.

Fractalus is to mountains what Beverly Hills is to swimming pools. The terrain is an awe-inspiring series of peaks and valleys, canyons and crevasses. Maneuvering in three dimensions, a Valkyrie pilot can and must swerve around mountains, duck into wingtip-threatening canyons, fly between towering cliffs and always be on the lookout for the downed space pilots below. Fractalus must be named after the fractal equations that Lucasfilm coders have used to generate such a terrain.

The pilots have a beacon aboard their ships that they can flash for help. But it's not easy to see them, as Fractalus atmosphere is thick cyanitric acid. Out-the-cockpit vision is provided by an Etheric Navigation System, which appears as a viewscreen taking up much of the gamescreen. To help locate the downed pilots, there is a long-range scanner that, like radar, helps the flyer home in on the craft to be rescued. Meanwhile, the gun emplacements atop many of the mountains fire their deadly loads of green energy, and the pilot of the Valkyrie must duck and swerve and fire back, all without crashing into more mountains than the Dirac Shield can handle.

When you finally do land close enough to pick up a pilot, if you have positioned your ship properly, you can see the downed craft outside your Valkyrie. Then the pilot runs out of the ship and knocks on your airlock door to signal that you should let him in. The animation in this sequence is superb, and the pilots quickly become personable guys worth rescuing.

At the higher levels of play there's a nine-minute day/night cycle (Fractalus having a pretty mean rotational period) and flying saucers to contend with along with everything else. The higher levels can go on for quite some time. There is no save-game option, which I missed.

Oh, and meanwhile, I'm not sure if I could recommend this game to anyone with a heart condition. You see, every so often, the rotten old Jaggies fake a downed spacecraft. I don't want to spoil the surprise and tell what happens when you land on such a bogus mission other than to say I seldom feel an actual thrill of panic when I play a video game. Rescue on Fractalus succeeded in doing something I never thought a game could accomplish: for a moment there, I was *really scared!*

HERE COMES THE CAPTAIN

I guess this is the month for rescue missions, because here's **Captain Goodnight and the Islands of Fear** (Broderbund). The Federation of Evil (F.O.E.) has planted a doomsday device somewhere in the Fear Islands and has threatened to blow up the Free World unless they receive 200 billion dollars in gold bullion. Well, you know the Free World is not going to want to send the money, so they send Captain Goodnight instead. And, of course, Captain Goodnight is you, or at least your

RESCUE ON FRACTALUS

animated alter-ego controllable via joystick and keyboard.

From first to last, it's up to you to guide the good Captain through a series of escapades to the rescue of the Free World, before time runs out. The fact that this is a race against time rather than just a shoot-'em-up adds a real element of strategy to the game. Coupled to the good, cartoon-style animation, this results in a game with lasting play value.

In the first scenario, for example, the Captain is flying a fast jet as the screen scrolls from right to left below. Cruise missiles shoot upwards while enemy aircraft twisting in from the right fire air-to-air missiles directly at the Captain's plane. Although the Captain can fire back, there are no points or rewards for destroying the enemy planes. In fact, such aerial shenanigans only slow things down and detract from the final outcome. You're out to save the world, and if that means you have to let a few creeps go, well, that's the situation.

But following scenarios feature more than ample opportunity to shoot (as well as the need). The Captain must fight his way across a desert patrolled by mindless but deadeye robot guards and many other obstacles before his final goal. The included map of the journey comes in handy but not as

CAPTAIN GOODNIGHT

handy as the Captain Goodnight Secret Decoder. The secret decoder is a large cardboard device needed to figure out what password you must enter at various points during the game for play to continue. It is so well worked into the plot and structured into the rulebook that it almost seems like something other than a form of copy protection. But without the Secret Decoder, you can say good night to Goodnight.

THE WILD, WILD APPLE

Okay, enough of the futuristic games; let's return to the time of pioneers, of outlaws and rustlers, of badmen and lawmen, of Indians and wagon trains. **Six-Gun Shootout,** (SSI) subtitled Gunfights of the Old West, is a rip-roaring new simulation game.

Not an arcade game, Six-Gun Shootout contains ten scenarios that are based on events in history, legends of the Old West and celluloid Hollywood dreams. Either two players or the player against the computer run the Good Guys side against the Bad Guys.

A screen is composed of various types of terrain. The terrain may be full walls or half walls, tall bushes, low bushes, cacti, rocks, covered or open wagons, barrels, boxes, windows, stoves, tables, beds—all in all, the on-screen characters may have to cope with up to 25 different objects. And on the screen, there may be upward of

SIX-GUN SHOOTOUT

30 Good Guys vs. Bad Guys at the same time.

Each character may carry an assortment of 18 possible weapons, from saber and tomahawk through pistols and shotguns, rifles and carbines. Each weapon has its own range and attack factors.

The characters take turns moving and firing via commands entered at the keyboard. Although the graphics are not awe-inspiring, they represent the action well. Ducking behind tables, diving through windows, dynamiting walls—an afternoon spent with Six-Gun Shootout is an exciting time.

If you've ever enjoyed a Western movie or an Old West novel, are an American history buff or are just looking for a good game, check out this latest SSI offering. But keep your powder dry! //

PRODUCT INFORMATION

Ballblazer
Rescue on Fractalus
Epyx Software
1043 Kiel Ct.
Sunnyvale, CA 94089
408-745-0700
From $29-$35

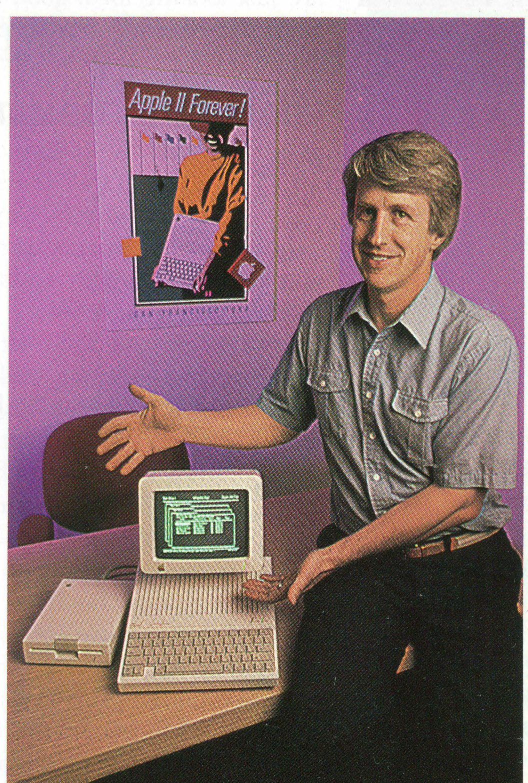
Captain Goodnight and the Islands of Fear
Broderbund Software
17 Paul Dr.
San Rafael, CA 94903
415-479-1170
$34.95

Six-Gun Shootout
Strategic Simulations Inc.
883 Stierlin Rd.
Bldg. A-200
Mt. View, CA 94043
800-772-3545
$39.95

Five Favorite Features of AppleWorks

as told to *II Computing*
by RUPERT LISSNER AND STEVE HIGH

*The **II Computing** editorial staff uses AppleWorks daily. We like its performance and have our favorite commands but decided to go right to the source to see what shortcuts we might be missing. Rupert Lissner, developer of AppleWorks, and PR man Steve High, who assisted Lissner with the original design of the program, have shared with us some of their prized features. And—we're very pleased to share them with our readers.*



LISSNER: I mostly use AppleWorks for my personal bookkeeping and these features seem to offer the most help.

[(🍎) "]
The ditto (or repeat) function.

[(🍎) K]
When used in database, this command turns the database in a mini-spreadsheet to perform arithmetic operations.

[(🍎) 1-9]
Helps find an approximate location in document.

[(🍎) F]
Lets you find something very specific.

[(🍎) P]
When used in the database, this command lets you print to screen before on paper.

HIGH: AppleWorks is simply part of my daily routine. I keep my calendar, checkbook, "to do" list, "rolodex," and timesheet on the Appleworks desktop at all times. These features help me a lot:

[(🍎) N]
This lets you change the name of the file while you're in the file and will let you change records in the database.

[(🍎) H]
This allows you to print out whatever you might have on your screen at the moment. It's handy for notes.

[(🍎) Space Bar]
This allows you to insert what AppleWorks calls a "sticky space." This space prevents a combination of words from being broken, such as a person's first and last names.

[(🍎) O+EK]
From the option menu "ek" will let you, when the document is printing, to enter something directly from the keyboard.

[The clipboard]
The handy space that lets you temporarily store parts of documents.

II COMPUTING: *Can you go into some detail of just how you use each function to accomplish certain tasks?*

LISSNER: Here's how "Open-Apple Ditto" works when I balance my checkbook. I enter the checks in a database that looks like this:

File: Checkbook

Date:
Check Number:
Payee:
Comment:
Amount:
Date Bank Statement:
GL Account:

"GL" stands for a general ledger number which in turn stands for a standard expense category such as "interest," "taxes," or "automobile." I enter cash receipts in another database, also with a general ledger number designating the source of the income, and the date the deposit cleared the bank.

Each month, I very easily sort "Date Bank Statement" to reconcile the bank's computer with my Apple. Those checks that are blank in this category are the outstanding ones and need to be subtracted from the bank's final statement. At tax time, I can sort by GL categories and turn over my neatly sorted records to my accountant.

On bill-paying days, I use standard values to automatically enter the current date for each check. With standard values you can enter the same information for a particular category at one time. If I decide that December 22 will be the standard date for all my new records, I press "Open-Apple-V" to get into the Standard Value mode and enter that information in the date category. As I get to each new record that information is already there. But standard values can't do everything. For instance, I can't enter the "month cleared bank" information until the statement is received from the bank, and standard values is no help for records already created.

But, that's where "Open-Apple-Ditto" comes in. I display "Date Bank Statement" on the multi-record layout, and use "Open-Apple-Ditto" to enter the date of the checks or deposits which have cleared on the same statement. Since no return key is required with "Open-Apple-Ditto," data entry of multiple records is very fast.

"Open-Apple-K" turns the database into a mini-spreadsheet. This lets me do arithmetic functions from category to category by giving one or more categories simple formulas. "Open-Apple-T" will total one particular category. For those people doing arithmetic functions, this command can replace a spreadsheet. *[Ed. Note: "Open-Apple-K," when used in the word processor, will show you exactly where each page breaks.]*

I also use "Open-Apple-1. . .9" frequently to find an approximate location in any of the three AppleWorks applications, and "Open-Apple-F" to find a specific reference. "Open-Apple-1" is the top of any file; "Open-Apple-9" is the bottom. The numbers in between represent approximate locations within the document.

"Find" locates any reference anywhere it is stored in the database or word processor. This is for the benefit of those who think like humans, not computers. For example, if I sometimes make a check payable to the newspaper and sometimes to the paperboy, "O-A-F" will find all the checks, whether the newspaper's name is entered as "payee" or under "comments."

My final favorite is the "print to screen" [Open-A-P] feature in the database. With this I can preview a report before committing it to the much slower printing process.

II Computing: *Both Lissner and High keep their appointment calendars in an AppleWorks database file. The file looks something like this:*

continued on next page

File: Appointment Calendar

Date
Day
Time
Appointment (with whom)
Phone

HIGH: Sorting by date presents the day's appointments at a glance each morning. In the event of conflicts, the phone number is right there to call and reschedule.

II Computing: *I've only used "Open-Apple N" in the database. How do you use it in the word processor?*

HIGH: "Open-Apple-N" lets me change the name of any document, experiment with it, and then either save it or throw it away without damage to the original file. This is especially valuable to English majors, like myself, many of whom like to change what they write while still holding onto the original. I save original report formats, word processing options, spreadsheet layouts and formulas and create new versions with "Open-Apple-N."

II Computing: *The database turns out to be particularly handy and useful, doesn't it?*

HIGH: Yes, I particularly like the "date" and "time" categories. Like any computer program, AppleWorks requires standardization of dates and times in order to sort information chronologically.

But unlike almost every other computer program ever written, AppleWorks requires the *computer*, not the *user*, to develop a standard from a dizzying array of user options. For example, each of the following represents the same date:

August 18, 1983
18 August 1983
8/18/83
08/18/83
18/8/83
18/08/83

With the exception of the version containing two "European-style" (18/08/83) notations, AppleWorks converts any of these (as well as other abbreviations) into this standard format: Aug 18 85.

The time feature is equally helpful—and almost uncanny. In any database category called "Time," AppleWorks can translate a "730" entry into "7:30 AM," recognizing that a "7" probably means 7 in the morning rather than in the evening for most business people. However, if you're noting an evening meeting, simply type in "p" or "pm" and it'll know what you mean.

LISSNER: Speaking of time, how about the actual clock you've installed?

HIGH: Right . . . I've installed an Applied Engineering Timemaster clock in my IIe that displays the date in the lower right hand corner of the monitor. In addition, an Applied Engineering software patch to AppleWorks permits entering the immediate time or date simply by typing the "@" sign in the time or date categories. Since we bill by the hour, the combination of this clock and AppleWorks is fabulous.

I also like "Open-Apple-H" for "hardcopy" which prints a "snapshot" of the screen at any place in the program without going through the print routines. "Open-Apple-H" and my Epson MX-80 are often the most convenient way to dump to paper a single bit of information, such as an appointment or phone number.

II COMPUTING: *How often do you use the "Open Apple-space bar" and "Open Apple O* + EK"?

HIGH: Not very frequently, but when I do need to use them, they're invaluable. For instance, one of my clients began doing business in 1983 as "S MOS Systems." Often, the "S" and the "MOS" would wind up on two different lines — it didn't look right. "Open-Apple-space bar" installed a "sticky space" between the "S" and the "MOS," causing AppleWorks to regard the expression for what it is, one word. The company has since wisely placed a hyphen between the elements of its name, but every so often I need to use that command. With "Open-Apple O+EK" I can change a word during the printing process, for instance, if I'm writing the same letter to two different people.

Now, let me mention the clipboard that I'm sure many users are familiar with. I frequently use it to temporarily delete words, sentences or paragraphs that I might want to retrieve. Usually, I don't want to, but, the process is easy on a tender-hearted editor who is loathe to part with anything that has emerged from his keystrokes.

I also move "labels" from the database "rolodex" to the clipboard for use in the word processor to print a large number of envelopes for a newsletter.

II COMPUTING: *Why transfer to the word processor?*

HIGH: It's easier. Let me explain the process. I copy the "New Page" command between addresses, and then insert a "Pause Each Page" command at the top of the document. The AppleWorks manual shows how to do the same thing from the database, but I do find this method easier to understand and control. It also doesn't demand any changes in printer specifications.

High and Lissner could have gone on . . . but this information is meant as, well, an inspiration. Perhaps these favorite AppleWorks functions from two of the first people to use the program will spur your thinking about creative ways to put AppleWorks to work for you. Numerous third-party developers are producing programs to run with AppleWorks to further enhance it and offer you more. The book *AppleWorks, Boosting Your Business With Integrated Software*, by Charles Rubin (Microsoft Press), offers more ideas for you as well. So, enjoy your AppleWorks—and when you come up with your five favorites, don't hesitate to contact the editors at ***II Computing!***///

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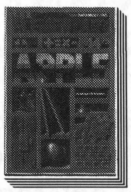
WORKING TOGETHER?

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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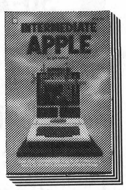

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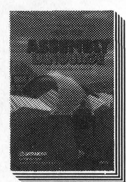

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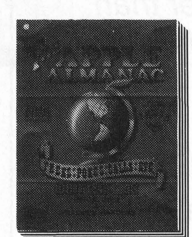

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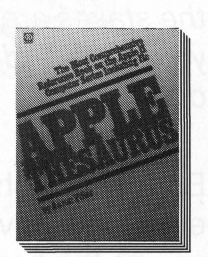

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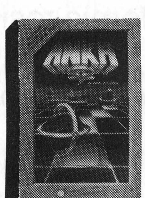

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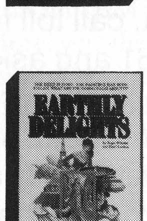

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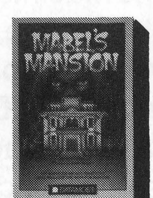

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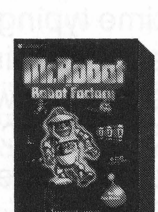

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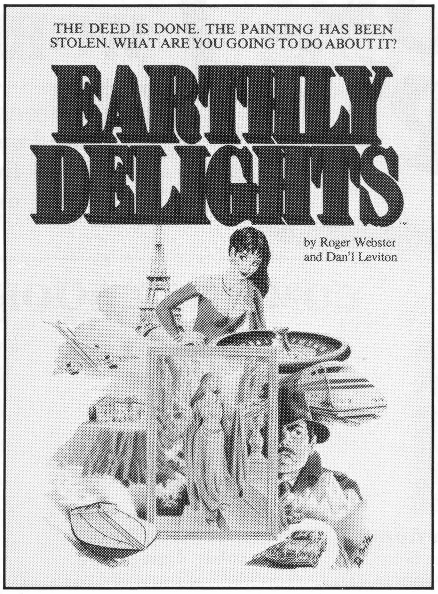

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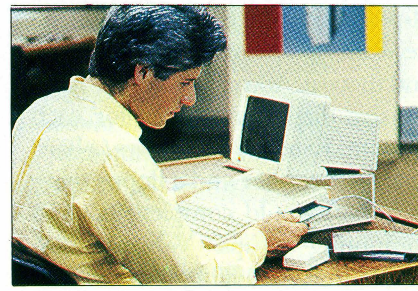
Doing Business with the Apple IIc



by CHARLES RUBIN

Since its introduction in April 1984, the Apple IIc has become the best-selling "home" computer because of its enormous software base, its ease of use, its convenient size and its low price. But these qualities and others can also make the IIc an excellent business partner. Whether it's the only computer in a family-owned retail store or an executive assistant in a billion-dollar conglomerate, the basic IIc and its wealth of enhancement options make it a productive addition to the working world.

HARDWARE BASICS

The IIc is often maligned by business users because of its basic hardware design. The IIc's 8-bit processor addresses only 64K at once, and the machine's standard complement of RAM is only 128K, which is small by today's standards. The built-in disk drive stores only 143K of data, as opposed to the more common 360K on an IBM PC or compatible. Moreover, the IIc contains no expansion slots for RAM cards, hard disk controllers and other goodies to enhance it. As such, the basic IIc seems a poor choice for those who build 500K spreadsheets or who maintain multimegabyte database files on a hard disk.

Fortunately, several enterprising third-party developers have overcome the IIc's original "closed-box" architecture so business users can expand the machine to meet their needs. Those who want the speed and convenience of a hard disk can turn to Quark's QC-10 hard disk, which plugs into the IIc's external disk drive port. The QC-10 gets data to and from the computer three to five times faster than a floppy drive, and it can store up to 10 megabytes, or some 70 floppy disks' worth of data, at a time.

If the price of the QC-10 ($1995) scares you off, then you can look forward to Apple's own introduction of 3½-inch microfloppy disk drives which can hold 800K of data each. [ED. NOTE: See Product News From Apple, page 95.]

And then there's the question of RAM. The single most important factor in the business world's movement to 16-bit computers is the 640K of RAM space directly available to the processor in an IBM PC or compatible, and the expansion slots that let users install that much memory. Spreadsheets in particular use up RAM space quickly, and the 40K to 55K of RAM in a standard IIc just isn't enough for many financial analysts or other professionals.

Now, however, there are at least two RAM expansion boards that can be installed *inside* the IIc. You have to open the IIc's case and remove a couple of chips to install these boards, but once you do, you can have either 256K or 512K of extra memory in addition to the IIc's own 128K. The RAM can be used to store larger spreadsheet models,—for example, expansion boards from Applied Engineering and Checkmate Technology come with software that modifies AppleWorks so individual files can exceed 400K.

Extra RAM can also be set up as a RAM disk. Disk-based software can be loaded into RAM and run at electronic speeds. Programs that must periodically read additional instructions from a program disk can get those instructions instantly, so the execution of the software is much faster than it is from floppy disks.

Applied Engineering offers another bonus to business users with its 256K or 512K Z-RAM boards for the IIc: a Z-80 coprocessor. Z-RAM boards come with the CP/M operating system, which lets the IIc run more than 3,000 additional programs. CP/M was the original "business" operating system, and there are hundreds of programs available for accounting, statistical analysis, real estate management and other applications. With CP/M, you can also

continued on next page

run time-tested business software classics such as dBASE II and WordStar.

Another hardware-related bonus for business users is the IIc's portability. An executive who frequently takes work home, for example, can simply pack up the IIc by itself (an 11-pound package) along with the necessary software and data disks, and move it. You can purchase inexpensive display monitors for each location. External disk drives (a hard disk for the office and a floppy drive at home) would complete the two computing setups. Various companies make carrying cases for the IIc to make the trip even easier.

Despite its laptop-like appearance, the IIc has proven disappointing as a totally portable unit. Because of its built-in disk drive, the machine can only run 6 to 8 hours on a battery pack such as the one sold by Prairie Power, and Apple's flat-panel LCD display has proven too fuzzy for long bouts of work. C-Vue, however, has a new LCD, 80-column flat panel display which offers respectable viewing for limited periods of time. But, the IIc's built-in composite and RGB video output and its external RF modulator mean that you can use any monitor or television anywhere as a display. On the road, for example, a salesperson might update a database in a hotel room, using the room's color TV as a display.

Thanks to the IIc's built-in serial ports, the system is compatible with most peripherals offered in the computing market. Plotters, printers, monitors and modems all interface with the IIc easily, and some products have been specifically designed to complement the IIc package. Prometheus Products' ProModem 300c, hooks directly to the back of the IIc and becomes part of the portable unit.

BUSINESS SOFTWARE OPTIONS

On the software side, the conventional wisdom that dictates against using the IIc in business is, again, based on RAM.

Since the IIc can only address 64K of RAM at once, the programs written for it tend to be less elegant and less powerful. But bigger or more elegant doesn't necessarily mean better. Larger programs such as Lotus's Symphony have lots of features, but they also tend to be difficult to learn, and the features aren't necessarily things users want.

In contrast, Apple business software tends to be much more straightforward—it doesn't offer as many bells and whistles, but it gets the job done as well in most cases, and it's much easier to use. For spreadsheet users, there's SuperCalc 3A, an Apple version of the popular spreadsheet for the IBM PC, which offers most of the features spreadsheet users want, including integrated graphing capabilities.

Other products, such as Paladin's Flashcalc or Artsci's Magicalc, automatically take advantage of up to 512K of extra RAM in a IIc. The IIc's lack of a numeric keypad can slow some number-crunching fanatics down, though.

> Plotters, printers, monitors and modems all interface with the IIc easily.

For word processing, IIc users can choose WordStar under the CP/M operating system, or they can go with a full-featured standard Apple program such as Word Juggler or PFS: Write. Word Juggler has a built-in spelling checker and allows access to a related communications program, called Terminus, with just two keystrokes.

For database management, Apple IIc users can choose from a range of products, from simple filing programs such as Quick File and PFS: File to more powerful programs such as DB Master and dBASE II. DB Master, in fact, is one of the few higher-powered data managers that lets users maintain single files on more than one floppy disk.

If you're thinking of using a IIc to run a small business, there are several old and new accounting programs that handle general ledger, accounts payable and receivable, payroll and inventory. State of the Art and BPI are two long-time leaders in this area, but other, simpler programs from Continental Software, Broderbund and other companies are also popular.

Another development that has drawn business users away from the Apple world is integrated software. On the Apple, though, AppleWorks has become the best-selling program for any type of personal computer because of its combination of simplicity and functionality. Its spreadsheet, word processor and filing program pack a lot of power for the average user, and the program is so easy to use that novices can get up to speed on it within an hour or two. In fact, some converts to AppleWorks on a IIc are professionals who gave up trying to learn how to use 1-2-3 or Symphony on an IBM PC.

One final consideration for would-be business users of the IIc is vertical market software—programs designed specifically to help you manage property, track call reports for a sales force, or do the billing in a dental office. The Apple's eight-year track record works in its favor in this case, as does the long business history of CP/M. There is a wealth of special-interest software for various businesses available under both CP/M and native Apple DOS, but finding it can be a challenge. One place to start is the *Apple Software Directory* from PC Telemart, which is available through bookstores for $24.95. Other good sources for this type of software are vertical-market magazines, such as *Sales & Marketing Management* or *Financial World.* Finally, you can always check the classified ads or "marketplace" sections toward the back of any Apple-specific magazine.

Taken together, these expansion options and the software base, as well as its convenience and ease of use, make the IIc a computer you can do business with.//

Charles Rubin is the author of the books, AppleWorks *and* The Endless Apple, *both published by Microsoft Press. He writes about computing for several magazines.*

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Multiplying Big Numbers

by DANIEL WOLF, Ph.D.

Many problems in computer science require the multiplication of big numbers, and the speed of this process is often crucial in getting the job done.

Unfortunately, when using the "shift and add" method to multiply with a computer, the time required increases geometrically as the lengths of the numbers increase. This is because the number of operations increases with the square of the number of digits. Beating the length-squared penalty is examined by Donald Knuth in *The Art of Computer Programming*, Vol. 2, second edition. It's tough, but possible.

One technique discovered independently by me and Mike Louder, author of Prime Factor Basic, multiplies big numbers about twice as fast as the classical method. While not a true solution to the length-squared problem, it works on 6502-type computers for whole numbers up to 1024 bits long.

Standard binary arithmetic gives us the model for multiplication, as an arbitrary example will show:

	1101	second number
	× 1010	first number
row 0	0000	by bit 0
row 1	1101	by bit 1
row 2	0000	by bit 2
row 3	1101	by bit 3
	10000010	product

Notice that in binary there are only two possible manifestations for each row. The row is either all zeros (the result of multiplying by a zero digit), or it is a replica of the second number, properly aligned beneath the 1 digit that produced it. Let's call this replica a "left-shifted version" of the second number.

In binary arithmetic, however, the sum of two digits can never exceed "1 carry 1," so the addition of intermediate steps is best carried out by adding each new row to the sum of previous rows, as shown here:

row 0	0000
row 1	1101
product so far	11010
row 2	0000
product so far	011010
row 3	1101
product	10000010

This "product accumulator" is convenient for a computer, because it reduces row memory to however much is needed for the accumulator row.

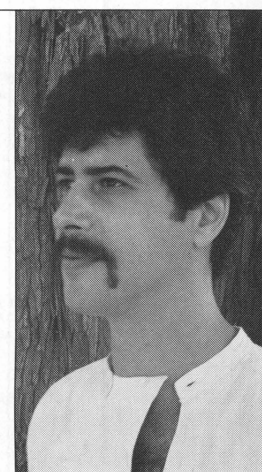
Recall that in binary the positions of bits have numbers, beginning with 0 on the right, and that each position signifies a decimal value, which doubles with each position to the left. For example, examine this sample byte:

```
Bit number               7 6 5 4 3 2 1 0
Arbitrary binary number  0 1 0 1 1 0 0 1
Value of a 1-bit in      | | | |   8 4 2 1
  a given position       | | | 16
                         | | 32  Decimal equivalent
                         | 64      of binary number
                        128            =89
```

As you can see, by doubling the value at each bit position, a binary number 1024 bits long would be a very large number indeed.

Now let's analyze the multiplication process to see what makes it so time consuming. For example, let's square a number containing n bits. Classical multiplication breaks down to the following, performed n times:

continued on next page



Daniel Wolf is a scientist who likes to use microcomputers to explore mathematic and scientific concepts. A musician as well, Dr. Wolf's academic background is in biology, physics and math.

1. Extract next bit of number.
2. If bit is 1, add shifted version of number to product.
3. Shift number left one bit.

For an n-bit number, there are n shifts and n adds of n bits. So even if few adds are performed, a certain amount of time is used doing one "alignment" shift for every bit.

Clearly, one method for speeding up multiplication would be to reduce the number of shifts. Our technique takes advantage of the dual index register, eight-bit architecture of the 6502 processor to reduce the number of shifts from n to a maximum of seven, for numbers up to 1024 bits in length. Within that limit, the longer the numbers, the greater the savings.

Our technique multiplies big numbers about twice as fast as the classical method.

Figure 1 shows a modest binary multiplication in which all the classical steps are taken, including product accumulation. Each row is either zeroes or a replica of the "second number," aligned under the digit whose multiplication produced that row. Ten shifts (alignments) are required, following the starting position.

Compare this with Figure 2, the same multiplication, but using the shift-saving technique. Row 0 is produced in the classical way by the digit in bit position 0, and in this example row 0 is a replica row. Now, instead of shifting, we produce row 8, which can only be one of two things: zeroes or replica, depending on whether bit 8 of the first number is a 1 or a zero. We test bit 8 with a "mask" byte in which a single 1-bit corresponds to the current shift position (in this case 00000001). If bit 8 is zero, the row will be zero, that is, no action required, but if bit 8 is 1, we know row 8 will be a replica row, offset for purposes of addition, to the left by eight bits.

Row 8 is added to row 0, and stored in the product accumulator. Again, before shifting, we test bit 16 of the first number, but there is no bit 16 because the first number is only eleven bits long. Time to shift. Conceptualize shifting as the second number shifting one position left so that its low-order bit now appears above the next to lowest bit (bit 1) of the first number. The digit in this position is a zero—no action required. Test bit 9, it's also a zero. Test bit 17. There is no bit 17. Time to shift.

The digit in bit position two is also zero. Test bit 10. Aha, it's a 1. Replicate the first number, offset by eight bits and add to the product accumu-

Figure 1. Classical binary multiplication

```
   5B9               10110111001  second number
×  5B9  ×            10110111001  first number
------  ------------------------
20BFB1               10110111001  row-0
                    00000000000   row-1
                    010110111001  product so far
                   00000000000    row-2
                   0010110111001  product so far
                  10110111001     row-3
                  11001110000001  product so far
                 10110111001      row-4
                1000111100010001  product so far
                10110111001       row-5
               10100011000110001  product so far
               00000000000        row-6
               10100011000110001  product so far
              10110111001         row-7
             1000010001010110001  product so far
             10110111001          row-8
            10011101101110110001  product so far
            00000000000           row-9
            10011101101110110001  product so far
           10110111001            row-10
--------------------------------
          1000001011111110110001  total
           2   0   B   F   B   1  total in hex
```

Figure 2. Binary multiplication using grouped rows

```
   5B9               10110111001  second number
×  5B9  ×            10110111001  first number
------  ------------------------
20BFB1               10110111001  row-0
             10110111001          row-8
             1011011111010111001  product so far
            0000000000000000000   rows 1 & 9
            01011011111010111001  product so far
                   00000000000    row-2
           10110111001            row-10
           111001010001010111001  product so far
                  10110111001     row-3
           111001101000010000001  product so far
                 10110111001      row-4
           111010010110000010001  product so far
                10110111001       row-5
           111011110001100110001  product so far
               00000000000        row-6
           111011110001100110001  product so far
              10110111001         row-7
--------------------------------
          1000001011111110110001  product
           2   0   B   F   B   1  product in hex
```

lator. Test bit 18. There is no bit 18. Time to shift.

Are you getting the picture? Instead of shifting after every bit, you produce all the rows you can for a single bit position before shifting. You can do this because we know what the rows will contain and how to position them relative to the product accumulator. In no case is it necessary to shift more than seven times, no matter how long the problem.

The BASIC program FASTMULT on page 75 implements this scheme to multiply two numbers of up to 128 bytes each (1024 bits). The machine-language algorithm is included as data statements, only 75 bytes. Three memory registers are used to store numbers:

\$4800—\$487F	(18432-18559)	First Number V1
\$4900—\$497F	(18688-18815)	Second Number V2 (shifted)
\$4A00—\$4AFF	(18944-19199)	Product Accumulator

The product accumulator is initialized to zero, the other registers hold our numbers. The program requests input in hexadecimal form (0,1,2 . . . 9, A, B, C, D, E, F). Remember, one hex digit represents four bits, so the program can handle input up to 256 hex digits long. BASIC, however, limits line input to less, so try using a machine-language monitor for full-length numbers.

We've achieved a method for squaring 1024 bit numbers, for which the running time is about half of the classical method. The longest running time is if all 1024 bits of the first number are 1-bits, and that's only about 2.5 seconds on a 1 MHz 6502.

Have we beaten the length-squared time penalty? Unfortunately, no. If we "double" our program to multiply 2048 bit numbers, it takes four times as long. Addition "loop" time doubles, and so does the maximum number of possible 1-bits. We have taken advantage of a specific computer environment to eliminate needless shifts.

> I saw it used to break a KNAPSACK type of public-key cipher—on an Apple!

I know of two products that use this technique. Mike Louder's Prime Factor Basic "hooks" to the BASIC interpreter for lightning-fast arithmetic with huge decimal numbers. I saw a historically significant demonstration of it to break a KNAPSACK type of public-key cipher—on an Apple! The other package is Arithex, which I wrote to demonstrate fast arithmetic with hex numbers.//

Listing on page 75

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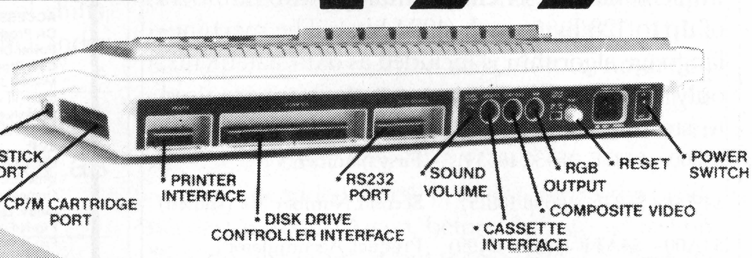

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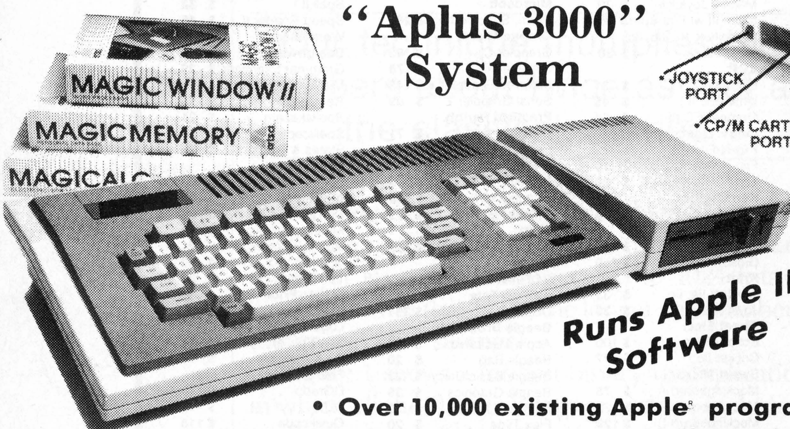

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Composite Video	**Yes**	Yes	Yes
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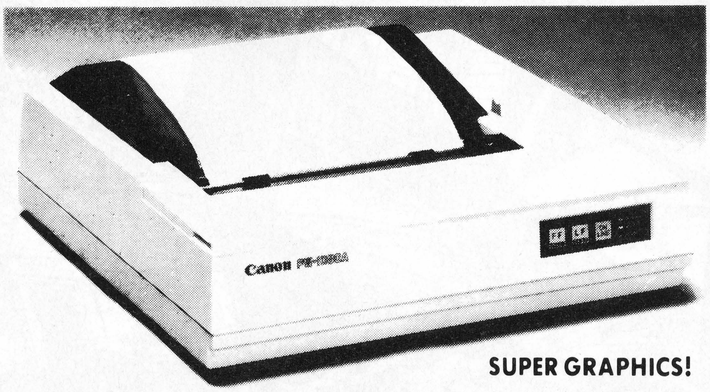
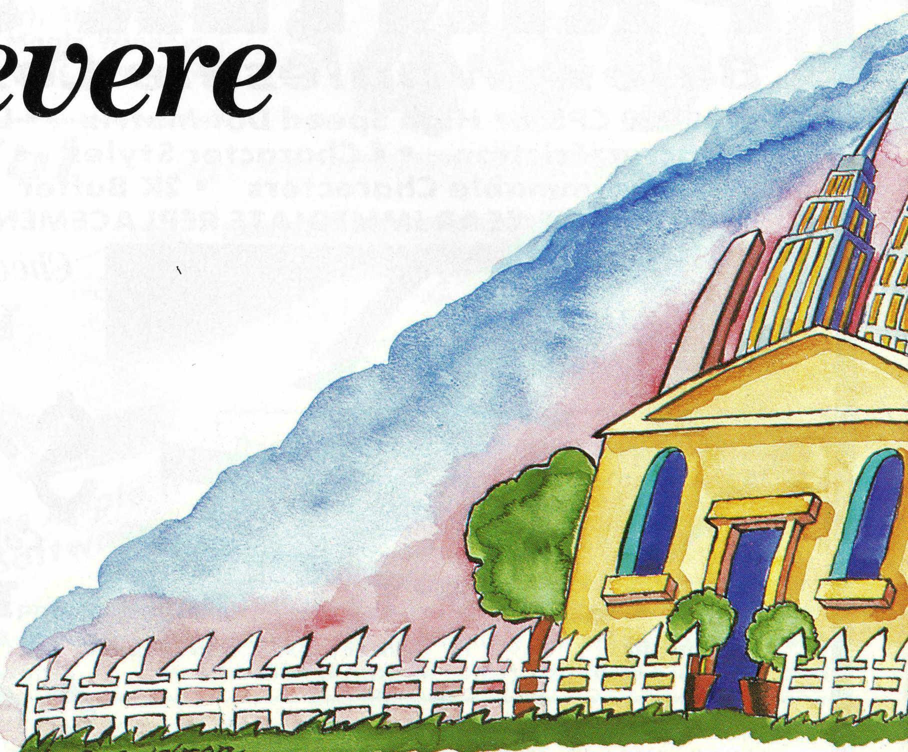


Canon

Boolean Logic and Paul Revere

by RON LICHTY and DAVID EYES



Learning to program in assembly language, as well as in higher level languages, requires learning to manipulate information both arithmetically and logically. Logical operations are quite different from arithmetic ones: in assembly language, logical operations manipulate binary data as a set of bit positions—often treating bytes as arrays of eight bits—rather than as a number.

Imagine the midnight ride Paul Revere might take today. "One if by land, two if by sea" would be an inadequate signal. Besides, the Old North Church might be hard to spot among Boston's skyscrapers.

A patriotic computer programmer suggests using the eight windows on the top floor of the John Hancock Building as Paul's new signal lights, to which he assigns modern meanings.

The rightmost window means tanks, the next window means marching troops, the third window means landing craft, the fourth window aircraft carriers, the fifth submarines, the sixth bomber planes and the seventh fighter planes. The eighth (leftmost) window remains lit throughout the night to give Revere a reference point for positioning the other windows. Notice that the number of lights lit is not the basis of the scheme, nor is construing them as digits in some larger binary number; instead, it's the position of each that is significant.

Imagine an adventure game on the Apple built around the premise of using the deeds and characters of 18th-century American history in the context of a 20th-century war. It might encode the exact same data in the eight bits that make up a byte. Since the average adventure game has hundreds of weapons, tools, locations, positions and so on, using bit-fields is one solution to the problem of storing all that data. A one in a bit-position indicates a true condition; a zero indicates a false condition.

The short listings in Figure 2 (see pages 42 & 43) are examples of the way assembly language might use the concepts presented in this article. Listing 1 uses a byte in memory as bit fields to store the methods of attack by the British. A program constant is loaded into the accumu-

lator, then stored to the byte to initialize it; this constant indicates attack by bomber planes, landing craft, marching troops and tanks. Note that bits in a byte are numbered, by convention, from right to left, from low-order through high-order, from 0 through 7. Here, the leftmost bit (bit 7) is used to indicate whether Revere is in a position to see the Hancock Building's lights.

7	6	5	4	3	2	1	0
1	0	1	0	0	1	1	1

The assembler directive DS saves bytes of memory for data storage. Its operand, a one, specifies that one byte of memory will be saved (the eight bit-fields). Its label specifies that the memory byte is known to the assembler as BRITISH. The directive EQU assigns the label INITBRIT to a constant with the binary value 10100111. Both directives allow labels, which are more easily remembered than the numbers they represent. The lines beginning with semicolons are comment lines. Notice that documentation is woven into the program so that you and others can understand the code when you refer to it.

The first of the two lines of actual program code loads the accumulator with a constant—the binary value, 10100111—which the label INITBRIT represents (equates to). The second stores this value to the memory byte located by the label BRITISH.

True-false data, whether represented by bits in a byte or lit windows in the Hancock Building, are manipulated by logical operations formulated by the 19th-century mathematician George S. Boole, hence the name Boolean logic. Three logical operations—and, or, and exclusive or—are performed by the 6502 and 65C02 microprocessors found in current Apple II computers, as well as by their successor processors, the 65802 and the 65816. Each of these operations needs two binary numbers (called arguments) to produce a logical result. Each requires that one of the arguments be in the accumulator and the other in memory; and each leaves the result of the operation in the accumulator. These microprocessors also use *exclusive or* to synthesize a fourth logical operation: *complement,* or *not.*

LOGICAL AND

To demonstrate logical *and,* suppose that Revere has not just the British to worry about but also the Hessians, who are preparing their own attacks. To warn Revere of the Hessian threat, the eight windows on the second to the top story of the John Hancock Building are used in the same manner as the top ones, which warn of the British. Revere has a notepad on which he records the two light patterns, using one for lit window and zero for dark window. For the British, he writes:

10100111

This signifies bomber planes, landing craft, marching troops and tanks, as shown in the last example. The leftmost window is lit as a point of reference. For the Hessians, he writes:

11000011

and realizes they are mounting their attack with fighter planes, marching troops and tanks.

Revere decides that it is important to know the types of attack planned by both the British and Hessians. It's obvious that to do this he must look for two lights lit, one above the other. So Revere uses the logical *and* operation to determine his areas of concern from both British and Hessians:

```
    10100111  British
and 11000011  Hessians
    --------
    10000011  British & Hessians
```

That pesky leftmost marker light confuses Revere into thinking he faces three types of joint attack, so he masks the high bit out—forces it to zero—by using the logical *and* operation on the prevous result with the mask 01111111.

Masking is an important technique often used in programming. A mask is a binary number specially designed by the programmer so that when the mask is used in a logical operation it preserves or eliminates certain bits in the result of the operation. This example of suppressing the marker light is just one way a mask can be used.

```
    10000011  British & Hessians
and 01111111  Mask
    --------
    00000011  British & Hessians
              marker light
              masked out
```

In each column where a zero appears in the mask, a zero result is forced. On the other hand, in each column where a one appears in the mask, the bit in the top value is passed through to the result unchanged. You can use masks in any of the two-argument logical operations to force bit-fields to true and false states.

With the leftmost light masked out, Revere is now confident that his defenses must cope with marching troops and tanks, which both the British and the Hessians have mounted against the Patriots.

Truth tables are a convenient way to show the results of two-argument logical operations. Find the setting of one argument's bit on the left and follow across until you're under the setting of the other argument's bit, to get the result of the operation—in this case, applying the *and* operator.

AND

first argument \ second argument	0	1
0	0	0
1	0	1

The assembly code for our modern revolutionary war adventure game might look like the code in Listing 2.

As is the case with all logical operations, one of the two values must first be loaded into the accumulator. Then the logical *and* operates on the other, which is in memory (either in the program itself as a constant—such as the mask to get rid of the high bit—or in a memory cell, as HESSIANS is) with the accumulator value. The result is left in the accumulator.

LOGICAL OR

Revere also needs to know all the possible ways either the British or the Hessians might attack. To figure this out, he uses the logical *or*. Whenever there's at least one light lit, that is a possibility of attack.

```
   10100111  British
or 11000011  Hessians
   --------
   11100111  British or Hessians
```

Again, he uses the *and* operator on the result with 01111111 ($7F) to mask out the leftmost marker window.

```
    11100111  British or Hessians
and 01111111  Mask
    --------
    01100111  British or Hessians,
              marker light
              masked out
```

Figure 2

Listing 1

```
INITBRIT  EQU  %10100111  ; Initialze British attack to
                          ; bomber planes, landing craft,
                          ; marching troops, & tanks.
                          ; Initialize British means of
                          ; attack with program constant
          LDA  #INITBRIT  ; Load constant: Initial British
                          ; attack.
          STA  BRITISH    ; Store to British-invasion
                          ; bit-fields.
BRITISH   DS   1          ; British- invasion bit-fields
                          ; 7 6 5 4 3 2 1 0: bit7 = Revere
                          ; sees Hancock Building's lights;
                          ; bit6 = fighter planes; bit5 =
                          ; bomber-planes; bit4 =
                          ; submarines; bit3 = aircraft
                          ; carriers; bit2 = landing craft;
                          ; bit1 = marching troops,
                          ; bit0 = tanks
```

Listing 2

```
          LDA  BRITISH    ; Get British means of attack.
          AND  HESSIANS   ; Logical AND with Hessian means
                          ; of attack.
          AND  #%01111111 ; Use logical AND to mask out high
                          ; bit (high bit is not a means of
                          ; attack) Means of JOINT attack by
                          ; BOTH forces now represented by
                          ; the byte in the accumulator.
BRITISH   DS   1          ; British invasion bit-fields:
                          ; 7 6 5 4 3 2 1 0
HESSIANS  DS   1          ; Hessian-invasion bit-fields:
                          ; 7 6 5 4 3 2 1 0: bit7 = Revere
                          ; sees Hancock Building's lights;
                          ; bit6 = fighter planes; bit5 =
                          ; bomber-planes; bit4 =
                          ; submarines; bit3 = aircraft
                          ; carriers; bit2 = landing craft;
                          ; bit1 = marching troops,
                          ; bit0 = tanks
```

Now he knows the Patriots face attack, from either the British or the Hessians, by fighter planes, bomber planes, landing craft, marching troops and tanks. The truth table for the *or* function is:

OR

	second argument 0	1
first argument 0	0	1
1	1	1

To express this in assembly language for our adventure game, you might write the code in Listing 3.

LOGICAL EXCLUSIVE OR

"Which threats will we Patriots face from just one of our foes?" Revere now asks himself. "Aha!" he thinks, "a job for *exclusive or*." Now, Revere could have taken the results of the *or* operation and subtracted the results of the *and* operation to find the fronts on which the Patriots face one and only one foe. But *exclusive or* will solve the problem in just one step. *Exclusive or* gives a one result only if the two arguments are different (a one and a zero, or a zero and a one). Two ones or two zeroes, on the other hand, both return a zero result.

> 'Aha!" he thinks. "A job for *exclusive or*."

```
EXCLUSIVE OR
10100111   British
11000011   Hessians
--------
01100100   Either British
           Or Hessians (Not Both)
```

Revere now knows that the Patriots face attack from either the British or the Hessians, but not both, by fighter planes, bomber planes and landing craft. Notice, too, that the *exclusive or* conveniently cleared the leftmost marker light, so no masking *and* operation is required.

The truth table for *exclusive or* is:

EXCLUSIVE OR

	second argument 0	1
first argument 0	0	1
1	1	0

To express this in assembly language for our adventure game, you might write the code in Listing 4.

LOGICAL COMPLEMENT

Finally, Revere would like to know which types of attack pose no problems to the Patriots. This is the opposite of all the types that do pose a problem, which he found with his *or* of the two sets of lights:

11100111

To get the opposite of each light, he would like to *complement* it—that is, turn each one into a zero and each zero into a one.

```
            11100111  British or
                      Hessians
comp-       --------
lemented    00011000  Neither British
                      Nor Hessians
```

But Paul Revere has an Apple II computer, and its processor does not have a *complement* or *not* instruction. He wants to do things the way his Apple does, so to produce the complement, he uses a mask (1111111) with an *exclusive or.*

```
EXCLUSIVE OR
11100111  British Or Hessians
11111111  Complement Mask
--------
00011000  Neither British
          Nor Hessians
```

Listing 3

```
                          ; Find all means of attack either
                          ; British or Hessians (or both)
         LDA   BRITISH    ; Get British means of attack
         ORA   HESSIANS   ; Logical OR with Hessian means of
                          ; attack.
         STA   ALLDANGR   ; Store to memory for use later
         AND   #%01111111 ; Use logical AND to mask high bit
                          ; (high bit not a means of attack)
                          ; All means of attack now
                          ; represented by the byte in the
                          ; accumulator.
ALLDANGR DS    1          ; 1 byte storage for all means of
                          ; attack by either British or
                          ; Hessians (or both)
                          ; (high bit not zeroed)
```

Listing 4

```
                          ; Find means of attack by either
                          ; British or Hessians (not both)
         LDA   BRITISH    ; Get British means of attack
         EOR   HESSIANS   ; Logical Exclusive OR Hessian
                          ; means of attack.
                          ; Means of attack by only one foe
                          ; now represented by byte in the
                          ; accumlator.
```

Listing 5

```
                          ; Find means of attack neither
                          ; British NOR Hessians will use.
         LDA   ALLDANGR   ; Get OR of British and Hessians
                          ; stored after ealier OR
         EOR   #%11111111 ; Use Exclusive OR to do logical
                          ; complement. Means of attack NOT
                          ; imminent, now represented by the
                          ; byte in the accumulator.
```

Listing 6

```
         LDA   NEWDATA    ; Contains an updated
                          ; reconnaisance report of troop
                          ; positions.
         TSB   BRITISH    ;
```

Now Paul knows there will be no attack by submarine or aircraft carrier.

Since the *complement* operation has only one argument, its truth table is simplified:

COMPLEMENT

argument	result
1	0

To use *exclusive or* to *complement* a value for an assembly language adventure game, you would write the code as in Listing 5.

OTHER USES OF LOGICAL OPERATIONS

The uses of logical operators far outstrip the simple adventure game examples used here. *Or* is often used with the mask 11110000 to set the high bit of an ASCII character for display as an Apple II video character; *and* is used with the mask 01111111 to strip the high bit from an ASCII character. All the chips in the 6502 family have another logical operation, *BIT.* This instruction performs the same operation as logical *and* except it does not save the result; the purpose is solely to set a condition-code flag indicating if the result is zero or non-zero (two other flags are also changed, but under entirely different rules).

A pair of "test-and-set" instructions were introduced on the 65C02: *TRB* and *TSB.* In the case of *TSB, or* operates on the accumulator value and the memory value, and the result is left in the memory location. In the case of *TRB,* the accumulator value is complemented, then operates on the memory with *and,* with the result left in the memory location. In our example, suppose the lookout on top of the John Hancock Building wants to update the values of the "lamps" in the windows with additional troop reports, from secondary sightings, without destroying the previous values. To turn on a light, he just flips the "on" switch—regardless of whether it was previously on or off. However, since he needs to make a report of changes in troop positions, he wants to remember the previous value. The *TSB* would allow you to simulate this kind of behavior in a game. See Listing 6.

The accumulator now holds a value indicating which troop positions have been confirmed by a second observer.

Finally, the 65802 and 65816 added two operations that use their operands as masks to alter any number of the status register flags at once: SEP (set bits in the processor status register) and REP (reset bits in P).//

Ron Lichty and David Eyes, both professional software developers, are the authors of the forthcoming **Programming the 65816, Including the 6502, 65C02 and 65802,** *published this fall by Brady/Simon and Schuster.*

Simple Substitution Ciphers

by CAXTON C. FOSTER

*This column is about using your computer to solve ciphered messages. Each installment builds on material previously presented, so first-time readers may be confused by some terminology and concepts. If you want the full series of these articles, start with Vol. 1, No. 1, of **II Computing**, or get Dr. Foster's book* Cryptanalysis for Microcomputers *(Hayden), which parallels much of this material.*

In the last installment I introduced *transposition* ciphers and *substitution* ciphers and explained the difference between them. In a transposition cipher the meaning of the plaintext message is hidden by scrambling the positions of its letters according to some scheme, but the letters stand for themselves. In a substitution cipher the letters stay in their proper places, but one letter is substituted for another.

As you might expect, these two methods can be combined, and in fact this technique is used in the Data Encryption Standard of the National Bureau of Standards.

In this article, I will examine techniques for solving the most simple substitution ciphers. There are two main kinds. If the ciphertext retains the interword spacing and punctuation of the plaintext, the American Cryptogram Association calls the crypts *aristocrats*. If spacing and punctuation are deleted, the ciphers are called *patristocrats*. Examples of aristocrats can be found in almost every daily newspaper, so there is a convenient body of material for you to practice on.

In the simple substitution cipher, each plaintext letter is replaced by a single ciphertext letter. This means you can construct a pair of alphabets: one alphabet is the plaintext letters (abcd . . .etc.), and a second is their substitutes in the ciphertext. For example, in a Caesar cipher the alphabets might look like this:

```
a b c d e f g h i j k l m n o p q r s t u v w x y z
X Y Z A B C D E F G H I J K L M N O P Q R S T U V W
```

Note that the plaintext is written in lowercase and the ciphertext in caps, a convention usually observed in cipher work. Using these alphabets to encipher a message, you might start:

```
now is the time for. . .
KLT FP QEB QFJB CLO. . .
```

This cipher is not very secure. A simple way to solve it is to write the alphabet vertically under each ciphertext letter, beginning with the letter that follows the cipherletter (see Figure 1). On one of the lines the plaintext pops out.

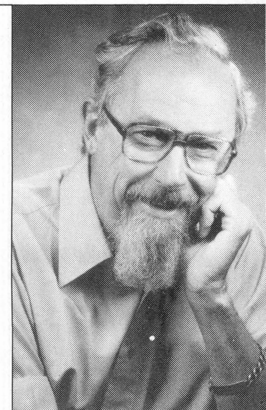
```
KLT  FP  QEB  QFJB  CLO
lmu  gq  rfc  rgkc  dmp
mnv  hr  sgd  shld  enq
now  is  the  time  for
opx  jt  uif  ujnf  gps
pqy  ku  vjg  vkog  hqt
qrz       k    l h    u
r
```

Figure 1

The reason this scheme is not secure is that there is too much regularity in the translation alphabets. When you discover one letter pair, you know them all. You could get rid of this regularity by choosing a cipher alphabet at random, but this would be very hard to remember, and if you write it down, you risk discovery. A common compromise is to use a *key* word that is not obvious, but is easily remembered.

Suppose you pick the word "cooperation" for the key. First rewrite the key word leaving out any duplicate letters—COPERATIN. The cipher alphabet is completed by writing the remaining

continued on next page



Caxton C. Foster, a Ph.D. in Electrical Engineering, was a Computer Science professor at the 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.

unused letters of the alphabet in order after the key word, thus:

C O P E R A T I N B D F G H J K L M Q S U V W X Y Z

The key word is easily remembered, but in this alphabet the letters toward the end tend to represent themselves, which isn't super secret. You can overcome this with a shift of a certain number of letters from the end to the beginning of the alphabet. A shift of five and the key word "cooperation" now gives:

plaintext:
a b c d e f g h i j k l mn o p q r s t u v wx y z
CIPHERTEXT:
V WX Y Z C O P E R A T I N B D F G H J K L MQ S U

Your first challenge this month is to write a BASIC subroutine that produces the appropriate cipher alphabet for an input key word and shift number. I will later use this routine in an enciphering program.

Using the alphabets given above is easy. For every letter in your plaintext message, substitute the corresponding cipher letter. Spaces and punctuation remain unchanged. Another cryptographic practice is to use an asterisk in ciphertext to mark the beginning of a proper name: for example, a message beginning "John said. . ." becomes *RBPN HVEY. . .

This is a good time to talk about the fallacy of large numbers. Suppose your friend says, "I have invented a cipher system that's impossible to crack because there are 17 quintillion billion possible keys!" Before agreeing too readily, let's just see how many possible keys there are for an aristocrat—the kind people find in the newspaper and often solve in a few minutes.

To create a key (cipher alphabet) for an aristocrat, I proceed as follows. There are 26 letters in the alphabet, so I pick one and put it down under the "a." That leaves 25, and I pick one to put under the "b." Proceeding this way through the alphabet, when I get to "y" I still have a choice of two letters, and at last only one letter to go under the "z." The total different ways I can do this (i.e., different keys) is 26*25*24*23. . .*2*1. This equals (approximately) 4 followed by 26 zeros. If my computer could try one of these keys per second, it would take 10^{19} years to go through all these possible keys, and that's a billion times longer than the universe has existed. Conclusion? No one could ever crack an aristocrat. But millions of people do so every day. Hmmm.

The fallacy is that you have to guess the key to solve the cipher. People bring all their skills and intuition to bear on the problem, and pick at it one letter at a time. Unless the cipherer has been diabolically clever, you can usually solve an aristocrat in half an hour.

What confirmed cryptanalysts do is to develop a bag of tricks to use in teasing out the message. As soon as a pattern begins to appear, ever more inspired guesses deliver the plaintext to their hands.

Let's look at some of these tricks. Every Scrabble player knows that some letters are better represented in the language than others. Trick number one is frequency analysis. As the number of letters in a sample message increases, the more the frequency of the letters in the sample approaches the frequency of the letters in the language at large, unless the sample is intentionally chosen to distort those frequencies.

The frequency of letters in English (and other languages) has been determined many times. Figure 2 shows the frequencies determined from a body of 2 million words called the Brown Sample of English. These and some other data were collected by Raj Wall at my request. Though he didn't have much choice in the matter because he was a graduate student, he did a super job, and at last, he gets the recognition he deserves!

Letter Frequency per 10,000 Letters

A:	805	E:	1250
B:	135	T:	925
C:	310	A:	805
D:	397	O:	760
E:	1250	I:	729
F:	231	N:	710
G:	195	S:	655
H:	542	R:	613
I:	729	H:	542
J:	16	L:	414
K:	66	D:	397
L:	414	C:	310
M:	254	U:	272
N:	710	M:	257
O:	760	F:	231
P:	202	P:	202
Q:	11	G:	195
R:	613	W:	188
S:	655	Y:	172
T:	925	B:	153
U:	272	V:	100
V:	100	K:	66
W:	188	X:	20
X:	20	J:	16
Y:	172	Q:	11
Z:	10	Z:	10

Figure 2

TALES FROM THE CRYPT

Other analyses of letter frequency in English may vary somewhat from ours. The letters O, I and N are often reported in different orders. This is not crucial because the typical crypt is so short that letter frequency will probably vary considerably from the norm anyway.

Your second challenge this time is to write a subroutine that can count letter frequencies in a sample of text and print out the results with the most frequent letters first. Remember, when you apply this tool, that letter frequencies are only approximate. E might not be the most frequent letter, but it isn't likely that X, Q or Z will be.

The program I provide for you this month is designed to make your guessing easier. It will read in a block of text, break it into 40-character chunks, and display those chunks together with your current guesses about the translation.

Use this code and try your hand at the crypts below, and at the ones in your daily paper. If you get stuck on one, try another. Nobody said you have to solve every one—after all, this is supposed to be fun—but if you do solve them all, the first reader who submits the correct solutions will receive a free six-issue subscription to ***II Computing's*** ACTION DISK edition. Send entries to The CRYPT, c/o ***II Computing***, 524 Second St., SF, CA 94107.

DISCUSSION OF BLOCKREAD PROGRAM

(See page 74 for listing, or load from your ACTION DISK.)

The program begins by putting blanks in all 256 slots of C%. I have chosen to store the letters of the text as their ASCII equivalents (A=65, B=66, etc.). Line 100 gets a character of text. If the character is a left arrow (ASCII value 8) you decrement the letter count N and backspace on the screen. Line 115 checks to see that you haven't backspaced beyond the beginning of the text.

Line 130 looks for the "/" signaling the end of the text, and lines 140-170 save the character, print it, and go back to get another.

Lines 180-200 initialize the translation alphabet to all blanks. Lines 240-260 print a line of ciphertext and 270-310 print a line of translated text.

Lines 350-420 get a cipher alphabet letter and your current guess as to what it stands for. Note that the program doesn't end; you have to press [CONTROL—RESET] to break out of it.

SAMPLE CRYPTS

1. RBY YUNLL QNHVSM TP MHSK VSMVKL H CHMY JHYULKLNHZ HSK YUL JHYULKLNHZ DVZZ IL ATNL JZTMLZF RHJXLK DVYU MHSK YUHS MRHJL VM DVYU MYHNM.

2. YB ABJ YB KAJB BJLZHI VI SBK PBKRY JLVJ JLZS ILBKRY YB KAJB SBK. JLZDH JVIJZI UVS ABJ WZ JLZ IVUZ.

3. BIV TQI'H CJUXV *MQXIVF'G BDVFQ *ABYVIXFZI QWHVF Q WZFGH YVQFZIX, QIU Z TVFHQZIAO UBI'H ZIHVIU YVQFZIX ZH Q GVTBIU HZSV. (Gioacchino Rossini.)

4. ES T OJHYJO ES *RTKTST IRYGY TGY IMA HUJLLH AZ *WRGEHIABRYG *WALJOVJH, "ASY MRYS RY MTH T VAP TSX ASY MRYS RY MTH T OTS." //

Listing on page 74

SOTTO VOCE

BILL BUDGE
continued from page 9

tremendous power, plenty for the professional, and it will be difficult to learn at this level. But others, anyone, will be able to use it at simpler levels."

A SINGLE TRACK

After visitors' day at the Hackers' Conference last autumn, my visiting friend, a philosopher by nature and education and a newcomer to the computer world, remarked on the number of extremely bright people he had met there. He lauded the unexpected integrity of a publisher, admired the minds of a group of outstanding programmers, paid homage to Woz and Burrell Smith and especially Scott Kim; and then he came to Budge.

"He's in a different category than all the rest," my wise friend said. "His is a brilliance I can only begin to fathom. He is the one who can change the world."

Considering the effects on the world of Steve Wozniak's Apple II and of the Macintosh that Burrell Smith had so much to do with, that's a tall order.

But did I forget to mention? Bill Budge is well over six feet tall.//

For more information on the game of Life and its significance,* **The Recursive Universe *by William Poundstone, William Morrow Publishers, © 1985.*

Deck the Halls With Computer Printouts

by KENDRA R. BONNETT

Kendra R. Bonnett is a free-lance writer living in Sausalito, California. She is the author of The Creative PrintMaster.

It's that time of year again. The days are growing shorter, the nights are getting colder and I'm spending more time in front of my computer. I need a new activity. Last year I made disk Christmas cards for a couple of friends, but it's too expensive to send disks to everyone, so this year I will deck my friends' halls with computer printouts. With software such as The Print Shop, Fontrix, and The Newsroom you too can put your Apple and printer to work creating holiday messages. Have fun designing festive banners, custom greeting cards, signs advertising a Hanukkah party, or a Christmas newsletter to bring all your friends up to date on your year's activities.

A NEW PHENOMENON

Such software is part of a phenomenon called desktop publishing. The Macintosh started the revolution in 1984 by simplifying the process of combining high-resolution text and graphics and printing them without using a clumsy screen-dump program. Apple II users can get some of the same effects through software. Broderbund's The Print Shop appeared in 1984 and became a best-seller overnight. It had Apple users around the county creating custom banners, signs, greeting cards and stationery. New products continue to appear, which incorporate more features and remain easy to use.

MAKING CUSTOM CARDS

In the spirit of the season let's create some holiday printouts. The Print Shop is a good place to begin. You can create custom greeting cards to send to friends and relatives. I like to create color-yourself cards for my young friends, and I often enclose a small package of crayons in the envelope. When designing coloring cards, select graphics that are line drawings and resemble the drawings in children's coloring books. If the pictures are filled in, a child must color over black ink. In my example (Figure 1), I picked a snowman graphic (from The Print Shop Graphics Library disk). Then, using the graphic editor, I erased the snowman's face, buttons and broom. This way a child can use his or her imagination.

If you have the time, you may want to hand color your cards with markers, watercolors, or crayons. You can also experiment with colored printer paper and ribbons. They cost a bit more, but you can get wonderful effects. I created a multicolored Rudolph the Red-nosed Reindeer by using the graphic editor to create two Rudolph graphics (Figure 2). One graphic was Rudolph without nose and candy cane. The second graphic was just the nose and cane. I set the printer to the top of the page, inserted a brown ribbon, and printed the first Rudolph. Then I rolled the paper back to the top of the page, inserted the red ribbon, added some text, and printed the second Rudolph. The green border required a third run through the printer with no graphics and no text. It takes thought and extra effort to get multicolored art, but I think the results are worth the trouble. You can order colored ribbons, paper and envelopes from PrintMaster PaperPax and Pixellite Computer Products.

THE SOFTWARE IMPROVES

My complaints with The Print Shop, the low quality of the graphics and the unsophisticated graphic editor, are being addressed. The graphics on the add-on graphic data disks are much better, and by the time you read this, The Print Shop Companion will be available. The Companion features an advanced graphic editor with mouse control and built-in drawing tools, 50 new border designs, 12 new fonts, border and font editors. You can even use artwork that you created with other graphic programs. The Companion turns The Print Shop into a more versatile utility. Of course, you can still create prefab signs and cards quickly and easily.

You can find lots of ways to use The Print Shop during the holidays—party invitations, holiday sale signs, party banners, or banner-size cards. My Season's Greetings banner (Figure 3) took three passes through the printer: one to print the green holly; two to print the red greeting; and three to print the green menorah. Finally, the Big Red Apple Club is an inexpensive resource for some public-domain Print Shop artwork—its PS Graphic Maker costs $2.50

Instead of sending greeting cards, you can use The Newsroom software to design a custom newsletter that combines graphics and the story of your year's activities. I like to divide up my escapades and events into separate articles and give each a title.

Although The Newsroom does not support color, I jazz things up a bit by designing the banner or headline first and printing it with a colored ribbon. (In Figure 4, the green and red banner took two passes through the printer.) Then I roll the paper back again and design and write the rest of the newsletter, which I print in black (easier on the eyes). Remember to leave the banner area free when you lay out the page for the final printing, to avoid printing over your previous design.

The Newsroom is easy to use and versatile. You can select from several fonts and over 600 graphics and you always create your own art. The Clip Art Collection adds another 1200 graphics.

TURNING YOUR APPLE INTO A MAC

The Print Shop and The Newsroom are excellent products if you want to design things quickly and can satisfy your needs from the menus of graphics, fonts, borders and layouts. However, if you want to design your own creations and not have to conform to the program's design, you can explore some of the graphic and font editors. Try Fontrix, the most versatile graphic print product for the Apple II series. It comes closest to turning your Apple into a Macintosh. You can design intricate graphics and fancy type fonts (in addition to using the many predesigned symbols, fonts and graphics included in the Fontpak add-on data disks).

The basic software includes a graphic writer, font editor and printer dump. The documentation is extensive (130 pages), yet the program is easy to operate. Fontrix supports graphic tablets, joysticks, paddles, keyboard and a mouse, and it takes advantage of the capabilities of high-resolution printers. You design your graphics and fonts in extended high-resolution graphics cells of 32 x 32 (most other

THE CREATIVE PRINTMASTER
by Kendra R. Bonnett
International Publishing
3204 Adeline St.
PO Box 3056
Berkeley, CA 94703
$13.95

FACELIFT 2
Companion Software, Inc.
PO Box 480741
Los Angeles, CA 90048
$ 49.95

FONT DOWNLOADER
Micro-W Distributing, Inc.
PO Box 113
Pompton Place, NJ 07405
$39.00

FONTRIX
Data Transforms
616 Washington St.
Denver, CO 80203
$75.00

MEGAWORKS
Megahaus Corporation
5703 Oberlin Drive
San Diego, CA 92121
$125.00

MISCO
1 Misco Plaza
Holmdel, NJ 07733
(send for free catalog of computer supplies)

MOUSEARTIST
Village Computer Resources
PO Box 155
Lakewood, CA 90714
$89.00 + $5.00 shipping

MOUSEFONT
MOUSEPRINT
Ahware
805 Luz Court
Danville, CA 94526
$34.95 / $22.95

THE NEWSROOM
CLIP ART
Springboard Software, Inc.
7807 Creekridge Circle
Minneapolis, MN 55345
$49.95 / $29.95

PIXELITE COMPUTER PRODUCTS
Pixellite
5221 Central Ave., Suite 205
Richmond, CA 94804
(catalog available)

PRINTMASTER PAPER PAX
PaperPax
International Publishing
3204 Adeline St.
PO Box 3056
Berkeley, CA 94703
Sample Pax and Catalog $5.00

THE PRINT SHOP
THE PRINT SHOP COMPANION
THE GRAPHICS LIBRARY
Broderbund Software
17 Paul Dr.
San Rafael, CA 94903
$39.95 / $39.95 / $24.95

PS GRAPHIC MAKER
Big Red Apple Club
1105 South 13th #103
Norfolk, NB 68701
$2.50

SEASON'S

Apple II font editors have a resolution of about 12 x 12 pixels). This means that the resolution of your printouts is higher than what you see on the screen. But what makes Fontrix so versatile is that you can combine several graphics cells to create a Graffile. Working in a Graffile is similar to working on a Macintosh screen. You can combine text and graphics in any area that you define. The Graffile can be larger than a graphic screen and can be large enough to fill a whole piece of paper.

I used a font that looks like letters on a music scale to create the lines from "Deck the Halls" (Figure 5). I positioned the letters with a mouse. The musical instruments are another font. Each character represents a section of an instrument (such as the top of a drum or the left half of a piano). I combined several characters to create an instrument by positioning the mouse and pressing a key to select the appropriate piece of instrument.

You can use Fontrix to combine text and graphics to create wonderful cards, ad copy, signs and newsletters. Also, you can employ some fancy printing techniques to add color and style to your creations. I printed "Deck the Halls" as two Graffiles, changing ribbons between printings. (At $75, Fontrix is a bargain.)

DON'T FORGET YOUR WORD PROCESSOR

Perhaps neither newsletters nor cards suit your holiday needs. If all you want to do is write personal letters to your friends your word processor lets you address letters individually and make little changes in the copy, saving you from typing each letter separately. For the holidays, you may want to dress up your printouts by adding special type fonts and varying the sizes and styles (italics, bold, condensed) of those fonts. Several inexpensive software packages on the market give you versatility and ease of use.

The new Facelift 2, for example, offers very small type (Babyface), reverse type, italics, subscripts and superscripts, heavy and condensed type at the touch of a key. Other features automatically center text, turn computer and printer into a typewriter, and let you write in eight languages. In all, Facelift 2 includes 92 typefaces, styles and sizes on Epson X printers and 416 on the Epson LQ-1500.

Mousefont and Mouseprint are designed to enhance your Apple MousePaint software. You can create fonts and edit existing ones; however, the graphic cell is small (12 x 13 pixels). You can design icons and borders and even print sideways. Mousefont also adds 12 new pre-designed fonts to

Figure 1

Figure 2

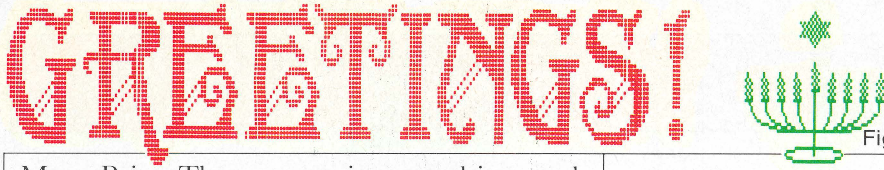


Figure 3

MousePaint. The program is menu driven and, once you initialize and back up the program, easy to use.

The Font Downloader is designed to work in conjunction with any word processor. Rather than loading a font into the computer, you load it into the printer, where it remains until you load a different font or turn off the printer. Press a couple of keys to incorporate the special font into any word-processor printout. The software is easy to use, but the graphic cell is small (8 x 8 pixels), which means that the fonts you design will be fairly simple.

If you are using your word processor to write holiday letters, save yourself an extra step with a mail-merge program that automatically addresses your letters and/or adds a personal salutation. You can send the same letter to Jane, Tom and Maria and have the letters start *Dear Jane, Dear Tom* and *Dear Maria* respectively. Most word-processor manufacturers now either make an add-on mail-merge program or support an existing program. Megahaus Corporation, for example, has a mail-merge feature in its MegaWorks software (an add-on for AppleWorks).

On the other hand, if you want to address envelopes or adhesive-backed labels, get a mailing list program. Enter and save names and addresses in a master list, then print the labels out whenever you need them. You can find continuous-feed envelopes and labels in most computer supply houses (such as Misco).

Once you feel you have exhausted your possibilities with the software, you can mix media by combining hand-drawn art with computer text and graphics, or you can color printouts by hand. Combine graphics you made with one piece of software with text created with another by printing the outputs separately, cutting everything out, and pasting it all on another sheet of paper. Once you photocopy the cut-and-paste sheet, no one will know how you created your masterpiece. (You can copy your designs using the new photocopiers that have colored toner.) Work in stages (the way you did when printing with several colored printer ribbons), and you can photocopy in several colors. *[ED. NOTE: If you want some ideas for creating unusual designs, look at Ms. Bonnett's* The Creative PrintMaster, *a handbook of graphic design tips for the computer.]*

So this holiday season, deck the halls with mistletoe and evergreen and light your Hanukkah candles. But don't forget the computer printouts and send personalized high-tech greetings to all.//


Happy Holidays 1985

Tom's Year in Review

Merry Christmas to You!

Ho-Ho Ho-Ho Ho!!

Tis the season to be jolly-- once more. Happy Holidays to all my friends. I thought I would use my computer to create a special holiday newspaper and let you all know how I spent this last year. So, here goes...

Welcome Spot

This past summer my parents bought me a dog. That was after I had begged them for two years. We went to the SPCA and found this great mutt. Mom says mutts are usually smart--well Henrietta is. That's her name, Henrietta. I liked Henry, but it's a girl dog and Henry doesn't fit.

Henrietta does not chase cars, but does keep the yard clear of cats and other neighborhood creatures. We are great pals.

Henrietta

An Apple A Day....

My parents have a new Apple II computer. They don't get to use it very often because I do my homework on it and program. In fact, I am creating this newspaper on the Apple. I think computers are great. Someday I will have my very own computer. In the meantime, I guess I can share. Dad wants to play chess right now. Bye!!!

Look Out Below....

Here is a shot of me parasailing in Mexico. It is a cross between waterskiing and parachuting. It is safer than it looks. You can see for miles out to sea and all along the coast.

We did a lot of siteseeing in Mexico. I think we are going to Mexico City next spring.

ME

Camp Wenetanawah

I went to camp in Maine during July and August. It was great. I can now start a campfire with two sticks and a box of matches. I am called Little Brave, because I rescued my roommate from an angry skunk. The kids were great.

At night we sat by the fire and told ghost stories. I know some real scary tales--some of which are true! I think that when I am old enough I will be a camp counselor. Those guys have lots of fun.

You won't believe all the things I learned to do. I can stalk other campers in the woods, I can do first aid, and swim 2 miles.

The best part of camp, however, was the fishing. Here I am catching JAWS--that was what everyone called the trout I caught. It was huge. I am definitely going back next summer.

Well, that about does it. All I have left to say, is have a cool yule, Merry Christmas, Happy Hanakkah, and Happy New Year.

TOM BANKS

Figure 4

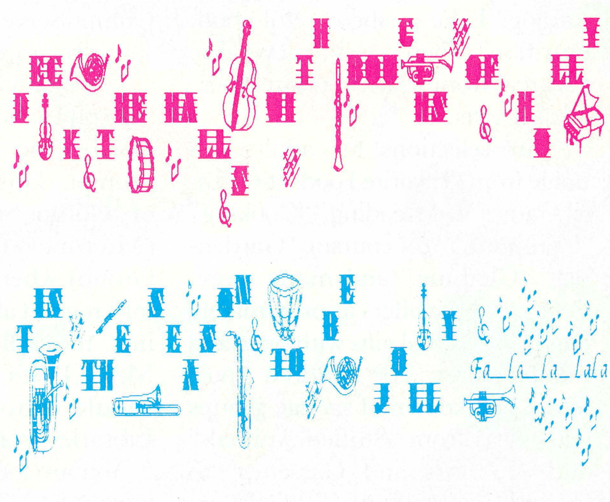


Figure 5

Sysop Santa

Electronic bag of gifts

by SCOTT ANTHONY

Everybody knows that Santa is a very busy guy at least once a year. He needs all the help he can get, so we arranged for him to put his bag of gifts online for your inspection. The Gift Selector program in this issue will sort through the gifts according to the criteria you give it about the person for whom the gift is intended.

For instance, suppose your friend is a fitness fanatic. Then, the category of "Sports and Fitness" would be a likely first choice. Does this person jog? Is he or she careful about nutrition? These are but several of the areas from which you can choose related gifts.

Your selections for adults will range from "Favorite Foods" to "Pencil Games" to "Reading," "Cooking," "Computing" (of course), "Gardening," "Clothing," and many more. Each category offers approximately four or five actual gifts with price and manufacturer. For children you'll find a breakdown of six age groups with ideas from "Stuffed Animals" and "Records and Cassettes" to "Sports Equipment," "College-Related Materials," and more.

To obtain data for this program, you must belong to CompuServe, and you will be charged for your connect time, which might amount to a half-hour before you're finished. However, the data then belongs to you and can be used throughout the year.

Type in the program on page 60 and save it. Then log onto CompuServe. If you don't belong to CompuServe, you will have to join to get an account number and password. Sometimes these memberships are included when you buy a modem or communications software. Otherwise, you can buy the CompuServe Starter Kit from any software store.

Once on CompuServe, just type the command GO APPLE2 when you see the ! (exclamation point) prompt. This takes you to the part of CompuServe called MAUG (Micronetworked Apple Users Group) where you will find much information about Apple II computing. You will be prompted to join MAUG (it's free), and then you should choose the Database Libraries from the menu.

You are looking for the database named SANTA. It is in the "Community Square" section (menu choice 6) of the library. At the next menu you want to choose "Download a File" (choice 5).

Next you must specify the protocol you will use. If your terminal program supports the XMODEM (Christensen) protocol, then choose 1. If your program only supports text capture, take choice 4.

CompuServe will then ask for the filename to be downloaded. Type SANTA and press return. Follow your own terminal program's instructions from that point on. This is a sizable file, and may take fifteen or twenty minutes to download at 300 baud. When you save this file, name it GIFTS.DATA, the name the Gift Selector program will be looking for.

If you have any problems, feel free to call the MAUG help line (516) 735-6924 any day from 7 pm to 10 pm Eastern time.

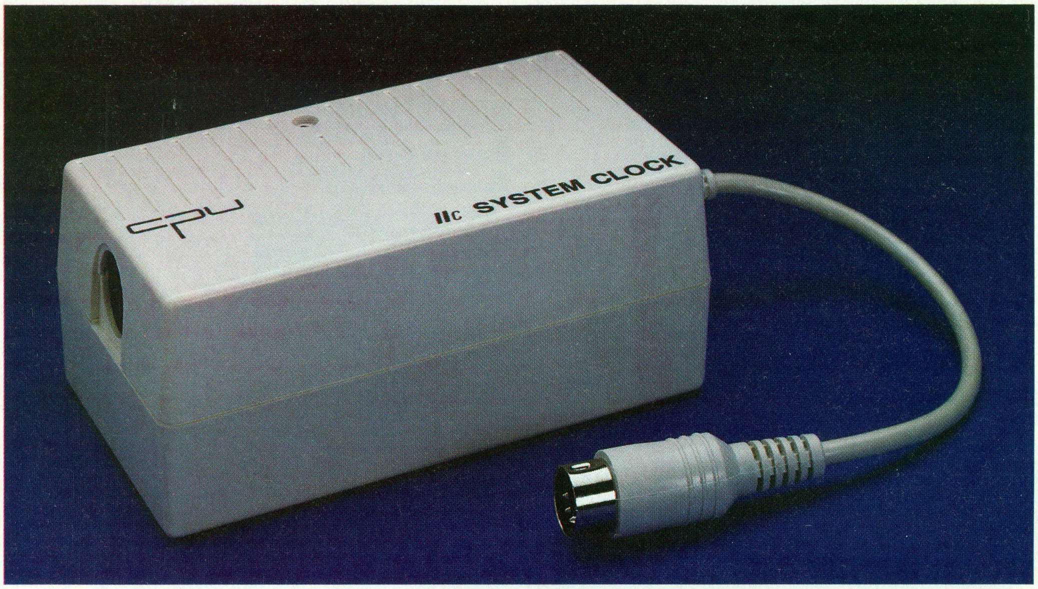
If you don't have a modem, or prefer not to download, GIFT SELECTOR and GIFTS.DATA are available on disk from ***II Computing.*** //

San Franciscan Scott Anthony holds a B.A. in biology from Dartmouth College. Presently he is both a fine and commercial artist, musician and computer software and hardware developer.

Listing on page 60


THON
SYSOP SANTA

NEW PRODUCT



IIc SYSTEM CLOCK

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Marble Mania

by BILL MARQUARDT

I would like this program to accomplish two things: to entertain you with a challenging puzzle and demonstrate some of the basic graphics techniques available on your Apple.

When you run **Marble Mania** you see a hi-res display of a playing board with 32 "marbles". The object is to jump a marble over any adjacent marble (providing there is a space to jump into) and remove the jumped marble from the board, until no more jumps can be made. You only win if there is but one marble left, and it is in the center.

Playing Marble Mania is as simple as RUNning the program and following the instructions on the screen. You make all moves with the I,J,K and M keys, but it would be simple to add a joystick handler. At any time during play, if you decide that you wish to restart the puzzle, press the Escape key.

Here's a little secret that only readers of this magazine know: If you want the computer to show you one possible solution, restart the puzzle and before you make any moves, hit the A key (for Auto-play). Don't spoil the fun by using this feature until you are absolutely, positively ready to give up.

Now let's examine how the program does what it does. First you have to create the shapes you will use and tell the computer where to find them so that you can move them around with Applesoft. This is accomplished with lines 60 to 90 and the data at lines 1470 to 1580. Store the Shape Table in the "safe" area of RAM at Page 3, which is $0300 in hexadecimal, or 768 in decimal. Line 70 tells the computer this information, and line 90 does the work.

The first byte in the table tells the number of shapes you are using. The second byte is always zero. The three succeeding pairs of bytes tell how far from the beginning of this table each shape's data starts, using the low-byte/high-byte convention. Shape 1, which is the marble, begins at the eighth byte from the start; Shape 2, the square, is at the 49th; and Shape 3, the empty circle, is at the 77th.

Each of the bytes within a shape's data creates two or three contiguous dots, which are either visible or invisible. The three least significant bits form the first dot, and the three next higher bits form the second. The upper two bits form a third, if they are not both zeroes. Check the following table to see how the bits affect the shape being drawn, remembering that a plotted point is a visible one:

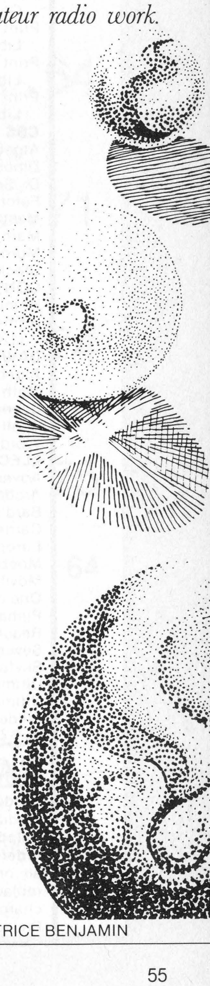
000	= no plot, move up
001 or 01	= no plot, move right
010 or 10	= no plot, move down
011 or 11	= no plot, move left
100	= plot, move up
101	= plot, move right
110	= plot, move down
111	= plot, move left

Note that the point is plotted or not before the movement, not after. The last byte in a shape's data must be a zero to signal the end. If you follow the data in lines 1530 to 1550 and plot the points on a piece of paper, you will see a square form. (I assume you can convert decimal to binary). For more detailed information on shape tables, see your Applesoft Reference or a book such as the *Apple II User's Guide* from Osborne/McGraw-Hill.

Using the Applesoft commands DRAW and XDRAW, we can draw and erase the three shapes anywhere we like on the hi-res screen. We can use a single shape to draw as many identical images on the screen as we need.

continued on next page

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.



BEATRICE BENJAMIN

GAME FRAME

One use for memory location 234 in the Apple is as a collision detection register. Check lines 1330 to 1350 where you draw a marble, check for a collision by seeing if 234 holds a zero, and erase the marble. This was done to make sure the jump was over an occupied space, which is one of the rules. This may not be the most elegant method, but it suits my purpose.

Location 49152 holds the value of the latest keypress from which you subtract 128 to obtain the ASCII value. The eighth bit is a flag bit to indicate that a key was pressed, thus the reason for subtracting 128. To clear this register, POKE 49168 (not 49152) with zero. It is a good idea to do this after a GET statement in any Applesoft program to avoid certain bugs that may arise.

There you have it. The rest of this program is straightforward and should not require explanation. Many improvements could be made, but I'll leave that up to you.//

VARIABLE TABLE

A	index for data reading
I,J,K	index for loops
X	horizontal coordinate for DRAWS & XDRAWS
Y	vertical coordinate
X1,X2,SX,NX,XX	temporary hor. coord.
Y1,Y2,SY,NY,YY	temporary vert. coord.
P,DL	delay loop counters
U,D,L,R	direction flags
IM,OK	illegal move flags
MV	move counter
A$,K$	keyboard readers

PROGRAM TAKE-APART

Line #'s	Use
60-90	set up shape table
100-160	intro screen
170-280	enter hi-res and draw puzzle
340-550	determine which marble to move
560-780	determine which way to jump
850-930	erase marbles when jumping
950-990	print keyboard image
1010-1090	ensure a marble is being jumped over
1110-1160	flash Illegal move
1180-1260	see if jump would go out
1280-1360	see if landing space is empty
1380-1450	see if square would go out
1470-1580	shape table data
1600-1660	print instructions
1680-1720	announce winning game
1740-2250	demo winning moves

Listing on page 71

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. All of the following programs work with DOS 3.3 and ProDOS.**

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 (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        ST   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. //

TYPO II MAKER

```
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
```

SYSOP SANTA

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```
10  REM  * GIFT SELECTOR
15  REM  * BY SCOTT ANTHONY
20  REM  * (C) 1985 ANTIC PUBLIS
HING INC.
25  REM  * II COMPUTING VOL.1 NO
.2
40 :
50 F$ = "GIFTS.DATA"
100  HOME : RESTORE : GOSUB 1000
0: ONERR  GOTO 9400
110  GOSUB 12110: HOME : VTAB 8:
 HTAB 5: PRINT "WHAT IS THE
AGE": PRINT : HTAB 8: PRINT
"OF THE PERSON": PRINT : HTAB
11: PRINT "YOU ARE GIVING TO
": PRINT : HTAB 14: PRINT "
(INFANTS ARE AGE 0) ";: INPUT
AGE: IF AGE < 0 OR AGE > 100
 THEN 1
130 A = 1 + (AGE > 21) + (AGE >
15) + (AGE > 12) + (AGE > 9)
 + (AGE > 5) + (AGE > 2):B =
0:C = 0:D = 0
140  HOME : ON A GOSUB 1000,2000
,3000,4000,5000,6000,7000
150  GOSUB 12110
970 CD$ =  STR$ (A) +  STR$ (B) +
  STR$ (C) +  STR$ (D)
980  HOME : GOTO 9000
995 :
996  REM  ***********************
*
997  REM      AGE CATEGORY MENUS
998  REM  ***********************
*
999 :
1000  HOME : GOSUB 9300: VTAB 3:
 HTAB 12: PRINT "INFANTS TO
2 YEARS"
1010  GOSUB 12100: GOSUB 12150
1020  VTAB 5: PRINT "1 - CLOTHES
": PRINT "2 - TOYS": PRINT "
3 - HELPFUL THINGS FOR": PRINT
"    MOM & DAD":CC = 3: GOSUB
12120
1050 B =  VAL (C$): RETURN
1997 :
1998  REM  ***********************
*
1999 :
2000  HOME : GOSUB 9300: VTAB 3:
 HTAB 10: PRINT "PRE-SCHOOLE
RS (3-5 YEARS)"
2010  GOSUB 12100: GOSUB 12150
2020  VTAB 5: PRINT "1 - BOOKS":
 PRINT "2 - TOYS": PRINT "3
- SOFTWARE": PRINT "4 - CLOT
HES": PRINT "5 - DOLLS & STU
FFED ANIMALS": PRINT "6 - GA
MES":CC = 6: GOSUB 12120
2050 B =  VAL (C$): RETURN
2997 :
2998  REM  ***********************
2999 :
3000  HOME : GOSUB 9300: VTAB 3:
 HTAB 16: PRINT "AGES 6-9"
3010  GOSUB 12100: GOSUB 12150
3020  VTAB 5: PRINT "1 - BOOKS":
 PRINT "2 - TOYS": PRINT "3
 - SOFTWARE": PRINT "4 - DOLL
S": PRINT "5 - GAMES": PRINT
"6 - SPORTS EQUIPMENT":CC =
6: GOSUB 12120
3050 B =  VAL (C$): RETURN
3997 :
3998  REM  ***********************
*
3999 :
4000  HOME : GOSUB 9300: VTAB 3:
 HTAB 15: PRINT "AGES 10-12"
4010  GOSUB 12100: GOSUB 12150
4020  VTAB 5: PRINT "1 - BOOKS":
 PRINT "2 - GAMES": PRINT "3
 - SOFTWARE": PRINT "4 - SPO
RTS EQUIPMENT": PRINT "5 - H
OBBIES": PRINT "6 - RECORDS/
AV/CASSETTES":CC = 6: GOSUB
12120
4030  GOSUB 12110:B =  VAL (C$):
 RETURN
4997 :
4998  REM  ***********************
4999 :
5000  HOME : GOSUB 9300: VTAB 3:
 HTAB 8: PRINT "JUNIOR HIGH
(AGES 13-15)"
5010  GOSUB 12100: GOSUB 12150
5020  VTAB 5: PRINT "1 - BOOKS":
 PRINT "2 - SOFTWARE": PRINT
"3 - SPORTS EQUIPMENT": PRINT
"4 - HOBBIES": PRINT "5 - EN
TERTAINMENT": PRINT "6 - REC
ORDS/AV/CASSETTES": PRINT "7
 - CLOTHES FOR GIRLS": PRINT
"8 - CLOTHES FOR BOYS":CC =
8
5030  GOSUB 12120: GOSUB 12110:B
 =  VAL (C$): RETURN
5997 :
5998  REM  ***********************
*
5999 :
6000  HOME : GOSUB 9300: VTAB 3:
 HTAB 3: PRINT "HIGH SCHOOL
& COLLEGE (AGES 16-21)"
6010  GOSUB 12100: GOSUB 12150
6020  VTAB 5: PRINT "1 - BOOKS":
 PRINT "2 - SOFTWARE": PRINT
"3 - SPORTS EQUIPMENT": PRINT
"4 - HOBBIES": PRINT "5 - CO
LLEGE RELATED MATERIALS": PRINT
```

```
"6 - RECORDS/AV/CASSETTES": PRINT
"7 - CLOTHES FOR FEMALES": PRINT
"8 - CLOTHES FOR MALES":CC =
8
6030 GOSUB 12120: GOSUB 12110:B
 = VAL (C$): RETURN
6997 :
6998 REM **********************
*
6999 :
7000 HOME : GOSUB 9300: VTAB 3:
 HTAB 17: PRINT "ADULTS"
7010 GOSUB 12100: GOSUB 12150
7020 VTAB 5: PRINT "1 - THE ART
S": PRINT "2 - SPORTS & FITN
ESS": PRINT "3 - ENTERTAINME
NT": PRINT "4 - COMPUTING": PRINT
"5 - REPAIR & HOME CRAFTS":
 PRINT "6 - COLLECTING": PRINT
"7 - FASHION & STYLE":CC = 7
: GOSUB 12120
7030 GOSUB 12110:B = VAL (C$):
 ON B GOTO 7100,7200,7300,74
00,7500,7600,7700
7100 HOME : GOSUB 9300: VTAB 3:
 HTAB 14: PRINT "THE ARTS"
7110 GOSUB 12100: GOSUB 12150
7120 VTAB 5: PRINT "1 - MUSIC P
ERFORMANCE": PRINT "2 - MUSI
C LISTENING": PRINT "3 - ART
S & CRAFTS": PRINT "4 - ART
APPRECIATION":CC = 4: GOSUB
12120
7130 GOSUB 12110:C = VAL (C$):
 ON C GOTO 7140,7150,7160,71
70
7140 HOME : GOSUB 9300: VTAB 3:
 HTAB 10: PRINT "MUSIC - PER
FORMANCE": GOSUB 12100: GOSUB
12150
7142 VTAB 5: PRINT "1 - STRINGE
D INSTRUMENTS": PRINT "2 - P
IANO": PRINT "3 - WIND INSTR
UMENTS": PRINT "4 - PERCUSSI
ON": PRINT "5 - ELECTRONIC":
CC = 5: GOSUB 12120: GOTO 79
00
7150 HOME : GOSUB 9300: VTAB 3:
 HTAB 11: PRINT "MUSIC - LIS
TENING": GOSUB 12100: GOSUB
12150
7152 VTAB 5: PRINT "1 - CLASSIC
AL": PRINT "2 - POP": PRINT
"3 - JAZZ": PRINT "4 - ROCK"
: PRINT "5 - COUNTRY WESTERN
":CC = 5: GOSUB 12120: GOTO
7900
7160 HOME : GOSUB 9300: VTAB 3:
 HTAB 13: PRINT "ARTS & CRAF
TS": GOSUB 12100: GOSUB 1215
0
7162 VTAB 5: PRINT "1 - PAINTIN
G": PRINT "2 - SCULPTING": PRINT
"3 - WOOD CARVING": PRINT "4
 - PHOTOGRAPHY": PRINT "5 -
CERAMICS": PRINT "6 - DRAWIN
G": PRINT "7 - NEEDLECRAFTS"
: PRINT "8 - MINIATURES":CC =
8: GOSUB 12120: GOTO 7900
7170 RETURN
7197 :
7198 REM **********************
7199 :
7200 HOME : GOSUB 9300: VTAB 3:
 HTAB 12: PRINT "SPORTS & FI
TNESS"
7210 GOSUB 12100: GOSUB 12150
7220 VTAB 5: PRINT "1 - FITNESS
": PRINT "2 - TEAM & COMPETI
TIVE SPORTS": PRINT "3 - OUT
DOOR SPORTS": PRINT "4 - SPE
CTATOR SPORTS":CC = 4: GOSUB
12120
7230 GOSUB 12110:C = VAL (C$):
 ON C GOTO 7240,7250,7260,72
70
7240 HOME : GOSUB 9300: VTAB 3:
 HTAB 16: PRINT "FITNESS": GOSUB
12100: GOSUB 12150
7242 VTAB 5: PRINT "1 - WEIGHT
LIFTING": PRINT "2 - AEROBIC
S": PRINT "3 - NUTRITION": PRINT
"4 - JOGGING": PRINT "5 - WA
LKING": PRINT "6 - SWIMMING"
:CC = 6: GOSUB 12120: GOTO 7
900
7250 HOME : GOSUB 9300: VTAB 3:
 HTAB 8: PRINT "TEAM & COMPE
TITIVE SPORTS": GOSUB 12100:
 GOSUB 12150
7252 VTAB 5: PRINT "1 - VOLLEYB
ALL": PRINT "2 - TENNIS": PRINT
"3 - SQUASH/RACQUETBALL": PRINT
"4 - GOLF": PRINT "5 - BOWLI
NG": PRINT "6 - BASEBALL": PRINT
"7 - FOOTBALL": PRINT "8 - B
ASKETBALL": PRINT "9 - HOCKE
Y":CC = 9: GOSUB 12120: GOTO
7900
7260 HOME : GOSUB 9300: VTAB 3:
 HTAB 13: PRINT "OUTDOOR SPO
RTS": GOSUB 12100: GOSUB 121
50
7262 VTAB 5: PRINT "1 - HUNTING
": PRINT "2 - FISHING": PRINT
"3 - HIKING": PRINT "4 - BIC
YCLING": PRINT "5 - BOATING"
: PRINT "6 - SKIING":CC = 6:
 GOSUB 12120: GOTO 7900
7270 RETURN
7300 HOME : GOSUB 9300: VTAB 3:
 HTAB 14: PRINT "ENTERTAINME
NT"
7310 GOSUB 12100: GOSUB 12150
7320 VTAB 5: PRINT "1 - EATING
& DRINKING": PRINT "2 - PUZZ
LES & GAMES": PRINT "3 - MOV
IES/THEATER": PRINT "4 - REA
DING": PRINT "5 - TRAVEL":CC
 = 5: GOSUB 12120
7330 GOSUB 12110:C = VAL (C$):
 ON C GOTO 7340,7350,7360,73
70,7380
7340 HOME : GOSUB 9300: VTAB 3:
 HTAB 12: PRINT "EATING & DR
INKING": GOSUB 12100: GOSUB
12150
7342 VTAB 5: PRINT "1 - DINING
OUT": PRINT "2 - DINING IN":
 PRINT "3 - BAR UTENSILS": PRINT
```

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```
"4 - BEVERAGES": PRINT "5 -
FAVORITE FOODS": PRINT "6 -
PARTIES": PRINT "7 - BARBECU
ES & PICNICS":CC = 7: GOSUB
12120: GOTO 7900
7350 HOME : GOSUB 9300: VTAB 3:
 HTAB 13: PRINT "PUZZLES & G
AMES": GOSUB 12100: GOSUB 12
150
7352 VTAB 5: PRINT "1 - BOARD G
AMES": PRINT "2 - CARD GAMES
": PRINT "3 - PENCIL GAMES":
 PRINT "4 - JIGSAW PUZZLES":
 PRINT "5 - PUZZLE TOYS": PRINT
"6 - MAGIC TRICKS": PRINT "7
 - FANTASY/ROLE PLAYING":CC =
7: GOSUB 12120: GOTO 7900
7360 RETURN
7370 HOME : GOSUB 9300: VTAB 3:
 HTAB 16: PRINT "READING": GOSUB
12100: GOSUB 12150
7372 VTAB 5: PRINT "1 - FICTION
": PRINT "2 - NON-FICTION": PRINT
"3 - POETRY": PRINT "4 - POL
ITICS & HISTORY": PRINT "5 -
 MYSTERIES": PRINT "6 - PERI
ODICALS": PRINT "7 - SCIENCE
 FICTION"
7374 PRINT "8 - BIOGRAPHY": PRINT
"9 - CLASSICS":CC = 9: GOSUB
12120: GOTO 7900
7380 RETURN
7400 HOME : GOSUB 9300: VTAB 3:
 HTAB 12: PRINT "COMPUTING"
7410 GOSUB 12100: GOSUB 12150
7420 VTAB 5: PRINT "1 - HARDWAR
E": PRINT "2 - GAMES": PRINT
"3 - PRODUCTIVITY TOOLS": PRINT
"4 - LANGUAGES": PRINT "5 -
OTHER SOFTWARE": PRINT "6 -

INCIDENTALS":CC = 6: GOSUB 1
2120
7430 GOSUB 12110:C =  VAL (C$):
GOTO 7900
7500 HOME : GOSUB 9300: VTAB 3:
 HTAB 10: PRINT "REPAIR & HO
ME CRAFTS"
7510 GOSUB 12100: GOSUB 12150
7520 VTAB 5: PRINT "1 - COOKING
": PRINT "2 - MAINTENANCE &
REPAIR": PRINT "3 - GARDENIN
G": PRINT "4 - DECORATING":C
C = 4: GOSUB 12120
7530 GOSUB 12110:C =  VAL (C$):
 ON C GOTO 7540,7550,7560,75
70
7540 HOME : GOSUB 9300: VTAB 3:
 HTAB 16: PRINT "COOKING": GOSUB
12100: GOSUB 12150
7542 VTAB 5: PRINT "1 - COOKBOO
KS": PRINT "2 - UTENSILS": PRINT
"3 - TABLE ITEMS": PRINT "4
- POTS & PANS": PRINT "5 - A
PPLIANCES": PRINT "6 - CONDI
MENTS": PRINT "7 - STAPLES":
CC = 7: GOSUB 12120: GOTO 79
00
7550 HOME : GOSUB 9300: VTAB 3:
 HTAB 10: PRINT "MAINTENANCE
 & REPAIR": GOSUB 12100: GOSUB
12150
7552 VTAB 5: PRINT "1 - CARPENT
RY": PRINT "2 - PLUMBING": PRINT
"3 - AUTO MECHANICS": PRINT
"4 - ELECTRICAL": PRINT "5 -
 PAINTING": PRINT "6 - CLEAN
ING":CC = 6: GOSUB 12120: GOTO
7900
7560 HOME : GOSUB 9300: VTAB 3:
 HTAB 15: PRINT "GARDENING":
 GOSUB 12100: GOSUB 12150
7562 VTAB 5: PRINT "1 - CLOTHIN
G": PRINT "2 - TOOLS": PRINT
"3 - PLANTS & SEEDS": PRINT
"4 - SOIL CONDITIONERS": PRINT
"5 - DECORATIVE ITEMS": PRINT
"6 - BOOKS":CC = 6: GOSUB 12
120: GOTO 7900
7570 RETURN
7600 HOME : GOSUB 9300: VTAB 3:
 HTAB 15: PRINT "COLLECTING"
7610 GOSUB 12100: GOSUB 12150
7620 VTAB 5: PRINT "1 - COINS":
 PRINT "2 - STAMPS": PRINT "
3 - ANTIQUES": PRINT "4 - BA
SEBALL CARDS":CC = 4: GOSUB
12120
7630 GOSUB 12110:C =  VAL (C$):
 GOTO 7900
7700 HOME : GOSUB 9300: VTAB 3:
 HTAB 12: PRINT "FASHION & S
TYLE"
7710 GOSUB 12100: GOSUB 12150
7720 VTAB 5: PRINT "1 - SEWING"
: PRINT "2 - COSMETICS": PRINT
"3 - FRAGRANCES FOR": PRINT
"    MEN & WOMEN": PRINT "4
- MEN'S CASUAL CLOTHES": PRINT
"5 - WOMEN'S CASUAL CLOTHES"

7730 PRINT "6 - WOMEN'S ACCESSO
RIES": PRINT "7 - MEN'S ACCE
SSORIES": PRINT "8 - MAGAZIN
ES & BOOKS":CC = 8: GOSUB 12
120: GOSUB 12110:C =  VAL (C
$): GOTO 7900
7900 GOSUB 12110:D =  VAL (C$):
 RETURN
7995 :
7996 REM *********************

7997 REM   MISCELLANEOUS SUBS
7998 REM *********************

7999 :
9000 GOSUB 9500:V = 3: GOSUB 12
110: HOME : PRINT " LIST OF
SUGGESTIONS"
9010 INPUT CODE$: IF CODE$ = CD
$ THEN  INPUT DES$: INPUT P$
: INPUT SO$: VTAB V: HTAB 1:
 PRINT DES$;: HTAB 30 -  LEN
(P$): PRINT P$;: HTAB 40 -  LEN
(SO$): PRINT SO$:V = V + 1
9030 IF V = 19 THEN V = 5: VTAB
 23: HTAB 1: PRINT "PRESS ANY
 KEY FOR MORE": GET A$: PRINT

9040 GOTO 9010
9300 GOSUB 12020: GOSUB 12030: GOSUB
 12020: RETURN
```

```
9400  PRINT  CHR$ (4);"CLOSE"
9410  VTAB 23: HTAB 5: PRINT "TH
   AT'S ALL! PRESS ANY KEY. . .
   ";: GET A$: POKE 216,0: GOSUB
    12110: GOTO 100
9500  PRINT C$: HOME : REM  PRI
   NT DUMMY CHARACTER BEFORE DO
   S COMMAND
9510  PRINT  CHR$ (4);"OPEN"F$
9520  PRINT  CHR$ (4);"READ"F$
9530  RETURN
9995 :
9996  REM  *******************
   *
9997  REM    TREE DISPLAY
9998  REM  *******************
   *
9999 :
10000  FOR L = 1 TO 17: READ S,N
   : VTAB L: HTAB S: FOR H = 1 TO
   N: PRINT "*";: NEXT H: NEXT
   L: FOR L = 18 TO 19: READ S,
   N: VTAB L: HTAB S: FOR H = 1
    TO N: INVERSE : PRINT " ";:
    NORMAL : NEXT H: NEXT L
10010  DATA  10,1,9,3,8,5,6,9,7,
   7,6,9,4,13,6,9,5,11,3,15,5,1
   2,4,14,2,18,4 ,14,3,16,2,18,
   1,20,9,3,8,5
10020  FOR N = 1 TO 22: READ V,H
   : VTAB V: HTAB H: INVERSE : PRINT
   " ";: NORMAL : NEXT N
10030  DATA  1,10,3,8,4,12,5,8,
   6,11,7,6,7,15,8,12,9,8,10,5,
   10,14,11,10,12 ,4,12,16,13,9
   ,14,5,14,14,15,10,16,3,16,16
   ,17,6,17,19
10040  VTAB 20: HTAB 1: GOSUB 12
   020: POKE 32,20: POKE 33,19
10050  VTAB 5: HTAB 1: PRINT "
    GIFT SELECTION": PRINT "
      HELPER": PRINT : PRINT "
     FOR READERS OF": PRINT : PRINT
   "    II COMPUTING": PRINT : PRINT
   "      MAGAZINE"
10060  VTAB 3: HTAB 3: FOR N = 1
    TO 16: INVERSE : PRINT " ";
   : NEXT N: NORMAL : FOR V = 3
    TO 14: VTAB V: HTAB 2: INVERSE
   : PRINT " ";: HTAB 19: PRINT
   " ";: NORMAL : NEXT V: VTAB

   14: HTAB 3: FOR N = 1 TO 16:
    INVERSE : PRINT " ";: NEXT
   N: NORMAL
10070  GOSUB 12130: GOSUB 12140:
    RETURN
11995 :
11996  REM  *******************
   *
11997  REM  MISC SUBROUTINES
11998  REM  *******************
   *
11999 :
12000  VTAB V: HTAB 1: RETURN
12020  FOR N = 1 TO 40: INVERSE
   : PRINT " ";: NORMAL : NEXT
   N: RETURN
12030  FOR L = 2 TO 20: VTAB L: HTAB
   1: INVERSE : PRINT " ";: HTAB
   40: PRINT " ";: NORMAL : NEXT
   L: RETURN
12100  POKE 32,3: POKE 33,35: POKE
   34,5: POKE 35,21: RETURN
12110  POKE 32,0: POKE 33,40: POKE
   34,0: POKE 35,23: RETURN
12120  GOSUB 12130: VTAB 23: HTAB
   1: PRINT "PRESS NUMBER OF CH
   OICE ";: GET C$
12125  IF  VAL (C$) < 1 OR  VAL
   (C$) > CC THEN  GOTO 12120
12127  RETURN
12130  POKE 32,0: POKE 33,40: POKE
   34,22: POKE 35,23: RETURN
12140  VTAB 23: HTAB 5: PRINT "P
   RESS ANY KEY TO CONTINUE . .
   .";: GET C$: PRINT : IF C$ =
    CHR$ (27) THEN  POP : TEXT
   : END
12145  RETURN
12150  POKE 32,8: POKE 33,30: RETURN
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
GV	10	SI	4020	DB	7240
RH	15	CR	4030	DP	7242
JZ	20	CG	4997	BE	7250
SS	25	II	4998	CR	7252
CG	40	CG	4999	RN	7260
ZS	50	XN	5000	RQ	7262
NA	100	LI	5010	GV	7270
RQ	110	VW	5020	IW	7300
KH	130	YA	5030	LI	7310
ML	140	CG	5997	ES	7320
SJ	150	VC	5998	HR	7330
RR	970	CG	5999	AY	7340
UA	980	BQ	6000	CV	7342
CG	995	LI	6010	XJ	7350
JM	996	AV	6020	QC	7352
VJ	997	YA	6030	GV	7360
JM	998	CG	6997	ZQ	7370
CG	999	VC	6998	DW	7372
IK	1000	CG	6999	XL	7374
LI	1010	YC	7000	GV	7380
EK	1020	LI	7010	MY	7400
GM	1050	IN	7020	LI	7410
CG	1997	YI	7030	FH	7420
VC	1998	DS	7100	QS	7430
CG	1999	LI	7110	XZ	7500
QF	2000	GL	7120	LI	7510
LI	2010	YC	7130	KB	7520
GY	2020	KS	7140	PA	7530
GM	2050	TT	7142	MZ	7540
CG	2997	LY	7150	TT	7542
II	2998	QC	7152	CA	7550
CG	2999	AU	7160	SM	7552
WK	3000	LH	7162	OQ	7560
LI	3010	GV	7170	RT	7562
RT	3020	CG	7197	GV	7570
GM	3050	II	7198	RJ	7600
CG	3997	CG	7199	LI	7610
VC	3998	YU	7200	OB	7620
CG	3999	LI	7210	QS	7630
IF	4000	JS	7220	CD	7700
LI	4010	CI	7230	LI	7710

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YP	7720	MQ	9010	GV	9530
NN	7730	GQ	9030	CG	9995
DH	7900	HH	9040	TY	9996
CG	7995	PD	9300	WB	9997
II	7996	VM	9400	TY	9998
FW	7997	PX	9410	CG	9999
II	7998	SU	9500	IW	10000
CG	7999	PV	9510	XF	10010
RT	9000	HE	9520	WB	10020

EY	10030	II	11998	RG	12120
CC	10040	CG	11999	HL	12125
GC	10050	JC	12000	GV	12127
LC	10060	IG	12020	LA	12130
OU	10070	KW	12030	HQ	12140
CG	11995	BD	12100	GV	12145
II	11996	XD	12110	DW	12150
FF	11997				

Total checksum = 23440114

MOTION ANALYSIS PART I

Article on page 16

```
10  REM  * KINESIOLOGY PART 1
20  REM  * BY DAVID EMPEY
30  REM  * (C) 1985 ANTIC PUBLIS
    HING INC.
40  REM  * II COMPUTING  VOL.1 N
    O.2
50  REM
60  ONERR  GOTO 5000
70  IF  PEEK (104) <  > 96 THEN
     POKE 103,24576 -  INT (2457
    6 / 256) * 256: POKE 104, INT
    (24576 / 256): POKE 24575,0
80  REM  PRINT CHR$(4);"RUN KIN
    .PART2": REM  DOS 3.3 USERS
    ONLY
90  REM PROTECT HI-RES PAGES
100  DIM PT$(34)
110  FOR I = 0 TO 19: READ PT$(I
    ): NEXT
120  DATA (TOP OF HEAD),(LEFT SH
    OULDER),(RIGHT SHOULDER),(BE
    TWEEN SHOULDERS-COMPUTED),(L
    EFT ELBOW),(RIGHT ELBOW),(LE
    FT WRIST),(RIGHT WRIST),(LEF
    T FINGERTIPS),(RIGHT FINGERT
    IPS)
130  DATA (LEFT HIP),(RIGHT HIP)
    ,(BETWEEN HIPS-COMPUTED),(TO
    P OF PELVIS-COMPUTED),(LEFT
    KNEE),(RIGHT KNEE),(LEFT ANK
    LE),(RIGHT ANKLE),(LEFT TOES
    ),(RIGHT TOES)
140 SF = 1
150  REM  DEFAULT VALUE FOR SCAL
    E FACTOR
160  DIM X%(35),Y%(35)
170  REM  TEMP TABLE OF POINTS F
    OR A SINGLE FRAME
180 FPS = 16: REM DEFAULT VALUE
     FOR FRAMES PER SECOND
190  DIM X(20),Y(20),XO%(20),YO%
    (20)
200  HOME : PRINT "USE THE KEYBO
    ARD INSTEAD"
210  INPUT "OF KOALA FOR INPUT?
    (Y OR N)";A$: IF  LEFT$ (A$,
    1) = "Y" THEN MODE = 1
220  PRINT  CHR$ (4);"CHAIN KIN.
    PART2": REM  PRODOS USERS ON
    LY
230  REM  * IF USING DOS 3.3 DEL
    ETE LINE # 220
240  REM  * AND REMOVE THE REM S
    TATEMENT FROM LINE# 230
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
FV	10	SB	90	PV	170
LG	20	UQ	100	OT	180
JZ	30	OX	110	KY	190
MT	40	FX	120	UU	200
GW	50	YA	130	IV	210
BI	60	OD	140	PC	220
JN	70	IJ	150	AY	230
ZE	80	VB	160	QY	240

Total checksum = 2604961

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.

MOTION ANALYSIS PART II

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LISTING 1

```
10   REM  * KINESIOLOGY PART 2
20   REM  * BY DAVID EMPEY
30   REM  * (C) 1985 ANTIC PUBLIS
     HING INC.
40   REM  * II COMPUTING  VOL 1.
     NO.2
45   REM
50   REM  * SAVE THIS FILE AS "KI
     N.PART2"
60   ONERR  GOTO 490
70   REM  MENU
80   HOME : PRINT : PRINT "
          MENU"
90   PRINT : PRINT " (1)  CREATE
     NEW DATA FILE"
100   PRINT : PRINT " (2)  APPEND
     DATA TO EXISTING FILE"
110   PRINT : PRINT " (3)  SET #
     OF FRAMES PER SECOND"
120   PRINT : PRINT " (4)  SET SC
     ALE"
130   PRINT : PRINT " (5)  INPUT
     NEW DATA POINTS"
140   PRINT : PRINT " (6)  EDIT A
     FRAME"
150   PRINT : PRINT " (7)  ANIMAT
     E STICK FIGURE"
160   PRINT : PRINT " (8)  TRACE
     PATH OF A POINT"
170   PRINT : PRINT " (9)  VELOCI
     TY PLOT OF A POINT"
180   PRINT : PRINT " (0)  QUIT"
190   PRINT : PRINT "      PICK 0
     -9 ";: GET A$
200   IF  VAL (A$) = 0 THEN 2910
210   IF  VAL (A$) < 1 OR  VAL (A
     $) > 9 THEN 80
220   ON  INT ( VAL (A$)) GOSUB 2
     50,370,580,620,960,1580,1730
     ,2240,2510
230   GOTO 80
240   REM *  CREATE DATA FILE  *
250   HOME
260   PRINT : PRINT "INPUT FILENA
     ME OR ": PRINT "TYPE 'C' FOR
     CATALOG": INPUT ":";FL$: IF
     FL$ = "C" THEN FL$ = "": GOSUB
     2170: GOTO 260
270   IF FL$ = "" THEN  RETURN
280   IF  LEFT$ (FL$,1) < "A" OR
     LEFT$ (FL$,1) > "Z" THEN  PRINT
     : PRINT "FILENAMES MUST BEGI
     N WITH A LETTER": GOTO 260
290   PRINT : PRINT "DATA WILL BE
     SAVED UNDER THE NAME '";FL$
     ;"'"
300   PRINT  CHR$ (4);"OPEN ";FL$
     ;",L280"
310   PRINT  CHR$ (4);"WRITE ";FL
     $;",R0"
320   PRINT 0;",";20
330  NF% = 0:NP% = 20
340   PRINT  CHR$ (4);"CLOSE"FL$
350   RETURN
360   REM * APPEND DATA TO FILE*
370   HOME
380   PRINT : PRINT "APPENDING DA
     TA TO A FILE"
390   PRINT : PRINT "HIT <RETURN>
     KEY TO RETURN TO MAIN MENU"
400   PRINT : PRINT "INPUT FILENA
     ME OR ": PRINT "TYPE 'C' FOR
     CATALOG": INPUT ":";A$: IF
     A$ = "C" THEN A$ = "": GOSUB
     2170: GOTO 400
410   IF A$ = "" THEN  RETURN
420  FL$ = A$
430   PRINT : PRINT "DATA WILL BE
     READ FROM AND APPENDED TO":
     PRINT "THE FILE '";FL$;"'."
440   PRINT  CHR$ (4);"OPEN ";FL$
     ;",L280"
450   PRINT  CHR$ (4);"READ ";FL$
     ;",R0"
460   INPUT NF%,NP%
470   PRINT  CHR$ (4);"CLOSE"
480   RETURN
490  B0% =  PEEK (222):B1% =  PEEK
     (218) +  PEEK (219) * 256
500   PRINT : PRINT "ERROR # "B0%
     " IN LINE # "B1%
510   IF B0% = 5 THEN  PRINT : PRINT
     "THAT FILE APPARENTLY HAS NO
     DATA"
520   IF B0% = 2 THEN  PRINT : PRINT
     "FILE PROBABLY EMPTY"
530   IF B0% = 12 THEN  PRINT : PRINT
     "NO BUFFERS AVAILABLE"
540   IF B0% = 13 THEN  PRINT : PRINT
     "FILE TYPE MISMATCH"
550   IF B0% = 255 THEN  PRINT : PRINT
     "CONTROL BREAK"
560   PRINT : PRINT "HIT A KEY TO
     RETURN TO MENU": GET A$: TEXT
     : HOME : PRINT  CHR$ (4);"CL
     OSE ": GOTO 80
570   REM * SET # FRAMES/SEC    *
580   HOME : PRINT : PRINT "CURRE
     NT NUMBER OF FRAMES PER SECO
     ND =": PRINT FPS
590   PRINT : PRINT "INPUT NEW NU
     MBER OF FRAMES PER SECOND": INPUT
     ":";A$:FPS =  INT ( VAL (A$)
     ): IF FPS <  = 0 THEN 590
600   RETURN
610   REM *    SET SCALE        *
620   IF MODE = 1 THEN 800
630   HOME : PRINT : PRINT "ENTER
     TWO POINTS ON THE KOALA PAD
```

continued on next page

```
 BY": PRINT "TOUCHING A POIN
 T AND PRESSING BUTTON": PRINT
 "ZERO (0), THE LEFT HAND BUT
 TON.": PRINT : PRINT "THEN E
 NTER THE DISTANCE BETWEEN TH
 E TWO": PRINT "POINTS, IN AN
 Y UNITS."
640  PRINT : PRINT "TO RETURN TO
 THE MAIN MENU, PRESS <ESC>"

650 X% =  PDL (0) - 13:Y% =  PDL
 (1) - 13:B0% =  PEEK ( - 162
 87):B1% =  PEEK ( - 16384)
660  IF B1% > 127 THEN  POKE  -
 16368,0: IF  PEEK ( - 16384)
 = 27 THEN  RETURN
670  IF B0% < 128 THEN 650
680  PRINT : PRINT "COORDINATES
 OF FIRST POINT ARE": PRINT "
 :";X%;",";Y%
690  PRINT : PRINT "DO YOU ACCEP
 T THESE COORDINATES?": INPUT
 ":";A$: IF  LEFT$ (A$,1) = "
 N" THEN 650
700  IF  LEFT$ (A$,1) <  > "Y" THEN
 690
710  PRINT : PRINT "ENTER THE SE
 COND POINT"
720 X1% =  PDL (0) - 13:Y1% =  PDL
 (1) - 13:B0% =  PEEK ( - 162
 87):B1% =  PEEK ( - 16384)
730  IF B1% > 127 THEN  POKE  -
 16368,0: IF  PEEK ( - 16384)
 = 27 THEN  RETURN
740  IF B0% < 128 THEN 720
750  PRINT : PRINT "COORDINATES
 OF SECOND POINT ARE": PRINT
 ":";X1%",";Y1%
760  PRINT : PRINT "DO YOU ACCEP
 T THESE COORDINATES?": INPUT
 ":";A$: IF  LEFT$ (A$,1) = "
 N" THEN 720
770  IF LEFT$ (A$,1) <  > "Y" THEN
 760
780  IF X% = X1% AND Y% = Y1% THEN
 PRINT : PRINT "YOU MUST SEL
 ECT TWO DIFFERENT POINTS!": GOTO
 650
790  GOTO 910
800  HOME : PRINT : PRINT "ENTER
 TWO POINT BY TYPING IN THE
 X,Y": PRINT "COORDINATES SEP
 ARATED BY A COMMA AND ": PRINT
 "EITHER A Y TO ACCEPT OR N T
 O REJECT THEM": PRINT "THEN
 ENTER THE DISTANCE BETWEEN T
 HE TWO POINTS"
810  PRINT : PRINT "HIT ANY KEY
 TO INPUT POINTS OR": PRINT "
 PRESS <ESC> TO GO RETURN TO
 MAIN MENU": GET A$: IF A$ =
 CHR$ (27) THEN  POKE 49168,
 0: RETURN
820  INPUT X%,Y%
830  IF X% > 279 OR X% < 1 THEN
 PRINT "INVALID COORDINATES.
 ..TRY AGAIN": GOTO 820
840  IF Y% > 191 OR Y% < 1 THEN
 PRINT "INVALID COORDINATES.
 ..TRY AGAIN": GOTO 820
850  PRINT "ACCEPT THESE COORDIN
 ATES": GET A$: IF A$ = "N" THEN
 POKE 49168,0: GOTO 820
860  INPUT X1%,Y1%
870  IF X1% > 279 OR X1% < 1 THEN
 PRINT "INVALID COORDINATES.
 ..TRY AGAIN": GOTO 860
880  IF Y1% > 191 OR Y1% < 1 THEN
 PRINT "INVALID COORDINATES.
 ..TRY AGAIN": GOTO 860
890  PRINT "ACCEPT THESE COORDIN
 ATES?": GET A$: IF A$ = "N" THEN

 POKE 49168,0: GOTO 8960
900  IF X% = X1% AND Y% = Y1% THEN
 PRINT : PRINT "YOU MUST SEL
 ECT TWO DIFFERENT POINTS!": GOTO
 820
910  PRINT : PRINT "ENTER THE DI
 STANCE BETWEEN THE TWO": PRINT
 "POINTS"
920  INPUT ":";A$: IF  VAL (A$) <
 = 0 THEN 800
930 SF =  VAL (A$) / ( SQR ((X1%
 - X%) ^ 2 + (Y1% - Y%) ^ 2)
 )
940  RETURN
950  REM *   INPUT POINTS    *
960  HOME : IF NF% AND MODE = 1 THEN
 1080
970  HOME : IF NF% THEN 1090:
980  IF FL$ >  < "" THEN 1010
990  IF FL$ = "" THEN  PRINT : PRINT
 "YOU HAVE NOT SELECTED A FIL
 E IN WHICH": PRINT "TO SAVE
 THE DATA.  PLEASE USE OPTION
 S": PRINT "(1) OR (2) TO DO
 SO BEFORE ENTERING": PRINT "
 DATA"
1000  PRINT "HIT A KEY TO GO ON"
 : GET A$: POKE 49168,0: RETURN

1010  PRINT : PRINT "HIT THE <RE
 TURN> KEY TO RETURN TO THE":
 PRINT "MAIN MENU"
1020  PRINT : PRINT "HOW MANY PO
 INTS WILL BE INPUT IN EACH":
 PRINT "FRAME?";: INPUT " ";
 A$
1030  IF A$ = "" THEN  RETURN
1040  IF  VAL (A$) < 20 OR  VAL
 (A$) > 35 THEN  PRINT "ENTER
 A NUMBER BETWEEN 20 AND 35"
 : GOTO 1020
1050 NP% =  VAL (A$)
1060  PRINT : PRINT "THE DATA YO
 U INPUT WILL BE SAVED AS YOU
 ": PRINT "ENTER IT."
1070  PRINT : PRINT "THE DATA WI
 LL BE SAVED UNDER THE NAME":
 PRINT "'";FL$;"'"
1080  IF MODE THEN  PRINT : PRINT
 "ENTER THE X,Y COORDINATES S
 EPARATED BY ": PRINT "A COMM
 A THEN HIT Y TO ENTER THE PO
 INT": PRINT "OR HIT N TO IF
 THE POINT IS INVALID": GOTO
 1100
1090  PRINT : PRINT "TOUCH THE P
 AD AT THE INDICATED POINT": PRINT
 "THEN HIT BUTTON 0 (ON THE L
```

```
EFT)": PRINT "TO ENTER THE P
   OINT, OR BUTTON 1 TO": PRINT
   "INDICATE THAT THE POINT IS
   NOT VALID"
1100  PRINT : PRINT "HIT THE <ES
   C> TO RETURN TO THE MAIN": PRINT
   "MENU, ANY OTHER KEY TO ENTE
   R POINTS.": GET A$: IF A$ =
    CHR$ (27) THEN  POKE 49168,
   0: RETURN
1110  IF MODE THEN 1200
1120  PRINT
1130  FOR I = 1 TO NP%: PRINT "P
   OINT #";I;" ";PT$(I - 1)
1140  IF I = 4 OR I = 13 OR I =
   14 THEN  GOTO 1460
1150 X% =  PDL (0):Y% =  PDL (1)
   :B0% =  PEEK ( - 16287):B1% =
   PEEK ( - 16286): IF B1% > 1
   27 THEN X% = X%(I - 1):Y% =
   Y%(I - 1): GOTO 1180
1160  IF B0% < 128 THEN 1150
1170 X% = X% - 13:Y% = Y% - 13
1180  PRINT "COORDINATES OF THAT
   POINT ARE:": PRINT X%;",";Y
   %
1190  GOTO 1310
1200  PRINT : FOR I = 1 TO NP%
1210  PRINT "POINT#";I;" ";PT$(I
   - 1)
1220  IF I = 4 OR I = 13 OR I =
   14 THEN 1460
1230  INPUT X%,Y%
1240  IF X% > 279 OR X% < 0 THEN
   PRINT "INVALID COORDINATES.
   ..TRY AGAIN": GOTO 1210
1250  IF Y% > 191 OR Y% < 0 THEN
   PRINT "INVALID COORDINATES.
   ..TRY AGAIN": GOTO 1210
1260  PRINT "ACCEPT THESE COORDI
   NATES"
1270  GET A$: IF A$ = "N" THEN  POKE
   49168,0: GOTO 1210
1280  IF A$ <  > "Y" THEN  POKE
   48168,0: PRINT "...Y OR N ":
   GOTO 1260
1290  POKE 49168,0: PRINT "COORD
   INATES OF THAT POINT ARE:": PRINT
   X%;",";Y%
1300  REM

  PAUSE


1310  FOR J = 1 TO 500: NEXT J
1320 X%(I) = X%:Y%(I) = Y%
1330  NEXT
1340  PRINT "DO YOU WISH TO CHAN
   GE ANYTHING?": GET A$
1350  IF A$ = "Y" THEN  POKE 491
   68,0: GOTO 1100
1360  IF A$ <  > "N" THEN  POKE
   49168,0: GOTO 1340
1365  IF E = 1 THEN 1650
1370 NF% = NF% + 1
1380  PRINT  CHR$ (4);"OPEN ";FL
   $;",L280"
1390  PRINT  CHR$ (4);"WRITE ";F
   L$;",R";NF%
1400  FOR I = 1 TO NP%: PRINT X%
   (I);",";Y%(I): NEXT
1410  PRINT  CHR$ (4);"WRITE ";F
   L$;",R0": PRINT NF%;",";NP%:
   PRINT  CHR$ (4);"CLOSE"
1420  PRINT : PRINT "HIT <ESC> K
   EY TO RETURN TO MAIN MENU.":
   PRINT "HIT ANY OTHER KEY TO
   ENTER MORE POINTS": GET A$
1430  IF  ASC (A$) = 27 THEN  POKE
   49168,0: RETURN
1440  GOTO 1110
1450  REM  * COMPUTE POINTS 4,13
   , AND 14 *
1460  IF I <  > 4 THEN 1500
1470 X% = (X%(2) + X%(3)) / 2 +
   0.5
1480 Y% = (Y%(2) + Y%(3)) / 2 +
   0.5
1490  GOTO 1320
1500  IF I <  > 13 THEN 1540
1510 X% = (X%(11) + X%(12)) / 2 +
   0.5
1520 Y% = (Y%(11) + Y%(12)) / 2 +
   0.5
1530  GOTO 1320
1540 X% = X%(13) + 0.2 * (X%(4) -
   X%(13)) + 0.5
1550 Y% = Y%(13) + 0.2 * (Y%(4) -
   Y%(13)) + 0.5

1560  GOTO 1320
1570  RETURN
1580  HOME
1590  PRINT "FRAMES WILL BE EDIT
   ED FROM THE FILE:"
1600  IF FL$ = "" THEN  PRINT "<
   NO CURRENT FILE>": GOTO 1620

1610  PRINT "'";FL$;"'."
1620  PRINT "INPUT A NEW FILE NA
   ME, OR HIT <RETURN>": PRINT
   "TO ACCEPT THIS FILE NAME.":
   GOSUB 400
1630  IF FL$ = "" THEN  PRINT "Y
   OU MUST SELECT A FILE TO EDI
   T FROM": PRINT : GOSUB 400: GOTO
   1630
1640  INPUT "FRAME #?";NF%:E = 1
   : GOSUB 960
1650  PRINT  CHR$ (4);"OPEN ";FL
   $;",L280"
1660  PRINT  CHR$ (4);"WRITE ";F
   L$;",R";NF%
1670  FOR I = 1 TO NP%: PRINT X%
   (I);",";Y%(I): NEXT
1675  PRINT  CHR$ (4);"READ ";FL
   $;",R";0: INPUT NF%
1680  PRINT  CHR$ (4);"CLOSE"
1690 E = 0: PRINT "EDIT ANOTHER
   FRAME? Y OR N"
1700  GET A$: IF A$ = "Y" THEN 1
   640
1705  GOTO 80
1710  REM *    ANIMATE THE     *
1720  REM *    STICK FIGURE    *
1730  HOME :F = 0
1740  PRINT "FOR THE STICK FIGUR
   E ANIMATION, DATA": PRINT "W
   ILL BE READ FROM THE FILE"
1750  IF FL$ = "" THEN  PRINT "<
   NO CURRENT FILE>": GOTO 1770
```

continued on next page

```
1760  PRINT "'";FL$;"'."
1770  PRINT "INPUT A NEW FILE NA
    ME, OR HIT <RETURN>": PRINT
    "TO ACCEPT THIS FILE NAME.":
     GOSUB 400
1780  IF FL$ = "" THEN  PRINT "Y
    OU MUST SELECT A FILE FROM W
    HICH TO": PRINT "READ DATA":
     PRINT : GOSUB 400: GOTO 178
    0
1790  PRINT " HIT 'F' TO SEE FRA
    ME NUMBERS OR ANY": PRINT "O
    R ANY OTHER KEY FOR ANIMATIO
    N ONLY": GET A$:F = 0: IF A$
     = "F" THEN F = 1
1800  HGR : HGR2
1810  FOR J = 1 TO NF%
1820  IF F = 1 AND J = 1 THEN  TEXT
    : PRINT "HIT ANY KEY TO BEGI
    N"
1830  IF F = 1 THEN 1860
1840  IF  PEEK (230) = 64 THEN  POKE
    230,32: POKE  - 16299,0: GOTO
    1870
1850  POKE 230,64: POKE  - 16300
    ,0
1860  IF F = 1 THEN  GET A$: HOME
    : POKE 230,32: POKE  - 16303
    ,0: POKE  - 16300,0: PRINT "
    FRAME# ="J: PRINT "PRESS ANY
     KEY TO VIEW FRAME": GET A$:
     POKE  - 16304,0: POKE  - 16
    302,0: HCOLOR= 0: GOSUB 1980

1870  FOR I = 1 TO 20:X(I) = XO%
    (I):Y(I) = YO%(I): NEXT
1880  HCOLOR= 0: GOSUB 1980
1890  PRINT  CHR$ (4);"OPEN ";FL
    $;",L280": PRINT  CHR$ (4);"
    READ ";FL$;",R";J
1900  FOR I = 1 TO 20:XO%(I) = X
    %(I):YO%(I) = Y%(I): INPUT X
    %(I),Y%(I): NEXT
1910  PRINT  CHR$ (4);"CLOSE"
1920  FOR I = 1 TO 20:X(I) = X%(
    I):Y(I) = Y%(I): NEXT
1930  HCOLOR= 3: GOSUB 1980
1940  NEXT
1950  IF  PEEK (230) = 64 THEN  POKE
    230,32: POKE  - 16299,0: GOTO
    1970
1960  POKE 230,64: POKE  - 16300
    ,0
1970  GET A$: POKE 49168,0: TEXT
    : RETURN
1980  IF Y(1) < 191 AND Y(4) < 1
    91 THEN  HPLOT X(1),Y(1) TO
    X(4),Y(4)
1990  IF Y(3) < 191 AND Y(2) < 1
    91 THEN  HPLOT X(3),Y(3) TO

    X(2),Y(2)
2000  IF Y(2) < 191 AND Y(5) < 1
    91 THEN  HPLOT X(2),Y(2) TO
    X(5),Y(5)
2010  IF Y(5) < 191 AND Y(7) < 1
    91 THEN  HPLOT X(5),Y(5) TO
    X(7),Y(7)
2020  IF Y(7) < 191 AND Y(9) < 1
    91 THEN  HPLOT X(7),Y(7) TO
    X(9),Y(9)
```

```
2030  IF Y(3) < 191 AND Y(6) < 1
    91 THEN  HPLOT X(3),Y(3) TO
    X(6),Y(6)
2040  IF Y(6) < 191 AND Y(8) < 1
    91 THEN  HPLOT X(6),Y(6) TO
    X(8),Y(8)
2050  IF Y(8) < 191 AND Y(10) <
    191 THEN  HPLOT X(8),Y(8) TO
    X(10),Y(10)
2060  IF Y(4) < 191 AND Y(14) <
    191 THEN  HPLOT X(4),Y(4) TO
    X(14),Y(14)
2070  IF Y(14) < 191 AND Y(11) <
    191 THEN  HPLOT X(14),Y(14) TO
    X(11),Y(11)
2080  IF Y(11) < 191 AND Y(15) <
    191 THEN  HPLOT X(11),Y(11) TO
    X(15),Y(15)
2090  IF Y(15) < 191 AND Y(17) <
    191 THEN  HPLOT X(15),Y(15) TO
    X(17),Y(17)
2100  IF Y(17) < 191 AND Y(19) <
    191 THEN  HPLOT X(17),Y(17) TO
    X(19),Y(19)
2110  IF Y(14) < 191 AND Y(12) <
    191 THEN  HPLOT X(14),Y(14) TO
    X(12),Y(12)
2120  IF Y(12) < 191 AND Y(16) <
    191 THEN  HPLOT X(12),Y(12) TO
    X(16),Y(16)
2130  IF Y(16) < 191 AND Y(18) <
    191 THEN  HPLOT X(16),Y(16) TO
    X(18),Y(18)
2140  IF Y(18) < 191 AND Y(20) <
    191 THEN  HPLOT X(18),Y(18) TO
    X(20),Y(20)
2150  IF Y(11) < 191 AND Y(12) <
    191 THEN  HPLOT X(11),Y(11) TO
    X(12),Y(12)
2160  RETURN
2170  REM   * CATALOG *
2180 S = 6:D = 1: PRINT "DEFAULT
     IS: SLOT="S", DRIVE="D: PRINT
    "CHANGE DEFAULT? (Y OR N)": GET
    A$: IF A$ = "N" THEN 2210
2190  INPUT "SLOT=";S: IF S < 4 OR
    S > 7 THEN  PRINT "INVALID S
    LOT #": GOTO 2190
2200  INPUT "DRIVE=";D: IF D < 1
     OR D > 2 THEN  PRINT "INVAL
    ID DRIVE #": GOTO 2200
2210  PRINT  CHR$ (4);"CATALOG,S
    "S",D"D: RETURN
2220  REM *  TRACE THE PATH   *
2230  REM *    OF A POINT     *
2240  HOME
2250  PRINT "FOR THE TRACE OF TH
    E POINT, DATA": PRINT "WILL
    BE READ FROM THE FILE"
2260  IF FL$ = "" THEN  PRINT "<
    NO CURRENT FILE>": GOTO 2280

2270  PRINT "'";FL$;"'."
2280  PRINT "INPUT A NEW FILE NA
    ME, OR HIT <RETURN>": PRINT
    "TO ACCEPT THIS FILE NAME.":
     GOSUB 400
2290  IF FL$ = "" THEN  PRINT "Y
    OU MUST SELECT A FILE FROM W
    HICH TO": PRINT "READ DATA":
```

```
    GOSUB 4020: GOTO 2290
2300  PRINT : PRINT "THERE ARE "
   ;NP%;" POINTS PER FRAME:"
2310  FOR I = 0 TO 19: PRINT "("
   ;I + 1;")   ";PT$(I): NEXT
2320  PRINT "AND ";NP% - 20;" AD
   DITIONAL POINTS"
2330  PRINT "ENTER THE NUMBER OF
    THE POINT YOU WISH": PRINT
   "TO TRACE";
2340  INPUT ":";A$
2350  IF  VAL (A$) < 1 OR  VAL (
   A$) > NP% THEN 2340
2360 P1 =  VAL (A$)
2370  PRINT "TRACING POINT #"P1;
   " ";PT$(P1 - 1): PRINT "IN T
   HE FILE '"FL$"'"
2380  HGR2 : HCOLOR= 3
2390  HPLOT 0,191 TO 0,0 TO 279,
   0 TO 279,191
2400 XO% = 0:YO% = 0
2410  FOR I = 1 TO NF%

2420 CF = I:P = P1: GOSUB 3040
2430  IF Y% < 192 AND I = 1 THEN
   HPLOT X%,Y%: GOTO 2450
2440  IF Y% < 192 THEN  HPLOT XO
   %,YO% TO X%,Y%
2450 XO% = X%:YO% = Y%: NEXT
2460  GET A$: POKE 49168,0: TEXT

2470  RETURN
2480  PRINT : PRINT "HIT A KEY T
   O RETURN TO THE MENU": GET A
   $
2490  REM * VELOCITY PLOT OF  *
2500  REM *      A POINT      *
2510  HOME
2520  PRINT "FOR THE VELOCITY PL
   OT, DATA WILL BE": PRINT "RE
   AD FROM THE FILE"
2530  IF FL$ = "" THEN  PRINT "<
   NO CURRENT FILE>": GOTO 2550

2540  PRINT "'";FL$;"'."
2550  PRINT "INPUT A NEW FILE NA
   ME, OR HIT <RETURN>": PRINT
   "TO ACCEPT THIS FILE NAME.":
    GOSUB 400
2560  IF FL$ = "" THEN  PRINT "Y
   OU MUST SELECT A FILE FROM W
   HICH TO": PRINT "READ DATA":
    GOSUB 400: GOTO 2560
2570 NS% = NF% / FPS
2580  IF NS% = 0 THEN  PRINT : PRINT
    "YOU HAVE LESS THAT A SECOND
    'S WORTH OF": PRINT "DATA. E
    NTER MORE DATA OR RESET THE"
    : PRINT "NUMBER OF FRAMES PE
    R SECOND IN ORDER TO": PRINT
    "GET A VELOCITY PLOT": PRINT
    "HIT ANY KEY": GET A$: POKE
    49168,0
2590  IF NS% = 0 THEN  RETURN
2600  PRINT : PRINT "THERE ARE "
    ;NP%;" POINTS PER FRAME:"
2610  FOR I = 0 TO 19: PRINT "("
    ;I + 1;")   ";PT$(I): NEXT
2620  PRINT "AND ";NP% - 20;" AD
   DITIONAL POINTS"
2630  PRINT "ENTER THE NUMBER OF
    THE POINT YOU WISH": PRINT
   "TO TRACE";
2640  INPUT ":";A$
2650  IF  VAL (A$) < 1 OR  VAL (
   A$) > NP% THEN 2640
2660 P1 =  VAL (A$)
2670  PRINT : PRINT "PLOT THE VE
   LOCITY OF POINT ";P1: PRINT
   "RELATIVE TO WHICH POINT?"
2680  INPUT ":";A$
2690  IF  VAL (A$) < 1 OR  VAL (
   A$) > NP% - 1 THEN 2680
2700 P2 =  VAL (A$)
2710  PRINT : PRINT "DO YOU WISH
    A TABLE OR A GRAPH OF": PRINT
   "VELOCITY? ": PRINT "     (1
   ) TABLE": PRINT "     (2)
   GRAPH"
2720  INPUT "      ?";A$: IF A$ >
    < "2" AND A$ >  < "1" THEN
   2710
2730  IF A$ = "2" THEN 2800
2740  HOME : SPEED= 200: PRINT "
   SPEED OF "P1" RELATIVE TO "P
   2: PRINT : PRINT "TIME"; TAB(
   20);"SPEED"
2750 FM =  INT (FPS / 2) + 1
2760  GOSUB 2940
2770  PRINT FM / FPS; TAB( 20);D
   P
2780 FM = FM + 1: IF FM +  INT (
   FPS / 2) <  = NF% THEN 2760
2790  RETURN
2800 IN = NF% / 280
2810  IF IN = 1 THEN NI = 1: GOTO
   2840
2820  IF IN > 1 THEN IN =  INT (
   IN + 1):NI = 1
2830  IF IN < 1 THEN NI =  INT (
   1 / IN):IN = 1
2840  HGR2 : HCOLOR= 3: HPLOT 0,
   0 TO 0,191 TO 279,191
2850 FM =  INT (FPS / 2) + 1
2860  GOSUB 2940
2870  IF DP > 191 THEN 2890
2880  HPLOT NI * FM,191 - DP
2890 FM = FM + IN: IF FM +  INT
   (FPS / 2) <  = NF% THEN 2860

2900  GET A$: POKE 49168,0: TEXT
   : RETURN
2910  END
2920  REM  *  CALCULATE SPEED  *
2930  REM  FM IS THE CURRENT
    FRAME; THAT IS, THE FRAME
   AT WHICH WE WISH TO KNOW THE
    SPEED OF POINT P1 RELATIVE
   TO P2
2940 CF = FM -  INT (FPS / 2):P =
   P1: GOSUB 3040:X0% = X%:Y0% =
   Y%
2950 P = P2: GOSUB 3040:X1% = X%
   :Y1% = Y%
2960 CF = FM +  INT (FPS / 2): GOSUB
   3040:X3% = X%:Y3% = Y%
2970 P = P1: GOSUB 3040:X2% = X%
   :Y2% = Y%
2980 D1 = X0% - X1%:D2 = X2% - X
   3%:DX = (D2 - D1) / (2 *  INT
   (FPS / 2))
```

continued on next page

```
2990 D1 = Y0% - Y1%:D2 = Y2% - Y
     3%:DY = (D2 - D1) / (2 *  INT
     (FPS / 2))
3000 DP =  SQR (DX * DX + DY * D
     Y)
3010 DP = DP * SF
3020  RETURN
3030  REM * INPUT VARIABLES: *
3040  PRINT  CHR$ (4);"OPEN ";FL
     $;",L280"
3050  PRINT  CHR$ (4);"READ ";FL
     $;",R";CF
3060  FOR QQ = 1 TO P: INPUT X%,
     Y%: NEXT
3070  PRINT  CHR$ (4);"CLOSE"
3080  RETURN
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
IZ	10	GG	460	IT	920
IQ	20	VM	470	XC	930
JZ	30	GV	480	GV	940
CI	40	RO	490	LS	950
GW	45	VV	500	HN	960
MJ	50	PH	510	JS	970
RN	60	HW	520	BQ	980
LL	70	PM	530	JW	990
GR	80	XC	540	RX	1000
UY	90	CD	550	ET	1010
SC	100	PG	560	TV	1020
BG	110	BL	570	NL	1030
WS	120	XU	580	GD	1040
AD	130	SI	590	LM	1050
KZ	140	GV	600	HO	1060
IL	150	QK	610	TF	1070
GO	160	RC	620	AT	1080
AU	170	AO	630	HK	1090
RM	180	JN	640	BV	1100
GZ	190	NC	650	YI	1110
XW	200	WO	660	HE	1120
BN	210	EJ	670	AG	1130
ZD	220	DS	680	EV	1140
QL	230	MO	690	YU	1150
VO	240	PP	700	BB	1160
FV	250	JX	710	QA	1170
WP	260	WQ	720	TV	1180
WY	270	WO	730	HA	1190
VI	280	DM	740	YY	1200
CM	290	OC	750	DC	1210
HT	300	HV	760	VU	1220
CX	310	OI	770	WO	1230
JC	320	FX	780	BL	1240
PA	330	YA	790	ZZ	1250
VE	340	AQ	800	XB	1260
GV	350	EC	810	IV	1270
EA	360	WO	820	ZD	1280
FV	370	TN	830	CX	1290
VJ	380	SB	840	LA	1300
IH	390	AE	850	MQ	1310
CO	400	YU	860	RA	1320
NL	410	VN	870	FA	1330
NN	420	TV	880	CN	1340
AB	430	SF	890	UK	1350
BB	440	DM	900	JF	1360
JU	450	SE	910	JZ	1365

IH	1370	RT	1930	FV	2510
HT	1380	FA	1940	FM	2520
PA	1390	NG	1950	XF	2530
UR	1400	LN	1960	KU	2540
KD	1410	NO	1970	GH	2550
OG	1420	PO	1980	WW	2560
IM	1430	NI	1990	FJ	2570
GU	1440	UX	2000	BI	2580
DE	1450	HS	2010	EG	2590
GB	1460	SK	2020	RK	2600
IF	1470	AG	2030	BY	2610
IW	1480	NB	2040	YG	2620
HE	1490	NV	2050	SH	2630
HY	1500	SX	2060	DR	2640
UN	1510	XT	2070	UD	2650
VF	1520	FK	2080	HC	2660
HE	1530	WO	2090	DL	2670
NY	1540	IW	2100	DR	2680
PP	1550	BM	2110	FE	2690
HE	1560	LO	2120	HE	2700
GV	1570	CS	2130	ZF	2710
FV	1580	HI	2140	PS	2720
OQ	1590	UF	2150	IR	2730
TL	1600	GV	2160	RX	2740
KU	1610	EC	2170	VR	2750
GH	1620	IX	2180	IL	2760
RF	1630	DO	2190	YH	2770
SU	1640	RE	2200	VK	2780
HT	1650	IJ	2210	GV	2790
PA	1660	CX	2220	SS	2800
UR	1670	VO	2230	SK	2810
HU	1675	FV	2240	QG	2820
VM	1680	HG	2250	QI	2830
ZI	1690	XI	2260	PJ	2840
VI	1700	KU	2270	VR	2850
QL	1705	GH	2280	IL	2860
WB	1710	KN	2290	AE	2870
RW	1720	RK	2300	SI	2880
HP	1730	BY	2310	NU	2890
YG	1740	YG	2320	NO	2900
BA	1750	SH	2330	EY	2910
KU	1760	DR	2340	UT	2920
GH	1770	RS	2350	MR	2930
XO	1780	HC	2360	EP	2940
CR	1790	AS	2370	MI	2950
AR	1800	IS	2380	YA	2960
XO	1810	AA	2390	NL	2970
OA	1820	VT	2400	XK	2980
KX	1830	XM	2410	AC	2990
MA	1840	GK	2420	ZA	3000
LN	1850	GD	2430	TD	3010
OU	1860	QZ	2440	GV	3020
JJ	1870	TP	2450	GA	3030
RN	1880	BE	2460	HT	3040
GC	1890	GV	2470	TF	3050
YQ	1900	SM	2480	XH	3060
VM	1910	CR	2490	VM	3070
EG	1920	MY	2500	GV	3080

Total checksum = 21425745

MARBLE MANIA

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```
10  REM  * MARBLE MANIA
20  REM  * BY BILL MARQUARDT
30  REM  * (C) 1985 ANTIC PUBLIS
    HING INC.
40  REM  * II COMPUTING VOL.1 NO
    .2
50  REM
60  REM  SET SHAPE TABLE POINTER

70  POKE 233,3: POKE 232,0
80  REM  INSTALL SHAPE TABLE
90  FOR I = 1 TO 101: READ A: POKE
    767 + I,A: NEXT
100  HOME
110  HTAB 14: VTAB 11: FLASH : PRINT
    " MARBLE MANIA ": NORMAL
120  VTAB 15: PRINT "OBJECT OF T
    HIS PUZZLE IS TO JUMP ONE": PRINT
    "MARBLE OVER ANOTHER, REMOVI
    NG IT FROM"
130  PRINT "THE BOARD UNTIL ONLY
     ONE MARBLE": PRINT "REMAINS
    , AND IT IS IN THE CENTER HO
    LE."
140  PRINT "IF YOU GET STUCK, HI
    T <ESC> TO START"
150  HTAB 18: PRINT "OVER.": PRINT

160  PRINT "PRESS ANY KEY TO BEG
    IN PLAY ... ";: GET A$: POKE
    49168,0
170  REM  ENTER HI-RES GRAPHICS
180  HOME : HGR : HCOLOR= 3: SCALE=
    1: ROT= 0
190 MV = 0
200  FOR X = 115 TO 151 STEP 18
210  FOR Y = 29 TO 119 STEP 15
220  DRAW 3 AT X,Y
230  DRAW 1 AT X,Y: NEXT : NEXT

240  FOR X = 79 TO 187 STEP 18
250  FOR Y = 59 TO 89 STEP 15
260  DRAW 3 AT X,Y
270  DRAW 1 AT X,Y: NEXT : NEXT

280  XDRAW 1 AT 133,74
290  REM
300  REM    ********************
310  REM    *   MAIN PROGRAM   *
320  REM    ********************
330  REM
340  GOSUB 950
350 X = 133:Y = 74
360 X1 = X:Y1 = Y: POKE 49168,0:
     REM  CLEAR KEYBOARD STROBE
370  GOSUB 1590
380  DRAW 2 AT X - 11,Y - 2
390 IM = 0:OK = 0
400  HTAB 3: VTAB 23: GET K$
410  IF MV = 0 AND K$ = "A" THEN
    1730
420  IF K$ =  CHR$ (27) THEN  GOTO
    180
430  FOR I = 1 TO 5: IF K$ =  MID$
    ("IJKM ",I,1) THEN I = 5: NEXT
    I: GOTO 450
440 NEXT I: GOTO 390
450  IF K$ = "I" THEN  GOSUB 138
    0:Y1 = Y - 15 * OK
460  IF K$ = "M" THEN  GOSUB 140
    0:Y1 = Y + 15 * OK
470  IF K$ = "J" THEN  GOSUB 142
    0:X1 = X - 18 * OK
480  IF K$ = "K" THEN  GOSUB 144
    0:X1 = X + 18 * OK
490  IF K$ = " " THEN  POKE 234,
    0: DRAW 1 AT X,Y: IF  PEEK (
    234) = 0 THEN IM = 1
500  IF IM THEN  XDRAW 1 AT X,Y:
     GOSUB 1110: GOTO 390
510  IF K$ = " " THEN 560
520  XDRAW 2 AT X - 11,Y - 2
530  DRAW 2 AT X1 - 11,Y1 - 2
540 X = X1:Y = Y1
550  GOTO 390
560  HOME :X2 = X:Y2 = Y
570  XDRAW 2 AT X - 11,Y - 2: GOSUB
    950
580  POKE 49168,0: REM  CLEAR KE
    YBOARD STROBE
590  DRAW 1 AT X,Y
600  VTAB 23: HTAB 3: FLASH : PRINT
    " ": NORMAL
610  VTAB 23: HTAB 10
620  PRINT "WHICH WAY TO JUMP?"
630  IF  PEEK (49152) < 128 THEN
     XDRAW 1 AT X,Y: GOTO 590
640 K$ =  CHR$ ( PEEK (49152) -
    128)
650  IF K$ =  CHR$ (27) THEN 180
660  FOR I = 1 TO 4: IF K$ =  MID$
    ("IJKM",I,1) THEN I = 4: NEXT
    : GOTO 680
670  NEXT : GOTO 580
680  IF K$ = "I" THEN Y1 = Y - 3
    0:U = 1: GOSUB 850: GOTO 730

690  IF K$ = "M" THEN Y1 = Y + 3
    0:D = 1: GOSUB 850: GOTO 730

700  IF K$ = "J" THEN X1 = X - 3
    6:L = 1: GOSUB 850: GOTO 730

710  IF K$ = "K" THEN X1 = X + 3
    6:R = 1: GOSUB 850: GOTO 730

720  GOTO 570
730  IF  NOT IM THEN MV = MV + 1

740  IF IM THEN IM = 0: GOTO 770

750  DRAW 1 AT X1,Y1
760  IF MV = 31 AND X1 = 133 AND
    Y1 = 74 THEN 1670
```

continued on next page

```
770 U = 0:D = 0:L = 0:R = 0
780  GOTO 360
790  REM
800  REM  ***************
810  REM  * SUBROUTINES *
820  REM  ***************
830  REM
840  REM    *** JUMPING MARBLE H
    ANDLER ***
850  GOSUB 1180: POKE 234,0: IF
     NOT IM THEN  GOSUB 1010
860  POKE 234,0: IF  NOT IM THEN
     GOSUB 1280
870  IF IM THEN  GOSUB 1110: RETURN
880  XDRAW 1 AT X,Y
890  IF U THEN  XDRAW 1 AT X,Y -
     15
900  IF D THEN  XDRAW 1 AT X,Y +
     15
910  IF L THEN  XDRAW 1 AT X - 1
     8,Y
920  IF R THEN  XDRAW 1 AT X + 1
     8,Y
930  RETURN
940  REM    *** KEYBOARD IMAGE **
    *
950  VTAB 22
960  PRINT "  I"
970  PRINT " J K"
980  PRINT "  M";
990  RETURN
1000  REM    *** CHECK FOR OCCUPI
    ED SPACE ***
1010 X2 = X:Y2 = Y
1020  IF U THEN Y2 = Y - 30
1030  IF D THEN Y2 = Y + 30
1040  IF L THEN X2 = X - 36
1050  IF R THEN X2 = X + 36
1060  DRAW 1 AT X2,Y2
1070  IF  PEEK (234) <  > 0 THEN
     IM = 1
1080  IF  NOT IM THEN  XDRAW 1 AT
     X2,Y2
1090  RETURN
1100  REM    *** ILLEGAL MOVE IND
    ICATOR ***
1110  HTAB 26: VTAB 21: FLASH : PRINT
     " ILLEGAL "
1120  HTAB 26: VTAB 22: PRINT "
     MOVE    "
1130  HTAB 26: VTAB 23: PRINT "
    ATTEMPT ";: NORMAL
1140  FOR P = 1 TO 1500: NEXT
1150  GOSUB 1590
1160  RETURN
1170  REM    *** CHECK FOR ILLEGA
    L MOVE ***
1180  IF U AND Y < 59 THEN IM =
     1
1190  IF U AND Y < 89 AND ((X <
     115) OR (X > 151)) THEN IM =
     1
1200  IF D AND Y > 89 THEN IM =
     1
1210  IF D AND Y > 59 AND ((X <
     115) OR (X > 151)) THEN IM =
     1
1220  IF L AND X < 115 THEN IM =
     1
1230  IF L AND X < 151 AND ((Y <
     59) OR (Y > 89)) THEN IM = 1
1240  IF R AND X > 151 THEN IM =
     1
1250  IF R AND X > 115 AND ((Y <
     59) OR (Y > 89)) THEN IM = 1
1260  RETURN
1270  REM    *** CHECK FOR UNOCCU
    PIED SPACE ***
1280 X2 = X:Y2 = Y
1290  IF U THEN Y2 = Y - 15
1300  IF D THEN Y2 = Y + 15
1310  IF L THEN X2 = X - 18
1320  IF R THEN X2 = X + 18
1330  DRAW 1 AT X2,Y2
1340  IF  PEEK (234) = 0 THEN IM
     = 1
1350  IF IM THEN  XDRAW 1 AT X2,
    Y2
1360  RETURN
1370  REM    *** CHECK FOR CURSOR
     BOUNDARY ***
1380  IF (Y > 59) OR ((Y > 29) AND
    ((X > 97) AND (X < 169))) THEN
    OK = 1
1390  RETURN
1400  IF (Y < 89) OR ((Y < 119) AND
    ((X > 97) AND (X < 169))) THEN
    OK = 1
1410  RETURN
1420  IF (X > 115) OR ((X > 79) AND
    ((Y > 44) AND (Y < 104))) THEN
    OK = 1
1430  RETURN
1440  IF (X < 151) OR ((X < 187)
     AND ((Y > 44) AND (Y < 104)
    )) THEN OK = 1
1450  RETURN
1460  REM    *** DATA FOR SHAPE T
    ABLE ***
1470  DATA  3,0,8,0,49,0,77,0
1480  DATA  219,219,83,45,45
1490  DATA  109,26,63,63,63,255,
    10,45,45
1500  DATA  45,45,173,59,63,63,6
    3,63,87
1510  DATA  45,45,45,45,173,27,6
    3,63,63
1520  DATA  191,9,45,45,173,219,
    219,3,0
1530  DATA  45,45,45,45,45,45,45
    ,53,54,54
1540  DATA  54,54,54,62,63,63,63
    ,63,63,63
1550  DATA  63,36,36,36,36,36,36
    ,0
1560  DATA  24,63,63,247,30,30,3
    0
1570  DATA   54,21,21,21,21,45,4
    5,101
1580  DATA   12,12,12,36,7,56,56
    ,56,0
1590  REM  *** PRINT DIRECTIONS
    ***
1600  VTAB 21
1610  HTAB 8: PRINT "USE THE I-J
    -K-M KEYS TO POSITION"
1620  HTAB 8: PRINT "THE SQUARE
    AROUND THE MARBLE YOU"
1630  HTAB 8: PRINT "WANT TO MOV
```

```
 E & HIT ";: INVERSE
1640  PRINT " SPACE ";: NORMAL :
  PRINT "."
1650  HTAB 8: PRINT "(PRESS <ESC
 > TO RE-START)";
1660  RETURN
1670  REM   *** PUZZLE HAS BEEN
  SOLVED ***
1680  HOME : HTAB 7: VTAB 21: FLASH
 : PRINT "PUZZLE HAS BEEN SOL
 VED!": NORMAL
1690  VTAB 23: PRINT "CONGRATULA
 TIONS, GENIUS. PRESS ANY KEY
 "
1700  HTAB 14: PRINT "TO REPLAY.
..";
1710  POKE 49168,0: GET A$
1720  POKE 49168,0: GOTO 180
1730  REM   *** AUTO PLAY ROUTINE
  ***
1740  HOME : FOR I = 1 TO 4
1750  PRINT "
                              "
1760  NEXT
1770  REM  * GET RID OF UNWANTED
  DATA *
1780  RESTORE : FOR I = 1 TO 101
 : READ A: NEXT
1790  HTAB 8: VTAB 21
1800  PRINT "HERE'S ONE WAY TO D
 O IT"
1810  FOR I = 1 TO 31
1820  READ SX,SY,XX,YY,NX,NY
1830  FOR J = 1 TO 10: XDRAW 1 AT
  SX,SY
1840  FOR K = 1 TO 10: NEXT K
1850  DRAW 1 AT SX,SY: NEXT J
1860  XDRAW 1 AT SX,SY
1870  DRAW 1 AT XX,YY
1880  XDRAW 1 AT NX,NY
1890  FOR DL = 1 TO 500: NEXT DL

1900  NEXT I
1910  HTAB 8: VTAB 21: PRINT "OK
 AY, NOW IT'S YOUR TURN!"
1920  FOR DL = 1 TO 1500: NEXT D
 L
1930 U = 0:D = 0:L = 0:R = 0: GOTO
  190
1940  REM   *** CO-ORDINATES ***
1950  DATA  169,74,133,74,151,74

1960  DATA  151,104,151,74,151,8
 9
1970  DATA  187,89,151,89,169,89

1980  DATA  151,74,151,104,151,8
 9
1990  DATA  151,119,151,89,151,1
 04
2000  DATA  133,89,169,89,151,89

2010  DATA  187,59,187,89,187,74

2020  DATA  187,89,151,89,169,89

2030  DATA  97,89,133,89,115,89
2040  DATA  115,119,115,89,115,1
 04
2050  DATA  133,89,97,89,115,89
2060  DATA  79,89,115,89,97,89
2070  DATA  133,119,133,89,133,1
 04
2080  DATA  79,59,79,89,79,74
2090  DATA  133,89,97,89,115,89
2100  DATA  79,89,115,89,97,89
2110  DATA  97,59,97,89,97,74
2120  DATA  97,89,133,89,115,89
2130  DATA  133,59,97,59,115,59
2140  DATA  115,29,115,59,115,44

2150  DATA  151,29,115,29,133,29

2160  DATA  115,74,115,44,115,59

2170  DATA  115,29,115,59,115,44

2180  DATA  151,44,115,44,133,44
2190  DATA  151,89,115,89,133,89

2200  DATA  115,44,115,74,115,59

2210  DATA  115,89,115,59,115,74

2220  DATA  97,59,133,59,115,59
2230  DATA  133,74,133,44,133,59

2240  DATA  169,59,133,59,151,59

2250  DATA  133,44,133,74,133,59
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
LV	10	HE	320	ME	630
JZ	20	GW	330	UR	640
JZ	30	YR	340	GU	650
SS	40	BC	350	OL	660
GW	50	CW	360	HF	670
AY	60	IR	370	IP	680
LW	70	RU	380	XX	690
MJ	80	OI	390	FP	700
UG	90	UP	400	JG	710
FV	100	VM	410	YK	720
KX	110	HA	420	NT	730
SE	120	IM	430	AK	740
UV	130	BN	440	AJ	750
CJ	140	WK	450	RP	760
YA	150	TI	460	RR	770
PF	160	VL	470	YD	780
SB	170	VW	480	GW	790
EF	180	JF	490	RQ	800
OZ	190	JN	500	ID	810
RZ	200	JK	510	RQ	820
IT	210	RV	520	GW	830
WX	220	FW	530	DA	840
SL	230	ND	540	LK	850
MH	240	YM	550	VZ	860
IG	250	GK	560	EO	870
WX	260	PK	570	WU	880
SL	270	GQ	580	SE	890
ED	280	WT	590	QM	900
GW	290	ZQ	600	KR	910
HE	300	ZZ	610	KV	920
IR	310	QZ	620	GV	930

continued on next page

BH	940	GV	1160	UU	1380	PT	1600	QN	1820	BQ	2040
PW	950	KY	1170	GV	1390	IX	1610	PV	1830	QO	2050
OH	960	GD	1180	FN	1400	MJ	1620	NI	1840	FU	2060
FM	970	VY	1190	GV	1410	IJ	1630	PE	1850	BK	2070
EY	980	FD	1200	ZN	1420	VJ	1640	RV	1860	RM	2080
GV	990	TO	1210	GV	1430	AI	1650	UE	1870	QO	2090
VI	1000	PS	1220	KX	1440	GV	1660	PS	1880	FU	2100
CT	1010	CJ	1230	GV	1450	CT	1670	LH	1890	RG	2110
VB	1020	PQ	1240	LQ	1460	AL	1680	KQ	1900	NN	2120
TL	1030	CP	1250	UP	1470	XJ	1690	VF	1910	LY	2130
WG	1040	GV	1260	US	1480	OO	1700	QZ	1920	SJ	2140
WK	1050	RA	1270	DK	1490	EL	1710	RR	1930	TD	2150
AW	1060	CT	1280	NM	1500	XP	1720	NX	1940	TU	2160
ZA	1070	WH	1290	EN	1510	AH	1730	UC	1950	SJ	2170
KL	1080	UR	1300	VE	1520	ZR	1740	NJ	1960	NS	2180
GV	1090	WI	1310	QC	1530	CS	1750	KT	1970	CV	2190
XA	1100	WM	1320	QA	1540	FA	1760	LJ	1980	UP	2200
VA	1110	AW	1330	ZI	1550	RN	1770	BE	1990	WK	2210
CH	1120	GA	1340	ZB	1560	AR	1780	GU	2000	JA	2220
KC	1130	GJ	1350	DK	1570	KQ	1790	IW	2010	TO	2230
GB	1140	GV	1360	PI	1580	TN	1800	KT	2020	ZN	2240
IR	1150	EF	1370	SH	1590	AF	1810	NN	2030	UJ	2250

Total checksum = 4231161

SIMPLE SUBSTITUTION CIPHERS

Article on page 45

```
1  REM  * SUBSTITUTION CIPHERS
2  REM  * BY CAXTON FOSTER
3  REM  * (C) 1985 ANTIC PUBLISH
   ING INC.
4  REM  * II COMPUTING VOL.1 NO.
   2
10  DIM C%(256),A%(26)
20  HOME
30  FOR I = 1 TO 256
40 C%(I) = 32
50  NEXT I
60  PRINT "ENTER YOUR TEXT. END
   IT WITH A '/'."
70  PRINT "PRESS CAP LOCK TO GET
   ALL CAPS"
80  PRINT
90 N = 0
100  GET R$
110 X =  ASC (R$)
115  IF X = 8 AND N = 0 THEN 100
120  IF X = 8 THEN  PRINT " " CHR$
   (8) CHR$ (8);:C%(N) = 32:N =
   N - 1: GOTO 100
130  IF R$ = "/" THEN 180
140 N = N + 1
150 C%(N) = X
160  PRINT R$;
170  IF N < 256 THEN 100
180  FOR I = 1 TO 26
190 A%(I) = 32
200  NEXT I
210  REM  DISPLAY CIPHER AND PLA
   IN TEXT
220  HOME
230  FOR I = 0 TO N - 1 STEP 40
240  FOR J = 1 TO 40
250  PRINT  CHR$ (C%(I + J));
260  NEXT J
270  FOR J = 1 TO 40
280 T = C%(I + J) - 64
290  IF T < 1 OR T > 26 THEN  PRINT
   CHR$ (T + 64);: GOTO 310
300  PRINT  CHR$ (A%(T));
310  NEXT J
320  PRINT
330  NEXT I
340  PRINT : PRINT
350  PRINT "CYPHERTEXT LETTER:";
360  GET C$
370  IF C$ < "A" OR C$ > "Z" THEN
   360
380  PRINT C$
390  PRINT "SHOULD BE REPLACED B
   Y:";
400  GET P$
410 C =  ASC (C$) - 64
420 A%(C) =  ASC (P$)
430  GOTO 210
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
KV	1	FV	20	DS	70
JB	2	RR	30	HE	80
JZ	3	CH	40	YO	90
SS	4	KQ	50	RU	100
NV	10	AC	60	JF	110

RK	115	FV	220	KQ	330
MY	120	PM	230	HC	340
MU	130	AG	240	VR	350
QF	140	PJ	250	QQ	360
XQ	150	KS	260	MV	370
AS	160	AG	270	QM	380
OB	170	ME	280	XK	390
BI	180	VE	290	RQ	400
CF	190	YA	300	CB	410
KQ	200	KS	310	BH	420
YA	210	HE	320	XM	430

Total checksum = 466580

MULTIPLYING BIG NUMBERS

Article on page 35

```
10  REM  * MULTIPLICATION OF BIG
     HEXADECIMAL NUMBERS
20  REM  * BY DANIEL WOLF PH.D.
30  REM  * (C) 1985 ANTIC PUBLIS
    HING INC.
40  REM  * II COMPUTING VOL.1 NO
    .2
45  GOTO 270
50 PA = 255:PG = 256:V = 0:U = 1
    :N =  - 1:TU = 31:F = 15:G =
    16
60 MU = 64 * PG:V1 = 72 * PG:V2 =
    73 * PG:V3 = 74 * PG
70  DEF  FN A(Z) = Z + 48 + 7 *
    (Z > 9)
80  RETURN
90 Q = P + 63: PRINT : PRINT ;: REM
     OUTPUT RESULT
100  FOR A = Q TO P STEP N:Z =  PEEK
     (A): REM  STRIP LEADING ZERO
     S
110  IF Z = V THEN : NEXT A
120  FOR D = A TO P STEP N:Z =  PEEK
     (D): REM  PRINT HEX ANSWER
130 Y =  INT (Z / G)
140  PRINT  CHR$ ( FN A(Y)); CHR$
     ( FN A(Z - G * Y));
150  NEXT : PRINT : RETURN
160 X = V:Y = U:ER = V: REM   IN
    PUT HEX NUMBER
170  FOR A =  LEN (C$) TO U STEP
     N: REM  CONVERT ASCII
180 H =  ASC ( MID$ (C$,A,U)): REM
     TO HEX
190 B = H - 48 - 7 * (H > 57)
200  IF B < 0 OR B > 15 THEN  PRINT
     : PRINT " USE ONLY 0-9, A-F
      !!":ER = U: RETURN : REM
     ERROR
210  POKE P, PEEK (P) + Y * B: REM
      AND PUT DIGIT INTO MEMORY
220 Y = Y + F: IF Y = TU THEN P =
     P + U:Y = U
230  NEXT : RETURN
240  PRINT : PRINT : PRINT "PRES
     S A KEY TO CONTINUE"
250  GET K$: IF K$ = "" THEN 250
260  RETURN
270  GOSUB 50
280  FOR A = 0 TO 74: REM  READ
     IN 75-BYTE ML PROGRAM
290  READ B: POKE MU + A,B: NEXT
300  HOME : PRINT : PRINT "  MUL
     TIPLY"
310  FOR A = V1 TO V1 + PA: POKE
     A,V: NEXT
320 C$ = "": PRINT : INPUT " V1
     ";C$:P = V1: GOSUB 160
330  IF ER THEN  GOSUB 240: GOTO
     300
340  FOR A = V2 TO V2 + PA: POKE
     A,V: NEXT
350  PRINT : INPUT " V2 ";C$:P =
     V2: GOSUB 160
360  IF ER THEN  GOSUB 240: GOTO
     300
370  CALL MU: PRINT : PRINT "
     V1 X V2 ="
380 P = V3: GOSUB 90: GOSUB 240
390  GOTO 300
400  DATA  120,162,1,134,255,202
410  DATA 138,157,0,74,232
420  DATA 208,250,169,0,133,254
430  DATA 166,254,189,0,72
440  DATA 37,255,240,25,160,0
450  DATA 24,189,0,74,121,0
460  DATA 73,157,0,74,232
470  DATA 200,16,243,189,0,74
480  DATA 121,0,73,157,0,74
490  DATA 230,254,16,218,6
```

continued on next page

```
500  DATA 255,240,14,162,0,24
510  DATA 62,0,73,232,16
520  DATA 250,62,0,73,144,196,88

530  DATA 96
```

TYPO II TABLE

Code	Line#	Code	Line#	Code	Line#
VI	10	JZ	30	YE	45
FX	20	SS	40	JS	60
UW	50	KR	220	PR	380
QW	70	DX	230	XL	390
GV	80	UZ	240	BO	400
UM	90	VQ	250	IP	410
VR	100	GV	260	QU	420
AX	110	QK	270	LM	430
KQ	120	FE	280	GJ	440
PV	130	SW	290	LC	450
JX	140	RL	300	BW	460
VX	150	DK	310	PN	470
MM	160	YK	320	QD	480
TA	170	TI	330	JT	490
UH	180	DX	340	GF	500
AV	190	BF	350	WH	510
EX	200	TI	360	TK	520
DP	210	HC	370	PR	530

Total checksum = 1163456

II Err is Human
continued from page 8

Lines 820 & 1080 fix a bug in the four-week averaging function. Without this fix the four-week average only works for the first matchup, and uses season totals for all others.

Lines 3880—4870 correct spacing and page ejection errors that were found to exist in the program.

Once these changes have been made to the program the new Typo II codes for these lines should read as follows:

Code Line#	Code Line#	Code Line#
JL 820	DR 3890	HH 4520
MY 1080	SD 4510	GR 4870
XZ 3880		

And the new checksum for the entire program should be:
Checksum = 14935698

Bill reports good success with the program through the fifth week. The program identified 14 games where its predictions were three or more points different from the Las Vegas line, and correctly picked the winner in 11 of these (78%). Also, we realize that most readers received their copies of II Computing late into the football season, so we are including the needed statistics for the first five weeks.

Football Prognosticator Statistics

ATLANTA FALCONS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
160	179	27	130	188	28
123	130	16	196	184	35
100	233	28	148	280	44
104	154	6	106	177	17
115	271	17	79	420	38

CHICAGO BEARS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
185	251	38	166	141	28
160	209	20	27	179	7
127	353	33	34	411	24
91	159	45	192	184	10
147	286	27	27	346	19

CLEVELAND BROWNS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
176	181	24	100	186	27
145	148	17	54	162	7
128	169	7	131	207	20
275	165	21	56	219	7
146	301	24	109	291	20

DENVER BRONCOS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
63	214	16	147	138	20
105	327	34	107	235	23
148	280	44	100	233	28
169	226	26	53	365	30
121	241	31	120	201	20

BUFFALO BILLS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
84	371	9	100	208	14
82	188	3	288	244	42
55	251	14	122	105	17
115	162	20	171	167	27
68	184	17	281	183	49

CINCINNATI BENGALS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
151	193	24	91	206	28
116	254	27	210	237	41
152	296	41	173	344	44
222	144	37	101	340	24
89	212	20	77	178	29

DALLAS COWBOYS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
98	206	44	120	249	14
102	452	21	72	128	26
131	207	20	128	169	7
156	183	17	81	133	10
106	317	30	70	403	29

DETROIT LIONS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
130	188	28	160	179	27
72	128	26	102	452	21
105	99	6	228	127	14
94	221	30	119	158	9
56	317	10	285	227	43

GREEN BAY PACKERS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
59	146	20	208	202	26
126	164	23	76	239	20
71	122	3	106	120	24
216	238	28	164	233	43
285	227	43	56	317	10

HOUSTON OILERS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
165	229	26	70	290	23
81	107	13	240	93	16
50	84	0	233	102	20
81	133	10	156	183	17
120	201	20	121	241	31

INDIANAPOLIS COLTS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
47	112	3	163	282	45
96	202	13	157	329	30
228	127	14	105	99	6
103	216	20	165	227	25
281	183	49	68	184	17

KANSAS CITY CHIEFS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
109	395	47	136	168	27
84	241	36	67	273	20
97	187	0	133	258	31
77	88	28	63	301	7
81	181	10	141	220	19

LOS ANGELES RAIDERS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
122	234	31	62	131	0
67	273	20	84	241	36
83	197	10	115	237	34
144	152	35	97	190	20
141	220	19	81	181	10

LOS ANGELES RAMS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
147	138	20	63	214	16
173	161	17	120	180	6
170	187	35	44	270	24
106	177	17	104	154	6
58	130	13	134	172	10

MIAMI DOLPHINS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
70	290	23	165	229	26
157	329	30	96	202	13
133	258	31	97	187	0
53	365	30	169	226	26
122	277	24	137	145	20

MINNESOTA VIKINGS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
86	182	28	217	282	21
79	183	31	115	234	16
34	411	24	127	353	33
171	167	27	115	162	20
134	172	10	58	130	13

NEW ENGLAND PATRIOTS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
208	202	26	59	146	20
27	179	7	160	209	20
122	105	17	55	251	14
97	190	20	144	152	35
109	291	20	146	301	24

NEW ORLEANS SAINTS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
136	168	27	109	395	47
107	235	23	105	327	34
112	226	20	114	220	13
175	179	20	150	81	17
71	146	23	107	256	21

NEW YORK GIANTS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
192	125	21	80	88	0
76	239	20	126	164	23
155	163	27	83	206	17
140	198	16	114	54	10
70	403	29	106	317	30

NEW YORK JETS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
62	131	0	122	234	31
288	244	42	82	188	3
106	120	24	71	122	3
165	227	25	103	216	20
77	178	29	89	212	20

PHILADELPHIA EAGLES

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
80	88	0	192	125	21
120	180	6	173	161	17
175	152	19	140	117	6
114	54	10	140	198	16
107	256	21	71	146	23

PITTSBURGH STEELERS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
163	282	45	47	112	3
54	162	7	145	148	17
233	102	20	50	84	0
101	340	24	222	144	37
37	145	20	122	277	24

SAN DIEGO CHARGERS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
100	208	14	84	371	9
63	494	35	196	293	49
173	344	44	152	296	41
56	219	7	275	165	21
40	305	21	108	145	26

SAN FRANCISCO 49ERS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
217	282	21	86	182	28
196	184	35	123	130	16
115	237	34	83	197	10
150	81	17	175	179	20
79	420	38	115	271	17

SEATTLE SEAHAWKS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
91	206	28	151	193	24
196	293	49	63	494	35
44	270	24	170	187	35
63	301	7	77	88	28
108	145	26	40	305	21

ST. LOUIS CARDINALS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
100	186	27	176	181	24
210	237	41	116	254	27
83	206	17	155	163	27
164	233	43	216	238	28
95	215	10	238	67	27

TAMPA BAY BUCCANEERS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
166	141	28	185	251	38
115	234	16	79	183	31
114	220	13	112	226	20
119	158	9	94	221	30
27	346	19	147	286	27

WASHINGTON REDSKINS

OFFENSE			DEFENSE		
RUSH	PASS	PTS	RUSH	PASS	PTS
120	249	14	98	206	44
240	93	16	81	107	13
140	117	6	175	152	19
192	184	10	91	159	45
238	67	27	95	215	10

The New Electronic Libraries

Academic research online

by ANN GARRISON

Ann Garrison is a free-lance writer in San Francisco. She has done research for the Fine Arts Museums of San Francisco, and uses electronic databases in her work.

If you do academic research, your computer and modem might save you many hours in the library. One minute of computer searching through "electronic libraries" can equal one hour of manual searching through card catalogues and periodical indexes. Computer searching costs money, but the time you save may be worth it.

There are now over 36 million applied science references online. There are over 28 million in pure sciences, over 9 million in social sciences and education, almost 3 million in the humanities and many, many more. Legal and business references are probably too numerous to estimate.

THE ONLINE RESEARCH PROCESS

It is important to distinguish between online databases and online services. A database is an electronic collection of information. Some databases correspond to printed reference works and have the same names *(Books in Print)*. Others correspond to printed references but have different names (the database *Social Scisearch* corresponds to the printed *Social Science Citation Index)*. In some cases, correspondence is partial and/or includes several references (the database *Enviroline* corresponds to the printed *Environmental Abstracts* and *Environment Index)*. Certain databases contain information not available in printed sources (such as *Federal Research in Progress*, a guide to current research funded by the federal government).

Databases are made available through online services (database vendors) which sell access to databases. Database producers and vendors may be the same, but vendors more often sell access to databases compiled by several producers (Dialog, a database vendor, sells access to over 200 databases, including all three mentioned above).

Want to know about the economics of hog farming? Try the database *Agricola*, produced by the National Agricultural Library, and available through Dialog, Bibliographic Retrieval Systems (BRS) and several other online services.

Want to read articles on Andy Warhol and art? Try the database *Arts and Humanities Search*, available through BRS, or the database *ARTbibliographies MODERN* available through Dialog. Or try both, available through Easynet, a "gateway" service selling access to over 600 databases from seven services including BRS and Dialog.

In either case, you call the online service, log on and search through any of its databases by subject, author's name, journal name or personal name. For certain databases, you might use specialized search techniques. For example, you can search chemistry databases by CAS registry numbers for chemicals with more than one name. Some services guide your search with menus, and others combine menus with command languages outlined in instruction manuals.

Information that appears on your screen can be temporarily retained in RAM, printed or captured to disk.

A FEW WORDS ON COST

Each online service calculates costs in its own way, but most charge by the hour for connect time. Additional charges may include one-time start-up fees, hourly telecommunications charges and charges for displaying abstracts and text online (see chart: Five Major Online Services).No additional costs appear on your telephone bill.

If costs seem overwhelming, keep in mind that many searches take only several minutes, and some services are inexpensive. My average search time is ten minutes, and the service I use most is Knowledge Index. Ten minutes on Knowledge Index costs only $4 with no additional costs after a one-time $35 start-up fee. Before choosing an online service, consider the costs and the databases offered.

FINDING OUT WHAT'S ONLINE

Consult one or two printed database directories. Look up music, philosophy, biochemistry or whatever in their subject indexes, and read the descriptions of relevant databases. The descriptions tell you which online services offer those databases, and the services will send you more information with applications. The most comprehensive directory is probably the *Directory of Online Databases,* published quarterly by Cuadra Associates in Santa Monica, California. You can study it at any major public or university library, or you can order a $95 annual subscription by calling (213) 829-9972.

TYPES OF INFORMATION ONLINE

There are two basic kinds of databases: reference and source. A *reference* database refers you to another document, organization or individual for additional information or text. Moreover, the two types of reference databases are bibliographic and referral. A *bibliographic* reference database contains citations and often abstracts of printed literature (for example *Sociological Abstracts*, available through BRS, BRS After Dark, Data-Star and Dialog).

A *referral* database refers you to organizations, individuals or nonprint media for further information (for example, *Electronic Yellow Pages,* available through Dialog).

A *source* database gives the full text and/or statistics from original sources. The three types of source

continued on next page

EXAMPLES OF ONLINE DATABASES

Most of the databases below are available through the online services BRS, BRS After Dark, Dialog, Knowledge Index and/or Easynet. Many are also available through other services. *The Reader's Guide* is available only through Wilsonline, and *Lexis,* a full text legal database, is available only through Mead Data Central.

Basic Reference
Academic American Encyclopedia
Books in Print
Facts on File World News Digest
Reader's Guide to Periodical Literature

Humanities
Historical Abstracts
MLA Bibliography (Literature and Language)
Philosopher's Index
RILM Abstracts of Music
Literature

Math, Engineering, Natural Sciences
Mathfile
Biosis Previews
CA Search (Chemistry)
Enviroline
INSPEC (Engineering)
Medline
Scisearch
SPIN (Physics)

Business
ABI Inform
Disclosure
Harvard Business Review
Business Publications Index and Abstracts

Social Sciences
ERIC (Education)
Language and Language Behavior Abstracts
PsycInfo
Social Sciences Citation Index
Sociological Abstracts

Law
Legal Resource Index
Lexis

Multidisciplinary
Dissertation Abstracts Online
Foundations
Library of Congress Machine Readable Cataloging
Magazine Index
National Newspaper Index

Government Publications
Congressional Record Abstracts
Monthly Catalogue of U.S. Government Publications

*If databases correspond to printed references but have different names, the printed references are listed. (e.g., the database Social Scisearch corresponds to the printed *Social Sciences Citation Index*). If databases partially correspond to a printed reference and/or correspond to several references, the database name is listed. (e.g., the database Enviroline corresponds to *Environmental Abstracts* and *Environment Index*).

databases are full text, numeric and textual-numeric. A *full text* database contains records of the complete text of a publication (for example, *New York Times-Online* available through Mead Data Central). A *numeric* database contains original survey data and/or statistically manipulated representations of data (for example, *BLS Consumer Price Index* available through Dialog). A textual-numeric source database has records including both text and numbers (for example *United Nations Commodity Trade Statistics*, available through I.P. Sharp).

Databases are most often bibliographic, referral, full text, numeric or textual-numeric. Many, however, are hybrid. (*Magazine Index*, for example, available through Dialog or Knowledge Index, contains citations from over 400 magazines and full text from over 85).

If abstracts or full text are available online, you can print them or save them on disk. You can order cited texts and abstracts online or check them out of your library. Ordering costs vary, and document delivery can take one to ten days.

ADVANTAGES

- speed
- databases are more up to date than printed sources
- there are more ways of locating information than in printed sources.

DISADVANTAGES

- most databases cover the literature of only the past ten years or so
- some topics do not have adequate online coverage
- costs can add up
- may take a while to get the right "keywords"

Computer searching is especially helpful when a topic is specified with several key words and would require a tedious search through subject headings and cross-references in printed indexes. (For example, I wanted to read about Peruvian President Alan Garcia's new policy of limiting Peru's debt payments to 10% of its export revenues. An Easynet search of *National Newspaper Index* for "Peru and Debt and Garcia" turned up seven articles in minutes. The database includes front to back page indexing of *The New York Times*, *The Wall Street Journal*, *The Christian Science Monitor*, *The Washington Post*, and *The Los Angeles Times* from 1970 to the present).

You should define your topic specifically before going online. A general topic can turn up too many citations. For instance, the editors of ***II Computing*** wanted to know about the use of computers in research on extrasensory perception. A Knowledge Index search for "ESP and Computers" turned up two citations with abstracts in three minutes, for a cost of $1.01. However, a Knowledge Index search for the general topic "ESP" turned up 395 citations. I would not want to pay to read through 395 citations online, even if I had enough RAM and/or disk space to capture them! Just browse through printed references first.

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The University of California in Berkeley catalogues much of its collection in *Melvyl*, its own noncommercial database. Students and faculty search from library terminals, or dial *Melvyl* without charge on home computers. New York University calls its electronic catalogue *Bobcat*, and plans to offer dial-in access within a year. However, librarians at both universities emphasize that their electronic catalogues are not complete and cannot provide an exhaustive search of library resources. Your university's reference librarian should be able to tell you what's online and how you can access it.//

DATABASE DIRECTORIES AND BOOKS ABOUT HOW TO GO ONLINE

Directories

Datapro Directory of Online Services, published by Datapro Research Corporation.

Directory of Online Databases, published by Cuadra Associates, (Santa Monica, CA) updated quarterly.

Omni Online Database Directory, by Owen Davies and Mike Edelhart, published by Macmillan (New York) and Collier Macmillan (London).

The Reston Directory of Online Databases, Your Computer's Phone Book: A Travel Guide to the World of Information That Can Be Called Up On Any Computer, by Jay Shafitz and Louise Alexander, published by Reston Publishing Co.

Books About Going Online (Equipment, Software, and Search Methods) with Some Database Listings:

Answers Online, by Barbara Newlin, published by Osborne McGraw-Hill.

Online, by Steve Lambert, published by Microsoft Press.

FIVE MAJOR ONLINE SERVICES

Name of Service	Bibliographic Retrieval System (BRS)	BRS After Dark	Easynet	Dialog	Knowledge Index
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Number of Databases	95+	58	600+	200+	26+
General Descrip./ Subject Areas	Life Sciences, Medicine/Pharmacology, Physical/Applied Sciences, Business/ Finance, Social Sciences/Humanities, Education and Reference/Multi-disciplinary	Same as BRS. However, the databases offered are at a lower rate during evening and weekend hours.	Databases available through BRS, Dialog, Pergamon/Infoline, Newsnet, Questel, SDC Information Services and VU/ Text Information.	Business/Industry/ Corporate, Chemistry, Medicine/Biosciences, Law/ Government/Intellectual Property, Science/Technology, News, Energy/ Environment/Agriculture, Education/ References, Humanities/Social Sciences and People.	A subset of Dialog databases offered at lower rates during evening hours.
Costs	$50 Start-up fee, $60 average Connect-time charges plus $8-12 for telecommunications charge and online display costs.	$75 Start-up fee, $12 monthly minimum. Time charges are database-dependent and average $15/hour.	No subscription fee, no hourly charge. Pay online with your credit card or Easynet Account Number. $8 per search (10 references), plus a $1 fee for logging on. Search should be specific because 10 more references cost another $8.	No Start-up fee. Connect-time charges are database dependent and average $75 per hour plus online display costs and a $6-$10 per hour telecommunications charge.	$35 Start-up fee—includes two free hours online. Hourly rate for all databases, $24.
Ease of Use	Command-driven and difficult to learn without training. Training classes and seminars in subject-specific search skills are offered in major cities throughout the country.	Menu-driven and easy to learn online.	Menu-Driven. No learning time necessary. If you want to try Easynet, just call 1-800-327-9638 and have your VISA, MasterCard or American Express handy.	Command-driven and difficult to learn without training, but a self-training manual is being written. One-day training sessions and subject-specific seminars are offered in major cities around the world.	Command-driven, can be learned in four hours with instructions manual.

Sneak Preview

THE WDC 65C816: CORE OF A NEW APPLE?

by JEFF HURLBURT

*Just before this article was to go to press, the editors of **II Computing** became aware of some pertinent information—the 65C816 chip may not be the one used in the new Apple upgrade after all. Motorola's 68020 is the one, according to Michael Murphy in* California Technology Stock Letter *of October 4, 1985. To quote Mr. Murphy ". . . we believe the upgrade will use the same Motorola chip that will be in the new Macintosh—the 68020—thus putting both computer lines on the same processor and creating the path to bring Apple II users into the more advanced Macintosh world. Our information is that the Western Design Center chip approach was killed by Apple over six weeks ago."*

No one at Apple is talking. We know that Western Design Center has been producing and shipping the 65C816 and third party developers (as you'll read below) are very involved in producing the board. Bill Mensch at WDC will not comment on what Apple is doing.

The advantages of this Motorola chip are: it's faster than the 65C816 (9 MHz vs. 6 MHz); and it will be used in the Macintosh upgrade, raising the opportunity for compatibility between the II and the Macintosh. The problem is that the 68020 would emulate the 6502 in software, a notoriously unsatisfactory solution, while the 65C816 is built for the job.

We think Apple will not risk the problems that the 68020 might create for the II's software base, and will use the 65C816 in its new II computers.

—**II Computing** Eds.

Since its introduction in late 1983, **Western Design Center's 65C816** microprocessor has been the focus of growing interest to Apple-watchers. Tailor-made for upgrading 6502 designs, the 65C816 features 16-bit architecture while retaining an 8-bit data bus. Even better, downward compatibility with existing software is assured via a unique "emulation" mode in which the chip behaves like a 65C02.

In its "native" (16-bit) mode, the microprocessor is an Apple II user's dream machine. Tired of cumbersome bank-switching kluges? How about 16 megabytes of directly accessible address space! Perhaps a multi-page stack, smooth interfacing with a math co-processor, 256 software selectable "zero pages," or prioritized interrupt capability is at the top of your wish list. With the 65C816 you've got it all. An operating system for this mode is on its way from Micro Magic.

Available in 2, 4, 6, and 8 MHz versions, the WDC chip is clearly a "natural" as the heart of a whole new breed of big, fast Apple II's. Thus, despite the company's protracted fling with slotless, monochrome, non-II-compatible office machines, rumors of a 65C816-based "IIx" persist. (Some things, after all, are too good not to be true!)

Though Apple refuses to admit even the existence of a IIx project in deference to IIe and IIc sales, there are several indicators that just such a product is nearing completion. As a glance at the "65C816 Products" listing will show, a number of vendors expect someone to introduce a computer built around the 65C816. A Western Design spokesman did confirm that at least three "fairly prominent" personal computer manufacturers are working on 65C816 designs, but refused to comment when asked if one of them is Apple. More to the point, a peripherals vendor reports that Apple has been experimenting with the WDC chip for some time.

The chip is a natural as the heart of a new breed of Apple II computers.

It's been six years since a significant upgrade for the II, during which escalating competition and slumping sales have taken their toll. Apple needs the IIx, maybe even more than users want it. The IIx is coming; and now is the time to explore the amazing microprocessor which makes it all possible.

To perform its wonders, the 65C816 expands the accumulator, X, Y, and stack registers to 16 bits, and adds a new "Direct" register to locate "zero page" anywhere in the lowest 64K of memory. "Program Bank" and "Data Bank" registers act as high order 8-bit extensions of the pro-

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WDC 65C816
continued from page 82

gram counter and index registers respectively. Multiplexing high order address and data signals allows the microprocessor to output a 24-bit address while retaining a convenient 40-pin footprint.

While most microprocessors, such as Intel's 8088 and Motorola's 68000 require four or five clock cycles per bus cycle, the 65C816 needs only one. In "real world" terms this means that a 4 MHz IIx will perform useful work at roughly three times the rate of an IBM PC. Faster clocking and 16-bit data buses allow AT&T's PC and Commodore's Amiga to make up much of this deficit; but compact instructions and the ability to shift in and out of emulation mode under software control more than tip the balance in favor of the 65C816-based product.

The 65C816 incorporates the entire 65C02 instruction set plus 74 new opcodes (for a total of 255). Of the new operations, the majority represent extensions of 6502 functions into the 16 megabyte address space. Others, including a co-processor software interrupt, block moves, and a host of register exchanges, pushes, and pulls, are entirely new.

The hi-res picture moving routine shown below illustrates the power of native mode coding:

```
$1F00:  18          -
$1F01:  FB
$1F02:  C2 30       -
$1F04:  A2 00 40    -    X = Source address
$1F07:  A0 00 20    -    Y = Destination address
$1F0A:  A9 00 20    -    Acc = # of bytes to move
$1F0D:  54 00 00    -    do the move in 64k block 0
$1F20:  38          -
$1F21:  FB          -    restore emulation mode
$1F22:  E2 30       -
$1F24:  60          -    RTS
```

Whereas I could easily see the picture form when using the Apple monitor's block move, the native mode transfer appeared instantaneous, as though I had done a page flip! The implications for hi-res graphics control on a 4 MHz IIx border on the awesome.

Since you can't plug the 65C816 directly into your Apple, the best way to get a handle on the new microprocessor is with a peripheral board. ComLog's 1 MHz "BASIC-816" card supplies the necessary hardware plus space for 256K RAM at $395. Checkmate Technology has a 65C816 adaptor for both the IIc and IIe ($149 and $189 respectively) but each requires the company's memory board for proper operation. For IIe and IIc owners an alternative is WDC's 65C802, a 64K-only version of the 65C816 which can replace the on-board microprocessor. Any of these approaches is a start towards preparing your Apple (and you) for the coming IIx revolution.//

Jeff Hurlburt is an Apple programmer and graduate student at the University of Houston, with special interest in education for gifted and talented children.

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Sneak Preview

Perry Mason Returns to the Screen

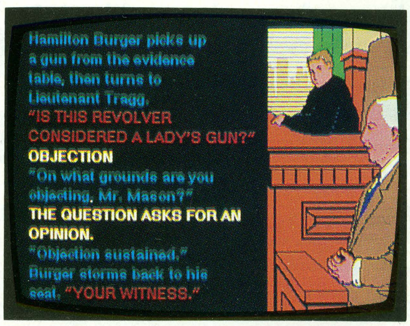
by ELIZABETH METZGER ARMSTRONG

PERRY MASON: THE CASE OF THE MANDARIN MURDER, created by Erle Stanley Gardner, Telarium Corp. and Paisano Productions, One Kendall Square, Cambridge, MA 02139, (617) 494-1200; 64K; includes two double-sided disks, $39.95.

If you're a "Perry Mason" fan and have always dreamed of stepping into your favorite criminal lawyer's shoes, you now have a chance in Telarium's new interactive adventure game, **Perry Mason: The Case of the Mandarin Murder**. As Mason, your job is to defend the unfortunate Laura Kapp, on trial for murdering her husband, famed Los Angeles restauranteur Victor Kapp. The object of the game is to convince the jury that your client is innocent and to discover the identity of the real murderer.

Perry Mason sets out to be a different kind of interactive game by simulating a real courtroom scene. As in a real criminal trial, you get to introduce evidence, cross-examine witnesses, raise objections (you must give a reason for objecting), break down witnesses, and interact with the judge and jury. Beginners can ask Della Street for tips during cross-examinations. Paul Drake is always on hand to help you dig for clues.

The game is aimed at anyone who enjoys a good murder mystery, loves strategy games, and wants to test his or her lawyering skills without having to go through law school first. Those good at deductive reasoning will do well in Perry Mason. Novice strategists might play the game again and again and never manage to save poor Laura from the gas chamber. But whether you win or lose, this is one interactive adventure



you will finish, and in just a few hours (instead of days)—a real breakthrough for this genre.

In Perry Mason, unlike many other interactive adventure games, you don't get bogged down digging for clues by moving north, south, east and west. (Many players give up as soon as they get lost, which they inevitably do.) In this game you can move automatically from scene to scene by typing "Go to (the location)." And, instead of wasting time drawing maps of mazes, you build up files of notes on Paul Drake's investigations and witnesses' testimonies, just like a real attorney. After playing the game a couple of times, you can refer to your notes and concentrate on planning your strategy for cracking the case.

The beauty of Perry Mason is that it's addictive, just like a good murder mystery, even for those who may claim "I'm not good at strategy games." For until you win your case and find out who really murdered Victor, you find yourself wanting to go back and defend your client as many times as it takes to uncover the villain. In the process, your strategy skills will improve and, if you do solve the case, you get the satisfaction of knowing you cracked a tough one and saved an innocent woman from going to the gas chamber. If one of the goals of interactive adventures is that players want to spend hours and hours lost in the story, Perry Mason comes close to that goal.

Perry Mason is engaging not only because the game uses Erle Stanley Gardner's well-known characters—besides Della Street and Paul Drake, your opponent, prosecuting attorney Hamilton Burger, plays a key role—but because the characters are complex, an unusual feature for an interactive adventure. These folks have

continued on page 90

The Advisor

by RICH MOORE

THE ADVISOR, Ultimate Media, Inc., 275 Magnolia Ave., Larkspur, CA 94939, 415-924-3644; $99.00.

The Advisor is a small expert system packaged with four small applications. It has a nice set of windows to observe and trace the progress of its "inference engine" during program execution. Although limited to only one type of variable (Boolean) and a relatively small list of rules, The Advisor does a good job of demonstrating the theory and operation of an expert system. It is not a good candidate for commercial applications, but would be an inexpensive and worthwhile educational tool.

Expert systems are tools for problems not easily solved by conventional programming techniques. They have two fundamental elements: rule lists that relate variables in IF. . .THEN structures, and an inference engine that analyzes the rules and other data to form conclusions. An inference engine typically employs backward chaining to achieve user-specified goals. It first finds a goal in the THEN. . . portion of a rule, notes the IF. . . elements in that rule, then starts tracing backwards from that point in the rule structure to determine the truth of those IF. . . statements using previous rules and additional input from the user or a database.

When it has completed its analysis in a backward chain, the inference engine proceeds forward again to reach as many conclusions as possible using its new "knowledge." This backward and forward chaining continues until the inference engine has reached its goal or exhausted the knowledge in the rule base. The order of the rules is important: to get the most from each pass of the chaining processes, the most general rules should occur near the front of the list and the most specific rules should fall at the end of the list.

For example, an adventurer might want to know if a creature is a Grue

> An inference engine employs backward chaining.

and has more than one life. "Grue" and "multiple lives" become goals within the following rule base:

IF from ZORK
THEN creature is fictional

IF creature is fictional
THEN multiple lives

IF avoids light
AND eats adventurers
AND from Zork
THEN Grue

The inference engine goes down the list to find the first THEN with "Grue" in it (third rule). It checks the last unresolved IF. . . in that rule ("from ZORK"), then chains backward to determine the truth of the assertion "from ZORK." It must stop at the top of the list and seek outside (user or database) assistance to reach a conclusion. The engine then chains forward and uses its new knowledge to conclude at the second rule (assuming positive answer to rule one) that the creature has multiple lives. Continuing forward, the engine is at the end of the list and must take queries regarding diet and avoiding light. Positive answers here result in flight, flame or filet!

The manual describes overall use of The Advisor pretty well. Operation of the inference engine is not clear, but an article from the suggested reading list helped immensely. "Inside an Expert System" from the April 1985 *Byte* magazine is a very good explanation of an inference engine. Only one of the four sample expert systems is documented; you must dump the rest to a printer for analysis. The "MYSTERY" example is trivial; "ANIMALS" is a good introduction and "FORWINES" a more advanced application. "CHEMISTRY" is the most complex example and demonstrates how you can set up technical systems.

You accomplish dictionary and rule list work with a cumbersome but effective line editor; the use of program overlays for rule input and modification could have helped here. Once you become used to it, how-

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REVIEWS

PERRY MASON RETURNS
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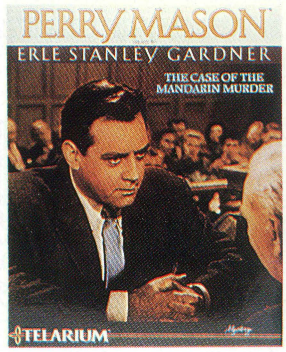

emotions, shady pasts, entangled lives and secrets they try to hide, just like real people.

The most difficult and only cumbersome element of the game is learning how to "speak" to the computer—how to ask questions correctly (you must use a specific sentence structure) and how to use the program's "vocabulary" (a list of words the program can understand). The parser (that part of the software that lets you "talk" to and interact with the characters) is inflexible to the extent that you'll find yourself frequently being told to "rephrase" sentences or that a word "is not in the vocabulary list." Fortunately, the accompanying documentation by John Bowman explains the rules clearly and entertainingly, making for a quick and understandable reference if you're stuck.

The on-screen text, created by Bowman, Seth Godin, Mitch Stein, Ruth Wick and Rob Jacoby, is engaging and witty. Players can choose to have well-crafted illustrations by artist Greg Garvey accompany the on-screen text or to play the game with text only.

True to the interactive adventure genre, once you discover the identity of the murderer, the case is closed. Hopefully, The Case of the Mandarin Murder is only the first in a series of Perry Mason mysteries from Telarium.//

Elizabeth Metzger Armstrong is a free-lance documentation writer for games and home computer software publishers and a Perry Mason fan.

THE ADVISOR
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ever, rule entry goes pretty quickly. An "offline" text editor and spelling checker was a good way for me to set up a draft version of a very simplified war-at-sea expert system with sorted lists of dictionary words and convenient block moves or insertion of rules. I had to manually enter the final draft version of 71 variables and 104 rules into The Advisor, but it was fairly well organized. Then came test and debug. It was nice to finally get the system running, though it still needs some work.

The best feature of The Advisor is the display of the operating inference engine: four windows detailing the process and excellent speed control make it easy to trace system logic and debug. Since practical commercial systems typically use thousands of rules, The Advisor's small capacity is an important drawback. It also lacks more powerful numeric and character data types and structures that would greatly increase its commercial utility, but likely drive up the cost proportionately. Nonetheless, it is still a good choice as a reasonably priced package for introductory studies of expert systems. //

Positive answers here result in flight, flame or filet.

Rich Moore is a naval flight commander and currently the computer simulations manager for the Naval War College's Computer Wargaming System in Newport, Rhode Island.

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Wishbringer

by HARVEY BERNSTEIN

WISHBRINGER, Infocom, 125 Cambridge Park Dr., Cambridge, MA 02140, (617) 492-1031; Requires 48K; $39.95.

Welcome to Festeron, a little hamlet somewhere on the coast of New England. Like most small towns in that part of the country, it looks quaint. You have the village church, movie theater and library. Naturally there is the statue in the center of the park. That's not to say that Festeron is completely behind the times. Why, there is even an arcade where you can go to play the latest video games (Leather Goddess of Phobos). The people are nice, if a bit conventional (although there have been whispers about the old woman who runs the magic shop on the outskirts of town). A real nice place to bring your kids up. Except . . .

Except that Festeron has its dark side—a mirror-image town known as Witchville where Evil rules, Magick abounds and the Elder Gods dwell. Even Mr. Crisp, the town postmaster (and your boss), is now the . . . well, the less said the better. It is in these two locales that the action takes place in **Wishbringer**, the latest in a long line of excellent adventure games from Infocom.

As the game begins, it is up to a junior postal clerk (that's you) to deliver a mysterious letter to the old woman who runs Ye Olde Magick Shoppe. Once she gets the letter, the game gets serious: you are suddenly thrust into Witchville with an important and dangerous mission—to rescue the old woman's cat, which has been kidnapped by a sorceress known only as The Evil One. Your only aid is the power of the stone known as Wishbringer, which, once you find it, will grant up to seven wishes to aid in your quest.

In many ways, Wishbringer can be seen as a successor to Sorcerer and Enchanter. Wishes take the place of spells, of course, but with a twist. You have seven wishes, and each works only if you possess the proper item. In addition, you can use each wish only once, so it is critical that you not misuse or waste one, should you need it later. However (according to Infocom), for every puzzle that can be solved with a wish, a logical solution exists, and you can finish the game without using any wishes at all. Well, if anybody has gotten past the Hellhound without using a wish, please write me care of ***II Computing*** and tell me how it's done.

Wishbringer is Infocom's second attempt at an introductory-level adventure, and as such it is considerably more successful than last year's Seastalker. Although written for novices, the prose is not in the least juvenile. Veteran adventure-game players will not be challenged, although they will enjoy the story line, wit and inside jokes (don't forget to visit the mailbox next to the white house). And there is the chance to complete the game sans wishes and with a perfect score. But most of all, Wishbringer is an excellent attempt to bring new blood into the fold—those who previously have been unable or unwilling to get the most out of Infocom's finest. If you've been curious about Infocom games before, but too timid to take the plunge, then Wishbringer is the game for you. //

Harvey Bernstein lives in San Francisco where he is employed part time as the all powerful master of space and time. He also frequently reviews adventure games.

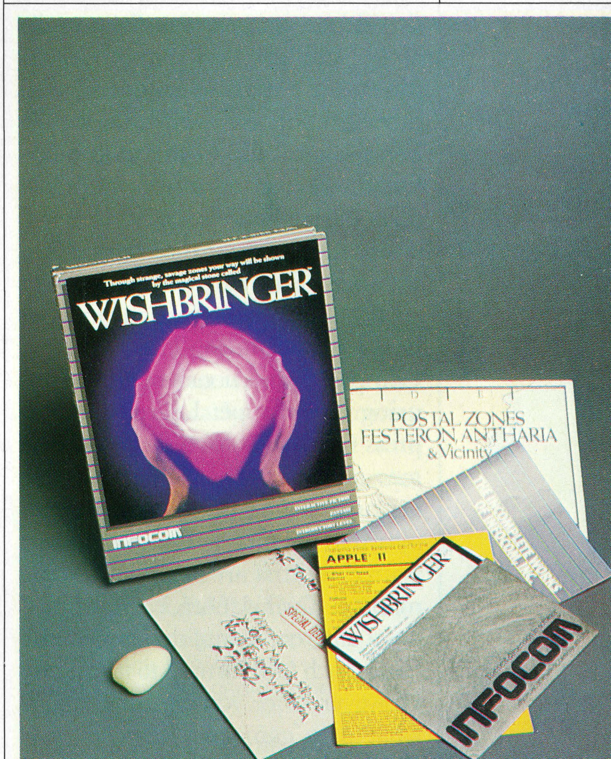


PHOTO: MARY RHOMBERG LAVERY

Muppet Learning Keys

More software to choose from

by ANITA MALNIG, Assistant Editor

The Muppet Learning Keys is a big, square board with bold letters and numbers. It's spillproof and unbreakable and has funny Muppet pictures on it.

The keyboard's biggest pluses are that the letters are in alphabetical order and both numbers and letters are large. For children learning the alphabet, the keyboard makes it simpler for them to find letters. The keyboard looks great; it's rather like using small blocks to identify numbers and letters. The software originally released for the keyboard lets children identify numbers and letters that dance, jump and make sounds.

The original developers are releasing more extensive software, and other developers are jumping on the bandwagon. However, each publisher here has a way to go to accomplish the keyboard's intent: to be an easier input device than any other. It can be, but isn't yet.

The main reason is vague instructions. For instance, The Learning Company's directions say, "If you are using the Muppet Learning Keys, press 6." That means 6 on the *computer keyboard.* The Sesame Street instructions never tell you how to return to the menu. The instructions from Sunburst are at the end of the manual. Furthermore, each package has a different way of doing the same thing, such as returning to the menu. However, once you get the hang of what to do, game play becomes easy. If you have the Muppet keyboard or are thinking about buying one, you'll want to know what software is available and if it's worthwhile.

ASTRO-GROVER, Sesame Street; published by CBS Software, 1 Fawcett Place, Greenwich CT 06836, (203) 622-2500; 48K; $19.95.

With this number program, you use the number keys to play. You also need the directional arrow keys that are on the Muppet keyboard. I found that the keys did not always respond to my touch, and in one game, it was hard to use these keys to control the on-screen action.

The premise in **Astro-Grover** is that you are in outer space (Grover's somewhere out there with you) and you must count objects called Zips, add them, subtract them and so on. When you count correctly, in the first game, for instance, the Zips blink and a solid form is revealed as the front of a building. You are building a city in outer space. It's a nice graphic but looks like a postcard of San Francisco.

The second game, "Beam That Number," was difficult for me and another adult and plain frustrating and boring for the children. You must zap the Zips with a ray of white light that comes out of some kind of space zapper. The ray broadens and narrows either by itself or when you press an arrow key. The chore is to shine the ray on as many Zips as the number shown on the space ship. Sometimes the game would freeze as I was trying to manipulate the ray of white. (It also froze in "Addition Countdown" as I was pressing keys to find out how to return to the menu.) The manual warns you that "Manipulating the Beam Keys may be hard at first."

Right on. We never got it. But the children went on to the next games—adding and subtracting the Zips. These moved faster and immediately gave you a clear idea of how to get the job done.

The manufacturer supplies an alternative to the Muppet keyboard for this game—a plastic overlay for the computer keyboard. This also has prominent numbers on it, but moves around a lot because it doesn't fit securely over the keys.

The dancing Grover who shakes his head gets laughs from kids and the incremental steps in the counting and arithmetic processes are good. The mechanics of the program aren't good enough, though.

DR. SEUSS FIX-UP THE MIX-UP PUZZLER, CBS Software, 1 Fawcett Place, Greenwich, CT 06836, (203) 622-2500; 48K; $19.95.

Fix-Up The Mix-Up Puzzler is the best example of "Why use the Muppet keyboard when this game works so well with the joystick?" Granted the children I played with were ages five through eight and not three and four, the prime ages for the keys . . . although not necessarily for the game.

Three Dr. Seuss characters appear in a box. You press ZAP to scramble the picture, and the box becomes filled with nine small boxes, each containing one third of one character. Using arrow keys you first remove the upper left hand box outside the big box and start piecing the mixed up boxes back together.

This game increases its difficulty in levels—one level has upside-down heads, torsos and legs. The children I played this with had a lot of fun with this game. The manual says this game teaches "problem solving, sequencing, object and pattern recognition, and logic and memory skills." That's a tall order, although a child might acquire some of those skills as a by-product of game play. For fun, this is a winner.

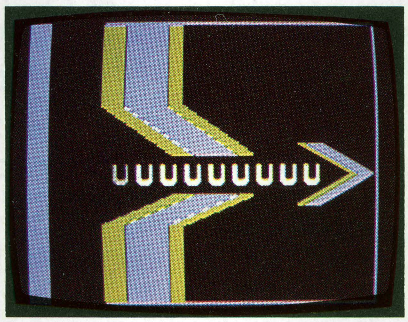
GETTING READY TO READ AND ADD, The Softcole Team; Sunburst Communication, 39 Washington Ave., Pleasantville, NY, 10570, (800) 431-1934, 48K, $59.

This program's games are all about matching: shapes, lowercase letters, uppercase letters, upper to lower, numeral to numeral and numeral to dots on a die. For all matching, you can use the GO button on the Muppet keyboard; one game lets you also use the up arrow and in others you can use the correct numeral or letter.

The games in **Getting Ready to Read and Add** are simple, to the point, graphically appealing and gratifying for the child. Entertainment is a by-product of the learning.

The school market is the primary one for this product and for many others from Sunburst, with good reason. But, parents can get the products from some retailers or directly from the publisher. If you are concerned about teaching your child the particular skills offered here, consider using this program.

Here's an example:



The letter within the arrow's point appears on the screen. The colors are primary and the music lively. A letter slides down from the left. If that letter matches the other, you press a key. For a correct match, a stream of that letter flies through the arrow accompanied by bright music.

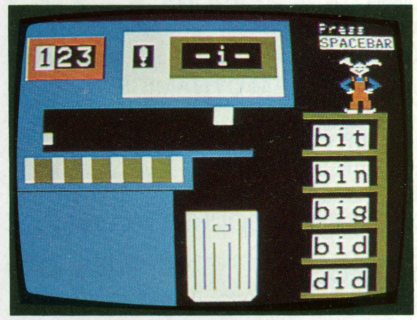
Three games use similar graphics. The other games use outer space scenes that are also effective.

You, as parent or teacher, have an option to go into the program and change letters and numbers to concentrate on problem ones—an excellent feature. With or without the Muppet keyboard, this is a solid educational program.

READER RABBIT, by Leslie Grimm, Ph.D.; The Learning Company, 545 Middlefield Rd., Menlo Park, CA 94025, (415) 328-5410; 64K; $39.95.

The four games in this package also involve matching, but **Reader Rabbit** concentrates solely on letters and words. The adult involved can alter the speed and change the letters in the words as well as the placement in the word of a particular letter being exercised.

For instance, in "The Sorter," as shown here, you must match the pattern shown.



If you see an s— — you only press GO when words that match that pattern appear, such as sap, sag, sat and so on. Not cat or pat. If you complete a series correctly, Reader Rabbit dances for you. If not, the incorrect words are highlighted and you get a chance to change them.

In "Word Train," you fill up each car on the train with a word that differs from the previous word by only one letter. For instance, follow dug and dog with a choice of den, dot or rug. If you get it right, more words appear and you continue. Eventually, the train gets full and chugs away.

Other games encourage matching and letter recognition. As with Sunburst, this program has a strong educational base. It's not a game that happens to have some skill building inherent in its game play. It's a carefully thought out way to teach fundamentals of early word learning and reading. Used at home with you, the parent, in the right context, this is a good tool. I hope teachers use it, too.//

MUPPET LEARNING KEYS
Koala Technologies Corp.
3100 Patrick Henry Drive
Santa Clara, CA 95052-8100
(408) 946-4483
Requires Apple II family,
color monitor recommended, $79.95

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- **An Interview With Charles Schwab and An Inside Look at Schwab's "Equalizer"**
- **Profile of Roger Keating, Creator of Carries At War**
- **Review of Sylvia Porter's "Personal Financial Planner"**
- **Review of Baudville's "Prince" — color printing package**
- **Poet Stephen Vincent on "Writing Programs for Children"**
- **Plus: Regular Columnists — Shapiro, Comstock, Foster, Wolf**

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If you're experienced at programming for and/or writing about the Apple II family, we'd like you to consider submitting your work to us.

Articles should be timely, lively, informative. . .
Programs in BASIC should be useful, fun.

Send for Authors Guidelines and/or send queries and submissions to:

Editorial Submissions
II Computing for Apple II Users
Antic Publishing, Inc.
524 Second St.
San Francisco, CA 94107

LOOK FORWARD TO SEEING YOUR WORK!

Product News from Apple

by ANITA MALNIG, Assistant Editor

Gleaming computers and peripherals lined the walls of a gray-toned, probably soundproof, conference room. We resisted sinking too deeply into the plush seats.

Product managers from Apple Computer were previewing for ***II Computing*** the new products Apple is offering for the holiday season. True to the company's recent pronouncement to be "market-driven," product managers Don Field and Jeff Belding told us that these products reflect what Apple users have been saying they want and need.

So, if you want to buy yourself, your family or a special friend an Apple peripheral, here are some interesting ones to choose from.

ImageWriter II

This product most dazzled ***II Computing's*** editors. It prints in color, has three speeds and helpful expandable features, and it interfaces with all Apple computers.

With the right supporting software, you can print your own holiday cards in color this year (without having to do any ribbon swapping). The ribbon has four colors, including black, which can produce seven colors. Software that will be updated to support the printer are: Sticky Bear Printer (Xerox), Dazzle Draw (Broderbund), Blazing Paddles (Baudville), SuperCalc3A (Computer Associates/Sorcim IUS) and PFS Graph (Software Publishing). Now Apple users can have colored pie charts and bar graphs and pretty pictures.

The draft quality prints at 250 characters per second (CPS), the correspondence quality at 180 CPS, and the near-letter quality at 45. Here's an example of the NLQ:

```
A nice-looking NLQ,
wouldn't you say?
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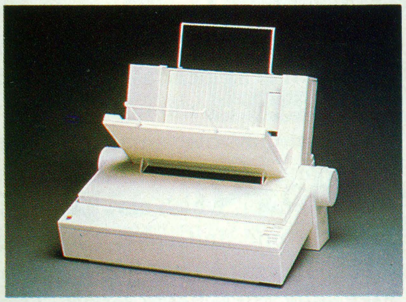
The two expandable features for the II family are terrific and, it seemed to us, clearly developed because people have real need for them.



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The first is a cut-sheet feeder. For someone writing a letter every so often, this doesn't mean much. But, if you are a secretary, sole owner of a small business, someone looking for a job or anyone who cranks out lots of letters, you know how time-consuming and frustrating it can be to hand-feed individual sheets of letterhead. **The ImageWriter II SheetFeeder**, does a beautiful job and it also accommodates envelopes. It's a pricey item (see table below), but your need may justify the cost.

The second in this expandable category is a printer buffer, called the **32K Memory Option.** The printer contains a slot to add the card for this buffer. It gives you 32K of memory—so while all those letters are printing out, you can be working on your spreadsheet.

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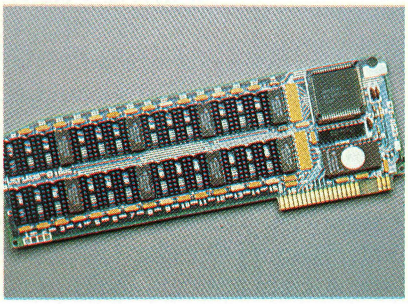
UniDisk 3.5

Long rumored, this trim, small disk drive is indeed here.The disk capacity is 800K—yes, 800. This drive will eventually render 5 1/4" drives obsolete; however, it's compatible with the 5 1/4" drive. The 3.5" disks are sturdier, the drive takes up less space, is fast—and has all that storage capacity! It's compatible with the II+ and IIe but needs a ROM upgrade for the IIc. A technician does this free of charge when you buy the drive. It plugs into the IIc

continued on next page

external drive port and is compatible with the controller card for the 5 1/4" drive in the II, II+ and IIe. You can daisy-chain the 3.5" drives. The drives can operate under ProDos and Pascal 1.3.

UniDisk is bundled with the **3 1/2" II Systems Utilities Disk and Users Manual.** Later, the UniDisk will come bundled with the Catalyst 3 program from Quark.



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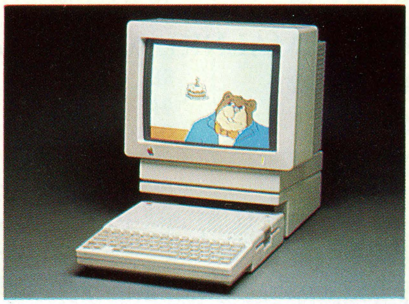
Apple II Memory Expansion Card

Still under development at the time of this writing, this also long-rumored product is probably available now. This expansion is for the II, II+ and IIe and gives you 256K of RAM—you were waiting for this, weren't you? Furthermore, the card will be expandable up to 1 megabyte. The II and II+ must already have 64K and the IIe 128K. As a Ramdisk, this can self-format when ProDos or Pascal 1.3 is booted or it can be initialized as a DOS 3.3 volume.

Apple is supporting third-party developers who've produced programs to especially enhance and make use of this extra memory. Catalyst 3 by Quark is a program selector (somewhat akin to Switcher for the Macintosh) that lets you move from one program to another very quickly. Another program is Pinpoint by Pinpoint Publishing, which works as an enhancement to AppleWorks. It has a calendar, a format to print out envelopes and make labels quickly and a calculator function; it can be set up to automatically dial phone numbers through a modem, and it can work in a typewriter mode.



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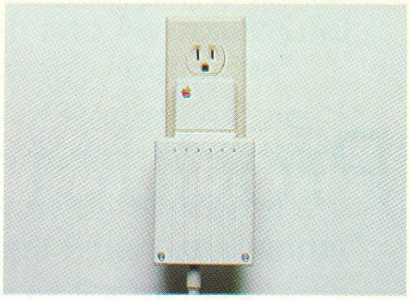
Apple ColorMonitor IIe and Apple ColorMonitor IIc

Internally the same monitor, each is designed to complement its own machine; the IIe is beige and sits atop the computer; the IIc is white, one inch narrower and rests on a specially designed stand. This composite monitor renders excellent color; it's 40-column in color and 80-column in monochrome, which on this monitor is white letters on black. Although we didn't think the text resolution is as clear as that on the monochrome IIc monitor, it is very good. Actually, black and white is a nice change from green. Unlike the RGB monitor, which also gives you monochrome and color, the color monitor doesn't require you to switch back and forth between modes. This monitor knows from the software whether to display in color or black and white. Apple is phasing out its RGB monitor because this new monitor better accomplishes the same tasks at a more reasonable cost.

Apple Personal Modem

This new, compact modem plugs directly into the wall or your power strip. It uses an RS-232C interface



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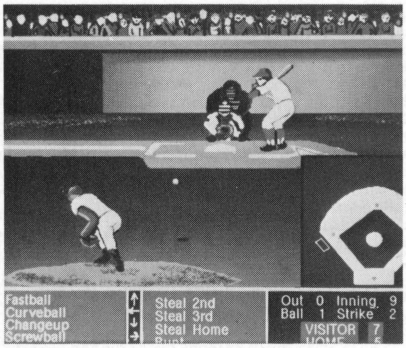
and works in high-speed mode (1200 baud) or low-speed (300 baud). It has an audible dial so you can hear when it makes its connection. Its ease of use and trim size make it a handy peripheral.//

PRICE LIST

ImageWriter II
$595.
Connector cable for printer
$29.95
Color Ribbons
$13.
ImageWriter II SheetFeeder
$225.
32K Memory Option
$99.
UniDisk 3.5
$499.
Apple II Memory Expansion Card
price not available at time of writing
ColorMonitor
$399.
IIc Monitor Stand
$25.
Apple Modem
$399.

NEW PRODUCTS



Hardball

Accolade
20863 Stevens Creek Boulevard
Cupertino, CA 95014
408-446-5757
$34.95 for Apple II version

Hardball is a baseball game that features three-dimensional field perspective, up to six different pitches, manager decisions, and total joystick control. Accolade claims the game offers "stunning graphics, accurate animation, and strategic decision-making."

Note-Us

Computers & Me, LTD.
Ashbrook Road
Exeter, NH 03833-9802
603-772-4399
$99.95

You can use your computer to learn music sight-reading with **Note-Us.** You use an Apple II and a four or more octave MIDI synthesizer keyboard. The computer is used to display the music staff, notes, and instructions to the student, and it signals the student when inaccurate notes are played.

Micro Expert

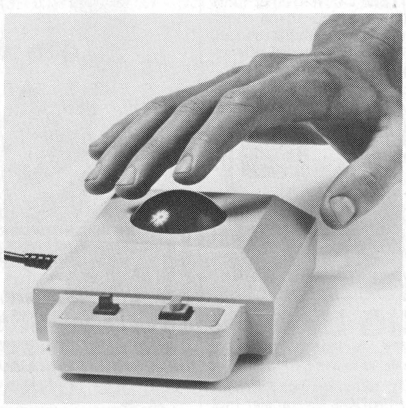
by Beverly and William Thompson
McGraw-Hill Book Co.
PO Box 400
Hightown, NJ 08520
1-800-628-0040 (MasterCard orders)
$49.95

Here is an expert system, a program that can make logical inferences from a database of rules. According to the publisher, this can greatly simplify problem solving in a wide variety of professions.

Sylvia Porter's Personal Financial Planner

Timeworks
444 Lake Cook Rd.
Deerfield, IL 60015
312-948-9200
$99.95

A stranger to no one, Sylvia Porter offers respected financial advice. This product, produced by the editors of Sylvia Porter's *Personal Finance Magazine* (Ms. Porter is editor-in-chief), is the first in a series of integrated financial planning and management programs. The series sets out to find the best plan for life insurance, investments, retirement and so on.



McBall

Interfirm Systems Corp.
110 Pioneer Way, Bldg. H
Mountain View, CA 94041
415-964-4464
$89.95

McBall is a high-performance, low-cost trackball that is directly interchangeable with the Apple Mouse. It works with the Macintosh, Lisa, and IIc directly or with an Apple Mouse interface card in the II, II+, or IIe. The trackball's design allows the physically disadvantaged to input to the computer with ease.

Briefcase Batteries

Computer Coverup, Inc.
1740 North Marshfield
Chicago, IL 60622
1-800-282-2541
$179.00

This is a computer battery pack for the IIc you can fit in your briefcase. They are rechargeable and maintenance-free providing up to six hours of operation time. There's a voltage meter to protect against low voltage shutdown. You get a one-year warranty.

Hacker

Activision
2350 Bayshore Frontage Road
Mountain View, CA 94043
415-960-0410
$39.95

Steve Cartwright's **Hacker** is a modern day computer mystery. A computer malfunction delivers you into the bowels of a private computer system, and provided with no rules and no clues, you must decide how to deal with the unintentional break-in. Activision plans a Hacker contest, open to members of Atari, Apple, and Commodore users' groups. //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It's the first of the new POLARWARE graphics adventures using Comprehend . . . an intelligent full- and multiple-sentence recognition and logic system. Graphics . . . the best you'll find. And now, the vocabulary, understanding, and depth they say can't be put into a graphics adventure.
It is not necessary to play Transylvania before playing The Crimson Crown. Available on Apple and Macintosh computers. Requires 64K.
For information about Crimson Crown and other Penguin software, please write for a free catalog to: Dept. T, P.O. Box 311, Geneva, IL 60134.
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